Exam Corner

March 2012 - Answers

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MCQs – Adult Pathology – Single Best Answer

1. Which of the following clinical findings is least likely to be associated with a pre-ganglionic brachial plexus injury?
Answer: a. Bruising in the anterior triangle of the neck
A pre-ganglionic plexus injury may be associated with bruising in the posterior triangle of the neck rather than the anterior, due to the anatomical location of the pre-ganglionic portion of the brachial plexus.

2. Following a latissimus dorsi transfer for chronic irreparable tears of the rotator cuff, which of the following factors has NOT been associated with a poor clinical outcome?
Answer: a. Male gender
Ianotti et al[1] found that female gender was more likely to be associated with a poor outcome following a latissimus dorsi transfer. It is postulated that men have an increased muscle mass and therefore improved pre-operative shoulder function and strength.

3. The alpha angle on the ultrasound of an infant's hip is defined as:
Answer: b. The acute angle between the lateral wall of the ilium and the bony acetabular roof
The alpha angle is used most commonly as a measurement of acetabular concavity, and it is calculated as the angle between the lateral wall of the ilium and the roofline. A normal alpha angle is 60° or greater. This measurement is vital to understanding the morphology of the immature acetabulum in developmental dysplasia.

4. Which of these values reflects the normal tibio-femoral axis for a child aged three years?
Answer: d. Valgus of 10°
During development, the tibio-femoral alignment in children changes during early years. At birth it is 10° to 15° of varus, which remodels to neutral at about 24 months of age and then becomes 10° of valgus by the age of three years. Over the next four years it gradually goes to normal alignment of 7°.[2]

5. Which of the following constituent accounts for 65-80% of the dry mass of flexor tendons?
Answer: a. Collagen type I
Tendons are composed of groups of collagen bundles (fascicles) separated by endotenon and surrounded by epitenon. Tendons are primarily composed of water, but of the dry mass type 1 collagen makes up 65-80% of the tendon. Type III collagen makes up less than 5%. Proteoglycans also make up less than 5% of the tendon's dry mass.
Collagen One: skin, tendon, vascular, ligature, organs, bone (main component of bone)
Collagen Two: cartilage (main component of cartilage)
Collagen Three: reticulate (main component of reticular fibers)
Collagen Four: forms bases of cell basement membrane

Vivas

Adult Pathology

A 28-year-old man presents with pain in his chest and lower back. This is his radiograph (Fig. 1).

Fig. 1

1. Describe the abnormality on the radiograph. What is your diagnosis?
Answer: The radiograph shows an abnormal right-sided lateral curvature of the thoracic spine. The diagnosis in this 28-year-old is of adult scoliosis. This is most likely to be due to pre-existent idiopathic adolescent scoliosis, but this also could be secondary to a neuromuscular disease, a tumour or degenerative change.

2. How can we assess the severity of this condition?
Answer: The severity can be assessed by performing a full history and examination to elucidate the clinical effect of the scoliosis.
The severity of the curve can be radiologically assessed by measuring the Cobb angle. This is derived by drawing intersecting perpendicular lines from the superior surface of the superior end vertebra of the curve and from the inferior surface of the inferior end vertebra of the curve. Vertebral rotation can also be measured to give an indication of severity.

3. What determines the prognosis?
Answer: The severity of the curve would determine prognosis. Curve progression is unlikely if the Cobb angle is less than 30°. Progression is highest for right sided thoracic curves > 50° (1 mm/year). The underlying causative reason behind the scoliosis would naturally affect prognosis. A simple idiopathic adolescent scoliosis at this stage at the age of 28 would have a much better prognosis than a neuromuscular or a tumour-related curve.

4. What other investigation/s would you like to request and why?
Answer: Other investigations that we be appropriate would include PA + lateral radiographs of the whole spine with the patient standing. Lateral bending films are also of benefit if planning further treatment. An MRI would be essential to rule out a syrinx and also if there were any features to suggest a malignancy or any neurological findings on examination.

5. Describe a classification system for this pathology.
Answer: The classification of King et al[3] is used to describe thoracic curves as follows;
   King I – lumbar curve larger than thoracic curve, which is more flexible on bending films.
   King II – thoracic curve is larger than lumbar curve, less flexible and the thoracic rib hump is larger than the lumbar rotational prominence.
   King III – a thoracic scoliosis where the lumbar curve does not cross the midline.
   King IV – single long thoracic curve
   King V – double structural thoracic curve.

6. What are the options for treatment?
Answer: The options for treatment are non-operative and operative. In this case, if no suspicious features were discovered on history and examination, simple observation and repeat interval radiography of this < 30° curve would be indicated. Analgesia and physiotherapy would also be of benefit. Other options for younger patients with more severe curves would include orthotic bracing or casting and possibly operative intervention. This may include an anterior/posterior approach with instrumented (Harrington, CD and Luque) fusion.

Trauma

A 48-year-old right hand dominant civil servant presented to the fracture clinic following a fall from a horse on his right arm. This is the radiograph obtained in A&E (Fig. 2).

Fig. 2

1. Describe the abnormality on the radiograph.
Answer: The radiograph shows a vertically displaced, comminuted fracture of the lateral third of the clavicle.

2. What is the classification system commonly used for this injury and how would you classify this fracture?
Answer: The Rockwood and Green classification[4] of lateral clavicle fractures:
   Type I – fracture lateral to the coracoclavicluar ligaments
   Type II – fracture medial to the coracoclavicluar ligaments
   Type III – injury extends into the ACJ
   Type IV – Paediatric periosteal sleeve injury
   Type V – comminuted fracture
   The radiograph shows a **Type V** fracture.

3. What are the ligaments attached to the distal end of clavicle and how do they influence displacement at the fracture site?
Answer: The ligaments attached to the distal end of the clavicle are the acromioclavicular and coracoclavicular ligaments. The acromioclavicular ligament provides anterior/posterior stability. It has superior, inferior, anterior, and posterior components, with the superior being the strongest. This is why the distal fragment in a lateral clavicle fracture is held in place adjacent to the acromion. The coracoclavicular ligaments (trapezoid and conoid) provide vertical stability. The trapezoid ligament inserts 3 cm from end of clavicle and the conoid ligament inserts 4.5 cm from end of clavicle in the posterior border. The conoid ligament is strongest. Rupture of these ligaments leads to significant vertical displacement of the clavicle fracture as seen in the radiograph.

4. Which type of fracture has the highest rate of nonunion?
Answer: Robinson et al[5] found that displacement of the fracture and increased age of patient were associated with a higher risk of non-union in lateral clavicle fractures. These fractures in themselves have an increased rate of non-union, when compared to middle or medial third fractures.

5. How would treat this injury?
Answer: A fall from a horse should be considered a high-energy injury and I would therefore manage the patient according to ATLS protocol. Assuming this is an isolated injury, I would perform a history and a thorough examination with special reference to neurovascular status also ensuring that this was a closed injury. Using Robinson's prognostic index I would explain to the patient that there was a 30% chance of nonunion at six months and that treatment could be operative or non-operative. Non-operative treatment would eliminate surgical risk. Indeed Robinson[6] advocated non-operative management in middle-aged individuals with displaced lateral clavicle fractures:

> 'Nonoperative treatment of most displaced lateral fractures of the clavicle in middle-aged and elderly patients achieved a good medium-term functional result. Symptoms that were severe enough to warrant a delayed reconstructive procedure developed in only 14% of the patients. Asymptomatic nonunion does not appear to adversely affect the functional outcome in the medium term.'[6]

I would therefore advocate non-operative management. However, operative intervention may lead to a quicker improvement in function and I would discuss this with the patient. Surgical options could include a hook plate or reconstruction of the coracoclavicular ligaments.

Hands

A 40-year-old scaffolder presents to the clinic with persistent pain in his wrist following a fall on his outstretched hand about six months ago. These are the radiographs obtained in clinic (Figs. 3a and 3b).

Fig. 3a

Fig. 3b

1. What is your diagnosis?
Answer: This is a radiograph of a chronic scapholunate (SL) injury with a dorsal intercalated segmental instability (DISI) deformity.

2. What is the classification system associated with this problem?
Answer: These injuries are assessed and best treated based on which restraints are damaged and the duration from the actual index event.

Garcia-Elias et al[7] set out the following assessment criteria in the assessment of SL injuries.
-Is the Dorsal Scapholunate ligament partially or completely torn?
-If Complete, can the ligament be repaired and what is the healing potential?
-What is the status of the secondary scaphoid stabilizers (ie- is the radioscaphoidangle less than 45°)?
-Is the carpal malalignment reducible?
-Are the cartilaginous surfaces normal?

Based on these conditions SL injuries can be classified as per Table I:

Table I:

Stages	Pathology
S1: Pre-dynamic	SLIL Partial Tear
S2: Dynamic	Complete SLIL Injury +Repairable DSL
S3 : Static no DISI	Complete Nonrepairable D and VSL no DISI STT ligaments intact
S4: Static with reducible DISI	Complete Scapholunate Ligament Injury With a Non-repairable Reducible Rotary Subluxation of the Scaphoid
S5: Static with irreducible DISI	Complete Scapholunate Ligament Injury With Irreducible Malalignment but Normal Cartilage
S6: Complete Scapholunate Ligament Injury With Irreducible Malalignment and Cartilage Degeneration	Complete Scapholunate Ligament Injury With Irreducible Malalignment and Cartilage Degeneration

3. What stage/grade would you assign to this radiograph?
Answer: This appears to be a static deformity. The reducibility can be checked on table during surgery. It is likely that this is stage 4 to 5 injury based on radiographs.

4. What is the natural history of this condition?
Answer: If left untreated chronic scapho-lunate dissociation will lead to a scapholunate advanced collapse (SLAC) wrist. This describes arthritic changes that result due to abnormal loading. The first joint to develop degenerative changes is the radio-scaphoid, then capitolunate and then the scapho-trapezoid/trapezium joints.

5. What are the options for treatment?
Answer: See Table II

6. How would you treat this patient?
Answer: See Table II

Table II: Treatment

Stage	Pathology	Management
S4: Static with reducible DISI	Complete Scapholunate Ligament Injury With a Nonrepairable Reducible Rotary Subluxation of the Scaphoid	Ideal indication for the tendon weaves. 3 LT tenodesis (Fig. 3c & 3d) of Brunelli Procedure[8]
S5: Static with irreducible DISI	Complete Scapholunate Ligament Injury With Irreducible Malalignment but Normal Cartilage	Better to accept the morbidity caused by a partial fusion than to attempt a ligament reconstruction that most likely will fail. Options: STT, Scapho Capitate fusions.

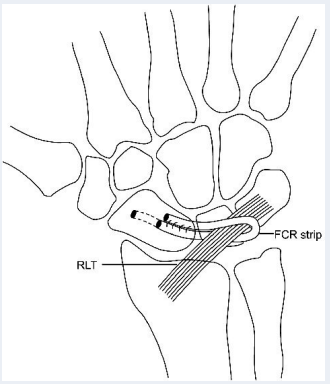

Fig. 3c

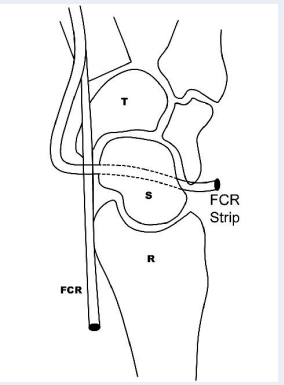

Fig. 3d

Children's Orthopaedics

Here are clinical photographs and a radiograph of a 14-year-old girl who complains of intermittent discomfort and loss of full extension and supination of the right elbow (Fig. 4).

Fig. 4a

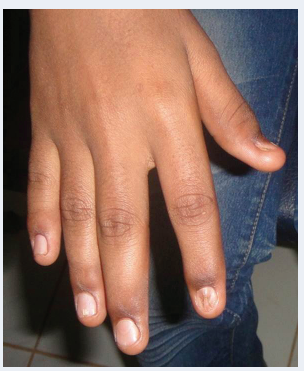

Fig. 4b

Fig. 4c

1. What is the diagnosis of the elbow disorder?
Answer: Posterior dislocation of the radial head.[9]

2. What is the underlying condition and how could you confirm this?
Answer: Nail-patella syndrome.
Examination and radiographs of the knees are likely to show absence or hypoplasia of the patellae and a pelvic radiograph may show iliac horns. The inheritance is autosomal dominant so siblings and parents may be affected.

3. How would you treat the elbow?
Answer: The symptoms are not bad enough for operative treatment but if they became so the radial head could be excised.

Clinical photograph and radiograph of a five-year-old boy who walks on his left heel (Fig. 5). The foot is painless but the foot deformity is progressive.

Fig. 5a

Fig. 5b

4. What are the deformities?
Answer: Calcaneo-cavus and tibial bowing

5. What is the likely cause?
Answer: Osteomyelitis with destruction of the lower tibial growth plate.

6. How would you manage the condition?
Answer: The foot should be made plantigrade by correction through the ankle and lower fibula. The tibial deformity may be left to mature and remodel but may need correction depending on progress and resources.

Basic Science

1. What do you understand by the term osteoporosis?
Answer: Osteoporosis means there reduced bone mineral density (BMD) but there is no problem with bone mineralisation.

2. What is the WHO definition for osteoporosis?
Answer: Osteoporosis is defined by the World Health Organisation (WHO) as a bone mineral density that is 2.5 standard deviations or more below the mean peak bone mass of an average young, healthy adult as measured by the DEXA scan (dual energy X-ray absorptiometry).

3. What are the risk factors for the development of osteoporosis?
Answer: Risk factors can be non-modifiable and modifiable:

Non-modifiable risk factors
- **Age** - BMD decreases, and consequently the risk of osteoporosis increases with age.
- **Gender** - Women are at greater risk of osteoporosis as they have smaller bones and hence lower total bone mass. Additionally, women lose bone more quickly following the menopause, and typically live.
- **Ethnicity** - Afro-Caribbean women have a higher BMD than white women at all ages due to a higher peak bone mass and slower rate of loss.
- **Reproduction factors** - A late menopause or short time from menopause to BMD measurement are associated with higher BMD. BMD decreases most rapidly in the early postmenopausal years. Current use of oestrogen replacement therapy is associated with a higher BMD.
- **Family history of osteoporosis**

Modifiable risk factors
- **Weight** - Higher risk with low weight.
- **Smoking**
- **Alcohol**
- **Exercise**
- **Diet**
- **Medications** - Steroids etc

4. What is the pathophysiology of osteoporosis?
Answer: Bone resorption is always followed by bone formation, a phenomenon referred to as coupling. In osteoporosis, this coupling mechanism is thought to be unable to keep up with the constant microtrauma to trabecular bone. Osteoblasts not only secrete and mineralise osteoid but also appear to control the bone resorption carried out by osteoclasts. Osteoclasts require weeks to resorb bone, whereas osteoblasts need months to produce new bone. Therefore, any process that increases the rate of bone remodeling results in net bone loss over time.[10]

5. How would you investigate a patient with suspected osteoporosis?
Answer: Initial work up would include a full history including family history, gynaecological history if appropriate, medications taken, history of previous fractures. Full examination would and blood tests to rule out other bone pathologies would be undertaken (calcium, phosphate, alkaline phosphatase levels) and possible urinary tests. Once other pathologies had been excluded a DEXA scan would confirm the diagnosis of osteoporosis.

6. What are the changes in peak bone mass with respect to age?
Answer: BMD increases until 25 then remains high until 45 to 50 years of age. BMD then reduces more rapidly after 50 in women (due to menopause) and steadily decrease in men.

7. How do you classify osteoporosis?
Answer: The disease may be classified as primary type 1, primary type 2, or secondary. The form of osteoporosis most common in women after menopause is referred to as primary type 1 or postmenopausal osteoporosis. Primary type 2 osteoporosis or senile osteoporosis occurs after age 75 and is seen in both females and males at a ratio of 2:1. Finally, secondary osteoporosis may arise at any age and affect men and women equally. This form of osteoporosis results from chronic predisposing medical problems or disease, or prolonged use of medications such as steroids.

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