

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
- Neurotmesis – cut nerve. Poor prognosis, esp. adults
- Entrapment

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

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

Reflex Sympathetic Dystrophy (RSD) – excess sympathetic response to injury. Red, shiny skin, stiffness, pain, hyperaesthesia, hyperaemia to ischaemia/atrophic. Treat with analgesia, nerve blocks, physiotherapy.

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 palsies
- 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)

Bulbocavernosus reflex – anal contraction on pulling penis

Central cord syndrome – hyperextension, >50. Upper limb effect > lower limb

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

Brown-Sequard syndrome – Ipsilateral motor, contralateral pain and 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 1 – avulsion of tip. Stable. Hard collar.
- 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.

Unifacet dislocation – 25% anterior subluxation. Reduce, halo/fusion.

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

- Thomas' test (fixed flexion deformity)
- Ab/adduction
- Internal/external rotation
- 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

- Skin
- Soft tissue
- Bone

Feel

- Skin
- Soft tissue
- Bone

Move

- Active
- Passive
- Resisted

Causes of limp:

- Long leg
- Inco-ordinate
- Muscle weakness
- Pain
- Stiffness

Foot and Ankle Trauma

'Posterior' malleolus – posterior lip of tibia. Damaged by hyperflexion.

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

<20	20-40	>40
Trauma	Labral pathology	Frozen shoulder
Instability	Biceps pathology	Rotator cuff disease
	Instability	Osteoarthritis
	Tendonitis	Tumour

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 physal 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/osteopenia

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 abscesses
 - Necrosis (7-10 days)
 - New bone – involucrum (10-14 days)
 - Resolution (if treated)
 - Subacute can cause Brody's abscess
 - 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.

Subtrochanter 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.

Protective inhibition – stops movement of an unstable fracture, irrespective of pain.

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