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## MCQs – Adult Pathology – Single Best Answer

1. MRI is sometimes used to investigate hip pain in order to exclude septic arthritis of the hip. Which of the following sets of findings is most likely to indicate that septic arthritis is present?

**Answer: c.** Signal intensity changes, enhanced by contrast, of tissue within the hip capsule  
 Synovial enhancement is likely to indicate increased vascularity and angiogenesis in keeping with septic arthritis and in a previous study was present in 98% of cases with proven septic arthritis. An effusion was present in 70% of septic arthritis cases in this study while bone oedema is associated with septic arthritis but has low sensitivity with this also identified in cases of proximal femoral osteomyelitis.<sup>1</sup>

2. A 15-year-old fast bowler who plays county cricket presents with lower back pain of four to six weeks duration following winter nets. What investigation would you request?

**Answer: b.** Radiograph of the lumbar spine  
 A radiograph of the lumbar spine including anteroposterior, lateral (most sensitive view) and oblique (most specific view) projections is the first line of investigation for a pars defect. On the oblique view the classical collar on the neck of the 'scotty dog' is visualised and the lateral view should be assessed for spondylolytic spondylolisthesis. A CT scan can be used in cases of diagnostic uncertainty or when the plain radiograph does not demonstrate the pars defect such as when it is near the sagittal plane. MRI is useful and has high sensitivity and specificity for pars defect and will demonstrate stress reaction in the pars in addition to fractures.<sup>2-4</sup>

3. Which of the following cells is solely responsible for the deposition and mineralisation of bone matrix?

**Answer: b.** Osteoblasts  
 Osteoblasts are responsible for the deposition and mineralisation of bone matrix. The collagen alpha chains are synthesised in the osteoblasts before being modified by hydroxylation of lysine and proline residues and forming collagen following export into the matrix and cross-linkings. The mineralisation of bone matrix follows secretion of vesicles by osteoblasts containing alkaline phosphatase.<sup>5</sup>

4. The most important determinant of post-operative range of movement following a total knee replacement is:

**Answer: e.** Pre-operative range of movement  
 The pre-operative range of movement is the most important determinant of post-operative movement following a total knee replacement as demonstrated in a multi-centre prospective clinical study using the modified Knee Society scoring system and multivariate analysis to assess relationship of various factors with post-operative knee flexion. Age, gender, weight, previous open surgery and altered femoral contour do not significantly correlate with post-operative knee flexion.<sup>6</sup>

5. The most significant factor reducing porosity in bone cement is:

**Answer: e.** Vacuum mixing only  
 Vacuum mixing of cement (optimal at 0.15 bar or 85% vacuum) reduces its porosity most significantly while centrifugation can result in highly porous bone cement. In addition to vacuum mixing, collection under vacuum in a delivery cartridge without the air entrapment in the cement during transfer to the cement gun contributes to reduced porosity.<sup>7,8</sup>

## Vivas

### Adult Pathology

A 72-year-old woman presents with a history of progressively worsening pain in her knee.

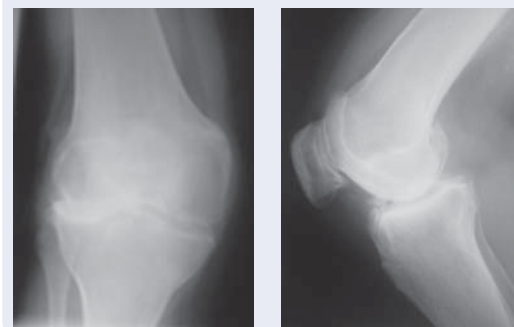


Fig. 1a

Fig. 1b

Examination reveals a valgus deformity of 30°, which is not correctable. These are her radiographs (Fig. 1).

1. Describe the radiograph.

**Answer:** The radiographs demonstrate arthritis with valgus deformity and significant lateral femoral condylar wear and hypoplasia; likely to be because of an inflammatory arthropathy e.g. Rheumatoid arthritis.

2. How would you stage this disease and what classification system would you use?

**Answer:** This is a Stage III pattern with severe progression and cartilage and bone destruction in addition to joint deformity. I would use the 2010 Rheumatoid Arthritis Classification Criteria to achieve the diagnosis.

3. What treatment would you offer her?

**Answer:** I would offer this patient a posterior

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stabilised total knee replacement.

**4. If you decided to proceed with a total knee replacement (TKR), how would you correct the deformity?**

*Answer:* The steps involved in correction of a valgus deformity include appropriate bony cuts followed by release of the tightened lateral soft-tissue structures. Care should be taken while making the bony cuts in the femur because of the wear and hypoplasia of the lateral condyle and the trans-epicondylar axis should be correctly defined prior to preparation of the femur. Medial structures require only minimal release and the lateral side is approached by removal of the osteophytes. Next the iliotibial band needs to be released and this can be achieved by releasing it from the Gerdy's tubercle, or from the joint line or via the 'pie-crusting' approach leading to fractional lengthening. The posterior capsule is released next followed by the posterior cruciate ligament and, only if required, the lateral collateral ligament. If the balancing still cannot be achieved the popliteus can be released sequentially. Finally, lateral retinacular release is usually required for adequate tracking of the patella.

**5. What kind of prosthesis would you use?**

*Answer:* I would opt for a cemented posterior stabilised replacement given that the posterior cruciate ligament is likely to have degenerated and be dysfunctional and having considered the pre-operative deformity and requirement for additional antero-posterior stability.

**6. What are the possible complications specifically related to correcting a valgus deformity?**

*Answer:* Correction of a valgus deformity can be complicated by a peroneal nerve palsy and potential patellofemoral maltracking.

**7. Which patients are more prone to developing a common peroneal nerve palsy following a TKR?**

*Answer:* In a retrospective review of 10,361 patients with 32 post-operative peroneal nerve palsies, a pre-operative valgus deformity (> 12°), epidural anaesthesia for pain control and previous laminectomy were significantly associated with a peroneal palsy compared with a matched control group.<sup>9,10</sup>

**8. If this patient developed a nerve palsy immediately following the TKR, how would you manage her?**

*Answer:* I would initially try and manage her conservatively by flexing her knee and taking down all the compressive bandaging. However, with a persisting but improving palsy, I would use a footdrop splint and range of movement exercises to prevent an equinus deformity. If complete neurological deficit is persistent then referral to a specialist peripheral nerve injuries unit and nerve conduction tests along with operative exploration and decompression is indicated. In a small series of 5 patients Krackow reported improved nerve function in all patients with 4 patients fully recovering following surgery.<sup>11</sup>

## Trauma

A 32-year-old man fell whilst skiing, injuring his knee. These are the



Fig. 2a



Fig. 2b

radiographs taken at the time of injury. (Fig. 2).

**1. Describe the abnormality.**

*Answer:* Lateral tibial plateau split depression fracture.

**2. How would you classify this injury?**

*Answer:* Answer: Schatzker classification<sup>12</sup>:

- 1: Lateral plateau split fracture
- 2: Lateral plateau split with depression fracture
- 3: Pure lateral depression fracture
- 4: Pure medial depression fracture
- 5: Bicondylar plateau fracture
- 6: Bicondylar split with extension to the meta-diaphysis

**3. How would you treat this patient?**

*Answer:* With open reduction and internal fixation using a curved lateral incision and using the plane between the iliotibial band and the biceps femoris muscle and lifting the lateral meniscus to visualise the lateral joint line. The depressed fragment will need to be elevated and consideration should be given to supporting this with a bone graft before applying a lateral buttress plate to stabilise the fracture.

**4. What is the expected outcome?**

*Answer:* In a review of the long term functional results of surgical treatment of tibial plateau fractures with a mean follow-up period of 8.3 years, patients under the age of 40 years old at the time of fracture had no statistically significant difference in SF-36 and WOMAC scores when compared to a healthy age-matched population. Patients older than 40 years at the time of fracture did have statistically worse outcomes compared with matched controls.<sup>13</sup>

**5. When will you start mobilising him fully-weight-bearing?**

*Answer:* I would start mobilising him fully weight-bearing when there is evidence of radiological and clinical union.

**6. What other structures may have been injured?**

*Answer:* Meniscal, ligamentous and osseous injuries may also occur in association with lateral plateau depression fractures. In a recent paper evaluating 39 patients with a tibial plateau fracture, MRI demonstrated unstable meniscal tears in 36% but no correlation was found between different fracture patterns and the meniscal findings.<sup>14</sup> Another paper evaluating non-surgically managed minimally displaced or undisplaced tibial plateau fractures found an 80% incidence of meniscal tears on MRI and 40% incidence of complete intra-articular ligamentous disruption suggesting the need for a high index of suspicion for associated injuries.<sup>15</sup>

**7. What are the principles of management of fractures involving the articular surface?**

*Answer:* The main principles include anatomical reduction and early mobilisation.

## Hands

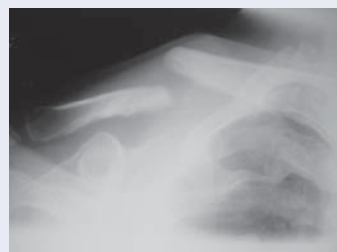


Fig. 3

A 32-year-old man presents with this injury (Fig. 3) following a road traffic accident.

**1. What is the diagnosis?**

*Answer:* 2-part fracture of the clavicle with 100% displacement and apparent skin tenting (although this would have to be confirmed clinically).

**2. How would you manage him?**

*Answer:* High energy injury (road traffic accident) and significant displacement. This has a risk of approximately 50% nonunion at 12 weeks<sup>16</sup> with conservative treatment. I would counsel the patient regarding the risks and complications of surgery and also assess the patient's aspirations regarding return to function. If the patient wishes to have a reduced risk of nonunion and improved function I would offer the patient operative treatment.

**3. What is the evidence to support your management plan?**

*Answer:* Evidence to support this plan can be found in Coupe et al.<sup>17</sup>

**4. If you were to opt for surgical management, describe your surgical approach and procedure.**

*Answer:* A skin incision made 1 to 2 cm below the inferior border of the clavicle and sharp dissection down to the pectoralis fascia. In the line of the incision, the pectoralis fascia is divided and carefully elevated off the underlying musculature by sharp dissection in a proximal direction to the superior border of the clavicle.<sup>17</sup> The fracture is exposed and fixed with an injury-specific plate with at least six cortex fixation proximal and distal to the fracture site.

**5. What is the expected outcome?**

*Answer:* 3 to 5% risk of nonunion and 18% re-operation rate (mainly for removal of metalwork).<sup>18</sup>

**6. The procedure was complicated by infection. What do you think has been performed (Fig. 4)?**

*Answer:* Serratus anterior or latissimus dorsi myocutaneous free-flap.



Fig. 4

**Children's Orthopaedics**

A girl aged nine presents with limited rotation of the forearm (Fig. 5).



Fig. 5a



Fig. 5b

**1. What is the likely diagnosis?**

*Answer:* The patient has congenital radio-ulnar synostosis. She cannot supinate, the forearm is short and in pronation.

**2. How would you treat the condition?**

*Answer:* Careful assessment of the disability. This child has not reported a disability, causing the late diagnosis. Therefore, surgery is not likely to be helpful.

As a general principle, any operative treatment would be in a younger child whose forearm is pronated. The operation would be rotational osteotomies, bringing the forearm to a position of slight supination.

This is an anteroposterior radiograph of both clavicles of a girl aged four (Fig. 6) who is asymptomatic.

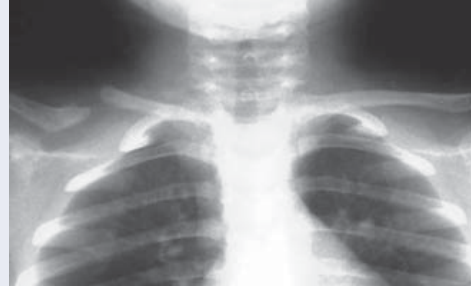


Fig. 6

**3. What is the diagnosis?**

*Answer:* Congenital pseudoarthrosis of the clavicle.

**4. How would you treat the condition?**

*Answer:* There is usually no functional disability and it is the appearance which is the problem. The surgery involved to reconstruct the defect is unlikely to improve the overall cosmetic appearance and any decision to proceed with, for example, excision of the pseudoarthrosis, grafting and periosteal suture should only be made with that understanding. The indications for surgery are unacceptable cosmetic deformities or significant functional impairment such as mobility of the fracture fragments and winging of the scapula. Surgery is best performed between the ages of 3 and 6 years of age and union is predictable.<sup>19</sup>

A mother and her teenage sons present with this deformity (Fig. 7).



Fig. 7

**5. What is the diagnosis?**

*Answer:* They have dyschondrosteosis (Leri-Weill Syndrome). They are of short stature and they all have Madelung's deformity. In the lower limbs, genu varum can also be a problem with Madelung's deformity.

**Basic Science**

**1. What is the composition of articular cartilage?**

*Answer:* The wet weight proportions of articular cartilage are water (65 to 80%), collagen (10% to 20%), proteoglycans (10% to 15%), chondrocytes (5%) and other matrix components such as adhesives and lipids.<sup>19</sup>

**2. Illustrate the histological appearance of articular cartilage.**

*Answer:* The histological appearance of articular cartilage would be:

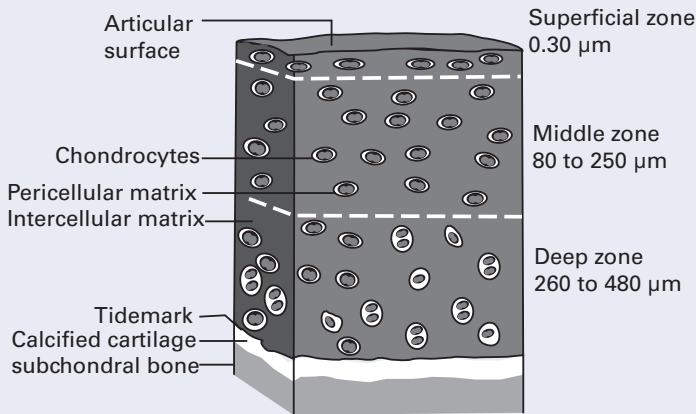


Fig. 8

**3. Describe the function of each layer.**

*Answer:* Superficial (gliding) zone – resistance to shear.  
 Middle (transitional) zone – resistance to compression.  
 Deep (radial) zone – resistance to compression.  
 Tidemark – resistance to shear.  
 Calcified zone – anchor for the various layers.

**4. What are the functions of articular cartilage?**

*Answer:* The functions are to distribute joint loads and reduce the stresses experienced. It also allows movement between opposing surfaces with the minimum amount of friction and wear.

**5. Describe the changes in articular cartilage with ageing.**

*Answer:* With ageing, there is disruption of the collagen-proteoglycan matrix. This reduces its compressive stiffness. Leeching out of the proteoglycan leads to increased permeability and reduced stiffness. Increased permeability leads to loss of lubricant. These processes lead to wear.

**6. What are the options for treating a 2 x 2 cm articular cartilage defect in the medial femoral condyle of a 22-year-old?**

*Answer:* The two options include osteochondral autograft transfer and microfracture. Osteochondral autograft transfer is recommended for smaller lesions, lesions in high-demand athletes, and lesions with associated bone loss. Donor-site morbidity is controversial but for a lesion of 2cm<sup>2</sup> only one or two grafts will be necessary. Microfracture is suited for medium-size defects with little or no bone loss in lower demand patients.<sup>20</sup>

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