Exam Corner

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MCQs – Adult Pathology – Single Best Answer

1. Which of the following organisms is currently least likely to be responsible for septic arthritis of the hip in a child?

Answer: b. *Haemophilus influenzae*
Haemophilus influenzae the least likely organism in a child of any age with septic arthritis of the hip. Common pathogens include streptococcus species, pseudomonas aeruginosa, pneumococci, neisseria meningitides, Escherichia coli, klebsiella species and enterobacter. The prevalence of H.influenzae in patients with septic arthritis has reduced since the introduction of a vaccine against this organism.

2. Which of the following quadrants of the acetabulum are most at risk for injury by screws during fixation of an uncemented total hip replacement?

Answer: e. Anterior-superior and anterior-inferior
The posterior superior zone is the preferred location for screw fixation of the uncemented acetabular component. This is defined by a line taken from the anterior superior iliac spine to the centre of the acetabulum and a second line perpendicular to this dividing the acetabulum into four quadrants. The anterior superior and anterior inferior zones are at highest risk with potential perforation and injury to the external iliac vessels and obturator neurovascular bundle respectively.[1]

3. Most post-operative deep infections in total hip replacement result from?

Answer: a. Airborne bacteria in the operating room
Strategies to reduce the bacterial count per cubic metre include laminar air flow and minimising the number of personnel in the operating environment.

4. A 72-year-old woman is noted to have sciatic nerve palsy, on the post-operative ward round, following a cemented total hip replacement. The immediate management of this patient would involve:

Answer: e. Urgent MRI scan
Possible causes of a post-operative sciatic nerve palsy complicating total hip replacement include direct intra-operative injury (surgical injury, traction from retraction, thermal injury from acrylic cement), traction injury from leg lengthening and a pressure effect from local haematoma. Butt et al[2] reported a series of six sciatic nerve palsies following 335 consecutive total hip replacements, all of which were a consequence of post-operative haematoma. An urgent MRI should be performed to determine whether a haematoma is present before proceeding to urgent surgical exploration and drainage.

5. Eliciting the impingement test in the hip involves which of the following manoeuvres?

Answer: b. Flexion, adduction and internal rotation
Flexion, adduction and internal rotation places the anterior femoral impingement lesion in contact with the anterosuperior acetabular margin where the patient is likely to have a symptomatic labral tear provoking pain.

Vivas

Adult Pathology

A 37-year-old woman presents with progressively worsening pain, severe restriction of movement and deteriorating function in both her hips along with an awkward limp with apparent leg-length discrepancy. This is her radiograph (Fig. 1).

Fig. 1

1. What is your diagnosis?

Answer: Bilateral osteoarthritis of the hip secondary to developmental dysplasia of the hip. This is worse on the right side where there is significant subluxation of the femoral head from the acetabulum.

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

Answer: Classification based on the system proposed by Crowe.[3]
Crowe 1: Less than 50% subluxation
Crowe 2: 50% to 75% subluxation
Crowe 3: 75% to 100% dislocation
Crowe 4: >100% subluxation
An alternative to this is the classification described by Hartofilakidis et al[4] describing three groups, dysplasia, low dislocation and high dislocation.

3. What treatment would you offer her at this stage?

Answer: The ideal management would be a total hip replacement after failure of conservative treatment aiming to restore the normal hip centre and offset. A pelvic and upper femoral osteotomy is unlikely to be successful.

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4. What kind of prosthesis will you use if any and why?
Answer: Cemented total hip replacement (Exeter) supported by national joint registry data.

5. What bearing surface will you use and why?
Answer: Ideally I would use a ceramic-on-ceramic bearing surface in a female patient in this age group. Ceramic is very smooth, hard, strong, stiff, biocompatible, bioinert, does not corrode and has very low friction and wear with linear wear rates minimal compared with metal-on-polyethylene.[5]

6. What are the potential problems that you could encounter while performing a total hip replacement for this condition?
Answer: The main issue is restoration of the normal hip centre potentially causing significant risk of a traction injury to the sciatic nerve. In order to avoid this I would consider performing a subtrochanteric osteotomy and femoral resection to prevent significant lengthening and consider using intra-operative nerve monitoring.

7. What are the possible complications?
Answer: The possible complications include the general risks of a total hip replacement and risks specific to this case, which include a nerve injury (sciatic and femoral), vascular injury (a consequence of the approach to the dysplastic acetabulum) and non-union of the femoral osteotomy.

Trauma

A 38-year-old woman slipped on ice landing on her outstretched hand and sustained this injury. This is the radiograph taken in A & E. (Fig. 2).

Fig. 2

1. What is the diagnosis?
Answer: Fracture of the distal radius.

2. Describe the abnormality in the radiograph.
Answer: The radiograph demonstrates a shortened, comminuted fracture of the distal radius with an intra-articular extension.

3. How would you classify this fracture?
Answer: Various classification systems are available to classify this fracture including the AO,[6] Frykman,[7] Melone[8] and Fernandez[9] classifications. I would use the classification described by Fernandez, which defines the fracture according to the mechanism of injury and is useful for planning surgical strategy.

4. How would you like to treat this fracture?
Answer: I would manage this patient with open reduction internal fixation with a volar distal Henry's approach through the bed of flexor carpii radialis using a fixed angle locking plate to achieve anatomical articular reduction and stable fixation of the fragments.

5. What is the evidence to support your answer?
Answer: There is no Level-I clinical evidence suggesting a superior mode for treatment of distal radial fractures. I would choose open reduction and internal fixation since this will allow accurate fracture reduction and restoration of radial length and inclination. Previous studies suggest that inaccurate reduction and articular incongruency of >2 mm, failure to restore length to within 6 mm and articular comminution correlate with a worse outcome.[10-12]

6. What is the expected outcome?
Answer: A large number of factors determine the outcome of patients following distal radius fracture including patient factors (age, occupation, psychosocial factors, handedness, pain scores pre- and post-surgery, injury compensation) and surgical factors (anatomical reduction, intra-operative complications, time to mobilisation). In a study by Knirk and Jupiter[13] of 43 distal radial fractures in young adults they found that anatomical reduction was the most important determinant of successful outcome at a mean follow-up of 6.7 years.

7. What is the diagnosis? (Fig. 3)
Answer: This patient has diffuse osteopenia, which is likely to represent complex regional pain syndrome
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Fig. 3

8. How would you manage this condition?
Answer: I would manage this with urgent physical and psychotherapy and also an urgent referral to the pain team. Other treatments that may be considered include sympathetic nerve block and medical treatment (local anaesthesia, anti-epileptics and anti-depressants).

Hands

A 32-year-old woman presents with insidious onset of pain in her wrist. These are her radiographs (Figs 4a and 4b).

Fig. 4a

Fig. 4b

1. What is the diagnosis?
Answer: Kienbock's disease[14]

2. What other investigations would you request?
Answer: A CT scan.

3. How would you stage this condition?
Answer: Stage iiib – Carpal collapse
Lichtmann staging of Kienbock's disease[15]
I – Plain radiographs normal
II – Increased lunate density on plain radiographs
IIIIa – Collapse of lunate without fixed scaphoid rotation
IIIb – Collapse of lunate with fixed scaphoid rotation
IV – Stage 3 with carpal degeneration

4. How would you manage this condition at this stage?
Answer: Depending on the symptoms and functional needs – conservative, inter-carpal fusion maintaining carpal height, scaphocapital fusion or proximal row carpectomy.

5. What is the diagnosis? (Fig. 5)
Answer: Stage IV Kienbock's disease with arthritic changes in the radioscaphoid joint.

Fig. 5

6. What is your plan of management?
Answer: Options of treatment at this stage include wrist denervation, proximal row capectomy or total wrist fusion.

Basic Science

1. Illustrate a free-body diagram of the knee joint.
Answer: A free body diagram of the knee is illustrated below (Fig. 6):

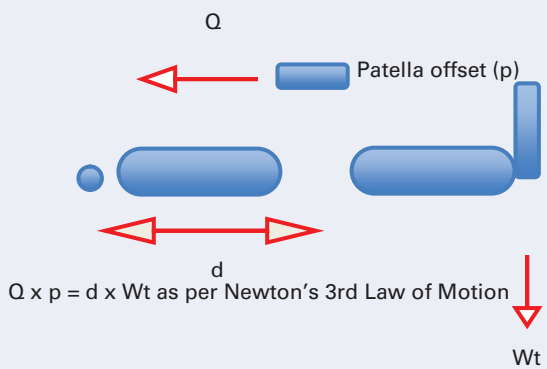

Fig. 6

2. Describe the kinematic behaviour of a normal knee.
Answer: The movements of the normal knee in early to mid flexion (10 to 120 degrees) are a consequence of lateral femoral rollback, internal rotation of the tibia and unequal radii of the centre of rotation of the medial and lateral femoral condyles.[16] During knee flexion the tibio-femoral contact point moves posteriorly to a significantly greater extent in the lateral compartment as the tibia internally rotates to the extent that during deep flexion there is no bony contact between the lateral femoral condyle and lateral tibial plateau as the femoral condyle and mobile posterior horn of the lateral meniscus drop over the posterior tibia. The rigid four bar linkage model, comprising the two cruciate ligaments and the areas of bone in-between has previously been suggested as the mechanism for femoral rollback but this is disputed since the cruciate ligaments are not rigid and do not have a single isometric point at all positions of flexion to act as pivots within a closed loop.[5]

3. What are the mechanical and clinical differences between a posterior stabilised and cruciate retaining total knee replacement?
Answer: The mechanical differences between the cruciate retaining (CR) and posterior stabilised (PS) total knee replacements are due to the resection of the posterior cruciate ligament in the latter and replacement with the cam-and-post mechanism reproducing femoral rollback.
Clinically studies have shown that there is no significant difference in clinical outcome or patient satisfaction following surgery with either CR or PS design knee replacements emphasising the overwhelming importance of accurate bony and soft tissue balancing of flexion and extension gaps.[17,18] There is some evidence from a small randomised controlled single surgeon study comparing CR and PS knee arthroplasty that a PS design can result in improved post-operative knee flexion but this may reflect how successfully the posterior cruciate ligament was protected in the CR knees.[19] While retention of the posterior cruciate ligament has been suggested by some as leading to improved proprioception this does not appear to translate into a superior clinical outcome.[20]

4. How does each one affect the kinematics of a total knee replacement?
Answer: In the posterior stabilised knee replacement the post cam mechanism engages the femoral component resulting in a constant and more physiological contact position in weight bearing conditions and posterior femoral rollback in passive flexion.[21,22] In the cruciate retaining knee replacement the tibiofemoral contact point tends to move anteriorly in mid-flexion and there is less consistent rollback.

5. What kind of a knee replacement is this? (Fig. 7) What is the principle of this system?
Answer: This is a medial pivot knee replacement. The principle of this design is to simulate normal knee kinematics and allow external rotation about at fixed medial axis.

6. How does this affect the kinematics of the knee?
Answer: This design aims to mimic normal knee kinematics by constraining the femoral component medially allowing it to externally rotate about an axis within the medial compartment as the lateral contact tibio-femoral contact point moves posteriorly during flexion.

Fig. 7

7. What is the principle behind the use of a mobile bearing total knee replacement?

Answer: Mobile bearing knee replacements aim to reduce the constraint within the knee replacement thereby allowing some restoration of normal knee biomechanics whereby the tibial polyethylene bearing insert is free to internally rotate as the knee flexes, potentially reducing polyethylene delamination, wear and ultimately failure. It works on the principle of dual surface articulation which reduces the stresses by maximising conformity of the tibial and femoral components.

Children's Orthopaedics

1. What is the diagnosis (Fig. 8)?

Answer: Early chronic slipped upper femoral epiphysis (SUFE).

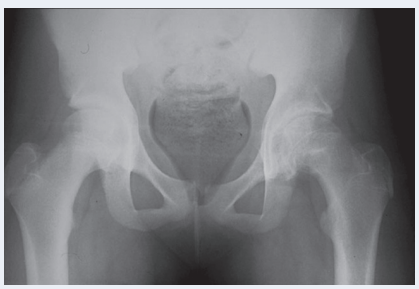

Fig. 8

2. Describe the radiographic signs to support your opinion.

Answer: Blurred metaphyseal margin, metaphysis displaced laterally, increased width of the growth plate, reduced epiphyseal height, prolonged superior neck line, prominent lesser trochanter, osteoporosis and Klein's line not bisecting capital femoral epiphysis (Trethowan's sign).

3. What is this condition (Fig. 9)?

Answer: Acute on chronic SUFE (unstable).

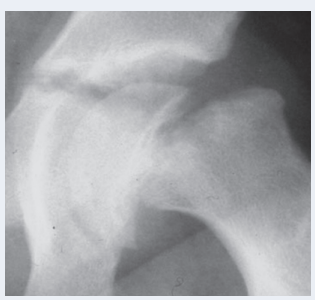

Fig. 9

4. What type is it? How would you treat it?

Answer: Unstable slip – recommended treatment is closed reduction and pinning within 24 hours. Aspiration may be useful; after 24 hours pin *in situ*. If this is not possible then traction for 2 to 3 weeks followed by realignment (Dunn or Fish).

Fig. 10

5. What is this condition (Fig. 10)?

Answer: Late chronic SUFE with an open growth plate. May be stable or unstable.

6. Name three predisposing pathological conditions.

Answer: Hypothyroidism, renal disease and radiotherapy.

7. What is the diagnosis (Fig. 11)?

Answer: Osteogenesis imperfecta in a patient on bisphosphonates.

Fig. 11

8. Explain how you arrived to this conclusion.

Answer: The rods indicate the need to stabilise the weakened bone and the sclerotic lines indicate the effects of cyclical Pamidronate therapy, which inhibits osteoclasis.

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