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- Log in to the website.
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- Select the "Enter answer sheet" link.
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American Society of Plastic Surgeons
In-Service Examination



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This In-Service Examination has been designed to enhance the participant's clinical knowledge base of plastic surgery and serve as a self-assessment tool. Each participant will become updated on the core curriculum of plastic surgery. Upon completion of questions and thoughtful review of individual scores, participants can establish a benchmark for areas of focus needing further concentrated educational efforts. It is expected that completion of this educational activity will assist participants in obtaining better outcomes in practice.

Material released March 2013.

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Section 1: Comprehensive

1. A 56-year-old man with type 1 diabetes mellitus comes to the office because of a foot ulcer over the first metatarsal head without evidence of exposed bone or osteomyelitis. A bioengineered cellular bilayered skin substitute (Apligraf®) is considered for treatment. Which of the following is the primary mechanism of action of this skin substitute to stimulate wound healing in this patient's ulcer?

A) Creation of a moist environment through creation of a barrier

B) Enzymatic degradation of the wound bed

C) Inhibition of growth factor release

D) Integration of the graft and creation of neo-dermis

E) Release of matrix proteins

The correct response is Option E.

Several biologic dressings have been FDA-approved for the treatment of diabetic foot ulcers. Apligraf® (Organogenesis, Inc., Canton, MA) and OrCel® (Ortec International, New York) are bilayered constructs of bovine collagen with human keratinocytes and fibroblasts. Although it appears like normal skin, it does not take like a skin graft, but rather the viable cells in the construct release and stimulate growth factors and matrix proteins to encourage wound healing.

Neo-dermis creation is the primary function of Integra ™ (Integra LifeSciences Corp, Plainsboro NJ) which is an acellular construct composed of collagen and chondroitin-6-sulfate covered with a silicone top layer to prevent evaporative losses. It does not have any active cells or release growth factors or matrix proteins. Enzymatic degradation of a wound bed is not a function of biologic grafts, but is the main function of topical wound treatments like the collagenase Santyl® (Healthpoint Biotherapeutics, Fort Worth TX).

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2. A 35-year-old man undergoes reconstruction of a degloving injury of the palmar surface of the hand. Full-thickness skin grafting from the groin is planned. Which of the following structures of healthy palmar skin will be missing from this graft?

A) Dermal neural mechanoreceptors

B) Dermal sweat ducts and glands

C) Irregular dermal-epidermal border

D) Pilosebaceous structures

E) Sensory and autonomic nerve fibers

The correct response is Option A.

The skin on the palm has specialized, encapsulated nerve endings called Meissner corpuscles in the dermal papillae and Vater-Pacini corpuscles in the deep dermis. These special dermal neural mechanoreceptors are unique to glabrous skin. Skin grafts from nonglabrous donor sites lack this feature and will have poor return of sensibility.

There are a few features that are common between palmar and regular skin. Both contain intraepidermal nerve endings and sweat ducts and glands. Both have an irregular border between the basal layer of the epidermis and dermis, at which juncture are the dermal papillae and epidermal rete ridges. A network of blood vessels and sensory and autonomic nerve fibers in the dermis is shared by all skin.

Palmar skin has deeper papillae and ridges, as the keratin layer is considerably thicker; however, glabrous donor sites for grafting are limited. Finally, pilosebaceous structures are absent in the palm.

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3. A 77-year-old woman undergoes excision of a basal cell carcinoma of the mid cheek. Physical examination shows a 4 × 4-cm circular skin defect with exposed subcutaneous fat. Reconstruction with skin grafting is planned. Use of which of the following is most appropriate to minimize long-term graft contracture?

A) Cultured epidermal autografting

B) Full-thickness skin grafting

C) Split-thickness skin grafting with meshing

D) Split-thickness skin grafting with no meshing

The correct response is Option B.

The defect is a full-thickness skin defect with exposed subcutaneous fat. A local flap or skin grafting are possible reconstructive options. If skin grafting were to be performed, then a full-thickness skin graft would minimize the amount of long-term contracture (secondary contracture). A skin graft can be either split-thickness or full-thickness.

Full-thickness skin grafts contain both the epidermis and the dermis and would have less long-term contracture. Defatting of the skin graft is important in the case of a full-thickness graft to optimize graft "take" in the early postoperative period. Various donor sites are available for skin grafting.

Cultured epidermal autografts (CEAs) are useful when there are limited areas on the body to be used as skin graft donor sites, such as in a massive burn patient. However, CEAs are costly, and the resulting skin is often very thin and fragile. Therefore, judicious use of CEAs is warranted.

Split-thickness grafts can be harvested with a mechanical dermatome or a free hand with a scalpel. Split-thickness skin grafts do not include the entire thickness of the dermis and have less initial contracture at the time of harvest (primary contracture) but are expected to have long-term contracture (secondary contracture). Harvesting with a mechanical dermatome is useful for obtaining split-thickness skin grafts. Typical thicknesses may range from 8/1000 to 14/1000 of an inch. Meshing allows for a broader surface area to be covered by a skin graft but will lead to greater contracture within the open interstices of the graft.

Of note for deeper wounds extending below the superficial musculoaponeurotic system, evaluation of facial motor nerve function and status of the parotid duct may be important considerations.

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4. An otherwise healthy 67-year-old woman with advanced breast cancer is scheduled to undergo mastectomy and immediate reconstruction with a free transverse rectus abdominis musculocutaneous (TRAM) flap. BMI is 35 kg/m^2. Which of the following is most appropriate for deep venous thrombosis prophylaxis?

A) Aspirin and intermittent pneumatic compression stockings

B) Elastic compression stockings only

C) Intermittent pneumatic compression stockings only

D) Low-molecular-weight heparin and intermittent pneumatic compression stockings

E) Positioning and early ambulation

The correct response is Option D.

This patient is at highest risk for deep venous thrombosis and she will require combination therapy of compression stockings and chemical prophylaxis.

Perhaps the most well-regarded set of guidelines in this matter comes from the American College of Chest Physicians. These guidelines provide treatment recommendations based on a patient's risk classification. Caprini model offers a very user-friendly method of calculating patient risk factors and categorizing them into low, moderate, high, and highest risks.

The patient in question has risk factors (age, malignancy, and major surgery) that would put her in the highest risk category. In the highest risk category, prophylaxis will require combination therapy or warfarin.

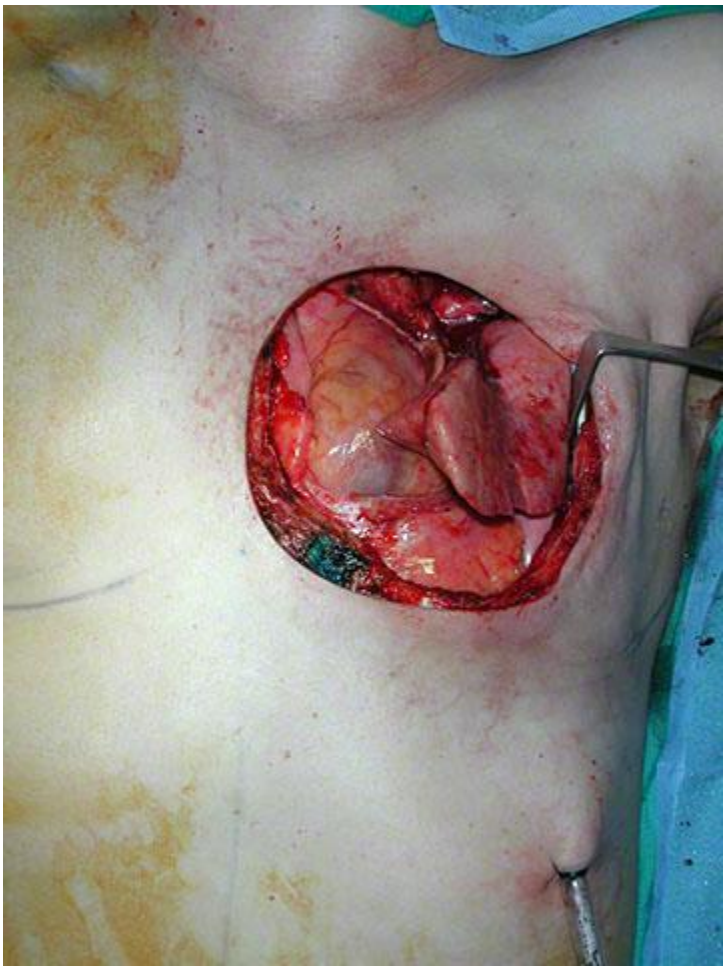
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5. A 48-year-old woman undergoes radical resection of the left breast, left hemisternectomy, four-rib resection, and visceral pleurectomy because of invasive inflammatory breast cancer extending through the thoracic wall into the mediastinum and chest. Examination of specimens obtained from intraoperative frozen section biopsies shows no residual disease. Postoperative adjuvant chemotherapy and radiation therapy to the area are planned. An intraoperative photograph of the 17 × 17-cm defect is shown. Which of the following is the most appropriate technique for soft-tissue reconstruction?

A) Left latissimus muscle flap with skin graft

B) Left rectus muscle turnover flap and skin graft

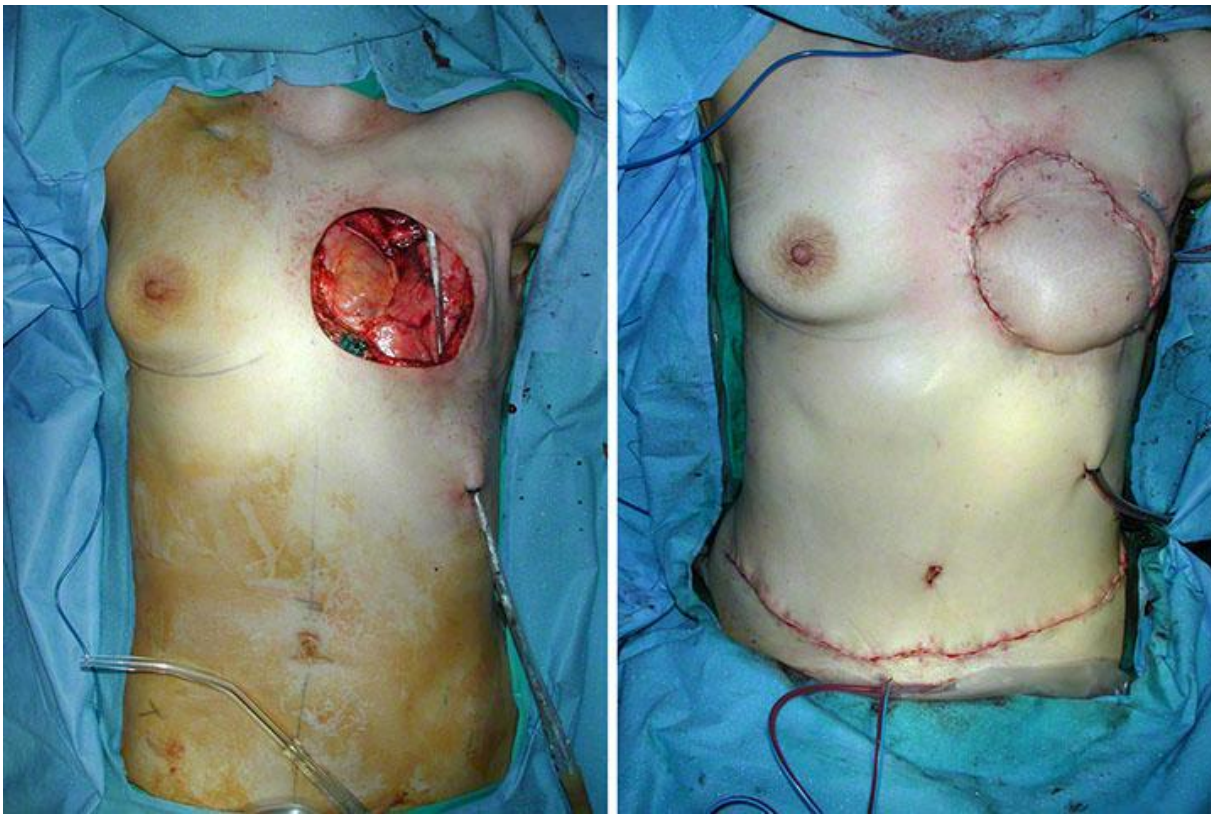
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C) Omental flap and skin graft

D) Reverse abdominoplasty flap

E) Right transverse rectus abdominis musculocutaneous (TRAM) flap

The correct response is Option E.



(Please note that this pictorial appears in color in the online examination)

The most appropriate option for this patient would be a right TRAM flap. The defect encompasses a composite defect of the left side of the sternum, including the left internal mammary artery, four contiguous ribs, and the entire left breast. The question specifically asks for soft-tissue thoracic reconstruction. The analysis of the defect yields a very large soft-tissue requirement. Given this, the most logical choice of flaps to provide this amount of soft tissue on a reliable pedicle would be a right (contralateral) TRAM flap. Furthermore, this flap could also be shaped to provide a breast mound versus all the other choices.

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A left latissimus muscle flap with skin graft is not the optimal choice as it would not provide sufficient soft-tissue coverage with its associated skin paddle without undue donor site morbidity in this particular patient with a large defect that spans parasternal and lateral chest wall. As a muscle-only flap with skin graft, however, it may be considered as a backup option in case of primary flap failure.

An omental flap with skin graft is an option for reconstruction of this defect; however, it would not be the most appropriate option in this case as it would necessitate an otherwise unnecessary intra-abdominal procedure and would not reshape a breast mound. It has been shown, however, to be optimal in contaminated areas due to its associated lymphatic vessels and nodes associated with its pedicle, so in different circumstances, this may be a preferred choice.

A left rectus turnover flap with skin graft would not be a good option for two reasons: the left internal mammary artery has been harvested, thereby compromising the superior epigastric vessel on which this flap would be based; and it would not cover the entirety of the defect.

A reverse abdominoplasty flap would not be able to reach the full superior extent of the defect.

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6. A 64-year-old man is evaluated 2 days after undergoing soft-tissue coverage of an open distal tibia fracture with a free rectus abdominis flap. On examination, the flap appears dark and swollen. Doppler signals are not present. The patient is brought to the operating room for reexploration, and thrombus is noted within the artery and vein. In addition to thrombectomy, which of the following is the most appropriate treatment to salvage this flap?

A) Aspirin

B) Intra-flap heparin

C) Intra-flap tissue plasminogen activator

D) Systemic dextran

E) Systemic urokinase

The correct response is Option C.

The most appropriate treatment in this patient is thrombectomy to restore flow within the artery and vein and administration of intra-flap tissue plasminogen activator (tPA) to dissolve clot formed within the flap.

Systemic urokinase will carry a high risk of bleeding from all surgical sites and is unlikely to dissolve clot in both the arterial and venous systems of the flap. Administration of intra-flap heparin will prevent further clot formation but will not dissolve the clot in the flap pedicle. Systemic dextran following thrombectomy might prevent clot formation and has mild thrombolytic properties, but it is not nearly as effective as tPA in lysing clot within the flap. Aspirin will potentially prevent further clot formation but has no thrombolytic properties and a slow onset of action.

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7. A 50-year-old woman is scheduled to undergo debridement and reconstruction of a Stage IV sacral pressure sore. Which of the following is the most appropriate method of reconstruction?

A) Free tissue transfer

B) Full-thickness skin grafting

C) Inferior gluteus maximus island flap

D) Split-thickness skin grafting

E) V-Y fasciocutaneous flap

The correct response is Option E.

Local flaps in the gluteal region are the first choice for reconstruction of sacral pressure sores. Various designs of gluteal fasciocutaneous and musculocutaneous flaps are commonly used. The gluteal fasciocutaneous V-Y advancement flap is a method that has been preferred for management of these ulcers. Use of this type of flap conserves the gluteus maximus muscle and does not preclude ambulation in a mobile patient. Fasciocutaneous flaps, which are less sensitive to ischemia and more resistant to pressure than muscle flaps, have high mechanical resistance. These flaps are especially useful in wounds of limited depth, as are many in the sacral area.

Traditional wound closure of back defects under tension, with skin (split- or full-thickness) grafts or local random transposition flaps, is a poor choice for the patient with a complicated posterior trunk wound. These treatment options fail because of the poor tissue vascularity and the presence of a significant zone of injury that produced the wound breakdown in the first place.

The majority of the defects encountered in the posterior trunk can be reconstructed with local flaps. In cases of irradiation of the spine, extensive trauma, or significant debridement of surrounding tissue, the patient may be left with poor local solutions for providing vascularized tissue to the wound. In these rare cases, free tissue transfer is used to provide coverage.

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8. An otherwise healthy 5-year-old boy is evaluated because of cyanosis and swelling of the thumb 1 day after he underwent revascularization of the right thumb after a partial amputation injury. Preoperatively, the dorsal skin was intact, and venous anastomosis was not indicated. Which of the following prophylactic antibiotics is most appropriate to administer before initiating leech therapy?

A) Ampicillin

B) Cefazolin

C) Ceftriaxone

D) Ciprofloxacin

E) Doxycycline

The correct response is Option C.

The most appropriate prophylactic antibiotic to initiate in this patient is ceftriaxone. Leech therapy is associated with *Aeromonas* species infections with incidences quoted in the literature from 2.4 to 36.2%. The most common clinical presentation of *Aeromonas* infection in humans is of cellulitis, often with a foul odor, complicated by subcutaneous abscess formation. In severe cases, extensive tissue loss and septicemia have been reported. Of most concern to microsurgeons is the ability of *Aeromonas* to invade the walls of blood vessels with resultant vasculitis, thrombosis, and hemorrhagic necrosis.

Aeromonas species produce beta-lactamase, so penicillins and first-generation cephalosporins, like cefazolin, are ineffective. High levels of resistance to tetracyclines and amoxicillin-clavulanate (Augmentin) have also been observed. These organisms are usually sensitive to second- and third-generation cephalosporins, aminoglycosides, chloramphenicol, fluoroquinolones, and trimethoprim.

The use of fluoroquinolones in children has been limited because of the potential of these agents to induce arthropathy in juvenile animals and to potentiate development of bacterial resistance. Fluoroquinolone use should be restricted to situations in which there is no safe and effective alternative to treat an infection caused by multidrug-resistant bacteria or to provide oral therapy when parenteral therapy is not feasible and no other effective oral agent is available.

Doxycycline is contraindicated in children younger than age 8 years, as it may cause permanent discoloration and altered development of teeth.

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9. A 27-year-old man is brought to the regional burn center 4 hours after he got lost in a snowstorm while he was hiking. Physical examination shows severe frostbite of the feet, purple coloring of the toes, heavy blistering, and marked edema. On Doppler examination, pulses are absent bilaterally. He sustained no other injuries and is otherwise healthy. In addition to warming and pain control, which of the following is the most appropriate next step in the treatment of this patient?

A) Angiography

B) Fasciotomy

C) Hyperbaric oxygen therapy

D) Intravenous administration of heparin

E) Technetium-99 triple-phase scanning

The correct response is Option A.

Frostbite is a common injury to the homeless and outdoor adventurers. Direct injury is caused by extracellular freezing of tissues with significant changes of the osmotic gradient of cells which can cause significant electrolyte imbalances. Many inflammatory mediators, including thromboxanes, prostaglandins, histamine, and bradykinin are released which lead to significant edema, endothelial injury, and tissue damage.

The mainstay of frostbite injuries, regardless of severity, includes rewarming, pain control, administration of tetanus prophylaxis, and frequent dressing changes and wound care. In cases of severe frostbite injuries with absent pulses, emergent angiography and infusion of tissue plasminogen activator (tPA) have been shown to significantly decrease the rate of amputation if administered within 24 hours of the onset of frostbite.

Although fasciotomy might be necessary after reperfusion, it is not indicated as a first-line therapy for frostbite. Likewise, heparin and hyperbaric oxygen have not been shown to improve the outcomes in frostbite injuries.

Technetium-99 triple-phase scanning can accurately estimate the level of eventual amputation required if performed in the first several days, but it is not a therapeutic modality and would delay the angiography and administration of tPA if indicated.

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10. A 35-year-old Asian woman desires dorsal augmentation to achieve a more "Western" nose. Autologous rib cartilage grafting is planned. Which of the following complications is most common with this procedure?

A) Extrusion

B) Infection

C) Pneumothorax

D) Resorption

E) Warping

The correct response is Option E.

The most consistent complication of costal cartilage grafting is the propensity to warp or change shape over time. This may be due to the presence of perichondrium or the nonuniform composition of the matrix that can affect the shape when it is placed.

Although there is a risk of pleural violation and pneumothorax, these complications are uncommon and can be recognized intraoperatively with the Valsalva maneuver. Through the same exposure for harvesting the rib graft, a red rubber catheter is placed in the chest to evacuate intrathoracic air. As long as the visceral pleura remain intact, a thoracostomy tube is unnecessary.

Fresh autologous grafts easily survive transplantation procedures and do not appear to resorb over time.

Autologous cartilage from septum, concha, or rib is considered the ideal graft material. These grafts have very low risk of infection or extrusion compared with an alloplast. Cartilage grafts are tolerated well by nasal tissue.

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11. A 42-year-old man who is a close friend of the on-call plastic surgeon is brought to the emergency department because of a metacarpal fracture. He is being treated by the on-call orthopaedic surgeon. The patient's wife sees the plastic surgeon and asks to view her husband's post-reduction x-ray studies. Which of the following is the most appropriate response?

A) Confirm only that the x-ray study was completed

B) Obtain verbal consent from the patient

C) Review the x-ray studies with the spouse

D) Share the report without showing the x-ray studies

E) View the x-ray studies with the radiologist

The correct response is Option B.

The most appropriate response is to obtain consent from the patient to access his medical record. Confirming that the x-ray studies have been performed, sharing the report, viewing the x-ray studies in person with the radiologist, and reviewing the x-ray studies with the spouse would require accessing the patient's medical record, for which the plastic surgeon has not obtained consent. Doing so would be a violation of the Health Insurance Portability and Accountability Act (HIPAA).

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12. An otherwise healthy 22-lb (10-kg), 2-year-old boy undergoes extirpation of a 5 × 5-cm arteriovenous malformation of the face. To decrease intraoperative blood loss, infusion of which of the following solutions around the lesion is most appropriate?

A) 20 mL of 0.25% bupivacaine with 1:100,000 epinephrine

B) 20 mL of 0.25% bupivacaine with 1:200,000 epinephrine

C) 20 mL of 1.0% lidocaine with 1:100,000 epinephrine

D) 20 mL of 1.0% lidocaine with 1:200,000 epinephrine

E) 20 mL of 1:200,000 epinephrine

The correct response is Option E.

The most appropriate solution to infuse around the lesion to decrease intraoperative blood loss is 20 mL of 1:200,000 epinephrine. Although the maximum dose of subcutaneous epinephrine is unknown in a healthy child, large amounts have been shown to be safe in patients undergoing liposuction. The most conservative estimate for the amount of epinephrine (1:200,000) that can be safely injected in this child is 30 mL (3 mL/kg) every 10 minutes. Because this estimate was used in the past when halothane anesthesia was being administered (halothane lowered the arrhythmogenic threshold to epinephrine), greater volumes could likely be infused because other inhalational anesthetics are now used.

Twenty mL of 1% lidocaine or 0.25% bupivacaine with epinephrine cannot be given to this 22-lb (10-kg) child because it exceeds the maximum dose. The maximum dose of lidocaine with epinephrine that can be administered is 7 mg/kg; because the concentration of 1% lidocaine is 10 mg/mL, only 7 mL of this solution could be injected. The maximum dose of bupivacaine with epinephrine that can be given is 3 mg/kg; because the concentration of 0.25% bupivacaine is 2.5 mg/mL, only 12 mL of this solution could be administered.

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13. A 24-year-old Chinese-American, right-hand-dominant man undergoes cadaveric hand transplantation after traumatic amputation at the right wrist from a machinery accident. The donor is a Hispanic man. Which of the following terms best describes the antigenicity of the transplant?

A) Allograft

B) Autograft

C) Isograft

D) Xenograft

The correct response is Option A.

Any tissue transplantation from another genetically nonidentical human is termed allograft, previously referred to as homograft. As these transplanted tissues are immunologically different from the recipient, they will eventually undergo rejection from the host immune system without immunosuppressive medications. There are many distinct antigens responsible for the rejection process, the most important of which are the major histocompatability complex (MHC) antigens, known as HLA-1 and HLA-2, which reside on the surface of cells.

Autograft implies that the donor tissues come from the same patient – such as the common autologous skin graft.

Isograft comes from a genetically identical donor, namely an identical twin. While such donations are very rare, it is of important historical note that the first human kidney transplantation was performed by Dr. Joseph Murray between identical twin donor and recipient. In this clinical scenario, as one patient is Asian and the other Hispanic, it is clear that the transplant is not an isograft.

Xenograft is a cross-species graft. Porcine skin grafts are commonly used as temporary skin substitutes to promote granulation formation in difficult wound beds.

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14. A 154-lb (70-kg), 54-year-old man is evaluated because of oliguria and malaise 2 days after he underwent subtotal glossectomy with reconstruction with a free radial forearm flap. History includes chronic renal insufficiency (baseline creatinine concentration was 1.8 mg/dL and is now 3.3 mg/dL). After the procedure, administration of aspirin 81 mg by mouth daily and dextran 40 at 20 mL/hr was initiated. Temperature is 99.9°F (37.7°C), heart rate is 88 bpm, respiratory rate is 20/min, and blood pressure is 110/60 mmHg. On examination, the flap is pink and soft. Urine output is 15 mL/hr. Which of the following is the most appropriate management?

A) Administer a 500-mL bolus of Ringer's lactate

B) Administer a diuretic

C) Administer dopamine

D) Discontinue dextran

E) Return to the operating room for neck exploration

The correct response is Option D.

This patient is presenting with an uncommon but major complication of dextran administration, specifically acute renal failure, thought to be caused by either direct toxic effect on the tubules and glomeruli or intraluminal hyperviscosity. Surgeons who employ its use must be aware of this potential side effect as well as other serious side effects such as anaphylaxis, volume overload, pulmonary edema, cerebral edema, and platelet dysfunction. At-risk patients include those with a history of diabetes, renal insufficiency, or vascular disorders. It is recommended to avoid dextran in patients with chronic renal insufficiency for this reason.

This head and neck cancer patient also was on aspirin for anticoagulation. It should be noted that a prospective randomized study of dextran- and aspirin-related complications in 100 patients undergoing microsurgical flap reconstruction for head and neck malignancy demonstrated that aspirin and dextran were actually equally efficacious in preventing flap failure. However, despite this, it was demonstrated that patients on dextran had a 3.9- to 7.2-fold increased relative risk of systemic complications after 48 and 120 hours of dextran infusion, respectively. Given this, aspirin should be used over dextran if anticoagulation is desired.

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A 500-mL bolus of Ringer's lactate would not be warranted because it contains potassium, which would already be elevated in acute-on-chronic renal failure and would exacerbate the hyperkalemia.

Administration of a diuretic would not be warranted in this case because there is no evidence of fluid retention.

Low-dose dopamine is commonly administered to critically ill patients in the belief that it reduces risk of renal failure by increasing renal blood flow. This has never been definitely proven, however, in multiple trials. This patient has chronic renal insufficiency exacerbated by dextran administration. Low-dose dopamine has not been demonstrated to confer any benefit in this clinical scenario.

If a hematoma, arterial insufficiency, or venous congestion were suspected, returning to the operating room would be the next most appropriate step. As this is not the working diagnosis, this would be inappropriate.

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(Please note that this pictorial appears in color in the online examination)

15. An otherwise healthy 50-year-old right-hand-dominant rodeo cowboy is brought to the emergency department immediately after he sustained a roping injury to the nondominant thumb. On examination, the digit is completely separated from the remaining hand, and is cool and pale. The flexor pollicis longus (FPL) tendon is attached to the amputated part, which has been avulsed from its musculotendinous junction. A photograph is shown. Which of the following is the most appropriate operative management?

A) Completion amputation and wound closure

B) Immediate toe-to-thumb transfer

C) Nonvascularized bone grafting and a reverse radial forearm flap

D) Tendon repair into the FPL muscle belly

E) Replantation with vein grafting

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The correct response is Option E.



(Please note that this pictorial appears in color in the online examination)

The most appropriate option for this patient is to perform a replantation with the use of vein grafts to the snuffbox for arterial inflow. Roping injuries are a combination of both an amputation as well as an avulsion, resulting in a significant zone of injury to all structures, but especially to the vessels, which sometimes have up to 4 cm of involvement with bruising of the intima and adventitia and separation of the media from the vessel walls. This zone of injury can result in anastomotic failure and digital demise if not recognized both by the mechanism of injury as well as careful examination of the structures under the operating microscope during attempted repair. Primary anastomosis in these particular injuries is most often not possible; therefore, the use of vein grafts after resection of the involved segment is an optimal strategy. The use of an end-to-side anastomosis into the radial artery at the snuffbox has been described with good success, and would be the preferred choice in this situation.

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A completion amputation of the thumb at this level (just distal to the metacarpophalangeal joint) would sacrifice needed thumb length and compromise ultimate function. As the thumb is reported to be responsible for up to 40% of hand function, this would represent a significant impact to the patient.

It is difficult to repair the FPL tendon once avulsed from the musculotendinous junction, and many authors advocate for FPL resection rather than attempted repair. As the carpometacarpal joint of the thumb is intact, it will afford good range of motion of the thumb in all directions, even if the thumb serves merely as a "post" without ability to flex at the interphalangeal joint.

Nonvascularized iliac crest bone grafting with a reverse radial forearm coverage is a surgical option but would not be the primary option in this acute amputation with an intact amputated part eligible for replantation, nor would it be preferred over staged toe-to-thumb transfer for better restoration of function and appearance.

A toe-to-thumb transfer would be a good option in this patient if the thumb could not be replanted due to extensive distal injury, distal contamination, or loss of the digit during injury. In this particular case, none of those criteria are met.

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16. A 54-year-old man comes to the office because of a lesion on his back that has enlarged gradually for the past 2 years. He says it occasionally expresses white material when he squeezes it. Physical examination shows a mobile, firm, 2 × 1.5-cm nodule with a central opening and white plug on the mid back. No tenderness is noted on palpation. Which of the following is the most appropriate initial step in management?

A) Excision

B) Incision and drainage

C) Punch biopsy

D) Wide local resection

The correct response is Option A.

The patient described has an epidermal inclusion cyst or sebaceous cyst. Cysts can occur anywhere on the body, including the face, back, and chest. These cysts are benign and occur as a result of proliferation of epidermal cells within the dermis. They are usually well circumscribed by a cyst wall made of stratified squamous epithelium. They communicate with the surface through a small opening, which may contain a keratinous plug or blackhead. Epidermal inclusion cysts grow slowly and occasionally can become inflamed and infected. Manual squeezing of the cysts may produce white keratinous material, which is often foul-smelling. Treatment is excision of the cyst in its entirety with care to leave no epithelial remnants in the wound that could develop into a recurrent cyst.

Wide local resection is performed for malignant skin lesions with appropriate negative margins that can be evaluated by frozen-section pathology.

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17. A 37-year-old man is waiting for a facial deceased-donor vascularized composite allotransplant. Which of the following components of a total face transplant is most antigenic?

A) Bone marrow

B) Muscle

C) Nerve

D) Skin

E) Tendon

The correct response is Option D.

Vascularized composite allotransplantation refers to the transplantation of an allograft consisting of heterogeneous cadaveric tissues. It provides a means of restoring structural, functional, and aesthetic form in severely injured patients. The potential for improvements in quality of life must be offset by the need for lifelong immunosuppression in adults with non-life-threatening injuries. The benefits and difficulties of immunosuppressive drugs have been established in solid organ transplantation. Regimens derived from renal transplantation have been successfully applied to composite tissue allografts.

Overall, more than 60 hand/forearm/arm transplantations and 16 face transplantations have been performed in the past 12 years. The overall functional and aesthetic outcome is satisfactory, but side effects and complications related to immunosuppression are challenges hindering progress in this field. The high levels of immunosuppression, skin rejection, nerve regeneration, donor legislation, and the acceptance level need to be addressed to promote growth of this promising new field in transplantation and reconstructive surgery.

Because composite tissue allograft transplantations are not life-saving procedures, much consideration is devoted to the issue of minimizing or withdrawing immunosuppression. When compared with solid organ transplants, composite tissue allografts are histologically heterogeneous, composed of different tissue types (e.g., skin, muscle, bone, bone marrow, lymph nodes, nerve, and tendon) and express different immunogenicity of transplanted elements. The hierarchy of antigenicity of composite tissue allografts was introduced in an experimental model of limb transplantation and showed that skin is the most antigenic tissue, and together with muscle, subcutaneous tissue, and bone (including bone marrow), may generate high immunologic response. The vascularized muscle component of limb allografts may induce a cell-mediated response greater than the skin; however, muscle as a single

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component is less antigenic than skin. Bone represents lower immunogenicity, and cartilage, tendon, and vessels are the least antigenic.

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18. An otherwise healthy 7-year-old boy is brought to the office because of a 4-year history of progressive soft-tissue atrophy of the left forehead with coup de sabre. Examination shows skin atrophy, discoloration, and alopecia at the hairline in the V1 distribution. Which of the following is the most appropriate method to correct the deformity?

A) Forehead contouring with a calcium phosphate ceramic

B) Free tissue transfer

C) Implantation of a custom silicone prosthesis

D) Injection of hyaluronic dermal filler

E) Serial fat grafting

The correct response is Option E.

Parry-Romberg syndrome can be associated with underlying neurologic disease. The symptoms generally first manifest in the first or second decade of life and can involve bone, cartilage, fat, or skin. Free tissue transfer performed once the disease has stabilized has been shown to be a highly satisfactory correction. However, in recent years, fat grafting has become a more utilized option. Although more procedures are required, it can begin in younger patients even if the disease is still active. It also has demonstrated high patient satisfaction.

Hyaluronic acid dermal fillers are not FDA-approved in children and are unlikely to provide long-term correction. Custom prostheses or calcium phosphate ceramics would not reconstruct with like tissue; one would be less likely to have a stable, soft aesthetically pleasing result.

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19. A 54-year-old woman with Stage IIIA right-sided breast cancer is scheduled to undergo right mastectomy and immediate reconstruction with a pedicled transverse rectus abdominis musculocutaneous (TRAM) flap. After induction of anesthesia, upon positioning the patient for surgery, she becomes extremely rigid, and the plastic surgeon is not able to move her arms. Which of the following drugs is most likely responsible?

A) Fentanyl

B) Midazolam

C) Nitrous oxide

D) Propofol

E) Succinylcholine

The correct response is Option A.

Fentanyl is a short-acting, synthetic opioid that is significantly more potent than morphine. Fentanyl generally produces less nausea compared to morphine, but fentanyl may produce marked respiratory depression. An occasional opioid side effect is skeletal muscle rigidity, particularly if large doses are rapidly given. Common offending agents include fentanyl, sufentanil, and alfentanil. Rigidity may occur in the chest wall, abdomen, neck, and extremity. It may be so severe that ventilation is inhibited. Treatment is administration of a neuromuscular blocking agent.

Propofol is a drug used for induction and maintenance of anesthesia, and can be used as a sedative. It is not considered an analgesic so other drugs like opioids are required to manage pain. Side effects include hypotension, apnea, and dystonia. Some patients report euphoria with propofol, which has occasionally led to its illicit use, as well as death.

Midazolam (Versed) is a benzodiazepine that can be used to treat seizures, insomnia, and to produce sedation and amnesia. It has a relatively fast recovery time and high effectiveness. Disadvantages include drug interactions, tolerance, and withdrawal.

Succinylcholine (suxamethonium chloride) is a depolarizing neuromuscular blocker that induces muscle relaxation and acts as a paralytic agent. Side effects include malignant hyperthermia, muscle pain, rhabdomyolysis, hyperkalemia, and cardiac arrhythmias. Patients with burns should not have succinylcholine because it can lead to rapid release of potassium by skeletal muscle that can result in cardiac arrest.

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Nitrous oxide gas is an inhaled anesthetic agent that can be used for general anesthesia. It can cause analgesia, euphoria, derealization, and depersonalization. The major hazards of nitrous oxide are the risk of asphyxiation and the dissociative affect it has on patients. In addition, there can be short-term decreases in mental performance, audiovisual ability, and manual dexterity. Long-term exposure can cause Vitamin B12 (cobalamin) deficiency, numbness, and reproductive side effects (in pregnant women).

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20. An 89-year-old man comes to the office because of a 2-year history of a pigmented lesion of the left cheek. The patient has an extensive history of sun exposure but no history of skin malignancy. On examination, the lesion is flat and light brown with irregular borders, but has no nodularity or ulceration. Examination of a specimen obtained on punch biopsy shows lentigo maligna. Which of the following is the most appropriate treatment?

A) Cryotherapy with liquid nitrogen

B) External beam radiation

C) Laser ablation

D) Resection with 1-cm margins

E) Topical treatment with imiquimod

The correct response is Option D.

Lentigo maligna is melanoma in situ that primarily occurs in elderly patients with a history of extensive sun exposure. It represents 4 to 15% of all melanomas and is slow-growing in a radial phase, but can progress to lentigo maligna melanoma with invasion and metastatic potential.

Surgical resection remains the standard of care for treatment of lentigo maligna. In 1992, the National Institutes of Health Consensus Conference on Melanoma recommended a 5-mm margin for excision of lentigo maligna. However, the use of 5-mm margins has been associated with recurrence rates of 8 to 20%. In 2008, the National Cancer Comprehensive Network released guidelines indicating that 5-mm margins may be inadequate for treatment of lentigo maligna. The use of a staged excision technique has shown that 10-mm margins or greater were required in a majority of patients and resulted in low (1.7%) recurrence rates at 2 years.

Nonsurgical modalities have been investigated in the treatment of this lesion, as they tend to occur in elderly patients who may not be surgical candidates. Nonsurgical treatments are associated with recurrence rates of 20 to 100%, with laser ablation associated with the highest recurrence rates. Topical imiquimod has shown promise, but data is limited, and long-term cure rates are unknown at this point.

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21. A 45-year-old woman comes to the office for consultation regarding mastectomy and immediate breast reconstruction because of recurrent right-sided breast cancer. She underwent breast-conserving therapy and radiation therapy 5 years ago. BMI is 23 kg/m^2. The patient is otherwise healthy, and she does not smoke cigarettes. On examination, the breast is soft with obvious fibrosis. Use of which of the following has the highest risk for reconstructive failure in this patient?

A) Deep inferior epigastric artery perforator (DIEP) flap

B) Free transverse rectus abdominis musculocutaneous (TRAM) flap

C) Latissimus flap with prosthesis

D) Pedicled TRAM flap

E) Tissue expander and prosthesis

The correct response is Option E.

Pre-reconstruction radiation is typically seen in two groups of patients: those who underwent mastectomy without reconstruction followed by radiation therapy, or those who underwent breast-conserving therapy and radiation with recurrence or new cancer. Although these patients may present with a reasonable skin envelope, complication rates associated with tissue expander/prosthesis have been reported as high as 70%, with a 40% rate of failure or conversion to flap. Additionally, aesthetic outcomes in most patients who completed expander/prosthesis reconstruction after previous radiation therapy were deemed good or very good compared with the majority of non-irradiated patients who achieved excellent results. Tissue expander/prosthesis can be considered as an option for patients with a history of previous irradiation who wish to avoid the scars and recovery of flap-type reconstructions; however, they should be counseled of the high risks of complications.

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22. A 37-year-old man comes to the emergency department 4 hours after he sustained a human bite wound to the nondominant hand. Examination shows no erythema, swelling, purulent drainage, lymphangitis, or fever. Exploration of the wound shows no joint or tendon involvement. Debridement and irrigation of the wound is performed. Which of the following is the most appropriate next step in management?

A) Administration of amoxicillin-clavulanate 875/125 mg twice daily

B) Administration of clindamycin 450 mg three times daily

C) Administration of doxycycline 100 mg twice daily

D) Administration of trimethoprim-sulfamethoxazole 1 double-strength tablet twice daily

E) Observation

The correct response is Option A.

A prospective, randomized study has shown that antibiotic prophylaxis is superior to placebo in decreasing infections after human bites that are less than 24 hours old. The most common pathogens in human bite wounds are *S aureus, E corrodens, H influenzae*, and beta lactamase-producing anaerobic bacteria. *Eikenella* species are resistant to clindamycin. Meanwhile, doxycycline and trimethoprim-sulfamethoxazole are not effective against anaerobes. Of the options mentioned, only amoxicillin-clavulanate has good activity against all common oral pathogens.

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23. A 40-year-old woman comes to the office because of fine rhytides and skin discoloration caused by photoaging. Topical application of 0.025% tretinoin is planned. Which of the following best describes the mechanism of action of topical retinoid therapy?

A) Decreased activation of skin appendages resulting in thinning of the stratum corneum

B) Decreased corneocyte cohesion resulting in increased desquamation

C) Increased free radical scavenging activity and synthesis of Types I and III collagen

D) Inhibition of AP-1 transcription factor binding to DNA resulting in diminished protease activity

E) Inhibition of tyrosinase resulting in diminished conversion of dopamine to melanin

The correct response is Option D.

Tretinoin (all-*trans*-retinoic acid; Retin-A) is one of the best long-term topical therapies available for chronically photoaged skin. The mechanism of action of retinoids is regulated through specific nuclear receptors. Ultraviolet (UV) radiation activates a series of phosphokinases that stimulate c-Fos and c-Jun proto-oncogenes and thereby activate AP-1 transcription factor. AP-1 causes activation of metalloproteases such as collagenase, gelatinase, and stromelysin, which then break down collagen. Tretinoin results in a 70% inhibition of AP-1 transcription factor binding to DNA and a significant reduction in protease activity.

Long-term use of tretinoin is associated with improved skin texture, decreased sallowness, a reduction in fine rhytides and actinic keratosis, fading of pigmented macules, and an overall improvement in skin appearance. Histologic effects of tretinoin include increased epidermal and granular layer thickness; elimination of dysplasia, atypia, and microscopic actinic keratoses; uniform dispersion of melanin granules; increased collagen and glycosaminoglycan deposition in the papillary dermis; and diminished dermal elastosis, angiogenesis, and compaction/thinning of the stratum corneum.

Tretinoin side effects include erythema, photosensitivity, and desquamation. Patients are initially started on a low dose with nightly application until tolerance is achieved. Because tretinoin is a photosensitizer, sunscreen use is absolutely imperative. Topical retinoids should be used for a minimum of 3 to 4 months, with the greatest improvement after 1 year of use. Patients who use alpha-hydroxy acids concomitantly with topical retinoids will see a

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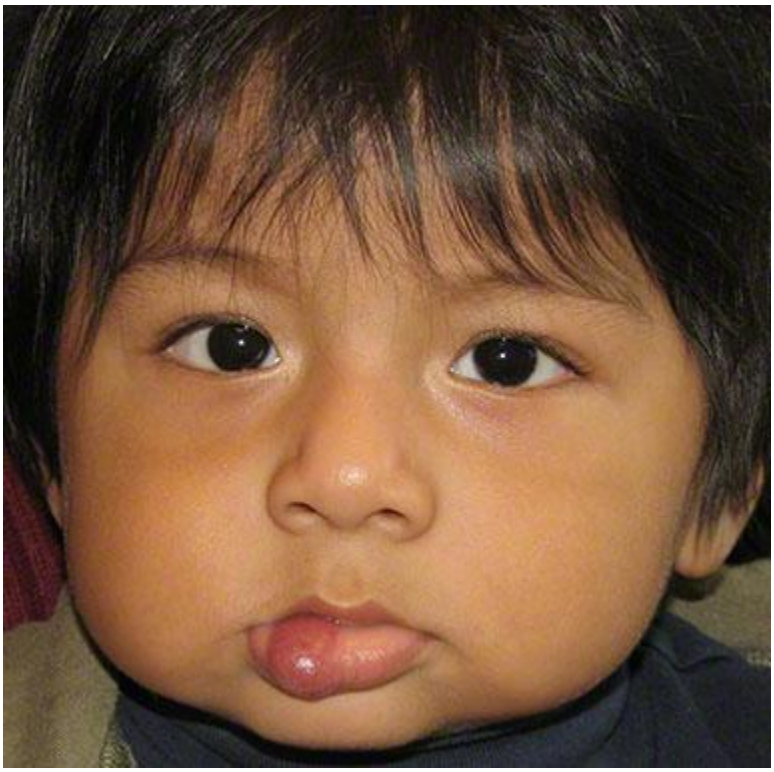
synergistic effect, and this combination is tolerated well in most patients.

Isotretinoin (13-*cis* retinoic acid; Accutane) impairs sebaceous gland activity, impairs epithelialization, and thins the stratum corneum. Alpha-hydroxy acids cause desquamation as a result of diminished corneocyte cohesion just above the granular cell layer. Dermal effects of these acids include increased collagen and glycosaminoglycan production. UV radiation-stimulated oxygen free radicals are the primary mediators of UV skin damage. Vitamin C has been shown to be the primary water-soluble nonenzymatic antioxidant that helps protect skin cells from UV radiation. Other functions of Vitamin C include increased Types I and III collagen production, decreased pigment synthesis, improved epidermal barrier function, and regeneration of oxidized Vitamin E. Hydroquinone impairs the conversion of dopamine to melanin. The result is decreased formation of melanin and increased degradation of melanosomes.

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(Please note that this pictorial appears in color in the online examination)

24. A 2-year-old boy is brought to the office because of an infantile hemangioma of the right lower lip. His parents say that he frequently drools and has difficulty in phonation. On examination, the lesion measures 1 cm in width and distorts the surrounding tissues. A photograph is shown. Which of the following is the most definitive treatment?

A) Bleomycin

B) Oral prednisolone

C) Propranolol

D) Pulsed-dye laser therapy

E) Surgical resection

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The correct response is Option E.



(Please note that this pictorial appears in color in the online examination)

The lip is a favorable area for early surgical intervention for infantile hemangiomas and vascular malformations. The amount of lip tissue that can safely be resected allows for primary closure in the majority of cases. The tumors often distort the local tissues and are "additive" to the amount of available tissue, so resection typically allows for safe linear closure along the vertical resting tension lines. Reconstruction of other facial areas, such as the cheek and eyelids, is usually more complicated, and nonoperative measures may be a better first line of treatment. Surgical treatment is further warranted in this case by the functional impact of the lesion.

Pulsed-dye lasers are effective treatment for thin vascular lesions. Multiple treatments are needed, they can be painful, and some residual scarring is usually left after resolution.

Intralesional bleomycin is another option for local control, though multiple treatments, often with anesthesia, are required.

Propranolol therapy has recently come to the forefront of hemangioma treatment. Oral treatment is preferred at 1 mg/kg three times daily. Dramatic responses are seen within 24

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hours of starting treatment, and significant resolution occurs over a course of weeks. Contraindications may include bronchospasm, significant cardiac abnormalities, or cerebrovascular abnormalities. Pretreatment MRI and pediatric medical management may help determine suitability for treatment. Propranolol is most effective for early lesions that are in a proliferative growth phase. In this case, by 2 years, the lesion is likely done with growth and in a stable to involuting phase.

Oral prednisolone is also effective at treating hemangiomas and is a common treatment option. Hyperglycemia and cushingoid features are temporary drawbacks. Given the symptoms in this case and the relative ease of surgical resection, medical therapies such as steroids and beta blockers would be secondary choices. In asymptomatic patients with minimal disfigurement, observation alone may be the preferred first line of treatment.

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25. An otherwise healthy 14-year-old girl with Poland syndrome is brought to the office because of breast asymmetry and severe symptoms of right macromastia. She wears a size E cup brassiere and needs to fill the left side to attain symmetry in clothes. On examination, she has amazia and an absent sternal head of the pectoralis major muscle on the left side and macromastia of the right breast. Which of the following is the most appropriate reconstructive option for this patient?

A) Left-sided breast reconstruction with a latissimus dorsi flap and right-sided reduction mammaplasty

B) Left-sided breast reconstruction with a latissimus dorsi flap only

C) Placement of a subcutaneous left-sided tissue expander and right-sided reduction mammaplasty

D) No surgery until after puberty

The correct response is Option C.

The most appropriate reconstructive option is to place a subcutaneous expander on the left side and perform a reduction of the right breast. This patient is still going through puberty and has a few years of growth left. However, her breast asymmetry is severe, symptomatic, and negatively impacting her life. Additionally, she has a good social support system with parents who are actively engaged in her well-being. Surgery that can potentially have permanent changes in a person's physical anatomy (e.g., scars), and potentially negative consequences (e.g., inability to breast-feed) must be performed with very detailed and complete informed consent, especially in minors. On the other hand, doing nothing could also lead to potentially negative social, emotional, psychological, and physical consequences. Therefore, if the patient and parents understand the risks and benefits, and are fully informed, surgical treatment is warranted in situations such as the one described.

In this situation, simply placing an expander on the left side and not addressing the symptomatic right breast does not take care of all of her issues. A reduction of the right breast will not only help with her symptoms of breast hypertrophy, but will also enable a more symmetric reconstruction. Using a prosthesis to mimic an E cup breast is not ideal and will not succeed. Reducing the breast to about a C cup will allow the surgeon a realistic chance to reconstruct the left side to mimic the right breast.

The expansion process on the left side would then continue until volume symmetry is attained compared with the right side. Through her growing years, the expansion process could continue. When she stabilizes in terms of her breast growth, the expander can then be

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substituted with a permanent prosthesis. A contralateral further reduction/lift can also be performed as needed. An ipsilateral latissimus muscle flap can also be performed simultaneously to recreate the anterior axillary fold or fill the infraclavicular space if grossly concave.

However, the latissimus muscle flap in and of itself does not have the amount of tissue needed for larger breast reconstructions, as in this case, and needs a simultaneous expander placed under it for that reason.

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26. A 67-year-old Caucasian man comes to the office because of a 3-month history of a lesion on his forehead that he says has enlarged gradually and sometimes bleeds. Examination shows a nontender, soft, flat, purple lesion on the anterior hairline that is 4 cm in its largest dimension. Results of punch biopsy are consistent with angiosarcoma. Which of the following is the most appropriate treatment?

A) High-dose chemotherapy

B) Radiation therapy

C) Vascular embolization

D) Wide local excision

E) Observation only

The correct response is Option D.

The patient has cutaneous angiosarcoma of the scalp that requires wide local excision with reconstruction.

Angiosarcoma is a rare (2% of all soft-tissue sarcomas) but highly aggressive tumor that is most commonly found in the face and scalp in older Caucasian men. Fifty percent of all cutaneous angiosarcomas are found in the head and neck, and they are also commonly found in the breast and extremities, particularly in patients with a history of lymphedema or radiation therapy. It appears initially as a purple plaque which is often confused with a bruise or cellulitis, which can delay diagnosis. It is frequently multifocal, and local recurrences are common, so wide local excision is recommended, frequently combined with radiation therapy. Preoperative serial punch biopsies of the surrounding tissue can help in determining appropriate resection margins. The tumor can microscopically infiltrate normal tissues for some distance away from the obvious tumor, so wide local excision is necessary.

Observation or embolization is not indicated for an aggressive cancer like angiosarcoma. Although radiation is frequently used postoperatively, its role as a neoadjuvant therapy is not well established. There is no current standard of care for chemotherapy in angiosarcoma patients, and most trials of chemotherapy have shown no survival benefit. There may be a role for taxanes in the treatment in metastatic angiosarcoma.

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27. A 60-year-old woman comes to the emergency department because of shortness of breath and right-sided chest pain 2 days after she underwent an uncomplicated abdominoplasty. Heart rate is 100 bpm, respiratory rate is 20/min, blood pressure is 110/60 mmHg, and oxygen saturation is 92% on room air. Chest x-ray study shows no abnormalities. Serum creatinine concentration is 2.5 mg/dL. Which of the following is the most appropriate first step in management?

A) CT angiography

B) Emergency cardiac catheterization

C) Enoxaparin therapy

D) Lower extremity venous Doppler

E) Ventilation/perfusion scanning

The correct response is Option E.

The most appropriate first step in management is to obtain a ventilation/perfusion scan. The patient described presents with the clinical picture of a pulmonary embolus (PE). Normal chest X-ray study rules out an obvious pulmonary process like pneumonia, atelectasis, or pneumothorax. The right-sided strain pattern on electrocardiography points to a PE as well. Vitals are abnormal, but she is hemodynamically stable. CT angiography (CTA) would have been the investigation of choice; however, serum creatinine is abnormally high, which precludes giving her the high doses of contrast dye a CTA would require. Empirically starting her on anticoagulation is another management option, though one has to weigh the risk-benefit of full-anticoagulation therapy so soon after major surgery. However, subcutaneous enoxaparin therapy in a patient with renal insufficiency is not ideal. Instead, systemic heparin therapy would be the agent of choice because it is not dependent on renal excretion, has a much shorter half-life, and its therapy can easily be measured with activated partial thromboplastin time levels. Therefore, it can be titrated more reliably, and its anticoagulation effects can be shut off quickly if the need arises.

A venous Doppler examination of the lower extremities will probably need to be done, but it is not the first step in management. Additionally, it does not diagnose a PE. An emergent cardiac catheterization is not indicated because this is not an acute myocardial ischemic event.

A ventilation/perfusion scan is performed in situations where an angiogram (conventional or CTA) is not indicated or available. It is especially useful in patients with renal insufficiency

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because the perfusion portion does not utilize contrast that could negatively affect the kidneys, but rather uses a radioactive tracer. The ventilation/perfusion scan helps stratify the probability of a patient having a PE, and thus helps the clinician to choose the appropriate way to potentially treat the patient.

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28. A 1-day-old female newborn is evaluated because of repair of a lumbar myelomeningocele. After dural repair, physical examination shows the spinal cord at the base of the wound with a 4 × 4-cm soft-tissue and skin defect. Which of the following is most appropriate to reconstruct the wound?

A) Gluteal muscle flap and skin advancement flap

B) Paraspinous musculofascial flap and skin advancement flap

C) Skin advancement flap only

D) Split-thickness skin grafting

The correct response is Option B.

The most appropriate method to reconstruct the wound is a local musculofascial flap and skin advancement flap. The major principle of myelomeningocele repair is to obtain a well-vascularized layer of soft-tissue coverage between the dural and skin repairs. The fascia overlying the paraspinous muscles can be turned over as flaps, followed by paraspinous muscle advancement flaps to cover the underlying dural repair. This vascularized soft-tissue layer will minimize the risk of cerebrospinal fluid contact with cutaneous bacteria and subsequent meningitis if either the dural repair or skin repair breaks down.

A split-thickness skin graft over the dura would not adequately protect the spinal cord. Closing the skin directly over the dural repair using skin advancement flaps would place the child at risk for meningitis in the event of a cerebrospinal fluid leak or if wound breakdown occurred along the incision line of the widely undermined skin flaps.

The use of a regional gluteal or latissimus muscle flap to cover the dural repair is unnecessary because local tissue (paraspinous muscles and fascia) is available. Harvesting the gluteal or latissimus muscles also may cause significant donor site morbidity in a child already at risk for ambulatory problems from a neurologic deficit.

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29. A 39-year-old woman is evaluated because of a 6-month history of a growth on the face. A biopsy is planned. Which of the following findings on pathology can be safely treated with observation only in this patient?

A) Cylindroma

B) Eccrine poroma

C) Nevus sebaceous

D) Trichoepithelioma

The correct response is Option D.

Trichoepitheliomas are neoplasms of follicular differentiation. Trichoepithelioma usually presents as multiple, yellowish-pink, translucent papules distributed symmetrically on the cheeks, eyelids, and nasolabial area. The lesions are more frequently seen in women. Lesions are benign but can be confused with basal cell carcinomas clinically and histologically. As they are benign, no further measures should be taken. However, in cases of desmoplastic trichoepithelioma, complete excision or Mohs surgery may be needed to clearly differentiate this entity from a carcinoma.

Eccrine poroma occurs as a solitary lesion usually on the sole of the foot or the palm of the hand in persons older than 40 years. It may also occur on the chest, the neck, or other locations. Eccrine poromas are seen as firm papules less than 2 cm in size. Lesions may occasionally be pedunculated and have a normal or erythematous color and a firm consistency. In rare instances, malignant eccrine poroma or porocarcinoma develops either spontaneously or from long-standing benign eccrine poroma. Treatment is surgical excision.

Verrucous nevus consists of closely set verrucous papules that may coalesce to form well-demarcated plaques. They may be skin colored, brown, or gray-brown. A linear configuration is common, especially for lesions on the limb. Such lesions may appear to follow skin tension lines. On histologic evaluation, there is hyperkeratosis, acanthosis, and papillomatosis. The histologic appearance is essentially that of a benign papilloma. Excision is the most reliable treatment. This may not be practical or advisable if the lesion is extensive or at sites not amenable to simple surgery. The excision should extend to the deep dermis; otherwise, the lesion may recur. Alternative treatments have included laser cryotherapy and electrodesiccation dermabrasion.

Cylindroma presents as either solitary or multiple lesions. Nodules may also be present on the face and rarely on the extremities. The lesion appears in adulthood. The surface is smooth and

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may be telangiectatic. Cylindromas are usually benign, but malignant changes have been reported. For solitary lesions, treatment is by excision or electrosurgery. For small cylindromas, the carbon dioxide laser may be used. Multiple cylindromas usually require extensive plastic surgery that may be obviated by progressively excising a group of nodules in multiple procedures.

Nevus sebaceous is a distinctive growth most commonly found on the scalp, followed by the forehead and retroauricular region. A nevus of epithelial and nonepithelial skin components, nevus sebaceous sustains age-related modifications in morphologic appearance. The nevus occurs singly and is asymptomatic. Two thirds are present at birth; the remaining third develop in infancy or early childhood. Male and female infants are equally affected. The three-stage evolution of the nevoid condition (newborn, puberty, and adult) parallels the natural histologic differentiation of normal sebaceous glands. In approximately 20% of patients, a third phase of evolution involves the development of secondary neoplasia in the mass of the nevus. A number of benign and malignant "nevoid tumors" may occur, the most common of which is the basal cell epithelioma. The malignant degenerations are relatively low grade; only a few instances of metastasis have been reported. Surgical excision of a nevus sebaceous is recommended because of the high potential for development of basal cell carcinoma and other tumors. The lesion should preferably be excised before puberty because it may enlarge, and the risk of malignant transformation increases after puberty.

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30. A 23-year-old man is brought to the emergency department 2 hours after a nightclub fire. Oxygen saturation is 98% on 4 L of oxygen via nasal cannula. Marked soot is noted in the pharynx. He sustained burns to less than 1% of the total body surface area. Which of the following is the most appropriate next step in management?

A) Admission to the intensive care unit for monitoring

B) Discharge with follow-up in 3 days

C) Evaluation of the upper airway with bronchoscopy

D) Securing of the airway with endotracheal intubation

E) Tracheostomy

The correct response is Option A.

The most appropriate next step in management is admission to the intensive care unit (ICU) for close monitoring as this patient has significant soot in his airway, which is a sign of inhalation injury. Although endotracheal intubation may become necessary, currently the patient is stable. With access to an ICU and close monitoring, intubation is not necessary for this patient at this time. Bronchoscopy is indicated if the patient requires intubation to assess the extent of injury and manage secretions but is not currently indicated in this patient who is awake and stable. Discharge with close follow-up is not acceptable as this patient may decompensate rapidly due to the delayed onset of inhalation injury. Tracheostomy would only be indicated if the patient required prolonged intubation or if the airway could not be obtained orally.

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31. A 7-year-old boy with a history of anaphylactic reaction to bee stings is brought to the office 45 minutes after epinephrine was mistakenly injected to the tip of the index finger from his automatic injection device. Physical examination of the finger shows swelling, tenderness, and decreased capillary refill. Which of the following is the most appropriate next step in management?

A) Apply a cold compress

B) Apply a warm compress

C) Elevate the extremity

D) Perform a stab incision and saline irrigation

E) Subcutaneously administer an antidote

The correct response is Option C.

The most appropriate next step in management is elevation of the extremity. Elevation facilitates venous return of the infiltrate, decreases swelling, and minimizes the risk of skin necrosis. The vasoconstrictive effects of epinephrine only last for 60 to 90 minutes; much longer ischemia times are necessary to cause skin necrosis. For example, amputated digits may be successfully replanted after 33 hours of warm ischemia time.

The use of warm or cold compresses on an infiltration site is controversial. Heat may theoretically stimulate the evacuation of the infiltrate through vasodilation and increased blood flow. Ice may theoretically limit the inflammatory reaction as well as the diffusion of the infiltrated substance by causing vasoconstriction. However, warm or cold compresses may worsen tissue damage. Heat can cause thermal injury, and ice can cause ischemia from vasoconstriction, resulting in a "second hit" at the extravasation site. A partial-thickness skin injury may be converted to a full-thickness wound.

Although phentolamine, an alpha-adrenergic antagonist, has been used to treat epinephrine infiltrations, the added volume of phentolamine can worsen the injury. Injection of an antidote adds more fluid to the subcutis and may increase the risk of pressure necrosis. In addition, because epinephrine causes vasoconstriction for only 60 to 90 minutes, its effects have usually worn off by the time the extravasation is noted, the patient is evaluated by a physician, the phentolamine is ordered, and the antidote is obtained from the pharmacy.

Saline flush-out, using stab incisions through which saline is flushed, may be helpful for the infiltration of chemotherapeutic agents, but it requires several incisions and would be

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considered after elevation of the extremity.

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(Please note that this pictorial appears in color in the online examination)

32. A 74-year-old woman comes to the office because of a 2-month history of increasing soreness over the left lateral chest wall. History includes bilateral radical mastectomy and adjuvant radiation to the left chest 30 years ago because of left-sided breast cancer. On examination, a small, nonhealing 1 × 2-cm wound is visible in the subaxillary region within an area of dense fibrotic skin. A photograph is shown. Which of the following is the most appropriate next step?

A) Biopsy of the nonhealing wound

B) Coverage with a left latissimus muscle flap and skin grafting

C) Hyperbaric oxygen treatment

D) MRI of the chest wall

E) Oral administration of antibiotics for 7 days

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The correct response is Option A.



(Please note that this pictorial appears in color in the online examination)

This patient's presentation is consistent with late radiation tissue injury (LRTI), which occurs in 5 to 15% of long-term cancer survivors who have received radiation and can occur months to years (even decades) after treatment. It can vary significantly with age, dose, and site of treatment. Characteristics include progressive tissue deterioration secondary to decreased vascularity followed by replacement of normal soft-tissue architecture by dense fibrotic tissue until there is insufficient oxygen delivery to sustain normal function. When LTRI of the chest wall progresses to skin breakdown and ulceration, as has happened in this patient, a biopsy is always required to rule out recurrence of the primary tumor or a radiation-induced squamous cell carcinoma or soft-tissue sarcoma.

Hyperbaric oxygen therapy has been proposed as a treatment modality that can improve tissue quality and prevent tissue breakdown in irradiated areas. While most data on this relate to treatment of osteoradionecrosis of the mandible, there have been some reports of its use on the chest wall after irradiation due to breast cancer. However, the question specifically asks for the most appropriate next step, which would be biopsy rather than hyperbaric oxygen therapy.

The principles of management once malignancy has been ruled out include debridement of necrotic tissues (including ribs) and reconstruction with well-vascularized flaps. In this case, a left latissimus muscle flap and skin graft was used for reconstruction after aggressive debridement. No alloplastic material was placed or thoracic cage reconstruction performed. This is common in these types of patients as excessive fibrosis caused by the radiation to the chest wall prevents loss of respiratory efficiency through paradoxical motion.

CT scan or MRI may be useful in evaluating the size, extent, and nature of the problem, but does not take priority over tissue biopsy.

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The redness that is visualized on the patient's skin in the case is related to post-radiation changes and telangiectasias, which are common in LTRI, and is not infection. Therefore, antibiotics would be unnecessary.

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33. A 48-year-old woman is evaluated because of a unilateral fixed, dilated, and nonresponsive pupil 1 day after she underwent prophylactic mastectomy and immediate reconstruction with a superior gluteal artery perforator free flap. History includes marked postoperative nausea. Multimodal antiemetic prophylaxis therapy was implemented during the procedure. Which of the following is the most likely causal agent of the fixed and dilated pupil?

A) Intravenous dexamethasone

B) Intravenous droperidol

C) Intravenous ondansetron

D) Oral metoclopramide

E) Scopolamine patch

The correct response is Option E.

Postoperative nausea and vomiting (PONV) is a distressing complication of general anesthesia and occurs in 25 to 30% of surgeries. Oftentimes, multimodality treatment is implemented for prophylaxis.

Transdermal scopolamine is a potential long-acting prophylactic antiemetic initially developed to prevent motion sickness but approved in 2001 by the US Food and Drug Administration (FDA) for the prevention of PONV. Scopolamine is a centrally acting anticholinergic agent and is designed as a patch placed behind the ear that will deliver 1.5 mg of scopolamine transdermally at a constant rate over 3 days. It has been shown to be effective in decreasing PONV for up to 24 hours after surgery. Several adverse events can occur including sedation, dry mouth, and blurred vision. In addition, mydriasis, usually ipsilateral to the side of patch application, can occur if direct contamination to the eye occurs from rubbing the eyes after manipulating the patch without hand washing. The diagnosis of scopolamine contamination can be confirmed by placing 0.5 to 1.0% pilocarpine hydrochloride in the affected eye. A dilated pupil from pharmacologic mydriasis will not constrict, whereas a dilated pupil from paralytic mydriasis will constrict. Misdiagnosis can result in an unnecessary and extensive workup for an intracranial etiology.

The other options including dexamethasone, droperidol, metoclopramide, and ondansetron are effective antiemetic agents but have no anticholinergic profile.

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34. A 65-year-old woman undergoes treatment for breast cancer with intravenous doxorubicin through a subcutaneous port on the left side of the chest. The patient complains of severe pain around the port 5 minutes after the treatment is initiated, and the infusion is discontinued. Examination shows marked swelling (8 × 6 cm) and erythema of the skin. Which of the following is the most appropriate next step in management?

A) Flushing of the port with a saline solution

B) Intravenous administration of dexrazoxane

C) Removal of the port

D) Subcutaneous injection of dimethyl sulfoxide

E) Subcutaneous injection of saline solution

The correct response is Option B.

The most appropriate next step in management is to initiate intravenous dexrazoxane. Recent data support the use of this agent in extravasation of anthracyclines (e.g., doxorubicin) as an antidote. It has been shown to decrease the frequency and severity of tissue injury. The mechanism by which dexrazoxane diminishes tissue damage is unknown. However, two mechanisms of action are hypothesized: 1) reduction of oxidative stress due to complexes of metal ions and anthracyclines by chelating metal ions; 2) and blockade of topoisomerase II poisons by catalytic inhibition of topoisomerase II. Patients receive treatment with dexrazoxane 1000 mg/m^2 administered intravenously on days 1 and 2, and 500 mg/m^2 on day 3. The infusion is given in the opposite arm of the extravasation site and is administered as soon as possible and no longer than 6 hours after the extravasation accident.

Flushing the port is not indicated because the port may be malfunctioning and this action could extravasate the flushing agent. Adding more fluid to the area (extravasation of saline from the port, subcutaneous saline injection, etc.) will only add to the pressure on the overlying skin, injuring the skin further. Removal of the port is not indicated until it has been ascertained it is malfunctioning.

Dimethyl sulfoxide (DMSO) is a known treatment option for anthracycline extravasations. However, it is used as a topical agent with or without cortisone, not as a subcutaneous injection. Additionally, it should not be used in patients who are receiving dexrazoxane because it has been shown to decrease the efficacy of the dexrazoxane therapy.

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35. A 55-year-old woman with recurrent rectal cancer comes to the office for preoperative consultation for pelvic exenteration, which will include total vaginal resection and reconstruction with a vertical rectus musculocutaneous flap. Which of the following long-term complications is most likely in this patient?

A) Abdominal hernia

B) Pelvic abscess

C) Rectovaginal fistula

D) Small-bowel obstruction

E) Vaginal stenosis

The correct response is Option E.

Reconstruction of the vagina after oncologic resection can be challenging for plastic surgeons, as restoration of form and function must be considered. Restoration of form is often achievable by a variety of procedures, including the vertical rectus musculocutaneous flap, gracilis musculocutaneous flap, pudendal artery fasciocutaneous flap, skin grafting, and interpositional colonic grafts.

Restoration of functional outcome, however, is controversial. Return of sexual activity across multiple studies shows wide variability from 31 to 100% (53.8% pooled data). A recent survey study found that 50% of responders were sexually active and were able to achieve orgasm after reconstruction. However, a majority of responders reported wishing that they had been given more information on the procedure before surgery.

The most common long-term complication from total reconstruction of the vagina is stenosis with rates reported from 18 to 22%. This requires regular use of obturators for dilatation and this should be clearly discussed with patients preoperatively. Abdominal hernia, rectovaginal fistula, pelvic abscess, and small-bowel obstruction are less common complications.

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36. A 25-year-old man is scheduled to undergo soft-tissue coverage and nerve grafting using a seventh intercostal space nerve graft after he sustained a gunshot wound just above the left clavicle. On preoperative examination, he had difficulty abducting the shoulder, and injury to the brachial plexus was suspected. Between which of the following structures is the thoracic intercostal nerve located?

A) External intercostal and pectoralis major muscles

B) Innermost intercostal and internal intercostal muscles

C) Internal and external intercostal muscles

D) Parietal pleura and transverse thoracis muscle

E) Transverse thoracis innermost intercostal muscles

The correct response is Option B.

Although not commonly used, the thoracic intercostal nerves can provide graft material up to 12 cm in length. Harvest of the intercostal nerve has minimal donor site numbness and can be harvested through an open or endoscopic approach.

The intrinsic chest muscles include (from superficial to deep) the external intercostal, internal intercostal, innermost intercostal, and transverse thoracis muscles. The external intercostal muscle is most active during inspiration. It functions to stiffen the chest wall during descent of the diaphragm to prevent paradoxical collapse of the chest. The other more internal intercostal muscles are weaker and are more involved in expiration.

The intercostal nerve emerges from the spinal cord and immediately splits into a dorsal ramus (that innervates the back) and ventral ramus. The ventral ramus runs between the internal and innermost internal intercostal muscles before crossing over the internal thoracic vessels and penetrating through the intercostal muscles to supply the anterior chest skin.

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37. A 23-year-old woman with no history of surgery undergoes augmentation mammaplasty with administration of nitrous oxide, isoflurane, and propofol. Sixty minutes into the procedure, the nurse anesthetist notifies the surgeon that the patient has increasing end-tidal carbon dioxide concentrations, tachycardia, and severe masseter muscle rigidity. Which of the following is the most appropriate next step in management?

A) Administer intravenous saline

B) Administer a muscle relaxant

C) Stop isoflurane

D) Stop nitrous oxide

E) Stop propofol

The correct response is Option C.

The patient is experiencing signs of early malignant hyperthermia, which is a life-threatening crisis and requires immediate attention. The typical symptoms of malignant hyperthermia are caused by a hypercatabolic state with increased heart rate, increased breathing rate, increased carbon dioxide production, increased oxygen consumption, acidosis, masseter muscle rigidity, and rhabdomyolysis. Very high temperature (110.0°F [43.0°C]) usually presents late. Even if treated properly, death may occur as brain damage, muscle damage, renal failure, and multiple organ failure ensue.

The malignant hyperthermia crisis is a biochemical chain reaction response that is "triggered" by commonly used general anesthetics and the paralyzing agent succinylcholine within the skeletal muscles of susceptible individuals. Volatile gaseous inhalation anesthetics like sevoflurane, desflurane, isoflurane, and halothane can trigger malignant hyperthermia. The exact incidence of malignant hyperthermia is not known. Estimates vary from a frequency of one in 5000 to one in 65,000. Over 80 genetic defects have been associated with malignant hyperthermia. Malignant hyperthermia susceptibility is inherited with an autosomal dominant inheritance pattern. Children and siblings of a patient with malignant hyperthermia susceptibility usually have a 50% chance of inheriting a gene defect for malignant hyperthermia.

The medical antidote is dantrolene. Additional methods include use of a hypothermia blanket (under/over the patient) and cold isotonic saline for intravenous solution.

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38. A 47-year-old man comes to the office because of an asymptomatic lesion of the anterior abdominal wall that has been enlarging gradually for the past 10 years. The lesion has accelerated in growth during the past several months and recently ulcerated. Examination shows a 6-cm, raised, indurated, and irregularly shaped violaceous plaque consisting of firm, irregular nodules. Examination of a specimen obtained on incisional biopsy shows a soft-tissue malignancy arising from mesenchymal cells in the dermis. Which of the following is the most appropriate treatment?

A) Wide local incision and molecular targeted therapy

B) Wide local excision and sentinel node biopsy

C) Wide local excision, molecular targeted therapy, and radiation therapy

D) Wide local excision only

E) Wide local excision, sentinel node biopsy, and chemotherapy

The correct answer is Option C.

The diagnosis of the described lesion is dermatofibrosarcoma protuberans (DFSP). It accounts for less than 0.1% of all malignant neoplasms and approximately 1% of all soft-tissue sarcomas, but is the most common type of cutaneous sarcoma. It is a malignant mesenchymal tumor that arises in the dermis and is characterized by latency in its initial detection, slow infiltrative growth, and local recurrence if not adequately treated. Distant metastasis is rare and generally occurs as a late sequela after repeated local recurrences. DFSP is most commonly found on the trunk followed by the proximal extremities, and rarely in the head and neck. These tumors have irregular shapes, frequent finger-like extensions, and an infiltrating growth pattern extending beyond clinical margins that result in incomplete removal and a propensity for local recurrence. Treatment primarily consists of wide surgical excision to include margins of 2 to 3 cm beyond the clinical tumor border if possible. Mohs micrographic surgery has been used with good outcomes in aesthetically sensitive areas such as the head and neck where tissue sparing is important. Reconstruction with tissue rearrangement or flaps should be performed after negative margins are confirmed. Most recurrences occur within 3 years of the primary excision, and close follow-up is indicated.

Conventional chemotherapy is rarely used. Radiation therapy is used as an adjunct to surgery for close or positive margins in areas where adequate wide resection alone may result in major cosmetic or functional deficits. Molecular targeted therapy such as imatinib mesylate (Gleevec) is indicated for unresectable, recurrent, or metastatic DFSP. Sentinel node biopsy is

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not indicated in the treatment for DFSP.

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(Please note that this pictorial appears in color in the online examination)

39. An 88-year-old woman comes to the office because of the 2-cm pigmented lesion on the vertex of the scalp shown. There is no evidence of cervical or suboccipital lymphadenopathy. Examination of a specimen obtained on punch biopsy shows a Breslow thickness of 2.1 mm, Clark Level IV, two mitotic figures per high-power field, and no evidence of ulceration. Which of the following is the most appropriate management?

A) Excision with 1-cm margins and bilateral cervical lymphadenectomy

B) Excision with 2-cm margins and delayed sentinel lymph node biopsy

C) Excision with 3-cm margins and bilateral cervical lymphadenectomy

D) Preoperative lymphoscintigraphy, excision with 1-cm margins, and immediate sentinel lymph node biopsy

E) Preoperative lymphoscintigraphy, excision with 2-cm margins, and immediate sentinel lymph node biopsy

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The correct response is Option E.



(Please note that this pictorial appears in color in the online examination)

In the patient described with an intermediate thickness tumor (1–4 mm) and clinically negative neck, the most appropriate treatment is wide excision with 2-cm margins (shown) and a concurrent sentinel lymph node biopsy. The defect may be reconstructed with a local flap or skin graft depending on patient and surgeon preference. In Stage I and II melanomas (localized disease T1-4, and no evidence of regional lymphadenopathy, N0), Breslow tumor thickness is the most important predictor of local recurrence, regional/distant metastases, and overall survival.

Current recommended excisional margins are 0.5 to 1.0 cm for melanoma in situ/lentigo

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maligna. For invasive lesions less than 1 mm thick, a 1-cm margin is adequate. Lesions with Breslow thickness of 1 to 2 mm should be resected with a 1- to 2-cm margin, using closer to 2 cm when the anatomical area is more forgiving (scalp/trunk), the thickness approaches 2 mm, or the lesion displays more aggressive histopathologic features, such as ulceration, lymphovascular invasion, tumor regression, or a mitotic index greater than one figure per high-power field. Lesions between 2 to 4 mm are adequately treated with 2-cm margins. Balch, et al., have shown that 2-cm margins are safe for lesions of intermediate thickness with equivalent survival rates, less use of skin grafting, shorter hospital stays, and lower medical costs when compared with more aggressive peripheral margins. When possible, 3-cm margins should be used for tumors greater than 4 mm thick because of their high local recurrence rate (greater than 20%).

Patients with intermediate-thickness melanomas have a 20 to 25% chance of microscopic regional disease. Before the advent of sentinel lymph node biopsy, elective lymphadenectomy (ELD) was advocated for patients with intermediate-thickness melanoma because of a significant improvement in overall survival at 10 years. The primary disadvantage of routine ELD, however, was that approximately 75 to 80% of patients underwent an unnecessary procedure.

The status of the sentinel lymph node is a powerful predictor of survival in melanoma because it identifies (1) those patients with a relatively favorable prognosis requiring no further therapy; and (2) high-risk patients who might benefit from additional surgery (completion lymphadenectomy) and interferon. Current indications for sentinel lymph node biopsy include all of the following: male patients with truncal melanoma less than 0.76 mm thick (9% incidence of nodal metastasis); all patients with melanoma thickness 0.76 to 1.0 mm (5% incidence of nodal metastasis); male patients with “thin” melanomas with aggressive features (Clark Level III or greater, ulcerated, evidence of regression, or axial location; these patients have a 10% risk of metastasis); and all melanomas greater than 1 mm in thickness.

In the scenario described, 1-cm margins would be too narrow. A 3-cm margin is excessive for the lesion described. As noted, elective lymphadenectomy has been replaced with sentinel lymph node biopsy in a clinically negative neck. Finally, sentinel lymph node biopsy should be performed at the time of the primary tumor resection if possible due to variations in the lymphatic drainage that may occur after wide excision, skin grafting, or flap closure.

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40. A 53-year-old ambulatory man comes to the office because of a chronic pressure ulcer of the inferior portion of the left buttock that developed during a prolonged hospitalization 1 year ago. Repeated packing and dressing changes have not been successful in healing. Which of the following is the most appropriate surgical option?

A) Excision of ulcer bursa and primary closure

B) Reconstruction with a posterior thigh fasciocutaneous rotation flap

C) Reconstruction with a superiorly based gluteal musculocutaneous rotation flap

D) Reconstruction with a tensor fasciae latae island rotation flap

E) Reconstruction with a V-Y hamstring musculocutaneous advancement flap

The correct response is Option B.

The best choice for managing an ambulatory patient with a chronic pressure sore is using a posterior thigh fasciocutaneous rotation flap. Fasciocutaneous flaps offer an axial blood supply with durable coverage and minimal potential for a functional deformity. The flap more closely reconstructs the normal anatomic arrangement over bony prominences. Disadvantages include limited bulk for large ulcers that have a significant three-dimensionality.

Musculocutaneous flaps offer excellent blood supply and bulky tissue and can be re-rotated like fasciocutaneous flaps. However, in an ambulatory patient they may cause functional impairment.

The tensor fasciae latae flap is occasionally used to close the ischial ulcer. Unfortunately, the distal aspect of the flap that is used to reach the ischial region is usually too thin to offer adequate padding to be effective. Therefore, this flap is not the best option.

Primary closure is associated with a high recurrence rate. A large dead space is usually present due to the absence of tissue, and the induration of adjacent areas makes them difficult to mobilize for a tension-free closure.

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41. A 25-year-old man is scheduled to undergo reconstruction of a 5 × 5-cm, full-thickness calvarial defect. A titanium/hydroxyapatite cement cranioplasty reconstruction is planned. Which of the following mechanisms best describes the healing process involved?

A) Endochondral ossification

B) Osteochondrosis

C) Osteoconduction

D) Osteogenesis

E) Osteoinduction

The correct response is Option C.

Restoration of craniofacial contour after infection, tumor resection, or trauma can be quite challenging. Autologous bone grafts have long been considered the gold standard due to their high likelihood of osseointegration/healing and low risk of rejection or infection. Autologous bone grafts, however, have several drawbacks, including unpredictable resorption, donor site morbidity, limited availability, prolonged operative times, and difficulty in contouring. As a result, there has been an ongoing search for alternative means of reconstruction with alloplastic material.

The ideal bone substitute should be chemically inert, easily contoured, retain a stable shape over time, strong, resistant to infection or foreign body reaction, inexpensive, and capable of osseointegration and tissue ingrowth. Methylmethacrylate has been used frequently for calvarial reconstruction but suffers several drawbacks, including infection requiring removal of implant, plate fracture, lack of osseointegration, difficulty shaping after polymerization, and necrosis of surrounding tissue due to the exothermic nature of the curing process.

Some of the most promising and well-tolerated alloplastic materials for craniofacial skeletal reconstruction are the calcium phosphate-based compounds. Hydroxyapatite [Ca(PO4)6(OH)2] forms the principal mineral component of bone and constitutes 60% of the calcified human skeleton. Calcium phosphate compounds are bioactive and capable of osteoconduction and osseointegration.

Osseointegration refers to the direct chemical bonding of an alloplast to the bony surface without an intervening fibrous tissue layer. During osteoconduction (creeping substitution), the alloplast acts as a nonviable scaffold for ingrowth of blood vessels and osteoprogenitor cells from the recipient site. Subsequently, the graft/alloplast is resorbed and replaced with

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new bone. This mechanism is also associated with the healing of cortical bone grafts.

Hydroxyapatite cement is a mixture of tetracalcium phosphate and dicalcium phosphate anhydrous which reacts in an aqueous environment to form a paste that can be easily applied and sculpted to fit the surgical defect. Hydroxyapatite cement sets isothermically, so there is no risk of thermal damage to the surrounding tissues. Additional benefits of hydroxyapatite include "off the shelf" ease of use, maintenance of volume over time, lack of radiologic scatter, and low incidence of infection.

Osteoinduction refers to the direct stimulation of mesenchymal cells at the recipient site by bone morphogenetic protein to differentiate into osteoprogenitor cells. This mechanism of action is associated with the healing of cancellous bone grafts and demineralized bone matrix.

Endochondral ossification is the process by which the cartilaginous soft callus covering a fracture is transformed into bone. Osteogenesis is the process by which vascularized bone grafts heal. Viable osteocytes survive the transplantation process and produce new bone at the recipient site. Osteochondrosis refers to a family of ossification disorders in children.

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42. A 60-year-old man with paraplegia who lives in an assisted care facility is evaluated because of a Stage II pressure sore of the right ischium. He spends each day sitting in a wheelchair. He smokes one pack of cigarettes daily. Which of the following is the most appropriate treatment?

A) Coverage with a lumbosacral flap

B) Coverage with a posterior hamstring musculocutaneous flap

C) Coverage with a tensor fasciae latae flap

D) Excision and direct closure

E) Placement of a hydrocolloid dressing

The correct response is Option E.

Stages I and II pressure sores usually can be managed nonsurgically. Stage I pressure sores are non-blanchable erythema of intact skin and usually resolve after 1 hour. Stage II is partial-thickness skin loss presenting clinically as a blister, abrasion, or shallow crater. Stage III pressure sores are full-thickness tissue loss down to, but not through, fascia. Stage IV pressure sores are full-thickness loss with involvement of underlying muscle, bone, tendon, ligament, or joint capsule.

A tensor fasciae latae flap would usually be the flap of choice for a Stage III or IV trochanteric pressure sore.

A lumbosacral flap would usually be used for a Stage III or IV sacral decubitus ulcer.

With reported recurrence rates up to 82%, cessation of smoking would be recommended before operating on a Stage III or IV pressure ulcer. Unless predisposing factors can be controlled, there is no reason to provide treatment to a clean Stage III or IV decubitus ulcer.

Excision and closure has a high failure rate and would not be indicated for a Stage II pressure sore.

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43. A 32-year-old woman is scheduled to undergo subtotal reconstruction of the vagina using a pedicled deep inferior epigastric artery perforator flap after tumor ablation. Which of the following is the most likely advantage of using this type of flap coverage rather than the pudendal thigh (Singapore) flap?

A) Better maintenance of sensory innervation

B) Less vaginal bulkiness

C) Less vaginal hair growth

D) More optimal mucus secretion

E) Single-staged procedure

The correction response is Option C.

Vaginal reconstruction for congenital vaginal agenesis or after tumor resection remains a challenging reconstructive endeavor. The ideal technique provides a vaginal canal with adequate dimensions, texture, appearance, and sexual function without excessive donor site morbidity.

The deep inferior epigastric artery perforator flap as a local regional flap has been described recently for vaginal reconstruction. It is a non-hair-bearing flap that is performed in a single stage but is insensate. Depending on the patient's body habitus, it is less bulky than the musculocutaneous flaps (gracilis, vertical rectus) used for vaginal reconstruction, but more bulky than the Singapore flap. Two perforators are included in the flap to ensure viability. The major disadvantage is a conspicuous donor site scar.

The pudendal thigh flap, commonly referred to as the Singapore flap, is a local fasciocutaneous flap that has been widely used for neovaginal reconstruction. It is a thin, sensate flap based on the posterior labial arteries, which are a continuation of the perineal artery. Modifications of the flap have been described to enhance the viability and reach of the flap. It is a reliable, single-staged operation, but can result in endovaginal hair growth. This can be improved with preoperative electric or laser depilation of the vulvar portion of the flap.

Neither flap secretes mucus. Both are single-staged operations.

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44. A 165-lb (75-kg), 40-year-old man is brought to the emergency department 3 hours after sustaining first-degree burns to the hands and second- and third-degree burns to the entire anterior thorax and both anterior and posterior lower extremities. According to the Parkland formula, administration of which of the following is the most appropriate method of initial fluid resuscitation in this patient?

A) Hypertonic saline solution 253 mL/hr for 5 hours

B) Hypertonic saline solution 1181 mL/hr for 8 hours

C) Ringer's lactate 506 mL/hr for 24 hours

D) Ringer's lactate 1013 mL/hr for 8 hours

E) Ringer's lactate 1620 mL/hr for 5 hours

The correct response is Option E.

Massive injury and burns result in a systemic inflammatory response with resultant leakage of fluid into the interstitial space. Large fluid shifts can decrease perfusion to vital organs and inadequate resuscitation will result in acidosis, oliguria, and relative polycythemia. Fluid replacement is based on the observation that intravascular fluid loss into the interstitium is relatively constant during the first post-injury day. All fluid, therefore, is administered at a constant rate to avoid excessive interstitial edema. Patients are monitored for an adequate clinical response by measurement of hourly urine output (0.5–1 mL/kg/hr for adults) with adjustments as needed. Invasive monitoring may be necessary in elderly patients, patients with cardiac dysfunction, or patients with severe pulmonary injury.

A variety of fluid resuscitation formulas are available to guide the initial management of fluid replacement. The Parkland formula and its variations have become the standard methods for resuscitation. Isotonic crystalloid, Ringer's lactate in particular (sodium concentration of 130 mEq/L) is the fluid of choice. The Parkland formula directs the resuscitation as follows: 4 mL of fluid × patient weight in kilograms × total body surface area (TBSA) percentage of second- and third-degree burns. Half of this total volume is delivered in the first 8 hours and the second half over the ensuing 16 hours. In a delayed presentation (3 hours in this clinical example), half of the total volume must be delivered within the 8-hour window (remaining 5 hours in this example).

The TBSA is calculated using the "Rule of Nines," as follows:

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Head/Neck = 9%
Each upper extremity = 9%
Anterior thorax = 18%
Posterior thorax = 18%
Each lower extremity = 18%
Groin = 1%

In this patient example, the TBSA of burn is 54%: Anterior thorax (18%) + each lower extremity (18% + 18%). The Parkland formula considers only second- and third-degree burns for calculation of resuscitation volume; therefore, the first-degree burns in this case are ignored.

In this clinical example, 4 mL × 75 kg × 54% TBSA = 16,200 mL total fluid over 24 hours. The patient will require 8100 mL in the first 8 hours and 8100 mL over the ensuing 16 hours. Because the patient presented 3 hours post burn, he will require 8100 mL over the next 5 hours which gives an hourly rate of 1620 mL/hr.

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45. A 9-year-old girl is evaluated for scar revision after sustaining a laceration of the left cheek that was repaired in the emergency department 2 years ago. Examination shows a 4 × 0.7-cm scar that is pale, flat, and wide in appearance. It has an oblique orientation between the oral commissure and zygomatic arch. W-plasty is considered. Which of the following is the most likely outcome of the W-plasty when compared with linear closure in this patient?

A) Decreased initial wound tension

B) Decreased procedural time

C) Increased contracture of the wound

D) Increased removal of healthy tissue

The correct response is Option D.

The W-plasty was first described by Borges in 1953. The repair involves a regular pattern of interdigitating triangular advancement flaps. This repair allows for the scar to have an accordion-like effect secondary to the broken line configuration. The W-plasty and geometric broken line closure (GBLC) techniques are commonly used for scar revisions and are best indicated for scars that cross the relaxed skin tension lines (RSTL) to redirect portions of the scar. Because of the flexibility these scars have, they are also indicated over convex or concave surfaces.

Compared with linear closure, the W-plasty will have decreased contracture of the wound because of the interrupted orientation of the scar. Even though a portion of the final closure will go against the RSTLs, W-plasties can be designed to orient a significant portion along the RSTLs. Because of the many triangular flaps made and repaired, it takes significantly longer to perform a W-plasty repair. The main disadvantage of the W-plasty and GBLC procedures is the need to remove a significant amount of healthy tissue on either side of the scar to be revised, which can lead to increased wound tension and the need for significant undermining.

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46. A 55-year-old man who is a commercial fisherman comes to the office because of a 3-week history of a swollen index finger. The patient holds the finger in a flexed position. Extension of the digit is difficult but not painful. Surgical exploration shows nonpurulent fluid in the tendon sheath. Culture of the fluid is most likely to show which of the following pathogens?

A) *Eikenella corrodens*

B) *Mycobacterium marinum*

C) *Sporothrix schenckii*

D) *Staphylococcus aureus*

E) *Vibrio vulnificus*

The correct response is Option B.

The patient described has an occupation that exposes him to contaminated water and raw seafood. Infections from *Mycobacterium marinum* and *Vibrio vulnificus* are both possible.

Mycobacterium marinum is the most common atypical mycobacterium seen in hand infections, often seen after penetration by aquatic equipment, colonized marine life, or contact with contaminated water. The most common deep infection is flexor tenosynovitis, and may present as a chronic tenosynovitis.

Sporothrix schenckii is a fungus found in plants and soil. Inoculation with the pathogen results in a papule at the entry site, followed by development of lesions along the lymphatic chain.

Suppurative flexor tenosynovitis typically presents with pain over the tendon sheath, semiflexed position of the involved digit, pain on passive extension, and symmetrical swelling of the finger. This classic presentation is commonly caused by pathogens such as *Staphylococcus aureus* or *Eikenella corrodens* (often seen in association with human bite injuries). In tenosynovitis infections involving atypical mycobacterium, however, there is absence of pain.

Vibrio vulnificus is a species of gram-negative, motile, curved bacterium found in the coastal waters of the United States. Infections from *V vulnificus* may be caused by direct exposure of an open wound to warm seawater containing the organism or from handling raw seafood or marine wildlife. Infections caused by *V vulnificus* result in painful cellulitis that progresses

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rapidly and presents with marked local tissue swelling with hemorrhagic bullae. Bacteremia with systemic symptoms is commonly seen.

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47. A 27-year-old woman is scheduled to undergo female-to-male transgender surgery. A fasciocutaneous radial forearm flap is designed to construct the phallus. This procedure includes neurorrhaphy of the lateral antebrachial cutaneous nerve to a terminal branch of which of the following?

A) Genitofemoral nerve

B) Iliohypogastric nerve

C) Ilioinguinal nerve

D) Posterior femoral cutaneous nerve

E) Pudendal nerve

The correct response is Option E.

In women, the pudendal nerve terminates in the dorsal nerve of the clitoris, which is responsible for most erogenous sensation. Neurorrhaphy to this nerve has been shown to result in superior sensory outcomes in phalloplasty. The dorsal nerve of the clitoris is analogous to the dorsal nerve of the penis, which is used as a target for neurorrhaphy during penile reconstruction for amputation or congenital microphallus. Other branches of the pudendal nerve include the inferior rectal and perineal nerves. The ilioinguinal nerve supplies sensation to the skin of the upper medial thigh and to the skin of the mons pubis and labia majora. The genitofemoral nerve also provides sensation to the labia majora and skin of the femoral triangle. The posterior femoral cutaneous nerve innervates the skin of the posterior surface of the thigh as well as part of the perineum. The iliohypogastric nerve innervates the skin above the pubis and in the gluteal region.

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(Please note that this pictorial appears in color in the online examination)

48. A 47-year-old man with hypertension and ulcerative colitis comes to the office because of a painful lesion of the right lower leg. He says that he dropped a typewriter on his leg 1 year ago and noticed a small wound that slowly began to grow larger despite treatment with bandages and topical antibacterial ointment. Examination of a specimen obtained on incisional biopsy shows neutrophilic dermatosis. Cultures grow *Staphylococcus aureus*. Which of the following is the most likely diagnosis?

A) Leishmaniasis

B) Marjolin ulcer

C) Necrotizing fasciitis

D) Pyoderma gangrenosum

E) Scleroderma

The correct response is Option D.

The patient has pyoderma gangrenosum, which is often associated with ulcerative colitis,

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Crohn disease, or rheumatoid arthritis. The lesion may begin as a small erythematous plaque or have purplish discoloration, and it commonly occurs on the lower extremities after minor trauma. The lesions may rapidly become painful and appear as a necrotizing ulcer. The exact cause of pyoderma gangrenosum is not entirely understood. It is believed the disease is immune-related, such that initial treatments may be primarily medical, including systemic steroids or immunosuppression. Generally speaking, surgery is reserved as a last resort as it is believed that further surgery may exacerbate the condition. Furthermore, recurrent, ulcerative lesions after surgery are not uncommon.

Marjolin ulcer is typically a squamous cell carcinoma arising from a long-standing wound, chronically inflamed tissue, or previous burn scar. The latency period may range from 5 to 30 years from the time of initial injury before developing into a Marjolin ulcer. Treatment generally involves radical resection, as Marjolin ulcers tend to be aggressive.

Leishmaniasis is a disease caused by a protozoan parasite (*Leishmania*), which is typically transmitted by the bite of a sand fly. In the area of the bite, patients develop ulcerations of the skin. Diagnosis can be made by obtaining a history of an insect bite, a history of travel and exposure to where sand flies reside (Central America, South America, West Asia, or the Middle East), and by obtaining scrapings from the ulcers and looking for the organisms under the microscope.

Scleroderma is a chronic autoimmune disease that is characterized by fibrosis of the skin. The underlying cause is not entirely understood. Patients may present with skin ulcers. Scleroderma may be categorized as systemic or limited. Patients with limited disease may present with Raynaud phenomenon as an early sign. The hands and fingers may be affected with distal tip ulceration and thin, taut skin over joints. Patients with systemic disease may have additional manifestations including gastrointestinal, pulmonary, renal, and cardiac fibrosis.

Necrotizing fasciitis is a rapidly spreading soft-tissue infection involving the skin and subcutaneous tissues. It typically travels along fascial planes and can result in tissue necrosis, sepsis, and death. It can be mono- or polymicrobial, with typical offending pathogens including Group A *Streptococcus*, *Staphylococcus aureus*, *Bacteroides fragilis*, and *Clostridium*. Treatment includes high-dose intravenous antibiotic therapy and timely surgical debridement. Patients may require repeat debridement frequently in the early stages of treatment to limit progression of the disease.

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49. During a procedure with general anesthesia, a 26-year-old male intern is told that the patient in the operating room next door has a very interesting tattoo on her lower abdomen. He takes a picture of the tattoo with his cell phone. This action is a violation of which of the following health care regulations?

A) Consolidated Omnibus Budget Reconciliation Act

B) Emergency Medical Treatment and Active Labor Act

C) Health Insurance Portability and Accountability Act

D) National Health Security Strategy

E) Patient Protection and Affordable Care Act

The correct response is Option C.

The Health Insurance Portability and Accountability Act of 1996 (HIPAA) was enacted by the US Congress in 1996. Title I of HIPAA protects health insurance coverage for workers and their families when they change or lose their jobs. Title II of HIPAA, known as the Administrative Simplification (AS) provisions, requires the establishment of national standards for electronic health care transactions and national identifiers for providers, health insurance plans, and employers. The AS provisions also address the security and privacy of health data. They allow the protection of individuals' health information, while also allowing communication between parties involved with patient care. The privacy rule outlines six permitted disclosures of individual health information including the following: per request of the patient, for treatment or payment, to individuals identified by the patient, incidental disclosure, limited data set with removal of individual identifiers, and public interest such as organ donation. Identifiable health information is treated as patient property.

Portable media devices and smartphones also have the ability to store data. Digital pictures and videos taken by cell phones are commonplace, and technology exists that can directly download to the Internet. Breach in HIPAA compliance from this new technology is viewed with increasing scrutiny, especially when patient features are identifiable. In addition, personal digital assistants (PDAs), cell phones, or other devices with appropriate patient lists, properly consented pictures, or other data should be password-protected and data properly disposed, destroyed, or used. Computer hard drives must be demagnetized, overwritten, and/or physically destroyed when disposed.

The Emergency Medical Treatment and Active Labor Act (EMTALA) is a US Act of Congress passed in 1986 as part of the Consolidated Omnibus Budget Reconciliation Act

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(COBRA). It requires hospitals to provide care to anyone needing emergency health care treatment regardless of citizenship, legal status, or ability to pay.

The Consolidated Omnibus Budget Reconciliation Act of 1985 (or COBRA) is a law passed by the US Congress that mandates an insurance program giving some employees the ability to continue health insurance coverage after leaving employment.

The National Health Security Strategy (NHSS) is a strategic plan developed by the US Department of Health and Human Services that is intended to minimize the health consequences associated with significant health incidents. The NHSS is a provision of the Pandemic and All Hazards Preparedness Act (PAHPA). The purpose of the NHSS is to ensure that the nation is prepared for health threats or incidents.

The Patient Protection and Affordable Care Act (PPACA) is a US federal statute signed into law in 2010. PPACA reforms certain aspects of the private health insurance industry and public health insurance programs, increases insurance coverage of pre-existing conditions, and expands access to insurance to over 30 million Americans.

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50. A 75-year-old woman undergoes rhytidectomy for facial rejuvenation. When compared with the skin of a 20-year-old woman, this patient's results are most likely to show an increase in which of the following?

A) Amount of glycosaminoglycan ground substance

B) Flattening of the dermal-epidermal junction

C) Fraction of Type III collagen

D) Number of keratinizing cells

E) Number of Langerhans cells

The correct response is Option B.

Aging skin can be identified histologically by an increase in the flattening of the dermal-epidermal junction. This results in a decreased area of contact between these two surfaces and predisposes older individuals to separation at this junction. The number of Langerhans cells, fraction of Type III collagen, and amount of glycosaminoglycan ground substance are all decreased with chronological aging. Other changes include disorganization of the major extracellular matrix components, such as collagen and other elastic fibers. The number of available keratinizing cells is also decreased with aging. It is hypothesized that this contributes to the problems associated with increased dry skin in the elderly.

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Section 2: Hand and Lower Extremity

1. A 25-year-old man is scheduled to undergo muscle transfer with the gracilis muscle to restore finger flexion. To optimize function, the muscle should be inset under which of the following?

A) Less tension than it was in the leg

B) The same tension as it was in the leg

C) More tension than it was in the leg

D) No tension

The correct response is Option B.

Functional muscle transfers are a way to restore motion that has been lost. The gracilis muscle is a common option for this kind of transfer. To optimize the outcome, the muscle should be inset at the same tension it was under in the leg.

The physiologic basis for this technique is that muscle fibers function best at a particular length/tension relationship. Muscles are typically under ideal tension in their donor position. When transferred, a muscle can be placed under too much or too little tension. If a muscle is overstretched, there is little overlap of the actin and myosin units, and the contractile force is weak. If the muscle is under too little tension, the actin and myosin units aren't able to achieve maximal contraction. Insetting a muscle under no tension produces the same result as insetting it under less tension.

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2. A 35-year-old handyman comes to the office for follow-up 12 days after he underwent repair of the flexor digitorum profundus and superficialis (FDP and FDS) tendons of the little finger of the nondominant hand because of a knife injury. Early active motion was initiated during occupational therapy with sudden loss of flexion of distal and proximal joints yesterday. Which of the following is the most appropriate treatment?

A) Delay treatment for 10 weeks, then place a silicone rod

B) Discontinue occupational therapy for 2 weeks, then resume with a Duran passive protocol

C) Fuse the proximal and distal joints of the little finger

D) Repair the FDS and FDP tendons

E) Transfer the FDS tendon of the ring finger to the FDP of the little finger

The correct response is Option D.

Tendon rupture can occur early or late, up to 6 to 7 weeks, with days 7 to 10 being most common. Reoperation with repair of the previously repaired tendons will yield results similar to primary repair. Therefore, discontinuation of therapy and rod placement are incorrect. Repair should be undertaken before 2 weeks due to tendon shortening.

Repair of both tendons will retain independent finger motion with greater power and decreased chance of proximal interphalangeal joint hyperextension. There will also be a better bed for FDP gliding. Therefore, flexor digitorum superficialis transfer is incorrect. Arthrodesis is reserved for failed treatment.

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3. A full-term male newborn is evaluated because of Blauth Type IV (pouce flottant) thumb hypoplasia. Physical examination shows no other abnormalities. A pollicization procedure is planned. At which of the following ages is it most appropriate to perform this procedure?

A) 1 Month

B) 1 Year

C) 5 Years

D) 10 Years

E) 15 Years

The correct response is Option B.

Pollicization for thumb hypoplasia Types IIIB and IV, and for aplasia, has been successful when performed when the patient is between 3 months and 3 years of age.

Most surgeons will prefer to do pollicization procedures when the patient is between 6 and 12 months of age because there is a more natural integration and adaptation process in using the pollicized digit as a thumb while the child becomes more involved with manual activities. Nevertheless, the outcome also depends on the quality of the anatomical structures of the pollicized digit.

Technically, the procedure can be done at any time; however, at less than 3 months of age, the child's cardiopulmonary maturation may be incomplete. Also, the child becomes aware of the thumb after the age of 3 months, so performing the procedure earlier than this age only raises the degree of technical difficulty because of the minute size of structures and potential circulatory issues, without any further advantage.

The older the child is at the time of the procedure, the more difficult it becomes to change the patterns of pinch and prehension that have already begun in the first 3 years of life. Fine coordination is achieved at 3 years of age. Reorganization of cortical representation of the index finger as a thumb is a slower and incomplete process in older children or adults. Exposure of the new configuration of the hand to the process of neuromuscular growth of the child is a key consideration.

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4. A 63-year-old right-hand-dominant woman with rheumatoid arthritis comes to the office because of a progressive deformity of the long finger of the left hand characterized by proximal interphalangeal (PIP) joint hyperextension and distal interphalangeal (DIP) joint flexion. Examination shows limited PIP joint flexion in all metacarpophalangeal (MCP) joint positions. Which of the following is the most appropriate management?

A) DIP joint arthrodesis with a small-caliber cannulated screw

B) Figure-of-eight splinting for 6 to 8 weeks

C) PIP joint arthrodesis and MCP joint intrinsic release

D) Transection of the terminal tendon

E) Translocation of the lateral bands and dorsal PIP joint capsulectomy

The correct response is Option E.

Rheumatoid arthritis is a chronic, systemic inflammatory disorder that principally affects synovial joints. Finger deformities resulting from rheumatoid arthritis are often disabling and aesthetically unsatisfactory. The swan-neck deformity consists of PIP joint hyperextension and DIP joint flexion. Classification of swan-neck deformities is based on PIP joint mobility and radiographic changes. Nalebuff described four types:

Type I Flexible PIP joint deformity, regardless of MCP joint position
Type II Limited PIP joint flexion with the MCP extended because of intrinsic tightness
Type III Limited PIP joint flexion in all MCP joint positions because of a fixed dorsal position of the lateral bands
Type IV PIP joint destruction

Management depends on the extent of the PIP joint deformity. Type I swan-neck deformities generally respond to figure-of-eight splinting. DIP arthrodesis can be considered for swan-neck deformity resulting from a mallet. Type II swan-neck deformities may be managed by a figure-of-eight splint or by an intrinsic release if the intrinsics are tight without MCP joint subluxation or degeneration. Type III swan-neck deformities are treated with translocation of the lateral bands, PIP joint capsulectomy and collateral ligament release. Type IV swan-neck deformities are treated with PIP joint arthrodesis or PIP joint silicone arthroplasty.

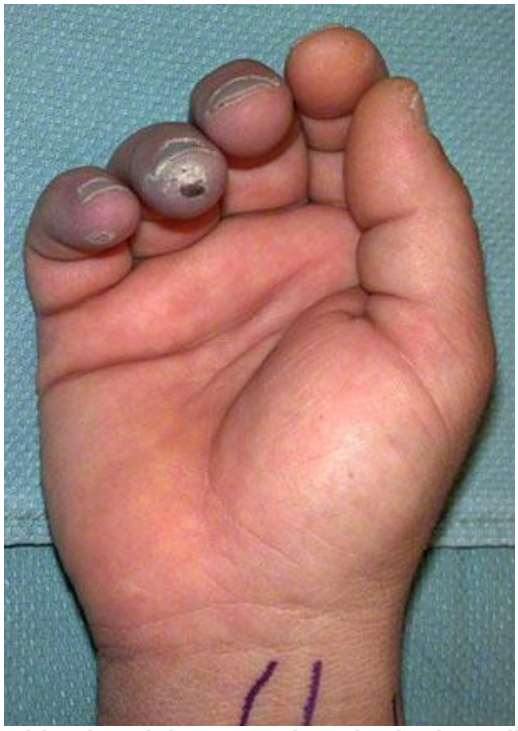
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5. A 46-year-old automobile mechanic comes to the office because of a 3-week history of localized pain in the fingers of the dominant right hand. He does not smoke cigarettes. He says the pain occurs intermittently and that he has no symptoms anywhere else in the body. Examination shows scattered, punctate, dark petechiae at the tips of the ring and little fingers. Rubor progressing from the distal interphalangeal joints to the tips of the ring and little fingers is noted. An additional bounding pulse is palpable in the proximal ulnar palm. Radial and ulnar pulses at the wrist are normal. Digital Allen tests show decreased flow at the ring and little fingers and the ulnar aspect of the long finger. Plain x-ray studies show no abnormalities. A photograph is shown. Which of the following is the most likely diagnosis?

A) Buerger disease

B) Congenital vasospastic disease

C) Distal embolization from the heart

D) Hypothenar hammer syndrome

E) Raynaud disease

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The correct response is Option D.



This is a classic presentation for the patient who develops an ulnar artery aneurysm at Guyon canal. The aneurysm typically is the source of small emboli that tend to affect vessels at the ulnar aspect of the hand and fingers. The emboli cause decreased flow, cold sensitivity, ischemic pain and rubor in the small and ring fingers most commonly. This problem occurs most often in men in their 40s, who suffer repetitive blunt trauma to the hand. Some use their hand as a hammer at work. Other forms of blunt trauma have been linked to this problem, including certain sports and weight lifting. The treatment options include oral medications for vasodilation, cessation of the offending physical activity, smoking cessation if present, sympathectomy, thrombolytics, and either exclusion of the aneurysm and ulnar artery ligation in the palm, or aneurysm excision and vascular reconstruction.

Raynaud disease is not the best answer because this presentation with embolic disease

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localized to the ulnar fingers and the palpable pulse/mass (aneurysm) in the hand are not consistent with Raynaud disease. Patients with Raynaud disease typically present complaining of cold sensitivity, periods of finger blanching, followed by diffuse return of flow to the fingers and pain. Raynaud disease is a diffuse sympathetic problem, not a local aneurysmal problem.

Congenital vasospastic disease is not the best answer because the patient in this vignette has no symptoms prior to 3 weeks ago. A congenital vasospastic problem would have presented before, and would be unlikely to be so localized.

Distal embolization from the heart is wrong for similar reasons: emboli from the heart would be very unlikely to present unilaterally, in two fingers, adjacent to one another. There would very likely be other symptoms and sites of embolization.

Buerger disease is not the best answer for a few reasons. The patient in this vignette is a nonsmoker. Thromboangiitis obliterans (TAO), or Buerger disease, is an inflammatory arteritis seen in smokers. It improves or stops progressing with smoking cessation. Buerger disease does not typically present with such isolated symptoms, and can involve the lower extremities as well.

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6. A 25-year-old man is brought to the emergency department after he sustained a knife wound to the right lower extremity. Examination shows numbness of the lateral aspect of the leg and weakness in plantar flexion and eversion of the foot. Which of the following nerves was most likely injured in this patient?

A) Femoral

B) Obturator

C) Peroneal

D) Sural

E) Tibial

The correct response is Option C.

The patient appears to demonstrate symptoms of a superficial peroneal nerve injury. The superficial peroneal nerve arises from the common peroneal nerve at the fibular neck. It supplies the lateral compartment of the leg, giving motor branches to peroneus longus and brevis, as well as sensory contribution to the lateral aspect of the leg. Injury to the superficial peroneal nerve results in anesthesia of the lateral aspect of the leg and weakness in eversion and plantar flexion of the foot.

The deep peroneal nerve arises from the common peroneal nerve at the fibular neck. It travels in the anterior compartment of the leg and gives branches to the tibialis anterior, extensor hallucis longus, and extensor digitorum longus and brevis, as well as peroneus tertius. The sensory distribution is in the area of the first web space. Injury to the deep peroneal nerve causes weakness in dorsiflexion of the foot.

The femoral nerve innervates muscles of the anterior thigh, including the quadriceps group, iliacus, and sartorius. Injury to the femoral nerve results in weakness of leg extension.

The obturator nerve provides innervation to the medial thigh muscles (adductor group), including adductor brevis, longus, and magnus, as well as the gracilis and obturator externus. The cutaneous branch provides sensation of the medial thigh. Injury to the obturator nerve results in weakness in thigh adduction and sensory deficits in the medial thigh.

The sural nerve travels on the posterior aspect of the leg between the lateral malleolus and calcaneus. It provides sensation to the lateral aspect of the foot and does not have a motor component. It is commonly sampled in nerve biopsy and used as a source of nerve graft.

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Injury or sacrifice of the sural nerve would result in numbness of the lateral foot.

The tibial nerve is a branch of the sciatic nerve. It travels through the popliteal fossa and gives off branches to gastrocnemius, soleus, plantaris, and popliteus muscles. The tibial nerve travels in proximity to the posterior tibial artery. In the leg, it gives off branches to the flexor digitorum longus, tibialis posterior, and flexor hallucis longus. Distally in the foot, it branches to give rise to the medial and lateral plantar nerves, which provide sensation to the plantar surface of the foot. Injury to the tibial nerve results in deficits of plantar flexion, as well as anesthesia to the plantar surface of the foot.

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7. A 24-year-old man comes to the office 3 months after closed reduction of a right knee dislocation. His knee is stable, but he still depends on an ankle/foot orthosis for ambulation. Physical examination shows decreased light-touch sensation along the dorsolateral aspect of the foot. Ankle eversion is absent. Sensation and motor function are otherwise intact. Nerve conduction testing is most likely to demonstrate a block in which of the following nerves?

A) Common peroneal

B) Lateral plantar

C) Medial plantar

D) Posterior tibial

E) Superficial peroneal

The correct response is Option E.

Common peroneal nerve injuries involving motor function loss have been reported in up to 50% of knee dislocations. If isolated sensory disturbances are also included, the incidence of nerve injury approaches 75%. If no recovery is noted by 3 to 6 months following injury, then surgical treatment is warranted. Physical exam primarily determines the nerve to be explored, neurolysed, and possibly grafted, but nerve conduction studies can be useful pre- and intraoperatively.

The common peroneal nerve divides into three branches at the knee, an articular branch that innervates the joint capsule and lateral collateral ligament of the knee, the superficial, and deep branches. The superficial branch innervates the muscles of the lateral compartment of the leg and provides sensation to the lateral calf and dorsal foot. The deep branch innervates the anterior compartment and provides sensation to the first web space of the foot. The scenario given above is most consistent with compromise of the superficial peroneal nerve. If dorsiflexion of the ankle and toe extension had also been lost, then common peroneal nerve injury would have been suggested.

The posterior tibial nerve proper innervates the muscles of the posterior calf, mediating ankle plantar flexion and toe flexion. The medial and lateral plantar nerves are terminal branches of the posterior tibial nerve. They provide motor innervation to the deep plantar muscles of the foot and sensation to the plantar surface of the foot.

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8. A 40-year-old, right-hand-dominant man comes to the office because of a 2-mm pigmented lesion beneath the thumbnail of the left hand. He says that he first noticed the lesion within the last week. The patient recalls no trauma to the thumb. He has no other fingernails or toenails with similar streaking. Biopsy of a subungual lesion is most appropriate after which of the following periods of time has passed without change?

A) 0 to 3 Weeks

B) 4 to 6 Weeks

C) 7 to 9 Weeks

D) 10 to 12 Weeks

E) 13 to 15 Weeks

The correct response is Option B.

The prognosis for a subungual melanoma is worse than that of cutaneous melanoma. Often, there is a delay in the diagnosis of subungual melanomas; in practice, it is better to be highly suspicious of any pigmented lesion beneath the nail and perform a biopsy. According to recent research, the 5-year survival rate for a patient with a subungual melanoma ranges from 28 to 30%. The 10-year survival rate drops to 0 to 13%. Clearly, this is a devastating disease, and over-vigilance regarding diagnosis is recommended. The current recommendation is to perform a biopsy of any subungual lesion after 4 to 6 weeks without significant change.

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9. A 55-year-old woman comes to the office because of a 2-year history of a painless mass within the thenar eminence. Physical examination shows a soft, mobile, nontender mass that does not transilluminate. Which of the following is the most likely diagnosis?

A) Epidermal cyst

B) Ganglion

C) Giant cell tumor

D) Glomus tumor

E) Lipoma

The correct response is Option E.

Lipomas are one of the most common tumors of the body with 10 to 20% occurring in the hand and wrist. Lipomas are most frequently located in the thenar eminence followed by dorsal or volar sides of the digits. The female-to-male ratio is 2:1 and age range is third to sixth decade.

Epidermal cysts have a 2:1 male-to-female ratio with a peak incidence at age 39. They are located in the distal phalanges, usually palmar index and long.

Ganglions account for 50 to 70% of all benign hand tumors with a female-to-male ratio of 3:1. They usually occur in the second to fourth decade with locations being dorsal carpal, volar carpal, volar retinacular, and mucous cyst of the distal interphalangeal joints. Some superficial ganglions will transilluminate.

Benign giant cell tumors of the tendon sheaths have no sex difference, occurring between the fourth and sixth decade and are located in the digits, mostly volar index and long.

Glomus tumors account for only 1 to 5% of hand tumors. There is a 2:1 female-to-male ratio, usually occurring between ages 30 to 50, and the tumors are subungual 50% of the time.

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10. A 60-year-old woman is evaluated in the emergency department after she fell on her outstretched hand while playing tennis. Examination shows tenderness in the dorsal and volar aspects of the wrist. Which of the following bones was most likely fractured in this patient?

A) Capitate neck

B) Distal radius

C) Lunate body

D) Scaphoid wrist

E) Triquetral ridge

The correct response is Option B.

Distal radius fractures usually occur in adults older than 40 years and are more common in women than in men due to the higher incidence of osteoporosis in women. The most common mechanism is a fall on an outstretched hand.

After distal radius fracture, the next most common fracture of the wrist is scaphoid, followed by triquetrum, trapezium, and lunate.

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11. A 35-year-old, right-hand-dominant man comes to the office because of passively correctable clawing of all four fingers of the right hand 1 year after he sustained a stab wound to the proximal right forearm that lacerated the ulnar nerve and artery, median nerve, flexor digitorum superficialis (FDS), flexor digitorum profundus, flexor carpi radialis (FCR), and flexor carpi ulnaris (FCU). Each of the injured structures was repaired primarily on the day of injury. A photograph is shown. Which of the following tendons is the most appropriate donor to address the clawing deformity?

A) Abductor pollicis brevis

B) Brachioradialis

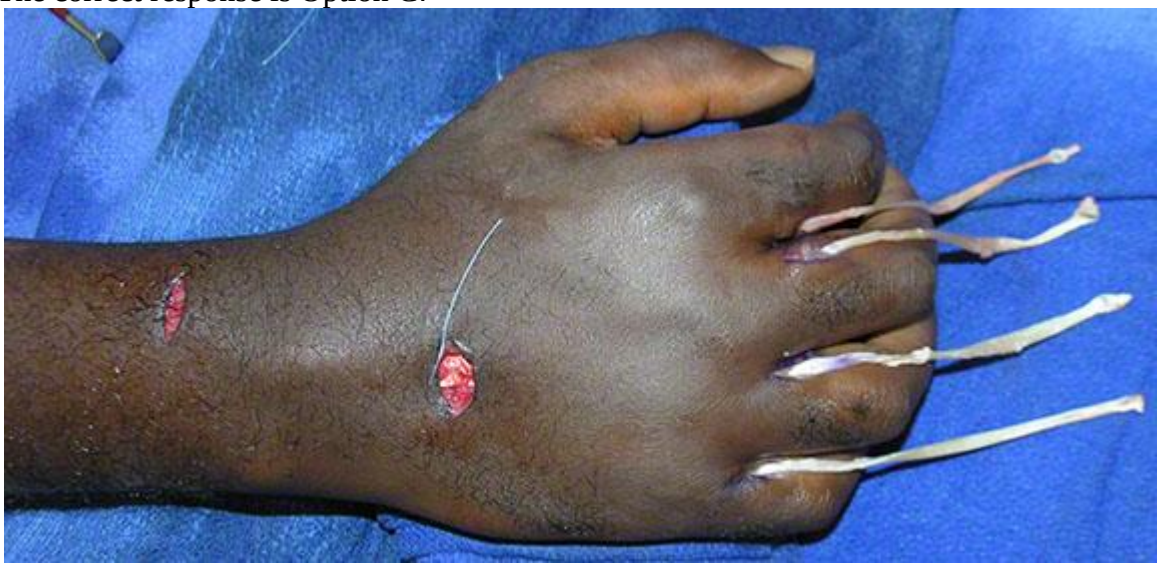
C) Extensor carpi radialis brevis

D) FCR

E) FDS-3 to the long finger

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The correct response is Option C.



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The flexor digitorum superficialis and flexor carpi radialis musculotendinous units were lacerated in the original injury. They would not be appropriate donor motors due to this. Brachioradialis transfer to the flexor pollicis longus transfer has been reported for patients with cervical spine injuries, but it is not used for transfers to restore intrinsic muscle function. The abductor pollicis brevis cannot be used to correct a claw deformity due to its small size and position in the thenar eminence; in addition, for this patient, its innervation was injured in the original trauma.

Both the extensor carpi radialis longus and brevis have been described as a tendon transfer. Neither muscle has been affected by the initial injury. Whichever tendon is not harvested can power wrist extension along with the extensor carpi ulnaris. The tendon does need to be elongated with a graft.

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12. Which of the following is the earliest one might expect to find electromyographic changes after suspected median nerve damage during carpal tunnel release?

A) 1 Week

B) 3 Weeks

C) 5 Weeks

D) 7 Weeks

The correct response is Option B.

Patients with nerve injuries can be evaluated by nerve conduction velocities and electromyography (EMG). Abnormal conduction velocities are associated with decreased amplitude, decreased velocity, and increased latency. Sensory nerve latency above 3.5 ms and/or motor nerve latency above 4.5 ms are considered abnormal. Muscle changes assessed by EMG are typically altered later (2 to 3 weeks after injury) in the clinical course and consist of the presence of fibrillation potentials and decreased motor unit potential recruitment. Though the sensitivity of these studies may be somewhat low, at around 66% when using conduction velocity and latency, the specificity has been reproducibly near 95%.

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13. A 32-year-old man comes to the emergency department after a motorcycle collision. Examination and x-ray studies show an isolated injury to the left wrist consistent with a perilunate dislocation. In perilunate dislocations, dislocation of which of the following is the initial injury that leads to lunate dislocation?

A) Dorsal carpal ligaments

B) Lunocapitate junction

C) Lunotriquetral ligaments

D) Scapholunate ligament

E) Triangular fibrocartilage complex

The correct response is Option D.

All the other answers are incorrect due to incorrect sequence of force transmission across the wrist. Furthermore B and E are wrong due to incorrect mechanism, as well.

Wagner and Mayfield conducted classic studies on carpal dynamics and anatomy to determine the progression of stresses across the wrist in severe hyperextension injuries. They determined that there is a reliable and predictable pattern to these injuries, which is described as Progressive Perilunate Instability (PLI). There are four stages of PLI, corresponding to the degree of stress applied in the injury. The mildest form is the isolated scapholunate dissociation: PLI stage 1. As the forces continue in an ulnar and distal direction, the distal row and scaphoid progress dorsally, and the capitate separates from the lunate: PLI stage 2. As the force continues in an ulnar direction, the lunotriquetral ligaments separate, and if the lunate is still in place, this is the full Midcarpal Dislocation: PLI stage 3. Finally, in the most severe cases, the dorsally dislocated capitate will dislodge the lunate and push it volarly, creating the true lunate dislocation: PLI stage 4.

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14. A 25-year-old woman comes to the office with a 2-day history of difficulty moving the left thumb. Eight weeks ago, she sustained a nondisplaced distal radius fracture. She has been out of a cast for the past 2 weeks. On examination, thumb retropulsion is absent. Which of the following is the most appropriate definitive treatment?

A) Fusion of the carpometacarpal (CMC) joint of the thumb

B) Fusion of the interphalangeal (IP) joint of the thumb

C) Transfer of the anterior interosseous nerve to the recurrent branch of the median nerve

D) Transfer of the extensor indicis proprius (EIP) tendon to the abductor pollicis brevis tendon

E) Transfer of the EIP tendon to the extensor pollicis longus tendon

The correct response is Option D.

The scenario depicts a classic case of extensor pollicis longus (EPL) tendon rupture following distal radius fracture. The reported incidence of EPL tendon rupture ranges from 0.2 to 3%. Ruptures can occur after internal or external fixation due to impingement of hardware on the tendon or due to ischemic changes in the tendon due to swelling of the tendon and the third dorsal compartment.

Reconstruction of the EPL tendon can be accomplished either by tendon transplantation, typically the palmaris interposition between the proximal and distal healthy segments of the EPL tendon, or by transfer of the EIP to the distal segment of EPL tendon. When identified and treated before the EPL muscles retract and shorten, equivalent outcomes can be achieved. Later treatment necessitates tendon transfer.

Fusion of the thumb IP joint may be useful in flexor pollicis longus ruptures that cannot be repaired, but this would not restore thumb retropulsion.

Fusion of the CMC joint can alleviate pain from basal joint arthritis, but would result in further loss of motion of the thumb.

Transfer of the EIP to the abductor pollicis brevis and transfer of the anterior interosseous nerve to the recurrent branch of the median nerve are techniques for restoring thumb palmar abduction/opposition and would not restore retropulsion/extension.

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15. A 25-year-old construction worker has a 4-cm-diameter posterior calcaneal ulcer with exposed bone on removal of a short-leg cast applied 6 weeks ago for an ankle fracture. Coverage with a lateral calcaneal artery flap is planned. The lateral calcaneal artery is usually the terminal branch of which of the following arteries?

A) Anterior tibial

B) Dorsalis pedis

C) Lateral malleolar

D) Peroneal

The correct response is Option D.

Anatomic dissections by Drs. Grabb and Argenta found that the lateral calcaneal artery is usually the terminal branch of the peroneal artery but occasionally may arise from the posterior tibial artery. The branches of the peroneal include the nutrient artery which supplies the fibula, the perforating branch which gives branches to the tarsus, the communicating branch and the lateral calcaneal.

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16. A 45-year-old man with a detailed history of alcohol abuse is referred for evaluation of pain in his left arm and forearm that began 1 week ago after a fall. Volkmann contracture is suspected. Which of the following is the most likely area to be initially affected?

A) Extensor digitorum communis

B) Flexor carpi radialis and palmaris longus

C) Flexor digitorum profundus

D) Supinator, brachioradialis, and extensor carpi radialis

E) Volar wrist ligaments and capsule

The correct response is Option C.

Volkmann ischemic contracture can evolve from an untreated acute injury or fracture, blunt or sharp. In the scenario described, the patient appears to have passed out on his forearm, inebriated, possibly compounded by drug use. He presents in a delayed fashion with an early or partial Volkmann ischemic contracture. Essentially, this item tests the examinee's basic knowledge of which parts of the forearm musculature are most sensitive to internal pressure and ischemic injury.

Useful classification systems that correlate well with clinical examination include the Tsuge and Holden classifications. The Tsuge classification basically describes a predictable injury pattern based on the relative susceptibility of different muscles in the forearm to ischemia and pressure. Essentially, the deeper compartments are the most susceptible. A mild Tsuge type affects the flexor digitorum profundus first. The moderate type involves the rest of the deep flexor compartment and begins to affect the superficial flexor compartment. Severe Tsuge type involves the complete deep and superficial flexor compartments, as well as the extensor compartment and mobile wad to varying degrees.

Therefore, in this case, the correct response is the flexor digitorum profundus because it is the most sensitive muscle group to a Volkmann ischemic contracture generating insult.

A complementary classification system is the Holden classification. The Holden Type 1 classification essentially describes contractures of varied severity caused by injuries proximal to the injured forearm muscles. Examples include a brachial artery thrombosis or a humeral fracture leading to vascular injury and a Volkmann ischemic contracture distal to the site of the initial injury. The Holden Type 2 classification describes direct injuries to the fascial

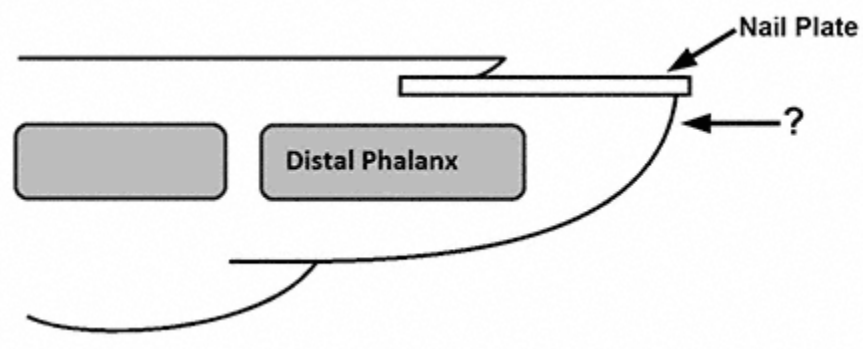
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compartment of varied severity, such as prolonged direct pressure, as in the scenario described. Other examples would be direct crush injuries or severe radial and ulnar fractures.

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17. The apical portion at which the distal nail loses its natural adherence and transitions to the white color indicated by the arrow in diagrammatic longitudinal section of the fingertip shown is called which of the following?

A) Eponychium

B) Hyponychium

C) Lunula

D) Perionychium

E) Sterile matrix

The correct response is Option B.

The hyponychium is the junction of the nail bed (sterile matrix) and fingertip skin beneath the distal free margin of the nail. It consists of a keratinous plug and contains large numbers of polymorphonuclear leukocytes and lymphocytes. It is the first barrier of defense, preventing microorganisms from invading the subungual region.

The perionychium extends along the lateral borders of the nail. The eponychium is the distal part of the nail fold where it attaches to the surface of the nail.

The lunula is the white arc just distal to the eponychium and marks the distal end of the germinal matrix of the nail bed. It is caused by nail cell nuclei in the germinal matrix as they stream distally and upwards, creating a difference in light reflection between this area and the more distal pink sterile matrix. The nail overlying the sterile matrix, on the other hand, is pink since the nuclei within the nail cells have disintegrated. The nail beyond the point of the lunula is thus clear and the blood vessels of the nail bed show through, giving that part of the

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nail a pink color.

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18. A 36-year-old man comes to the emergency department 8 hours after he sustained a sharp circumferential laceration of the proximal forearm. Most of the musculature is visibly transected. The distal forearm and hand are pale and insensate, and there are no discernible pulses distal to the laceration. X-ray study shows no bony injury. All structures are successfully repaired and hand perfusion is restored during a 6-hour procedure. Which of the following is the most appropriate next step in treatment?

A) Administration of an anticoagulant

B) Administration of thrombolytic agents

C) Forearm and hand fasciotomies

D) Splinting, and intravenous administration of antibiotics

E) Tissue oximetry

The correct response is Option C.

Following a protracted course of tissue ischemia, reperfusion will lead to soft-tissue and muscle edema, and there is a very high risk of compartment syndrome. Routine prophylactic fasciotomy after arterial repair has been questioned. Nevertheless, an extended warm ischemia time of greater than 8 hours and a combined injury involving both major arteries and veins have been proposed as indications for this procedure. In this scenario, the patient has both of these risk factors for reperfusion compartment syndrome, and fasciotomy of the hand and forearm should be performed before leaving the operating room.

Wound management, splinting, intravenous administration of antibiotics, and monitoring of hand perfusion are important postoperative modalities, but they are not as temporally relevant as fasciotomy. The use of thrombolytic agents is not indicated in this setting because the perfusion was restored and there is no reason in the vignette to suspect evolving thrombus formation. The routine use of anticoagulant after uncomplicated vessel repair is controversial.

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19. An otherwise healthy 58-year-old man comes to the office because of numbness of all fingers of the left hand. He says he first noticed symptoms after a cross-country drive 6 weeks ago. On physical examination, the thumb, index, and long fingers show sensitivity to the 2.83 Semmes-Weinstein monofilament. The ring and little fingers show sensitivity to the 3.22 monofilament. The little finger is held in an abducted position. Abductor pollicis brevis muscle strength is normal. First dorsal interosseous muscle strength is diminished. Which of the following anatomical structures is the most likely cause of these findings?

A) Arcade of Frohse

B) Lacertus fibrosus

C) Ligament of Struthers

D) Osborne ligament

E) Transverse carpal ligament

The correct response is Option D.

This scenario depicts a patient with ulnar nerve compression. Often patients who present with compression neuropathies give a history of numbness of all fingers; however, careful physical examination will show sensory abnormalities only in the anatomical location of the compression. The patient has weakness of the ulnar nerve innervated intrinsic muscles, the first dorsal interosseous muscle, but retains strength in the abductor pollicis brevis muscle. The diagnosis of ulnar nerve compression is suggested. The most common sight of ulnar nerve compression is at the elbow. The anatomical causes of all the nerve compression at the elbow are the arcade of Struthers, the medial intramuscular septum, the bony cubital tunnel, Osborne ligament, an anconeus epitrochlearis muscle, and the origin of the flexor carpi ulnaris muscle. The ligament of Struthers, lacertus fibrosus and the transverse carpal ligament are anatomical sites of compression of the median nerve. The arcade of Frohse is a site of compression of the radial nerve.

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(Please note that this pictorial appears in color in the online examination)

20. A 24-year-old, right-hand-dominant man comes to the office because of a 2-year history of a deformity of the ring finger of the left hand that has worsened progressively. History includes rheumatoid arthritis that is managed with multiple disease-modifying medications. A photograph and an x-ray study are shown. Which of the following anatomical abnormalities is the most likely cause of this patient's ring finger deformity?

A) Contraction of the oblique retinacular ligament

B) Flexor digitorum profundus avulsion at the distal interphalangeal (DIP) joint

C) Palmar subluxation of the metacarpophalangeal (MCP) joint

D) Rupture of the central slip of the extensor mechanism

E) Volar plate laxity of the proximal interphalangeal (PIP) joint

The correct response is Option E.

Swan-neck deformity can occur in the post-traumatic setting as well as in the rheumatoid

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arthritis population. The PIP joint hyperextends, and the DIP joint flexes. Unlike boutonnière deformity, which is always initiated by a rupture of the central slip of the extensor mechanism, the origin of a swan-neck deformity can be at the DIP, PIP, or MCP joint. Regardless of the initiating problem, a swan-neck deformity can only occur if there is laxity of the volar plate of the PIP joint to allow hyperextension.

Flexor digitorum profundus avulsion would lead to inability to flex the DIP joint and would not cause hyperextension of the PIP joint. The oblique retinacular ligament can be used to repair a swan-neck deformity but is not causative of the pathology. Palmar subluxation of the MCP joint can lead to a swan-neck deformity in rheumatoid arthritis patients, but the photograph and x-ray study show this is not present in this patient. Rupture of the central slip of the extensor mechanism would lead to a boutonnière deformity.

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21. A female newborn is evaluated in the neonatal intensive care unit because of severe congenital constriction band syndrome of the left lower extremity. Examination shows cyanosis and severe swelling of the distal affected extremity. The constriction is located at the distal thigh and is very deep, extending down to the anterior distal femur. A Doppler popliteal pulse is audible. Plantar stimulation shows no sensory pain withdrawal reflex. Which of the following is the most appropriate immediate treatment?

A) Application of medicinal leeches to the foot

B) Constriction excision and Z-plasties

C) Leg elevation and edema wrapping

D) Limb amputation

E) Microsurgical repair of popliteal artery and vein and of the sciatic nerve

The correct response is Option B.

The patient described has type IIIB constriction (amniotic) band syndrome. Constriction banding affects 1:1,200 live births. Severity of the banding is classified as follows:

Type I (mild) – Shallow indentation of skin and soft tissue without distal lymphedema;
Type II (moderate) – Distal lymphedema, acrosyndactyly, and even discontinuous neurovascular or musculotendinous structures, but without vascular compromise;
Type III (severe) – Progressive lymphaticovenous or arterial compromise;
Type IV – Intrauterine amputation.

Weinzweig introduced the concept of a dynamic, or type IIIB, subtype in which there is evolving vascular compromise and in which “limb rescue” can be performed with emergency surgery despite a severe band. The dynamic progressive swelling and cyanosis and certain ischemic necrosis can be reversed by surgery.

However, there are consequences, and these are neurologic deficits and long-term leg-length discrepancies that may even require leg-lengthening procedures or appropriately timed opposite extremity epiphysiodesis. Early release of such a severe constriction band does not result in long-term neurologic improvement. Early excision of the involved nerve segment may be required, accompanied by nerve grafting.

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22. A 32-year-old man comes to the office because of a "mallet" deformity of the distal joint of the long finger of the dominant hand sustained 12 years ago while he was playing baseball. He has not sought medical treatment until now. On examination, which of the following deformities is most likely?

A) Boutonnière

B) Camptodactyly

C) Clinodactyly

D) Hook-nail

E) Swan-neck

The correct response is Option E.

Flexion deformity of the distal joint seen in mallet finger will lead to secondary hyperextension of the proximal joint. This occurs in a zigzag fashion because of the imbalance of forces. If the terminal tendon is displaced proximally, the conjoined tendons will slide proximally and become extensors to the proximal joint.

A boutonnière deformity is a flexion deformity of the proximal joint from disruption of the central slip. The lateral slips migrate volarly becoming an extensor to the distal joint which then hyperextends. Clinodactyly is a genetic condition in which there is a curvature of the fifth finger toward the fourth finger. A hook nail usually results from loss of nail bed support, usually after amputation. Camptodactyly is also a genetic condition in which there is a fixed flexion deformity of the proximal joint of the little finger.

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23. A 53-year-old man is brought to the emergency department after sustaining a laceration of the index flexor digitorum profundus, superficialis, and radial digital nerve of the nondominant left hand. He is scheduled to undergo urgent repair with single-cuff Bier block anesthesia. Which of the following would be the best reason to use an axillary block in this patient?

A) Age

B) Gender

C) Occupation

D) Surgical duration

E) Urgency of surgery

The correct response is Option D.

The advantages of Bier block include reliability with low incidence of block failure, safety with rapid onset and recovery. The block is limited to tourniquet pain often occurring after 20 to 30 minutes and limits its use to shorter procedures on the upper extremities.

Sudden cardiovascular collapse or seizures may occur if local anesthetic is released into the circulation too early. Disease processes in which a tourniquet is contraindicated include Raynaud disease, sickle cell disease, and severe hypertension. Uncooperative patients and young children are also contraindications.

Short duration procedures, including carpal tunnel release, tendon contracture release, foreign body extraction, and trigger finger release, are examples of procedures where Bier blocks may be considered.

Age, gender, occupation, and urgency of surgery are not contraindications to this procedure. Bier block anesthesia is a contraindication in the very young and very old, but not in a 53-year-old patient.

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24. A 20-year-old man comes to the office 2 months after "jamming" the long finger of the right hand in a rugby game. On examination, the patient has a boutonnière deformity. The distal interphalangeal (DIP) joint has 20 degrees of hyperextension and active flexion to 85 degrees. X-ray study shows no fracture. Which of the following is the most appropriate initial treatment?

A) Open central slip repair

B) Resection of the lateral bands and oblique retinacular ligament

C) Resection of the lateral bands only

D) Splinting of the proximal interphalangeal (PIP) and DIP joints in extension

E) Splinting of the PIP in extension and active DIP flexion

The correct response is Option E.

The patient has a boutonnière deformity that is passively correctable. In most instances, this can be successfully managed with splinting of the PIP joint in extension while allowing active DIP flexion. Splinting of the PIP in extension helps restore central slip continuity; active DIP flexion with the PIP joint extended draws the tight, volarly displaced lateral bands into a more dorsal position while reducing DIP joint hyperextension. Holding the PIP and DIP joints both in extension will not correct the deformity. Open central slip repair is indicated if there is an open wound, but that is not the case in this scenario. Resection of the distal lateral bands only is a reasonable treatment for chronic deformity by relaxing the lateral bands. There is no role for resection of both lateral bands and oblique retinacular ligament in the management of this condition.

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25. A 48-year-old woman comes to the office because of burning pain and stiffness in the right hand 6 weeks after treatment of a distal radius fracture. She says she has had difficulty sleeping and that she has discomfort despite taking narcotics. Physical examination shows a shiny appearance of the right hand, decreased range of motion of the fingers, and hypersensitivity to light touch. X-ray studies show good alignment of the fracture. Which of the following tests is the most appropriate to evaluate this patient's condition?

A) Bone scan

B) CT scan

C) Digital subtraction angiography

D) Lymphoscintigraphy

E) Ultrasonography

The correct response is Option A.

This patient exhibits symptoms of complex regional pain syndrome (CRPS). The persistence of physiological changes after surgery or injury can lead to debilitating consequences. This condition is characterized by persistent pain, cold intolerance, autonomic dysfunction, and trophic changes. Patients may show swelling, stiffness, difficulty sleeping, and persistent pain out of proportion to the normal postoperative course that may be relieved incompletely by narcotics.

CRPS is a clinical diagnosis without a single definitive test, and is divided into two types: type I, which occurs without identifiable nerve involvement (also known as reflex sympathetic dystrophy); and type II, which has identifiable nerve involvement (causalgia). It is more common in people who smoke and in women. Pain in CRPS can be either sympathetically mediated or sympathetically independent.

The diagnosis of CRPS involves history, physical examination, and diagnostic testing. Although no specific test is pathognomonic, triple-phase bone scans are helpful in adding credence to the diagnosis. First- and second-phase bone scans may show asymmetric flow and autonomic dysfunction, while the third phase demonstrates increased periarticular uptake in multiple joints of the affected extremity.

A variety of treatment modalities have been employed in addressing CRPS. These range from therapy modalities such as range of motion, stress loading, and desensitization to

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pharmacologic interventions with anticonvulsants or antidepressants. Stellate ganglion blocks or autonomic nerve blocks may be helpful in sympathetically mediated pain, and nerve stimulation (either transcutaneous or at the spinal cord level) can also be employed. Often, multiple modalities are used concurrently and in sequence. Peripheral nerve decompression may be helpful in resolving symptoms related to CRPS type II.

CT scans can be used to assess bony alignment in fractures and are helpful in the evaluation of articular anatomy.

Digital subtraction angiography is useful for evaluation of vasculature and circulation.

Lymphoscintigraphy is used to analyze lymphatic drainage in cases of lymphedema.

Ultrasonography can be performed to assess venous outflow and look for deep venous thrombosis.

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26. A 345-lb (156-kg), 5-ft 1-in (155-cm), 59-year-old woman comes to the office because of the condition of the lower extremities in the photograph shown. BMI is 65 kg/m^2. She says she has tried "everything" and "nothing seems to work." She states that the left leg is worse than right. The condition first appeared over 20 years ago after she underwent surgery of the left leg. She was hospitalized 10 times for cellulitis/infection in the past 1 year. She refuses compression therapy because it has become too painful. Which of the following are the most likely diagnosis and most appropriate management?



(Please note that this pictorial appears in color in the online examination)

A) Primary lymphedema; medical management

B) Primary lymphedema; surgical management

C) Secondary lymphedema; medical management

D) Secondary lymphedema; surgical management

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The correct response is Option D.

The morbidly obese patient described suffers from severe secondary lymphedema. Assuming she doesn't have any contraindications to an operative procedure, she has failed medical management and should be offered surgery.

Lower extremity lymphedema can be considered either primary or secondary. Primary lymphedema can be congenital, praecox, or tarda based on the age at presentation. Secondary lymphedema can be due to either lymphatic obstruction (due to cancer, infection, or radiation) or lymphatic interruption (due to groin surgery or lymph node excision).

By far, the most common approach to lymphedema (either primary or secondary) is medical management. However, the most common indication for surgery is failure of medical management.

There are a variety of surgical options. These include procedures to improve lymphatic flow and procedures to debulk the affected tissue.

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27. During harvest of a plantaris tendon graft, which of the following structures is at greatest risk for injury?

A) Dorsalis pedis artery

B) Extensor hallucis brevis muscle

C) Medial plantar artery

D) Sural nerve

E) Tibial nerve

The correct response is Option E.

When multiple tendon grafts are needed or when it is necessary to harvest grafts long enough to reach from the forearm to the fingertip, lower extremity tendon graft harvest is necessary. The plantaris tendon is a good source of tendon graft and is present in about 80% of limbs.

The graft is harvested through a vertical incision just anterior to the medial aspect of the Achilles tendon. Then the graft is followed proximally using either a tendon stripper or with further incisions. As such, dissection of the plantaris tendon begins behind the medial malleolus and close to the tibial nerve. The sural nerve lies about the lateral malleolus and thus is not likely to be inadvertently injured during plantaris harvest. The medial plantar artery is on the sole of the foot and would be distal to the field of dissection. The extensor hallucis brevis muscle is a small muscle that lies over the dorsum of the foot and thus, like the dorsalis pedis artery, would not be injured in the dissection.

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28. A 35-year-old man comes to the emergency department with a humerus fracture. On examination, he is unable to extend his wrist, fingers, and thumb. Which of the following nerves is most likely injured?

A) Axillary

B) Median

C) Musculocutaneous

D) Radial

E) Ulnar

The correct response is Option D.

This patient has a radial nerve injury, which can occur with humerus fractures. The radial nerve innervates the wrist extensors, extensor carpi radialis longus (ECRL) and extensor carpi radialis brevis (ECRB); the thumb extensors, extensor pollicis longus (EPL) and extensor pollicis brevis (EPB); and the finger extensors, extensor digitorum communis (EDC). These radial nerve injuries are usually managed with a period of observation and therapy until a potential neurapraxia resolves. Early evidence of muscle reinnervation would be evident with improved function of the ECRL, followed by the ECRB, then the finger and thumb extensors. If the patient does not regain any function by 3 to 6 months, exploration and nerve repair or tendon transfers to restore lost function can be considered. The standard tendon transfers considered for radial nerve function loss include the pronator teres to the ECRB (wrist extension), flexor carpi ulnaris to the EDC (finger extension), and the palmaris longus to the EPL (for thumb extension). A median nerve deficit would result in loss of flexion of wrist, fingers, thumb, and loss of palmar sensation and not typical after humerus fractures. An ulnar nerve injury could present with loss of hand intrinsic function and loss of sensation of the small finger. The musculocutaneous nerve innervates the biceps and would result in loss of elbow flexion. The axillary nerve is not injured with humerus fractures.

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29. A 49-year-old man comes to the office because he has been unable to extend the wrist, fingers, and thumb of his right hand since fracturing his humerus 16 months ago. He underwent open reduction and internal fixation at that time. The fracture healed well. There has been no change in function since the procedure. Physical examination shows the patient is unable to actively extend the wrist, fingers, and thumb. Tendon transfers are planned. Which of the following is the most appropriate muscle to transfer for restoration of finger extension?

A) Brachioradialis

B) Extensor carpi radialis longus

C) Flexor carpi ulnaris

D) Palmaris longus

E) Pronator teres

The correct response is Option C.

The most appropriate muscle to transfer for restoration of finger extension is the flexor carpi ulnaris.

The radial nerve can be injured as a result of humerus fracture and/or surgery as it crosses the spiral groove of the humerus. The resultant radial nerve palsy will cause inability to extend the wrist, fingers, and thumb.

Reinnervation of the muscle ideally should be completed within 12 to 18 months following injury to allow for recovery. In this patient who has radial nerve palsy after humerus fracture, the time following injury has been too long, so nerve repairs or nerve transfers are not a viable option, and tendon transfer is the procedure of choice.

Tendon transfer involves the use of a noncritical or expendable donor tendon to provide a missing function. The tendon to be transferred should have adequate strength and range of motion to provide the desired function. Ideally, the tendon used should have synergistic action and allow for tenodesis to facilitate reeducation.

Transfer of the flexor carpi ulnaris to the extensor digitorum communis will provide extensor function of the fingers, as it has adequate power and excursion and takes advantage of the linkage between wrist flexion and finger extension. Other typical tendon transfers for finger extension in radial nerve palsy include the flexor carpi radialis and the flexor digitorum

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superficialis.

The brachioradialis is a radial nerve innervated muscle and will not be functioning in this patient who has a high radial nerve palsy. In low radial nerve palsies, it can be used to restore thumb extension. The brachioradialis can also be used to restore finger or wrist extension, as well as finger or thumb flexion in the appropriate patient.

The extensor carpi radialis longus is not functional in this patient with radial nerve palsy. It can be used as a transfer for finger flexion in the appropriate patient.

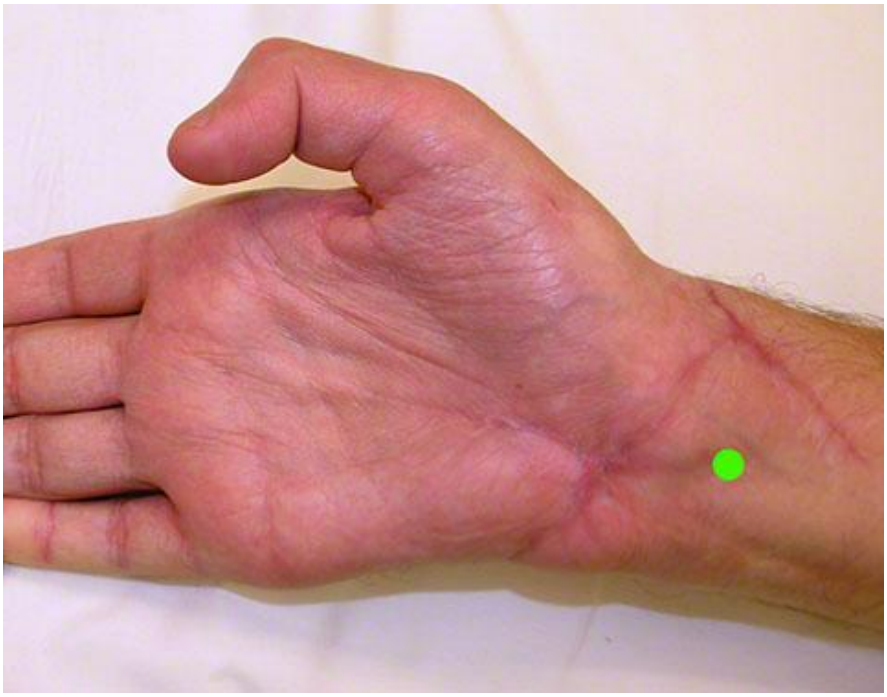
The palmaris longus does not have sufficient power to provide finger extension. It can be used as a transfer for thumb extension.

The pronator teres has adequate power but less excursion. It is typically used to restore wrist extension rather than finger extension.

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(Please note that this pictorial appears in color in the online examination)

30. A 40-year-old, right-hand–dominant man comes to the office because of minimal sensation in the tips of the digits of the right hand and severe pain in the volar aspect of the right wrist. He sustained lacerations of the median and ulnar nerves, radial and ulnar arteries, and all volar flexor tendons 11 months ago when he punched a window. Each of the structures was repaired primarily within hours of injury. On examination, the hand is well perfused. Percussion at the location of the dot in the photograph shown produces severe, painful paresthesia, which radiate distally. Sharp touch sensation is minimally present at the tips of the thumb, index, and long fingers and the radial side of the ring finger; light touch sensation is absent. Which of the following is the most appropriate next step in treatment?

A) Administration of tacrolimus

B) Excision repair with a sural graft

C) Neurolysis and conduit wrap

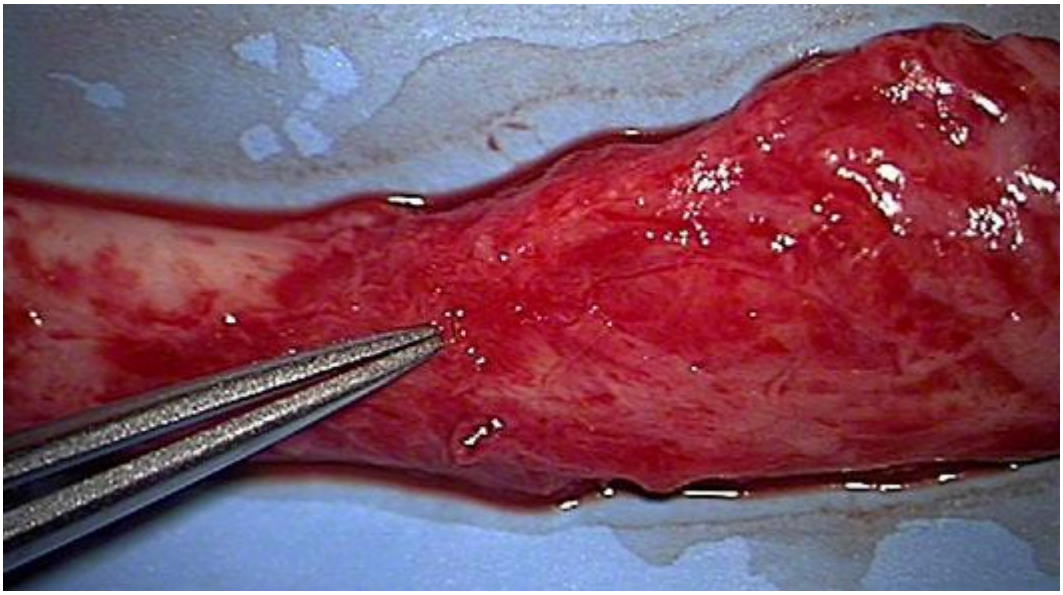
D) Reassessment in 3 months

E) Transfer of the extensor indicis proprius

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The correct response is Option B.

The patient has a neuroma of the median nerve after laceration and repair. At 11 months out from injury, he would be expected to have improving light touch at the fingertips. The combination of this and the severe pain with percussion of the volar wrist indicates that very few axons have crossed the repair site. Observing the patient for additional time is unlikely to yield improved recovery. At surgical exploration, the patient had a large neuroma at the repair site. A photograph is shown.



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Tacrolimus is an immune modulating agent commonly used in solid organ transplants. It has been investigated in animals and clinical trials in humans and shown some effectiveness in improving nerve regeneration across the repair. It is not currently used in humans outside of clinical trials. Also, in all trials of tacrolimus use, the medication was started at the time of repair, not 11 months later.

Nerve conduits have been used to repair short-gap nerve injuries. Although there are reports of successful nerve regeneration of gaps greater than the original indication of 1.5 cm, a gap of 6 cm is well beyond the limits of what a conduit can bridge.

Transfer of the extensor indicis proprius tendon would restore thumb opposition and use a tendon not involved in the original injury. However, this would not address the patient's

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principal complaint of pain and lack of sensation.

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31. The primary blood supply to a free anterolateral thigh fasciocutaneous flap arises from vessels that perforate which of the following muscles?

A) Gluteus maximus

B) Rectus femoris

C) Sartorius

D) Tensor fascia lata

E) Vastus lateralis

The correct response is Option E.

The anterolateral thigh (ALT) flap has proven to be one of the most versatile free tissue transfers in reconstructive surgery. Based on perforators from the descending branch of the lateral circumflex femoral artery that traverse the vastus lateralis (VL) (80%) or the septum between the rectus femoris and VL (18-20%), this flap can be fashioned as large as 10 cm wide by 25 cm long. Occasionally, no large perforator will be identified during dissection; in this circumstance, the flap may be carried on multiple perforators along with the vastus lateralis muscle.

Branches of the lateral circumflex femoral artery also supply the sartorius (partial, as the supply is segmental), rectus femoris (descending branch), and tensor fascia lata (ascending branch). Vascular supply to the gluteus maximus arises from the superior and inferior gluteal arteries.

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32. A 35-year-old, right-hand-dominant man comes to the office 3 months after he completely severed both the flexor digitorum superficialis and profundus tendons in Zone II of the right long finger. He did not seek medical attention at the time of the injury. Physical examination shows inability to flex actively at the proximal interphalangeal (PIP) joint and distal interphalangeal (DIP) joint. He has passive range of motion. Which of the following is the most appropriate management?

A) One-stage tendon grafting

B) Primary repair

C) Tendon transfer

D) Two-stage tendon reconstruction

E) Observation only

The correct response is Option D.

When patients present with zone II flexor injuries, it is optimal to repair both flexors within 10 days after the injury before the tendons retract excessively preventing primary approximation of the tendon ends. Late flexor injuries (after 2 weeks) in zones I, III, IV, and V can be managed with single-stage tendon grafting. However, when the injury is in zone II, the sheath has collapsed and tendon grafts cannot be easily pulled under intact pulleys, necessitating pulley reconstruction over a silicone rod in the first stage. Then, in a second stage, the tendon rod is replaced with the tendon graft pulled into the sheath in the proximal to distal direction after suturing the graft to the rod. The tendon is repaired first distally to bone, and then the appropriate tension is set on the proximal juncture repair of the graft to the motor tendon (usually the flexor digitorum superficialis to avoid quadriga and lumbrical plus posture). Two-stage tendon grafting in general is recommended for zone II flexor repairs that present late, require simultaneous critical pulley reconstruction (A2, A4), or if volar finger soft-tissue reconstruction is required. Tendon transfer options would not be long enough to span the defect out to the distal phalanx and the flexor digitorum profundus from other fingers should not be sacrificed. Further observation is certainly not warranted.

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33. A 35-year-old man comes to the office for follow-up 3 years after he sustained a scaphoid fracture of the dominant right wrist that was treated in a cast until radiographically healed. Examination shows reduced wrist extension of 35 degrees, weakened grip strength, and dorsoradial wrist pain. Scaphoid malunion is suspected, and an oblique sagittal CT scan is obtained. Which of the following is the minimum intrascaphoid angle at which surgical intervention is required?

A) 10 Degrees

B) 25 Degrees

C) 45 Degrees

D) 65 Degrees

E) 80 Degrees

The correct response is Option C.

Treatment of a scaphoid malunion or "humpback" nonunion deformity by means of an opening interposition wedge bone graft is indicated when the lateral intrascaphoid angle is greater than 45 degrees. The intrascaphoid angle is determined by drawing a line tangent to the dorsal cortex of the distal fragment and the palmar cortex of the proximal fragment. Normally, this angle is 30 to 40 degrees. Amadio and coworkers reported on 45 patients with 46 scaphoid fractures greater than 6 months after healing. There were good clinical outcomes in 83% of those with intrascaphoid angles less than 35 degrees, and posttraumatic arthritis in 22%. In contrast, in those with greater than 45 degrees of lateral intrascaphoid angulation, only 27% had good outcome, and 54% developed posttraumatic arthritis.

Nakamura and colleagues performed volar wedge bone grafting on seven symptomatic patients with scaphoid malunion, and all improved their symptoms.

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34. A 30-year-old man is scheduled to undergo great toe-to-thumb transfer 7 months after traumatic amputation of the dominant thumb. During dissection of the toe, the first dorsal metatarsal artery is most likely to be found branching from which of the following vessels?

A) Deep plantar

B) Dorsalis pedis

C) Plantar arterial arch

D) Posterior tibial

E) Proper digital

The correct response is Option B.

The origin and course of the first dorsal metatarsal artery (FDMA) are key to dissecting the first or second toe and the variety of available toe flaps. This anatomy is quite variable. In two thirds of cases, this artery emanates from the dorsalis pedis artery as its distal continuation. This course can then be superficial, within, or deep to the interosseous muscle. However, in one third of patients, the metatarsal artery may arise from the deep plantar artery that communicates with the plantar arch or actually from the plantar arch itself, in which case the FDMA may be vestigial. In the latter two situations, the metatarsal artery passes plantar to the deep transverse metatarsal ligament. The proper digital arteries are the distal continuations of the FDMA. The posterior tibial artery runs longitudinally in a superficial plane to the forefoot on the plantar surface. It is the larger lateral plantar artery that travels deeply to become the plantar arterial arch.

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35. An otherwise healthy 47-year-old man is transferred to the hospital because of an infection of the leg. He sustained the initial injury in a fall 6 weeks ago that was treated with internal fixation. The infection is now under control, and the internal hardware has been removed. Examination shows a 9-cm bony defect of the lower extremity. Neurovascular status of the foot is normal. Angiography of both lower extremities shows no abnormalities. A photograph and x-ray study are shown. Which of the following considerations favors vascularized bone grafting in this patient?

A) Length of time since the initial injury

B) Mechanism of the injury

C) Method of injury stabilization

D) Patient age

E) Size of the bony defect

The correct response is Option E.

The injury described is a Gustilo IIIB lower extremity wound complicated by infection. The

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sequence of reconstruction is often bony stabilization and debridement until bacterial balance. Bony deficits can be reconstructed in a variety of ways, including non-vascularized grafts, vascularized grafts (free of pedicle), and bone transport.

Generally, for defects greater than 6 to 8 cm, vascularized bone grafting is indicated.

Other indications for vascularized bone grafting are the presence of infection and prior failure of conventional (non-vascularized) grafting.

Age of the patient is not a contraindication to reconstruction per se, as long as he or she is medically stable to undergo a prolonged operation.

Gustilo Classification
I: open fracture; clean; wound less than 1 cm
II: open fracture; wound greater than 1 cm
IIIA: open fracture; extensive soft-tissue injury but adequate tissue for coverage
IIIB: open fracture; extensive soft-tissue injury but inadequate tissue for coverage
IIIC: any of the above with a vascular (arterial) injury

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36. A 48-year-old man is evaluated for reconstruction after resection of a tumor of the distal radius. Physical examination shows a 10-cm defect of the metaphysis and shaft. Which of the following is the most appropriate source of bone for reconstruction?

A) Contralateral fibula

B) Contralateral radius

C) Humeral shaft

D) Medial femoral condyle

E) Osteodistraction of the ipsilateral radius

The correct response is Option A.

The preferred source of bone for such a long piece of bone reconstruction is the fibula microsurgical vascularized transfer. Another viable option, which was not listed, could be the iliac crest.

Other sources listed would not yield as much bone stock, nor would they offer sufficient bicortical bone to yield a stable reconstruction with rigid fixation, such as:
-Contralateral radius (presumably with the radial vascular supply)
-Humeral shaft (presumably with the posterior radial collateral vessels)
-Medial femoral condyle (based on descending genicular vessels)

Thus, they would not be the preferred source, although they could all be transferred microsurgically.

Osteodistraction would not be the first line of treatment for this defect because of the length of bone transport necessary.

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37. A 34-year-old woman is scheduled to undergo bilateral prophylactic mastectomy because of a strong family history of breast cancer. Reconstruction with free flaps from the upper inner thigh is planned. Which of the following is the pedicle to these flaps?

A) Ascending branch of the lateral femoral circumflex artery

B) Descending branch of the lateral femoral circumflex artery

C) Medial femoral circumflex artery

D) Superficial circumflex iliac artery

E) Superficial femoral artery

The correct response is Option C.

The transverse upper gracilis (TUG) flap is a free flap that can be used in breast reconstruction. It is particularly useful in cases where the abdominal donor site is not available or not desired. The flap incorporates the skin and subcutaneous tissues of the upper inner thigh, in the region of the medial thigh lift. The TUG flap is based on the gracilis vessels and perforators from the descending branch of the medial femoral circumflex artery, which forms the dominant pedicle. This arises from the profunda femoris artery. Modifications of this flap have been proposed to increase the volume available for free tissue transfer.

The ascending branch of the lateral femoral circumflex artery provides blood supply to the tensor fascia lata flap.

The descending branch of the lateral femoral circumflex artery forms the pedicle for the anterolateral thigh flap.

The superficial circumflex iliac artery forms the pedicle for the groin flap.

Branches from the superficial femoral artery provide minor pedicles to the distal portion of the gracilis muscle, but are less important and distal to the area of the TUG flap.

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38. A 30-year-old man is evaluated because he is unable to abduct or externally rotate his shoulder or flex his elbow 4 months after he was involved in a high-speed motor vehicle collision. Physical examination shows numbness of the lateral upper arm and forearm. Which of the following nerve transfers is most appropriate to restore external rotation of the shoulder?

A) C7 ipsilateral root to anterior division of upper trunk

B) Medial pectoral nerve to medial cord

C) Phrenic nerve to long thoracic nerve

D) Radial nerve to axillary nerve

E) Spinal accessory nerve to suprascapular nerve

The correct response is Option E.

Examination findings indicate a C5-6 avulsion or very proximal upper trunk injury. External rotation of the shoulder is provided by the supraspinatus and infraspinatus muscles. Multiple techniques for harvest of the distal spinal accessory nerve to transfer to the suprascapular nerve have been described. This transfer would restore external rotation.

Transfer of the radial nerve to the axillary nerve will provide deltoid and possibly teres major innervation. This will improve shoulder function overall but will not restore external rotation. The phrenic nerve is commonly used to provide donor motor axons, but the long thoracic nerve goes to the serratus anterior.

Contralateral C7 transfer can be used to innervate the upper trunk. Ipsilateral C7 would not be used because the C5 and C6 roots were destroyed in the injury. Also, coaptation to the anterior division of the upper trunk would be distal to the origin of the suprascapular nerve.

The medial pectoral nerve can also be used for donor motor axons. It is limited by its relatively short reach. Coaptation to the medial cord of the brachial plexus would innervate the ulnar nerve, which is not injured in this patient.

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39. A 35-year-old man is transferred to the emergency department via helicopter 7 hours after he sustained a table saw injury to the left hand. The patient smokes one pack of cigarettes daily. Physical examination shows amputation of the thumb and partial amputation of the index finger. No other injuries are noted. An x-ray and a photograph study are shown. Which of the following is the most appropriate management?

A) Replantation of the thumb and index finger segment

B) Revision amputation of the index finger and replantation of the thumb

C) Revision amputation of the thumb and index finger

D) Revision amputation of the thumb and microvascular "on-top plasty" of the index finger

E) Revision amputation of the thumb and pollicization of the index finger

The correct response is Option B.

In patients with traumatic amputations of the thumb, optimal reconstruction is provided by replantation. Vein grafts from the princeps pollicis artery, in the anatomical snuff box, are often required because of the difficult positioning. Vein grafts can be harvested from the foot

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or the forearm. For injuries at the metacarpophalangeal joint level, no reconstruction method approximates that of the replanted thumb. All efforts should be utilized in order to salvage the amputated thumb. In contrast, for index finger amputations, any surgery which would not provide normal or near normal function often only serves to hamper hand function. A traumatic injury which involved the index finger metacarpophalangeal (MCP) joint would require arthrodesis. A fused MCP joint would only get in the way and detract from function. Option (A) replantation of the thumb and index segment is not correct because of the decreased function which would be observed after a replantation of a poorly functioning index finger. Option (B) is the correct answer. Option (C) is incorrect and since it involved the amputation of both the thumb and index finger. Option (D) "on-top plasty" is a procedure which involves a non-vascularized bone graft covered with a local pedicle flap; this would not provide optimal function. Option (E), which is pollicization of the thumb to index finger, would be suboptimal. Pollicization would only be an option if the thumb were deemed unreplantable.

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40. A 37-year-old man comes to the office because of wound breakdown 2 weeks after he sustained a calcaneal fracture. Orthopaedic stabilization was performed in the emergency department at the time of the injury. Examination today shows a 3 × 4-cm wound over the lateral calcaneus. Coverage with a propeller fasciocutaneous flap from the lateral leg is planned. Which of the following blood vessels supplies the perforators of this flap?

A) Anterior tibial artery

B) Lateral plantar artery

C) Lateral sural artery

D) Peroneal artery

E) Posterior tibial artery

The correct response is Option D.

Propeller flaps are a useful method of lower extremity reconstruction. These flaps were initially popularized by Teo and have been utilized for a variety of defects in the lower leg and foot. The propeller flap is based on perforating blood vessels from the peroneal artery to reconstruct lateral defects and perforators from the posterior tibial artery to reconstruct defects on the medial aspect of the leg wound. The propeller flaps can often replace the need for a sural artery, neurocutaneous artery flap or a free tissue transfer. Laterally based plantar flaps may be used to cover small defects on the weight-bearing surface of the foot but are not reliable for larger or lateral defects. The posterior and anterior tibial arteries do not have perforator in the desired location for a distally based propeller flap. The lateral sural vessels are too proximal for heel coverage.

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41. A 32-year-old woman comes to the emergency department after she sustained an isolated sharp transverse laceration of the flexor digitorum profundus tendon of the index finger of the left hand at the proximal interphalangeal joint flexion crease with a kitchen knife. A four-strand core suture is planned for repair. The ideal purchase length is which of the following distances from the cut tendon end?

A) 5 cm

B) 10 cm

C) 15 cm

D) 20 cm

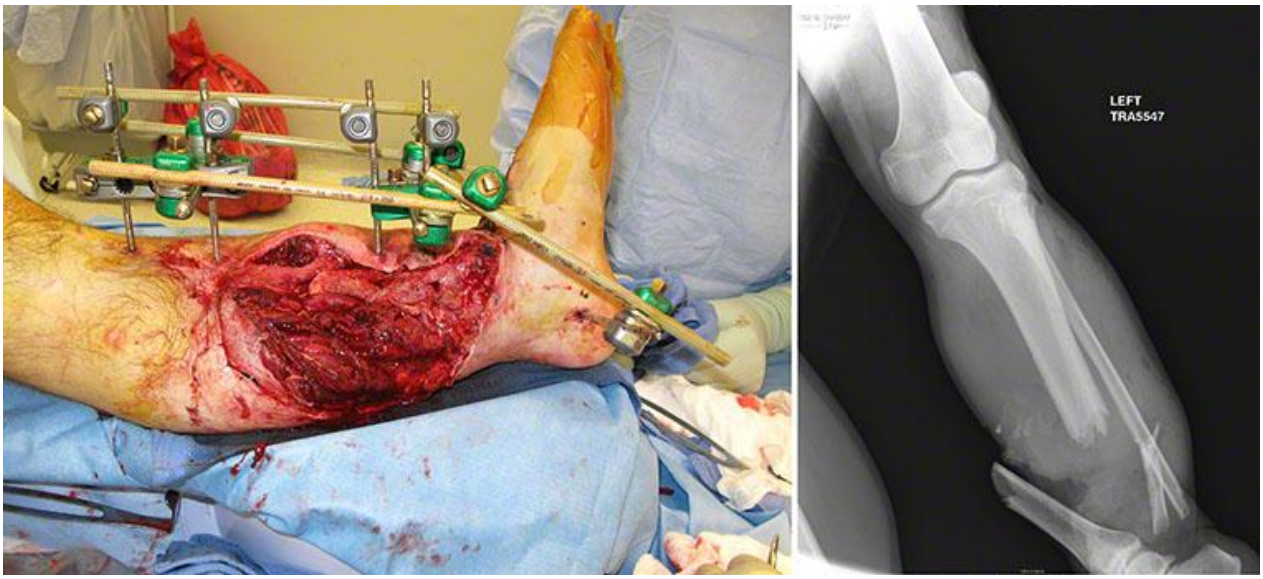
The correct response is Option B.

For both two-strand and four-strand locking core repair methods, the length of core suture purchase significantly influences both resistance to gapping and also ultimate strength to breaking. The optimal length of purchase is between 0.7 and 1.0 cm. Increased length of purchase from 0.7 to 1.2 cm does not increase the repair strength. Purchase length of 0.4 or less greatly reduces repair strength.

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42. A 55-year-old man is evaluated in the emergency department for foot salvage after he was involved in a motorcycle collision. Flow is restored after 6 hours from the time of injury. On examination, the foot is cold, and no plantar sensation is noted. The posterior tibial nerve is disrupted. A temporary external fixator is placed. A photograph and an x-ray study are shown. Which of the following is the most appropriate classification of this injury and recommendation for management?

A) Gustilo type IIIB; amputation

B) Gustilo type IIIB; reconstruction

C) Gustilo type IIIC; amputation

D) Gustilo type IIIC; reconstruction

The correct response is Option C.

The patient described has a Gustilo IIIC injury. Based on the best available data, he should undergo amputation.

Ultimately, the choice to reconstruct versus amputate is a gestalt of the situation and the patient, as well as the capabilities of the hospital and the care team. In this case, the factors influencing the decision would be the warm ischemia time of 6 hours and severed posterior tibial nerve, as well as the extensive soft-tissue injury.

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Some of the newer data suggests that absence of plantar sensation is no longer criteria for amputation in and of itself. However, an anatomically disrupted nerve in an adult strongly favors amputation.

In addition, there is evidence supporting the notion that limb salvage might involve less cost in the long term versus reconstruction.

Gustilo Classification
I: open fracture; clean; wound less than 1 cm
II: open fracture; wound greater than 1 cm
IIIA: open fracture; extensive soft-tissue injury but adequate tissue for coverage
IIIB: open fracture; extensive soft-tissue injury but inadequate tissue for coverage
IIIC: any of the above with a vascular (arterial) injury

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43. A 16-year-old girl is brought for evaluation because she has been unable to extend her left ring finger since the tip of her finger was struck by a basketball during a game 3 hours ago. On physical examination, she is unable to straighten the distal interphalangeal (DIP) joint. An extensor lag of 35 degrees is noted. X-ray study shows no fracture or dislocation. Which of the following is the most appropriate management?

A) Arthrodesis of the DIP joint

B) Continuous extension splinting of the distal phalanx

C) Exploration and suture of the torn tendon

D) Open repair with reinsertion of the tendon into bone

E) Splinting of the proximal interphalangeal (PIP) joint in extension with the DIP free

The correct response is Option B.

The most appropriate management is continuous extension splinting of the distal phalanx.

The patient has sustained a mallet injury to the left ring finger. There is tearing of the terminal extensor tendon from its insertion at the base of the distal phalanx, resulting in inability to extend the finger at the DIP joint. On occasion, these injuries may be associated with an avulsion fracture from the dorsal aspect of the distal phalanx.

The majority of closed mallet injuries (Type I) in Zone I of the extensor tendon can be treated by continuous extension splinting for 6 to 8 weeks. It is important that the finger not be allowed to flex at the DIP joint during this time period to avoid disruption of healing.

Arthrodesis of the DIP joint is reserved for cases of DIP joint arthritis and would not be necessary in this patient.

Exploration and suture of the tendon can be performed, but results are no better than closed treatment due to the difficulty of obtaining adequate repair of the thin tendinous substance at this level. Additionally, the patient will still require prolonged immobilization of the DIP joint after open repair. Exploration and suture of the tendon is used to treat Type II (open) mallet injuries.

Open repair with reinsertion of tendon into bone is performed in flexor digitorum profundus avulsion injuries.

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Splinting of the PIP joint in extension with the DIP joint free is used to treat Zone III extensor tendon injuries (central slip avulsion injuries).

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44. A 48-year-old man comes to the office because of drainage from the distal aspect of the wound 2 weeks after he underwent soft-tissue coverage with a free latissimus dorsi muscle flap for a degloving injury of the left lower extremity sustained in a motorcycle collision. Examination in the emergency department showed a Gustilo type IIIB tibia/fibula fracture and 6 cm of tibial loss. Debridement of the bone and stabilization with an external fixator were performed at the time of the injury. The patient underwent soft-tissue coverage 8 days after the injury. Examination today shows purulent drainage at the lower portion of the flap. Which of the following is the most likely cause of this complication?

A) Age of patient

B) Delay in soft-tissue coverage

C) Distal flap necrosis

D) Inadequate debridement

The correct response is Option D.

Posttraumatic reconstruction of the lower extremities with significant soft-tissue defects that expose bone, joints and tendons generally require free tissue transfer. The Gustilo-Anderson fracture classification system is widely used to describe the injury when associated with a long bone fracture. Gustilo type IIIB fractures are associated with periosteal stripping and exposure of bone with contamination. In 1986, Godina emphasized coverage of these soft-tissue defects within the first 72 hours of injury. Given the nature of these poly-trauma injuries, coverage of these wounds is not always possible in the given time frame. Staged debridement and negative pressure therapy have become common in the management of these injuries. Inadequate bone or soft-tissue debridement prior to reconstruction is a common cause of failure. The wound has to be free of all contaminants prior to reconstruction; thus, it is unlikely that an 8-day delay is the cause of breakdown. Distal flap necrosis would show more superficial breakdown and, in this case, is not the cause for a deep space infection. The patient's age does not have any bearing on this complication.

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45. A 60-year-old woman comes to the office because of a 15-year history of rheumatoid arthritis affecting both hands. She has intractable pain, wrist collapse with carpal supination, a severe ulnar deviation with volar subluxation deformity of the metacarpophalangeal (MCP) joints, and distal interphalangeal (DIP) joint flexion deformities. She says these conditions are greatly decreasing her strength when she attempts to grasp objects. Which of the following findings is a contraindication to immediate MCP joint arthroplasty in this patient?

A) DIP joint flexion deformities

B) Grasp weakness

C) MCP joint subluxation

D) Severe pain

E) Wrist collapse

The correct response is Option E.

Patients with rheumatoid arthritis can have progressive deformity of their metacarpophalangeal (MCP) joints, ultimately resulting in loss of function. Classically, these patients present with ulnar drift and volar dislocation of these joints. When the pain in the MCP joint is severe along with weak grasp and poor appearance, implant arthroplasty may be performed to improve the functional range of motion, stability, and resistance to lateral and rotational forces.

These patients can also present with concurrent deformity of the wrist and joints distal to the MCP joint. Reconstruction of the rheumatoid hand must proceed from proximal to distal joints. If there is significant deformity of the wrist that is not addressed, the patient may get recurrent ulnar deviation of the fingers after arthroplasty. In addition, preoperative wrist pain may limit hand function, even after successful treatment of the MCP joint with arthroplasty. Thus, the wrist should be addressed first prior to MCP joint arthroplasty.

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46. Which of the following is the most likely cause of congenital constriction band syndrome of the lower extremity?

A) Defect in the zone of polarizing activity

B) Deletion of the gene responsible for the apical ectodermal ridge

C) Early amnion rupture

D) Exposure to retinoic acid

E) Use of thalidomide during pregnancy

The correct response is Option C.

Early amnion rupture with subsequent entanglement of fetal parts (mostly limbs and appendages) by amniotic strands is the primary theory of pathogenesis.

A wide spectrum of clinical deformities is encountered and range from simple ring constrictions to major visceral defects. Lower extremity limb malformations are extremely common and consist of asymmetric digital ring constrictions, distal atrophy, congenital intrauterine amputations, acrosyndactyly, lymphedema, and clubfoot.

Amniotic band syndrome is not a rare anomaly, as first described more than 150 years ago, and appears to be rising. Once believed to have an incidence of 1:100,000, recent literature supports the incidence today as 1:1200 to 1:5000 births.

No distinct sex predilection has been determined. Nearly 60% of the cases documented have some sort of abnormal gestation history. Prenatal risk factors associated with amniotic band syndrome include prematurity (less than 37 weeks), low birth weight (less than 2500 g), maternal illness during pregnancy, maternal drug exposure, and maternal hemorrhage. Attempted abortion in the first trimester is also a highly associated finding. Family history seldom shows any direct inheritance pattern since the syndrome occurs in no particular association with known genetic or chromosomal disorders.

The zone of polarizing activity signals the developing limb bud towards anterior/posterior polarity and does not result in truncation.

Proximodistal limb growth is the result of the apical ectodermal ridge. Deletion of the gene responsible for the apical ectodermal ridge will result in shortening of the limb but not in congenital constriction band syndrome. Experiments in which the apical ectodermal ridge has

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been removed show truncated limb growth. Scientific evidence supports that the pattern of limb anomalies in the offspring of mothers exposed to exogenous retinoids, such as retinoic acid, causes interference with apical ectodermal ridge function, resulting in similar deformities.

Thalidomide results in various limb deformities, including phocomelia, dysmelia, amelia, and bone hypoplasticity, with as little as a single dose of thalidomide during gestation. It does not, however, result in constriction bands. It is postulated that thalidomide-associated malformations are the result of the drug's interference with vasculogensis.

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47. A 10-year-old girl is brought to the office 2 years after she sustained a crush injury to the nail bed of the long finger of the right hand. Her mother sought no treatment at the time of injury. She now says that the nail appears split in two with no growth of the middle third of the nail. Examination shows a midline deformity that involves both the sterile and germinal matrices. Which of the following is the most appropriate management?

A) Excision of scar and primary closure of the nail bed

B) Full-thickness grafting from the nail bed of the great toe

C) Full-thickness grafting from the nail bed of the ring finger

D) Split-thickness grafting from the nail bed of the great toe

E) Split-thickness grafting from the nail bed of the ring finger

The correct response is Option B.

This patient has a split-nail deformity; the most appropriate management is full-thickness nail grafting from the toe. This deformity is caused by injury to the nail bed, leading to scarring of the bed. The nail plate does not grow in the scarred area, resulting in a split in the nail plate. The deformity described involves both the sterile and germinal matrices. Therefore, only a full-thickness nail will provide the sterile and germinal matrix components required for reconstruction. When a full-thickness nail bed graft is harvested, donor morbidity will always occur. Therefore, the donor site should be from the first or second toes or from spare parts in multidigit injuries.

In patients who have a small scar affecting the sterile matrix only, appropriate management may include excision of the scar and reapproximation of the sterile matrix. This is usually not possible unless the affected area is quite narrow and there is no involvement of the germinal matrix.

A split-thickness nail bed graft from either another finger nail bed or a toe will not provide the components needed for reconstruction of this defect. In addition, using another finger as a donor will result in an unsightly donor defect in the hand.

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(Please note that this pictorial appears in color in the online examination)

48. A 62-year-old man comes to the office 1 week after he sustained an avulsion injury to the soft tissue of the dorsal aspect of the left thumb while firing his crossbow. Moist dressing changes have not resulted in granulation tissue over the tendon. A photograph is shown. Which of the following is the most appropriate definitive treatment of the defect?

A) Alginate dressing changes

B) Cross-finger flap transfer

C) First dorsal metacarpal artery flap transfer

D) Full-thickness skin grafting

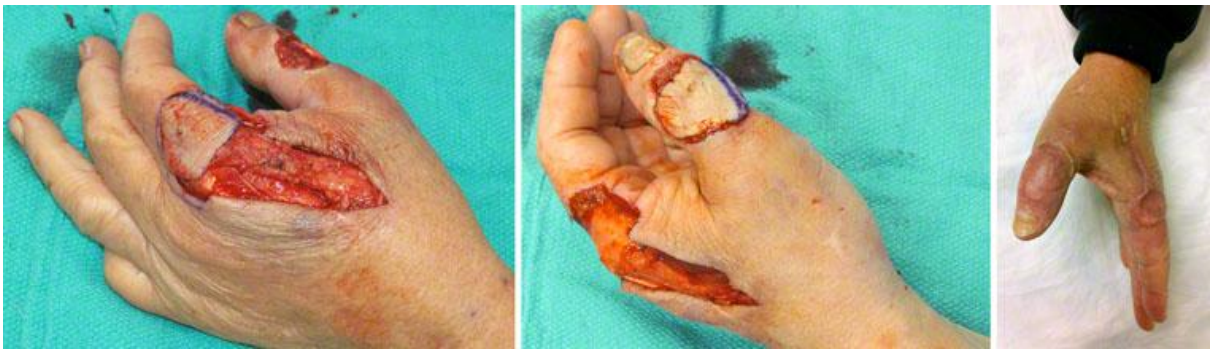
E) Split-thickness skin grafting

The correct response is Option C.

In this patient with exposed tendon denuded of tenosynovium (as evidenced by the photo and failure to granulate) flap coverage with the first dorsal metacarpal artery flap, or "kite" flap, will provide closure of the wound with similar skin to what has been lost with minimal morbidity. Apart from reaching the thumb dorsal surface, this flap has been successfully used

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to resurface palmar wounds of the thumb. Photographs of the flap are shown.



(Please note that this pictorial appears in color in the online examination)

Alginate dressings would keep the wound moist but would not add to the conservative management of dressing changes the patient has already tried.

Skin-graft take relies on adequate granulation tissue in the recipient site to survive. Here neither split- nor full-thickness grafts would be likely to take. Furthermore, grafts directly to tenosynovium can limit tendon excursion after healing.

Cross-finger flaps are useful for resurfacing the palmar defects of adjacent digits. Reversed/turnover cross-finger flaps, or cross-finger fascial flaps, can resurface adjacent digits. Wound closure then requires skin grafting of the fascial flap at the recipient site.

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49. An active 73-year-old woman comes to the office because of Eaton Stage IV arthritis of the carpometacarpal joint of the dominant thumb (pantrapezial arthritis with carpometacarpal [CMC] joint subluxation). She says she has severe pain when she tries to grip something, such as open a door or twist off the top of a jar. Which of the following is the most predictable procedure to decrease pain and improve hand function in this patient?

A) CMC fusion

B) Metacarpal osteotomy

C) Trapezial hemi-resection and tendon interposition

D) Trapezial resection and silicone implantation

E) Trapezial resection, ligament reconstruction, and tendon interposition

The correct response is Option E.

Thumb basilar joint arthritis is a common debilitating problem. The prevalence in postmenopausal women has been estimated at 33%, although many patients with radiographic evidence of arthritis remain asymptomatic. It more often occurs in the dominant hand. The extent of arthritis and joint deformity dictates the best treatment choice. The most widely used classification is that of Eaton and is based on radiographic findings. Stage I has normal joint contours but possible joint widening due to effusion. Although most patients respond to splinting, anti-inflammatory medications, trapezial hemi-resection, and metacarpal osteotomy have been advocated in very symptomatic patients.

Stage II shows slight trapeziometacarpal (TM) joint narrowing and minimal sclerosis of the articular surface. The indications for operative treatment are more concrete, and surgical options are largely the same as Stage I, with the addition of CMC fusion as an option in a laborer.

Stage III presents as TM joint narrowing with cystic or sclerotic changes in the articular surface. There is variable dorsal subluxation of the TM joint, and adduction contracture may occur. There can be early signs of scaphotrapezial (ST) joint arthritis. If the ST joint is in relatively good condition, some authors still advocate trapezial-sparing procedures such as hemi-resection. Nevertheless, most advocate trapeziectomy with or without ligament reconstruction/tendon interposition (LRTI). There is some evidence that ligament reconstruction preserves the joint space better than no reconstruction, but provides no better clinical outcome and has a higher complication rate. Trapeziectomy ± LRTI provides

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excellent pain relief and improved function, especially in lower demand patients.

In Stage IV, the TM and ST joints are completely destroyed. In these patients, LRTI is the preferred treatment. Some authors report good early results in selected patients with implant arthroplasty; however, there is a moderately high rate (up to 40%) of instability, dislocation, and implant breakage. The use of silicone as a spacer has fallen into disuse due to the risk of chronic tissue inflammation and resultant bone resorption.

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50. Which of the following is the most common sequela of using the Moberg volar skin advancement flap for closure of thumb defects?

A) Difficulty retraining sensory function

B) Extension deficit of the interphalangeal joint

C) Hook-nail deformity

D) Necrosis of the flap

E) Skin necrosis of the dorsal thumb

The correct response is Option B.

The Moberg volar advancement flap is a useful and rugged flap for thumb tip coverage of open wounds up to a maximum of 2 cm. The principal advantage of the flap is that it provides like tissue with near-normal sensitivity. In one series of Moberg flaps, when patients with associated bony amputations were excluded, 6 of 11 patients were found to have extension deficits at the interphalangeal joint with a resultant reduction in active range of motion of at least 20 degrees.

Unlike other flaps used for thumb coverage, like the Littler neurovascular island flap, sensory retraining is not necessary with the Moberg flap. Dorsal thumb skin necrosis is not a likely complication of the Moberg flap when used for thumb coverage, as the thumb has an independent and hardy dorsal circulation. This is in contradistinction to the other digits, where a volar advancement flap would likely result in dorsal skin necrosis because of inadequate dorsal circulation.

Hook-nail deformity can occur after distal fingertip injuries with tissue loss; this would not likely be related to use of a Moberg flap, but instead to loss of support of the distal nail bed.

Because the thumb neurovascular bundles are included in the volar tissue advancement of the Moberg flap, volar flap necrosis is an unlikely complication given the robust circulation of the flap.

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Section 3: Craniomaxillofacial

1. A 4-year-old boy is brought for evaluation because his mother is concerned about a growth on his neck. Physical examination shows a nontender mass in the midline of the neck that moves vertically when the patient swallows. Which of the following is the most likely cause of this patient's condition?

A) Failure of vascular apoptosis at 12 weeks' gestation

B) Failure of the thyroglossal duct to atrophy

C) Ossification of cartilage from the second and third pharyngeal arches

D) Persistent ectopic parathyroid tissue in the neck

E) Persistent ectopic thymus tissue in the neck

The correct response is Option B.

The patient described has a persistent thyroglossal duct cyst.

The thyroid gland is the first of the body's endocrine glands to develop, at approximately 24 days' gestation. The gland originates as a proliferation of endodermal epithelial cells on the median surface of the developing pharyngeal floor known as the foramen cecum. The foramen cecum originates from between the first and second pouches and represents the opening of the thyroglossal duct into the tongue. Descent of the thyroid gland carries it anterior to the hyoid bone and anterior to the laryngeal cartilages. As the thyroid gland descends, it forms its mature shape. The thyroid completes its descent in the seventh gestational week, coming to rest in its final location immediately anterior to the trachea.

If the thyroglossal duct does not atrophy, then the remnant can manifest clinically as a thyroglossal duct cyst. While half of these generally midline cystic masses are located at or just below the level of the hyoid bone, they may be located and can track anywhere from the thyroid cartilage up the base of the tongue. Because the hyoid bone develops in an anterior direction and may surround the thyroglossal duct, the surgeon should resect the central portion on the hyoid bone along with the cyst.

The thyroid gland is ensheathed by the visceral fascia, which attaches it firmly to the laryngoskeleton (i.e., Berry ligament). This firm attachment of the gland to the laryngoskeleton is responsible for movement of the thyroid gland and related structures

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during swallowing. This also causes a thyroglossal duct cyst to move on physical examination.

Ectopic thyroid gland may occur anywhere along the path of initial descent of the thyroid, although it is most common at the base of the tongue, just posterior to the foramen cecum.

Ectopic parathyroid glands occur in 15 to 20% of patients. The glands may be located anywhere near or even within the thyroid or thymus. For example, if parathyroid IVs do not descend entirely, they may be located as high as the bifurcation of the common carotid artery. Conversely, if parathyroid IVs do not release from the thymus, they may be located intrathoracically, as low as the aortopulmonary window. Other common ectopic locations include the anterior mediastinum, posterior mediastinum, and retroesophageal and prevertebral regions. However, even when the parathyroid glands are in an ectopic location, they still often are symmetrical from side to side, making localization somewhat easier.

Ossification of cartilages from the second and third pharyngeal arches gives rise to the hyoid bone.

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2. Which of the following best describes the orbital deformities observed in a patient with Apert syndrome?

A) Enophthalmos

B) Esotropia

C) Exophthalmos

D) Exorbitism

E) Exotropia

The correct response is Option D.

Exorbitism describes bulging of the globe due to decreased volume of the bony orbit, whereas exophthalmos describes protrusion of the globe due to increased orbital soft-tissue contents. There is decreased orbital bony volume due to craniosynostosis in Apert syndrome.

Exotropia and esotropia describe strabismus, in which the eyes are deviated laterally (outward) or medially (inward), respectively.

Enophthalmos is a condition where the globe is recessed in the orbit. This can be due to increased bony volume or malposition of the bony orbit after trauma and/or under-correction or repositioning of the bony skeleton.

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3. A 5-year-old boy is brought to the office because of a whistle deformity. History includes repair of a bilateral cleft lip at 6 months of age. On examination, the orbicularis oris is not in continuity across the lip. Dry, crusting mucosa on the vermillion of the whistle deformity and nasolabial fistulas are noted. A cleft lip revision is planned to repair the muscles, close the nasolabial fistulas, and correct the whistle deformity. Which of the following Current Procedural Terminology (CPT) codes is most appropriate for this procedure?

A) 40650 (Repair lip, full-thickness; vermillion only)

B) 40652 (Repair lip, up to half of vertical height)

C) 40654 (Repair lip, over one-half vertical height, or complex)

D) 40701 (Primary bilateral lip repair, one-stage procedure)

E) 40720 (Secondary lip repair, by recreation of the defect and reclosure)

The correct response is Option E.

Since all components of the lip require revision, this is best achieved by recreation of the defect, and therefore the most appropriate code is 40720. Minor revisions of vermillion only or of half the lip would not address correction of all the components requiring reconstruction. Only recreation of the defect and repair will allow for closure of nasolabial fistulas, whistle deformity, and repair of the orbicularis oris across the lip.

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4. In patients with syndromic craniosynostosis, successful mid facial distraction is most likely to result in which of the following outcomes?

A) Decreased ANB angle

B) Decreased exorbitism

C) Decreased upper airway volume

D) Increased negative overjet

E) Increased SNB angle

The correct response is Option B.

Distraction osteogenesis allows anterior movements of the midface that cannot be achieved with conventional Le Fort III and bone grafting. The advancement obtained with single-stage midfacial advancement is limited by soft-tissue tension to 10 to 12 mm, and bone grafting is required to buttress the advanced segments. These procedures have long operative times and major blood loss, and some reports suggest long-term relapse presumably due to bone graft resorption. In contrast, the gradual soft-tissue creep achieved with distraction allows osseous advancement in excess of 30 mm. In addition, distraction osteogenesis obviates the need for bone grafting and relapse is minimal.

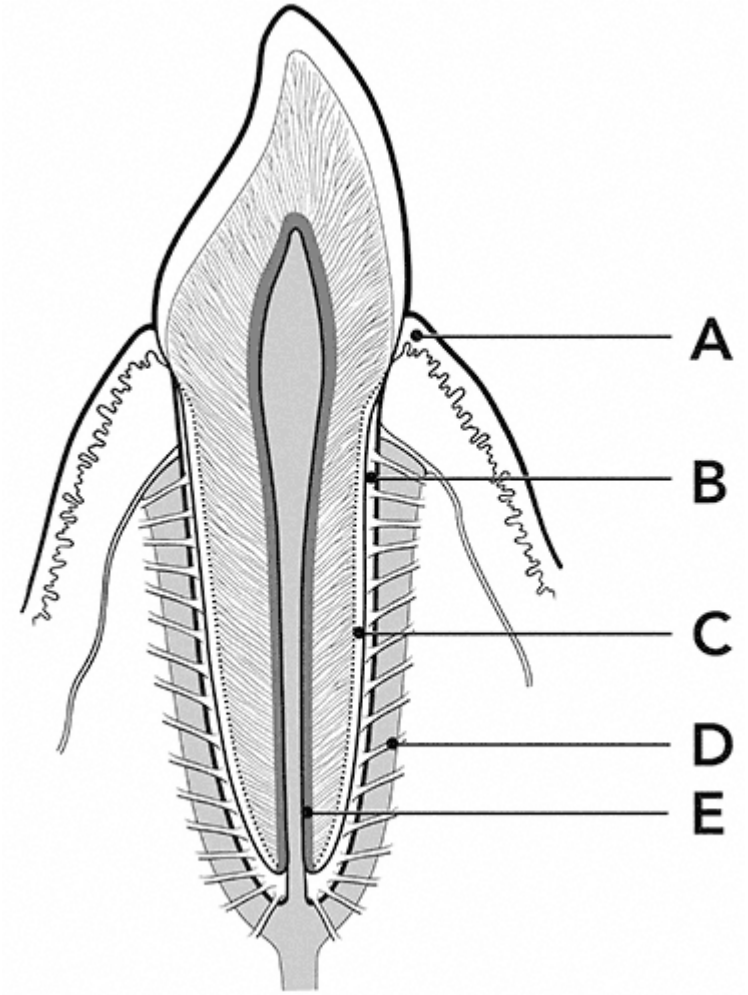
The effect of successful midfacial advancement is a decrease in SNB, an increase in ANB, decrease in negative overjet, and an increase in upper airway volume. The latter change often leads to an improvement in obstructive sleep apnea. Exorbitism is reduced by the increase in orbital volume.

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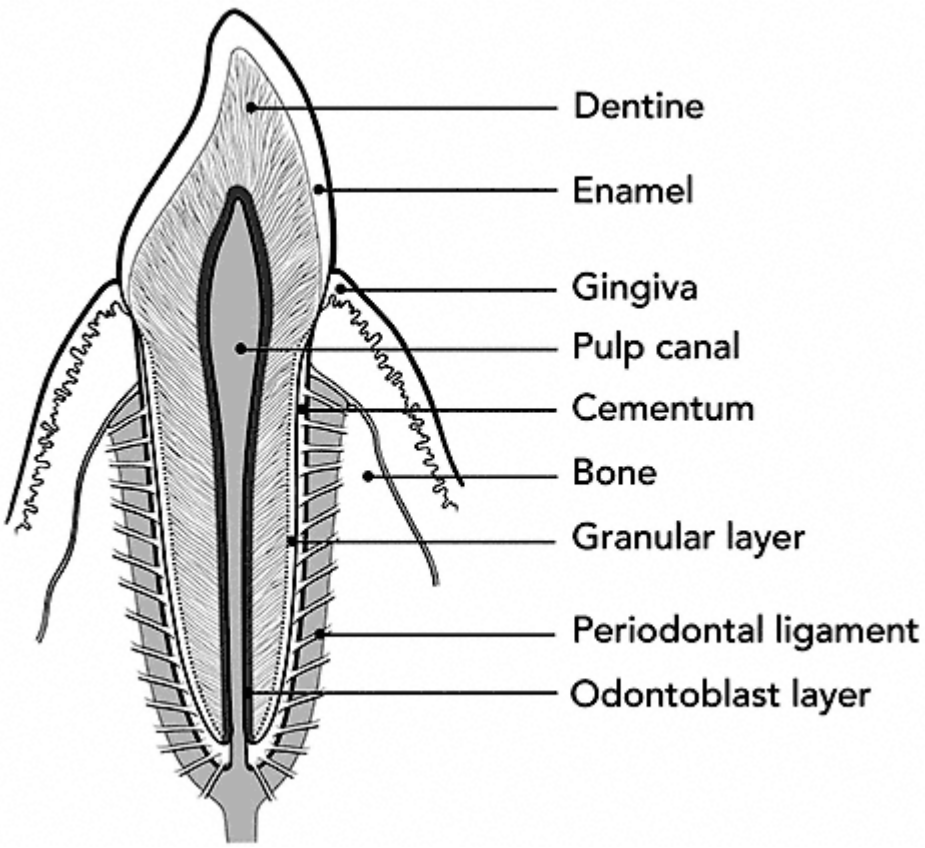
5. Which of the following structures (A-E) is responsible for anchoring the tooth in its socket?



A) B) C) D) E)

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The correct response is Option D.



The periodontal ligament is responsible for keeping the tooth anchored. Enamel is the outer protective layer of the tooth. Dentine, enamel, cementum, and pulp are the four major components of the tooth but none are responsible for anchoring the tooth.

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6. A 32-year-old woman comes to the office for consultation regarding cosmetic improvement of her nose. On examination, facial animation (smiling) causes marked descent of the nasal tip, shortening of the upper lip, and a transverse crease in the mid philtral area. These findings are most consistent with the action of which of the following muscles?

A) Depressor septi nasi

B) Nasalis

C) Procerus

D) Risorius

E) Zygomaticus major

The correct response is Option A.

A deformity upon facial animation characterized by descent of the nasal tip, shortening of the upper lip, and a transverse crease in the mid philtral area may be created or accentuated by the action of the depressor septi nasi muscles. These are small, paired muscles located on each side of the nasal septum, which originate at the medial crura foot plates and insert either on the incisive fossa of the maxilla or into the fibers of the orbicularis oris muscle.

Physical examination upon facial animation should be part of the routine preoperative evaluation of the rhinoplasty patient. Those who present with the dynamic deformity as described may benefit from excision or transection of the depressor septi nasi muscles. Several surgical techniques have been described, as well as the use of botulinum toxin type A.

The nasalis muscle compresses the cartilaginous part of the nose and draws the ala toward the septum. Although this may generate some depression of the tip of the nose, it should not cause shortening of the upper lip.

The procerus muscle depresses the medial angle of the eyebrows, creating transverse rhytides over the bridge of the nose. The risorius muscles retract the angles of the mouth, as in a grinning expression. The zygomaticus major muscles draw the angles of the mouth posteriorly and superiorly, as in laughing. These muscles do not cause depression of the tip of the nose.

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7. A male newborn is emergently intubated in the prenatal intensive care unit because of severe respiratory distress. Examination shows marked mandibular micrognathia and a cleft palate. Nasopharyngoscopy shows glossoptosis, laryngomalacia, and laryngeal webbing. Which of the following is the most appropriate treatment for the airway compromise?

A) Extubation and prone positioning

B) Insertion of a nasal airway

C) Mandibular distraction

D) Tongue-lip adhesion

E) Tracheostomy

The correct response is Option E.

Treatment of airway compromise associated with Robin sequence depends on the severity and etiology of the airway obstruction. Obstruction is often caused by glossoptosis (tongue retropositioning into the oral pharynx), but this may not be the only cause of respiratory distress in these infants. Additional anatomic and physiologic causes of poor respiration (e.g., central apnea, laryngeal anomalies) have been documented in Robin sequence patients and can limit treatment options. Mandibular distraction and tongue-lip adhesion are both effective addressing the glossoptosis and upper airway obstruction, but will have no effect on the subglottic laryngomalacia and webbing. Similarly, prone positioning and nasal airway do not address the lower airway causes of airway obstruction in this child. Only tracheostomy will bypass the laryngeal anomalies and ensure adequate airway patency.

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8. During the period of mixed dentition, which of the following is the first permanent tooth to erupt?

A) Mandibular canine

B) Mandibular first molar

C) Mandibular first premolar

D) Maxillary central incisor

E) Maxillary lateral incisor

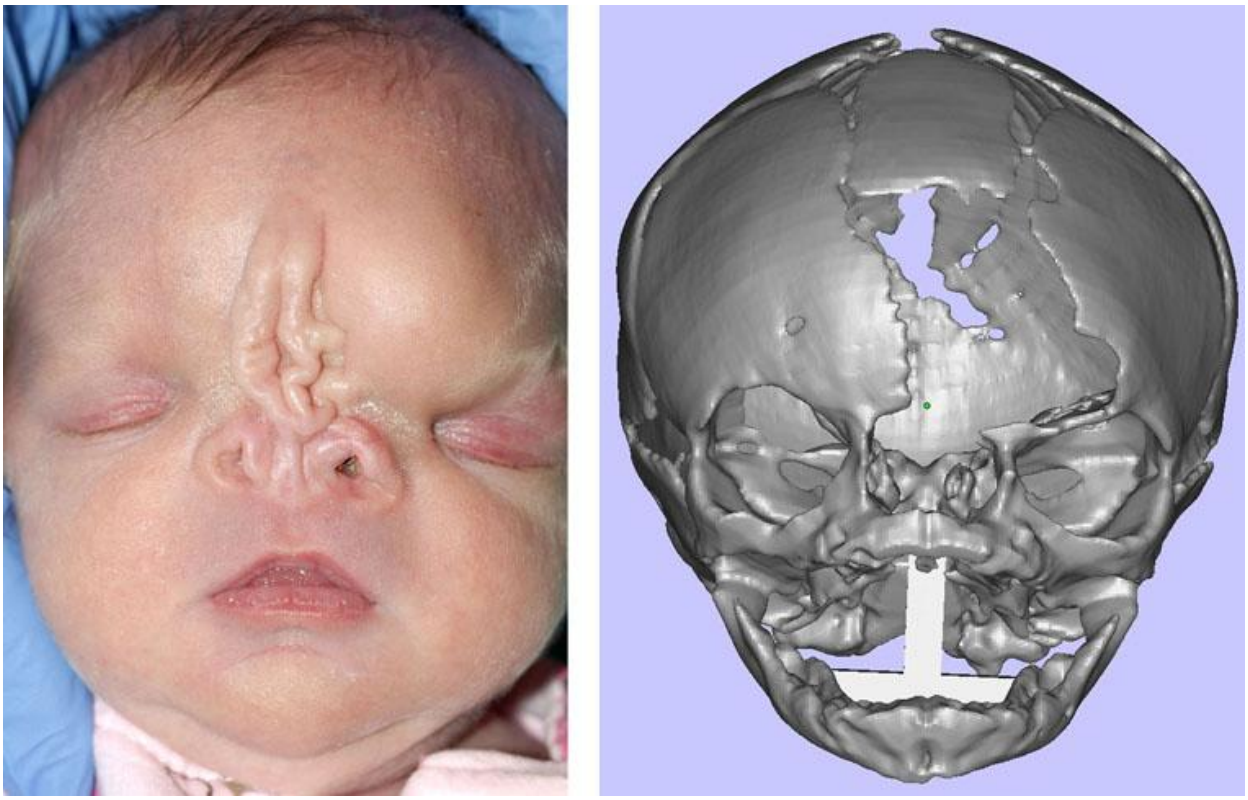
The correct response is Option B.

The stage of mixed dentition is defined as the age range in which there are both deciduous (primary) and permanent (secondary) teeth erupted in the oral cavity at the same time. Normally, the mandibular and maxillary teeth erupt in a slightly different pattern. This usually occurs at age 6 to 7 years and is completed by age 11 to 12 years. In the maxilla, the order of eruption is as follows: first molar, central incisor, lateral incisor, first premolar, second premolar, canine, second molar, and third molar. In the mandible, the order is slightly different and is as follows: first molar, central incisor, lateral incisor, canine, first premolar, second premolar, and second molar. The permanent first molars erupt between ages 6 and 7 years, the central and lateral incisors erupt between ages 6 and 8 years, and the first premolars erupt between ages 8 and 9 years. The first tooth to erupt is the permanent mandibular first molar, which erupts first in a position posterior to the deciduous second molar. There are no premolars in deciduous teeth.

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9. A 2-week-old male newborn is brought to the office for evaluation of median craniofacial dysraphia. His parents say that aside from the deformity, the child is thriving. Physical examination shows Tessier No. 0 and 14 clefts. A clinical photograph and a three-dimensional CT scan are shown. Which of the following additional findings is most likely in this patient?

A) Choanal atresia

B) Contact between the dura and ectoderm through the anterior fontanelle

C) Failure of closure of the foramen cecum

D) Heterotopic glial tissue

E) Rathke pouch cyst

The correct response is Option C.

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The classification scheme by Tessier is perhaps the most accepted and basic approach to describe these rare craniofacial clefts. As it only provides an anatomical description, others have further developed description schemes. Some have an embryonic emphasis to further characterize these disorders. These severe clefts can be associated with encephalocele, which if not repaired can be life-threatening. Nasal dermoids arise from contact between dura and ectoderm through the foramen cecum. These can be dangerous if there is intracranial extension. Heterotopic glial tissue is equivalent to the term glioma because these are generally not connected to the intracranial space and are treated as benign lesions. The Rathke pouch occurs during development when the stomodeum ectoderm invaginates toward the hypophysis and remnants are usually located in the nasopharynx as a cyst. An encephalocele is similar to a glioma but contains meninges and/or brain (encephalomeningocele) and can communicate with the ventricle (encephalomeningocystocele). Fifteen percent of these are intranasal. Resection of these without knowing about their intracranial communication can be disastrous. Left untreated, these lesions can significantly increase the risk of meningitis and be life-threatening.

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10. A 23-year-old man is brought to the emergency department unconscious after a head-on motor vehicle collision. Physical examination shows left periorbital bruising. When a light is shined into the left eye, no pupillary constriction is noted, and thereafter, the light is shined into the right eye, and both pupils constrict. When the light is subsequently shined again into the left eye, the right pupil constricts and the left pupil dilates. Which of the following best explains this finding?

A) Extraocular muscle entrapment

B) Hyphema

C) Inadequate brain perfusion

D) Optic nerve injury

E) Tentorial herniation

The correct response is Option D.

The vignette illustrates findings consistent with a Marcus Gunn pupil. A lesion at the level of the posterior globe (retina) and optic nerve anterior to the chiasm alters the afferent response normally expected from shining a light in the eye. The test is done by shining a light in the pupil of the affected side first, and this will cause little or no constriction on that side, yet there will be a consensual response on the normal side. Then, the light is shined in the normal pupil, resulting in constriction of both pupils (normal ipsilateral and consensual response). The third step is to swing the light back to the injured side, and this typically will cause paradoxical dilatation of the affected pupil. A fracture in the posterior orbit may cause pressure on the optic nerve directly by impingement of a fracture fragment or from hematoma.

Extraocular muscles control the directionality of the globe for the purpose of binocular vision. There is no direct distal anatomical connection to the pupillary sphincter muscle (parasympathetic) or the iris dilator (sympathetic), both of which control pupillary size. However, there is a proximal commonality in that some extraocular muscles (superior/medial/inferior recti, inferior oblique) and the pupillary muscles are supplied by the oculomotor nerve. Most commonly, it is the inferior oblique with or without the inferior rectus muscle that is entrapped in an orbital floor fracture, and thus has no direct bearing on pupillary size. Therefore, pupils should react normally in an isolated orbital floor fracture with muscle entrapment.

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Hyphema is the presence of blood in the anterior chamber. It does not cause a Marcus Gunn pupil, or any other abnormal pupillary reaction.

The pupils in a patient with inadequate brain perfusion are usually dilated and fixed, or react sluggishly to light, but always symmetrical.

In tentorial herniation, due to a laterally expanding intracranial hematoma, the oculomotor nerve is susceptible to compression as it exits the mid brain. The pupillary examination will show one ipsilateral dilated pupil that is fixed or sluggish, and the globe will be laterally displaced due to the unopposed tone generated by cranial nerve VI on the lateral rectus muscle over a paralyzed medial rectus muscle.

Normal pupillary constriction as a reaction to light begins with a light stimulus on the retina that triggers a signal via afferent fibers in the optic (II) nerve. These fibers connect to the pretectal nucleus and both Edinger-Westphal nuclei. A response is generated from there through parasympathetic fibers via the oculomotor (III) nerve, which supplies the sphincter pupillae.

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11. A 16-year-old boy who successfully underwent Le Fort III advancement with bone grafting 6 years ago because of severe maxillomandibular disharmony comes to the office due to severe malocclusion. Physical examination shows an Angle class III malocclusion and severe mid face deficiency. Which of the following is the most likely explanation for the reappearance of this patient's condition?

A) Age during original surgery

B) Discrepancy in the growth rate of the operated mid face and the mandible

C) Lack of bony stability in the first postoperative year

D) Poor follow-up

E) Poorly performed orthognathic surgery

The correct response is Option B.

A recent article showed for the first time that children who underwent Le Fort III advancement had recurrence of their initial pathology due to minimal mid face sagittal growth, but with normal mandibular growth. This study displayed this, despite excellent early advancement and bony stability up to 1 year. After 5 years, the lack of mid face growth ultimately relegates these patients to at least another advancement surgery. Definitive orthognathic surgery is required following the completion of skeletal growth to improve maxillomandibular relationships and to achieve optimal occlusion. In multiple studies, the average age of children undergoing Le Fort III osteotomies was close to age 6 years and age was not an independent factor for recidivism. Finally, studies of distraction after a Le Fort III osteotomy show better advancement and may help to minimize the recurrence of pathology.

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12. A 32-year-old man comes to the office because of a pleomorphic adenoma in the right parotid. A mass is palpated over the angle of the mandible. Examination of the oral cavity and neck shows no abnormalities. Which of the following is the most appropriate surgical treatment?

A) Enucleation

B) Radical parotidectomy

C) Superficial parotidectomy

D) Total parotidectomy

E) Total parotidectomy and neck dissection

The correct response is Option C.

The salivary gland neoplasms are uncommon and generally benign. Most benign tumors can be easily cured by wide local excision. Pleomorphic adenoma is the most common salivary gland tumor, with a propensity for local recurrence. Simple enucleation is discouraged. Removal is usually done by a superficial parotidectomy. The superficial lobe is anatomically defined by the traversing facial nerve. The nerve is preserved, as pleomorphic adenoma is a benign tumor that does not infiltrate the nerve. The parotid gland is also the most frequently affected major salivary gland, and the palatal salivary tissue is the most commonly affected minor salivary gland.

Pleomorphic adenomas are the most common neoplasm of salivary glands, comprising 45 to 75% of all tumors in most series. These tumors typically affect patients in their 20s to 50s and there is a female predilection. Warthin's tumor is the second most common tumor of the salivary glands and constitutes approximately 14 to 21% of salivary gland neoplasms. The tumor is almost exclusively found in the parotid gland, typically affects males in their 50s to 60s, and often may be bilateral.

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13. A 2-year-old girl is brought to the office because of the lower eyelid colobomas and malar deficiency shown in the photograph. Which of the following syndromes is most likely?

A) Apert

B) Crouzon

C) Goldenhar

D) Pfeiffer

E) Treacher Collins

The correct response is Option E.

Bilateral lower eyelid colobomas are commonly found in patients with Treacher Collins syndrome (TCS). TCS is also known as mandibulofacial dysostosis, first and second branchial arch syndrome, and Franceschetti-Zwahlen-Klein syndrome. Edward Treacher Collins described the syndrome in 1900. It is autosomal dominant with variable penetrance and has an incidence of 1 in 7,000 live births. It has significant dysmorphology, which includes lower eyelid colobomas, clefted and hypoplastic zygomas, clefted lateral orbit, hypoplastic mandible, lateral canthal vertical dystopia, antimongolian palpebral fissure, ear deformities, long anterior sideburns, anterior open bite, cleft palate, and macrostomia.

Crouzon, Apert, and Pfeiffer syndromes involve craniosynostosis, typically bicoronal. These patients also have underdevelopment of the mid face also. They do not have any eyelid

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abnormalities. Apert patients also may have a cleft palate and syndactyly of the hands and feet.

Goldenhar syndrome involves epibulbar dermoids of one or both eyes and underdevelopment of one or both sides of the face. It is also known as hemifacial and bifacial microsomia. The soft tissue as well as the bone is hypoplastic.

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14. A 6-year-old boy who underwent repair of cleft palate 5 years ago is brought to the clinic for follow-up. The patient is hypernasal. Nasoendoscopy shows good lateral pharyngeal wall motion and a sagittal closure pattern. Cephalometric analysis shows a posterior gap of 10 mm. Which of the following is the most appropriate management?

A) Intravelar veloplasty

B) Obturator

C) Palatal lift

D) Pharyngeal flap

E) Sphincter pharyngoplasty

The correct response is Option D.

Satisfactory lateral pharyngeal wall movement and sagittal or circular velopharyngeal closure patterns should be treated with a pharyngeal flap. A large posterior gap with coronal, circular, or bowtie patterns of closure and good velar elevation, but poor lateral wall motion, should be treated with a sphincter pharyngoplasty. A palatal lift is used in patients with adequate tissue, but poor control of coordination. An obturator is used to assist with closure when there is inadequate palatal tissue. Finally, intravelar veloplasty is used in unrepaired clefts or a submucous cleft with a small posterior gap on closure.

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15. A 22-year-old man comes to the emergency department after he sustained a machete laceration of the left cheek extending from the tragus through the midpoint of the upper lip. The wound is full thickness along the central third. Examination shows left upper lip droop and flattening of the associated nasolabial fold. Which of the following structures were most likely injured?

A) Lacrimal sac, mandibular branch of the facial nerve, and pterygoid muscle

B) Maxillary sinus, zygomatic branch of the facial nerve, and pterygoid muscle

C) Parotid duct, buccal branch of the facial nerve, and masseter muscle

D) Zygomatic arch, zygomatic branch of the facial nerve, and orbicular muscle

The correct response is Option C.

The middle third of a line drawn between the tragus and the middle of the upper lip defines the course of the parotid duct. The buccal and zygomatic branches of the facial nerve lie in close proximity to the parotid duct, which lies superficial to the masseter muscle. Deep penetrating trauma in this region is likely to injure all three of these structures. Evidence of injury to the zygomatic or buccal branch of the facial nerve with a central cheek laceration should raise concern for a parotid duct injury.

The lacrimal sac is outside of the described zone of injury, as is the mandibular branch of the facial nerve. The pterygoid muscle is deep to the mandible and would be outside of the described zone of injury.

The maxillary sinus and the zygomatic branch of the facial nerve could have been injured, but not in combination with the pterygoid muscle, which is outside the zone of injury.

Concomitant injury of the zygomatic arch and zygomatic branch of the facial nerve is possible, but because this injury was full thickness in the central third, the orbicularis muscle would not have been involved.

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16. A 20-month-old girl is brought to the office for evaluation of mid face hypoplasia, craniosynostosis, and anomalies of the hands and feet. The most likely cause of these findings is a genetic error in which of the following?

A) 22q.11

B) *FGFR2*

C) *IRF6*

D) *TCOF1*

The correct response is Option B.

The patient described has Apert syndrome. This autosomal dominant syndrome is characterized by bicoronal craniosynostosis leading to turribrachycephaly, mid face hypoplasia, and complex hand and foot syndactyly. Patients with Crouzon syndrome, an autosomal dominant disorder, typically have craniosynostosis involving the coronal, sagittal, and lambdoid sutures, as well as turribrachycephaly. Other findings include mid face hypoplasia, exorbitism, and proptosis. The extremities are normal. Defects in the Fibroblast Growth Factor Receptor-2 (*FGFR2*) are found.

22q deletion syndrome, which has several presentations, including DiGeorge syndrome, velocardiofacial syndrome, and Shprintzen syndrome, is caused by the deletion of a small piece of chromosome 22. The deletion occurs near the middle of the chromosome at a location designated q11.2; i.e., on the long arm of one of the pairs of chromosome 22. Characteristic signs include congenital heart disease, cleft palate, learning disabilities, mild elongation of facial features, and mental illness in the teenage years.

Mutations in the *IRF6* gene cause van der Woude syndrome. Van der Woude syndrome is an autosomal dominant form of cleft lip and palate. Affected individuals usually have lip pits.

Mutations in the *TCOF1* gene cause Treacher Collins syndrome. The official name of this gene is "Treacher Collins-Franceschetti syndrome 1." Patients with Treacher Collins syndrome, or mandibular dysostosis, have hypoplasia of the zygoma, maxilla, and mandible, downward slanting of the palpebral fissures, colobomas of the lower eyelids, absence of eyelashes, and auricular defects.

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17. Which of the following best describes the ear anomaly seen in the photograph?

A) Cryptotia

B) Microtia

C) Pixie ear

D) Prominent ear

E) Stahl ear

The correct response is Option A.

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Cryptotia is a congenital anomaly in which the upper part of the retroauricular sulcus is absent or buried under the temporal skin. Various surgical techniques have been reported for correction of cryptotia, starting with a V-Y plasty in 1933. Conventional methods using local flap, skin grafting, tissue expander, Z-plasty, and any combined approaches correct the skin deficiency of the upper auricle. However, cosmesis can still be unsatisfying because of a visible periauricular scar, color mismatch, or a contracture deformity. Cryptotia may be treated early nonsurgically with splinting of the ear or with surgical release at a later age.

Microtia is a hypoplastic condition of the ear which includes a spectrum from complete absence of the ear (anotia) to a smaller than normal ear with normal morphology. Microtia is seen in patients with the hemifacial microsomia. In fact, patients with isolated microtia are considered to have a mild form of hemifacial microsomia.

Pixie ear deformity is a complication of rhytidectomy.

Prominent ear has a widening of the conchal-scaphal angle, an increased auriculocephalic distance, and loss of the antihelical fold.

Stahl ear, also known as Spock ear, has a third crus, a flat helix, and a malformed scaphoid fossa.

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18. An obese 65-year-old man who undergoes resection of an oral tongue nodule has a 5 × 9-cm defect of the hemitongue and floor of the mouth. Which of the following is the most appropriate method of reconstruction?

A) Full-thickness skin grafting

B) Primary closure

C) Radial forearm fasciocutaneous flap

D) Rectus abdominis musculocutaneous flap

E) Submental artery island flap

The correct response is Option C.

The radial forearm fasciocutaneous free flap is the most appropriate reconstructive choice among those listed. It is generally a thin, pliable flap with a long pedicle and vessels of adequate caliber for straightforward microvascular anastomosis. The physical characteristics of this flap are well-suited to preserving the mobility of the remaining hemitongue, resulting in reasonable speech and swallowing function following surgery in most cases.

The primary goals of reconstruction following hemiglossectomy include watertight wound closure such that oral secretions do not communicate with the neck contents and result in a fistula, and restoration of speech and swallowing function by preserving the mobility of the remaining native tongue. Primary closure would result in severe tongue tethering and impaired speech and swallowing. Although likely to contract less than a split-thickness skin graft, a full-thickness skin graft may also restrict mobility of the tongue and is unlikely to achieve a watertight wound closure. The submental artery island flap is based on a branch of the facial artery that can be used to close defects up to approximately 7 × 18 cm, depending on neck skin laxity. This flap is generally unreliable following neck dissection in which the facial artery and its branches may be ligated. The rectus abdominis musculocutaneous free flap is a highly reliable free flap but is often too bulky to permit optimal mobility of the remaining tongue, especially in patients with truncal obesity.

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19. Which of the following is a critical feature required to obtain the optimal reproducible digital photographs for valid pre- and postoperative comparison?

A) Lens with a focal length of 90 to 105 mm

B) Matching anatomical landmarks

C) Single flash

D) Three-dimensional capability

E) White background

The correct response is Option B.

There have been numerous publications on subtopics in clinical photography. Clinical photographs should be taken with the same camera lens, lens setting, lighting, film, and patient position to ensure reproducibility and to enable valid pre- and postoperative comparisons. Specific anatomical landmarks are used as guides for positioning each pose. These landmarks should be used each time to ensure the exact duplication of poses. A grid pattern can also be used. Two lenses are recommended. A single lens with a focal length of 50 to 60 mm with macro capability is required as a minimum, although the longer focal length lens of 90 to 105 mm can aid in facial photography close-ups. At least two light sources are required to avoid flatness and shadowing. An even, uncluttered background is best, with a color such as sky blue that is most visually pleasing with skin tones. This can be painted on a wall, paper, or retractable fabric. Three-dimensional capability is useful for volumetric evaluation and changes, but is not yet standard of care in plastic surgery photography.

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20. A 4-year-old girl is brought to the office because of a congenital mucous-draining skin sinus located on the lower third of the neck, overlying the anterior border of the left sternocleidomastoid muscle. On physical examination, swallowing causes noticeable puckering of the sinus. Intraoperative probing shows that it communicates with the left tonsillar fossa. On surgical exploration, which of the following is the most likely ascending course of this sinus?

A) Deep to the hypoglossal nerve

B) Deep to the internal carotid artery

C) Superficial to the posterior belly of the digastric muscle

D) Superficial to the stylohyoid muscle

E) Superficial to the stylopharyngeal muscle

The correct response is Option E.

Surgical exploration is most likely to show the ascending course of this pharyngeal fistula to be superficial to the stylopharyngeal muscle.

Second pharyngeal cleft and pouch anomalies (including cysts, fistulas, and sinuses) account for 67 to 95% of the total anomalies of the pharyngeal apparatus. Cysts are the most common finding, occurring three times more often than fistulas. Fistulas usually present at birth. They derive from the ventral portion of the second pharyngeal cleft and pouch. The external opening is usually found along the anterior border of the sternocleidomastoid muscle, between the hyoid bone superiorly and the suprasternal notch inferiorly. Fistulas have a muscular coat, which is continuous superficially with the platysma and internally with the palatopharyngeal muscle. If this muscle coat is well developed, swallowing causes a pull on the fistulous opening, resulting in puckering.

The anatomical relations between a second pharyngeal cleft and pouch fistula and the surrounding cervical structures are dictated by the embryogenesis of the pharyngeal apparatus. As an anomaly of the second cleft and pouch, the fistula is expected to course deeply to the second arch structures and superficially to the structures derived from the third to sixth arches.

Therefore, the described fistula is expected to course deep to the stylohyoid muscle and posterior belly of the digastric muscle (derived from the second pharyngeal arch), and superficial to the internal carotid artery and stylopharyngeal muscle (derived from the third

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pharyngeal arch).

The hypoglossal nerve and associated infrahyoid muscles do not develop in the mesenchyme of the pharyngeal apparatus, instead being derived from occipital somites in the paraxial mesoderm. All pharyngeal anomalies derived from ectoderm (e.g., fistulas) will be found superficial to the hypoglossal nerve and the infrahyoid strap muscles.

Other cervical structures not mentioned in this scenario but which are relevant to the course of the described fistula include the external carotid artery (second pharyngeal arch) and the glossopharyngeal nerve (third pharyngeal arch). The expected fistula course is deep to the former and superficial to the latter.

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21. A 13-year-old girl is brought to the office because of a mass of the tongue that has been growing for 10 years. The patient says she has recently noted ulcers from the mass, and bleeding occasionally occurs. Examination of a specimen obtained on biopsy shows a microcystic lymphatic malformation with microthromboses and chronic inflammation. Photographs are shown. Which of the following is the most appropriate management?

A) Embolization

B) Radiation therapy

C) Resection

D) Sclerotherapy

E) Observation only

The correct response is Option C.

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Resection is the most appropriate management for the symptomatic lesion described in the photographs. Oropharyngeal tumors must always be biopsied to assess malignancy potential. If the tumor is then deemed to be benign, appropriate management is determined based on symptoms. This patient presented with a biopsy result and a sizable lesion that is still growing. Typically, an imaging study such as MRI is performed of the head and neck to assess the extent of the disease. For this type of isolated lesion that is ulcerating and interfering with eating, resection is the most appropriate treatment. Observation is not the best option, as the patient is symptomatic. Embolization is not indicated, as this is not a vascular structure. Sclerotherapy yields poor results with a microcystic lesion and would likely result in painful necrosis of the involved tissue. Radiation therapy is not a described treatment for benign lymphatic lesions.

Carbon dioxide laser treatment has been described for these types of lesions, but it often requires multiple treatments and leaves a raw surface for healing following each treatment.

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22. A 65-year-old man is evaluated because of hypernasal speech and nasal regurgitation 12 months after he underwent resection of a soft palate tumor. Examination shows patent nasal passages and no soft palate. Which of the following is the most appropriate treatment?

A) Injection of corticosteroids to the inferior turbinates

B) Placement of an obturator prosthesis

C) Skin grafting

D) Tracheotomy

E) Observation only

The correct response is Option B.

The patient describes velopharyngeal insufficiency post-soft palate resection.

Prosthetic obturation is the traditional means of reconstructing palatal defects. After 12 months, observation has already been performed without resolution of symptoms. Skin grafting of soft palatal defects is of little use because it does not adequately reestablish the bulk necessary for through-and-through palatal defects, therefore leading to contracture and palatal dysfunction. Tracheotomy would exacerbate speech and swallowing difficulties and therefore is not appropriate. Injecting the inferior turbinates with corticosteroids would not functionally correct the velopharyngeal insufficiency and is therefore not appropriate.

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23. A 35-year-old man is evaluated because of pain in one of the right lower molar teeth 6 months after he underwent open reduction and internal fixation of a right mandibular angle fracture. Examination shows grayish discoloration and tenderness to axial percussion in the mandibular second molar. A panoramic x-ray study (Panorex) shows an intact mandibular second molar with 1.5-cm radiolucency at its apex. Which of the following is the most likely cause of these findings?

A) Dentigerous cyst

B) Mucous retention cyst

C) Odontogenic keratocyst

D) Periapical cyst

E) Traumatic bone cyst

The correct response is Option D.

The periapical cyst is the most common odontogenic cyst. The usual etiology is a nonviable tooth that becomes infected, leading to necrosis of the pulp. Toxins exit the apex of the tooth, leading to periapical inflammation leading to a radiolucency seen on x-ray study.

The dentigerous cyst is the second most common odontogenic cyst which develops within the normal dental follicle surrounding an unerupted tooth such as a mandibular or maxillary third molar or maxillary canine. Most are asymptomatic and found incidentally on x-ray study.

The odontogenic keratocyst or OKC is the third most common odontogenic cyst. It is a great mimic and can have a wide variety of clinical presentations. These cysts are rapid growing and aggressive and can be difficult to remove; recurrence rates are high. They are also a component of the basal cell nevus syndrome.

Mucous retention cyst, or mucocele, is a pseudocyst that arises from trauma to the minor salivary glands in the lips.

Traumatic bone cyst is a self-limiting radiolucent lesion of uncertain etiology that forms an empty or fluid-filled cavity most commonly within the mandible but also elsewhere in the body.

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24. A 7-month-old female infant is brought to the office because of a large, rapidly growing vascular tumor of the mandible. Physical examination shows a reddish purple lesion with a centrifugally advancing rim of ecchymosis. Initial platelet count is below 10,000/mm^3. Administration of which of the following is the most appropriate initial treatment?

A) Imiquimod

B) Interferon alfa-2a

C) Prednisone

D) Propranolol

E) Vincristine

The correct response is Option E.

Kaposiform endothelioma is a malignant vascular tumor which is often associated with Kasabach-Merritt phenomenon. It is generally seen in infancy. It can be seen in the trunk and extremities. The skin overlying the tumor is deep red-purple, tense, and shiny, which is pathognomonic for kaposiform endothelioma. These patients typically have profound thrombocytopenia. As this is a malignant tumor, the primary mode of therapy is chemotherapy, sometimes combined with surgical resection. Vincristine is considered first-line therapy and has supplanted interferon alfa-2a due to its efficacy and decreased risk of major side effects. Interferon alfa-2a has a high risk of spastic diplegia, which is irreversible.

Corticosteroids are not considered a first-line therapy for kaposiform endothelioma.

Propranolol and imiquimod are not yet widely studied in kaposiform endothelioma.

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25. A 25-year-old man comes to the office for consultation regarding a 10-year history of gradual swelling of the right side of the face. Physical examination shows class I occlusion, normal interincisal distance, and smooth occlusal surfaces on the right molar teeth. The right cheek is enlarged when he clenches the teeth. CT scan shows a right masseter that is twice as large as the left one, and there is an outward curvature of the angle of the mandible. Which of the following is the most appropriate treatment?

A) Condylar reduction

B) Masseter resection

C) Orthodontics

D) Radiation therapy

E) Sagittal split osteotomy

The correct response is Option B.

Benign masseteric hypertrophy may present as a bilateral or a unilateral condition. When unilateral, it is associated with repetitive unilateral clenching of the teeth. Both the masseter and temporalis muscles of the affected side show varying degrees of enlargement. When mild, medical management may be offered first and can include muscle relaxants, anxiolytics, antiepileptic drugs, and botulinum toxin type A. Surgical resection of a portion of the masseter and/or bone contouring are appropriate surgical procedures for correction of the resulting cosmetic deformity.

Unilateral masseteric hypertrophy must be distinguished from unilateral condylar hyperplasia, the latter consisting of the enlargement or overgrowth of the mandibular condyle. Condylar hyperplasia may also present with unilateral facial enlargement (type IB or type II), deviation of the mandibular midpoint toward the unaffected side, class III occlusion on the ipsilateral side, and a crossbite on the contralateral side. Condylar resection is the mainstay of treatment.

Condylar reduction is appropriate for cases of condylar dislocation. This condition can occur unilaterally in patients with a hypermobile or stretched temporomandibular joint, or in patients with dystonia (hyperfunction of the lateral pterygoid muscle). Condylar dislocation occurs suddenly, and causes pain and a class III occlusion on the involved side. Condylar reduction is performed with the aid of muscle relaxants. Eminence surgery may be necessary (eminectomy, eminoplasty).

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Orthodontics are unnecessary for someone with bruxism, which is a typical feature of masseteric hypertrophy. However, a mouth guard is appropriate.

Radiation is inappropriate for benign masseteric hypertrophy. It does not correct the underlying cause or the deformity associated with this condition.

Sagittal split osteotomy is indicated in cases of class II or III malocclusion in which reduction or lengthening of the anteroposterior length of the mandible will achieve dental harmony. This procedure is not appropriate for class I occlusion or flaring of the mandibular angle.

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26. An otherwise healthy 3-month-old female infant is admitted to the pediatric intensive care unit because of progressive difficulty breathing for the past 3 weeks. Examination shows mild stridor. Cultures are negative for acute viral or pulmonary illness. A photograph is shown. Administration of which of the following is the most appropriate treatment?

A) Imiquimod

B) Interferon alfa-2a

C) Propranolol

D) Vincristine

The correct response is Option C.

In the absence of other pulmonary disease, the stridor is most likely being caused by the hemangioma which is present in the beard distribution. Hemangiomas can be present in the

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airway as well as the surrounding soft tissue.

In some centers, propranolol has supplanted corticosteroids as the first-line medical therapy for complicated hemangiomas. Currently, there is no universally accepted protocol for propranolol administration. Propranolol is initially given intravenously and then converted to oral dosing. Blood pressure and heart rate monitoring must be done on an outpatient basis, generally by a pediatric cardiologist. Treatment is typically 2 to 6 months.

Systemic corticosteroids are still considered effective therapy. Corticosteroids generally require prolonged therapy to prevent rebound effect. It can take upwards of 2 years for treated patients to catch up in growth after prolonged corticosteroid therapy in infancy. Treatment is typically upwards of 9 to 12 months.

Vincristine is a first-line treatment for kaposiform hemangioendothelioma. It has supplanted interferon alfa-2a, which is avoided due to the risk of spastic diplegia.

Topical imiquimod is still considered an experimental therapy.

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27. A 22-year-old man who has type 1 diabetes mellitus comes to the office because of a 1-day history of cervical and chest pain. Temperature is 102.2°F (39.0°C). Physical examination shows right-sided cervical erythema and moderate swelling. A broad-spectrum antibiotic is administered, and he undergoes incision and drainage. During the procedure, extensive soft-tissue necrosis not confined by fascial planes is noted. Which of the following is the most likely cause of this infection?

A) Mastoiditis

B) Meningitis

C) Parotitis

D) Pharyngitis

E) Sinusitis

The correct response is Option D.

The patient described has cervical necrotizing fasciitis (CNF) that likely extends into the mediastinum. Pharyngeal and tonsillar infections, along with dental abscesses, are the most common sources of infection. Diabetes and other immunocompromised states are frequent comorbidities in this disease. Early presentation may be clinically indistinguishable from a superficial soft-tissue infection and, therefore, requires a high index of suspicion. Skin necrosis is often a late finding, as the infection begins in the fascial and deep tissues of the neck. CT scan is usually obtained to define the extent of the disease and may or may not show gas within the soft tissues. Patients are treated with broad-spectrum antibiotics and aggressive surgical debridement.

Mastoiditis is an infection of the mastoid air cells usually arising in the setting of untreated otitis media. Mastoiditis can spread to surrounding structures, including the brain.

Meningitis is an infection of the meninges that is associated with neck pain as well as fever, headache, and photophobia. It does not present with unilateral neck erythema and swelling.

Parotitis is an infection of the parotid gland that usually arises in the setting of an obstructed parotid duct and is a very rare but potential cause of CNF.

Sinusitis is not usually associated with CNF but may spread to the orbit, resulting in orbital cellulitis or orbital abscess, and, occasionally, cavernous sinus thrombosis. Cavernous sinus

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thrombosis is a life-threatening condition.

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28. A 25-year-old man comes to the office for evaluation of unilateral proptosis, visual impairment, and limitation of ocular movements. History includes basilar skull fractures and repair of panfacial fractures 4 weeks ago. On physical examination, the left eye appears to be pulsating. Which of the following is the most appropriate next step?

A) Beta-2 transferrin assay

B) Carotid duplex

C) Cerebral angiography

D) Craniotomy

E) Noncontrast CT scan

The correct response is Option C.

This case described represents the classic presentation of a posttraumatic carotid-cavernous fistula (CCF). Symptoms include pulsatile proptosis, ocular and orbital erythema, chemosis, diplopia, headaches, and visual loss. This pathology occurs through abnormal connections between the internal carotid artery and the cavernous sinus, and, on rare occasions, may appear between the internal carotid or branches of the external carotid artery and the venous plexus of the skull. Traumatic CCF can lead to blindness as the disorder progresses and, in rare cases, can result in paralysis, unconsciousness, and even death. It is important that clinicians operating on the craniofacial region, and especially those who manage craniofacial trauma, have a thorough understanding of this potentially lethal entity. Although CCF occurs rarely after craniofacial trauma, this disorder is thought to occur relatively frequently in patients with basilar skull fractures. Once there is a suspicion, a prompt evaluation of the arterial vasculature around the cavernous sinus is required. Most commonly, a cerebral angiogram is used to make the diagnosis and, using related techniques, a variety of curative measures (e.g., embolization) can then be enacted. A craniotomy-type modality would be relegated to only the most refractory of cases and would be for cure and not diagnosis. A noncontrasted CT scan would only show posttraumatic bony derangements. Beta-2 transferrin assay could be used if there is an accompaniment of clear rhinorrhea to rule out a craniospinal fluid leak. CCF can be mistaken for other pathologies such as an orbital apex syndrome or even stroke. The latter suspicion may lead to the ordering of a carotid duplex, which would be expected to be normal.

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29. In a trauma patient with an isolated mandible fracture, which of the following is the likelihood that this patient will have a concomitant cervical spine injury?

A) 1%

B) 5%

C) 15%

D) 25%

E) 50%

The correct response is Option B.

In a recent review of the National Trauma Data Bank of over 1.3 million trauma patients, an analysis of isolated facial fractures and neurologic injury was undertaken. An isolated mandible fracture had a 5.1% relationship with a cervical spine injury. These data showed a higher than previously published rate of cervical spine and head injures associated with isolated facial fractures.

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30. A 4-year-old girl is brought to the emergency department for evaluation of mandibular fractures 12 hours after being kicked in the face by a horse. Physical examination shows an anterior open bite and bilateral crossbites. CT scans are shown. Which of the following is the most appropriate management at this time?

A) Closed reduction of all mandibular fractures and maxillomandibular fixation

B) Open reduction and internal fixation of all mandibular fractures

C) Open reduction and internal fixation of the parasymphysial and condylar fractures, closed reduction of the ramal fracture, and maxillomandibular fixation

D) Open reduction and internal fixation of the parasymphysial fracture, closed reduction of the condylar and ramal fractures, and maxillomandibular fixation

E) Observation only

The correct response is Option D.

In comparison to adult fractures, pediatric fractures are treated more conservatively due to the stage of mixed dentition, the elasticity of the craniofacial skeleton, and the potential for remodeling of the bone and fracture site with growth. Consideration must be given to the effects of invasive surgery on growth of the jaw. Many surgeons believe that conservative management prevents further growth disturbance.

Given the extent of fractures and displacement of the parasymphysial fracture, observation alone is not an option. Closed reduction of all of the fractures followed by maxillomandibular fixation (MMF) will not yield a stable result due to the unfavorable forces displacing the right hemi mandible. Open reduction and internal fixation (ORIF) of all fractures is not possible due to the intracapsular nature of the condylar fracture. The fragments are too small to

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internally fixate. ORIF of the displaced parasymphysial fracture and closed reduction of the condylar and ramal fractures is the most appropriate management. The occlusion is restored, and bone anchor screws are used to obtain MMF. Due to the child's dentition, arch bars are not an option. MMF can be accomplished with a custom splint and drop wires with circummandibular wires or with bone anchor screws. Care needs to be taken to place the screws to avoid the dentition. MMF is typically removed at 3 to 4 weeks in this age group to prevent any ankylosis of the temporomandibular joint. If a titanium plate is used to fixate the parasymphysial fracture, removal of this 2 to 3 months following surgery is also recommended to prevent any growth restriction and embedding of the plate.

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31. Which of the following syndromes is most likely in a patient with venous malformations?

A) Kasabach-Merritt

B) Maffucci

C) Osler-Weber-Rendu

D) Parkes-Weber

E) Sturge-Weber

The correct response is Option B.

Maffucci syndrome is associated with venous malformations and multiple enchondromas. It can be associated with malignant chondrosarcomas, and intracranial tumors occur in 20% of patients.

Kasabach-Merritt syndrome is associated with a hemangioma or with diffuse hemangiomatosis. The hallmark is profound thrombocytopenia. The child can present with petechiae, ecchymosis, and bleeding.

Sturge-Weber syndrome is associated with facial capillary malformations (port-wine stain) distributed in a trigeminal nerve pattern, most often the first and second divisions of the nerve. Vascular malformations on the ipsilateral side can be found deep to the leptomeninges, and seizure disorders are common.

Parkes-Weber syndrome is a variant of Klippel-Trenaunay syndrome (patchy port-wine stains of the lower extremity with lymphatic/venous malformations and hypertrophy). However, in Parkes-Weber syndrome, there are arteriovenous fistulae present.

Osler-Weber-Rendu syndrome is also called hereditary hemorrhagic telangiectasia syndrome. It is inherited in an autosomal dominant fashion. The telangiectasia is located on the face, tongue, lips, nasal and oral mucosa, conjunctiva, and hands/nails. The lesions often emerge later in life.

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32. A 65-year-old woman is scheduled to undergo reconstruction of a total laryngopharyngectomy defect. Use of which of the following is most likely to promote intelligible postoperative tracheoesophageal speech?

A) Anterolateral thigh flap

B) Gastric pull-up

C) Jejunal flap

D) Pedicled muscle flap

E) Silastic stent

The correct response is Option A.

When dealing with a near or total circumferential defect of the laryngopharyngeal unit, function must be considered as well as incidence of strictures and fistulas. Many of these patients receive a tracheoesophageal puncture prosthesis (TEP) for speech and many are quite intelligible after rigorous therapy. Speech with fasciocutaneous flaps, such as the anterolateral thigh flap and the radial forearm, is consistently better than with jejunal free flaps. In one study, a direct comparison between these flaps was performed, and 78% of patients used tracheoesophageal speech for conversation when reconstructed with an anterolateral thigh free flap compared with only 25% following a jejunal free flap. The distensibility and mucous production in reconstructions using a jejunal free flap appears to be responsible for the low-pitched, "wet" speech. There is some evidence that intensive speech rehabilitative programs can produce excellent results with jejunal flaps. A pedicled muscle flap is typically used to cover laryngeal or laryngopharyngeal closures, especially in radiation salvage cases. A silastic stent is usually used as salivary diversion while the reconstruction is healing. During its occupancy, no TEP speech can be generated. A gastric pull-up is usually used when a large portion of the cervical esophagus is involved with tumor, and thus a laryngopharyngoesophagectomy is performed so that the anastomosis of the swallowing system is cephalad to the thorax.

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33. A 16-year-old girl with facial asymmetry secondary to hemifacial microsomia comes to the office for evaluation of orthognathic surgery. Which of the following procedures puts her at the highest risk for perioperative bleeding?

A) Bilateral sagittal split osteotomy

B) Distraction osteogenesis

C) Le Fort I osteotomy

D) Mandibular vertical ramus osteotomy

E) Osseous genioplasty

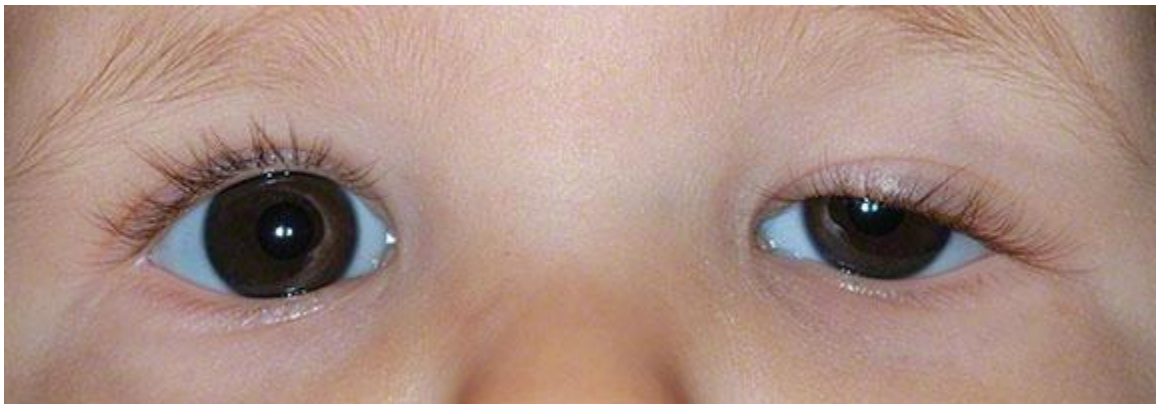
The correct response is Option C.

Significant hemorrhage is uncommon in orthognathic surgery, but when it occurs, it is most likely secondary to the maxillary osteotomies. The vessels at risk with the maxillary osteotomy include the greater palatine vessels, maxillary artery, and pterygoid plexus. The incidence of significant hemorrhage with mandible osteotomies is rare. The vessels at risk include the inferior alveolar artery, facial artery, retromandibular vein, and the pterygoid venous vein. Distraction osteogenesis is associated with lower risk for bleeding than any of the open procedures.

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34. A 26-month-old boy is brought to the office for evaluation because of worsening congenital ptosis. A photograph is shown. Which of the following is the most appropriate next step in management?

A) Eye lubrication

B) MRI

C) Patching of the non-affected eye

D) Surgical correction

E) Observation only

The correct response is Option B.

A drooping eyelid is called ptosis or blepharoptosis. In ptosis, the upper eyelid falls to a position that is lower than normal. In severe cases of ptosis, the drooping eyelid can cover part of or the entire pupil and interfere with vision, resulting in derivational amblyopia. The eyelids are elevated by the contraction of the levator palpebrae superioris.

In most cases of congenital ptosis, a droopy eyelid results from a localized myogenic dysgenesis. Rather than normal muscle fibers, fibrous and adipose tissues are present in the muscle belly, diminishing the ability of the levator to contract and relax. Therefore, the condition is commonly called congenital myogenic ptosis. Most cases of congenital ptosis are idiopathic.

Surgical correction of congenital ptosis can be undertaken at any age depending on the severity of the disease. Earlier intervention may be required if significant amblyopia or ocular

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torticollis is present. If intervention is not urgent, surgery is often delayed until age 3 to 4 years. Waiting until this age allows for more accurate measurements preoperatively.

Congenital ptosis can also occur when the innervation to the levator is interrupted through neurologic or neuromuscular junction dysfunction. Nerve compression by external forces such as tumor must be ruled out. Specifically, when ptosis presents acutely or subacutely in a child over 1 year of age, compression of cranial nerve III is a concern.

Rhabdomyosarcoma is the most common primary malignancy of the orbit in children. MRI shows a well-circumscribed mass that typically enhances with gadolinium. On T1-weighted imaging, the tumor usually appears isointense to extraocular muscles but hypointense to orbital fat. On T2-weighted imaging, the lesion appears hyperintense to extraocular muscles and orbital fat. This tumor can grow rapidly and is treated with combined chemotherapy and radiation.

A history of difference in the size of the pupil may be helpful in diagnosing Horner syndrome. Patients with Horner syndrome have ptosis and miosis on the same side. Cervical or apical thoracic tumors can cause damage to the sympathetic chain and result in this condition. Neuroblastoma, which is one of the most common childhood cancers, should be ruled out with this presentation.

Intermittent patch therapy is indicated for strabismus to strengthen the weak rectus muscles.

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35. A 75-year-old man comes to the office because of a squamous cell carcinoma of the lower lip. A wide local excision, removing two thirds of the lower lip extending inferiorly to the chin crease but sparing both oral commissures and bilateral selective neck dissections, is performed. Which of the following is the most appropriate method of reconstruction?

A) Estlander flap

B) Facial artery musculomucosal flap

C) Karapandzic flap

D) Primary closure

E) Radial forearm fasciocutaneous free flap

The correct response is Option C.

The Karapandzic technique involves performing circumoral incisions, mobilizing the orbicularis oris muscle, and preserving the nerves as well as the vascular supply to the lips from the superior and inferior labial arteries. The advantage of Karapandzic flaps is that they maintain a continuous circle of functioning orbicularis muscle, which helps to restore oral competence. Microstomia can occur, but is usually less of a problem in older patients who have greater tissue laxity.

The optimal method for lip reconstruction depends on the size of the defect, the location of the defect, and the laxity of the remaining tissues. Primary closure can lead to excellent cosmetic and functional results but is restricted to wounds less than one third to one half of the lip width. The Estlander flap is a full-thickness lip transposition flap that borrows tissue from the opposite lip and can be used to reconstruct defects up to two thirds of the lip width. However, the Estlander flap is specifically designed to restore defects of the oral commissure. The Abbé flap is also a transposition flap that "steals" tissue from the opposite lip and is used for central defects, but must remain pedicled by a bridge of lip for several weeks, severely restricting mouth opening during that time. The radial forearm fasciocutaneous free flap is used for total lower lip defects, particularly in situations where sufficient cheek tissue cannot be recruited to close the defect (which is known as the Webster-Bernard technique). Suspension of the folded radial forearm flap over a palmaris longus tendon graft secured to the maxillary bone helps prevent flap ptosis that can result in loss of oral competence, a major problem that can occur with this technique. The facial artery musculomucosal (FAMM) flap is a pedicled flap consisting of buccal mucosa and a portion of the buccinator muscle that can be useful for reconstructing the vermillion lip, but not the cutaneous portion of the lip. Also,

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because the FAMM flap is based on the facial artery, it may not be reliable following a neck dissection in which the facial artery has been ligated.

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36. A 48-year-old woman comes to the clinic with new left eyelid ptosis 1 week after receiving injections of botulinum toxin type A for treatment of glabellar rhytides. The patient is prescribed apraclonidine ophthalmic solution for the left eye. Complete resolution is noted 2 days later. Which of the following is the most important mechanism by which apraclonidine resulted in improvement of this patient's eyelid ptosis?

A) Displacement of botulinum toxin type A from its presynaptic receptors

B) Inhibition of alpha-adrenergic receptors in the levator palpebrae superioris muscle

C) Inhibition of alpha-adrenergic receptors in the superior tarsal (Müller) muscle

D) Stimulation of alpha-adrenergic receptors in the levator palpebrae superioris muscle

E) Stimulation of alpha-adrenergic receptors in the superior tarsal (Müller) muscle

The correct response is Option E.

The most important mechanism by which apraclonidine caused improvement of this patient's eyelid ptosis as described is stimulation of alpha-adrenergic receptors in the superior tarsal (Müller) muscle.

Botulinum toxin type A is a protease that, through degradation of the SNAP-25 protein within axonal terminals, prevents fusion of cytoplasmic vesicles to the presynaptic membrane and subsequent release of neurotransmitters, in particular acetylcholine (ACh). Release of ACh into the synaptic cleft is necessary for normal skeletal muscle contraction.

Transient eyelid ptosis is a potential side effect of injection of botulinum toxin type A into the upper third of the face, with reported incidence between 2 and 11%. It occurs when the injected toxin migrates through the orbital septum and reaches the levator palpebrae superioris (LPS) muscle, a skeletal muscle innervated by the oculomotor (III) nerve.

The superior tarsal (Müller) muscle acts in conjunction with LPS to elevate the upper eyelid. Müller muscle is a smooth muscle, innervated by the sympathetic nervous system via alpha-adrenergic receptors. Stimulation of these receptors (as caused by apraclonidine – a selective alpha-2 receptor agonist with weak alpha-1 activity) can compensate for partial LPS dysfunction, correcting 1 to 3 mm of eyelid ptosis.

Apraclonidine is not known to cause significant displacement of botulinum toxin type A from its presynaptic receptors. Contraction of the LPS muscle, as for other skeletal muscles, occurs

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by stimulation of its cholinergic receptors within the neuromuscular junctions. Inhibition of alpha-adrenergic receptors in Müller muscle would cause it to relax, increasing the upper eyelid ptosis.

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37. A 45-year-old man comes to the office because of slowly progressive unilateral loss of facial volume on the right side that began 30 years ago. Physical examination shows facial asymmetry and a line of cutaneous sclerosis on the forehead. No abnormalities in ocular mobility and visual acuity are noted, and no malocclusion is present. Which of the following is the most appropriate management?

A) Change of antiretroviral medications

B) Immunosuppression with oral administration of corticosteroids and methotrexate

C) Restoration of skeletal support with bone grafting

D) Soft-tissue augmentation with fat grafting

E) Observation only

The correct response is Option D.

Parry first described the syndrome of progressive facial atrophy in 1825, followed by Romberg in 1846. Parry-Romberg syndrome (also known as progressive hemifacial atrophy) is a rare neurocutaneous syndrome characterized by progressive shrinkage and degeneration of the tissues beneath the skin, usually on only one side of the face (hemifacial atrophy) but occasionally extending to other parts of the body.

The syndrome often begins with a circumscribed patch of scleroderma in the frontal region of the scalp which is associated with a loss of hair and the appearance of a depressed linear scar extending down through the mid face on the affected side. This scar is referred to as a "coup de sabre," and is indistinguishable from the scar observed in frontal linear scleroderma.

Symptoms and physical findings usually become apparent during the first or early during the second decade of life. The average age of onset is 9 years, and the majority of individuals experience symptoms before age 20 years. The disease may progress for several years before eventually going into remission.

Most patients do not have severe enough disease to warrant immunosuppression. However, for those with more severe and progressive disease, treatments used include methotrexate (for which there is limited evidence in linear scleroderma), corticosteroids, cyclophosphamide, and azathioprine, but benefits are unclear.

The timing of surgical intervention is generally agreed to be the best following exhaustion of the disease course and completion of facial growth. When Parry-Romberg syndrome is

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severe, the skeleton may be affected, and bony restoration may be required. Soft-tissue reconstruction in patients with severe disease may require free tissue transfer. It is much more common to begin reconstruction with autologous fat transfers. Off-the-shelf cutaneous fillers have also been employed.

The use of highly active antiretroviral therapy with protease inhibitors can result in a syndrome of peripheral wasting, facial fat atrophy, and central adiposity in as many as 64% of patients who are HIV-positive who are treated with this regimen for 1 year. This is usually a bilateral process, but also responds to similar treatment options. Switching antiretroviral drugs may be effective but is only employed in those patients with complete viral suppression. Injections of poly-L-lactic acid (Sculptra) are now licensed for cosmetic management of facial lipoatrophy.

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38. A 62-year-old woman comes to the office because of skin necrosis and scabbing following a minor injury 6 weeks ago. A photograph is shown. History includes glioblastoma that was treated with craniotomy and radiation therapy 20 years ago. Debridement is performed, exposing the calvaria and dura. Which of the following is the most appropriate treatment for this patient?



(Please note that this pictorial appears in color in the online examination)

A) Bone burring with skin grafting

B) Coverage with acellular dermis matrix

C) Coverage with a free flap

D) Coverage with scalp rotation flaps

E) Negative pressure wound therapy

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The correct response is Option C.

The patient described has severe radionecrosis of the skin and the underlying bone from the previous radiation therapy. The skin is thinned, and spontaneous necrosis with scabbing can be seen in the photograph and will require extensive debridement including necrotic skin and underlying bone. As a result, closure with scalp rotation flaps will be inadequate because of the extensive skin damage, size of the defect, and exposed underlying dura. Similarly, bone burring will not be possible even if the underlying calvaria was preserved due to the history of radiation. Negative pressure wound therapy is not an option due to exposure of the underlying dura and brain matter. Similarly, acellular dermis will not be effective due to the damaged underlying tissues and chronic contamination. Radical debridement and coverage with a free flap (e.g., latissimus flap) will offer the best option for reconstruction in this patient because this procedure will deliver healthy vascularized tissues to cover the exposed cranial structures.

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39. An 18-month-old girl is brought to the office because of a soft spot with pulsations on the right parietal region of her skull. At age 6 months, the patient sustained a linear skull fracture due to head trauma, which was managed nonoperatively. CT scan shows a growing skull fracture. Which of the following is the most likely cause of this patient's growing fracture?

A) Dural injury at the time of the fracture

B) Genetic bone healing disorder

C) Isolated right unicoronal craniosynostosis

D) Patent anterior fontanelle

E) Trauma-related infection

The correct response is Option A.

Growing skull fractures occur in children. If a child sustains a fracture that appears linear but has an underlying dural injury, then the fracture may fail to heal. As the skull continues to grow, so does the cranial defect.

Trauma alone, open fontanelles, genetic bone disorders, and craniosynostosis are not associated with growing skull fractures.

Children under 2 years of age have a tremendous ability to regenerate bone and heal fractures or even large defects. Having normal, healthy dura is very important to bone healing.

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40. Patients with hemifacial microsomia have an increased incidence of which of the following?

A) Craniosynostosis

B) Glossoptosis

C) Hemihypertrophy

D) Microstomia

E) Velopharyngeal insufficiency

The correct response is Option E.

Hemifacial microsomia (HFM) is the second most common congenital anomaly, with a reported incidence of approximately one in 5,600 live births. It is thought to be a result of vascular injury to the first and second branchial arches during the 30th to 45th day of pregnancy. The presentation of HFM is highly variable and ranges from mild facial asymmetry and microtia to a severe asymmetry of the orbit and mid and lower faces. Vertebral, cardiac, and renal malformations can also occur with HFM.

A number of studies document velopharyngeal insufficiency (VPI) in patients with HFM. This VPI results from a unilateral hypodynamic palate. With this lack of movement, the nasopharyngeal port cannot be closed fully, and the speech is hypernasal. Some patients are able to compensate for the asymmetry of the palatal movement and have normal speech. Approximately 15% of patients with HFM have evidence of VPI based on speech evaluation and nasoendoscopy.

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41. A 45-year-old man comes to the office because of frequent blinking and squeezing of the eyelids. Examination shows idiopathic blepharospasm. Which of the following is the most appropriate management?

A) Administration of a benzodiazepine

B) Injection of botulinum toxin type A

C) Myectomy

D) Neurectomy

E) Use of tinted glasses

The correct response is Option B.

Blepharospasm is an involuntary eye movement disorder characterized by frequent blinking and squeezing of the eyelids. Blepharospasm is treated with botulinum toxin type A. Treatment usually brings some relief, although patients require constant monitoring and re-treatment with botulinum toxin type A. Use of tinted glasses may reduce a trigger of essential blepharospasm but is not the primary treatment. Benzodiazepines are not used as the first-line management of essential blepharospasm. Myectomy and neurectomy are reserved for severe cases that are refractory to medical management and are therefore not indicated unless the patient fails all other forms of management.

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42. A 65-year-old woman is evaluated immediately after she underwent subtotal maxillectomy for an adenoid cystic carcinoma. The resulting defect includes the right hemi-palate, maxillary sinus, orbital floor, and nasal lining. A photograph is shown. Which of the following is the most appropriate option for reconstruction?



(Please note that this pictorial appears in color in the online examination)

A) Facial artery musculomucosal flap

B) Obturator

C) Omentum flap

D) Rectus flap

E) Temporalis flap

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The correct response is Option D.

This is an extensive subtotal maxillectomy (Type IIIA Cordeiro classification) that requires reconstruction of a number of anatomical structures including the hard palate, the orbital floor, and the nasal lining. In addition, vascularized tissues are required to separate the maxillary sinus content from the orbit. In this case, the rectus flap is the best option because it can provide skin to re-line the maxillary sinus and repair the palatal defect. In addition, the rectus flap has sufficient bulk to obliterate the maxillary sinus and provide vascularized tissue to support the orbital floor reconstruction that is required. The omentum flap usually has enough bulk to obliterate the sinus but will not enable reconstruction of the palatal defect. The obturator will reconstruct the palate but will not provide vascularized tissue to line the orbital floor reconstruction and separate this region from the maxillary sinus. The temporalis flap can be used to cover the orbital floor reconstruction but does not reconstruct the palatal defect. The facial artery musculomucosal flap is a flap based on the facial artery and would not be useful in this reconstruction.

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43. Which of the following cranial nerves is responsible for parasympathetic innervation to the parotid gland?

A) Trigeminal (V) nerve

B) Vestibulocochlear (VIII) nerve

C) Glossopharyngeal (IX) nerve

D) Vagus (X) nerve

E) Hypoglossal (XII) nerve

The correct response is Option C.

The innervation of the parotid gland comes from parasympathetic fibers of the glossopharyngeal nerve (cranial nerve IX). It also receives taste sensation (afferent) from the posterior one third of the tongue.

The maxillary nerve of cranial nerve V (V2) is a sensory nerve and receives sensation from the mid face.

Parasympathetic fibers (efferent) innervate the submandibular and sublingual glands via the chorda tympani. Afferent fibers, via the chorda tympani, send taste sensation of the anterior two thirds of the tongue.

The vestibulocochlear nerve (cranial nerve VIII) supplies sound and equilibrium to the brain.

The Arnold nerve, also called the auricular branch of the vagus nerve (cranial nerve X), innervates the external acoustic meatus. Stimulation of the Arnold nerve can lead to reflex coughing (Arnold reflex).

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44. A 64-year-old man with peripheral vascular disease is evaluated because of an oral squamous cell carcinoma that is invading the mandible. On examination, pedal pulses are not palpable. Surgical resection and postoperative radiation therapy are planned. The resulting defect is expected to extend from the left mandibular parasymphysis to the right mandibular mid body. A flap supplied by which of the following arteries is most appropriate for reconstruction?

A) Anterior tibial

B) Circumflex scapular

C) Superficial circumflex iliac

D) Supraclavicular

E) Thoracoacromial

The correct response is Option B.

The circumflex scapular artery is the blood supply to the scapular bone or osteocutaneous free flap. The pedicle can be extended by including the subscapular artery and vein proximally. This flap can be designed as a chimeric flap to include the latissimus dorsi and serratus anterior muscles based on the thoracodorsal artery, another branch of the subscapular system, to reconstruct complex defects that involve multiple tissue types. The scapular flap can also be based on the angular branch of the thoracodorsal artery. One disadvantage of the scapular flap is that it is on the back, usually precluding simultaneous oncologic resection and flap harvest to save operative time.

Composite bony reconstruction is indicated for the expected mandibular defect. Soft-tissue reconstruction alone for anterior mandibular defects is associated with significant cosmetic deformity as well as impaired masticatory, speech, and even swallowing function. The fibula osteocutaneous free flap, based on the peroneal artery, not the anterior tibial artery, is favored by many surgeons based on its generous bone length and good quality bone stock. However, the flap is contraindicated when blood supply to the distal lower extremity is compromised, such as in advanced peripheral vascular disease (also known as peripheral arterial disease, or PAD). The thoracoacromial artery is the blood supply for the pectoralis major muscle or myocutaneous pedicled flap, which is a soft-tissue flap that would not satisfactorily restore this patient's appearance and function. An osteomyocutaneous variant of the pectoralis major flap that incorporates the fifth rib has been described, but would not be a first-line option due to limited reach of the flap and the tendency to tether the reconstructed jaw to the neck as scar contracture occurs. The superficial circumflex iliac artery is the blood supply to the groin free

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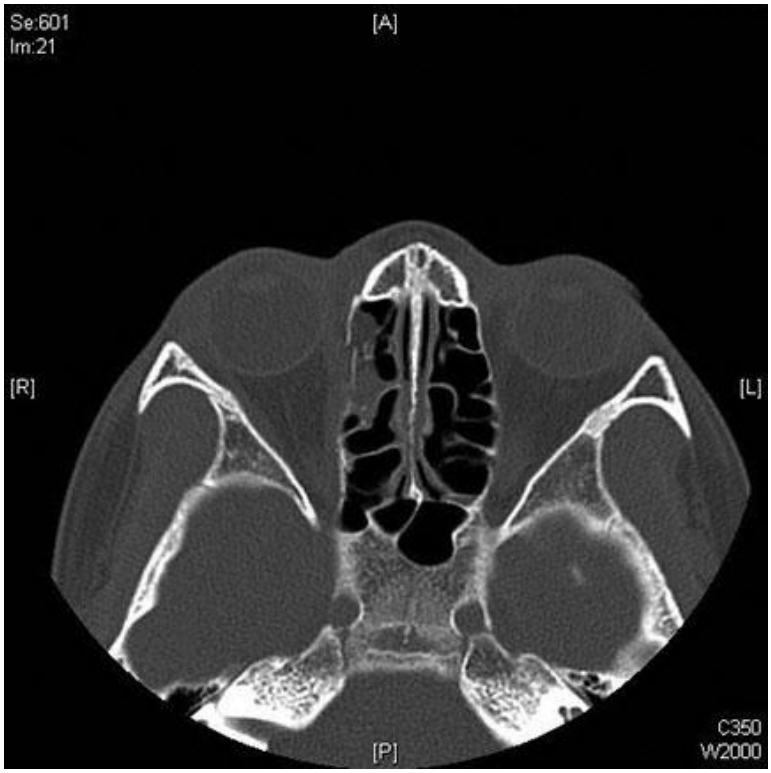
flap, which is a soft-tissue flap without a bony component and, therefore, not appropriate for reconstructing the anticipated defect. The supraclavicular artery is the blood supply to the supraclavicular artery island pedicled flap, which is a soft-tissue flap that would be also inadequate to reconstruct this large bony defect.

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45. A 14-year-old boy is brought to the emergency department after a fall. Physical examination shows ocular entrapment. A CT scan is shown. Surgical correction is planned. Which of the following is the most appropriate location for incision in this patient?



A) Bicoronal

B) Lateral brow

C) Orbital rim

D) Subciliary

E) Transcaruncular

The correct response is Option E.

The CT scan shows an isolated medial wall fracture with entrapment of the medial rectus muscle. The transcaruncular approach can be used for isolated medial wall surgery or combined with a retroseptal transconjunctival approach to the orbital floor (with or without a lateral canthotomy).

Although a bicoronal incision will give the necessary exposure to reduce the entrapment and repair the fracture, it has a higher morbidity associated with it, primarily in regards to blood loss and scarring. In this case, it would be excessive in regards to what is needed to expose and treat an isolated medial wall fracture. The bicoronal incision is more appropriate in complex cases where multiple fractures are involved or if access to a naso-orbital-ethmoid or frontal sinus fracture is needed.

In this case, subciliary, orbital rim, or lateral brow incisions would not give adequate exposure to reduce the entrapped muscle and repair the fracture.

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46. A 27-year-old man is brought to the emergency department after he sustained a small-caliber gunshot wound through the cheek, obliterating the intraoral orifice of the parotid duct. Which of the following is the most appropriate management?

A) Ligation

B) Primary repair

C) Secondary intention healing

D) Stenting

E) Superficial parotidectomy

The correct response is Option D.

It is recommended that injury to the orifice of the parotid duct be managed with a stent or a drain to maintain patency during healing and guide the flow of saliva into the mouth.

Allowing the ductal injury to heal secondarily will likely result in blockage of the orifice with scar tissue, which could lead to a sialocele or cutaneous fistula.

Ligation of the proximal duct is recommended for extensive injuries of the glandular/duct system in which neither end of the duct is amenable to repair. This will result in eventual atrophy and loss of function of the parotid gland.

Primary repair alone would not be recommended given the degree of soft-tissue loss and contusion with this mechanism of injury.

Superficial parotidectomy would be considered for management of chronic glandular/duct system fistulas.

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47. During breast reconstruction with a free transverse rectus abdominis musculocutaneous (TRAM) flap, the axillary vessels are dissected, and the anastomosis is performed using an operating microscope. During flap elevation, an umbilical hernia is encountered and repaired. The TRAM flap is then contoured and inset to form the new breast. The abdomen is then closed. In addition to 19364 (breast reconstruction with free flap), which of the following is the most appropriate Current Procedural Terminology (CPT) coding for this procedure?

A) 15847 (abdominoplasty)

B) 49585 (repair of umbilical hernia, reducible)

C) 49585 (repair of umbilical hernia, reducible), 15847 (abdominoplasty), and 69990 (use of operating microscope)

D) 69990 (use of operating microscope)

E) No additional coding is necessary

The correct response is Option B.

The Current Procedural Terminology (CPT) code set is maintained by the American Medical Association through the CPT Editorial Panel. The CPT code set describes medical, surgical, and diagnostic services and is designed to communicate uniform information about medical services provided and procedures performed among physicians, coders, patients, accreditation organizations, and payers for administrative, financial, and analytical purposes.

CPT codes group together portions of an operation or procedure. Reporting or billing for each individual part of a procedure is legal and known as “unbundling” the procedure. The free flap breast reconstruction code includes harvesting of the flap, microvascular transfer, closure of the donor site, and inset/shaping of the flap into a breast. The CPT code book specifically states that use of the operating microscope cannot be added.

It does not include repair of an incidentally found hernia, which may be coded additionally.

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48. A 6-year-old boy with velopharyngeal insufficiency is brought to the office for sphincter pharyngoplasty. History includes repair of a cleft palate as an infant. Innervation of the muscle used to create the sphincter arises from which of the following?

A) Cranial part of the accessory (XI) nerve

B) Glossopharyngeal (IX) nerve

C) Greater and lesser palatine branches of the pterygopalatine ganglion

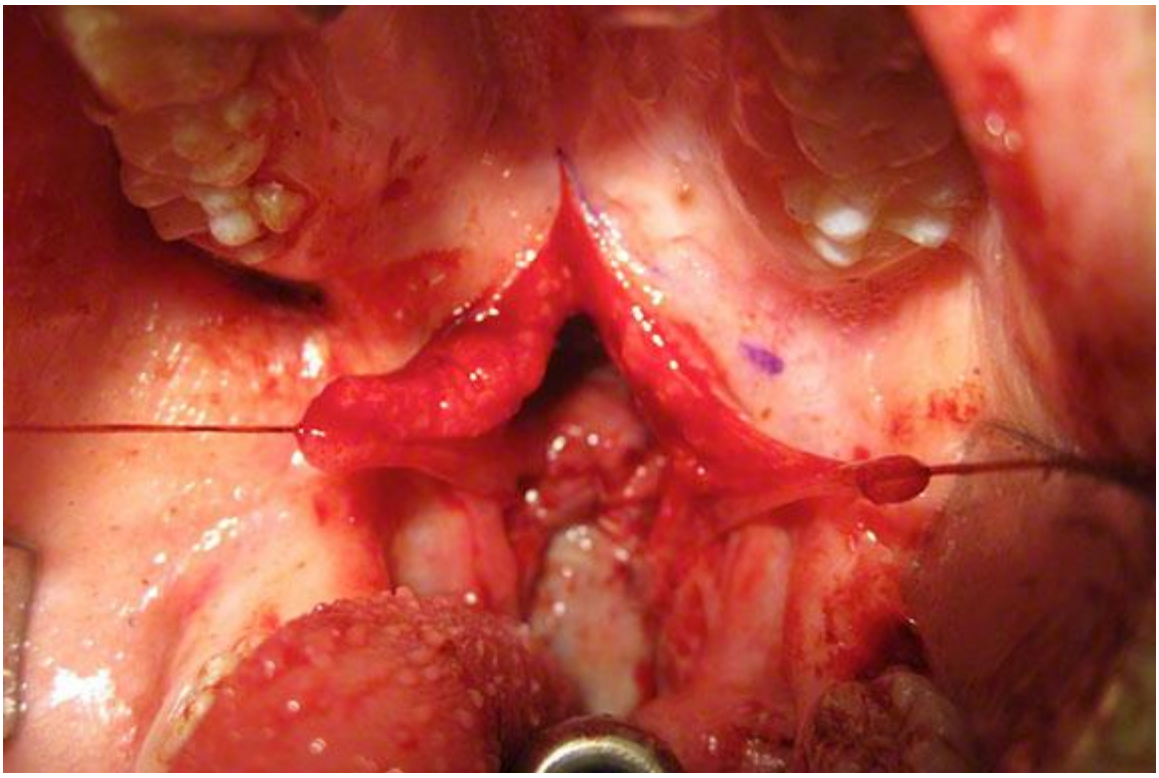
D) Hypoglossal (XII) nerve

E) Medial pterygoid nerve

The correct response is Option A.

Sphincter pharyngoplasty for correction of velopharyngeal insufficiency is performed by elevation of myomucosal flaps from the posterior tonsillar pillar, which involves the palatopharyngeus muscle. The palatopharyngeus muscle is supplied by the cranial part of accessory (XI) nerve through the pharyngeal branch of vagus (X) nerve via the pharyngeal plexus. The medial pterygoid nerve innervates the tensor veli palatini. The greater and lesser palatine nerves are branches of the pterygopalatine ganglion which provide sensory innervation to the palate. The hypoglossal (XII) nerve innervates the lingual muscles, with the exception of the palatoglossus, which is supplied by pharyngeal branch of the vagus (X) nerve, via the pharyngeal plexus. A photograph is shown.

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(Please note that this pictorial appears in color in the online examination)

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49. A 33-year-old man is brought to the emergency department after he is struck in the forehead with a baseball bat. The patient is awake and alert. Examination shows an obvious deformity in the frontal region. Emergency CT scan shows a displaced and comminuted fracture of the anterior wall of the frontal sinus and a nondisplaced fracture of the posterior wall. The frontonasal duct is patent. Which of the following is the most appropriate treatment?

A) Cranialization of the sinus

B) Craniotomy

C) Obliteration of the sinus and fat grafting

D) Observation and intravenous administration of antibiotics

E) Open reduction and internal fixation of the anterior wall of the frontal sinus

The correct response is Option E.

Frontal sinus fractures can be assessed by patency of the nasofrontal duct and by whether the fracture involves the anterior wall of the sinus, the posterior wall, or both. In this case, CT scanning shows significant damage to the anterior wall and a minimal fracture in the posterior wall. The normal nasofrontal duct would allow salvage of the sinus with minimal risk of a mucocele or an infection. The underlying brain is uninvolved, so craniotomy is unnecessary. The obvious deformity indicates open reduction and fixation, and because the posterior wall is minimally involved, repair of the anterior wall without craniotomy could be performed.

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50. A 25-year-old man comes to the office for treatment of malocclusion 6 days after he was involved in an altercation. Physical examination shows right-sided facial swelling. X-ray study shows an unfavorable fracture through the angle of the right mandible. No other associated injuries are noted. Which of the following is the most appropriate treatment?

A) Closed reduction and maxillomandibular fixation

B) Open reduction and maxillomandibular fixation

C) Open reduction and rigid fixation

D) Open reduction, wire fixation, and maxillomandibular fixation

E) Observation only

The correct response is Option C.

Mandible fractures are a frequent injury because of the mandible's prominence and relative lack of support. Numerous investigators have reported studies on populations on all continents; fractures of the mandible have been reported to account for 36 to 70% of all maxillofacial fractures. All reports apparently show a higher frequency in males aged 21 to 30 years. In patients with mandible fractures, 53% of patients had unilateral fractures, 37% of the patients had two fractures, and 9% had three or more fractures. Fractures sustained in altercations – low-energy fractures – tend to have single, simple patterns.

The indications for closed versus open reduction have changed dramatically over the last century. The ability to treat fractures with open reduction and rigid internal fixation (ORIF) has dramatically revolutionized the approach to mandibular fractures.

Traditionally, closed reduction (CR) and ORIF with wire osteosynthesis have required an average of 6 weeks of immobilization by maxillomandibular fixation for satisfactory healing. Difficulties associated with this extended period of immobilization include airway problems, poor nutrition, weight loss, poor hygiene, phonation difficulties, insomnia, social inconvenience, patient discomfort, work loss, and difficulty recovering normal range of jaw function.

In contrast, rigid and semirigid fixation of mandible fractures allow early mobilization and restoration of jaw function, airway control, improved nutritional status, improved speech, better oral hygiene, patient comfort, and an earlier return to the workplace.

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Section 4: Breast and Cosmetic

1. A 53-year-old woman comes to the office because of unilateral swelling of the breast 5 years after undergoing subglandular augmentation mammaplasty. A diagnosis of anaplastic large T-cell lymphoma (ALCL) is established. Which of the following is most likely to represent the progression of this patient's disease when compared with a patient who has ALCL but no breast prostheses?

A) A more aggressive clinical course and a poorer prognosis

B) A more aggressive clinical course but a more favorable prognosis

C) A more indolent clinical course and a more favorable prognosis

D) A more indolent clinical course but a poorer prognosis

E) The same clinical course and prognosis

The correct response is Option C.

Anaplastic large T-cell lymphoma (ALCL) is a rare (1 per million) non-Hodgkin lymphoma that has been reported in women with and without breast prostheses. However, increasing case reports suggest an association with breast prostheses, although direct causation has not been established. ALCL associated with breast prostheses has malignant cells infiltrating the periprosthetic capsule or in the periprosthetic fluid collection. It is associated with both silicone- and saline-filled prostheses and seen in patients who have had prostheses for augmentation mammaplasty as well as breast reconstruction. Although the cytology is the same between ALCL associated with and without breast prostheses, ALCL that develops around prostheses tend to have an indolent clinical course and favorable prognosis when compared with systemic ALCL.

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2. A 53-year-old woman comes to the office for symmetry revision of a previous breast reconstruction that requires a Ryan flap. The area of advancement is 15 × 4 cm. Which of the following is the most appropriate Current Procedural Terminology (CPT) coding for this procedure?

A) 14001 (Advancement flap, 10 to 30 cm^2)

B) 15734 (Muscle, myocutaneous or fasciocutaneous flap; trunk) and 14301 (advancement flap, 30 to 60 cm^2)

C) 19380 (Revision of reconstructed breast)

D) 19380 (Revision of reconstructed breast) and 14001 (Advancement flap, 10 to 30 cm^2)

E) 19380 (Revision of reconstructed breast) and 14301 (Advancement flap, 30 to 60 cm^2)

The correct response is Option E.

A Ryan flap involves advancement of the lower thoracic skin and subcutaneous tissue in postmastectomy breast reconstruction. It is helpful for modest supplementation of prethoracic skin coverage and creation of a well-defined inframammary fold. The benefits of this maneuver include a good skin color match, ease of performance, and a scar that is confined to the inframammary fold area.

A Ryan flap is not a global component of any of the breast reconstruction codes. The advancement flap procedure is reported separately. The code selected is based upon the surface area of the flap: 14001 (advancement flap, 10 to 30 cm2) or 14301 (advancement flap, 30 to 60 cm2).

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3. A 35-year-old woman is evaluated because of numbness of the upper helical rim of the left ear 30 days after she underwent neurosurgical decompression to treat facial pain. Which of the following nerves was most likely injured?

A) Auriculotemporal

B) Glossopharyngeal

C) Great auricular

D) Lesser occipital

E) Vagus

The correct response is Option A.

Knowledge of the innervation of the external ear is critical to the understanding of its embryologic development, as well as in the delivery of adequate local anesthesia for minor surgical procedures. Sensation to the external ear is derived from several cranial and extracranial nerve branches. The great auricular (C2 to C3) and lesser occipital (C2) are cranial nerves which innervate the posterior aspect of the auricle and lobule. While the distribution is variable, in most cases the lesser occipital supplies the superior ear and mastoid region while the great auricular nerve supplies the inferior ear and a portion of the preauricular area. The anterior surface of the ear, including the helix, scapha, and concha, is supplied by the auriculotemporal nerve (V3 trigeminal) and is most likely to be injured in a microvascular decompression for the treatment of trigeminal neuralgia. Branches of the vagus (X) and glossopharyngeal (IX) nerve innervate the external auditory meatus.

The innervation to the external ear follows its embryologic branchial arch origins with the great auricular nerve innervating first branchial arch structures and the auriculotemporal nerve innervating second branchial arch structures. An auriculotemporal nerve block provides anesthesia to the helix and tragus and is approached by injecting 2 to 4 mL of anesthesia superiorly and anteriorly to the tragus. The great auricular nerves and lesser occipital nerves are blocked by injecting 2 to 4 mL of anesthetic to the posterior sulcus from the inferior aspect of the earlobe. This will provide anesthesia to the earlobe and lateral helix.

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4. A 49-year-old woman is scheduled to undergo subglandular augmentation mammaplasty with silicone prostheses. During the preoperative discussion, the patient asks about postoperative complications with silicone versus saline prostheses. Which of the following is a disadvantage of using silicone in this patient?

A) Their rupture results in an obvious decrease in breast size

B) They are more likely to result in invasive breast cancer

C) They can obscure breast tissue on mammagraphy

D) They may show more rippling

The correct response is Option C.

Silicone prostheses are radiopaque on mammography. Therefore, when placed in the subglandular position, a small percentage of breast tissue is obscured on mammography. Breast prostheses made completely of or in part with silicone have not been shown to cause a delay in detection of breast cancer. Women with breast prostheses are not more likely to develop breast cancer. Women with breast prostheses who have developed breast cancer are not diagnosed at a more advanced stage and do not have a worse prognosis or survival when compared with women without prostheses. Silicone prostheses are less likely to show superior pole rippling when compared with saline prostheses. If a saline prosthesis ruptures, the saline tends to become absorbed by the body, resulting in an obvious decrease in breast size after a few days. When silicone prostheses rupture, the silicone may remain intracapsular. These ruptures may change the breast shape slightly but usually do not change the size and are often subclinical.

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5. A 35-year-old woman is scheduled to undergo functional septorhinoplasty for nasal airway obstruction. In this patient, perioperative administration of corticosteroids is most likely to have which of the following effects on edema and ecchymosis?

	Edema	Ecchymosis
A)	Decreased	decreased
B)	Decreased	no change
C)	Increased	increased
D)	No change	decreased
E)	No change	no change

The correct response is Option A.

Minimizing complications after rhinoplasty is a priority for every surgeon performing the procedure. Perioperative steroid administration has been shown to decrease postoperative edema and ecchymosis in a number of prospective randomized trials. In an effort to further elucidate the significance of the data and develop an evidence-based algorithm for steroid administration, a meta-analysis of the existing literature was performed. All articles were reviewed for relevant data, which were extracted, pooled, and compared. Seven prospective randomized trials investigating perioperative steroid use in rhinoplasty have been conducted and reported. Four of these studies had the same method of patient edema and ecchymosis assessment, and their data were compared. Based on results from the four relevant studies, perioperative steroid use significantly reduces postoperative edema and ecchymosis of the upper and lower eyelids at 1 day and 7 days postoperatively ($P < .0001$). Preoperative steroid administration decreases postoperative upper and lower eyelid edema at 1 day preoperatively, when compared with postoperative administration ($P < .05$). Extended dosing is superior to one-time dosing ($P < .05$). Perioperative steroid use decreases postoperative edema and ecchymosis associated with rhinoplasty. Preoperative administration is superior to postoperative, and extended dosing is superior to singular. Based on these results, evidence-based guidelines for perioperative steroid administration can be given.

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6. Which of the following techniques minimizes fat necrosis and increases the viability of fat grafting?

A) Avoidance of pressure on grafted areas postoperatively

B) Avoiding placement of the grafts in irradiated tissue

C) Centrifuging the fat grafts

D) Placing the graft in multiple small volumes in a lattice-like framework

E) Using ultrasound-assisted liposuction to harvest grafts

The correct response is Option D.

The results of fat grafting are dependent upon the surgeon's experience and technique. Strategies to increase the take of the fat graft and decrease fat necrosis include atraumatic harvest techniques. Placement of the graft in multiple small aliquots increases the availability for vascularity and creating a lattice-like framework when depositing the grafts avoids large-volume deposits. Placement of the grafts in a few large-volume deposits is avoided to minimize fat necrosis and creation of fatty oil cysts. Fat grafting has been refuted for soft tissues that have been affected by radiation.

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7. Which of the following is the most common long-term complication of auricular cartilage harvesting?

A) Cauliflower ear

B) Hematoma

C) Necrosis

D) Perichondritis

E) Sensory impairment

The correct response is Option E.

The external ear provides a versatile cartilage source for reconstructive procedures, especially for augmentative rhinoplasty. Short- and long-term morbidity associated with ear cartilage harvest using concha, tragus, and scapha as donor sites were evaluated. The relevant morbidity factors in the early postoperative period were hematoma formation (6.7%) and sensory impairment (3.3%). In long-term follow-up, sensory impairment was the most frequent condition objectively assessed and subjectively complained of (12.9%). Overall, sensory impairment was confined to concha as the donor site. Anthropometric measurements showed a mean difference in the length of the affected ear compared with the contralateral ear of 1.8 mm, a width difference of 2.5 mm, a difference in tragus/lateral canthus distance of 1.4 mm, and a difference in protrusion angle of 2.4 degrees. Aesthetically relevant complications were rare and their occurrence restricted to single cases. Long-term cases of necrosis, infection, and perichondritis were exceedingly rare. Cartilage graft harvest from the auricle can be considered as a relatively safe procedure with a favorable aesthetic outcome. Cauliflower ear may result from long-standing loss of blood supply to the ear cartilage and formation of neocartilage from disrupted perichondrium. This complication is almost never seen from harvest but from auricular trauma.

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8. An otherwise healthy 34-year-old woman calls the office because of nonspecific left-sided chest pain and mild shortness of breath 2 weeks after she underwent abdominoplasty with plication of a rectus diastasis and liposuction of the flanks. The procedure was performed during general anesthesia in 3 hours and 15 minutes. She was admitted overnight, and heparin was administered subcutaneously during her hospital stay, including one dose preoperatively. She reports no postoperative complications and feels extremely well otherwise. She says she is "finally getting back to herself physically" and does not want to worry her husband or children. She just wanted to make sure she had not "pulled a muscle or injured anything." Which of the following is the most appropriate action by the plastic surgeon?

A) Evaluation at the emergency department

B) Reassurance

C) Reduction of physical activity

D) Use of incentive spirometer at home to assist in improving pulmonary toilet

E) Use of over-the-counter anti-inflammatory drugs

The correct response is Option A.

This patient is likely suffering from a pulmonary embolism and requires emergent workup and treatment with anticoagulation. Although she was treated perioperatively with subcutaneous heparin, deep venous thrombosis (DVT) can still develop as well as a resultant pulmonary embolism (PE). In one survey of board-certified plastic surgeons, PE was found to be the leading cause of death following liposuction. In aesthetic plastic surgery patients, abdominoplasty patients appear to be at a higher risk of venous thromboembolism (VTE) when compared to those undergoing other commonly performed elective procedures. Rates range from 1 in 1000 to 1 in 300 for standard abdominoplasty, and when combined with other procedures, the risk of VTE and death from PE increases significantly. Any possible symptoms that are suspicious for PE, even several weeks postoperatively, must be taken very seriously and treated urgently with immediate presentation to the closest emergency department for aggressive and urgent medical workup as well as imaging and laboratory studies to evaluate for DVT and/or PE.

Venous thrombus formation occurs secondary to a triad of factors describes by Virchow: venous stasis, vascular injury, and hypercoagulability. During abdominoplasty, the combination of general anesthesia, supine positioning, and immobilization promotes venous stasis. In addition, decreased venous return prevents clearance of activated clotting factors,

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further leading to thrombus formation. The highest risk period for fatal postoperative PE occurs 3-7 days after surgery, with approximately 10% of symptomatic PE being fatal within 1 hour of first symptoms. The risk of symptomatic venous thromboembolism is highest within 2 weeks of surgery and remains elevated for 2 to 3 months. Two thirds of patients with a DVT may appear clinically silent making the need for thromboprophylaxis extremely important. Current strategies to reduce risk include proper patient positioning, early ambulation postoperatively, flexion of the patient's knees 5 degrees, supplemented with mechanical (e.g., pneumatic compression boots) and/or pharmacological prophylaxis in most patients. The most common practice for pharmacological prophylaxis is to begin therapy preoperatively and continue treatment until 5 to 10 days after surgery. Some studies have even suggested a full month of postoperative treatment for those patients at a higher risk.

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9. A 56-year-old woman undergoes resection of the conjunctiva and Müller muscle for treatment of blepharoptosis. Which of the following structures is encountered immediately anterior to the Müller muscle?

A) Capsulopalpebral fascia

B) Central fat pad

C) Levator palpebrae superioris muscle

D) Lockwood ligament

E) Retro-orbicularis oculi fat

The correct response is Option C.

The layers of the upper eyelid, in order from superficial to deep, are skin, orbicularis oculi muscle, retro-orbicularis oculi fat, orbital septum, orbital fat (central and nasal or medial in the upper eyelid), levator palpebrae superioris muscle and aponeurosis, Müller muscle, and the conjunctiva. In a Fasanella-Servat procedure for the correction of eyelid ptosis, the conjunctiva and Müller muscle are grasped between clamps just above the border of the tarsal plate. The tissue in the clamp is then excised and closed, thus resecting the Müller muscle and conjunctiva. At the base of the wound after the resection is the levator muscle.

The capsulopalpebral fascia and Lockwood ligament are part of the lower eyelid and orbital contents. The capsulopalpebral fascia inserts on the inferior border of the tarsus. It makes up the anterior superior portion of the lower eyelid retractors distal to the Lockwood ligament. The Lockwood ligament is a fascial thickening that supports the globe. It surrounds the inferior rectus and inferior oblique muscles and fuses with the capsulopalpebral fascia. It is analogous to the Whitnall ligament in the upper eyelid.

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10. A 45-year-old woman comes to the office because of persistent dysesthesias of the medial forearm 2 months after she underwent brachioplasty for brachial ptosis. Examination shows a well-healed scar on the medial aspect of the arm extending to the proximal elbow. Which of the following nerves was most likely injured during the procedure?

A) Axillary

B) Medial antebrachial cutaneous

C) Median

D) Posterior interosseous

E) Ulnar

The correct response is Option B.

When performing brachioplasty, injury to the medial antebrachial cutaneous nerve can occur. This nerve runs along to the medial epicondyle and adjacent to the basilic vein. Maintaining superficial dissection at the ulnar aspect of the elbow and preserving the basilic vein is paramount in minimizing injury to the medial antebrachial cutaneous nerve.

Although theoretically possible, injury to the ulnar and median nerves has not been reported with brachioplasty. The axillary nerve and posterior interosseous nerve should not be in the field of dissection when performing a brachioplasty.

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11. An 8-year-old boy is scheduled to undergo otoplasty to correct prominence of the ears. Recreation of the antihelical fold, conchal setback, and lobule setback are planned. Mustardé sutures will be used to recreate the antihelical fold. The most appropriate location for placement of the Mustardé sutures in this patient is between which of the following structures?

A) Conchal cartilage and conchal cartilage

B) Conchal cartilage and mastoid fascia

C) Scapha cartilage and conchal cartilage

D) Scapha cartilage and mastoid fascia

E) Scapha cartilage and scapha cartilage

The correct response is Option C.

Placement of Mustardé sutures is the most common maneuver performed for a routine otoplasty and consists of horizontal mattress sutures placed between the scapha cartilage and the conchal cartilage in order to recreate the antihelical fold. Conchal setback sutures are also commonly used during an otoplasty and fixate the conchal cartilage to the mastoid fascia. Scapha cartilage would not be fixated to the mastoid fascia or else a significant pinning deformity would result. Occasionally, a wedge of excess conchal cartilage is excised to lessen the degree of conchal prominence in cases of excess. In this situation, conchal cartilage is sutured to conchal cartilage to close the resultant defect so that no contour irregularity is produced from the resection. This would not, however, have any effect on producing an antihelical fold. There is no indication for scapha cartilage to be fixated to scapha cartilage for routine otoplasty.

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12. A 29-year-old woman comes to the office 1 year postoperatively after rhinoplasty with slight irregularities and asymmetry of the nasal bridge and tip. Physical examination shows mild depression of the nasal dorsum and asymmetric alar domes. Injection of a calcium hydroxyapatite gel is planned. Which of the following combinations of injection depth and anatomical location is most appropriate in this patient to minimize complications?

A) Subcutaneous area into the nasal alae

B) Subcutaneous area into the nasal alar domes

C) Subperiosteal area into the nasal sidewall

D) Supraperichondrial area into the nasal dorsum

E) Supraperichondrial area into the nasal tip

The correct response is Option D.

Soft-tissue fillers are minimally invasive and offer an attractive alternative to revision rhinoplasty. A variety of fillers are available, including hyaluronic acid derivatives, calcium hydroxyapatite gel, and silicone. Because of the risk of adverse reactions, silicone injectables should be avoided. Hyaluronic acid-derived and calcium hydroxyapatite fillers are better tolerated but still may occasionally cause infection, necrosis, or thinning of the soft-tissue envelope. To minimize the risk of these complications, fillers should be placed in the sub-superficial musculoaponeurotic system plane just above the plane of the periosteum. This will lessen the chance of visibility and palpability. Also, use should be restricted to the nasal dorsum and nasal sidewalls. The nasal tip and alae should be avoided because necrosis is at a much higher risk. The use of soft-tissue fillers in the nose should be approached with caution.

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13. A 48-year-old man comes to the office because he is dissatisfied with the appearance of his "enlarged" breasts. He underwent gastric bypass surgery 2 years ago followed by a 110-lb (50-kg) weight loss. Current weight is 185 lb (84 kg), which has been stable for 6 months. Physical examination shows nipples with an enlarged areola inferior to the inframammary fold, excess skin with loss of skin elasticity, and a moderate amount of fatty tissue. No palpable or painful masses are noted. Which of the following is the most appropriate surgical procedure for correction of this patient's deformity?

A) Injection of phosphatidylcholine

B) Nonsurgical radiofrequency fat ablation

C) Reduction mammaplasty

D) Skin-sparing mastectomy

E) Ultrasound-assisted liposuction

The correct response is Option C.

This patient suffers from pseudogynecomastia, also known as lipomastia.

Reduction mammaplasty with repositioning the nipple at or above the inframammary fold, reduction of the size of the areola, removal of excess skin, and removal of excess fatty tissue will most appropriately correct this patient's deformity. However, many insurance companies recognize this code as a gender-specific code for women. This patient's concerns are primarily with appearance. Breast reduction should be performed as a cosmetic procedure.

No good controlled studies show the benefit of radiofrequency in the treatment of gynecomastia or pseudogynecomastia. The safety and efficacy of phosphatidylcholine injections have yet to be established. Liposuction will not address the skin problem or correct the enlarged areolae. Mastectomy for gynecomastia is a surgical procedure for the removal of painful, periareolar glandular tissue usually in pubescent males and is sometimes covered by insurance.

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14. A 21-year-old woman comes to the office for consultation regarding rhinoplasty. She says she is dissatisfied with the tip of her nose because it is "too big and wide." Which of the following is the most effective suture technique to achieve a more refined triangular tip in this patient?

A) Columellar septal

B) Interdomal

C) Lateral crural mattress

D) Medial crural

E) Transdomal

The correct response is Option E.

The first suture for a broad, bulbous tip is the transdomal suture. This suture will narrow the dome and narrow the convexity of the lateral crus with mild increased tip projection. The interdomal suture is used mainly if there is asymmetry in domal height or to reduce the interdomal width.

The columellar septal suture is used to establish tip strength and integrity, which might have been lost with a transfixion incision. Lateral crural mattress sutures are used to create lateral crural concavity. Medial crural sutures or medial crural septal sutures are used to increase or decrease tip projection.

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15. A 41-year-old woman comes to the office because of an invasive ductal carcinoma of the left breast. On mammography, the tumor is 3 cm from the nipple and measures 4 cm. A left-sided lateral periareolar scar extending from the 12 o'clock to the 3 o'clock position from a previous biopsy is noted. The patient wishes to undergo a nipple-sparing mastectomy. Which of the following findings places the patient at greatest oncologic risk, including risk for de novo or recurrent cancer or inadequate surgical margins, with this procedure?

A) Distance of tumor to nipple

B) Patient age

C) Presence of the periareolar scar

D) Size of tumor

E) Type of tumor

The correct response is Option D.

As surgical approaches to breast cancer treatment have evolved, nipple-sparing mastectomy (NSM) has emerged as an alternative to other approaches. It was initially used for prophylactic mastectomies, and patients reported increased satisfaction and body image with nipple-areola complex (NAC) preservation. The role of NSM has been expanded to therapeutic mastectomy, and with that there has been increased research in the oncologic safety of this approach.

Studies have evaluated therapeutic NSM in the context of invasive ductal carcinoma, invasive lobular carcinoma, and ductal carcinoma in situ. The type of cancer does not appear to be associated with the oncologic safety of NSM. Several studies have demonstrated an inverse association between NAC involvement and distance of the tumor from the nipple. While these studies have varied in their distance cutoffs, nipple involvement is reported to be over 50% when the tumor-nipple distance is less than 2 cm, as noted in one study. There is a direct correlation between tumor size and NAC involvement—the same study cited data that when the tumor was greater than 4 cm, the likelihood of nipple involvement was greater than 50%.

One published screening algorithm for plastic surgery includes tumor size less than 3 cm, and tumor location greater than 2 cm from the nipple as criteria for NSM candidacy.

A periareolar scar, if large, may compromise the blood supply to the NAC. Acceptable incisions for NSM, however, include a periareolar incision of 25 to 50%.

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16. A 21-year-old man comes to the office because of difficulty breathing through the left nostril after he was struck in the nose during a soccer game 1 year ago. He had a nosebleed at the time but did not seek medical treatment. Physical examination shows a depressed left nasal sidewall and a buckle in the nasal septum. He has increased difficulty breathing through the left naris when the right naris is occluded, although the nostril appears open. The right nasal passage is widely patent. Closed rhinoplasty with septoplasty is planned. In addition to submucous resection of septal cartilage, which of the following is the most appropriate technique for correction of the nasal airway obstruction?

A) Lateral osteotomies with a right spreader graft

B) Left lateral osteotomy with a columellar strut

C) Left lateral osteotomy with a left spreader graft

D) Medial osteotomies with bilateral spreader grafts

E) Right medial osteotomy with a left alar batten graft

The correct response is Option C.

Fracturing the nose with medial and lateral osteotomies is necessary to mobilize the bony nasal pyramid and correct the collapsed left nasal bone by out-fracturing it. A left spreader graft is also necessary to keep the left internal nasal valve open and prevent the left nasal bone from collapsing and recurrence of the deformity.

A spreader graft is not necessary on the right because the right nasal passage is widely patent. Placing bilateral spreader grafts would give the nasal dorsum a wide appearance and is not required.

Since the rhinoplasty was performed through a closed technique, the columella is not destabilized, which can happen during the open rhinoplasty technique. A columellar strut is not necessary.

The patient has left internal nasal valve collapse, not external nasal valve collapse. An alar batten graft is not indicated in this situation.

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17. A 32-year-old woman, gravida 3, para 3, comes to the office for consultation regarding a slimmer abdominal contour. She says the most weight she lost after pregnancy was 30 lb (13.6 kg). Current BMI is 23 kg/m^2. Examination shows mild diastasis recti and vertical skin redundancy above and below the umbilicus. No hernias or scars are noted. Which of the following is the most appropriate treatment?

A) Suction-assisted lipectomy

B) Repair of the diastasis with prosthetic mesh and cryolipolysis

C) Miniabdominoplasty and suction-assisted lipectomy of the epigastrium

D) Abdominoplasty with rectus plication

E) Fleur-de-Lis abdominoplasty

The correct response is Option D.

In addition to a thorough medical history, careful analysis of the patient's goals and evaluation of the anatomy is the basis for correctly selecting the optimum choice for aesthetic restoration of the abdomen after child bearing. This patient's skin redundancy above and below the navel requires that panniculectomy incorporate downward tension for the portions superior to and inferior to the umbilicus. Miniabdominoplasty fails to include supraumbilical skin tensioning. Liposuction alone may actually worsen the degree of skin laxity by deflating fat compartments or disrupting musculocutaneous suspensory fasciae. It is unlikely that prosthetic material will be necessary to repair a diastasis when plication (folding adjacent fascial halves with sutures) suffices unless a concurrent hernia of significant proportions exists. Traditional abdominoplasty incorporates mobilization of the abdominal panniculus, addresses laxity above and below the navel, and may incorporate more recent techniques such as progressive tension sutures to ensure an optimum aesthetic result while minimizing the need for revision. Fleur-de-Lis abdominoplasty involves a vertical incision and is not indicated. Cryolipolysis is not effective in this level of skin laxity.

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18. A 33-year-old woman comes to the office for consultation because she is dissatisfied with the "sagging" appearance of her breasts. Examination shows grade II ptosis and loss of fullness in the upper pole. A vertical mastopexy is planned. The most common medial innervation to the nipple-areola complex is the anterior cutaneous branches of which of the following intercostal nerves?

A) Second and third

B) Third and fourth

C) Fourth and fifth

D) Fifth and sixth

E) Sixth and seventh

The correct response is Option B.

The most common medial innervation of the nipple-areola complex is mainly 57% from the anterior cutaneous branches of the third and fourth intercostal nerves. The third intercostal nerve accounts for 21.4%. They always reach the areolar edge between 8 and 11 o'clock on the left and 1 and 4 o'clock on the right. The nerve innervation to the nipple-areola complex is important in planning different incisions around the areola in both reduction mammaplasty and mastopexy.

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19. A 29-year-old woman comes for evaluation because she is dissatisfied with the appearance of her nose. Physical examination shows internal nasal valve collapse. Rhinoplasty with spreader grafts and the use of septal cartilage is planned. Which of the following best represents the minimum amount of dorsal-caudal strut that must be retained to prevent collapse?

A) 2 mm

B) 5 mm

C) 10 mm

D) 15 mm

E) 20 mm

The correct response is Option C.

When harvesting septal cartilage as a graft, a minimum of 10 mm of a dorsal-caudal L-shaped strut should remain to prevent collapse. While some authors advocate a more conservative approach, leaving 15 mm, others are more aggressive, leaving as little as 8 mm. The generally accepted rule of thumb, however, is 10 mm.

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20. A 25-year-old woman is considering augmentation mammaplasty with silicone prostheses. The patient asks about the associated risks of developing connective tissue disease. Which of the following risk assessments is most accurate in this patient?

A) Increased risk of extracapsular leak only

B) Increased risk of intra- and extracapsular leak

C) Increased risk only if the silicone migrates to the lymph node

D) Increased risk only in the pre-1990 prostheses

E) No increased risk

The correct response is Option E.

Concern regarding an association between silicone breast prostheses and connective tissue disease was raised in the 1980s and early 1990s, eventually leading to the US Food and Drug Administration (FDA) moratorium of the use of silicone breast prostheses in augmentation mammaplasty. Since then, multiple cohort studies and case control studies in Europe and North America have failed to determine a causative association between silicone breast prostheses and any traditional or atypical connective tissue diseases.

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21. A 23-year-old woman comes to the office for consultation regarding surgical correction of a tuberous breast deformity. On physical examination, which of the following characteristics is most likely in this patient?

A) Absence of the sternal head of the pectoralis muscle

B) Effacement of the inframammary fold

C) Grade III ptosis of the nipple-areola complex

D) Herniation of breast tissue into the nipple-areola complex

E) Macromastia

The correct response is Option D.

Physical examination of a tuberous breast would show herniation of the nipple-areola complex. A constricted inframammary fold, rather than an effaced inframammary fold, is often associated with tuberous breast deformity. Macromastia and/or grade III ptosis of the nipple-areola complex are not standard components of tuberous breast deformity. Absence of the sternal head of the pectoralis muscle is a characteristic feature of Poland syndrome.

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22. A 65-year-old woman comes to the office because of dysphagia and voice changes 3 days after undergoing injection of 50 units botulinum toxin type A because of platysmal banding. This patient's condition is most likely caused by injection of botulinum toxin type A to which of the following anatomical locations?

A) Central fat pad below the thyroid cartilage

B) Cervicomental junction

C) Inferior border of the mandible at the angle

D) Pars facialis below the mandibular margin

The correct response is Option B.

In patients wishing to avoid platysmaplasty or surgical neck lift, platysmal bands can be softened with neuromodulators. The platysma is a very superficial muscle, and injecting neuromodulators too deeply may affect the strap muscles, causing dysphagia, or the cricothyroid muscle, causing voice changes. While injection into the pars facialis just below the mandibular margin is safe, the cervicomental junction is considered a danger zone because of the potential effect on deeper muscles involved in swallowing. Injection inferior to the thyroid cartilage and centrally would not effectively treat the banding but a superficial injection into the fat is unlikely to cause any muscular disturbance. Injection along the inferior border of the mandible at the angle may affect facial nerve function but would not cause dysphagia or voice change. Injection at the medial margin of the sternocleidomastoid is unlikely in the treatment of platysmal banding.

In a patient who presents with dysphagia or vocal changes after treatment of platysmal banding with neuromodulator, a reversible orally active anticholinesterase agent like pyridostigmine may be useful to counteract some of the effects until the agent wears off. Care must be taken to monitor for adverse side effects of anticholinesterase treatment, such as nausea, vomiting, diarrhea, and increased salivation.

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23. A 24-year-old woman with bilateral micromastia comes for consultation regarding augmentation mammaplasty. The patient says she would like her breasts to be "as big as possible." On examination, which of the following is the most important factor in determining the maximum acceptable prosthesis size for this patient?

A) Breast base width

B) Diameter of the areola

C) Grade of nipple-areola ptosis

D) Maximum manufactured prosthesis volume

E) Pectoralis muscle height-to-prosthesis height ratio

The correct response is Option A.

The most important factor in determining the maximum acceptable prosthesis size in this patient is breast base width. Grade of nipple-areola ptosis, areola diameter, maximum manufactured prosthesis volume, and pectoralis height may all impact overall appearance of the breast but do not have an impact on breast prosthesis size choice.

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24. A 5-ft 1-in (155-cm), 185-lb (84-kg), 45-year-old woman comes to the office for follow-up 1 week after she underwent reduction mammaplasty with a medial pedicle in the outpatient facility. BMI is 35 kg/m^2. On examination, the right nipple-areola complex is dusky and cool. Nipple ischemia is suspected. Which of the following is the most appropriate next step in management?

A) Debridement of the necrotic nipple with primary closure

B) One-stage debridement of the necrotic nipple and reconstruction of the nipple-areola complex

C) One-stage exploration and conversion to a free nipple graft

D) Release of all insetting sutures

E) Observation only

The correct response is Option E.

Partial or total nipple necrosis may be one of the most devastating complications of reduction mammaplasty. The incidence of compromise of the nipple-areola complex is typically less than 5% after breast reduction. Increased BMI is a risk factor for and increased risk of both nipple necrosis and wound healing complications. Reduction mammaplasty is frequently performed on an outpatient basis. Patients are seen within a week of surgery for wound checks, but this may be too late to address a nipple with vascular compromise.

If nipple ischemia is noted at the time of surgery during inset, stitches should be released and vascularity reevaluated. An objective assessment of blood flow can be aided with the use of fluorescein injection and a Woods lamp, or with newer screening modalities that are currently being evaluated for this purpose. While inset may be reattempted, the patient will likely require conversion to a free nipple graft. The nipple should be grafted to well-vascularized, deepithelialized dermis and not to ischemic fat that may be part of the compromised pedicle.

If nipple ischemia is detected in the early postoperative period, and there is no hematoma or issue with external compression, the nipple should be released from its inset position. This will relieve tension on the pedicle. If the nipple does not improve, the patient is taken back to the operating room for free nipple grafting.

If nipple ischemia is not identified in the early postoperative period, the patient should be

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treated with conservative wound care until healing is complete. Nipple reconstruction can then be undertaken in a delayed manner.

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25. A 41-year-old woman comes to the office for consultation regarding breast reconstruction after mastectomy. She is also embarrassed by her sudden loss of hair as a result of chemotherapy with paclitaxel. All of her hair has fallen out, and she wears a wig. Which of the following is the most likely diagnosis for this patient's hair loss?

A) Alopecia areata

B) Anagen effluvium

C) Androgenetic alopecia

D) Telogen effluvium

E) Traction alopecia

The correct response is Option B.

Anagen effluvium occurs after an insult to the hair follicle that impairs its mitotic or metabolic activity. This hair loss is commonly associated with chemotherapy. The characteristic finding in anagen effluvium is the tapered fracture of the hair shafts. The hair shaft narrows as a result of damage to the matrix. Eventually, the shaft fractures at the site of narrowing and causes the loss of hair. Hair regrowth occurs after the cessation of chemotherapy.

Androgenetic or androgenic alopecia is caused by the action of androgens. Dihydrotestosterone (DHT) is partially to blame, as it is in men. Androgenic alopecia can be caused by a variety of factors tied to the actions of hormones, including some ovarian cysts, taking high-androgen-index birth control pills, pregnancy, and menopause.

Telogen effluvium is attributable to stress on the body, such as childbirth, malnutrition, severe infection, major surgery, or extreme mental stress. Many of the 90% or so of hairs in the growing (anagen) or transitional (catagen) phases can shift all at once into the resting (telogen) phase. A few weeks to several months after the stressful event, a shedding phenomenon called telogen effluvium begins. It is possible to lose handfuls of hair at a time. This phenomenon is usually self-limited, and hair growth returns.

Alopecia areata is an inflammatory condition thought to result from the immune system

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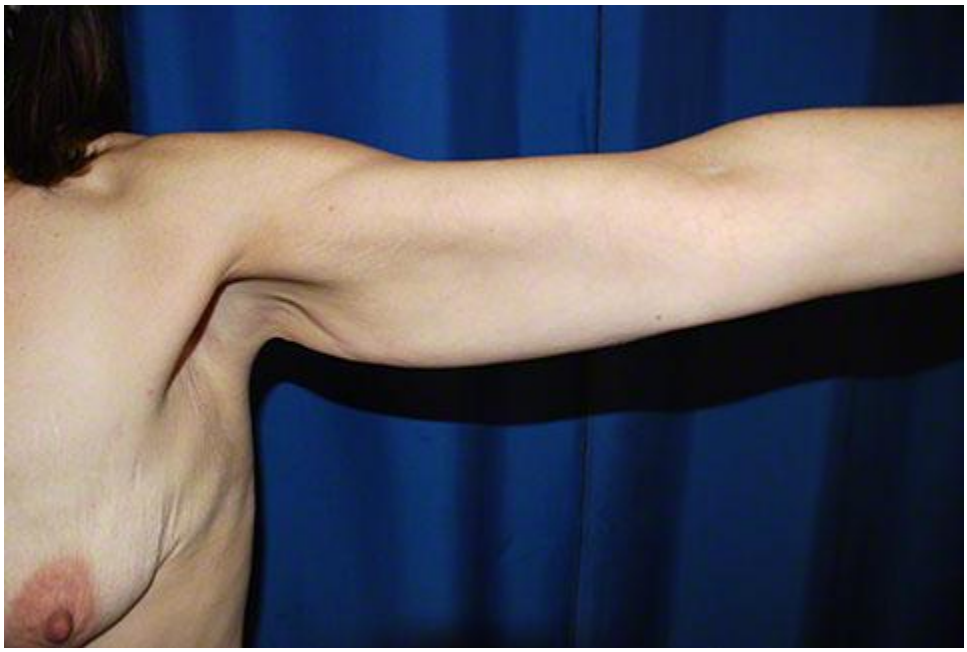
attacking the hair follicles at the root. Treatment may include steroids or minoxidil. Hair loss can be temporary or permanent.

Traction alopecia is caused by localized trauma from tight hairstyles, braids, cornrows, etc. If recognized early enough, the hair will grow back.

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(Please note that this pictorial appears in color in the online examination)

26. A 60-year-old woman comes to the office for evaluation of a poor outcome after liposuction of the arms. She says she is dissatisfied with the marked laxity of the skin of her arms. A photograph is shown. History includes gastric bypass surgery followed by a 100-lb (45.3-kg) weight loss. BMI is 28 kg/m^2. Which of the following procedures is most appropriate to improve contour of the arm in this patient?

A) Laser-assisted liposuction

B) Lipobrachioplasty

C) Radiofrequency treatment (Thermage)

D) T-incision brachioplasty

E) Ultrasound-assisted liposuction

The correct response is Option D.

Traditional brachioplasty comprises a T-shaped scar along the length of the arm and the axilla. This patient has excess skin on her arm, which dictates the necessity for an excisional procedure. Further liposuction of any modality will exaggerate her presentation further, including Vaser liposuction, a form of ultrasound-assisted liposuction, and laser-assisted

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liposuction, both of which are reported to tighten skin through heating its undersurface. There is no evidence to support Thermage as an effective treatment for lax skin. Lipobrachioplasty is a technique which safely combines liposuction with excisional surgery, performing liposuction on the proposed area to be excised. In a thinned arm, potential risks of neuropathy and seroma that accompany liposuction are unnecessary in a patient with lax skin that requires excision to improve contour. Limited incision brachioplasty with excision limited to an ellipse in the axilla, with or without liposuction, provides very limited results with regard to improving overall arm contour, particularly with moderate-to-severe skin redundancy.

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27. A 21-year-old female cheerleader is scheduled to undergo suction-assisted lipectomy for contouring of the outer thigh. She is physically fit and has lost 10 lb (4.5 kg) over the past 6 months. Current weight is 145 lb (65.8 kg). Preoperative examination showed adiposity along the outer thigh area. To decrease the risk of postoperative deformities in this patient, particular attention should be paid to which of the following zones of adherence?

A) Gluteal crease

B) Iliotibial tract

C) Lateral gluteal depression

D) Mid medial thigh

E) Posterior thigh

The correct response is Option C.

The key element to avoid postoperative deformities in liposuction is avoiding the zones of adherence. These are zones where the superficial fascial system sends elements through the deep compartment attaching to the investing fascia of the underlying musculature. These zones of adherence accentuate localized fat deposits between them. The lateral gluteal depression is just superior to the outer lateral thigh and attention to that zone is important when performing liposuction along the outer thigh area. The other zones are not related to the outer thigh, except the inferolateral iliotibial tract, which is distal to the area of concern.

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28. A 26-year-old woman with a strong family history of breast cancer undergoes genetic testing. She is found to have a deleterious mutation of the *BRCA1* gene. Which of the following best describes her lifetime risk for the development of breast cancer when compared with women without this mutation?

A) Two times greater

B) Six times greater

C) Ten times greater

D) Fifteen times greater

E) Twenty times greater

The correct response is Option B.

A woman's lifetime risk of developing breast and/or ovarian cancer is greatly increased if she inherits an altered *BRCA1* or *BRCA2* gene. Women with an inherited alteration in one of these genes have an increased risk of developing these cancers at a young age (before menopause) and often have multiple close family members with the disease. These women may also have an increased chance of developing colon cancer.

Men with an altered *BRCA1* or *BRCA2* gene also have an increased risk of breast cancer (primarily if the alteration is in *BRCA2*) and possibly prostate cancer. Alterations in the *BRCA2* gene have also been associated with an increased risk of lymphoma, melanoma, and cancers of the pancreas, gallbladder, bile duct, and stomach in some men and women.

According to estimates of lifetime risk, approximately 13.2% (132 of 1000 individuals) of women in the general population will develop breast cancer, compared with estimates of 36 to 85% (360 to 850 of 1000) of women with an altered *BRCA1* or *BRCA2* gene. In other words, women with an altered *BRCA1* or *BRCA2* gene are 3 to 7 times more likely to develop breast cancer than women without alterations in those genes. Lifetime risk estimates of ovarian cancer for women in the general population indicate that 1.7% (17 of 1000) will get ovarian cancer, compared with 16 to 60% (160 to 600 of 1000) of women with altered *BRCA1* or *BRCA2* genes. No data are available from long-term studies of the general population comparing the cancer risk in women who have a *BRCA1* or *BRCA2* alteration with women who do not have an alteration in these genes. Therefore, these figures are estimated ranges that may change as more research data are added.

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29. A 50-year-old woman undergoes upper and lower eyelid blepharoplasty with local anesthesia and intravenous sedation. The procedure begins with no patient discomfort; however, the patient reports marked pain once removal of the lower lateral fat pad is initiated. Which of the following nerves is the source of pain in this patient?

A) Facial nerve

B) Infraorbital nerve

C) Infratrochlear nerve

D) Lacrimal nerve

E) Zygomaticofacial nerve

The correct response is Option E.

The zygomaticofacial nerve provides sensory innervation to the lateral fat pad of the lower eyelid.

Branches of the trigeminal nerve provide sensation to the face. The infraorbital nerve, the second branch of the trigeminal nerve, supplies innervation to the lower eyelid, cheek, and upper lip. The lateral palpebral branch of the lacrimal nerve, a branch of the infraorbital nerve, supplies sensory innervation to the superior lateral portion of the upper eyelid. The infratrochlear nerve provides sensory innervation to the medial aspect of the upper and lower eyelid. The lacrimal nerve provides sensation to the upper eyelid through the first branch of the trigeminal nerve. The facial nerve is a motor nerve to the face and is not responsible for sensation in the face.

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30. A 25-year-old man undergoes a submucous resection of the septum for airway obstruction. While the surgeon is scoring the remaining L-strut, the cartilage fractures along the dorsal strut. Reconstruction with which of the following grafts is the most appropriate next step in management?

A) Columella

B) Crural turnover

C) Dorsal onlay

D) Spreader

E) Spring

The correct response is Option D.

When performing a submucous resection for airway obstruction, leaving an intact L-strut is recommended for nasal support. When an L-strut fracture occurs, it should be repaired to avoid middle-third nasal collapse. The strut tends to rotate posteriorly, creating a saddle-nose deformity. Spreader grafts secured with sutures will act like a batten graft and secure the L-strut in place.

A columella graft is used to support the structure and position of the lower third of the nose.

A crural turnover graft is used to support weakened or deformed lower lateral cartilages.

A dorsal onlay graft is used for dorsal augmentation and would not adequately support the fracture.

A spring graft spans between both upper lateral cartilages and is used to widen the middle vault.

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31. A previously healthy 38-year-old woman has onset of a brief tonic-clonic seizure 30 minutes after a lidocaine-based tumescent anesthesia is administered during large-volume liposuction of the abdomen, hips, and thighs. After 3 minutes, she has onset of asystole, and cardiopulmonary resuscitation is initiated. She is unresponsive to the standard ACLS resuscitation protocols for asystole. Administration of which of the following is the most appropriate next step?

A) Dantrolene

B) Dimercaprol

C) Lipid emulsion

D) *N*-acetylcysteine

E) Naloxone

The correct response is Option C.

This is a case of inadvertent lidocaine toxicity with subsequent seizure and cardiac arrest. Furthermore, lipid emulsion has been used with apparent success early in the spectrum of local anesthetic systemic toxicity to preempt cardiac arrest. The role of lipid emulsion has expanded to treatment of cardiac toxicity due to other lipophilic drugs.

Dantrolene is a treatment for malignant hypothermia. Dimercaprol is a chelating agent used for the treatment of heavy metal toxicities. *N*-acetylcysteine is used as a mucolytic and also in cases of acetaminophen overdose. Naloxone is used to treat narcotic overdose. There are no data to suggest that any of these medications are otherwise helpful in lidocaine toxicity.

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32. A 65-year-old woman comes to your office because of pain and weakness in the left shoulder 3 months after undergoing cervicofacial rhytidectomy with a different practice. The pain began immediately after the procedure. She has no history of cervical spine disease, neuropathy, diabetes mellitus, rheumatoid diseases, or other trauma. Physical examination shows atrophy of the left trapezius muscle and left shoulder droop. She has full passive range of shoulder motion but limited active abduction. On attempts at active arm abduction, scapular winging is noted. Which of the following is the most appropriate next step?

A) Angiography of the upper extremity

B) Electromyography and nerve conduction study

C) MRI of the glenohumeral joint

D) Nerve blocking of the great auricular nerve

E) Shoulder splinting

The correct response is Option B.

This patient has a spinal accessory nerve injury related to the recent rhytidectomy. The spinal accessory nerve (XI) may potentially be injured as it passes through the posterior triangle of the neck. Iatrogenic injury is the most common cause of spinal accessory nerve dysfunction. Patients with injury to the spinal accessory nerve present with shoulder pain and trapezius muscle palsy that subsequently results in drooping of the shoulder girdle inferior and laterally along with scapular winging. The diagnosis is confirmed and the level of injury assessed with the use of electromyography and nerve conduction studies.

Loss of spinal accessory motor nerve function due to neurapraxia should be managed conservatively, while the remaining patients with no sign of clinical or electrical recovery by 3 months should undergo evaluation for surgical exploration with neurolysis, repair, or grafting.

Patients often have pain secondary to loss of the ability to suspend the shoulder girdle appropriately. Physical therapy with strengthening of the remaining scapular stabilizers, prevention of trapezius stretch/lengthening, and maintaining full range of motion of the shoulder girdle are important to good function after the nerve recovers. Shoulder splinting is of no benefit. The great auricular nerve is not involved in the patient's pathology, so nerve blocks would not be helpful. Similarly, MRI of the shoulder joint does not image the injured area, and does not help in patient management or surgical planning. Upper extremity

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angiography is of no benefit in the diagnosis or surgical planning of this disorder.

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33. A 60-year-old woman is evaluated in the recovery room during the first hour after rhytidectomy, plication of the platysma, and malar fat grafting. On examination, the patient's mouth appears crooked when she speaks. Moderate diffuse swelling of the mid face and weakness of the right lower lip are noted. Which of the following is the most appropriate next step in management?

A) Administration of methylprednisolone

B) Consultation with a neurologist

C) Reexploration

D) Removal of the tension sutures

E) Observation only

The correct response is Option E.

Motor nerve dysfunction in the first few hours after surgery is common. This muscle weakness is attributable to the lingering effects of local anesthetic. For surgeons who inject the right and left sides of the face at different steps during the procedure, facial muscle asymmetry will be expected. Motor nerve dysfunction that is present days later is usually due to traction, cautery sutures, or transection.

This patient underwent fat grafting to the mid face, and therefore, swelling is expected.

Many surgeons routinely give intraoperative corticosteroids to decrease postoperative swelling. This patient does not need corticosteroids for her muscle weakness.

Removal of the sutures and reexploration are not indicated.

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34. To maintain innervated muscle flaps during abdominal component separation, which of the following is the most appropriate plane of dissection?

A) Below subcutaneous fat pad, above fascia

B) Below fascia, above external oblique

C) Below external oblique, above internal oblique

D) Below internal oblique, above transversalis

E) Below transversalis, above peritoneum

The correct response is Option C.

Component separation for closure of large abdominal wall defects was first described by Ramirez in 1990. The purpose of the surgery is to achieve abdominal wall closure with well-vascularized, innervated muscle flaps. The muscles of the abdominal wall are innervated by the intercostal nerves from T7-L4. The plane below the external oblique and above the internal oblique is an avascular plane that will allow for medial advancement of the rectus muscle flaps while protecting the intercostal nerves that run under the internal oblique.

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35. Which of the following regions accounts for the most marked contribution to total nasal airflow resistance?

A) Choanae

B) Internal nasal valve

C) Keystone area

D) Middle meatus

E) Nasal alae

The correct response is Option B.

The septum, the caudal border of the upper lateral cartilage, the pyriform aperture, and the anterior border of the inferior turbinate define the internal nasal valve. It is the narrowest portion of the nasal airway and accounts for approximately 50% of nasal airway resistance.

The entrance to the nostril is not an area of resistance in particular; however, the inner nostril can contribute to resistance particularly in the secondary rhinoplasty patient or a patient with weak lower lateral cartilages. This area is called the external nasal valve and is bounded by the caudal edge of the lateral crus of the lower lateral cartilage, the soft-tissue alae, the membranous septum, and the nostril sill.

The majority of airflow in the nose is through the middle meatus. It exits through the choanae posteriorly into the nasopharynx.

The choanae can be a source of resistance in the case of congenital choanal atresia where this region is blocked by bone or soft tissue. This would typically present shortly after birth.

The keystone area is the junction of the bony and cartilaginous septum with the bony dorsum. It is a structural landmark and does not describe a region of airflow.

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36. A 24-year-old woman comes to the office because of a capillary malformation of the right cheek. Which of the following lasers is the most appropriate treatment in this patient?

A) Carbon dioxide laser (10,200 nm)

B) Er:YAG (2940 nm)

C) Nd:YAG (1064 nm)

D) Pulsed-dye (585 nm)

E) Q-switched ruby (694 nm)

The correct response is Option D.

The chromophore for the pulsed-dye laser at a wavelength of 585 nm is oxyhemoglobin. Thus, this laser is best suited to treat vascular lesions. Rhytides, acne scars, and dyschromias can also be managed by ablative resurfacing techniques, such as a carbon dioxide laser, which is absorbed by water. Er:YAG has a wavelength of 2940 nm and is absorbed by water. This laser causes less collateral thermal necrosis than a carbon dioxide laser. Acne scarring is best managed with infrared lasers at wavelengths of 1064 to 1540 nm. These include the Nd:YAG, diode, and erbium lasers. Tattoos are best managed with a Q-switched ruby laser at a wavelength of 694 nm, which is absorbed by melanin and carbon pigments.

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37. A 43-year-old woman with a history of ovarian cancer is evaluated because of recurrence in the incision and bladder dome. History includes resection, chemotherapy, and radiation therapy. The gynecologic surgeon plans a wide resection of skin, fascia, bilateral lower rectus muscles, and bladder dome resulting in a 10 × 16-cm defect in the central lower abdomen. Which of the following is the most appropriate procedure to achieve abdominal closure?

A) Bilateral component separation

B) Primary closure only

C) Primary closure with interpositional mesh

D) Use of a free latissimus muscle flap

E) Use of a pedicled anterolateral thigh flap

The correct response is Option E.

The patient described will have a 10 × 16-cm, full-thickness defect of the abdominal wall in the setting of previous radiation. A full-thickness defect this large in the setting of past radiation makes primary closure alone and primary closure with interpositional mesh a poor choice. Bilateral component separation will not be possible because the rectus muscles will be resected with the specimen. A pedicled anterolateral thigh flap will offer well-vascularized, nonradiated tissue that will include soft-tissue coverage as well as fascia for abdominal wall reconstruction. A free latissimus muscle flap, while providing well-vascularized tissue, would involve the increased risks of microsurgery and not provide fascia for closure. Therefore, Option E is most appropriate.

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38. A 30-year-old woman is brought to the emergency department 1 day after undergoing outpatient liposuction because of difficulty breathing and confusion. A tumescent technique with lidocaine was used during the procedure, in which 4000 mL of tumescent fluid was infiltrated and 4000 mL of lipoaspirate was removed. Physical examination shows respiratory distress and petechial rash. Which of the following is the most likely cause of this patient's condition?

A) Drug allergy

B) Fat embolism

C) Lidocaine toxicity

D) Pulmonary edema

E) Pulmonary embolism

The correct response is Option B.

A known risk of liposuction is fat embolism syndrome (FES), and clinical examination remains the gold standard for diagnosis. The three classic symptoms of FES are respiratory distress, decreased cerebral function, and petechial rash. This generally occurs within 48 hours postoperatively. With manual disruption of both fatty tissue and blood vessels that occurs with liposuction, microparticulate fat showers the lung, brain, kidney, and skin with emboli, leading to mechanical obstruction and/or a biochemical inflammatory reaction. Overall mortality from FES after liposuction is approximately 10 to 15%.

Lidocaine at high concentrations can cause serious central nervous system disturbances, including anxiety, agitation, psychosis, seizures and/or coma, and cardiovascular toxicity, including arrhythmias and hypotension. Symptoms of toxicity include light-headedness, euphoria, digital paresthesia, restlessness, and drowsiness. Symptoms of objective toxicity include nausea, vomiting, tremors, blurred vision, tinnitus, confusion, excitement, psychosis, and muscular fasciculations. Seizures and cardiorespiratory depression occur typically when blood levels reach 8 to 12 mcg/mL. Above this level, subjects may become comatose, with respiratory arrest and cardiac asystole. A rash is not associated with lidocaine toxicity. The safe dose of lidocaine has been established as 35 mg/kg during liposuction, and some authors suggest using 55 mg/kg may be safe.

Anaphylaxis from a drug allergy also does not cause a rash but can cause respiratory distress from laryngeal edema.

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Pulmonary edema is characterized by respiratory distress that does not respond to oxygen therapy. This can occur because of fluid overload or from physiologic issues related to extubation.

Pulmonary embolism must be considered with respiratory distress but is not associated with rash and can occur at any time postoperatively.

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39. A 43-year-old woman is scheduled to undergo mastopexy and circumferential lower body lift in an accredited hospital setting for body contouring. She lost 150 lbs (68 kg) after undergoing bariatric surgery 3 years ago. The planned duration of the procedure is 6 hours. In the preoperative holding room, she is dressed in an air-heated gown. Maintenance of normothermia during the perioperative period is most likely to decrease the risk of which of the following complications in this patient?

A) Deep venous thrombosis

B) Fat necrosis

C) Pulmonary embolism

D) Seroma formation

E) Surgical site infection

The correct response is Option E.

There is a significant and growing body of evidence showing that normal body temperature during surgery specifically reduces the likelihood of surgical site infections and reduces the risk of bleeding. For this patient with a long operative time and exposure of a significant amount of body surface area, she is at increased risk for hypothermia and surgical site infection.

Fat necrosis is attributable to devascularization of fatty tissue. Seroma formation is attributable to inadequate drainage of the surgical wounds.

The likelihood of deep venous thrombosis and pulmonary embolus is reduced by the use of subcutaneous heparin, low-molecular-weight heparin, and/or sequential compression devices.

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40. A 28-year-old man who is an aspiring actor comes to the office for consultation regarding rhinoplasty. He says he feels that his nose is preventing him from being a successful actor. Examination shows a 1-mm dorsal hump and a 0.5-mm supratip depression. No abnormalities of nasal width and tip shape are noted, and nasal symmetry is acceptable. Examination of the internal airway is within the normal ranges. Which of the following is the most appropriate management?

A) External rhinoplasty with rasping of the nasal hump, osteotomy, and infracture

B) Injection of hyaluronic acid gel fillers

C) Internal rhinoplasty with hump reduction

D) Referral to psychiatric consultation

E) Tip rhinoplasty only

The correct response is Option D.

Body dysmorphic disorder (BDD) is a preoccupation with an imagined defect in one's appearance, or, if a slight physical anomaly is present, the person's concern is marked excessive. According to the diagnostic criteria in the DSM-IV, the preoccupation should last for at least one hour per day, and have clinically significant impairment in social or occupational functioning, as in this clinical case.

Approximately 5% of patients seeking aesthetic surgery have BDD. The most common preoccupation in BDD is with the nose. Between 20 and 33% of patients seeking rhinoplasty have at least some features of BDD. Previous reports suggest that rhinoplasty in these patients is associated with marked dissatisfaction and an increase in BDD symptoms, not an improvement. Interestingly, the commonly used mnemonic of SIMON to identify a BDD patient – "single, immature male, overly narcissistic" was disproven by the research of Picavet, et al., who found no relationship between sex or marital status and BDD. BDD patients do best with psychiatric help and are likely to have worsened quality of life if surgery is performed.

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41. A 45-year-old man approaches his neighbor, a plastic surgeon, at a cocktail party. He was seen in the emergency department 1 day ago with a broken toe and was given a prescription for ibuprofen. He says his toe is still aching and asks for a prescription for acetaminophen with codeine, which he has taken before. The plastic surgeon asks the man about his medical history, and a physical examination shows "buddy" taped toes and moderate ecchymosis and swelling. The plastic surgeon writes the prescription for acetaminophen with codeine. Which of the following is the most necessary next step for the plastic surgeon?

A) Contact his treating physician

B) Have the man sign a Health Insurance Portability and Accountability Act (HIPAA) consent form

C) Order a repeat x-ray study

D) Send the man to the emergency department

E) Write a medical note of the encounter

The correct response is Option E.

The key to the scenario described is that the plastic surgeon is out of the office and the man is not his patient. However, as soon as a prescription is written, he is now a patient, and the plastic surgeon is obligated to document this encounter. A prescription is a legal document and as such is subject to local, state, and federal laws. Each state has its own individual laws, many of which are very restrictive, demanding taking a history and conducting a physical examination before prescribing as well as maintaining written records of all treatments and prescriptions. Federal law limits its prescription writing laws to controlled substances. These laws require that the prescriber have a bona fide patient-physician relationship with any person for whom he or she prescribes controlled substances. This relationship includes maintenance of a written medical record. Violating these standards can jeopardize a license.

Contacting his treating physician is unnecessary.

Sending the man to the emergency department or ordering an x-ray study is unnecessary.

HIPAA stands for the Health Insurance Portability and Accountability Act. This rule set national standards for the protection of individually identifiable health information.

Having the form signed would not be the most appropriate next step.

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42. A 42-year-old woman comes to the office because she is dissatisfied with an obvious step-off between the chest wall and the superior pole of the breast 6 months after she underwent immediate expander reconstruction of the left breast. No further adjuvant therapy was indicated. After full expansion, the tissue expander was removed, and a permanent smooth, round silicone prosthesis was placed. BMI today is 28 kg/m^2. Examination shows a well-defined inframammary fold. The volume is matched to the contralateral breast. Which of the following is the most appropriate surgical procedure for correction of this patient's deformity?

A) Exchange of the silicone prosthesis with a silicone prosthesis of a larger volume and dimension

B) Exchange of the silicone prosthesis with a saline prosthesis of the same volume and dimension

C) Fat grafting to the superior pole and chest wall

D) Placement of acellular dermal matrix as an inferolateral sling

E) Removal of the prosthesis and reconstruction with a deep inferior epigastric perforator flap

The correct response is Option C.

Fat grafting has been shown to successfully address acquired contour deformities in breast reconstruction. Changing the prosthesis to a saline prosthesis of the same size and dimension will not address the problem of the step-off between the prosthesis and the chest wall in this slender patient (BMI 20 kg/m^2) which is due to decreased soft-tissue coverage in the superior pole. Likewise, increasing the size and dimensions of the silicone prosthesis would not correct this contour deformity and would also lose the symmetry with the contralateral breast. This patient, without excess lower abdominal skin and subcutaneous fat, is not a candidate for a deep inferior epigastric perforator flap. Placement of acellular dermal matrix as an inferolateral sling is typically performed in the initial stage of tissue expansion and reconstruction. It can help define the inframammary fold, which this patient does not need.

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43. A 50-year-old woman comes to the office for consultation because of upper eyelid dermatochalasis and lower eyelid bags. History includes hypothyroidism and type 2 diabetes mellitus. She underwent laser eye (Lasik) surgery 1 year ago. Medications include estrogen and thyroid hormone replacements as well as metformin. Upper and lower eyelid blepharoplasty is planned. This patient is at greatest risk for which of the following postoperative complications?

A) Bleeding

B) Blindness

C) Chemosis

D) Dry eye syndrome

E) Eyelid malposition

The correct response is Option D.

Dry eye syndrome (dysfunctional tear syndrome) is a problem of tear deficiency and eye discomfort that may result in damage to the cornea. Combining upper and lower eyelid blepharoplasty relative to staged upper and lower eyelid surgery presents a greater risk for dry eye syndrome due to orbicularis oculi dysfunction after surgery. Women on hormone replacement therapy also have a higher risk for developing dry eye syndrome after blepharoplasty. Eye lubrication before and after surgery needs to be strongly considered. Patients with prior laser vision correction should wait at least 6 months before pursuing blepharoplasty because of the effects on corneal sensation and tear production. In this case, the patient's Lasik procedure 1 year prior would not impair her surgical outcome with upper and lower eyelid blepharoplasty.

Chemosis is characterized by conjunctival swelling and irritation after blepharoplasty surgery, requiring lubrication after surgery. Some surgeons advocate treatment of this condition with steroid drops.

Eyelid malposition is more likely in patients with a negative vector, defined as those with a maxilla that does not project beyond the orbital rim. It is also common in patients who have poor eyelid tone, diagnosed by snap test or evident as ectropion.

Major adverse postoperative events such as bleeding and loss of vision are rare. Bleeding is more risky with uncontrolled hypertension.

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Smoking history, diabetes, and hypothyroidism are not directly associated with specific complications of blepharoplasty.

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44. A 45-year-old woman comes to the office for consultation regarding smoothing of furrows between the eyebrows. Which of the following findings is a contraindication to abobotulinum toxin type A (Dysport) treatment in this patient?

A) Diabetes mellitus

B) Ehlers-Danlos syndrome

C) Gluten intolerance

D) Lupus

E) Milk allergy

The correct response is Option E.

Since the U.S. Food and Drug Administration approval and introduction of botulinum toxin type A in the 1990s, injectable cosmetic treatments have exponentially outnumbered cosmetic surgical treatments provided by plastic surgeons, and the prevalence of treatment continues to increase. Dysport is a product developed by Medicis (Scottsdale, AZ), which also has botulinum toxin as an active ingredient to reduce glabellar furrows. Dysport is contraindicated for individuals who have an allergy to cow's milk protein.

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45. A 54-year-old woman comes to the office because of severe facial rhytides and photodamage. Examination shows Fitzpatrick skin type III. Ablative laser resurfacing is planned. Which of the following is the most likely complication of laser resurfacing in this patient?

A) Acneiform eruption

B) Bacterial infection

C) Erythema

D) Hyperpigmentation

E) Scarring

The correct response is Option D.

Hyperpigmentation is the most common adverse effect of laser resurfacing. It occurs in 36% of patients and is most common in people with Fitzpatrick skin Types III to VI. Treatment consists of hydroquinone and tretinoin. Sun exposure should be avoided. Rates of hyperpigmentation can be reduced in those pretreated with retinoic acid and bleaching agents. While hyperpigmentation can be permanent, with proper treatment it usually resolves within a few months.

Acne can occur post-laser treatment. It is especially common in patients with a prior history and should be treated with standard acne therapies. Infection risk from bacteria is minimized with prophylactic antibiotics and good topical care. Viral herpes simplex outbreaks can occur in those with and without a history. Antiviral prophylaxis is now used in all patients undergoing laser resurfacing. Yeast infections are also a possible infectious complication. These respond well to systemic antifungals. Scarring can occur with improper technique that causes excessive thermal damage (i.e., too many passes and excessive energy fluencies). Areas that develop scarring can be treated with topical and intralesional corticosteroids, silicone sheeting, and pulsed-dye laser. Erythema is not considered a complication and is a normal part of the healing process. It can last 1 to 4 months depending on the type of laser used.

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46. A healthy 24-year-old nulliparous woman comes to the office for consultation regarding reduction mammaplasty because of back pain and macromastia. BMI is 26 kg/m^2. She wears a 36 DDD brassiere. Which of the following is most likely to adversely affect the patient's ability to breast-feed after reduction mammaplasty?

A) Pedicle thickness

B) Pedicle type

C) Preoperative BMI

D) Preoperative breast cup size

E) Volume of resected tissue

The correct response is Option A.

The World Health Organization defines successful breast-feeding as 6 months of exclusive breast-feeding. While several papers have examined the ability to breast-feed after reduction mammaplasty, the definition of successful breast-feeding varies greatly. In general, there exists consensus that neither pedicle type nor quantity of resected glandular tissue affected successful breast-feeding. Successful breast-feeding requires that the mammary lobules remain connected to the ducts and nipple after surgery; the free nipple technique precludes breast-feeding. The amount of gland that has to be preserved during reduction mammaplasty for maintaining the ability to breast-feed has not yet been determined. Many studies have shown that regardless of the type of full-thickness pedicle (inferior, superior, or medial) that is used for reduction mammaplasty, breast-feeding rates are equivalent to those for women who have not had reduction mammaplasty.

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47. A 57-year-old woman comes to the office because she is dissatisfied with the appearance of her eyes. She says they appear "small" and "tired." Physical examination shows dermatochalasis of the upper eyelids, 2 mm of eyelid ptosis, deep transverse rhytides of the forehead, and fine periorbital rhytides. She elevates her eyebrows 3 mm when she opens her eyelids. A skin-only blepharoplasty with formal eyelid ptosis repair is planned. After the procedure, which of the following clinical findings is most likely in this patient?

A) Blepharospasm

B) Brow ptosis

C) Decreased pretarsal show

D) Decreased volumetric convexity

E) Eyelid retraction

The correct response is Option B.

A patient who undergoes blepharoplasty and ptosis repair in the context of a compensated brow ptosis is likely to experience worsened brow ptosis after the procedure. Evaluation of the blepharoplasty patient requires careful examination of the entire upper third of the face. Patients may have, in addition to excess upper eyelid skin, an eyelid ptosis. In addition to identifying the ptosis, it is important to recognize compensated brow ptosis. A compensated eyelid ptosis occurs when the patient uses the frontalis muscles to raise the eyebrows, which results in a functional improvement in visual fields. This is most easily identified by having the patient close her eyes, and evaluate the automatic raising of the eyebrow on eyelid opening. In this case, the change in the position of the brow on downward gaze and on frontal gaze indicates a compensated brow ptosis.

After ptosis repair and blepharoplasty, brow ptosis can become more manifest as the need for compensation decreases.

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48. A 33-year-old woman comes to the office with a 6-cm rapidly growing tumor of the left breast. She wears a size 36C brassiere. The tumor has a bluish hue and skin veins are dilated. A phyllodes tumor is diagnosed, and surgical excision is planned. Which of the following is the most appropriate surgical procedure to treat this patient?

A) Excision with 1-cm margin

B) Excision with 2-cm margin

C) Excisional biopsy

D) Modified radical mastectomy

E) Radical mastectomy

The correct response is Option A.

Phyllodes are large benign tumors that occur primarily in the perimenopausal patient. Previously, they were referred to as cystosarcoma phyllodes, a term coined in 1838 because the tumors are fleshy and have a gross leaf-like intracanalicular growth pattern. However, this is a misnomer because these tumors do not behave like sarcomas and are rarely malignant. The histologic characteristics that separate fibroadenomas from phyllodes tumors are not well defined and have been somewhat controversial. Nevertheless, phyllodes tumors typically are large fibroadenomas that histologically have more stromal cellularity than that seen in the typical fibroadenoma. The classification of benign versus malignant phyllodes tumors is not sharply delineated, and the term borderline lesion may be more appropriate. Borderline lesions have more mitoses per high-power field and moderate nuclear pleomorphism. They have a tendency to recur after local excision but do not demonstrate true malignant behavior. When metastases of a phyllodes tumor have been reported, there have been obvious sarcomatous elements such as liposarcoma or rhabdomyosarcoma in the lesion.

The surgical treatment of phyllodes tumors has recently been redefined. In the past, simple or radical mastectomies were recommended for the treatment of large phyllodes tumors. Currently, most surgeons perform more conservative surgery. Several clinical studies have recommended the excision of tumors with 1-cm clear margins or mastectomy if breast conservation is impossible.

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49. A 46-year-old woman comes to the office for evaluation of persistent erythema 2 weeks after she underwent full-face carbon dioxide laser resurfacing. Which of the following topical treatments is most appropriate to decrease this patient's postoperative erythema?

A) Amoxicillin

B) Ascorbic acid

C) Hydroquinone

D) Prednisone

E) Valacyclovir

The correct response is Option B.

Erythema following laser resurfacing is an anticipated consequence of therapy. Posttreatment erythema is more severe and of longer duration with carbon dioxide laser resurfacing when compared to the fractionated carbon dioxide or Er:YAG laser. Postoperative topical application of ascorbic acid has been shown to decrease the duration as well as the severity of erythema. Topical therapy with ascorbic acid should be applied following reepithelialization. Antibiotics or antivirals have not been shown to decrease erythema. Hydroquinone is a skin bleaching agent that does not treat erythema. Topical corticosteroids postoperatively may delay reepithelialization and have not been associated with a decrease in erythema.

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50. A 45-year-old woman comes to the office for consultation regarding reduction mammaplasty because of pain of the neck and upper back. She currently wears a size 42 DDD brassiere and would like to be a C cup. A vertical reduction mammaplasty with a superomedial pedicle is planned. Which of the following is the dominant blood supply for this pedicle?

A) Ascending branch from the fifth intercostal space

B) Ascending branch from the sixth intercostal space

C) Descending branch from the first intercostal space

D) Descending branch from the second intercostal space

E) Descending branch from the fourth intercostal space

The correct response is Option D.

Almost 60% of the blood flow to the breast is from the internal mammary artery. The second and third anterior perforating branches are most dominant. In a superomedial pedicle both the second and third descending branches are captured in the pedicle. In a pure medial pedicle, it is usually the third. The other branches do not constitute any significant contribution to the pedicle blood supply in a superomedial or medial reduction.

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Thank you for your participation.

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