Frykman Classification of Distal Radial #

Type | Fracture |
--- | --- |
I | Extra-articular fracture |
II | Extra-articular fracture with an ulnar fracture |
III | Intra-articular fracture of the radiocarpal joint without an ulnar fracture |
IV | Intra-articular fracture of the radius with an ulnar fracture |
V | Fracture of the radioulnar joint |
VI | Fracture into the radioulnar joint with an ulnar fracture |
VII | Intra-articular fracture involving radiocarpal and radioulnar joints |
VIII | Fracture involving radiocarpal and radioulnar joints with an ulnar fracture |

Galeazzi Fracture

Fracture shaft of ulnar, together with disruption of the proximal radioulnar joint and dislocation of radio-capitellar joint

distal third of radius with dislocation or subluxation of distal radio-ulnar joint

Gartland’s classification of supracondylar fracture of humerus

- **Galeazzi fracture** - a fracture of the radius with dislocation of the distal radioulnar joint
- **Colles’ fracture** - a distal fracture of the radius with dorsal (posterior) displacement of the wrist and hand
- **Smith’s fracture** - a distal fracture of the radius with volar (ventral) displacement of the wrist and hand
- **Barton’s fracture** - an intra-articular fracture of the distal radius with dislocation of the radiocarpal joint
- **Essex-Lopresti fracture** - a fracture of the radial head with concomitant dislocation of the distal radio-ulnar joint with disruption of the interosseous membrane

Gustillo Anderson Classification of Open Fracture

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Open fracture with a wound &lt; 1cm and clean</td>
</tr>
<tr>
<td>II</td>
<td>Open fracture with wound &gt; 1cm with extensive soft tissue damage and avulsion of flaps</td>
</tr>
<tr>
<td>IIIa</td>
<td>Open fracture with adequate soft tissue coverage of bone in spite of extensive soft tissue laceration or flaps or high energy trauma irrespective of size of wound</td>
</tr>
<tr>
<td>IIIb</td>
<td>Open fracture with extensive soft tissue loss, periosteal stripping and exposure of bone</td>
</tr>
<tr>
<td>IIIc</td>
<td>Open fracture associated with an arterial injury which requires repair</td>
</tr>
</tbody>
</table>

ORTHOPAEDICS CLASSIFICATION PART 1 (UPPER LIMB)

Contributors: Dr. Tham, Goh, Poh, Shanm, Justine, Shanth, Huda, Niruma, Liu, Phirindha, Sivkin, Yong, Phoon, Ling Ying, Siew Ling, Quah
Letournel classification acetabular #

Simple Types
- Anterior column
- Anterior wall
- Posterior column
- Posterior wall

Associated Types
- Transverse
- T-type
- Both columns + posterior wall
- Both columns + posterior wall hemitransverse

Pipkin classification of femoral head fracture

Type I - # below fovea/ligamentum (small)
Type II - # above fovea/ligamentum (larger)
Type III - # I or II with associated femoral neck # (high risk of AVN)
Type IV - # I or II with associated acetabular #

Russel Taylor classification of subtrochanteric #

Type IA
- Piniformis fossa
- Greater trochanter

Type IB
- Lesser trochanter

Type IIA
- Lateral bimalleolar # w/o depression

Type IIB
- Lateral bimalleolar # with depression
- Medial bimalleolar # with no associated split

Type IIC
- Medial bimalleolar # with or without depression

Type IIIAB
- Brody bimalleolar #

Type IIIAC
- Brody bimalleolar # with diaphyseal discontinuity

Winquist classification of femoral shaft fracture

I. Tiny cortical fragment
II. Butterfly fragment is large but there is still 50% cortical intact between the main fragments
III. Butterfly fragment involves more than 50% of the bone width
IV. Segmental fractures

Schatzker classification of tibia plateau #

Type I
- Lateral bimalleolar # w/o depression

Type II
- Lateral bimalleolar # with depression
- Focal depression with no associated split

Type III
- Medial bimalleolar #, with or without depression

Type IV
- Bicondylar #

Type V
- Tibial plateau fracture with diaphyseal discontinuity

Garden classification of femoral neck #

Garden I fracture complete and minimally displaced
Garden II fracture complete and nondisplaced
Garden III fracture partially displaced
Garden IV fracture completely displaced with no engagement of the 2 principal fragments

Evan classification of intertrochanteric #

Evan I
- Undisplaced 2 parts fracture

Evan 2
- Displaced 2 parts fracture

Evan 3
- Displaced 3 parts fracture with posteromedial commination

Evan 4
- Displaced 3 parts fracture with large posteromedial comminated fragment

Evan 5
- Displaced 4 parts fracture with commination involving both trochanters

Lisfranc classification of tarsometatarsal injury

Homolateral
- Isolated
- Divergent

Sanders classification of calcaneal fractures

I. # are non-displaced # (displacement < 2 mm)
II. # consist of a single intrarticular # that divides the calcaneus into 2 pieces
III. # occurs on lateral aspect of calcaneus
IV. # occurs on central aspect of calcaneus
V. # occurs on medial aspect of calcaneus
VI. # consist of 2 intrarticular fractures that divide the calcaneus into 3 articular pieces
VII. # consist of 3 intrarticular fractures that divide the calcaneus into 4 articular pieces
VIII. # consist of 4 intrarticular fractures that divide the calcaneus into 5 articular pieces
IX. # consist of > 5 intrarticular fractures

ORTHOPAEDICS CLASSIFICATION
PART 2 (PELVIC & LOWER LIMB)

Together In Delivering Excellence (T.I.D.E.)
Contributors: Tham, Goh, Shaun, Justin, Shanthi, Rudo, Minh, Hua, Preeti, Syikin, Fong, Phoon, Ling Ying, Sin Ling, Phuak
DENIS THREE COLUMN CONCEPT

Anterior column:
- AAL: Anterior longitudinal ligament
- AAF: Anterior annulus fibrosus

Middle column:
- PLL: Posterior longitudinal ligament
- PAF: Posterior annulus fibrosus

Posterior column:
- SSL: Supraspinous ligament
- ISL: Interspinous ligament
- LF: Ligamentum flavum
- PC: Facet capsule

Localisation of level of injury

Vertebral spine | Spinal Cord Segment
---|---
C1-C7 | Add 1
T1-T6 | Add 2
T7-T9 | Add 3
T10 | L1, L2
T11 | L3, L4
T12 | L5, S1
L1 | rest of sacroccygeal segment

Upper limb myotomes and dermatomes

<table>
<thead>
<tr>
<th># Type &amp; column involvement</th>
<th>Anterior column</th>
<th>Middle column</th>
<th>Posterior column</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression</td>
<td>Compression</td>
<td>None</td>
<td>None or distraction</td>
</tr>
<tr>
<td>Burst</td>
<td>Compression</td>
<td>Compression</td>
<td>None or distraction</td>
</tr>
<tr>
<td>Seatbelt</td>
<td>None or compression</td>
<td>Distraction</td>
<td>Distraction</td>
</tr>
<tr>
<td>Fracture/disl</td>
<td>Compression</td>
<td>Distraction</td>
<td>Distraction</td>
</tr>
</tbody>
</table>

Lower limb myotomes and dermatomes

- Hip flexors
- Knee extensors
- Ankle dorsiflexor
- Ankle plantar flexion
- Bulbocavernous reflex

Criteria of unstable spine injury
- On palpation gap between 2 spinous processes increased
- Neurological deficit
- Vertebral compression > 1/3
- Vertebral displacement > 1/3
- Vertebral canal compression > 1/3
- Bilateral facet joints dislocation
- According to Denis 3 columns concept: 2 columns disrupted

DENIS CLASSIFICATION OF SPINAL TRAUMA

MAJOR INJURIES

- Transverse process #
- Articular process #
- Par interarticularis #
- Spinous process #

MINOR INJURIES

- Compression Fracture
- Burst Fracture
- Chance Fracture

Stable fractures - don't cause spinal deformity or neurologic deficit, still able to weight bear

Unstable fractures - unable to weight bear, may progress and causing further neurological and structural damage.

TLICS: Thoracolumbar Injury Classification and Severity Score

<table>
<thead>
<tr>
<th>Morphology</th>
<th>Posterior Ligamentous complex (PLC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No abnormality</td>
</tr>
<tr>
<td>1</td>
<td>Compression</td>
</tr>
<tr>
<td>2</td>
<td>Burst fracture</td>
</tr>
<tr>
<td>3</td>
<td>Rotation/translation</td>
</tr>
<tr>
<td>4</td>
<td>Distraction</td>
</tr>
</tbody>
</table>

Neurological status

- 0 Intact
- 2 Root injury
- 2 Complete cord / conus medullaris injury
- 3 Incomplete cord / conus medullaris injury
- 3 Cauda equina

Treatment

- TLICS <= 3: non-operative
- TLICS = 4: consider for operative or non-operative intervention
- TLICS >= 5: operative

Central cord lesion
- • Upper > lower limb involved
- • Sacral sparing
- • Due to hyperextension/Spine OA

Cord hemisection (Brown Sequard Syndrome)
- • Ipsilateral paraparesis with contralateral loss of pain sensation
- • Due to unilateral lamina or pedicle #

Anterior cord lesion
- • Motor - Sensory - Proprioception +
- • Due to hyperextension with disc or bone compressing ant spinal a

ORTHOPAEDICS ESSENTIALS PART 3 THE SPINE

CONTRIBUTORS: Dr. Tham, Goh, Poh, Shaun, Justine, Shanthy, Huda, Miruna, Lin, Phrindha, Syikin, Fong, Phoon, Ling Ying, Siew Ling, Quah
<table>
<thead>
<tr>
<th>Name</th>
<th>Active Ingredient</th>
<th>Indication</th>
<th>Contraindication</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
</table>
| 1. Opsite                     | semi-permeable-thin, adhesive transparent polyurethane film                       | superficial wounds as secondary dressing        | highly exudative wounds                                                        | • some moisture evaporation  
• reduce pain  
• barrier to external contamination  
• allows inspection | • exudate may pool  
• maybe traumatic to remove |
| 2. Jelonet Bactigras PARAFFIN | non-adherent moist (Tulle Gras dressing) gauze impregnated with paraffin or maybe with antisepsics or antibiotics | burn wounds healing by secondary intention       | allergy                                                                        | • reduces adhesion to wound  
• moist environment aids healing | • does not absorb exudate  
• requires secondary dressingg  
• allergy  
• may delay healing when impregnated |
| 3. Kaltostat CALCIUM ALGINATE  | Calcium alginate natural polysaccharide from seaweed                              | moderately/highly exudative wounds need for hemostasis | dry wound hard eschar                                                          | • forms gel on wound & hence moist  
• environment  
• reduces pain  
• can pack cavities  
• absorbent in exudative wounds  
• promotes hemostasis  
• low allergenic | • may require secondary dressing  
• not recommended in anaerobic infections  
• gel can be confused with slough  
• or pus in wound |
| 4. Duoderm E HYDROCOLLOID     | hydrocolloid dressing-hydrophilic colloid bound to polyurethane film coated with adhesive mass | burn (small) abrasions mildly exudating ulcers donate moisture & absorb exudates | dry wound infection full thickness wound                                       | • retains moisture  
• painless removal  
• facilitate autolytic debridement  
• thermal insulation  
• worn for 3-5days-fewer dressing changes | • avoid on high exudate wounds, sinus tracts  
• fragile skin |
| 5. Duoderm Hydroactive HYDOGEL | hydrogel - water or glycerin-based 80-99% water on a nonadherent, cross-linked polymer | pressure ulcer stage II-IV, partial & full thickness wound dermabrasion, painful wound dermal ulcer, radiation burn donor sites necrotic wounds | dry eschar 3rd degree burn heavy bleeding                                      | • retains moisture  
• absorb & retain exudate & harmful components  
• do not damage tissues surrounding exudating wound when dressing changes  
• removal trauma free  
• reduce dead space  
• no frequent change | • dressing non-adherent, need 2ndary dressing  
• 2ndary dressing to secure silver dressing |
| 5. Aquacel HYDROFIBER SODIUM CARBOXY-METHYLCELLULOSE | soft, sterile, nonwoven pad or ribbon with sodium carboxymethylcellulose | moderate to heavily draining wound partial & fully thickness wound pressure ulcer (stage III & IV) surgical wound, donor site dehisced wound, cavity wound wounds with sinus tracts or tunnels | stage I pressure ulcers 3rd degree burn non-exudating wounds | • inhibit pathogen growth, especially antibiotic-resistant strains  
• effective antimicrobial action up to 7 days | • 2ndary dressing to secure silver dressing  
• allergy  
• not to use with topical medication  
• silver turns black when oxidizes, may stain or discolor periwound tissue |
| 6. Aquacel Ag SILVER          | ionic silver for immediate and controlled release                                 | infected/highly colonized wound partial thickness (2nd degree) burn DFU, leg ulcers traumatic wound wounds prone to bleeding oncology wounds with exudate | stage I pressure ulcers 3rd degree burn non-exudating wounds | | |
| 7. Elase FIBRINOLYSIN DESOXYRIBONUCLEASE | fibrinolysin desoxyribonuclease                                                   | enzymatic debridement of necrotic tissue in wound & liquefaction & dissolution of exudates of injured skin & mucous membrane | allergic to bovine compound                                                    | |
Bohler's stirrup
U shaped device to hold a Steinmann pin and applying traction

Crutchfield tongs
To apply skull traction in case of cervical injury

Gigli saw
Twisted wire bone saw, use to cut bone during amputation

Cortical and Cancellous Screws
Used either itself (as lag screw) or with plates, they are non tapping screws, thread tapping should be done in the bone with bone tap

Malleolar Screws
Are self tapping screws

Dynamic Compression Plate (DCP)
Exerts axial compression over # site by combing screw hole geometry while screw insertion. Broad – humerus, femur Narrow – tibia, foream, pelvis

Buttress Plating
(Fr – to strike/shake)
The plate serves to push or buttress the split tibial plateau fragment against displacement and depression. T and L plates are designed to be used as buttress plates

Low Contact Dynamic Compression Plates
Designed to limit vascular compromise by decreasing plate-to-bone contact

Reconstruction Plates
Have notches alongside the plate, which enables bending in 3 dimension to contour towards complex surfaces easily

Dynamic Condylar Plate/Screw
Used in distal end femur # (unicondylar/intercondylar)

Angle Blade Plates
95° angled plates are used in the repair of metaphyseal fractures and reconstruction of the femur. It provides very rigid fixation. Condylar- distal femur, intertrochanteric/sub-trochanteric #. Double angled – femoral valgus repositioning osteotomy

Hip Prosthesis
Used for replacement of head of femur following NOF #. Help patients to early mobilise and eliminate complication such as AVN, non union, fixation failure

Austin Moore – used in NOF# with calcar femorale intact, no osteoporosis; prosthesis has neck, collar and holes, bone cement is not required during application

Thompson – used in NOF# with no calcar, with osteoporosis; prosthesis has NO neck, collar and holes, bone cement is required during application

Bipolar – used in younger patients with non union of femoral neck. It has low incidence of protrusio acetabuli

**Calcar femorale = thin plate of condensed cancellous bone oriented vertically within the medullary canal of the proximal part of the femur, deep to lesser trochanter

ORTHOPAEDICS ESSENTIALS
PART 5 PLATINGS, NAILS AND SCREWS

Together In Delivering Excellence (T.I.D.E.)
### SHOULDER DISLOCATION

**HOPi**
- Fall on the outstretched hand with rotation

**Posterior dislocation (due to internal rotation)**
- Anterior dislocation (due to external rotation of abducted arm)

**Signs**
- Absent of normal contour of shoulder
- Bryan sign – anterior axillary fold looks elongated
- Callaway’s sign – axillary girth get increased
- Duga’s sign – inability to touch opposite shoulder by affected hand
- Hamilton’s ruler test – a ruler can touch lateral epicondyle and acromion process at the same time

**X-ray**
- AP view in internal and external rotation
- Axillary view

**Reduction Methods**

**A. Hippocratic Method**
1. The patient lies supine.
2. The physician’s foot is placed in the patient’s axilla against the chest wall while leaning backward.
3. Slow, steady and gentle longitudinal traction is applied to the affected arm in 30-40° abduction for about one minute.
4. The foot acts as a counterforce and as a lever to push the humeral head laterally while the physician pulls the head toward the patient’s foot along the surface of the glenoid, effectively adducting the affected arm.
5. Put patient on arm sling

**B. Kocher Method**
- T – Traction in line of humerus
- E – External Rotation of humerus
- A – Adduction of arm
- M – Medial rotation

**Complications:**
- Shoulder stiffness
- Axillary nerve damage
- Traumatic OA
- Recurrent dislocations
- Unreduced dislocation

**Plan:** CMR of shoulder joint with Velpeau’s strapping x 3/52 followed by physiotherapy

### ELBOW DISLOCATION

**HOPi**
- Fall on the outstretched hand with elbow slightly flexed

**Types**

**Posterior Dislocation**
- Most common

- Signs
  - Absent of normal contour of shoulder
  - Bryan sign – anterior axillary fold looks elongated
  - Callaway’s sign – axillary girth get increased
  - Duga’s sign – inability to touch opposite shoulder by affected hand
  - Hamilton’s ruler test – a ruler can touch lateral epicondyle and acromion process at the same time

**X-ray**
- AP view in internal and external rotation
- Axillary view

**Reduction Methods**

**A. Hippocratic Method**
- Flex ABDUCT EXTERNAL ROTATION EXTENSION NEUTRAL ROTATION

**B. Allis Method**
1. The patient is supine
2. Affected hip and knee are flexed in 90 degree
3. In neutral rotation of hip, an upward traction is applied along the axis of femur and the same counter traction is given by holding the pelvis.

**C. Stimsons’ gravity method**
- The patient is laid prone with the lower limb hanging over the other end of the table
- Femoral head is pushed down into the acetabulum and at the same time the traction is applied downward along the axis of femur

**Complications:**
- Sciatic nerve injury
- Vascular injury
- Irreducible dislocation
- Recurrent dislocation
- Associated fractures
- AVN (15%)
- Secondary OA
- Myositis ossificans

**Plan:** CMR with fixed skin traction on Thomas splint or POP hip spika x 4-6/52 then partial weight bearing on crutches x 6/52

### HIP DISLOCATION

**Classification:**
- Posterior 70%
- Anterior 10-15%
- Central

**HOPi**
- Usually occurs in an MVA as a result of dash board injury

**Signs**
- Posterior dislocation shows: FLEXION, ADDUCTION, INTERNAL ROTATION deformity with shortening of limb, abnormal gluteal bony mass of head of femur
- X-ray (AP and Lateral view)
  - Femoral head out of acetabulum
  - Lesser trochanter less prominent
  - Broken Shenton’s line
  - ASIS shifted upward
  - Associated fractures

**Reduction Methods (Posterior Dislocation)**
- Should be done ASAP to reduce the chance of AVN of head

**A. Bigelow Method**
- FLEX ABDUCT EXTERNAL ROTATION EXTENSION NEUTRAL ROTATION

**B. Allis Method**
1. The patient is supine
2. Affected hip and knee are flexed in 90 degree
3. In neutral rotation of hip, an upward traction is applied along the axis of femur and the same counter traction is given by holding the pelvis.

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- Vascular injury
- Irreducible dislocation
- Recurrent dislocation
- Associated fractures
- AVN (15%)
- Secondary OA
- Myositis ossificans

**Plan:** CMR with fixed skin traction on Thomas splint or POP hip spika x 4-6/52 then partial weight bearing on crutches x 6/52

**ORTHOPAEDICS ESSENTIALS**
**PART 6 DISLOCATIONS**

Together in delivering Excellence (T.I.D.E.)

Contributors: Dr. Tham, Goh, Poh, Shaun, Justine, Shanthy, Iluda, Miruna, Lin, Phirindha, Fong, Ling Ying, Phoon, Quah
**Calcaneum Fracture**

**Bohler's Angle**

**Q angle**

Increased in genu valgum, external tibia torsion, lateral positioned tibial tuberosity, tight lateral retinaculum

Norm: male = 14° ± 3

females = 17° ± 3

**Gissane's Angle**

**Cobb's angle (Scoliosis)**

**Distal end radius fracture**

2- Radial incline = 22° (12-28)

3- DRUJ space ≤ 4 mm

4- Ulnar variance ± 5 mm

5- Volar tilt = 11° (3-16)

6- Step < 2 mm

7- Gap < 2 mm

**Supracondylar Fracture**

**Baumann's angle**

Norm: 5° – 15°

Excessive = cubitus valgus

Decrease = gunstock deformity

**Wagner Classification of Diabetic Foot Ulcers:**

Grade 0: No ulcer in a high risk foot.

Grade 1: Superficial ulcer involving the full skin thickness but not underlying tissues.

Grade 2: Deep ulcer, penetrating down to ligaments and muscle, but no bone involvement or abscess formation.

Grade 3: Deep ulcer with cellulitis or abscess formation, often with osteomyelitis.

Grade 4: Localized gangrene (forefoot).

Grade 5: Extensive gangrene involving the whole foot.

**Carrying angle**

**Orthopaedics Essentials**

**Part 7 (a) Angles in Orthopaedics (b) Diabetic Foot**

**Amputations**

**Hemipelvectomy**

Hip disarticulation

Above knee A.—Ideally 12 cm proximal to knee joint to leave room for the artificial joint.

(Preferred length in adult is 25 cm.)

Gritli Stroke A.—Trimmed patella is opposed to the trimmed femoral condyle.

Knee disarticulation

Below knee A.—Ideal bone length 12.5–17.5 cm or

2.5 cm ± 30 cm of body height.

Syme’s A.—Through 0.6 cm. proximal to ankle joint.

Firogoff’s A.—Only anterior part of calcaneus is removed.

Boyd’s A.—Takedown + calcaneocubial arthrodesis.

Chopart’s A.—Through talonaviclar & calcaneocuboid joint.

Lisfranc’s A.—Through tarsal-metatarsal joint.

Midtarsal A.—Through midtarsal shaft.

**Rays Amputation**—Removal of toes with metatarsal from tarsometatarsal joint

**Contributors:** Dr. Tham, Goh, Poh, Shaun, Justine, Shanthy, Huda, Miruna, Lin, Phrindha, Fong, Phoon, Quah

Together in Delivering Excellence (T.I.D.E.)
**ORTHOPAEDICS ESSENTIALS**

**PART 8 SPLINTS, CASTS, PLASTERS, FRAMES**

**Upper limb and Spine**

- **DUNLOP TRACTION**
  Used in transcondylar or supracondylar fracture of the humerus in children.

- **HEAD HALTER TRACTION**
  Used in cervical spine injury.

- **CRUSH FIELD TRACTION**
  Used in cervical spine injury.

- **HALO-PELVIS TRACTION**
  Used in scoliosis.

- **SCAPHOID CAST**
  Applied from below elbow proximal to knuckle distally and incorporating proximal phalanx of thumb. The wrist is held in dorsiflexion (glass holding position).

- **SCAPHOID CAST**
  Applied from below elbow proximal to knuckle distally and incorporating proximal phalanx of thumb. The wrist is held in dorsiflexion (glass holding position).

- **BROAD ARMSLING AND FIGURE ‘8’ STRAPPING**
  Used in undisplaced and displaced clavicle fracture respectively.

- **PERKINS TRACTION**
  Used in femur shaft # in adult.

- **BUCK’S TRACTION**
  Apply skin traction in femur shaft #, NOF #, acetabulum # after reduction of hip dislocation, to correct minor deformity of hip and knee.

- **GALLOW’S/BRYANT’S TRACTION**
  Used in femur shaft # in children <2 yrs.

- **HAMILTON-RUSSELL TRACTION**
  Used in femur shaft # in adult, trochanteric #.

- **HAMILTON-RUSSELL TRACTION**
  Used in femur shaft # in adult.

- **BÖHLER BRAUN FRAME**
  Apparatus used for application of skeletal traction of lower limb. It may be used with transcondylar, tibial or calcaneal pins.

- **PERKINS TRACTION**
  Used in femur shaft # in adult.

- **CALCANEAL TRACTION**
  Used in open # of ankle joint/leg.

- **BÖHLER BRAUN FRAME**
  Apparatus used for application of skeletal traction of lower limb. It may be used with transcondylar, tibial or calcaneal pins.

- **TAMARW5B/GKS2013/4-**

**Lower limb and Pelvis**

- **BUCK’S TRACTION**
  Apply skin traction in femur shaft #, NOF #, acetabulum # after reduction of hip dislocation, to correct minor deformity of hip and knee.

- **CALCANEAL TRACTION**
  Used in open # of ankle joint/leg.

- **BÖHLER BRAUN FRAME**
  Apparatus used for application of skeletal traction of lower limb. It may be used with transcondylar, tibial or calcaneal pins.

- **PELVIC BINDER**
  Used acutely in management of exsanguinating pelvic trauma, by applying large amount of compressive force to the pelvis to reduce the volume of the pelvis.

- **HEAD HALTER TRACTION**
  Used in cervical spine injury.

- **THOMAS SPLINT**
  (with and without sling) Temporary stabilisation of femoral shaft fracture.

- **BALKAN FRAME**
  A frame employed in the treatment of fractured bones of extremities that provides overhead weights and pulleys for suspension, traction, and continuous extension of the splinted fracture limb.

- **ROBERT JONES DRESSING**
  A tape stirrup is applied to the foot before the bandage is started. Cotton roll is wrapped around a forelimb after the application of the tape stirrup. Elastic gauze is then applied firmly bind the cotton to the leg. Elastic tape is then used to complete the dressing.

- **POP CAST & SLAB**
  Active ingredient of Plaster of Paris is Gypsum CaSO$_4$·2H$_2$O. Slab only covers a part of circumferential of a limb whereas a cast covers whole of the limb circumference.

- **HAMMOCK TRACTION**
  Used in pelvis # with rotational instability e.g. open book, Malgaigne # (both pubic rami+ posterior SI complex/sacrum #), and bucket handle injury.

- **CRUSH FIELD TRACTION**
  Used in cervical spine injury.

- **THOMAS SPLINT**
  (with and without sling) Temporary stabilisation of femoral shaft fracture.

- **BOLS OF SAND**
  Used for displacement of fractures of the pelvis.

- **ROBERT JONES DRESSING**
  A tape stirrup is applied to the foot before the bandage is started. Cotton roll is wrapped around a forelimb after the application of the tape stirrup. Elastic gauze is then applied firmly bind the cotton to the leg. Elastic tape is then used to complete the dressing.

- **MILWAUKEE BRACE**
  For dorsal scoliosis.

- **BOSTON BRACE**
  For lumbar scoliosis.

- **THOMAS SPLINT**
  (with and without sling) Temporary stabilisation of femoral shaft fracture.

- **BOLS OF SAND**
  Used for displacement of fractures of the pelvis.

- **HADDON CAST**
  Used in undisplaced and displaced clavicle fracture respectively.

- **MILWAUKEE BRACE**
  For dorsal scoliosis.

- **BOSTON BRACE**
  For lumbar scoliosis.

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- **BOLS OF SAND**
  Used for displacement of fractures of the pelvis.

- **HADDON CAST**
  Used in undisplaced and displaced clavicle fracture respectively.

- **MILWAUKEE BRACE**
  For dorsal scoliosis.

- **BOSTON BRACE**
  For lumbar scoliosis.

- **THOMAS SPLINT**
  (with and without sling) Temporary stabilisation of femoral shaft fracture.

- **BOLS OF SAND**
  Used for displacement of fractures of the pelvis.

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  Used for displacement of fractures of the pelvis.
**COMPARTMENT SYNDROME**

**Definition:** An increase in compartment pressure to the point where tissue perfusion is impaired.

**Causes**
- Fracture (tibia, radius)
- Circumferential burns
- Tight dressings
- Crush injuries
- Bleeding (minor injury while anticoagulated)
- Repetition injury

**Early signs**
- Tight
- Escalating pain
- Pain with passive stretch of the involved muscle

**Late signs -6P**
- Pain
- Pallor
- Pulselessness
- Paresthesia
- Paralysis
- Poikilothermia

**Initial Management**
- Remove all circumferential dressings/casts
- Ensure leg is at level of the heart - the affected part should not be elevated above the level of the heart because this maneuver does not improve venous outflow and reduces arterial inflow
- Remove any traction

**Definitive management**
- Compartment fasciotomy-2 incisions, 15 cm long
- Delay>12 hr. often results in irreversible muscle and nerve damage in that compartment

**Complications**
- If left untreated: rhabdomyolysis and kidney failure

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**FAT EMBOLISM SYNDROME**

**Definition:** Syndrome caused by presence of fat globules in the lung parenchyma and peripheral circulation. Usually subclinical event after long bone fractures in young adults (tibia/fibula) and hip fractures in elderly

**Symptoms**
- Syndrome usually appear in 1-2 days after an acute injury or after IM nailing.

**Diagnosis:** Based on clinical features after excluding other causes

**Gurd's Diagnostic Criteria**
- (at least 1 major + 4 minor criteria)

**Major Criteria**
1. Respiratory insufficiency (PO2 < 60mmHg)
2. Neurological depression/restless
3. Skin - Petechial rash (axillary/subconjuctiva)

**Minor Criteria**
- Tachycardia
- Fever
- Jaundice
- Retinal changes
- Renal changes
- Laboratory Features
  - Microglobulinemia (required)
  - Thrombocytopenia
  - Elevated ESR
- Anemia
- Urine for fat globule

**Management:**
1. Oxygenation.
2. Fluid resuscitation
   - 6 pints NS/3 hours followed by 3 pints of NS/2 hours followed by 1 pint NS over 1 hour x 3
3. Surgical Care - early stabilization of long bone fractures

**Complications**
- If untreated: rhabdomyolysis and kidney failure

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**NECROTISING FASCIITIS**

Rapidly progressive inflammatory infection of the fascia, with secondary necrosis of the subcutaneous tissues. The speed of spread is directly proportional to the thickness of the subcutaneous layer. Necrotizing fasciitis moves along the fascial plane.

**Diagnosis:** Requires a high degree of suspicion
- H/O antecedent trauma or surgery
- Intense pain over the involved skin and underlying muscle; over the next several hours to days, the local pain progresses to anesthesia
- Fever, malaise, and myalgia
- Edema extending beyond the area of erythema, skin vesicles, and crepitus
- Comorbid factors, including DM

**Types:**
- I-Polymicrobial
- II-Group A Streptococcus
- III-Gas gangrene

**Complications**
- Renal failure
- Septic shock with cardiovascular collapse
- Scarring with cosmetic deformity
- Limb loss
- Sepsis
- Toxic shock syndrome

**Management:**
- Prompt surgical debridement is continued until tissue necrosis ceases and the growth of fresh viable tissue is observed.
- Antibiotic (broad spectrum covering both gram positive and negative)
- Hyperbaric oxygen therapy (HBOT)

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**SPINAL SHOCK**

Temporary loss of spinal cord function and reflex activity below the level of spinal cord injury, characterised by bradycardia, hypotension (due to loss of sympathetic tone), and an absent bulbocavaneous reflex

**Mechanism**
- Peripheral neurons become temporarily unresponsive to brain stimuli
- Loss of sympathetic tone and decrease systemic vascular resistance
- Decreased preload = decreased cardiac output

**Treatment**
- Immobilisation
- Neurological charting (until return of bulbocavaneous reflex)
- Early surgical intervention
- Swan-Ganz monitoring for careful fluid Mx
- Vasopressors
- Fluid/blood resuscitation
- Haemostasis

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**DEEP VEIN THROMBOSIS**

**Wells Criteria:**
- Active cancer (1)
- Paralysis/paralysis/recent immobilisation of LL (1)
- Recent bed ridden x3/7/major surgery x4/52 (1)
- Localised tenderness over deep vein (1)
- Entire leg swollen (1)
- Calves swelling >3cm compare to asymptomatic limb (10 cm below tibial tubercle) (1)
- Pitting oedema (1)
- Collateral superficial vein (1)
- Alternative diagnosis (1)

**Interpretation:**
- <0 - low risk (3% probability DVT)
- 1-2 – moderate risk (17% probability DVT)
- ≥3 – high risk (75% probability DVT)

**Management:**
- Heparin/LMWH
- Compression stocking

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**ORTHOPAEDICS ESSENTIALS**

**PART 9 ORTHOPAEDIC EMERGENCIES**

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