

ANSWERS AND ADDITIONAL INFORMATION FOR ORTHOPAEDIC CLINICAL QUIZ

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Answer 1

- Shepherd crook deformity.
Ground glass appearance.
- Hypointense on T1.
Hyperintense on T2.
Lesion involving the proximal femur and shaft of the femur.
No breakage of the cortex of the bone.
Physis plates of the proximal femur and distal femur are still open.
- Fibrous dysplasia.
- Café au lait spots.
Endocrine disorder.
Soft tissue mass.
Irregular bone growth.
Bone deformity.
Increase susceptibility to bone fracture.
(Any four)
- McCune Albright disease.

Description 1

Fibrous dysplasia (FD) is a monostotic or polyostotic benign pseudotumoral bone disorder, in which osteofibrous connective tissue replaces the normal bone marrow. It can also be associated with endocrinopathies (particularly precocious puberty, acromegaly, hypercortisolism and hyperthyroidism) and hyperpigmented skin lesions ('coffee-with-milk' spots), constituting the so-called McCune–Albright syndrome (MAS), or myxomas of skeletal muscle, being part, in this case, of Mazabraud syndrome. Finally, FD can also be associated with the development of hypophosphatemic osteomalacia due to the increased hormone regulating phosphate metabolism: the fibroblast growth factor 23 (FGF-23), produced by the dysplastic bone tissue. It is a rare condition that affects one in 30,000 people and represents 2.5% of overall bone lesions and 1% of primary bone tumours. Monostotic FD is the most frequent FD and its prevalence is similar in both sexes. Only in 2–3% of cases is FD associated with endocrine disorders (MAS). In this case it is clearly predominant in females.

Reference:

Florez H, Peris P, Guanabens N. Fibrous Dysplasia. Clinical review and therapeutic management. *Medicina Clinica* (Barc). 2017. doi.org/10.1016/j.medcli.2016.07.030

Answer 2

- When diameter increases, torsional stiffness increases proportional to the 4th power.
- Length of nail spanning the fracture site from its distal point of fixation in the proximal fragment to proximal point of fixation in the distal fragment.
Length between proximal and distal point of firm fixation to the bone.
Unsupported portion of the nail between two major fragments.
- Torsional stiffness is inversely proportional to the working length.
- Reaming the medullary canal improves contact between implant and bone.
Choosing appropriate nail diameter – size that tightly fits against the medullary surface.
(shorter working length better – better stiffness of fixation– more stable fixation).

Description 2

Intramedullary nailing is the preferred method for treating fractures of the femoral shaft. The piriformis fossa and greater trochanter are viable starting points for antegrade nailing. Alternatively, retrograde nailing may be performed. Each option has relative advantages, disadvantages, and indications. Patient positioning can affect the relative ease of intramedullary nailing and the incidence of malalignment. The timing of femoral intramedullary nailing as well as the use of reaming must be tailored to each patient to avoid systemic complications. Associated comorbidities, the body habitus, and associated injuries should be considered when determining the starting point, optimal patient positioning for nailing, whether to use reduction aids as well as which to use, and any modifications of standard technique. Intramedullary nailing of diaphyseal femur fractures provides a stable fixation construct that can be applied using indirect reduction techniques. This method yields high union rates and low complication rates when vigilance is maintained during preoperative planning, the surgical procedure, and the postoperative period.

References:

- Ricci WM, Gallagher B, Haidukewych GJ. Intramedullary nailing of femoral shaft fractures: current concepts. *J Am Acad Orthop Surg*. 2009;17(5):296-305.
- Nork SE. Femoral shaft fractures. In: Buchholz RW, Heckman JD, Court-Brown CM, Tornetta P editors. *Rockwood and Green's Fractures in Adults*. 7th ed. Philadelphia: Lippincott Williams & Wilkins; 2010: 1655 -1719.

Answer 3

- CT angiogram of both lower limbs.
- Complete absence of flow in the affected popliteal artery.
Distal run off of anterior tibial and posterior tibial artery on the affected side.
Presence of collaterals.
- Compression by fracture fragment.
Intimal tear.
Thrombosis.
- Resuscitate patient (including pharmacotherapy, fluid management).
Reduce the fracture (include splinting).
Vascular consultation.

Description 3

Blunt trauma to the lower extremity has been associated with a 28% to 46% rate of injury to the popliteal artery in the form of transection, occlusion, or intimal injury. The popliteal artery, by virtue of its ligamentous fixation and anatomic relationships to the femur, tibial plateau, and knee joint apparatus, is uniquely susceptible to blunt extremity trauma. Early literature documented the considerable risk of limb loss with these injuries, particularly when managed with ligation alone, with reported amputation rates of up to 49%. Delay in diagnosis of major arterial injuries represents a significant contributor to high amputation rates, although increasingly sophisticated orthopaedic and vascular surgical techniques have markedly improved overall outcomes in most modern series. Recent studies of both military and civilian populations have demonstrated a marked improvement in limb salvage with early recognition of arterial injury and application of advanced techniques of vascular repair. Early literature demonstrated a high rate of association of vascular injuries with blunt lower-extremity trauma and emphasized the importance of rapid diagnosis and aggressive efforts at limb salvage, advocating mandatory arteriography in all patients irrespective of the results of neurovascular examination on admission. Current literature suggests that only selected patients with normal neurovascular examination, following limb injury, require angiogram, based on red flags identified during admission.

Reference

Abou-Sayed H, Berger DL. Blunt lower-extremity trauma and popliteal artery injuries: revisiting the case for selective arteriography. *Arch Surg*. 2002;137(5):585-9. doi:10.1001/archsurg.137.5.585

Answer 4

- Interbody cage.
PEEK (polyetheretherketone).
- A : graft window.
B : hole for cage inserter.
- It is radiolucent – allows visualization of bone growth.
Young modulus close to that of bone.
- Disc pathology (i.e. degenerative disc disease).
Instability (i.e. spondylolisthesis – isthmic/degenerative).
Deformity (i.e. degenerative scoliosis).
Revision surgery for post-discectomy syndrome (i.e. Failed back surgery syndrome).

Description 4

Spinal fusion has been used for decades to manage a variety of spinal disorders. The earliest fusions typically involved a large amount of muscle dissection, copious amounts of autogenous bone graft, and periods of enforced bed rest. Spinal instrumentation was introduced to increase the rate of successful fusion, decrease the period of patient recovery, and allow surgeons to alter the position of the spine. To minimize failure rates of posterior instrumentation, concepts of anterior column support were developed. Originally this necessitated bone being placed in the disc space either from an anterior or posterior approach. This had the advantage of a better blood supply, weight-bearing fusion, and better ability to maintain lordosis. However, when bone graft was used as a stand-alone device, it did not prove to be strong enough. Bone-only anterior lumbar interbody fusion (ALIF) and posterior lumbar interbody fusion (PLIF) had a significant incidence of collapse and pseudarthrosis. Intervertebral cages or spacers were developed to prevent the collapse and pseudarthrosis seen with bone-only fusions. Vertically placed titanium mesh cylinders and rectangular carbon fiber cages were among the earliest spacers used for this reason.

Reference:

Zdeblick TA, Phillip FM. Interbody cage devices. *Spine (Phila Pa 1976)*. 2003; 28(Suppl 15):S2-S7 doi: 10.1097/01.BRS.0000076841.93570.78

Answer 5

- a) A : AP radiograph of the ankle revealing intra-articular lesion of the medial corner of talar body surface with loose fragment and sclerotic margin.
B : MR image of the ankle sagittal plain revealing cartilage defect at the center of talar dome.
- b) Osteochondral disease (OCD) of the right talus.
- c) Minimal disability.
Lesion less than 1.5 cm² surface area.
Absence of mechanical symptoms like clicking, locking or snapping.
- d) Debridement and micro fracture.
Mosaicplasty.
Autologous Chondrocyte Implantation (ACI)

Description 5

Osteochondritis dissecans (OCD) is an acquired idiopathic lesion of subchondral bone that can produce delamination and sequestration with or without articular cartilage involvement and instability. The cause of OCD is still debated: the most recognized aetiology is the occurrence of repetitive microtraumas associated with vascular impairment, causing progressive ankle pain and dysfunction in skeletally immature and young adult patients. Ankle OCD is classically located in the medial part of the talus, while lateral and posterior involvement is less frequent. Diagnosis of OCD, based on MRI findings, is quite straightforward; MRI examination can also be very useful for dating the defect and obtaining information about the associated bone bruise. Osteochondritis dissecans, if not recognized and treated appropriately, may lead to secondary osteoarthritis with pain and functional limitation. Surgical treatment is mandatory especially in young patients with unstable cartilage fragments. There are various surgical options: fixation, microfracture, or substitution using autologous chondrocyte implantation techniques.

Reference

Zdeblick TA, Phillip FM. Interbody cage devices. *Spine (Phila Pa 1976)*. 2003; 28(Suppl 15):S2-S7 doi: 10.1097/01.BRS.0000076841.93570.78

Answer 6

- a) Halovest.
- b) Treatment of cervical spine trauma including
- occipital condyle fracture.
 - occipitocervical dislocation.
 - stable Type II Atlas fracture (stable Jefferson fracture).
 - type II odontoid fracture.
 - stable hangman's fracture.
- Adjunctive postoperative stabilization following cervical spine surgery.
- c) A : halo ring.
B : adjustable frame.
C : vest.
D : padding.
- d) Abducens nerve palsy.
Supraorbital nerve palsy.
Supratrochlear nerve palsy.

Description 6

The halo skeletal device commonly is used both as primary treatment and as an adjunct to internal fixation in patients with cervical spinal injuries. For optimal outcome, the multidisciplinary team should have a basic understanding of the indications, design rationale, and complications associated with the halo skeletal fixator. The halo device provides the most rigid form of external cervical immobilization. Adherence to established application guidelines is critical to minimize morbidity. Safe zones for pin placement have been delineated. Protocols for management of pin-site infections have been established to appropriately manage these unfortunate complications.

Reference

Kang M, Vives MJ, Vaccaro AR. The halovest: principles of application and management of complications. *J Spinal Cord Med*.2003;26(3):186-92