

November 2014 • Answers

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MCQs and EMQs

1. When using distraction lengthening of bone of the upper limb what would be the most common complication with a too rapid rate of distraction?

Answer: b. Distraction osteogenesis bone lengthening works by mimicking the tension stress environment seen in intramembranous ossification. As the two bone edges are drawn apart, gradually stretching the soft tissues, the fibrous tissue forming between the bones develops a bony scaffold. Too rapid distraction of the osteotomy site inhibits this bony integration and a fibrous nonunion develops. Too slow distraction can result in premature consolidation preventing further lengthening.¹

2. Steindler's release may be considered for which one of the following?

Answer: b. Steindler described a plantar fascia release in 1921 for the treatment of pes cavus. The technique includes releasing insertions of the short toe flexors and abductors followed by serial casting. This soft tissue release is used contemporarily, most frequently in conjunction with osteotomies for a dorsiflexed first ray.²

3. A 25-year-old fit and healthy male with past history of conservatively treated right calcaneal fracture presents with a burning sensation on the plantar aspect of his right foot with occasional paraesthesia. There is a decrease in two-point discrimination in the affected area. Prolonged standing, walking and running exacerbate the symptoms. "Mulder's click" is conclusively negative. The most likely diagnosis is?

Answer: c. The tarsal tunnel is found underneath the tarsal bones, bounded by the flexor retinaculum, calcaneum, talus and tibia. Flexor hallucis longus, flexor digitorum longus and tibialis posterior tendons along with posterior tibial artery and nerve run within it. Branches of the posterior tibial nerve include the calcaneal branch innervating the medial and posterior aspect of

the foot. Tarsal tunnel syndrome is a compressive neuropathy of the tibial nerve or its branches. It is more common following trauma, such as the calcaneal fracture described.³

4. In relation to a sternocleidomastoid release for Congenital Muscular Torticollis select the most appropriate response from the list below:

Answer:
A - Trapezius
B - Platysma
C - Manubrium⁴

5. A 13-year-old girl presents with an osteosarcoma of the distal femur that extends into the soft tissue. Work-up is negative for metastasis, but biopsy reveals a high-grade lesion. What is the stage of this tumour as per the Musculoskeletal Tumour Society (Enneking) system?

Answer: d. IIB.⁵

Stage	Grade	Site	Metastasis
IA	Low (G1)	Intracompartmental (T1)	No metastasis (M0)
IB	Low (G1)	Extracompartmental (T2)	No metastasis (M0)
IIA	High (G2)	Intracompartmental (T1)	No metastasis (M0)
IIB	High (G2)	Extracompartmental (T2)	No metastasis (M0)
III	Any (G)	Any (T)	Regional or distant metastasis (M1)

6. A 35-year-old manual worker is admitted after a devastating crush injury to his dominant thumb. The possibility of a free thumb transfer is raised, which of the following statements is correct?

Answer: c⁶

Vivas

Adult Pathology

A 70-year-old female presents with left shoulder pain and difficulty raising her arm and performing her activities of daily living.



Fig. 1a



Fig. 1b



Fig. 1c



Fig. 1d

1. Describe the radiograph and CT scan (Fig.1). What is the diagnosis?

Answer: a. Superior migration of the humeral head resulting in decreased acromio-humeral distance. Osteophytes, joint space narrowing, rounding of the greater tuberosity of the proximal humerus and acetabularisation of the undersurface of the acromion. Superior glenoid wear, osteopenia of the acromion and proximal humerus and glenohumeral joint subluxation also noted.

The diagnosis is Glenohumeral rotator cuff arthropathy with antero-superior escape.

2. How do you classify this?

Answer: Cuff Tear Arthropathy: Seebauer Classification⁷

Type 1A - Centered stable, Minimal superior migration, C-A arch acetabularisation

Type 1B - Centered medialised, Minimal superior migration, medial glenoid erosion, C-A arch acetabularisation

Type 2A - Decentered limited stable, superior translation, superior-medial erosion significant C-A arch acetabularisation

Type 2B - Decentered unstable, anterior superior escape, C-A arch and anterior structures deficient

Glenoid erosion in cuff tear arthropathy: Sirveaux Classification⁸

E0: Humeral head migration without glenoid erosion

E1: Concentric glenoid erosion

E2: superior glenoid erosion

E3: inferior glenoid erosion

Sirveaux et al, JBJS (B), 86: 388-3985, 2004

Cuff Tear Arthropathy: Hamada Classification⁹

Grade 1: AHL > 6mm

Grade 2: AHL 5mm or less

Grade 3: Grade 2 with acetabularization of acromion (concave deformity of acromion undersurface)

Grade 4: Grade 3 changes with narrowing of gleno-humeral joint

Grade 5: Bony destruction- humeral head collapse

(AHL: Acromio- humerus Interval)

3. Assuming she has failed non-operative management, what surgical option(s) will you offer her?
Answer: Arthroscopic or open suprascapular nerve ablation (if responds positively to a suprascapular nerve block).
Rotator cuff arthropathy large head hemiarthroplasty.
Reverse total shoulder replacement.

4. What are the absolute contraindications for your operative choice?
Answer: Arthroscopic or open suprascapular nerve ablation (if responds positively to a suprascapular nerve block).
Partial infraspinatus function.

Rotator cuff arthropathy large head hemiarthroplasty
Active or indolent infection.

Reverse total shoulder replacement.

Active or indolent infection.

Deltoid dysfunction.

Neuropathic joint.

Bony deficiency that cannot be reconstructed to yield a stable glenohumeral joint.

5. What are the biomechanical principles of your operative choice?
Answer:
- Arthroscopic or open suprascapular nerve ablation: Remove the pathological glenohumeral stimulus of pain.
 - Rotator cuff arthropathy large head hemiarthroplasty: Remove humeral component of bone on bone arthritis contributing to pain.
 - Reverse total shoulder replacement: Medialise the centre of rotation of the glenohumeral joint. No GH translation -> nil rim loading. Centre of rotation of the glenohumeral joint moved medially and distal to glenoid. Lever arm of deltoid improved -> deltoid force acts to stabilise the joint -> reduces the moments that challenge fixation
- Intrinsic stability:
- nature of design has increased intrinsic stability
 - humeral socket forms an angle of 155° with the humeral shaft
 - inherent stability -> prosthesis works even if only part of deltoid functions.

Trauma

A 6-year-old has presented after a fall off a swing leading to an injury at the elbow. These are the radiographs done in A and E (Fig. 2).

1. Describe the radiographs.
Answer: Anteroposterior and lateral radiographs of immature skeleton demonstrating a proximal ulna fracture with associated radial neck fracture.



Fig. 2a



Fig. 2b

2. Classify Monteggia fractures in children.
Answer: Bado classification¹⁰
- Type 1 – fracture proximal/middle third ulna with anterior dislocation radial head
 - Type 2 – fracture of the proximal/middle third ulna with posterior dislocation of the radial head
 - Type 3 – Fracture ulnar metaphysis with lateral dislocation of radial head
 - Type 4 – Fracture proximal or middle third ulna and the radius with concurrent radial head dislocation
3. What group of injury does this fracture fall into? What are Monteggia equivalent injuries?
Answer: This is a variation of Monteggia fractures (fracture of the ulna and dislocation of radial head). Known as Monteggia equivalent fracture – fracture of the proximal radius instead of dislocation of radial head.
4. How would you manage this patient?
Answer: Careful neurological assessment. Closed reduction should be attempted. If radial head remains unreduced or unstable then open reduction of the ulna with K-wire fixation.
5. How would you manage chronic dislocations of radial head in late presenters?
Answer: Annular ligament reconstruction using triceps fascia – Bell Tawse procedure.

Hands

A 21-year-old medical student presented to a specialist hand clinic three weeks following injury to his left thumb when he fell off whilst skiing in Scotland. He initially had pain and swelling around the thumb but this has improved with the thumb brace he was given in A and E. He now feels pain mainly on the inner side of his thumb when stressing his thumb with activities like gripping or pinching. In addition, he complains that his thumb does not feel right and feels weak.



Fig. 3

1. Please describe the test being undertaken in the clinical photograph (Fig. 3)?
Answer: Valgus stress test. The metacarpal is held still whilst a valgus force is applied to the metacarpophalangeal joint (MCPJ) by holding the proximal phalanx in extension. This is repeated with the MCPJ flexed.
2. What is the provisional diagnosis if the test is positive?
Answer: Asymmetric excursion of the thumb proximal phalanx whilst holding the metacarpal stable is suggestive of an ulnar collateral ligament injury.
3. What is a Stener's lesion?
Answer: As the ulnar collateral ligament is avulsed from the

proximal phalanx, the free edge is pulled past the adductor aponeurosis, which then blocks reduction of the ligament to the bone. These injuries are less likely to heal with conservative management in cast and have a higher risk of MCPJ instability.¹¹

4. What name is given to the chronic variant of this injury and why?

Answer: Chronic ulnar collateral ligament injuries are known as 'game keepers thumb'. So called due to the repetitive stressing of the ulnar collateral ligament (UCL) when breaking rabbits' necks, found in a series of Scottish game keepers.

5. How would you differentiate between a complete and an incomplete tear?

Answer: Clinical examination should differentiate between the complete and incomplete lesions. Incomplete lesions have a definite end point to collateral ligament stressing. There are two components to the ulnar collateral ligament, the proper UCL and the accessory UCL. Instability of the MCPJ in flexion suggests an isolated proper UCL injury where instability in extension suggest the accessory ligament is involved.¹² Plain radiographs would not demonstrate any joint widening on the ulnar border of the MCPJ in an incomplete lesion.

Children's Orthopaedics

A 12-year-old boy presents with pain in his right arm; three months ago he was treated non-operatively for a fracture of the same humerus sustained after a low energy fall (Fig. 4).



Fig. 4a

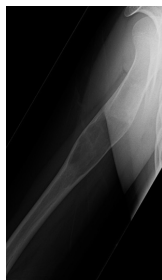


Fig. 4b

- What are the possible diagnoses and what is the most likely diagnosis? Why?
Answer: The differential diagnoses are unicameral (simple) bone cyst, aneurysmal bone cyst, fibrous dysplasia. This lytic lesion is central, intramedullary, associated with thinning of the cortices, and some expansion of the bone. The lesion has a narrow zone of transition. There is no periosteal or soft tissue reaction. This is therefore most likely to be a simple bone cyst.
- How are these lesions believed to develop?
Answer: The pathogenesis of these lesions remains uncertain. They are believed to arise as a defect during bone growth, which fills with serosanguinous fluid resulting in thinning and expansion of the bone. The cyst has a fibrous membranous lining and bone resorptive factors such as interleukin 1-B and prostaglandin E2 have been found in the fluid. Another proposed theory is that vascular obstruction causes cyst fluid to accumulate under pressure and expand at the expense of the normal bone.
- How would you differentiate this lesion from an aneurysmal bone cyst?
Answer: Magnetic resonance imaging (MRI) would usually demonstrate fluid levels if this were an aneurysmal bone

cyst, but not with simple bone cysts. If the lesion were aspirated, one would expect serosanguinous fluid from a unicameral bone cyst, but blood from an aneurysmal bone cyst.

4. How would you decide whether to treat a simple bone cyst?

Answer: Simple bone cysts can cause pain, deformity and even avascular necrosis when in the proximal femur. The other indication for treatment is the risk of pathological fracture. The bone cyst index has been reported as a method for predicting fracture risk, but there are conflicting reports about its validity and reliability.

5. What are the treatment options for this lesion?

Answer: A number of different treatments have been described for simple bone cysts. Options include aspiration of fluid with or without injection of steroid, bone marrow or bioceramic material. A randomised controlled trial comparing steroid with bone marrow found higher rates of success with steroid. Methods to disrupt the cyst wall and allow drainage such as drill holes, percutaneous curettage or insertion of a cannulated screw have shown good rates of success. Elastic nails have been shown to have a high success rate, because as well as providing structural support, they allow drainage of the cyst fluid. Various combinations of a number of these methods have been described. Open curettage and bone grafting is usually restricted for severe or resistant cases.^{13,14,15,16,17}

Basic Science

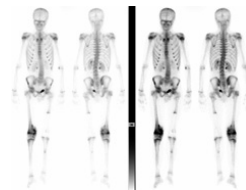


Fig. 5

- What investigation is this (Fig. 5)?
Answer: This is a three phase whole-body Tc-99m MDP bone scan.
- How is it done and what is the basis of the images obtained?
Answer: The patient is injected with a radiolabelled tracer intravenously. They then lie down on a screening couch whilst the image is taken at different time points. A gamma camera is used to pick up nuclear activity (decay photons) from the tracer. The decaying photons from the tracer hit the salt crystal within the gamma camera. Most commonly technetium-99m is used as the tracer.
- How is technetium 99m produced?
Answer: Technetium 99m (Tc99m) is a metastable isotope of technetium. Technetium 99m is a byproduct of molybdenum-99, a more stable form, with a longer half life that is then used to transport and deliver Tc99m. Molybdenum 99m is created by fission of highly enriched uranium in nuclear reactors. Tc 99m has a short half life (six hours).
- What are the phases in a triple phase scan?
Answer: A triple phase scan uses three separate time points to image the body. The first image is immediate and demonstrates arterial flow. A few minutes later the second scan demonstrates venous pooling. Finally after several hours the third scan represents bony metabolism. From an orthopaedic point of view the first two phases demonstrate hyperemia to a lesion and inflammation. The latter phase

indicates increased bone metabolism such as seen with neoplasm, healing fractures, osteolysis.

5. What are the pitfalls of this scan?

Answer: Bone scans do not differentiate between increased activity due to chronic infection, osteolysis, fracture or neoplasm. They are helpful at excluding pathology but helpful with diagnosis. Not all cancers show on the bone scans, so-called "cold lesions" such as multiple myeloma.¹⁸

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