

December 2014 • Answers

Authors: Mr Emmet Griffiths and Mr Vikas Khanduja
SpR, East of England

MCQs and EMQs

- With regards to the applied anatomy while performing adductor tenotomy, select the most appropriate response for the course of the anterior branch of obturator nerve while leaving the pelvis.
Answer: a. Descends in front of the adductor brevis and behind adductor longus.
- Which of the following statement is true in comparing open versus arthroscopic removal of loose body from the shoulder joint?
Answer: a. The difficulty with accessing the bicipital groove arthroscopically is described, a mini open approach is advocated.²
- The anterior approach to correct kyphosis should be considered in which of the following circumstances?
Answer: b. Anterior approach for kyphosis is generally described to short segment kyphosis such as post-traumatic or infection to clear the canal. The Smith-Peterson osteotomy is an extension osteotomy of the posterior elements.³
- Select the artery of choice for treatment of nonunion of scaphoid with vascularised graft by different techniques from the list below.
Answer:
a) 1,2 ICRSA (Intercompartmental supraretinacular artery)
b) 2,3 ICRSA
c) 4th EC branch of 5th ECA (extensor compartment artery)
- What is the absolute limit on effective radiation dose (dose to the whole body) introduced by the IRR99 for employees over five years? (mSv = millisieverts)
Answer: c. Ionising Radiations Regulations 1999 states a regulation of maximum exposure to radiation for employees.⁴
- Warfarinisation of patients leads to an increased international normalised ratio (INR), however in the first 36 hours of treatment there may be a prothrombotic state due to which one of the following?
Answer: d. Protein C and S levels fall with the commencement of Warfarin, increasing thrombotic risk.⁵

Vivas

Adult Pathology

A 45-year-old right hand dominant female fell off from a bike sustaining a closed, isolated injury to her right elbow. She is neurologically intact and has moderate swelling of the elbow.



Fig. 1a



Fig. 1b



Fig. 1c

- What is the diagnosis?
Answer: Plain radiographs demonstrate a posterior elbow dislocation with associated radial head fracture and avulsion of the tip of the coronoid. The images are in keeping with a 'terrible triad' of radial head, coronoid and lateral collateral ligament injury.
Mason classified radial head fractures in 1954:⁶
1) minimally displaced (< 2 mm)
2) displaced > 2 mm or angulated
3) comminuted and displaced
4) radial head fracture with elbow dislocations (a later addition by Hotchkiss)
- How would you reduce this injury?
Answer: These dislocations often reduce with traction and supination/pronation. Supination helps unlock the coronoid from the olecranon fossa. A prone position to the patient is described so that gravity can be used to aid reduction.
- What is the likely mechanism of injury?
Answer: The most common mechanism is falling onto an outstretched hand with the elbow in extension.
- She elects to undergo surgical management. What is your surgical plan? What approach will you use?
Answer: The so-called terrible triad elbow injury has a high association with elbow instability. Surgical intervention involves re-establishing the lateral restraint with radial head fixation or replacement. Medial collateral ligament repair/reconstruction is often undertaken, although there is some evidence from case series suggesting that this may not be routinely required (Forthman et al).⁷
Direct posterior approach allows access to medial and lateral sides. The coronoid can be repaired through the lateral side prior to radial head fixation/replacement.
Post-operative complications include; recurrent instability, delayed ulnar nerve palsy, stiffness and heterotrophic ossification.⁸
- What equipment will you have available?
Answer: In this example the radial head is highly comminuted, reconstruction with internal fixation may not be possible in which case a radial head replacement must be considered. The patient is young and replacement should only be performed if reconstruction has failed.
External fixation can be used as an adjunct to unstable elbows in the immediate post-operative period.
Suture anchor systems are helpful for repair of the lateral and/or medial collateral ligament complexes.⁹

Trauma

A 5-year-old child fell off the bed sustaining an injury to his right elbow. These are the radiographs obtained in A and E (Fig. 2).



Fig. 2a



Fig. 2b

1. Describe the radiographs.

Answer: Antero-posterior and lateral radiographs of an immature skeleton demonstrating a radial neck fracture with dislocation of the physis.

2. At what age does the radial head physis appear?

Answer: Appears at five years and fuses between 16 to 18 years.

3. What is the mechanism of these injuries?

Answer: Fall on extended and supinated arm. Direction of radial head displacement depends on degree of supination – forearm fully supinated – lateral displacement; midprone – posterior.

4. What are the reduction techniques that one can use for the treatment of these fractures?

Answer: Several techniques have been described: Israeli technique – pronate the supinated forearm with elbow flexed at 90 degree and direct pressure on radial head. Patterson techniques – Traction with the forearm supinated and varus stress and direct pressure on radial head. Kirschner-wire can be used as a joy stick. Retrograde flexible nail can be used to help reduction.

5. How would you manage this patient?

Answer: Fracture needs to be reduced by closed or open means.

Angulation < 30° can be accepted.

If > 30° – attempt closed reduction.

If > 45° after manipulation then open reduction will be required.

Residual intact periosteum and capsule provides inherent stability and stabilisation with K-wires may not be routinely required after open reduction.

Hands

A 32-year-old farmer presented to a specialist hand clinic with left wrist pain for the past seven to eight months. He could not recollect any obvious injury leading to this pain. He felt that his wrist would be sore after a day's work mainly on the dorsum. He also noticed that his wrist was slightly stiff mainly on extension and felt weak when undertaking heavy work. He was otherwise fit and well.

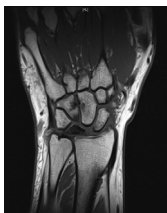


Fig. 3

1. Please describe the MRI (Fig. 3) and what is your provisional diagnosis?

Answer: Coronal T2 weighted MRI centred on the carpus of the right wrist. There is abnormal signal within the lunate in keeping with avascular necrosis. The most likely provision diagnosis is Kienbock's disease.

2. How do you stage this condition?

Answer: Lichtman classification for Kienbock's:¹⁰

I - Normal radiograph

II - Increased radiodensity of lunate

IIIa - Lunate collapse, no scaphoid rotation

IIIb - Lunate collapse, fixed scaphoid rotation

IV – Pan lunate degeneration

3. What are the possible factors involved in the pathophysiology of this condition?

Answer: The exact cause for avascular necrosis of the lunate is not fully understood. There is an association between the blood supply to the lunate and the vulnerability AVN. In the 80's Gelberman¹¹ described the three types of vascularity X, Y and I forms within the lunate. The single vessel form having more risk of disruption.

4. Please describe the pattern of blood supply to the lunate?

Answer: Ulna negative variance is also implicated, possibly related to higher risk of radial impaction on the lunate. A thickened triangular fibrocartilage complex is also found in these patients.

Repetitive trauma to the wrist is a risk factor for Kienbock's.

5. What is the natural history of this condition?

Answer: The long term prognosis of Kienbock's was detailed by Kristensen in 1986¹² on 49 conservatively treated patients (23 casted, 26 no treatment). Mean 20 year follow-up, 67% had arthritic change, none had normal lunates however 80% were asymptomatic. Takahara et al¹³ present 21 year mean follow-up on 19 patients who received surgical treatment in the form of radial shortening osteotomy. Reasonably good results for Lichtman II and III disease with high patient satisfaction reported. Lichtman IIIB patients had a higher chance of dissatisfaction and progression of disease.

Children's Orthopaedics

A 2-year-old girl presents to clinic as her mother has noticed that she has a waddling gait. On examination, you find that she is moderately short for her age, and has symmetrical varus deformities of the lower limbs. She does not have abnormal facies. There is no other significant birth/past medical or family history. Radiographs are taken and shown below (Fig. 4).



Fig. 4a

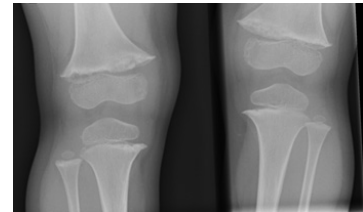


Fig. 4b

1. What abnormalities are seen on the radiographs?

Answer: The radiographs show coxa vara deformities bilaterally. There is widening and irregularity of the proximal and distal femoral metaphyses, with medial beaking. The physes are widened.

2. What is the differential diagnoses?

Answer: The radiographs and clinical features given suggest

this is most likely to be a metaphyseal chondrodysplasia. The radiographs show that the epiphyses are unaffected. Rickets is the main differential diagnosis that needs to be excluded.¹⁴

3. What further investigations would you request?
Answer: A skeletal survey and biochemical tests of bone profile and vitamin D (to exclude metabolic bone disease) are required.¹⁵
4. What radiographic measurements would you use to evaluate magnitude of the coxa vara deformities?
Answer: The neck shaft angle and Hilgenreiner-piphyseal angle (the angle between the Hilgenreiner line and the line of the proximal femoral physis; normal is less than 25°).
5. When would you consider surgery for coxa vara?
Answer: This depends on the magnitude and progression of the deformities. A neck-shaft angle of less than 110° is likely to progress, and so surgical correction should be considered. Similarly, it has been suggested that surgical correction should be considered if the Hilgenreiner-epiphyseal angle is greater than 60°.¹⁶
6. What procedure would you perform?
Answer: A valgus proximal femoral osteotomy to overcorrect the neck-shaft angle, and restore the physis to a more horizontal position (less than 38° according to Carroll et al).¹⁷

Basic Science

A 60-year-old female is admitted with a history of left hip pain and this is the radiograph obtained whilst she was on the ward (Fig. 5).



Fig. 5

1. Describe the radiograph, what are the possible diagnoses?
Answer: A mixed sclerotic lytic lesion in the left proximal femur. It occupies part of the greater and lesser trochanters. There is thinning of the medial cortex. Metastasis most likely with mixed sclerotic lytic lesion, breast carcinoma most likely as renal, lung and thyroid usually lytic. Lymphoma of bone usually produces sclerotic lesions but a mixed lesion is possible. Multiple myeloma unlikely as usually purely lytic. Not typical of any primary malignant tumours of bone but must always be considered if solitary.
2. Which tumours tend to metastasise to bone?
Answer: Breast, prostate, renal, thyroid, lung. Bowel increasingly been seen due to improved survival from primary tumour. Myeloma is not a metastasis per definition, it arises within the marrow.
3. How can you estimate fracture risk?
Answer: Mirels¹⁸ looked at 78 pathological lesions in bone that had been irritated but not stabilised. He created a scoring system that is widely used to predict risk of pathological fracture. Four variables are scored (max three for each area): Location: upper limb 1, lower limb 2, intertrochanteric 3
Lesion appearance: blastic 1, mixed 2, lytic 3

Size (% cortical thickness): < 1/3rd = 1, 1/3rd to 2/3rd = 2, > 2/3rd = 3

Pain: mild 1, moderate 2, functional 3.

A score of 8 indicates a 15% risk of fracture in six months, above 8 has a risk of 33% and 7 or below 4% risk. Operative intervention is recommended with a mirels score above 8.

4. How would you treat this patient?
Answer: Need to know primary diagnosis and whether patient has visceral and bone metastases or just bone metastases. This allows an estimate of prognosis which, in turn, determines treatment. Treatment if solitary – referral to bone tumour centre needed to exclude primary malignant bone tumour and consideration given to resection and proximal femoral replacement. Multiple mets – depending on fitness and disease volume endoprosthesis replacement may still be required as standard total hip arthroplasty will fail as tumour at level of lesser trochanter. Very high failure rate of nailing with this type of lesion as extensive, into neck and breast carcinoma with bone metastases usually has reasonable survival so will fail as < 20% of metastatic lesions heal with radiotherapy.
5. What is the expected prognosis?
Answer: Prognosis is dependent on primary cancer. A figure of 6 to 48 months is documented as the average prognosis of patients with bony metastases. Lung carcinoma, particularly small cell carcinoma have a poor prognosis compared to prostate, renal and breast cancer. There has been a more recent move to curative surgical intervention in patients with renal carcinoma and a solitary metastases.¹⁹

References

1. **Staheli LT.** Practice of paediatric orthopaedics. In: Canale ST, Beatty JH, eds. *Campbell's operative Orthopaedics*. 11th ed. Missouri: Mosby, 2008:1348.
2. **Lunn JV, Castellanos-Rosas J, Walch G.** Arthroscopic synovectomy, removal of loose bodies and selective biceps tenodesis for synovial chondromatosis of the shoulder. *J Bone Joint Surg [Br]* 2007;89-B:1329-1335.
3. **Kostuik JP, Matsusaki H.** Anterior stabilization, instrumentation, and decompression for post-traumatic kyphosis. *Spine* 1989;14:379-386.
4. www.gov.uk
5. **Esmon CT, Viganò-D'Angelo S, D'Angelo A, et al.** Anticoagulation proteins C and S. *Adv Exp Med Biol* 1987;214:47-54.
6. **Mason ML.** Some observations on fractures of the head of the radius with a review of one hundred cases. *Br J Surg* 1954;42:123-132.
7. **Forthman C, Henket M, Ring DC.** Elbow dislocation with intra-articular fracture: the results of operative treatment without repair of the medial collateral ligament. *J Hand Surg [Am]* 2007;32-A:1200-1209.
8. **Eyendaal D, Verdegaal SH, Obermann WR, et al.** Posterolateral dislocation of the elbow joint: Relationship to medial instability. *J Bone Joint Surg [Am]* 2000;82-A:555-560.
9. **Pugh DM, Wild LM, Schemitsch EH, et al.** Standard surgical protocol to treat elbow dislocations with radial head and coronoid fractures. *J Bone Joint Surg [Am]* 2004;86-A:1122-1130.
10. **Lichtman DM, Lesley NE, Simmons SP.** The classification and treatment of Kienbock's disease: the state of the art and a look at the future. *J Hand Surg Eur Vol* 2010;35:549-554.
11. **Gelberman RH, Bauman TD, Menon J, et al.** The vascularity of the lunare bone and Kienbock's disease. *J Hand Surg [Am]* 1980;5-A:272-278.
12. **Kristensen SS, Thomassen E, Christensen F.** Kienbock's disease--late results by non-surgical treatment. A follow-up study. *J Hand Surg [Br]* 1986;11-A:422-425.
13. **Takahara M, Watanabe T, Tsuchida H, et al.** Long-term follow-up of radial shortening osteotomy for Kienbock disease. Surgical technique. *J Bone Joint Surg [Am]* 2009;91 (Suppl 2):184-190.
14. **Benson M, Fixsen J, Macnicol M, Parsch K.** *Children's Orthopaedics and Fractures*. Third ed Springer:Berlin, 2010.
15. **Herring JA.** *Tachdjian's Pediatric Orthopaedics: From the Texas Scottish Rite Hospital for Children* Fifth Ed Elsevier: Amsterdam, 2013.
16. **Trigui M, Pannier S, Finidori G, et al.** Coxa vara in chondrodysplasia: prognosis study of 35 hips in 19 children. *J Paediatr Orthop* 2008;28: 599-606.
17. **Carroll K, Coleman S, Stevens PM.** Coxa Vara: surgical outcomes of valgus osteotomies. *J Paediatr Orthop* 1997;17:220-224.
18. **Mirels H.** Metastatic disease in long bones. A proposed scoring system for diagnosing impending pathologic fractures. *Clin Orthop Relat Res* 1989;256-264.
19. **Dabestani S, Marconi L, Hofmann F, et al.** Local treatments of metastases of renal cell carcinoma: a systematic review. *Lancet Oncol* 2014;15:e549-e561.

