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MCQs – Adult Pathology – Single Best Answer

- All of these are examples of enchondral bone formation except:
Answer: d. During distraction osteogenesis Distraction osteogenesis mimics intramembranous ossification where recruitment and differentiation of primitive cells create a new bony framework.
- All of these are diseases that involve the proliferative zone of the growth plate except:
Answer: a. Kniest syndrome
Kniest syndrome (spondyloepiphyseal dysplasia) is condition that involves a disproportionate dwarf. Patients have a short trunk and limbs with large joints. It is inherited in an autosomal dominant pattern and is caused by mutations in the COL2A1 gene. Kniest syndrome involves all zones of the growth plate as there is a defective collagen II molecule assembly.¹
- Which one of these regulates cartilage and bone formation in the fracture callus?
Answer: b. Transforming growth factor- β^2
- What is the diagnosis in a patient who presents with reduced serum calcium, raised serum phosphate, normal alkaline phosphatase and parathormone level and a reduced urinary calcium excretion?
Answer: c. Pseudohypoparathyroidism
In this case there is a PTH receptor abnormality and PTH is not able to exert its effect on target cells. This leads to a reduction in the active form of Vitamin D. The low PTH and low active Vitamin D levels lead to the low calcium. In hypoparathyroidism the PTH level would be low as well.¹
- During revision knee arthroplasty with the trial components in place, the knee is tight in extension and loose in flexion. Correction involves which of the following changes?
Answer: b. Use of a thinner distal femoral augmentation wedge
Using a thinner distal femoral augmentation wedge will increase the extension gap without affecting the flexion gap.³

Vivas

Adult Pathology

A 42-year-old female presents with a history of lower back and right leg pain. This is her radiograph (Fig. 1).



Fig. 1

- Describe the abnormalities seen in this radiograph.
Answer: This is an example of lumbosacral transitional vertebra (LSTV); there is an abnormal joint between right lateral process and ileum/sacrum with evidence of sclerosis of this joint.
- What are the associations of this condition?
Answer: Lumbosacral transitional vertebrae are associated with cervical ribs, altered nerve root functioning and facet joint arthrosis. These patients are at higher risk of disc degeneration and back pain.⁴
- What is the approximate incidence of this abnormality in the general population?
Answer: A systematic review of studies from 2007⁴ has shown a total prevalence of 7.5% sacralisation in the general population. There is a prevalence of 5.5% for lumbarisation. The total for both is under 13%.
- What are the main surgical implications of this condition?
Answer: Treatment of this condition is largely conservative. The majority of patients are asymptomatic. If symptoms occur, a steroid and local anaesthetic injection is the first line treatment and can provide pain relief.

There is little data regarding surgical interventions and surgery may be indicated in radiculopathy, degenerative disc disease higher up the spine and in certain chronic pain cases.
Finally, failure to recognise this can lead to errors in lumbar numbering in surgery for other lumbar spinal problems.
- Describe the embryology of the spine.
Answer: During the pre-cartilaginous stage sclerotomes appear as paired condensations around the notochord and neural tube in a four-week-old embryo. These sclerotomes consist of cells, which move cranially to form the intervertebral discs, and cells, which move caudally to form the primordial of the body of the vertebra. Where vertebral bodies surround the notochord it degenerates. Between the vertebrae the notochord expands to form the nucleus

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pulposus. Mesenchymal cells that surround the neural tube become the neural arch (primordium of the vertebral arch). There are two primary ossification centres in the vertebrae – ventral and dorsal. Ossification becomes evident in the neural arches at eight weeks.⁵

Trauma

A 46-year-old patient was brought into A&E following a fall from a horse. The patient is haemodynamically stable and this is the radiograph of the pelvis (Fig. 2).



Fig. 2

1. Describe the abnormalities on the radiograph.

Answer: There is a significant diastasis of the symphysis pubis and significant widening of the right sacro-iliac (SI) joint.

2. What is the possible mechanism of this injury and how would you classify pelvic fractures in general?

Answer: This is likely to be an antero-posterior compression injury. This injury can be classified by the Tile⁶ or Young and Burgess⁷ Classification systems.

The Tile classification includes Type A (stable), Type B (rotationally unstable but vertically stable) and Type C (rotationally and vertically unstable).

The Young and Burgess system is based on mechanism of injury, type A (lateral compression), Type B (AP compression) and Type C (Vertical Shear).

Within the AP compression (APC) type there are three further subdivisions:

APC-I

- Slight widening of pubic symphysis / anterior SI joint
- Intact anterior SI, sacrotuberous & sacrospinous ligaments
- Intact posterior SI ligaments

APC II

- Widened anterior SI joint; disrupted anterior SI, sacrotuberous and Sacrospinous ligaments
- Intact posterior SI ligaments

APC III

- Complete SI joint disruption with lateral displacement
- Disrupted anterior SI, sacrotuberous and sacrospinous ligament
- Disrupted posterior SI ligaments

3. Where would this injury fit in your classification?

Answer: This is therefore a Type B, APCII injury.

More specifically this is an open book pelvis injury. As the posterior SI joint is intact it acts as a hinge from which the displaced anterior SI joint and the right hemipelvis can externally rotate.

4. What is the risk of urological injury or impotence in patients with such injuries?

Answer: A recent study (Pavelka et al) showed that primary injury to the urological tract was recorded in 13.5% of patients with pelvic fractures. Injury to the urethra was found in 7.5% and urinary bladder trauma in 6%.

Injury to the urological tract was associated with a Type A pelvic ring fracture in 5 %, type B in 34 % and type C in 61 % of the patients.

Out of the patients with urethral trauma, 35 % receive therapy for urethral stenosis and 30% reported urinary incontinence. 30% have problems related to impotence.⁸

5. What are the radiological signs of rotational and vertical instability in pelvic fractures?

Answer: Radiological signs of rotational instability include pubic symphyseal diastasis of more than 2.5cm; fracture of the ischial spine and avulsion fracture of lateral sacrum.

Radiological signs of Vertical instability include a Sacral fracture with a gap; avulsion fracture of the tip of the L5 transverse process; vertical displacement of the sacroiliac joint of more than one cm.

6. How would you manage this patient?

Answer: I would adopt the ATLS approach, initially assessing airway with cervical spine control, breathing and then circulation. There is likely to be massive blood loss from this injury so rapid fluid replacement including type O negative blood will be key. A full primary survey would be undertaken with a chest radiograph, lateral cervical spine and AP radiograph of the pelvis. A pelvic binder would be applied on suspicion of a pelvic injury. A detailed trauma CT would ideally be obtained, which may obviate the need for a chest and lateral C-spine radiograph.

The genitourinary examination would be undertaken and retrograde gastrograffin cystogram would be undertaken to assess urethral integrity prior to catheter placement.

A pelvic external fixator could be considered in this case if the appropriate expertise was available. Also, transfer to a Level 1 trauma centre should be considered for angiographic embolisation if necessary.

After initial resuscitation and temporary stabilisation (either pelvic binder or external-fixator) definitive management would involve stabilisation of anterior symphyseal (open reduction and internal fixation with a symphyseal plate) and posterior sacroiliac diastases (sacro-iliac screws).

Hands

A 50-year-old female presents with a history of a painful swelling in her finger. It appears to burst on occasion. This is the clinical photograph and radiograph (Fig. 3a and 3b).



Fig. 3a

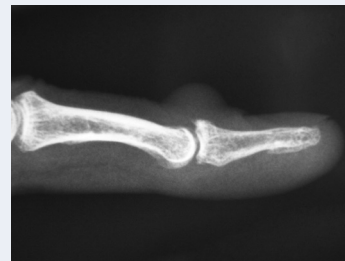


Fig. 3b

1. What are the differential diagnoses?

Answer: The differential diagnoses here would include the following:

- Mucous cyst
- Tumour (benign/malignant)
- Xanthoma
- Abscess

2. What is the diagnosis?

Answer: The diagnosis is a Mucous cyst with associated breakdown of the skin. There are degenerative changes in the DIPJ (dorsal osteophytes).

3. What are the causes of this condition?

Answer: Osteoarthritis of the DIPJ and trauma can cause this condition. There is mucoid degeneration of the connective tissue.

4. How would you treat this patient?

Answer: I would take a detailed history and examination and ascertain the effect of the cyst on function of the finger and the patient's symptoms. Conservative measures include massage and compression. Aspiration can be attempted but re-accumulation is likely.

The definitive management is excision of the cyst, which can result in loss of skin over the ulcerated area. In order to achieve skin coverage a flap can be rotated using the excess skin over the PIP joint. There are several ways of doing this, one of which is demonstrated below in Fig. 3c.

The procedure is performed using a digital block and a digital tourniquet for haemostasis. The flap is marked and with the area of skin ulceration that needs to be excised (Fig. 3d).

The flap is raised and rotated to cover the defect (Fig. 3e). This is facilitated by a proximal release (arrow) of the flap, which allows rotation and coverage. Any osteophyte associated with the cyst must be removed to decrease chances of recurrence.

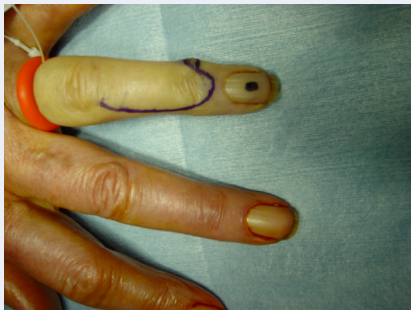


Fig. 3c

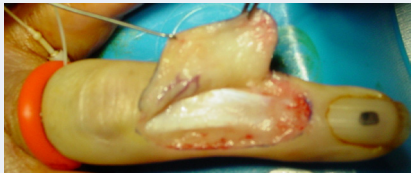


Fig. 3d

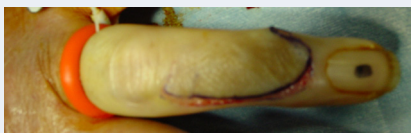


Fig. 3e

5. What are the possible complications?

Answer: Recurrence, nail deformities, risk of nerve/tendon/vessel damage (rare).¹

Children's Orthopaedics

1. What is this condition (Fig. 4a), how would you manage it and what is the likely outcome?



Fig. 4a



Fig. 4b

Answer: There is a calcaneovalgus deformity due to congenital postero-medial bowing of the tibia and fibula. (Fig. 4b). The condition

should be treated by gentle stretching and simple splintage during infancy.

The bowing will correct spontaneously during childhood but there will be mild to moderate residual shortening of the order of 1-2cm, which may need to be addressed towards the end of growth.

2. Describe these foot deformities (Fig. 5). How should they be treated?



Fig. 5

Answer: In the upper photograph, the feet rest in positions of forefoot varus and hindfoot equinovarus.

In the lower image, the hindfoot on the baby's left is correctible, indicating residual forefoot varus, but not on the right, which indicates resistant congenital talipes equinovarus.

On the left, the hindfoot does not require surgery. It will respond to simple stretching. The metatarsus varus is likely to resolve spontaneously over the next few years. If it does not it can be helped by a period of casting or release of abductor hallucis. Major surgery on the asymptomatic mid-foot is rarely justified.

On the right, the hindfoot requires operative release, either a simple tendo achillis lengthening or a more extensive release. Thereafter, any residual forefoot varus should be addressed as described above.

Basic Science

1. What is the pathophysiology of rheumatoid arthritis?

Answer: Rheumatoid Arthritis (RA) is an auto-immune systemic inflammatory disorder. There is a synovial inflammatory response (pannus) around the joint capsule. This inflammatory tissue leads to erosive arthritic changes within joints due to destruction of the articular cartilage.

2. What is the aetiology of rheumatoid arthritis?

Answer: The aetiology of disease is obscure; auto-immunity has a large role in development of RA. The disease may arise as a result of:

- Age: The average age of onset of disease are about 40, but it may occur at all ages. It is less common before puberty.
- Gender: Females are affected three times more than males.
- Genetic: Individuals with HLA-DR1 or HLA-DR4 serotypes are at risk of developing RA. Concordance of RA in identical twins is approximately 15%

3. What are the ARA criteria for the diagnosis of rheumatoid arthritis?

Answer: Revised ARA Criteria for the Classification of Rheumatoid Arthritis (RA).⁹

For classification purposes, a patient is said to have RA if he or she has satisfied at least four of the following seven criteria. Criteria 1 through 4 must have been present for at least six weeks. Patients with two clinical diagnoses are not excluded. Designation as classic, definite, or probable RA is not to be made.

1. Morning stiffness: Morning stiffness in and around the joints, lasting at least one hour before maximal improvement.
2. Arthritis of three or more joint areas: At least three joint areas

simultaneously have had soft tissue swelling or fluid (not bony overgrowth alone) observed by a physician; the 14 possible joint areas are right or left proximal interphalangeal (PIP) joints, metacarpophalangeal (MCP) joints, wrist, elbow, knee, ankle, and metatarsophalangeal (MPT) joints.

3. Arthritis of hand joints: At least one area swollen (as defined above) in a wrist, MCP or PIP joint.
4. Symmetric arthritis: Simultaneous involvement of the same joint areas (see 2 above) on both sides of the body (bilateral involvement of PIPJs, MCPJs, or MTPJs is acceptable without absolute symmetry).
5. Rheumatoid nodules: Subcutaneous nodules, over bony prominences, or extensor surfaces, or in juxta-articular regions, observed by a physician.
6. Serum rheumatoid factor: Demonstration of abnormal amounts of serum rheumatoid factor by any method for which the result has been positive in < 5% of normal control subjects.
7. Radiographic changes: Radiographic changes typical of RA on posteroanterior hand and wrist radiographs, which must include erosions or unequivocal bony decalcification localized to or most marked adjacent to the involved joints (osteoarthritis changes alone do not qualify).

4. What are the potential extra-articular manifestations in patients with rheumatoid arthritis?

Answer:

Cardiovascular – atherosclerosis, pericarditis, IHD
Pulmonary – pulmonary fibrosis, pleural effusions
Abdominal – Splenomegaly
Skin – vasculitis, Raynauds syndrome, nodules, Sjogrens syndrome
Eye – scleritis, episcleritis

5. How would you investigate a patient with rheumatoid arthritis?

Answer: A blood test for rheumatoid factor (RF) is undertaken. A negative RF does not rule out RA. Other blood tests are usually done to allow for other causes of arthritis, such as lupus erythematosus.

The ESR, CRP, full blood count, renal function, liver enzymes and other immunological tests (e.g. antinuclear antibody/ANA) are all performed.

If there is small joint disease then radiographs of the hands or feet may be taken. There may be no radiographic changes early on. Radiographs of other symptomatic joints would be obtained as well.

6. What are the poor prognostic indicators for patients with rheumatoid arthritis?

Answer: Poor prognostic factors include:

- Persistent synovitis
- Early erosive disease
- Extra-articular findings
- Positive Rheumatoid Factor
- Family history of RA
- Poor functional status
- Socioeconomic factors
- Elevated ESR/CRP.

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