

ORTHOPAEDIC EMERGENCIES IN GENERAL PRACTICE

Jean-Claude Theis

Section of Orthopaedics
Department of Surgical Sciences
Dunedin School of Medicine and Hospital
Dunedin

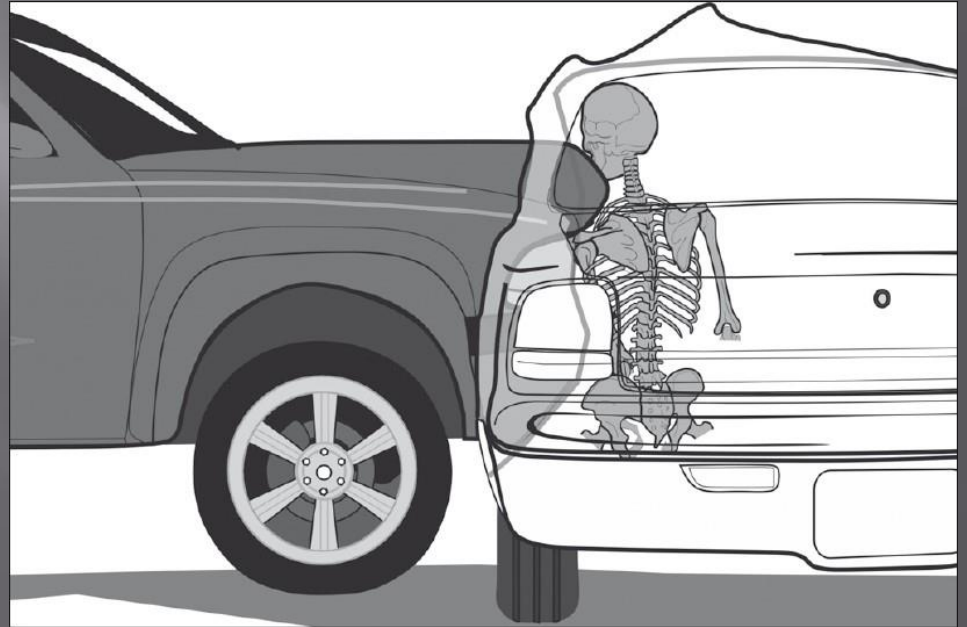
Life threatening emergencies

- ▣ Rare
- ▣ Unstable pelvic fractures
- ▣ OC1C2 fracture dislocations
- ▣ Open arterial limb injuries
- ▣ Serious necrotising infections
- ▣ Spinal infections

Atlanto occipital dislocation



Figure 8. Atlanto-occipital dislocation.



Limb threatening emergencies

- ▣ More common
- ▣ Open fracture
- ▣ Knee dislocation
- ▣ Compartment syndrome
- ▣ Acute spinal cord/cauda equina compression
- ▣ Penetrating limb injuries

Non limb threatening emergencies

- ▣ Common
- ▣ Fracture and dislocations
- ▣ Bone and joint infections
- ▣ Tendon and ligament injuries
- ▣ Nerve injuries

Musculoskeletal injury

▣ Priorities:

1. Save the patient's life
2. Save the endangered limb/spine
3. Save the function of the limb

Most important MSK injury to detect quickly is an unstable pelvic fracture

Can lead to massive life threatening internal bleeding

First aid management

- ▣ Bleeding control
- ▣ Restore circulation to limb
- ▣ Immobilisation
- ▣ Pain control
- ▣ Sterile dressing to open wounds
- ▣ Antibiotics
- ▣ Tetanus

- ▣ Bleeding control by compression rather than tourniquet
- ▣ If no pulse correct limb deformity by traction
- ▣ Immobilise joint above and below
- ▣ Pain relief using narcotics and/or nerve blocs

Pelvic fractures

- ▣ Mortality rate 10-20%
- ▣ Mortality 38% if patient hypotensive and 50% if open fracture
- ▣ Neurologic damage 60%
- ▣ Associated injuries chest, abdominal, urological, spine etc
- ▣ Reduce pelvic volume via sheet wrap (applied level of trochanters)



Femur splinting



Plaster of Paris



Splints/synthetic casting



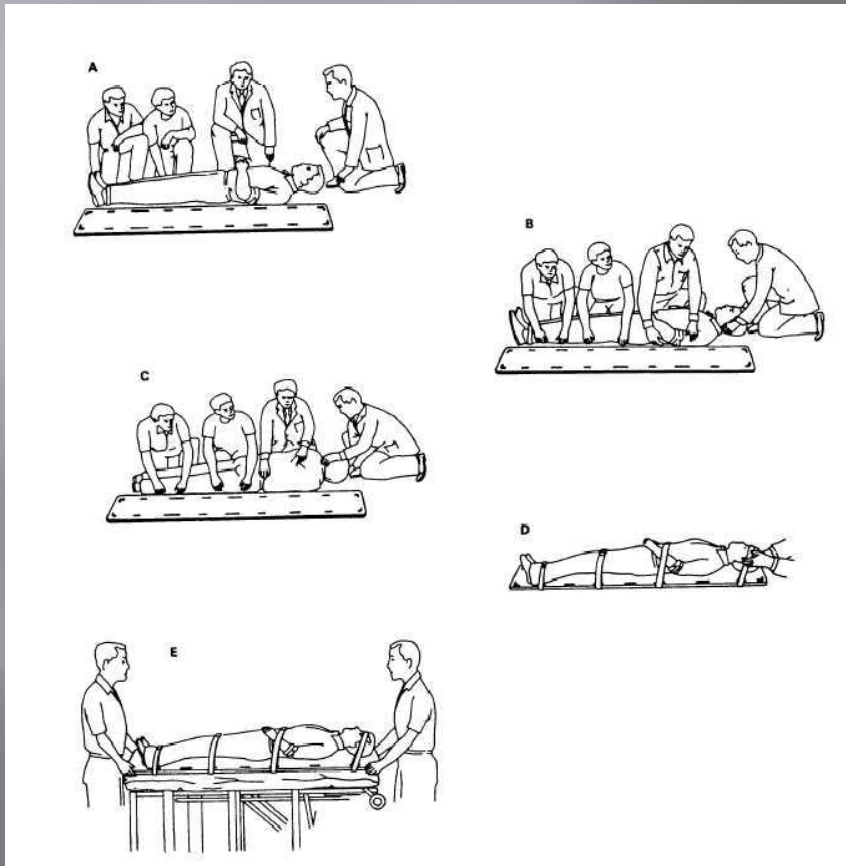
Scotchcast one step splints



Neck braces



Spinal board



Trauma evaluation

- ▣ ATLS = Advanced Trauma and Life Support
- ▣ Standardised protocol for the evaluation and treatment of victims of trauma
- ▣ Airway (+ cervical spine immobilisation)
- ▣ Breathing (+ high flow oxygen)
- ▣ Circulation
- ▣ Disability
- ▣ Exposure

Primary survey

- ▣ Rapid assessment of ABC's and addressing life threatening problems
- ▣ Large bore IV access for fluid replacement if haemodynamic instability
- ▣ Trauma Xrays:
 - Chest
 - Pelvis
 - Lateral C spine

Secondary survey Other non life threatening injuries

- ▣ Other non life threatening injuries
- ▣ Orthopaedic assessment limbs, pelvis and spine
 - Dress wounds
 - Neurovascular assessment
 - Splint fractures
- ▣ Obtain X-rays

Radiographic assessment

- ▣ AP and lateral X-rays showing joint above and below on 1 film
- ▣ No X-ray puzzles!!
- ▣ Beware of inadequate X-rays (cervical spine, shoulder, elbow, hip etc.)
- ▣ Repeat films if poor quality or not showing the entire bone

Diagnosis open fractures

- ▣ Open fracture versus closed fracture with overlying skin laceration?
 - Bone visible in depth of wound
 - Blood with fat globules oozing from wound
- ▣ Open joint injury
 - Air in joint on radiographs
- ▣ Beware of pelvis fractures open into rectum/vagina

Classification open fractures

Classification of Open Fracture (Gustilo and Anderson)

Type	Wound	Level of Contamination	Soft Tissue Injury	Bone Injury
I	<1 cm long	Clean	Minimal	Simple, minimal comminution
II	>1 cm long	Moderate	Moderate, some muscle damage	Moderate comminution
III ^a				
A	Usually >10 cm long	High	Severe with crushing	Usually comminuted: soft tissue coverage of bone possible
B	Usually >10 cm long	High	Very severe loss of coverage; usually requires soft tissue reconstructive surgery	Bone coverage poor; variable, may be moderate to severe comminution
C	Usually >10 cm long	High	Very severe loss of coverage plus vascular injury requiring repair; may require soft tissue reconstructive surgery	Bone coverage poor; variable, may be moderate to severe comminution

* Segmental fractures, farmyard injuries, fractures occurring in a highly contaminated environment, shotgun wounds, or high-velocity gunshot wounds automatically result in classification as type III open fracture.

From Chapman MW. The role of intramedullary fixation in open fractures. *Clin Orthop* 1986;212:27.

Open fracture issues

- ▣ Soft tissue damage often more extensive than at first sight
 - Wound coverage?
 - Muscle/tendon injury
- ▣ Contamination
- ▣ Neurovascular injury
- ▣ Bone comminution/loss

Initial treatment

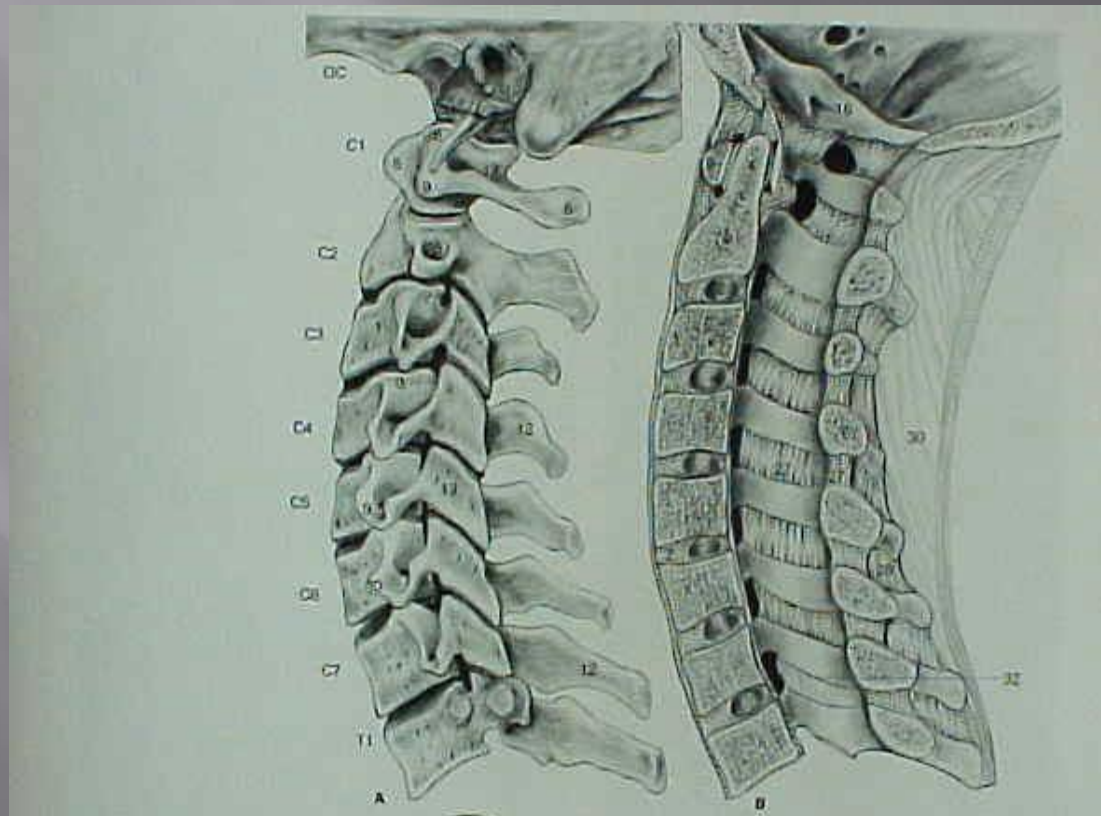
- ▣ Remove foreign material
- ▣ Reduce bacterial contamination by
 - Irrigation
 - Normal saline + antiseptic solution (Betadine)
 - Large quantities up to 2 litres
- ▣ Apply sterile saline soaked dressing + compression bandage
- ▣ Immobilise
- ▣ Antibiotics and tetanus

Antibiotics in open fractures

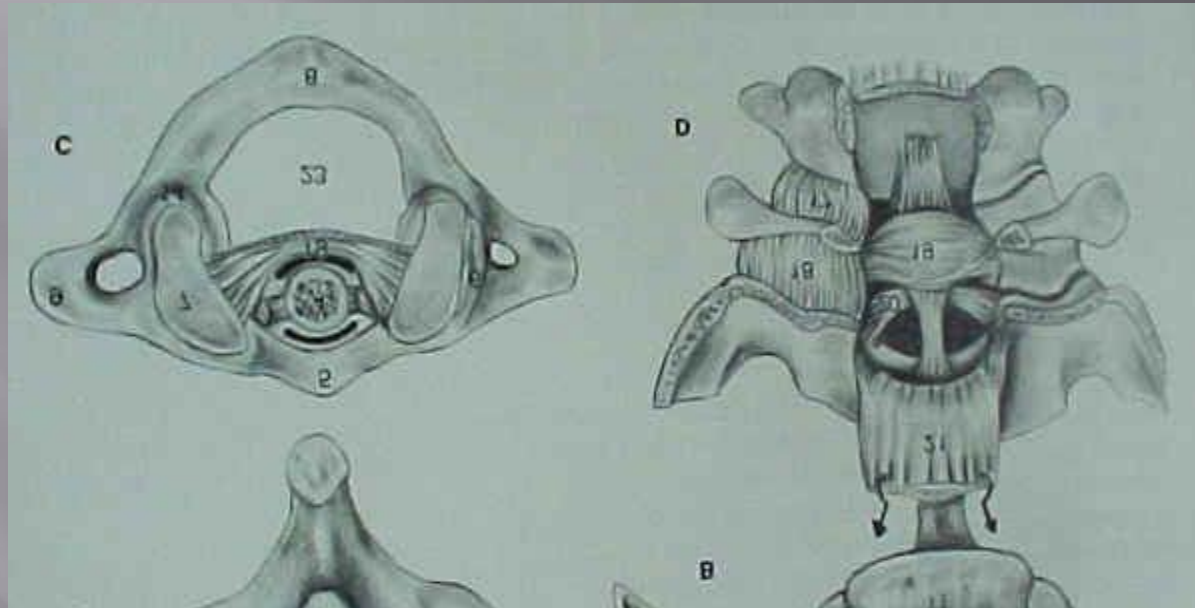
- ▣ Should cover Gram positive, negative and anaerobes in some situations
- ▣ Combination first generation cephalosporin (cefazolin) and aminoglycoside (gentamycin, tobramycin)
- ▣ Substitutes for amynoglycoside: quinolones, 3rd generation cephalosporin etc)
- ▣ Anaerobic cover for farm, vascular injuries etc: penicillin, ampicillin

Cervical spine

ANATOMY

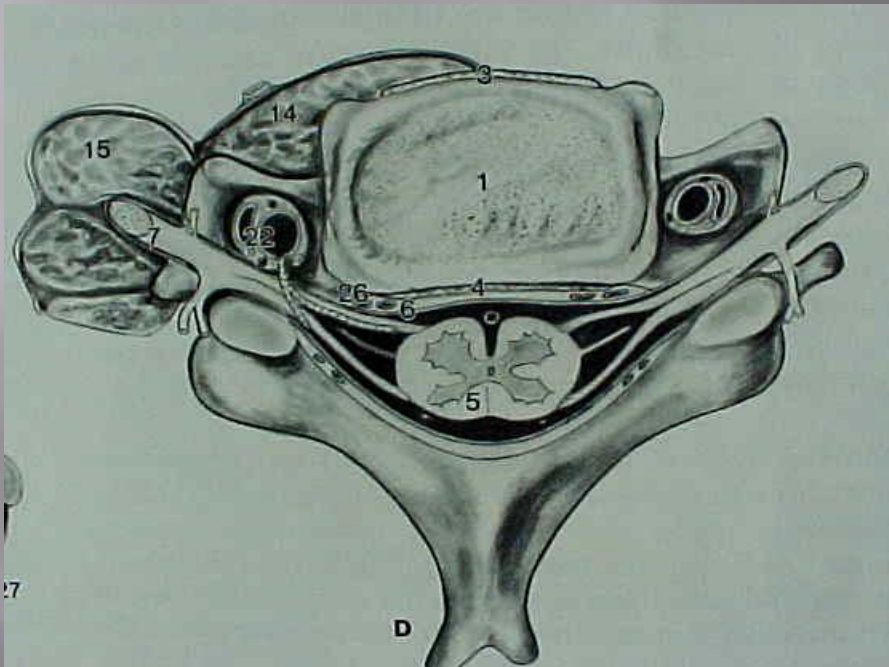


ANATOMY C1 C2



- ❑ cruciform ligament
- ❑ alar ligaments
- ❑ apical ligament

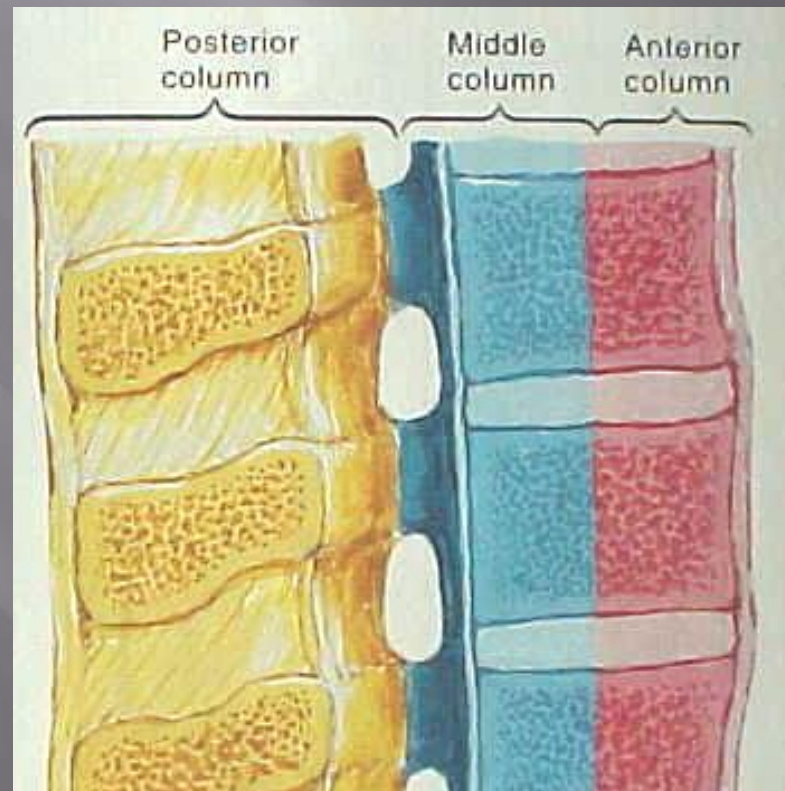
ANATOMY NEURAL

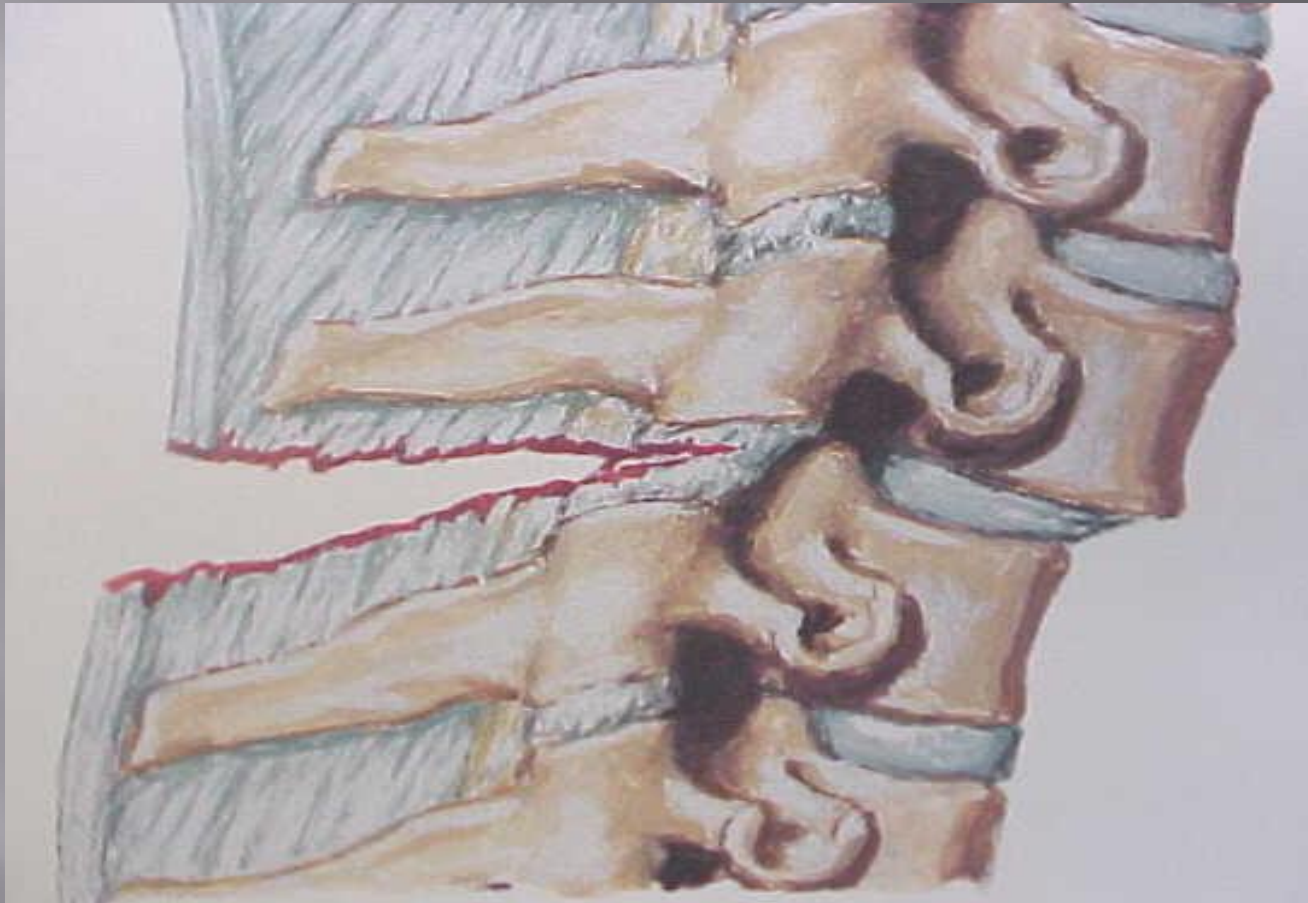


- ▣ Cervical cord
- ▣ Nerve roots
- ▣ Vertebral artery

ANATOMY

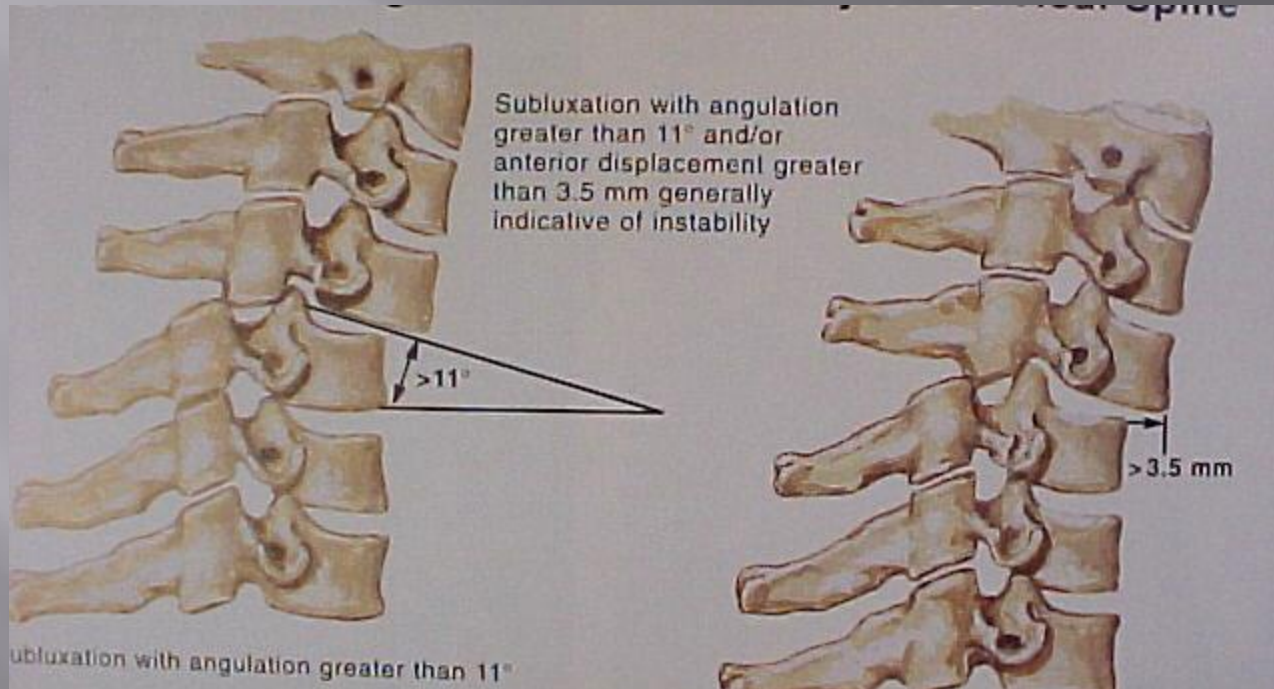
▣ 3 column concept





▣ 2 or 3 column injury

Radiological signs of instability

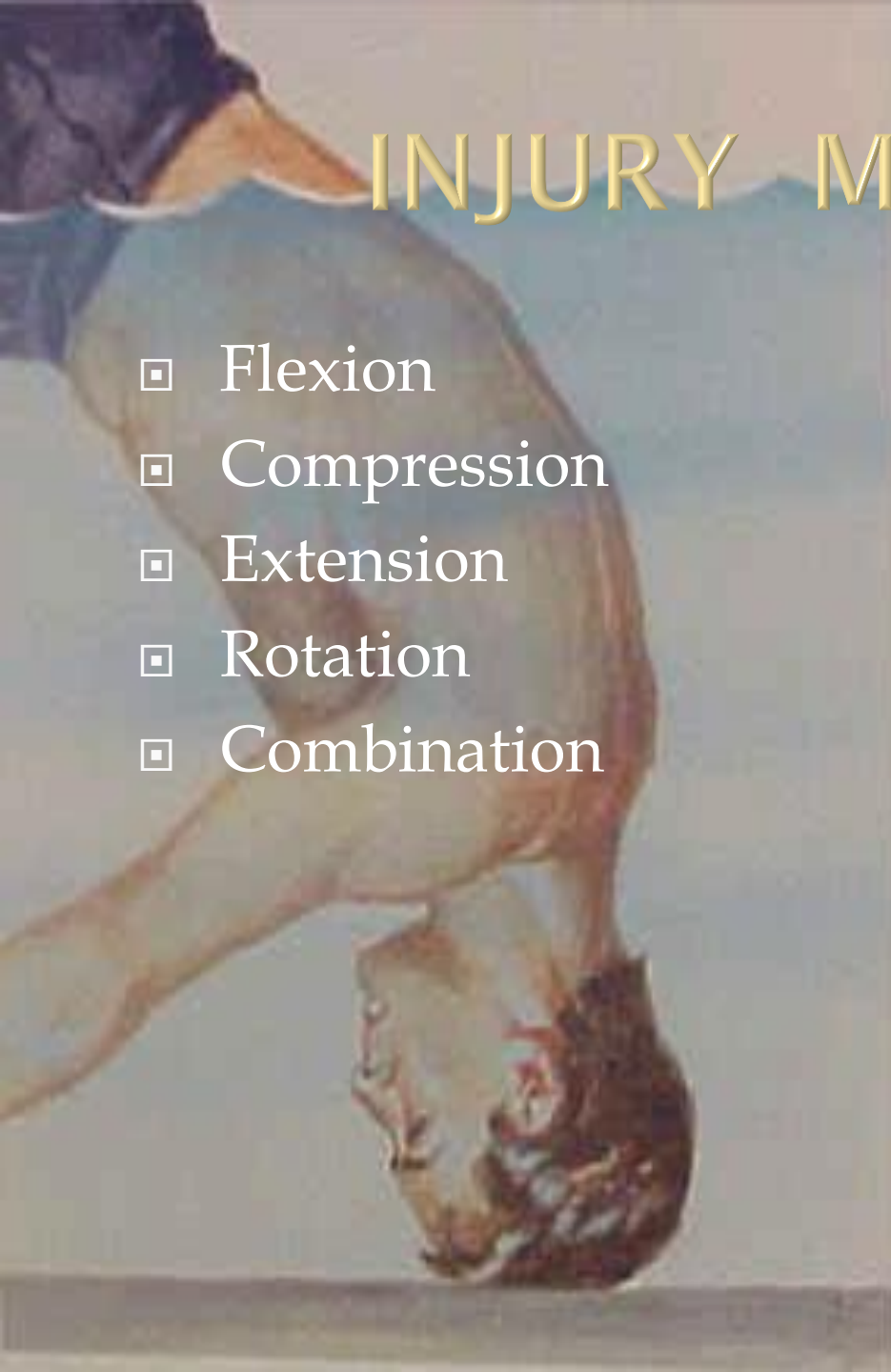


- ❑ Spine potentially unstable if 2 or more columns are disrupted!

INJURY MECHANISM

- ▣ Flexion
- ▣ Compression
- ▣ Extension
- ▣ Rotation
- ▣ Combination

- ▣ Fall from height
- ▣ Direct blow to head
- ▣ Sports
- ▣ MVA



CLINICAL ASSESSMENT

▣ Roadside

- first aid principles apply 'ABCSL'
- injured conscious - Neck pain? sensation/motor power limbs?

if positive apply hard collar

- injured unconscious or decreased level of consciousness

apply hard collar

careful airway management

safety position

CLINICAL ASSESSMENT cont

- ▣ Local hospital/GP surgery
 - other acute injuries requiring transfer
leave hard collar on and let them sort it out
 - isolated injury
you need to rule out neck injury

HOW TO RULE OUT NECK INJURY

- ▣ Medico legal! Cover yourself
- ▣ History and associated features
 - MVA thrown out
 - MBA helmet?
 - Head/facial injury
 - Sport
 - Fall from height
 - Intoxication/drugs etc

HOW TO RULE OUT NECK INJURY

cont

- ▣ Electric shock type feeling
- ▣ Transient paraesthesiae/weakness
- ▣ shortly after injury
- ▣ Pain
 - not always proportional to severity of injury
- ▣ Numbness/motor weakness limbs
- ▣ Able to stand up/hold head unsupported after injury

HOW TO RULE OUT NECK INJURY

cont

- ▣ Clinical criteria to rule out serious injury (NEXUS study NEJM 94: July 2000)
 - no posterior midline tenderness
 - no focal neurologic deficit
 - normal level of consciousness
 - no evidence of intoxication
 - isolated injury

CLINICAL EXAMINATION

- ▣ Remove cervical collar
- ▣ Look
 - head position torticollis ?C1C2
 - laceration face forehead ?odontoid
 - swelling back neck 3 column injury?
- ▣ Feel
 - posterior midline tenderness
- ▣ Move
 - active ROM
- ▣ Neuro exam

RADIOLOGICAL ASSESSMENT

▣ STANDARD VIEWS

- AP
- Lat
- Obliques left and right

▣ OTHER VIEWS

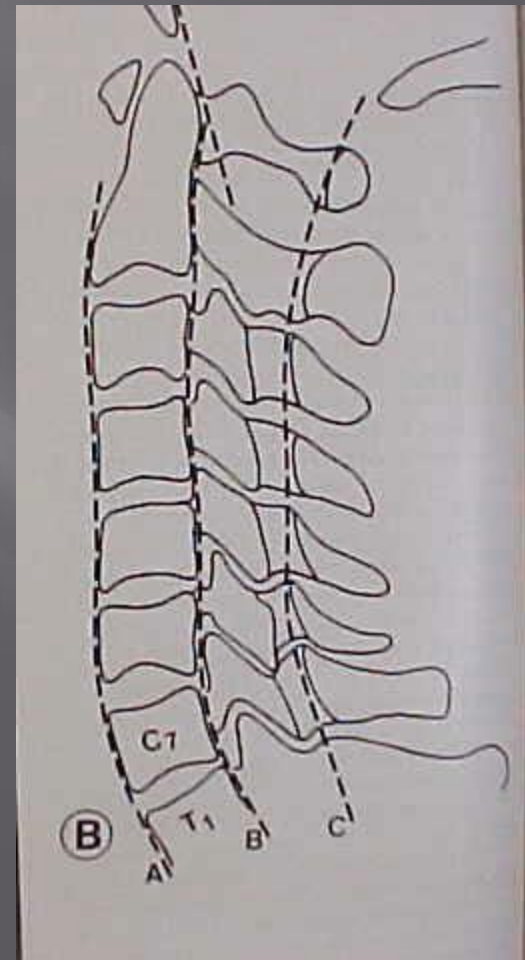
- Open Mouth (C1 C2)
- Swimmers (C7 T1)
- Flexion-Extension?

BEWARE !!

- ▣ Interpretation of cervical spine Xrays is difficult
- ▣ Quality of acute films often poor
- ▣ Get help from Radiologist/orthopaedic surgeon
- ▣ Teleradiology useful

RADIOLOGICAL ASSESSMENT

- ▣ A=Anterior spinal line
- ▣ B=Posterior spinal line
- ▣ C=Spinolaminar curve



WHAT TO LOOK FOR

- ▣ Displacement vertebral body
- ▣ Prevertebral swelling
- ▣ Shape vertebral body
- ▣ 'Kink' posterior spinal line
- ▣ Increased interspinous distance
- ▣ 'Tear drop' fractures
- ▣ Facet joints oblique views
- ▣ Spinous processes (use bright light)
- ▣ C1C2 AND C7T1



RADIOLOGICAL ASSESSMENT

- ▣ DIFFICULTIES!
 - C1 C2
 - Unilateral facet dislocation
 - C7 T1
- ▣ CT SCAN
- ▣ MRI SCAN







RADIOLOGICAL ASSESSMENT

cont

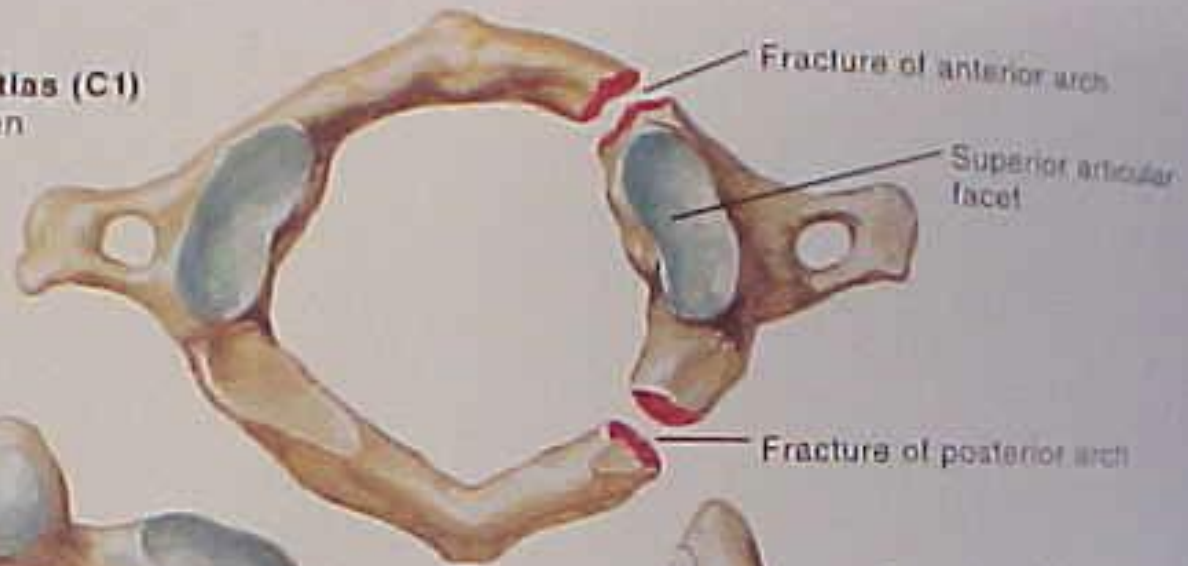
- ▣ Flexion-extension views?
 - Static
 - Dynamic (under fluoroscopy)
- ▣ Safe in conscious patient
- ▣ Unconscious patient?
 - Use fluoroscopy
 - MRI safer option

INJURY TYPES

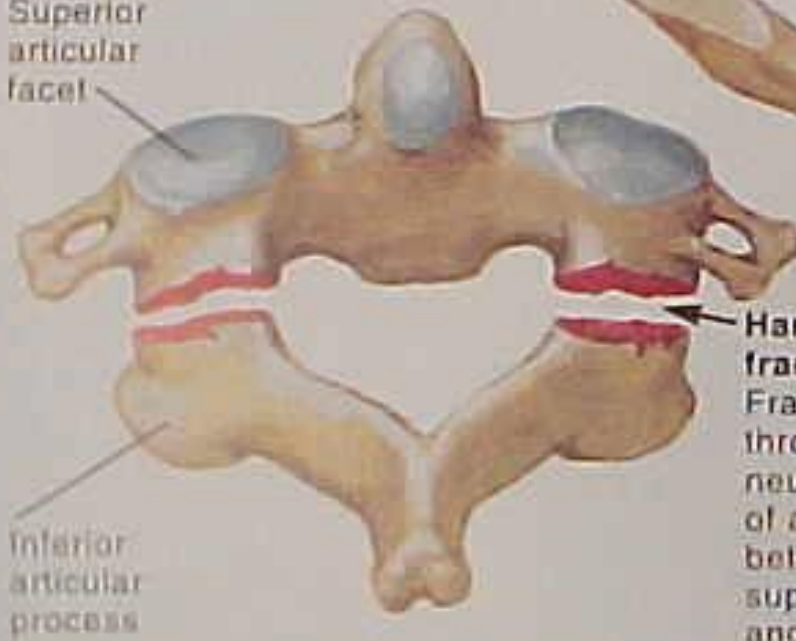
- ▣ Upper cervical
 - C1 ant/post arch Jefferson
lat mass
blow out
 - C2 dislocation C1 on C2
rupture transverse lig (lat Xray
distance peg ant arch C1 >5 mm)
neural arch Hangmann's
odontoid peg (type 1,2,3)
 - C1C2 rotatory subluxation
diagnosis difficult
common in children

Jefferson fracture of atlas (C1)

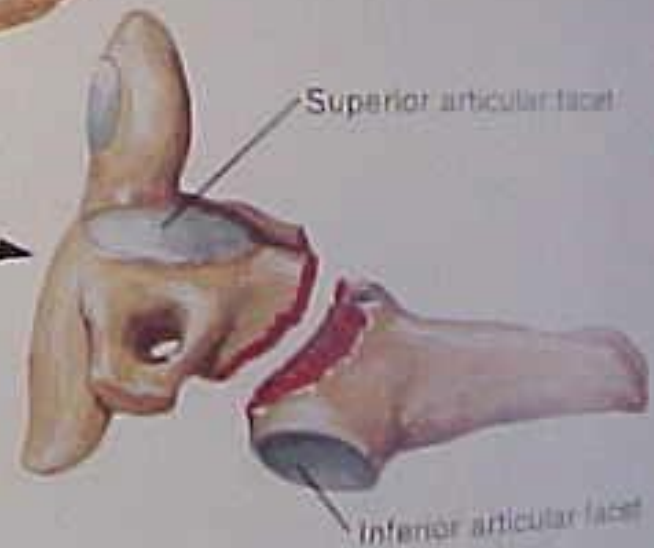
Each arch may be broken in one or more places



Superior articular facet



Hangman fracture
Fracture through neural arch of axis (C2), between superior and inferior articular facets



Process

Type I. Fracture of

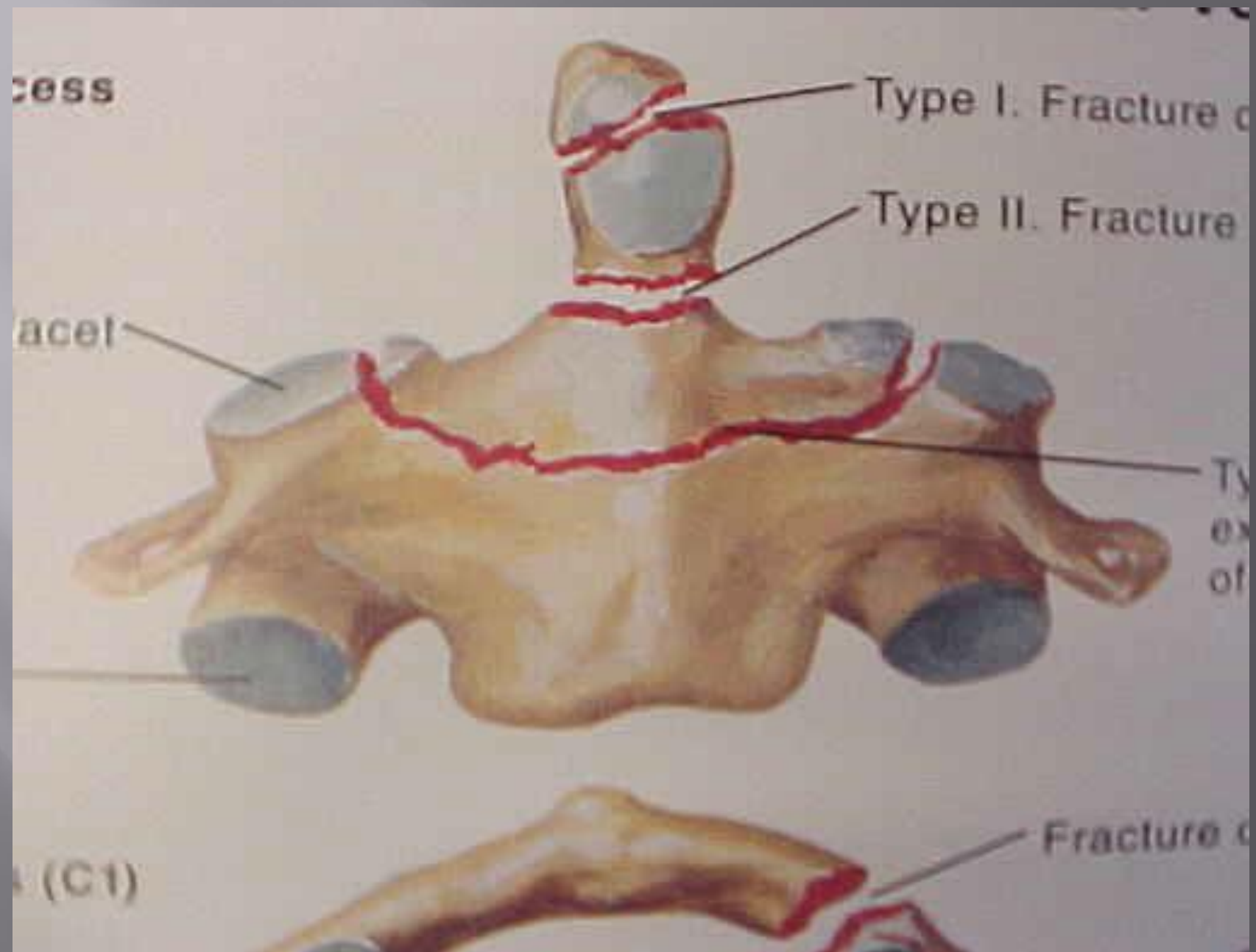
Type II. Fracture

acet

Type
ex
of

(C1)

Fracture of





FRACTURE TYPES cont

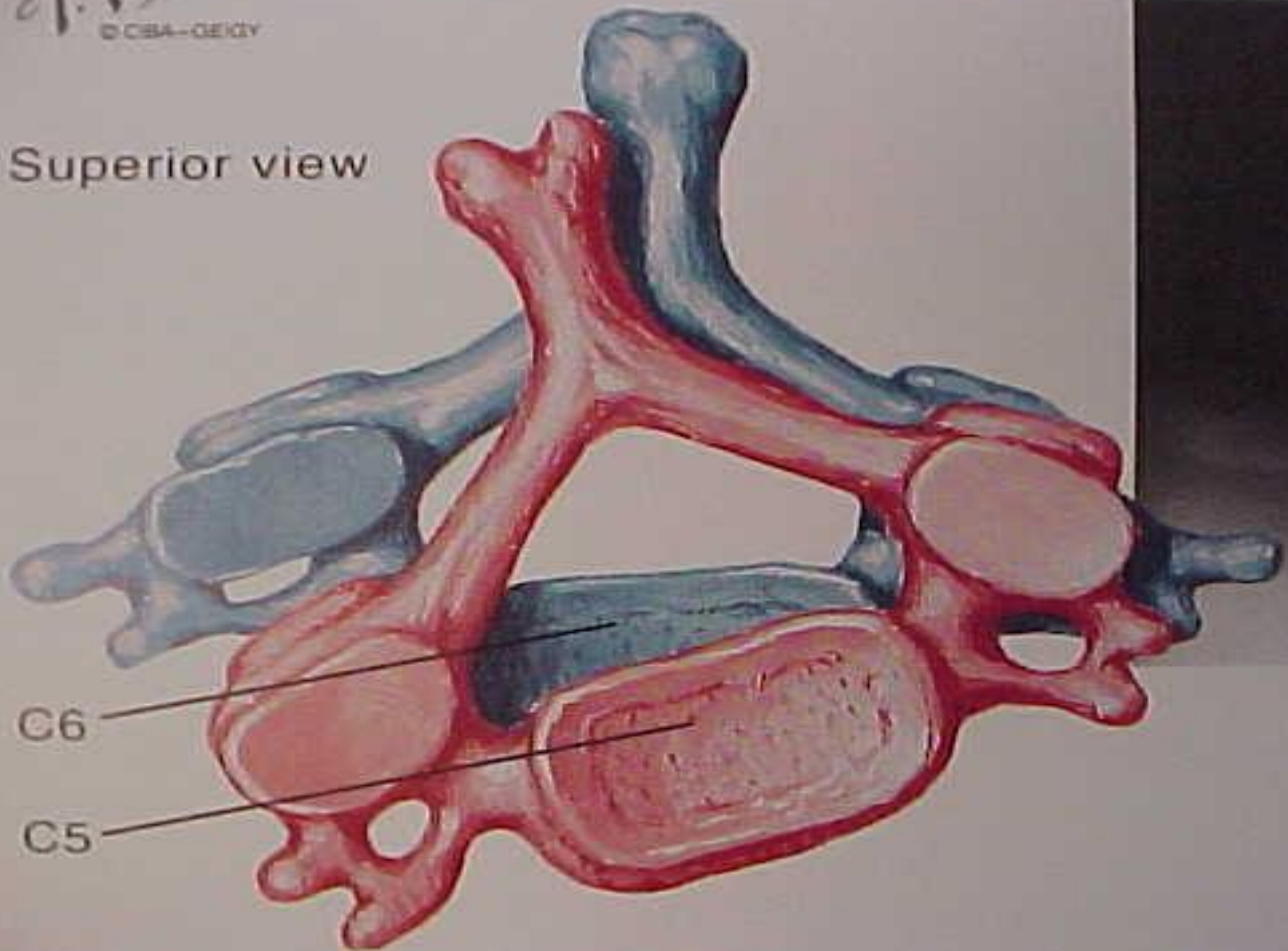
- ▣ Mid and Lower cervical
 - simple wedge compression #
 - dislocations
 - rotational # dislocations
 - extension injuries
 - burst #
 - shear #

Stable or unstable that's the question

CERVICAL DISLOCATIONS

- ▣ Unilateral facet dislocation
 - often associated with facet #
 - 30% nerve root injury
 - head tilted to the side of lesion
 - x rays < 25% displacement
 - spinous process deviated to the abnormal side
- ▣ Bilateral facet dislocation
 - cord injury common
 - xrays >50% displacement
 - MRI prior to reduction disc disruption

Superior view



Anterior rotational dislocation of C5 on C6 with uni

PAEDIATRIC CERVICAL SPINE INJURIES

J Ped Surg 36(2) Feb 2001

- ▣ National Pediatric Trauma Registry
- ▣ 75172 cases
- ▣ 1098 cervical spine injury 1.5%
- ▣ Mean age 11+/-5 years
- ▣ 61% boys
- ▣ 30% neurologic injury 50% no evidence of bony injury
- ▣ 24% complete 76% incomplete cord lesion
- ▣ Mortality upper 23% (atlanto axial dislocation)
lower 4%

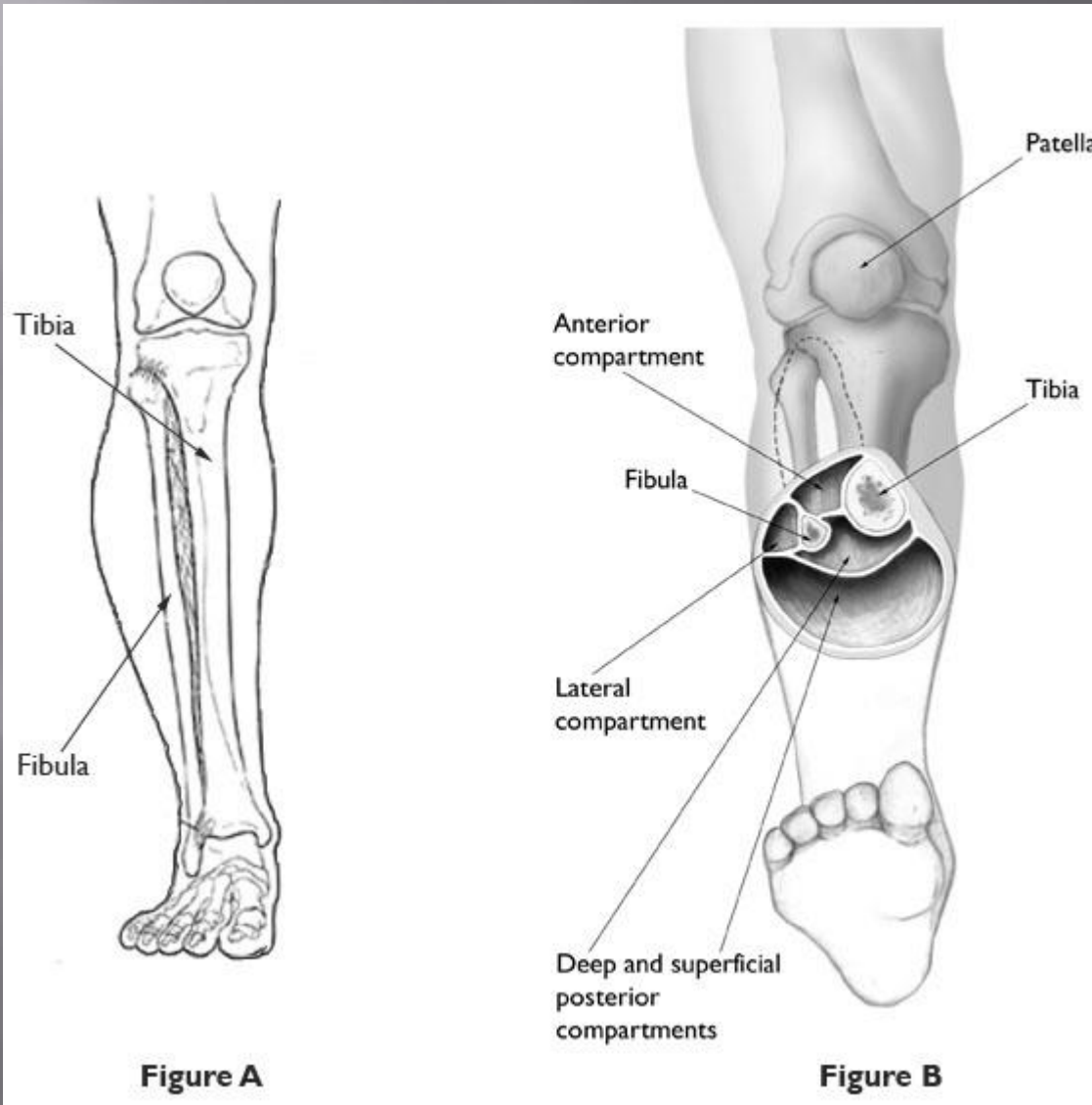
CERVICAL SPINE XRAYs IN CHILDREN

- ▣ Evaluation difficult
 - numerous epiphyseal centres
 - normal wedge shaped bodies
 - pseudosubluxation due to horizontal angle of facet joints
- ▣ Get specialist advice

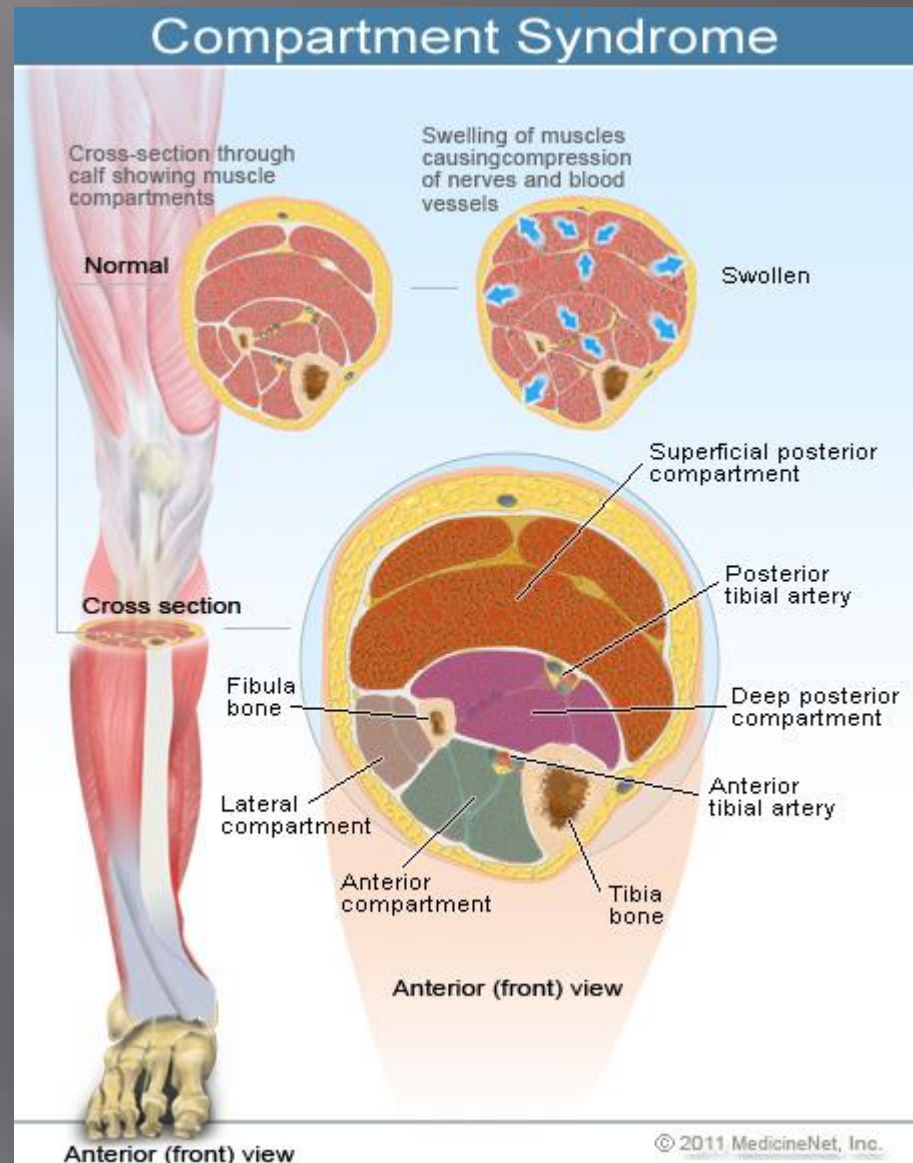
CORTICOSTEROIDS IN SPINAL CORD INJURY

- ▣ High dose IV methyl prednisolone in acute SCI remains controversial
- ▣ 1990 NASCIS study NEJM reported an increase in spinal cord recovery
- ▣ Findings and data interpretation has been questioned
- ▣ Recent systematic review does not support its use

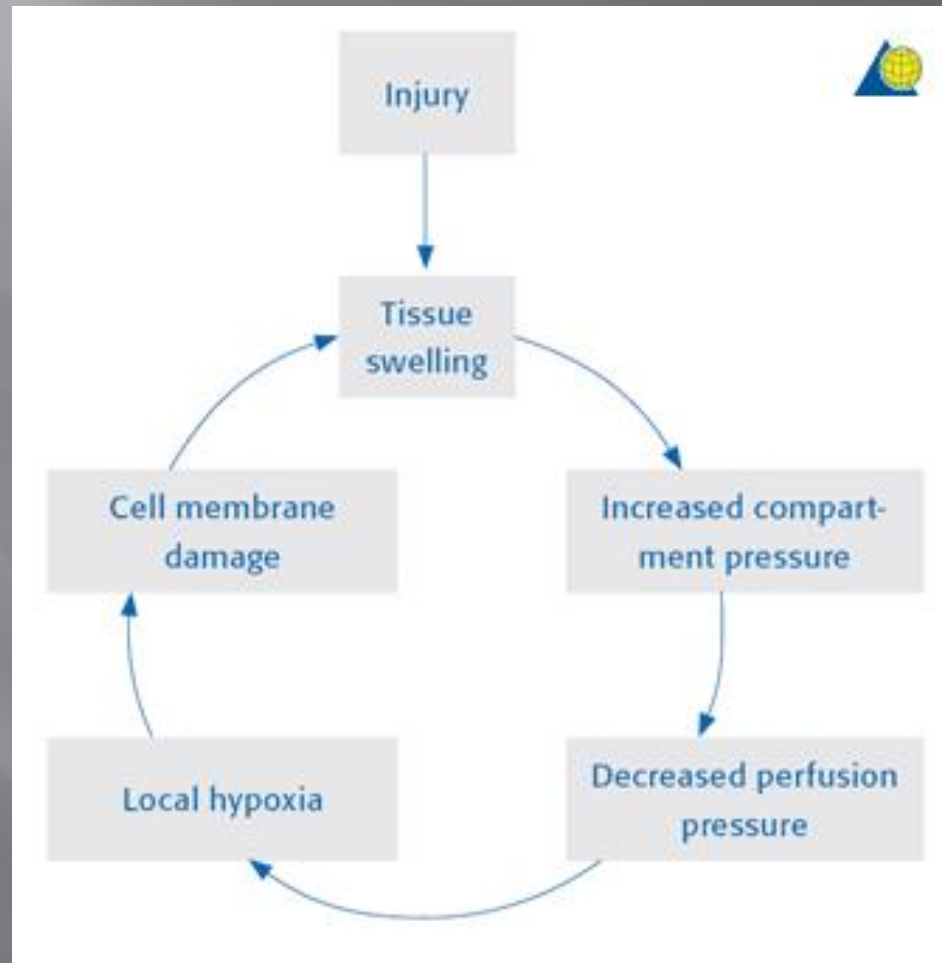
Acute Compartment syndrome



- ▣ Location:
 - Leg
 - Forearm
- ▣ Cause:
 - Fracture
 - Crush
 - Reperfusion
 - Closed muscle/tendon rupture



Pathophysiology



Symptoms and signs ACS

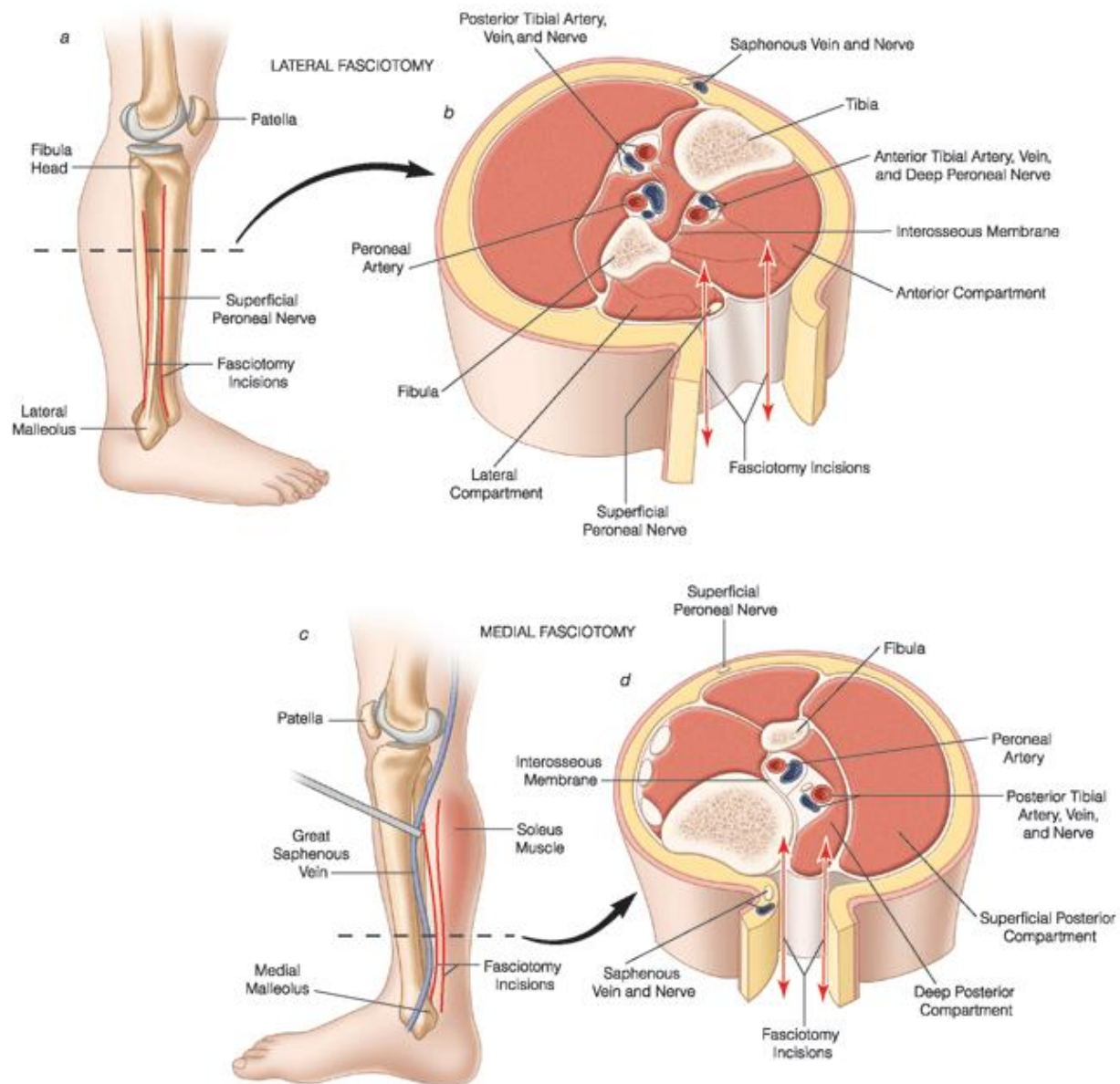
- ▣ 6 P's
- ▣ Pain
- ▣ Paraesthesia
- ▣ Puffiness
- ▣ Pallor
- ▣ Paralysis
- ▣ Pulselessness
- ▣ Pain with passive muscle stretch
- ▣ Limb tense “wood like” feeling
- ▣ Altered sensation
- ▣ Muscle weakness

Diagnosis

- ▣ High index of suspicion
- ▣ Presence of a distal pulse does not exclude compartment syndrome
- ▣ Compartment pressure measurements

Management

- ▣ Split plaster, bandage down to skin
- ▣ Elevate limb to level of heart
- ▣ Urgent fasciotomies



Serious orthopaedic infections

- ▣ Necrotising infections (gas gangrene, necrotising fasciitis)
- ▣ Spinal infections
- ▣ Septic arthritis
- ▣ Osteomyelitis
- ▣ Cellulitis

Necrotising infections

- ▣ High mortality if delay in diagnosis and/or management
- ▣ Patient very unwell (high temperature, rigours etc) often with multiple co morbidities
- ▣ Very painful and swollen limb (sometimes skin breach in the area)
- ▣ No abscess formation
- ▣ Skin discolouration or necrosis (late feature)
- ▣ Can lead to multi organ failure!

▣ Bloods:

- High CRP, ESR
- WCC not always elevated
- Abnormal liver/renal function
- Myoglobinaemia/uria

▣ Cultures:

- Septicaemia in most cases
- Streptococcus pyogenes/beta haemolytic
- Clostridium if gas gangrene

▣ Investigations:

- Xrays look for gas in the soft tissues
- Ultrasound to look for collection

- ▣ High index of suspicion required
- ▣ Differential diagnosis cellulitis
- ▣ Refer as soon as possible



Septic arthritis

- ▣ Painful swollen joint in somebody feeling unwell
- ▣ Types:
 - Haematogenous
 - Direct seeding
 - Surgery
- ▣ Artificial joint infection is a separate entity!!

- ▣ Knee 50%
- ▣ Other joints: hip, shoulder, wrist, elbow, ankle (hip in new born and children beware!)
- ▣ Symptoms: acute pain, swelling, redness if joint superficial, movement painful in all directions, systemic symptoms with fever...
- ▣ Bloods consistent with infection
- ▣ Aspirate to confirm diagnosis
- ▣ Common organism *Staphylococcus aureus*
- ▣ Differential diagnosis gout

▣ Management:

- Joint wash out via arthrotomy
- Antibiotics
- Splinting
- Physiotherapy

Artificial joint infection

- ▣ Diagnosis difficult
- ▣ Often low grade infection
- ▣ Temperature often normal
- ▣ “a painful joint replacement is infected until proven otherwise”
- ▣ Diagnosis difficult in postoperative period
- ▣ Most commonly haematogenous infection

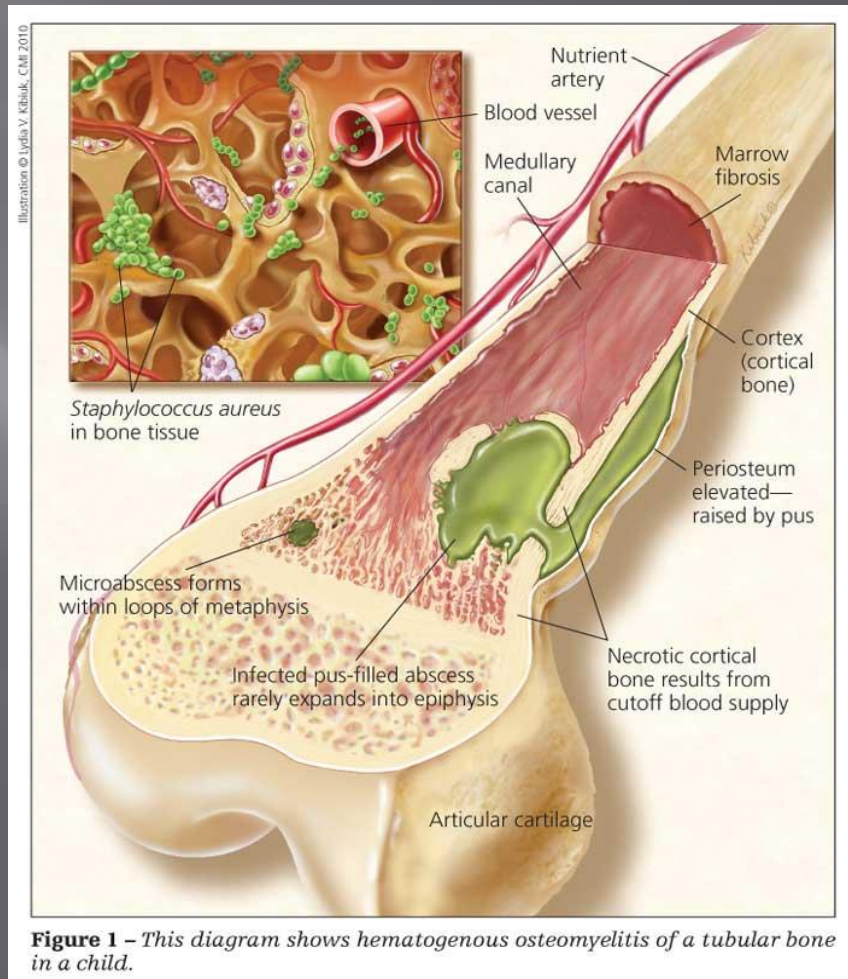
▣ Diagnosis:

- Raised inflammatory markers
- X rays normal or loosening in chronic infections
- Joint aspiration (easy for knee, image intensifier required for hip)
- Often few organisms difficult to grow (patient often been given antibiotics prior to aspiration!!)
- Organisms: staph aureus, strep, gram negative, staph epidermidis etc

- ▣ Bacteria walled off from immune cells/antibiotics by glycocalix
- ▣ Removal of implant often required
- ▣ Antibiotics alone often not able to cure infection
- ▣ Prevention of infection following joint replacement surgery essential!!!

Osteomyelitis

- ▣ Acute OM in children rare except Polynesians
- ▣ Presents like septic arthritis
- ▣ High temperature
- ▣ Blood cultures positive in 50%
- ▣ Same organisms
- ▣ Xrays normal initially but will show bone destruction/periosteal new bone formation after some weeks
- ▣ Ultrasound/MRI to confirm and localise
- ▣ High dose antibiotics and surgery if abscess formation
- ▣ Chronic osteomyelitis rare



Spinal infections

- ▣ Rare but serious
- ▣ Acute back pain and systemic symptoms (red flags)
- ▣ Diagnosis often delayed
- ▣ Types:
 - Discitis
 - Osteomyelitis
 - Epidural abscess
- ▣ Serious infection with high morbidity
- ▣ Mortality in elderly and immuno compromised

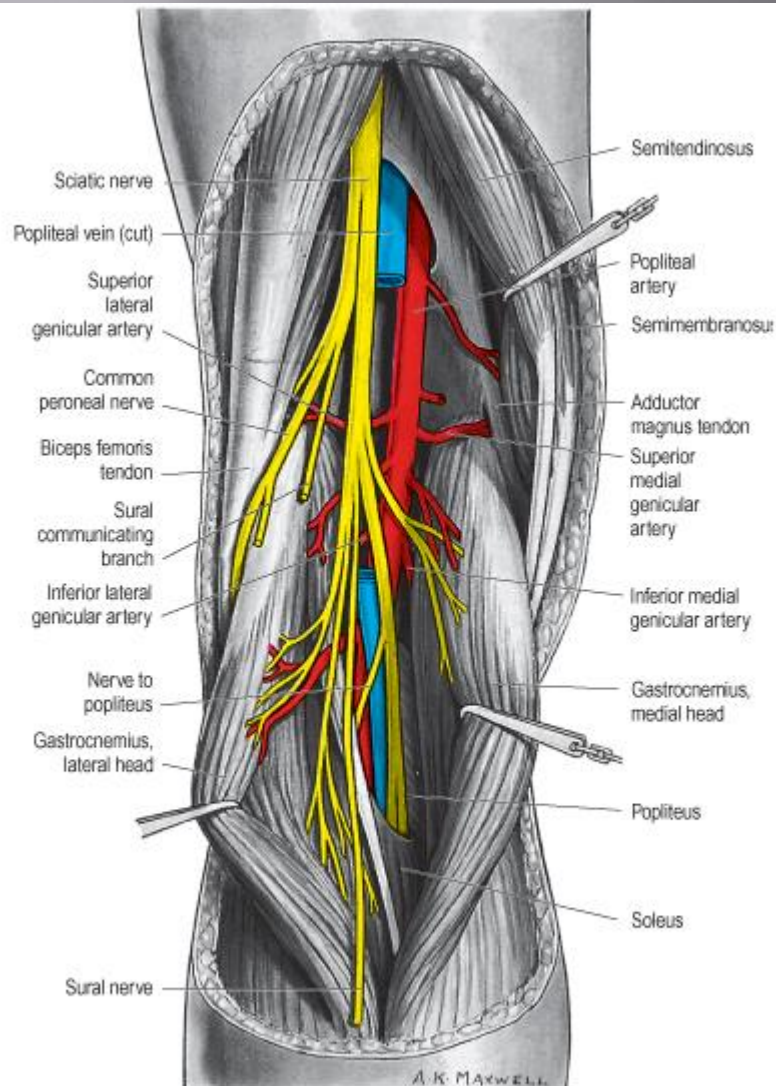
- ▣ Mainly haematogenous with positive blood cultures
- ▣ CT guided biopsy
- ▣ Organisms: staph aureus, gram neg etc (tuberculosis rare)
- ▣ Other concomitant sites of infection!!
- ▣ Refer early if red flags
- ▣ Treatment:
 - High dose IV antibiotics
 - Surgery if instability and neurological compromise

Cauda equina syndrome

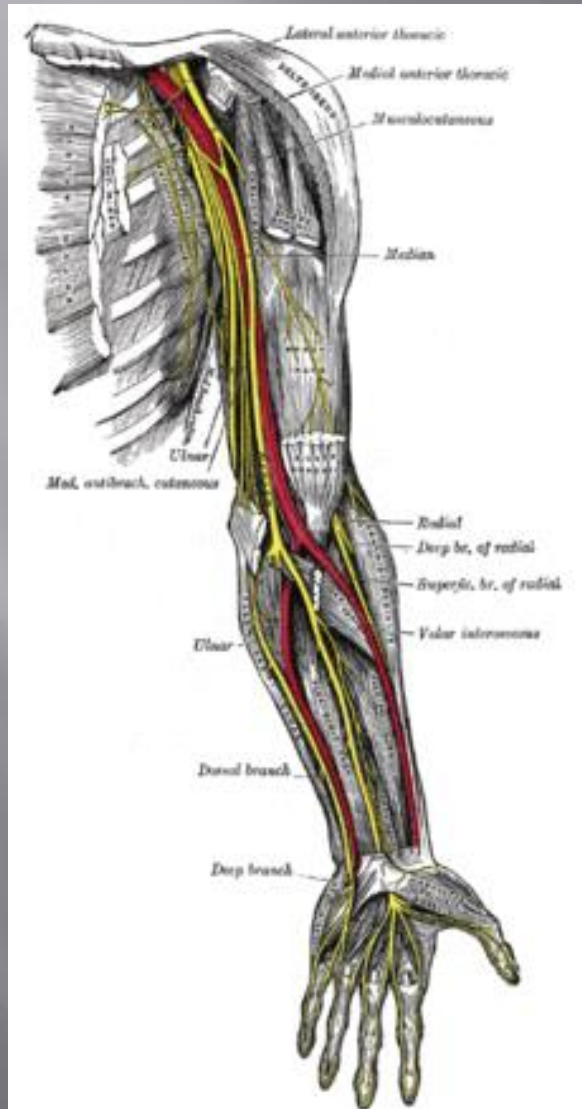
- ▣ Acute compression cauda equina
- ▣ Large midline disc prolapse mainly
- ▣ Pain, numbness (including perianal), weakness (gait disturbance) both legs, urinary retention, absent reflexes
- ▣ Urgent referral for surgical decompression

Knee dislocation

- ▣ Serious injury
- ▣ High velocity injury
- ▣ 3 out of 4 ligaments ruptured
- ▣ High incidence of popliteal artery and sciatic nerve injury (foot drop) injury
- ▣ Leg ischaemia if not recognised can lead to amputation
- ▣ Swollen knee+++
- ▣ X rays often dislocation partially reduced
- ▣ Check circulation distal pulses (Doppler!)
- ▣ Refer urgently

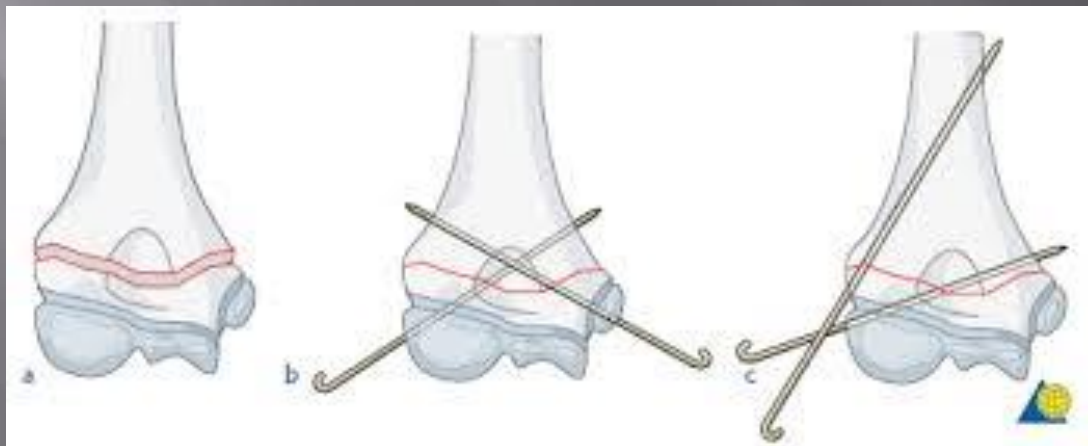
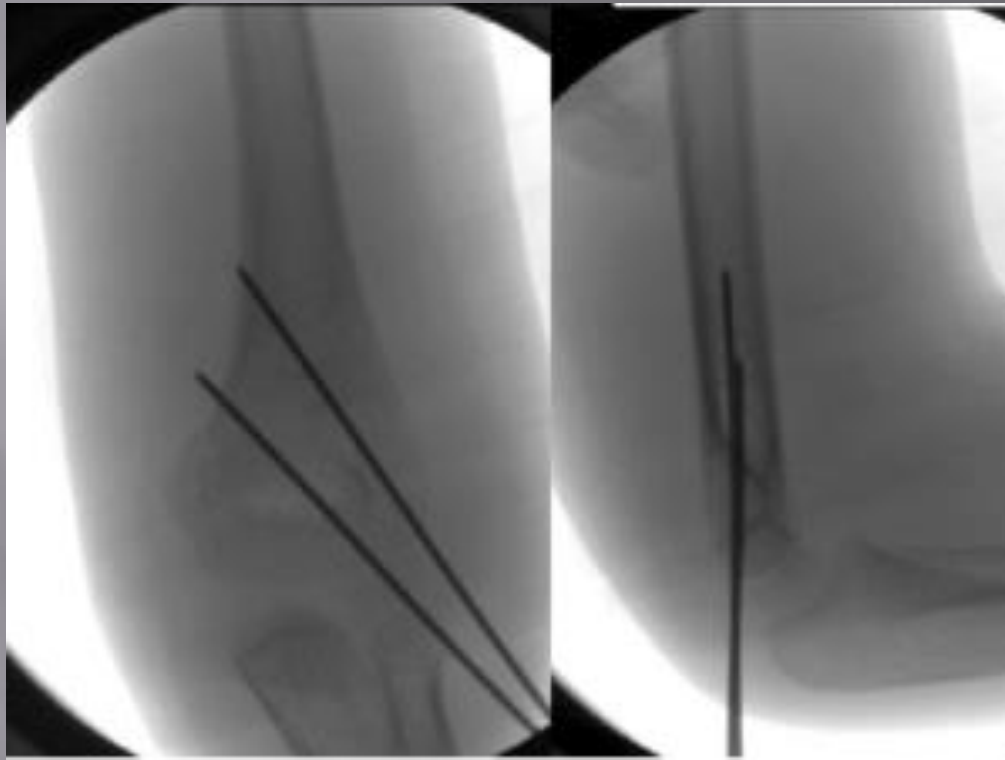


Supracondylar fracture in children



- ▣ Common
- ▣ If significant displacement risk of serious neurovascular injury (brachial artery, median nerve)
- ▣ Extensive swelling elbow + deformity
- ▣ Ecchymosis above elbow crease
- ▣ 2 situations:
 - No radial pulse white hand
 - No radial pulse pink hand
- ▣ Check nerve function

- ▣ Immobilise arm in extension
- ▣ Refer urgently particularly if no pulse and white hand!!!
- ▣ Can lead to compartment syndrome fore arm and muscle necrosis if treatment delayed
- ▣ Will require closed/open reduction + K wire fixation +/- vascular repair



Case studies





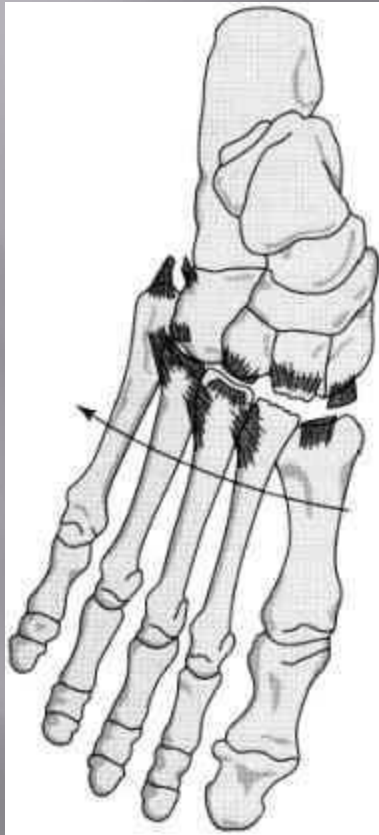




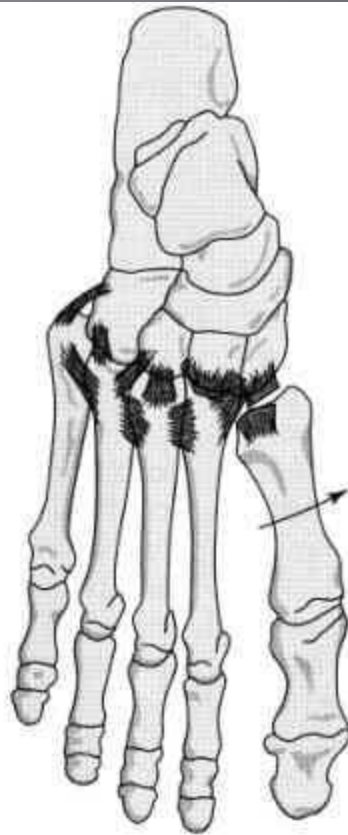




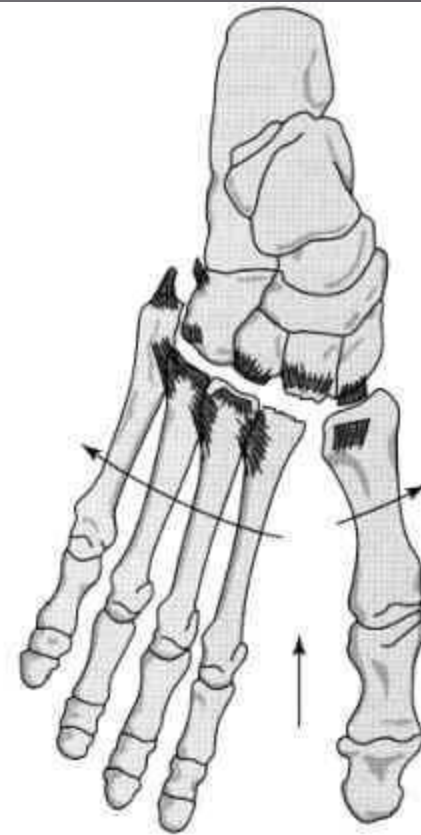




Homolateral



Isolated



Divergent

