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MCQs – Adult Pathology – Single Best Answer

1. What is the half life of Clopidogrel in plasma?

Answer: a. Four hours
 Thienopyridine clopidogrel, an inhibitor of the P2Y12 adenosine diphosphate (ADP) receptor, has a half-life of 4 to 6 hours.¹

2. Which one of the following methods for assessing patellar height cannot be performed using radiological images?

Answer: a. Biedert and Albrecht
 Biedert and Albrecht² is a method for assessing patellar height on MRI generating the patello-trochlear index. A ratio of the vertical length of the patella articular surface (PAS) and the trochlea articular surface. The other methods, drawn on a lateral plain radiograph of the knee, are summarised below:

Blackburne and Peep³ – This is a ratio of the length of the PAS to a line drawn from the inferior edge of the PAS to another intersecting it projected anteriorly from the tibial plateau

Burgess⁴ – This is a ratio of the width of the femoral condyle to a line drawn from the midpoint of the PAS to the tibial plateau

Caton and Deschamps⁵ – This ratio compares the length of the PAS to a line drawn from the inferior edge of the PAS to the anterosuperior angle of the tibial plateau

Insaill and Salvat⁶ – This well-known ratio compares the length of the patella

3. Which surgical approach is most suitable for reconstruction of a high dislocation of the hip using a total hip replacement?

Answer: d. Trochanteric osteotomy
 non-linear, decrease in load
 A high dislocation of the hip requires an extensile approach allowing adequate exposure of both the

proximal femur and the acetabulum. The ultimate extensile exposure is the trochanteric osteotomy allowing optimal circumferential exposure of the hip without compromising soft tissue attachments. While the posterior approach is satisfactory in many complex primary hip arthroplasty scenarios, for a high dislocation it may require modification with the posterolateral Kocher–Langenbeck approach where the incision is placed more anteriorly over the greater trochanter. The triradiate approach refers to a combined anterior and posterior approach using a triradiate skin and fascia incision providing adequate exposure for the complex primary hip arthroplasty but must be avoided where there are concerns about skin and soft-tissue vascularity such as in diabetics. The Hardinge and Watson–Jones approaches are not extensile and less appropriate for the scenario described.¹

4. Which of the following forms of lubrication does not occur in resurfacing hip replacements?

Answer: d. Microelastohydrodynamic
 The main type of lubrication present in resurfacing hip replacements is fluid film. Microelastohydrodynamic lubrication does not occur in resurfacing hip replacements since there are no asperities.

5. Which of the following has the most important role as a passive stabiliser of the patellofemoral joint?

Answer: b. Medial patellofemoral ligament
 The medial patellofemoral ligament is a band of retinacular tissue connecting the medial femoral epicondyle to the medial edge of the patella and is the most important passive stabiliser of the patellofemoral joint.⁷

Vivas

Adult Pathology

A 63-year-old plumber presents with a 12-month history of increasing pain in his first metatarsophalangeal joint (MTPJ). These are his radiographs (Figs 1a and 1b).

1. Describe the radiographic appearances (Figs 1a and 1b).



Fig. 1a



Fig. 1b

Answer: The radiographs demonstrate hallux rigidus with osteoarthritis of the first MTPJ with gross joint space narrowing, peripheral osteophytes, subchondral sclerosis and visible subchondral cysts.

2. What ligaments support the first MTPJ?

Answer: The first MTPJ is supported by the plantar and collateral ligaments (medial and lateral) with the plantar plate acting as the primary stabilising structure. In addition ligamentous support is provided

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by the medial and lateral sesamoid-metatarsal ligaments and sesamoid-phalangeal ligaments. An intra-articular ligament within the first MTPJ has been described attached dorsomedially to the first metatarsal head connected to the interior part of the articular surface of the base of the proximal phalanx.⁸

3. How much dorsiflexion is necessary for the MTPJ to function normally?

Answer: The range of dorsiflexion for normal function has been reported as ranging between 60° and 90°. A study by Hetherington et al⁹ obtained measurements in the toe off phase of gait, thereby reflecting the functional range more accurately.

4. How would you classify this condition?

Answer: Hallux rigidus can be classified radiologically with the Hatstrup and Johnston¹⁰ classification or with range of movement, or with examination and radiological features as described by Coughlin and Shurnas¹¹ as a modification of the former. These are included below:

Hatstrup and Johnston¹⁰:

- Grade 1 – Mild changes with a maintained joint space and minimal spurring
- Grade 2 – Moderate changes, joint-space narrowing, bony proliferation on the metatarsal head, and phalanx and subchondral sclerosis or cysts
- Grade 3 – Severe changes with significant joint-space narrowing, extensive bony proliferation, and loose bodies or a dorsal ossicle

Coughlin and Shurnas¹¹:

- Grade 0 – Dorsiflexion of 40° to 60°, normal radiological results, and no pain
- Grade 1 – Dorsiflexion of 30° to 40°, dorsal osteophytes, and minimal to no other joint changes
- Grade 2 – Dorsiflexion of 10° to 30°, mild flattening of the MTPJ mild to moderate joint narrowing or sclerosis, and dorsal, lateral, and/or medial osteophytes
- Grade 3 – Dorsiflexion of less than 10°, often less than 10° plantar flexion, severe radiological changes with hypertrophied cysts or erosions or with irregular sesamoids, constant moderate to severe pain, and pain at the extremes of the range of movement
- Grade 4 – Joint stiff, radiographs show loose bodies or osteochondritis dissecans and pain throughout the entire range of movement

5. What are the options of treatment?

Answer: The surgical options available for management of severe hallux rigidus include excision, interposition, arthroplasty and arthrodesis.

6. What treatment would you offer him? Why?

Answer: I would treat this active patient with severe hallux rigidus with an arthrodesis given the risk of early failure following arthroplasty and concerns relating the hallux shortening and transfer metatarsalgia using a Keller's resection arthroplasty.¹²

7. What are the advantages of an MTPJ arthrodesis over a replacement?

Answer: In a randomised controlled trial,¹³ 63 patients aged between 34 and 77 with MTPJ osteoarthritis were recruited to either arthrodesis or arthroplasty groups and outcome was assessed with a visual analogue scale and functional scores at six, 12 and 24 months. Significantly improved pain scores were reported in the arthrodesis group at follow-up with all achieving fusion at a mean dorsiflexion angle of 26°. In contrast six of the 39 arthroplasties had to be removed due to phalangeal component loosening and the increased range of movement in the other arthroplasty patients was negligible. Overall the outcome was better in the arthrodesis group with a cost benefit of 2:1 compared with arthroplasty.

8. If you decided to proceed with a replacement, what kind of prosthesis will you use and why?

Answer: All data relating to MTPJ replacements are limited by short-term follow-up. One of the best studies with some promising results is the 10-year results of a series of 130 cases of first MTPJ replacement with the Roto-Glide (Implants International Ltd, Cleveland, United Kingdom) uncemented TiCaP coated prosthesis. The authors report no evidence of radiological loosening at ten-year follow-up and adequate function and pain relief, though this is contrary to the majority of published series concerning first MTPJ arthroplasty.^{14,15} A series¹⁶ reporting results for the Moje arthroplasty at a mean three year follow-up demonstrated that 15% of patients had radiological evidence of prosthetic loosening and 44% required a further surgical procedure for ongoing symptoms while a small series of 37 patients receiving a ceramic press-fit arthroplasty reported 92% satisfaction rates despite a 16% radiological loosening rate.

Trauma

A 32-year-old builder fell from a height of 30 feet sustaining this injury (Figs 2a and 2b).



Fig. 2a



Fig. 2b

1. Describe the radiographic appearances.

Answer: The plain radiographs demonstrate an intra-articular fracture of the calcaneum with a primary fracture line extending through the posterior facet which is displaced superolaterally.

2. What other areas are likely to be injured?

Answer: This injury has multiple associations as a consequence of the high energy force being transmitted more proximally and also potentially impacting the contralateral side of the body. These include the following:

- a) Injury to the contralateral foot
- b) Tibial plateau fracture
- c) Pelvis vertical shear fracture
- d) Renal artery avulsion
- e) Vertebral compression fracture

3. Describe the abnormality seen on the CT scans (Figs 2c and 2d).

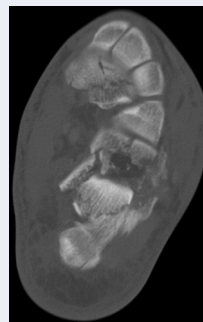


Fig. 2c



Fig. 2d

Answer: The sagittal CT image demonstrates a depression fracture of the calcaneum with marked impaction of the posterior facet and loss of articulation with the talus. The axial CT image shows calcaneal widening caused by displacement of the posterolateral fragment.

4. How would you classify this fracture?

Answer: This fracture can be classified with the Essex-Lopresti classification¹⁷ on plain radiographs and the Sanders classification¹⁸ based on the sagittally reconstructed CT images reformatted parallel and perpendicular to the posterior facet of the subtalar joint. Using the CT images provided, the Sanders classification would make this a type IIIC.

5. How would you like to treat this patient?

Answer: I would manage this patient surgically with open reduction and internal fixation.

6. Could you provide any evidence to support your answer?

Answer: There remains limited level-one evidence concerning the management of calcaneal fractures. A recent systematic review¹⁹ of randomised trials suggested that a large scale high quality randomised controlled trial is needed to compare surgical and conservative management of calcaneal fractures and that existing trials are of poor quality. No difference in residual pain scores was demonstrated in the systematic review but surgical management was favoured when assessed by patients returning to the same work and reduced the need for later subtalar fusion.

7. What are the goals of surgical intervention in this fracture?

Answer: The goals of surgery are to restore articular congruity of the posterior facet and calcaneal height and width while avoiding soft-tissue complications.

8. What is the expected outcome?

Answer: The expected outcome is that this patient will continue to have a significant risk of early onset subtalar osteoarthritis. In a review of 47 patients²⁰ managed with open reduction internal fixation for intra-articular calcaneum fractures using an AO calcaneal plate and lateral approach, an 11% superficial wound infection rate was reported with 75% good to excellent functional results, 6% fair and 19% poor outcomes. Five patients (11%) went on to have a subtalar arthrodesis and restoration of Böhler's angle,²¹ but not the degree of subtalar arthritic change, correlated with improved outcome.

Hands

A 24-year-old woman sustained a spiral fracture of the junction of upper 2/3rd and lower 1/3rd of the humerus. On examination she was unable to extend her wrist, metacarpophalangeal joints or thumb (Figs 3a and 3b).

1. Describe the clinical photographs.

Answer: Figure 3a illustrates a lack of extension at the metacarpophalangeal joints. The terminal 30° of extension is lacking. There is also a lack of extension of the thumb. Figure 3b shows that wrist extension is possible.



Fig. 3a



Fig. 3b

2. What is the diagnosis?

Answer: A low radial nerve palsy.

3. What is the level of the lesion?

Answer: The radial nerve has been injured distal to its branch to brachioradialis.

4. How do you classify nerve injuries?

Answer: Seddon²² classified nerve injuries into neuropraxia, axonotmesis and neuronotmesis. Neuropraxia is a demyelination injury and recovers within days. Axonotmesis is an axonal injury and regeneration may take weeks or months. Neuronotmesis is an injury to the endoneurium and regeneration occurs but is not complete and the results are unsatisfactory.

5. How would you manage her at this stage?

Answer: I would manage this injury conservatively. At this stage the degree of injury is undetermined and the rate of recovery will help guide investigation. If the fracture requires surgical fixation, then this should be performed open with inspection of the nerve to determine macroscopic damage. Nerve conduction studies after two weeks would be indicated if there was no recovery.

6. When would you consider a tendon transfer in this patient?

Answer: If there was no clinical or electrophysiological evidence of recovery.

7. If you did decide to undertake a tendon transfer, which transfer will you carry out?

Answer: For finger extension – flexor carpi ulnaris to extensor digitorum communis 2-4. For thumb extension – palmaris longus to extensor pollicis longus.²³

Children's Orthopaedics

1. What is this condition (Figs 4a and 4b)?

Answer: The diagnosis is congenital fibular deficiency (hemimelia).



Fig. 4a



Fig. 4b

2. What are the features that have to be addressed in its management?

Answer: Dietary rickets due to prolonged breast-feeding without vitamin D supplementation.

3. This is the radiograph of a girl who underwent reconstruction for developmental dysplasia of the hip when aged two years (Fig. 5). Describe the abnormality on the radiograph.



Fig. 5

Answer: The radiograph shows a flattened femoral head. The femoral neck is shortened and has a varus deformity. The lesser trochanter is less visible. There is evidence of a remodelling false acetabulum. The acetabular index is low and there is asymmetry of the iliac wings.

4. She has no disability but there is 1 cm of shortening of the left lower limb. What operation was done and how do you explain the radiological appearances?

Answer: The reconstruction operation for her dislocated left hip was an open reduction and innominate (Salter) osteotomy. Post-operatively she showed damage to the upper femoral epiphysis and growth plate, either due to avascular necrosis or infection. This would likely cause shortening in excess of 1 cm but, in this case, it has been compensated by the usually unwanted lengthening effect of the pelvic osteotomy.

Basic Science

1. Describe a normal gait cycle.

Answer: The gait cycle begins when the foot strikes the ground and ends when the same foot strikes the ground again. This cycle is divided into a stance phase (60% of the cycle) and a swing phase (40% of the cycle). The stance phase begins when the foot strikes the ground and ends when the foot leaves the ground, at which point the swing phase commences.

2. What do you understand by the term cadence?

Answer: The number of steps taken per unit of time.

3. Describe the three rockers of gait.

Answer: The first rocker of gait is during heel strike when there is eccentric contraction of the ankle dorsiflexors so that the foot does not slap down. The second rocker is during mid-stance. There is eccentric contraction of the ankle plantar flexors that allows dorsiflexion of the ankle as the centre of gravity moves forward. The third rocker is during toe-off when the gastrocnemius-soleus complex contracts concentrically to lift the heel.

4. What are the pre-requisites for an efficient gait?

Answer: Gage²⁴ described five prerequisites for normal gait:

- Stance phase stability
- Adequate step length
- Sufficient foot clearance in swing
- Appropriate swing-phase pre-positioning of the foot
- Energy conservation

5. What should the observer be looking for in basic gait examination?

Answer: Observations in the coronal and sagittal planes, considering one leg at a time and dividing it into stance and swing phases. The pelvis, hip, knee and ankle should be observed for normal and abnormal movements.

6. What are the basic components of gait analysis in a gait laboratory?

Answer: Video recording to monitor the sequences of gait. EMG studies are also performed to assess the pattern of muscle contraction to determine contraction out of sequence. The energy consumption and efficiency of walking can also be calculated.²⁵

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