Orthopaedics Teaching

- Principles
- Complications of fractures
- Spinal trauma
- Pelvis
- Hip
- Knee
- Foot and Ankle
- Shoulder
- Elbow
- Hand
- Paediatric trauma
- Paediatrics
- Arthritis
- Infections
- Radiology
- Tips

Principles
Fracture: A soft tissue injury complicated by a break in a bone.

Treatment
- Resuscitation
- Reduce
- Hold
- Rehabilitate

Imaging
- Need two perpendicular views
- Two joints visible
- Site
- Obliquity
- Displacement (translated/impacted/angulated/rotated)

Complications of Fractures

Injury and Fracture
Local and General
Early and Late

Nerve damage
- Neuropraxia – bruised nerve. Recovers over weeks/months
- Axontemesis – cut axon. Poor prognosis, esp. adults
- Neurotemesis – cut nerve. Poor prognosis, esp. adults
- Entrapment

Compartment syndrome. Cardinal sign is pain on passive stretch. Pulseless/paralysis very late signs. Treatment is fascicotomy.

Heterotopic ossification – excess ossification, especially elbow, quads, acetabulum. More common if patient is also head injured. Decreased by NSAIDs, movement.


Union problems
- Delayed Union
- Malunion
- Nonunion
  - atrophic (no bone formation)
  - hypertrophic (bone produced but no union. Increasing stability may help)
- Cross-union
Late

- Avascular necrosis
- Osteoarthritis
- Growth changed (increased or decreased – former long bones in very young)
- Tardy palsy
- Osteomyelitis
- Volkman’s contracture – functionless muscular contraction due to muscle ischaemia

Spinal Trauma

Unstable:

- >50% vertebral height lost
- >20° angle
- 2 or more columns
- 3 or more sequential vertebrae

3 Columns:

- Anterior – anterior body
- Middle – posterior body
- Posterior – spinolaminar

Neurology:

Neurological level – most caudal cord segment with normal motor and sensation on both sides.

Sacral sparing – perianal sensation, voluntary anal sphincter contraction preserved.

SCIWORA possible in children.

Neurogenic shock – loss of sympathetic tone, ↓BP, low or normal HR.

Spinal shock – flaccid paralysis (not cardiovascular shock)

- Bulbocavernous reflex – anal contraction on pulling penis
- Central cord syndrome – hyperextension, >50. Upper limb effect > lower limb

Anterior cord syndrome – hyperflexion. Motor, pain, temperature loss


Lateral film

- <3mm between anterior border of C3 and soft tissue
- (or) <50% vertical body height above C4, <1 vertical body below C4
- Atlas-Dens interval (ADI) <4mm

Peg fracture:

- Type 2 – base. Non-union in 30%. Halo, posterior fusion, screw repair.
- Type 3 – body axis, below peg. Halo.

Hangmans fracture – Pars interarticularis of C2.


Bifacet dislocation – 50% anterior subluxation. Usually need fusion.

Pelvic Fractures

Open pelvic # has 100% mortality if no defunctioning colostomy performed.

Major haemorrhage – 90% venous.
*Lateral Compression*
- LC I  Pubic rami + Sacral damage
- LC II
- LC III
- Spike of bone produced – visceral +/- vessel damage

*AP Compression*
- ‘Open book’ – damage venous plexus in front of sacrum
- AP I  Pubic symphysis splits
- AP II  Anterior sacroiliac and sacrotuberous ligaments ruptured
- AP III  posterior sacroiliac ligaments ruptured – detached hemipelvis – tends to rise

*Vertical Shear*
- VS – ‘rips’ hemipelvis

Non-operative – traction. PASG for API/LCI in short term
Operative – Ex-fix/ORIF/percutaneous fixation
Post-op – 2-3/12 non-weightbearing. Unilateral# - may weightbear early.

*Acetabular fractures*
- 2 walls, 2 columns
- X-ray – AP and Judet views (45° oblique)
- Non-operative treatment if <2.5mm displacement in dome
- Operate if unstable, incongruity, patient factors
  - Approach – ilio-inguinal (anterior), kocher-langenbach (posterior)
  - Mobilise NWB 2-3/12

*Hip Exam*

*Standing*
- Look
  - Pelvic tilt
  - Rotation
  - Lumbar lordosis
  - Scoliosis
- Feel
  - Trendelenburg test
  - Block test for shortening
- Move
  - Gait (antalgic/trendelenburg/short leg)

*Supine*
- Look
  - Skin/soft tissue/bone
- Feel
  - Skin/soft tissue/bone
  - Nelaton’s line (ASIS to ischial tuberosity, should touch greater trochanter)
Move
  o Thomas’ test (fixed flexion deformity)
  o Ab/adduction
  o Internal/external rotation
  o Abnormal movements

Prone
  Look, feel, move (extension, rotation)

Hip Fractures

Blood supply to head of femur
  • Ligamentum teres
  • Nutrient arteries in medulla
  • Capsular – main – risk of avascular necrosis in intracapsular #

Intracapsular (subcapital)
  Attempt repair with 3x cannulated screws if young (<70) or undisplaced (Garden I/II)
  Hemiarthroplasty if older or displaced (Garden III/IV)

Risks of replacement – leg length discrepancy, infection, dislocation, DVT(10%), PE.

Extracapsular
  Intertrochanteric – usually DHS repair
  Subtrochanteric – consider possibility of cancer – not an anatomical weak point

Knee

Force patient to describe one chief complaint.

Instability
  • ‘Nothing, nothing’ knee – quads inhibition
  • ‘Something, nothing’ knee – ligament failure

Locking
  • Meniscal/loose body/crucaite/synovium – true locking
  • Patello-femoral subluxation resembles meniscal tear
  • Effusion/plicae – pseudo-locking

‘Catching’
  • Chondral flap

Look Feel Move
  • Skin • Skin • Active
  • Soft tissue • Soft tissue • Passive
  • Bone • Bone • Resisted

Causes of limp:
  • Long leg
  • Inco-ordinate
  • Muscle weakness
  • Pain
  • Stiffness
Foot and Ankle Trauma


Weber classification:
- Level of fibular fracture relative to syndesmosis
  - A – below – intact
  - B – same level – need to test stability
  - C – above – disrupted

Other fractures
- Talar – usually fall from height, forced dorsiflexion
- Calcaneal – fall from height, often bilateral. Associated with # lumbar spine, tibial plateau, and acetabulum.
- Metatarsal fracture – beware MTP dislocation.

Care of soft tissues vital – often marked swelling.

Shoulders

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<tbody>
<tr>
<td>Trauma</td>
<td>Labral pathology</td>
<td>Frozen shoulder</td>
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<tr>
<td>Instability</td>
<td>Biceps pathology</td>
<td>Rotator cuff disease</td>
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<tr>
<td>Instability</td>
<td>Instability</td>
<td>Osteoarthritis</td>
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<td>Tendonitis</td>
<td>Tumour</td>
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Include clavicle, lesser tuberosity of humerus, coracoid process.

Assess range of movement:
- Flexion
- Abduction
  - Recall thoracic/scapular movement
- External rotation
- Internal rotation and extension

Specific tests for nerve impingement and specific muscle actions.

Elbow

Radiographs
- Radial head points to capitulum on all views
- Shaft-condylar angle of humerus should be 40°
- Anterior humeral line bisects capitulum on lateral view
- Fat pads indicate fracture

Exam
- Carrying angle is 10° in men, 15° in women. ↑ if #lat epicondyle → ulnar n. stretch
- Swelling best seen on lateral aspect
- ROM 0°-150°, supination 90°, pronation 80°
Epicondylitis
Lateral (tennis elbow), medial (golfers elbow)
Degenerative changes lead to inflammation
Pain on forced extension/flexion
Treat with strapping, stretching, activity modification, steroid injection (repeated –
risk of tendon rupture), surgical release.
Medial – can have ulnar nerve symptoms as well.

Bursitis
Increased risk in RA, gout, pseudogout, trauma, repetitive stress
May get infected
If drained, wound is often slow to heal
Myositis Ossificans
Form of heterotopic ossification, common in brachialis

Ulnar nerve compression
In cubital tunnel. Tinel sign +ve – tap over nerve increases symptoms
Treat conservatively with night splint or surgically with release

Hand

Deformities
- Mallet finger – loss of DIP extension
- Boutonniere – rupture of central slip of extensor expansion
- Swan neck – rupture of volar plate

Trigger finger – swelling of flexor tendon, gets stuck in flexor sheath.

Nerve lesions
- Radial – wrist drop. Lose ‘Paper’
- Ulnar – ulnar claw hand. Lose ‘Scissors’
- Median – thenar wasting. Lose ‘Stone’

Paediatric Trauma

Recall that physeal injuries can effect growth.

Salter-Harris:
- I – through physis
- II – through epiphysis
- III – through metaphysis
- IV – through epiphysis and metaphysis
- V – crush of epiphysis
Paediatrics

Common conditions
- Cerebral palsy
- Congenital hip dislocation (DDH)
- Talipes (club foot)
- Perthes
- Slipped epiphysis

Uncommon
- Scoliosis
- Osteogenesis imperfecta
- Fibula aplasia
- Arthrogryposis
- Tibial dysplasia

Developmental Dysplasia of Hip (DDH)

Exam
- Ortolani and Barlow tests
- US if +ve Barlow or high risk neonate
- Radiology for >6mths age

Graf grade:
- I – normal
- II – in joint, shallow acetabulum
- III – subluxed
- IV – displaced

Treatment:
- <6mths
  - Abduction splintage
    - Pavlik harness
  - 90% success
- 6-12mths
  - Arthrogram
  - Adductor tenotomy
  - Closed reduction
  - Plaster hip spica
  - 90% success
- >18mths
  - Open reduction +/-
    - Femoral osteotomy
    - Pelvic osteotomy

Talipes calcaneo-valgus
- Most common
- Usually resolves spontaneously

Talipes equino-varus
- Usually requires treatment
  - Strapping/serial casts
  - Surgical release

Class: Mild/Moderate/Severe

Arthritis

Osteoarthritis
Degenerative, mainly large joints, primary or secondary (trauma)
Hip – groin pain, radiates to thigh. May have knee pain alone. Hip is flexed, adducted, shortened, and externally rotated.
Knee – varus deformity
Hand – Heberden’s nodes (DIP)/Bouchard’s nodes (PIP)
Narrowed joint space/cysts/sub-chondral sclerosis/osteophytes

Treat
- Conservative
- Surgical – debride/arthrodesis/osteotomy/arthroplasty
**Rheumatoid**
Inflammatory, synovial disease. Raised ESR, RF, anaemia. Polyarticular, symmetrical Morning stiffness
Marginal erosion/narrowed joint space/joint destruction/osteoopenia
Treat
- Conservative
- Surgical – synovectomy/repair soft tissue/arthrodesis/arthroplasty

**Arthroplasty**
- Excision (e.g. of hip joint – Girdlestone)
- Interposition
- Replacement (partial – one compartment or component, total)
- 95% survival at 10 years

Complications
- DVT/PE
- Neurovascular injury
- Leg length discrepancy – symptomatic if >2.5cm
- Aseptic loosening – 10%-40% at 10 years
  - Wear particles trigger immune response, → osteoclastic resorption
- Infection 1%-2%
- Dislocation 1%-4%, most common first three months
- Heterotopic ossification
- Periprosthetic fracture in ~1%

**Infection**

*Main types:*
- Osteomyelitis
  - Acute or subacute haematogenous
    - Inflammation causing pain
    - Suppuration (2-3 days)
      - Sub-periosteal abcesses
    - Necrosis (7-10 days)
    - New bone – involucrum (10-14 days)
    - Resolution (if treated)
      - Subacute can cause Brody’s abcess
      - Post-traumatic/operative
      - Chronic
        - Acute not adequately treated
      - Usually presents with local or systemic signs of infection/inflammation
- Septic arthritis
  - Synovitis
  - Purulent joint effusion
  - Spreads if not treated
  - Ankylosis of joint
- Post-operative infections
Radiology

Acetabular dysplasia - mild form DDH. Leads to degenerative changes at young age.
Slipped Upper Femoral Epiphysis (SUFE) – trauma, spontaneous in overweight, early teens. May present as knee pain.
Avascular necrosis – trauma, steroids, Perthe’s (idiopathic)
Spinal canal stenosis – osteophytes impinge on cauda equina. Mixed upper/lower neuron signs.
Cervical spondylosis – osteophyte impinges on nerve root. Lower neuron signs.
Atlanto-axial subluxation – requires flexion + extension views to exclude.
Rheumatoid arthritis – starts at synovium. Can lead to atlanto-axial subluxation.

Useful Tips

Persistent night pain should be assumed to be due to malignancy until proven otherwise.

Subtrochlear fracture should be assumed to be due to tumour until proven otherwise.

‘John Thomas sign’ – on XR the penis tends to point towards the side of a problem.

Locking is the inability to extend the leg, as in this position the joint has the smallest volume.

Charnley made the first modern hip prosthesis.

Bone tumours are frequently mets, from breast, lung, kidney, prostate, thyroid (5’Bs’)

The enemy of good is better.


Scars in children spread with time.

The solution to pollution is dilution – wash out infected joints.

Textbook: Apley and Solomon, Concise system of orthopaedics and fractures