

# Fracture Management Overview

## History

- **Who, what, when, where, why**
  - **Who** – age, job, hobbies, hand dominance (if hand involved), cognition (AMTS score if elderly)
  - **What** happened and exactly how it happened
    - Mechanism of injury
    - Force involved
    - Likelihood of other structure damage
  - **When** it happened
  - **Where** it happened
  - **Why** it happened – the fracture may be the secondary result of another major problem (e.g. if patient fell, do a full before/during/after falls history; do a full systems review if the cause is unclear)
- **Rest of history:**
  - Ortho system review:
    - Joints/bone/soft tissue: pain, stiffness, swelling, movement restriction/ability to weight bear
    - Mechanical symptoms: locking, giving way
    - Neurological symptoms: weakness, numbness, paresthesia
  - PMHx: co-morbidities, ask specifically about tetanus vaccines (may need to vaccinate), epilepsy/Parkinsons/dementia/alcoholism (will increase risk of falls and total joint replacements may be avoided)
  - DHx: especially anticoagulants, steroids (osteopenia), allergies
  - SHx: smoking/alcohol (delays bone healing), comprehensive social history e.g. mobility, who performs activities of daily living, carers, living situation, work/drive etc (will determine risks/benefits of fracture management options)

## Examination

- **Examine all bones top to toe** for swelling/tenderness/↓ROM if any possibility there could be other injuries (skull→ spine process tenderness→ ribs→ arms→ hips→ legs→ knees→ feet)
- **Assess limb**
  - Fracture assessment – open/closed
  - Neuro-vascular status of limb (temp, pulses, cap refill, sensation, motor)
- **Assess skin**
  - Wound
  - Skin around fracture site e.g. any cellulitis, ulcers
- **Signs of complications** e.g. compartment syndrome, infection

## Investigations

- **Imaging**
  - **X-Ray** of bone (AP and lateral) including joint above and below (see [musculoskeletal radiograph interpretation](#))
  - **CT** may be used to: assess 3D anatomy of complex fractures; to image head/C-spine/chest/abdomen/pelvis in polytrauma
  - **CT angiogram** may be used to assess suspected vascular injury
  - **MRI** may be used to: image soft tissues or spinal cord; determine undisplaced fracture anatomy; look for osteomyelitis (shows up before on X-ray)
  - **USS** may be used to: image soft tissues such as tendons; to determine presence of any collections or radiolucent foreign bodies; to guide injection/aspiration; to Doppler blood vessels
- **Bloods** including INR and G&S (may require theatre)
- **Swab** open wounds for culture

## Conclude assessment

- **Type of fracture (SOD)**
  - Fracture description (SOD)
    - **Site**
      - Bone
      - Intra/extra-articular
      - Position (proximal/middle/distal third)
    - **Obliquity**
      - Completeness (complete, incomplete)
      - Direction (transverse, oblique, spiral)
      - Skin penetration (open, closed)
      - Condition of bone (comminuted, segmental, multiple, impacted)

- Displacement
  - Translation (% of bone diameter) – *ant/pos or med/lat*
  - Angulation (°) – *ant/pos or med/lat*
  - Rotation (°)
  - Length distraction/shortening
- Complications
  - Open wound
  - Neurovascular compromise
  - Compartment syndrome
  - Infection

## Management

Fracture management stages include (4 Rs):

1. Resuscitate
2. Reduce (if displaced) – may be by open reduction, closed manipulation, or traction
3. Retain (to maintain position while healing occurs) – by internal fixation, external fixation, or conservative methods
4. Rehabilitate

### Resuscitate

- **Advanced trauma life support** in life threatening wounds (see notes on [ATLS](#))
- **Look for other injuries** (don't get distracted by one obvious injury!) – does the cervical spine need to be immobilised?

### Reduce (if displaced)

- **Open reduction** – when anatomical (perfect) reduction is required (e.g. for intra-articular fractures) or associated neurovascular damage
- **Closed manipulation** (may be done in clinic or require general anaesthesia) – for extra-articular fractures where accurate reduction can be achieved
- **Traction** (below)

### Retain (to maintain reduced position while callous forms in ~6 weeks)

- **External fixation** – required for: contaminated open wounds, severe open fractures, severe associated soft tissue injury
- **Internal fixation** – required for: comminuted or displaced fractures, intra-articular fractures, bones not able to be reduced by other methods, associated joint incongruity
  - Intramedullary
    - Intramedullary nail – for long bone fractures (femur/tibia/humerus)
    - K-wires (stainless steel pins which can be inserted percutaneously to hold bone fragments together; can be used as temporary fixation for ~4 weeks) – if small fracture fragments, or for intramedullary fixation of small bones
  - Extramedullary
    - Plates and screws – to bridge comminuted fractures, support areas of thin cortex, or secure tension side of fracture
- **Conservative immobilisation** – can be used for most fractures without properties above (exceptions in red in table below), and also 'stabilise' fractures in the interim if there will be a delay before reduction/fixation
  - Nothing may be needed
  - Cast (circumferential immobiliser) e.g. full plaster cast (most), fibreglass cast
  - Splint (non-circumferential immobiliser) e.g. plaster backslab, fibreglass backslab, aluminium/wire/heat-mouldable plastic splints
  - Brace (supportive device that allows continued function)
  - Sustained traction e.g.
    - Collar and cuff arm sling
    - Skin traction (adhesive strappings around parts of limb distal and proximal to fracture, and weight traction applied to each in opposite directions)
    - Traction splint
    - Skeletal traction (pins passed through bone to provide point of traction)

See table below

For detail on the plaster casts/ backslab versions, see OSCEstop notes on [plastering](#)

Conservative fracture immobilisation options	
Fracture	Conservative management options
<b>Torso</b>	
Cervical spine	Cervical collar or traction (e.g. halo, halter, tongs)
Thoracic/lumbar spine	Usually none necessary if stable fracture Stryker frame or POP jacket may be used to maintain reduction A back brace (e.g. thoracolumbosacral orthosis (TLSO), Jewlett) may be used for compression spinal fractures Strict bed rest if spinal cord involved
Clavicle	Broad arm sling or polysling (large degree of displacement acceptable)
Scapula	Broad arm sling or polysling
Ribs	None necessary if stable
Pelvis	None necessary if stable (weight bear as tolerated if mechanically stable, or progressive weight bearing for sacral/acetabular fractures) Pelvic binder is used for immediate management
<b>Upper limb</b>	
Humerus	<u>Proximal</u> Collar and cuff sling (applies traction) <u>Mid-shaft</u> Collar and cuff sling <b>and</b> U-slab cast/functional humeral brace <u>Distal/olecranon/epicondyle</u> Above elbow backslab/cast
Radius/ulna	<u>Distal radius isolated fracture</u> Below elbow backslab/cast ↳ If Colles' fracture: Colles backslab/cast (below elbow backslab/cast with wrist flexed and ulnar deviated) ↳ If Smith's fracture: below elbow backslab/cast with wrist extended ↳ Exception is Volar Barton's fracture – requires above elbow backslab/cast <u>Ulna</u> Above elbow backslab/cast <u>Both bones/radius</u> Above elbow backslab/cast ↳ Proximal 1/3: wrist in supination ↳ Middle 1/3: wrist mid-prone ↳ Distal 1/3: wrist in pronation (if both bones only – isolated distal radius fractures managed as above)
Carpals	<u>Scaphoid</u> Futuro splint ± thumb extension, or thumb spica splint/cast if definite fracture <u>Other carpals</u> Below elbow backslab/cast or volar/dorsal forearm splint
Metacarpals	<u>1<sup>st</sup> metacarpal base (Bennett's fracture)</u> Bennett's cast (positions thumb correctly) <u>2<sup>nd</sup>/3<sup>rd</sup> metacarpals</u> Radial gutter splint or volar/dorsal forearm slab/splint <u>4<sup>th</sup>/5<sup>th</sup> metacarpals (Boxer's fracture)</u> Ulnar gutter splint or volar/dorsal forearm slab/splint
Phalanges	<u>Proximal or middle phalynx</u> Buddy tapping or ulnar/radial gutter splint or dorsal/volar finger splints <u>Distal phalynx</u> U-shaped splint, or mallet finger splint if mallet fracture (avulsion of the extensor tendon)
<b>Lower limb</b>	
Femur	<i>Femur fractures almost always require surgical fixation</i> <u>Displaced/unstable/mid-shaft</u> Traction (e.g. Thomas splint, skin/skeletal traction) <u>Proximal/mid-shaft</u> Hip spica cast (non-weight bearing) <u>Distal (rare)</u> Above knee backslab/cast or leg cylinder cast or hinge brace or cricket splint (non-weight bearing)
Patella	Above knee backslab/cast or leg cylinder cast or hinge brace or cricket splint (non-weight bearing)
Tibia/Fibula	<i>Shaft fractures are often managed surgically to reduce time non-weight bearing</i> <i>Medial or bicondylar tibial plateau fractures (i.e. Schatzker IV or more) require surgical fixation</i> <i>Ankle fractures require surgical fixation if they are: bimalleolar, trimalleolar, or disrupt the syndesmosis (i.e. Weber C and some Weber B)</i> <u>Tibial plateau</u> Hinge brace or above knee backslab/cast (non-weight bearing) <u>Both bones/tibia</u> Above knee backslab/cast (non-weight bearing) <u>Fibula</u> Below knee backslab/cast or posterior leg splint (non-weight bearing) <u>Bi/trimalleolar</u> Below knee backslab/cast (non-weight bearing) <u>Lateral malleolus – Weber A</u> Below knee backslab/cast or aircast boot or stirrup brace (full weight bearing) <u>Lateral malleolus – Weber B/C</u> Below knee backslab/cast or aircast boot (non-weight bearing)
Tarsals	<u>Calcaneus/talus</u> Below knee backslab/cast or aircast boot (non-weight bearing) <u>Tarsal-navicular</u> Padded cast with toe platform (non-weight bearing)
Metatarsals	Stiff soled shoe or walking boot (weight bear as tolerated)
Phalanges	Buddy tapping (dynamic splinting) ± walking cast with toe platform

**In acute fractures: use a splint or backslab (to allow for swelling)**

**1 week post-injury: change to a full circumferential cast (for better immobilisation)**

## Rehabilitate

- **Physiotherapy** to regain function
  - Consider weight bearing status of affected lower limb
    - Non-weight bearing (leg must not touch floor) – for ~6 weeks in conservatively managed unstable fractures and after plates
    - Toe-touch weight bearing (toe may touch floor to balance but not support any weight)
    - Partial weight bearing (<50% body weight)
    - Weight bear as tolerated
    - Full weight bearing – after intramedullary nails, external fixations, joint replacements

May progress through these stages with X-Ray monitoring in some potentially unstable fractures

## Other aspects to management

- **For swelling RIE: Rest, Ice, Elevation**
- **STOP SMOKING!** – severely delays bone healing (document that you told the patient)
- **Analgesia** (but avoid NSAIDs – they interfere with bone healing)
- **Antibiotic prophylaxis** for open fractures e.g. 2<sup>nd</sup>/3<sup>rd</sup> generation cephalosporin, co-amoxiclav or clindamycin
- **VTE prophylaxis**
  - Omit dose if theatre planned <12 hours
  - All inpatients should have prophylaxis (unless contraindication or post-spinal surgery)
  - Certain outpatients should have prophylaxis:
    - Lower limb cast (continue until cast removed)
    - If patient is not fully weight bearing
    - After total knee replacement (14 days)
    - After total hip replacement (35 days)
- **Treat the cause of the fracture if necessary** e.g. osteoporosis, fall etc

## Complications

- **IMMEDIATE:** haemorrhage, arterial damage, surrounding structure damage (e.g. tendons, nerves), fat embolus
- **EARLY (few weeks):** wound/prosthesis infection, loss of position/fixation, VTE, chest infection, compartment syndrome
- **LATE (months-years):** malunion, non-union, delayed union, osteoarthritis

## Other points

- **Timings**
  - Callous forms in 6 weeks – temporary fixations (e.g. traction, cast, external fixations, K-wires) removed at this stage
  - Full fracture healing in 12 weeks
  - Generally, lower limbs take twice as long as upper limb bones to fully heal, and children's bones heal twice as quick as adult bones
- **Repeat X-rays** are performed post-op or after cast application
- Fractures with a fragment at risk of **avascular necrosis** due to retrograde blood supply:
  - Head of femur
  - Waist of scaphoid
  - Neck of talus

