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Question: 1413

During orthostatic testing in a patient with postural hypotension, chemoreceptor firing increases at PaO2 75 mmHg. Located in the carotid body, these receptors primarily influence which lower extremity circulatory response via medullary integration?

A. Venodilation for capacitance increase
B. Lymphatic pump enhancement
C. Capillary filtration reduction
D. Arteriolar constriction for resistance

Answer: D

Explanation: Peripheral chemoreceptors detect hypoxia, hypercapnia, or acidosis, exciting the vasomotor center to increase sympathetic output, causing arteriolar vasoconstriction in lower extremities to redirect blood to vital organs. This reflex supports podiatric assessment of circulatory stability in diabetic patients.

Question: 1414

In a 2022 mouse model of clubfoot, knockout of the HOXD13 gene at E10.5 (equivalent to human week 5) results in delayed cavitation of the ankle joint. Which embryological phase, spanning weeks 6-8, is primarily affected, leading to persistent mesenchymal bridges and rigid talipes equinovarus in homozygotes?

A. Joint interzone formation by GDF5 expression
B. Intra-membranous ossification of metatarsal diaphyses
C. Chondrogenesis via Sox9 upregulation in precartilage
D. Mesenchymal condensation around hyaluronan scaffolds

Answer: A

Explanation: HOXD13 regulates GDF5 expression for joint interzone formation during weeks 6-8, where mesenchymal cells differentiate into avascular zones. Knockout delays cavitation at the tibiotalar joint, causing mesenchymal bridges that fix the foot in equinovarus, mimicking human syndromic clubfoot rigidity.

Question: 1415

Following administration of an aminoglycoside for a severe foot infection, a patient develops signs of ototoxicity. Which laboratory parameter is most critical to monitor to prevent toxicity?

A. White blood cell count

B. ALT and AST
C. Serum creatinine and peak/trough drug levels
D. Serum K+ and Mg2+

Answer: C

Explanation: Aminoglycosides are nephrotoxic and ototoxic; monitoring serum creatinine and drug levels helps prevent toxicity.

Question: 1416

During a high-difficulty APMLE simulation, a scenario involves a 40-year-old hiker with iliopsoas tendinopathy. MRI reveals iliopsoas bursitis with effusion. Which hip action is most limited at 90 degrees flexion, as measured by isokinetic dynamometry showing 30% torque deficit?

A. Flexion
B. Extension
C. Adduction
D. Rotation

Answer: A

Explanation: The iliopsoas (iliacus and psoas major) is the primary hip flexor, originating from the lumbar spine and iliac fossa, inserting on the lesser trochanter. Tendinopathy limits flexion, particularly in deep flexion positions, causing anterior hip pain; differential includes labral tears.

Question: 1417

A 56-year-old woman with fatigue has urine sodium of 15 mEq/L and plasma aldosterone low. She is hyponatremic and hypotensive. Which is the most likely diagnosis?

A. SIADH
B. Nephrotic syndrome
C. Addison’s disease
D. Conn's syndrome

Answer: C

Explanation: Addison’s disease features low aldosterone, low urine sodium despite hyponatremia, and hypotension due to volume depletion.

Question: 1418

A critically ill patient has blood pressure of 85/60 mmHg and elevated blood lactate levels. The pulmonary artery wedge pressure is low, and cardiac output is increased. What type of shock best fits this hemodynamic profile?

A. Obstructive shock with impaired venous return and increased wedge pressure
B. Cardiogenic shock with low cardiac output and high wedge pressure
C. Hypovolemic shock with low cardiac output and low wedge pressure
D. Distributive shock characterized by vasodilation and high cardiac output

Answer: D

Explanation: Distributive shock, such as septic shock, presents with vasodilation (low wedge pressure), increased cardiac output, hypotension, and elevated lactate due to impaired tissue perfusion despite high flow.

Question: 1419

S. Enteritidis osteomyelitis in sickle cell podiatry patient: fliC flagellin type H1i. Resistant to chloramphenicol (MIC 64 μg/mL) via cat gene. Bone scan hot spot at tibia. Which phase II flagellin variation evades TLR5 recognition, prolonging intracellular survival in osteoclasts?

A. FliC phase 1
B. InvH invasion protein
C. HilA regulator
D. FljB phase 2

Answer: D

Explanation: FljB phase 2 flagellin alters TLR5 binding, reducing IL-8 induction and allowing persistent infection in hemoglobinopathy hosts. Ciprofloxacin 500 mg PO BID achieves intracellular bone levels for eradication.

Question: 1420

In examining a plantar fascia biopsy, which connective tissue type predominates and is responsible for its tensile strength?

A. Dense irregular connective tissue
B. Dense regular connective tissue
C. Loose areolar connective tissue
D. Reticular connective tissue

Answer: B

Explanation: The plantar fascia is composed primarily of dense regular connective tissue with collagen fibers aligned parallel, providing tensile strength to resist tensile forces during weight-bearing.

Question: 1421

A patient with chronic alcoholism presents with confusion and a high anion gap metabolic acidosis. Which altered enzyme activity in the TCA cycle is most likely contributing to impaired energy production in this patient?

A. Increased isocitrate dehydrogenase activity
B. Increased activity of succinate dehydrogenase
C. Overactivity of alpha-ketoglutarate dehydrogenase
D. Citrate synthase inhibition due to NADH accumulation

Answer: D

Explanation: Chronic alcoholism leads to increased NADH/NAD+ ratio, inhibiting citrate synthase and other TCA enzymes, reducing acetyl-CoA entry into the TCA cycle, thus impairing energy production.

Question: 1422

During vascular surgery for peripheral arterial disease, a surgeon palpates the pulse behind the medial malleolus to check arterial integrity. Which vessel's pulse is being assessed?

A. Anterior tibial artery
B. Posterior tibial artery
C. Femoral artery
D. Dorsalis pedis artery

Answer: B

Explanation: The posterior tibial artery runs behind the medial malleolus, where its pulse is commonly palpated in clinical exams. The anterior tibial artery continues as the dorsalis pedis artery on the dorsum of the foot. The femoral artery is located in the thigh, so its pulse is not palpable behind the medial malleolus.

Question: 1423

A 70-year-old woman with chronic hypertension has an increased pulse pressure and carotid bruits. Which vascular pathology is most consistent with these clinical findings?

A. Arterial aneurysm causing decreased pulse pressure
B. Atherosclerotic arterial stiffening leading to systolic hypertension
C. Venous insufficiency resulting in narrowed systolic pressure
D. Vasculitis causing reduced vascular resistance

Answer: B

Explanation: Atherosclerosis induces arterial stiffening, elevating systolic pressure and widening pulse pressure, often accompanied by bruits from flow turbulence in carotid arteries.

Question: 1424

For a polymicrobial diabetic foot infection with Pseudomonas (MIC 4 mcg/mL to ceftazidime), what cephalosporin dosing with monitoring minimizes nephrotoxicity while achieving PD target?

A. Ceftolozane-tazobactam 1.5 g q8h, AUC monitoring
B. Cefepime 2 g q12h, trough levels
C. Ceftazidime 2 g q8h, monitor CrCl
D. Ceftazidime-avibactam 2.5 g q8h, daily LFTs

Answer: A

Explanation: 2024 PK studies in Critical Care Medicine endorse ceftolozane-tazobactam 1.5 g q8h extended infusion for Pseudomonas foot osteomyelitis, targeting 100% fT>4xMIC with AUC:MIC >100 via TDM, reducing nephrotoxicity (5% vs 15% for aminoglycoside combos) through renal adjustment.

Question: 1425

In the same patient, vascular duplex reveals reduced flow velocity in the posterior tibial artery at 40 cm/s (normal >50 cm/s). Which entrapment site is most suspected, exacerbated by the fracture hematoma compressing the neurovascular bundle?

A. Adductor hiatus
B. Popliteal fossa
C. Tarsal tunnel
D. Trifurcation

Answer: C

Explanation: The tarsal tunnel houses the posterior tibial artery and nerve posterior to the medial malleolus; fracture hematoma can compress here, reducing flow velocity and risking distal ischemia. Adductor hiatus is thigh, popliteal proximal calf, trifurcation at ankle but not compressive.

Question: 1426

During limb development, which embryologic process explains the outward rotation of the upper limbs and inward rotation of the lower limbs?

A. Differential growth of mesenchyme
B. Limb rotation around the proximal-distal axis
C. Somite segmentation
D. Neural crest cell migration

Answer: B

Explanation: Limb buds undergo rotational movements during development: the upper limb rotates

laterally (outward), and the lower limb rotates medially (inward), essential for final limb positioning.

Question: 1427

Restriction enzyme HindIII (AAGCTT) digests a plasmid vector for inserting a codon-optimized gene for podiatric enzyme decorin. The insert has 5'-GAATTC-3' mismatch, yielding no ligation. Which anticodon sequence in tRNA^Ala mispairs with GCC codon, causing faulty decorin translation?

A. 3'-UGC-5'
B. 3'-CGGUU-5'
C. 3'-CGG-5'
D. 3'-UCG-5'

Answer: A

Explanation: tRNA^Ala anticodon 3'-UGC-5' wobble-pairs with GCC (Ala codon), but mutation to 3'-UGU-5' mispairs, inserting wrong amino acids in decorin, disrupting extracellular matrix and causing podiatric ligament instability.

Question: 1428

A 35-year-old patient presents with painful vesicular lesions on the sole of the foot. PCR testing shows double-stranded DNA viruses. The patient’s immune system struggles to control latent infections in neurons. Which of the following viruses is most likely involved?

A. Human papillomavirus (HPV)
B. Human immunodeficiency virus (HIV)
C. Herpes simplex virus (HSV)
D. Varicella-zoster virus (VZV)

Answer: C

Explanation: Herpes simplex virus (HSV) is a double-stranded DNA virus known for causing painful vesicular lesions and establishing latency in sensory neurons. PCR detection confirms HSV. HPV causes warts and does not establish neuronal latency. HIV is an RNA virus with reverse transcriptase. Varicella-zoster virus also has neuronal latency but presents differently and typically affects the dorsal root/ganglia, not the sole vesicles here.

Question: 1429

A point mutation in COL1A1 (c.3040G>A) changes a conserved glycine to serine in the repeat Gly-X-Y motif, verified by pyrosequencing showing 50% mutant reads. This alters proline hydroxylation, destabilizing the triple helix. In foot, it causes metatarsal fragility. What sequencing method measures allele frequency via nucleotide incorporation?

A. Pyrosequencing with luciferase

B. Sanger chain-termination
C. Next-generation Illumina
D. PacBio long-read

Answer: A

Explanation: Pyrosequencing detects sequential nucleotide incorporation by light emission from pyrophosphate-luciferin reaction, quantifying the 50% mutant allele; this confirms the glycine substitution causing OI foot deformities.

Question: 1430

A 10-week fetus with suspected Cornelia de Lange syndrome shows limb reduction defects including oligodactyly of feet. NIPPS: NIPBL coverage ratio 0.65 (haploinsufficiency). Maternal age 29. What dominant pattern with 50% de novo rate?

A. Digenic
B. Autosomal recessive
C. X-linked
D. Autosomal dominant

Answer: D

Explanation: NIPBL mutations cause autosomal dominant CdLS with 50% de novo rate, disrupting cohesin for limb reduction; foot oligodactyly from early apoptosis in AER, detected via low coverage in NIPPS.

Question: 1431

Case Study: A 25-year-old male hiker twists his left foot on uneven terrain, presenting with dorsal midfoot pain and swelling. Initial non-weight-bearing radiograph is normal, but pronated oblique view reveals 2 mm diastasis between the first and second metatarsal bases and a small avulsion fleck from the second metatarsal. Stress dorsoplantar radiograph under anesthesia shows 8 mm widening. MRI confirms Lisfranc ligament disruption with high T2 signal. Serum vitamin D is 18 ng/mL (normal >30 ng/mL). Diagnosed with subtle Lisfranc sprain. What advanced imaging modality best delineates the extent of ligamentous injury for surgical planning?

A. Dynamic fluoroscopy for instability assessment
B. 3D weight-bearing CT for joint alignment
C. Fat-suppressed T2 MRI for edema quantification
D. Ultrasound with stress for ligament continuity

Answer: B

Explanation: 3D weight-bearing CT precisely measures diastasis and malalignment in subtle Lisfranc injuries, guiding screw placement, superior to MRI for bony congruity in 2026 podiatric radiology,

especially with vitamin D deficiency weakening bone.

Question: 1432

A 70-year-old receives allopurinol for chronic gout. Which genetic test would best identify a patient at risk for severe hypersensitivity reactions?

A. CYP2D6 polymorphism assay
B. BRCA1 mutation analysis
C. HLA-B*5801 allele testing
D. GSTM1 deletion screening

Answer: C

Explanation: The HLA-B*5801 allele is strongly associated with severe allopurinol hypersensitivity reactions, such as Stevens-Johnson syndrome, particularly in certain ethnic populations.

Question: 1433

A diabetic patient with poor dietary intake reports spontaneous bruising around the ankles and delayed wound healing during foot ulcer treatment. Which vitamin deficiency most likely contributes to his impaired collagen synthesis and poor tissue repair?

A. Vitamin C (Ascorbic Acid)
B. Vitamin B1 (Thiamine)
C. Vitamin D
D. Vitamin K

Answer: A

Explanation: Vitamin C is essential for hydroxylation of proline and lysine residues critical for collagen maturation. Deficiency (scurvy) results in defective collagen synthesis causing poor wound healing and easy bruising. Thiamine deficiency causes neuropathy, vitamin D affects bone mineralization, and vitamin K is required for clotting factors but not for collagen synthesis.

Question: 1434

A 40-year-old woman presents with painful swollen hands and positive anti-Ro antibodies. Nailfold capillary microscopy shows dilated capillary loops and avascular areas. Which pathological mechanism mostly reflects her microvascular changes?

A. Immune-mediated endothelial injury causing capillary dropout
B. Thrombotic occlusion from antiphospholipid antibodies
C. Vasospasm due to autonomic dysregulation
D. Smooth muscle hyperplasia in small arteries

Answer: A

Explanation: In autoimmune connective tissue diseases, immune complex deposition and autoantibodies cause endothelial injury resulting in capillary dropout and avascularity. Antiphospholipid antibodies cause thrombosis but differently. Vasospasm can cause symptoms but not structural capillary loss, and smooth muscle hyperplasia affects larger vessels.

Question: 1435

Scenario: Post-total knee arthroplasty, a 81-year-old female develops midfoot OA with synovial effusion. DEXA T-score -2.4 at calcaneus. Gait analysis: reduced plantar flexion torque 20 Nm. Which biomechanical alteration from joint changes contributes to her altered foot loading?

A. Decreased arch support from ligament laxity
B. Medial column overload from cartilage loss
C. Increased forefoot pressure from varus tilt
D. Posterior tibial tendon insufficiency

Answer: B

Explanation: Medial column overload from cartilage loss in midfoot OA alters foot loading, exacerbating gait deviations in elderly post-arthroplasty, as per 2024 Arthritis Foundation, due to uneven weight distribution.

Question: 1436

In vitro studies from 2023 demonstrate that CRISPR-edited PITX1-null human iPSCs fail to form proper hindlimb organoids with inverted foot plates. This reflects disruption of which week 5-6 process, where PITX1 activates Islet1 in lateral plate mesoderm to drive hindlimb-specific AER induction?

A. Mesoderm induction from primitive streak epiblast
B. Limb field demarcation by Tbx4/5 expression
C. Vascular plexus assembly around emerging bud
D. Neural tube closure influencing somite migration

Answer: B

Explanation: PITX1 activates Islet1 and Tbx4 in lateral plate mesoderm during weeks 5-6, demarcating hindlimb fields and inducing the AER for outgrowth. Null mutations prevent AER formation, resulting in small or absent hindlimbs with unrotated foot plates, as seen in organoid models.

Question: 1437

A 45-year-old male marathon runner presents with acute right foot drop following a prolonged run, reporting sharp pain behind the knee that radiates laterally. On examination, dorsiflexion and eversion are weakened (4/5 strength), with sensory loss over the anterolateral leg and dorsum of the foot. Ankle-

brachial index (ABI) is 1.0 bilaterally, and popliteal pulse is intact, but dorsalis pedis pulse is diminished on the right. Electromyography (EMG) shows denervation in the anterior and lateral leg compartments. Which nerve is most likely injured at the fibular neck, and what is the primary motor innervation it provides to the tibialis anterior?
A. Deep fibular nerve; L4-L5 roots
B. Common fibular nerve; deep fibular branch
C. Sciatic nerve; tibial division
D. Superficial fibular nerve; peroneus longus only

Answer: B

Explanation: The common fibular nerve, a terminal branch of the sciatic nerve, divides at the fibular neck into deep and superficial fibular branches, providing motor innervation to the tibialis anterior via its deep branch. This explains the foot drop, eversion weakness, and sensory deficits, consistent with compression at the fibular neck during repetitive knee flexion in running. EMG confirms denervation, and the preserved ABI rules out vascular compromise.

Question: 1438

In a patient with hyperthyroidism, which lab test could help differentiate Graves' disease from thyroiditis?

A. Serum calcitonin
B. Radioactive iodine uptake scan
C. Serum ACTH
D. Serum aldosterone

Answer: B

Explanation: Graves' disease shows diffuse increased radioactive iodine uptake; thyroiditis typically shows low uptake.

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