

Bone & Joint Emergency for Extern

Worawat Limthongkul, M.D.

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Definition

A musculoskeletal injury or condition that, if missed, could result in additional complications, significant impairment, or death

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FRACTURE & DISLOCATION

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OPEN FRACTURE

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Direct pressure

- Gauze pad
- Elastic bandage
- Stop venous bleeding



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Tourniquet

- controversy
- may occasionally be life and/or limb saving in the presence of ongoing hemorrhage uncontrolled by direct pressure
- must occlude arterial flow ($>$ SBP)
- risk increase over time



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Rationale for Splinting

- Prevents further blood loss and injury
- Can restore or maintain perfusion
- Relieves pain
- Important during evaluation
- Do not delay

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Before splint

- Early concern
- Vascular compromise
- Open fractures

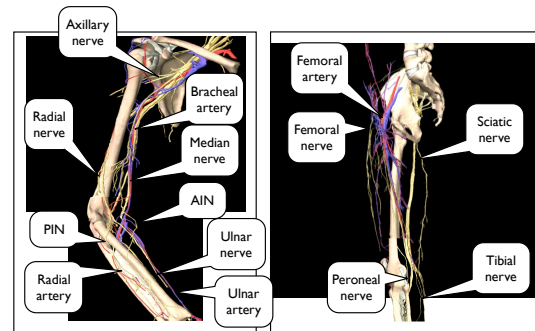


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NEURO-VASCULAR INJURY

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Neuro-vascular tract



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Vascular compromise

- Reduce fracture(s)
- Splint fracture(s)
- Assess by Doppler
- Obtain surgical consult Time is critical!
- Consider angiography

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Nerve assessment

- Upper extremities
 - opponent (Median n.)
 - wrist dorsiflexion (Radial n.)
 - finger abduction (Ulnar n.)
- Lower extremities
 - ankle dorsiflexion (Peroneal n.)

NERVE	MOTOR	SENSATION
Ulnar	Index finger abduction	Little finger
Median distal	Thumb contraction with opposition	Index finger
Median, anterior interosseous	Index tip flexion	
Musculocutaneous	Elbow flexion	Lateral forearm
Radial	Thumb, finger metacarpophalangeal extension	First dorsal web space
Axillary	Deltoid	Lateral shoulder

NERVE	MOTOR	SENSATION
Femoral	Knee extension	Anterior knee
Obturator	Hip abduction	Medial thigh
Posterior tibial	Toe flexion	Sole of foot
Superficial peroneal	Ankle eversion	Lateral dorsum of foot
Deep peroneal	Ankle/dorsiflexion	Dorsal first to second web space
Sciatic nerve	Plantar dorsiflexion	Foot
Superior gluteal	Hip abduction	
Inferior gluteal	Gluteus maximus hip extension	

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Table 3.2. Classification of open fractures

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	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

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Management of open fracture

- Apply appropriate splint
- Antibiotic / tetanus status
- Recommendation of Antibiotic coverage
- Bacteriocidal group
- Cefazolin 2 gm IV q 6 h. + Aminoglycoside 3-5 mg/kg/d
- Limit this Rx to only 2-3 days-(superinfection)



Do not concern about pulling the fracture into the wound



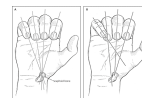
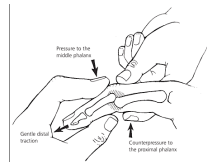
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Joint Dislocation

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PIP dislocation

- Traction Method
- pull & push



3 weeks immobilization in slight flexion position

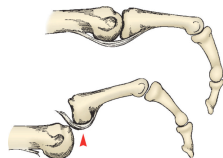


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MCP joint

- Simple dislocation
- Complex dislocation: volar plate entrapment
- Reduction
 - hyperextension
 - push into flexion*

Maintain joint contact in all time

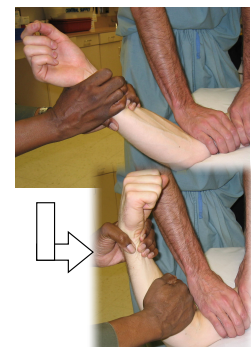


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Posterior elbow

Traditional traction (supine approach)

- Position patient supine on the stretcher.
- Have an assistant stabilize the humerus against the stretcher with both hands.
- Grasp the wrist and apply slow, steady, inline traction, keeping the elbow slightly flexed and the wrist supinated.
- If not successful after 10 minutes, gently flex the forearm or apply traction to the proximal volar surface of the forearm

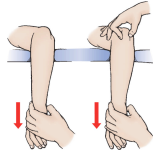


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Posterior elbow dislocation

Prone (one-person) technique

- Position patient prone.
- Correct any medial or lateral translation of the proximal ulna.
- Grab wrist of injured arm. Apply traction and slight supination to forearm.
- Attempt to distract and unlock the coronoid process from the olecranon fossa.
- Using the other hand, apply pressure to the posterior aspect of the olecranon while the arm is pronated



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Posterior elbow

Prone (two-person) technique

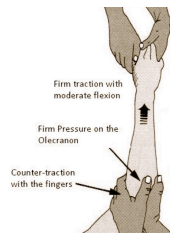
- Apply longitudinal traction to the arm with the elbow in slight flexion.
- Have an assistant, with his or her back toward the patient, encircle the humerus with both hands and apply pressure with the thumbs to the posterior aspect of the olecranon.
- If reduction is not achieved, flex the elbow or have assistant lift the humerus.



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Tips

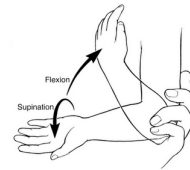
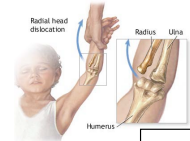
1. longitudinal traction (in-line) + elbow supination
2. pressure on olecranon
3. flexion elbow



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Nursemaid's elbow

- Supinate method
- supination & flexion



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Anterior shoulder

- Traction and counter traction



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Anterior shoulder

- Hippocrates



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Anterior shoulder

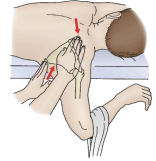
- Stimson
 - To prevent the patient from sliding off the stretcher, strap the patient tightly with a sheet and then securely fasten 5-10 lb of weight to the patient's wrist to provide continuous traction. If weights are unavailable, 2-4 1-L containers of normal saline and a stockinette can be used (as demonstrated in the picture).
 - Instruct patient to maintain this position for at least 15-20 minutes or until reduction is accomplished.



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Anterior shoulder

- Scapular manipulation
 - Place affected arm in 90° of forward flexion at the shoulder and apply slight traction.
 - If in prone position, use weights (as in the Stimson technique) or have an assistant apply manual downward traction.
 - If in seated position, have an assistant stand, facing the patient, and use one arm to firmly grasp the wrist of the dislocated arm. The assistant should then apply steady forward traction parallel to the floor while applying countertraction with the other arm, which is outstretched and resting on the patient's clavicle.
 - Use both hands to rotate the inferior tip of the scapula medially and the superior aspect laterally with slight dorsal displacement. The goal is to move the glenoid fossa back into anatomical position.



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Anterior shoulder

- Milch
 - Place affected arm in full abduction overhead or instruct patient to raise affected arm laterally and behind the head. Operator may assist abduction gently.
 - With arm in full abduction, gently apply longitudinal traction and external rotation with one arm.
 - If reduction is not completed, use the thumb or fingers to push the humeral head upward into the glenoid fossa with gradual adduction of the extended arm still held in traction.



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Anterior shoulder

- Spaso technique
 - Gently lifted vertically toward the ceiling with vertical traction



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Anterior shoulder

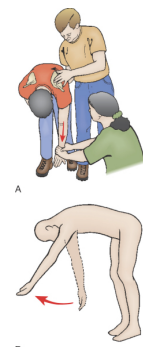
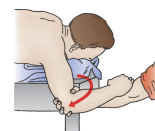
- Kocher method



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Tips

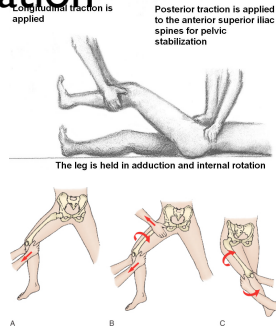
- Gently traction \pm counter-traction
- External rotation
- Abduction or Flexion
- Glenohumeral manipulation



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Posterior hip dislocation

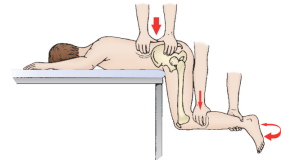
- Place the patient supine on a stretcher that is elevated to the height of the waist of the practitioner performing the reduction.
- The injured hip is initially held in a position of adduction and internal rotation, with one practitioner applying longitudinal distraction and an assistant applying pressure on the patient's anterior superior iliac spines so as to stabilize the patient's pelvis.



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Posterior hip dislocation

- Stimson
 - prone
 - distal pelvis overhangs the edge of the stretcher.
 - hip and knee flex 90°
 - downward pressure apply to proximal tibia
 - direct downward pressure on the femoral head by assistant.



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SPINAL CORD INJURY

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Evaluation

- NEXUS criteria
 - No posterior midline cervical spine tenderness
 - No evidence of intoxication
 - Normal level of alertness
 - No focal neurologic deficit
 - No painful distracting injury
- Indication for C-spine film
 - Tenderness
 - Neurologic deficit
 - Forceful Mechanism of injury
 - Distracting injury
 - Altered sensorium

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Neurogenic shock

- Lesions above T6
- Minutes – hours (fall of catecholamines may take 24 hrs)
- Disruption of sympathetic outflow from C1 - L2
- Unopposed vagal tone
- Peripheral vasodilatation
- Hypotension, Bradycardia & Hypothermia
- BUT consider haemorrhagic shock if – injury below C6, other major injuries, hypotension with spinal fracture alone without neurological injury.

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Spinal shock

- Transient physiological reflex depression of cord function – 'concussion of spinal cord'
- Loss anal tone, reflexes, autonomic control within 24-72hr
- Flaccid paralysis bladder & bowel and sustained Priapism
- Lasts even days till reflex neural arcs below the level recovers.

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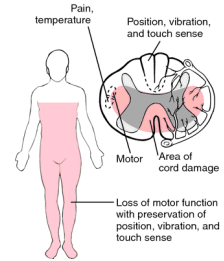
Evaluation

- Complete - flaccid paralysis + total loss of sensory & motor functions
- Incomplete - mixed loss
 - Anterior spinal cord syndrome
 - Posterior spinal cord syndrome
 - Central cord syndrome
 - Brown sequard's syndrome
 - Cauda equina syndrome

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Anterior spinal cord syndrome

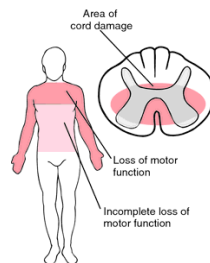
- Flexion rotational force to spine
- Due to compression fracture of vertebral body or anterior dislocation
- Anterior spinal artery compression
- Loss of power, reduced pain and temperature below the lesion.



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Central cord syndrome

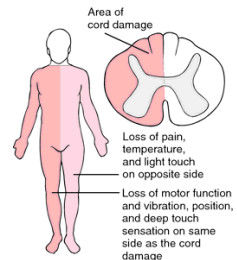
- Older age with cervical spondylosis
- Hyperextension with minor trauma
- Cord is compressed by osteophytes from vertebral body against thick ligamentum flavum.
- Damages the central cervical tract
- UMN lesion to legs (spastic)
- LMN to arms (flaccid paralysis)



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Brown sequard's syndrome

- Hemisection of the cord
- Stab injury and lateral mass fractures
- Uninjured side has good power but absent pinprick and temperature.
- Spinothalamic tracts cross to opposite side of the cord three segments below.



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Posterior cord syndrome

- Hyperextension injuries
- Posterior vertebral body fracture
- Loss of proprioception and vibration sense
- Severe ataxia



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Interpretation of Lateral Plain Film

- Mnemonic AABCDEF
 - Adequacy
 - Alignment
 - Bones
 - Cartilage
 - Dens
 - Extracorporeal soft tissue
 - Facet

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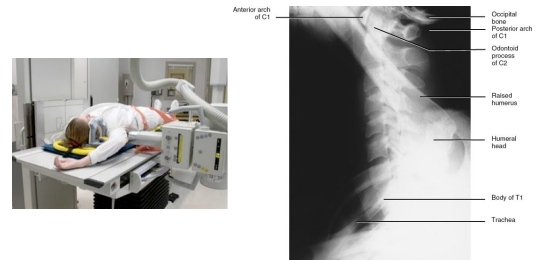
Interpretation of Lateral Plain Film

- Adequacy
 - Should see C7-T1 junction
 - If not get swimmer's view or CT



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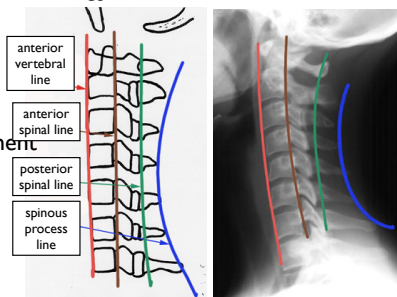
Swimmer view



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Interpretation of Lateral Plain Film

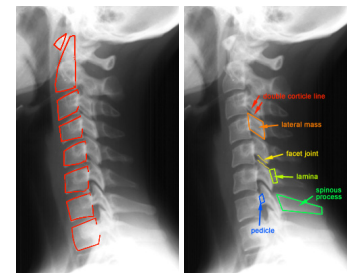
- Alignment



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Interpretation of Lateral Plain Film

- Bone



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Interpretation of Lateral Plain Film

- Cartilage
 - Predental Space should be no more than 3 mm in adults and 5 mm in children
 - Increased distance may indicate fracture of odontoid or transverse ligament injury



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Interpretation of Lateral Plain Film

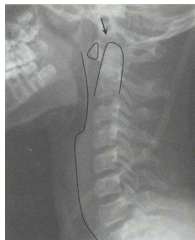
- Cartilage
 - Disc Spaces
 - Should be uniform
 - Assess spaces between the spinous processes



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Interpretation of Lateral Plain Film

- Den
- Fracture??



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Interpretation of Lateral Plain Film

- Extracorporeal **S**oft tissue
- Nasopharyngeal space (C1) ~ 10 mm (adult)
- Retropharyngeal space (C2-C4) ~ 5-7 mm
- Retrotracheal space (C5-C7) ~ 14 mm (children), 22 mm (adults)
- Extremely variable and nonspecific

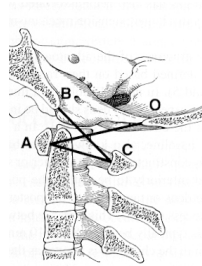


3-7-7-3
or
3-7-21

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Interpretation of Lateral Plain Film

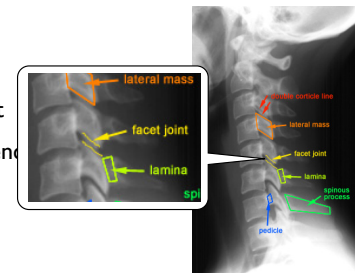
- Extracorporeal **S**oft tissue
- Power's ratio
- BC/OA
- >1 considered abnormal
- Limited Usefulness
- Positive only in Anterior Translational injuries
- False Negative with pure distraction



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Interpretation of Lateral Plain Film

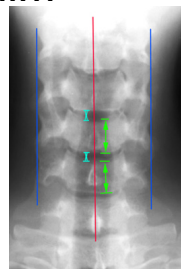
- Facet joint
- congruence



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Interpretation of Lateral Plain Film

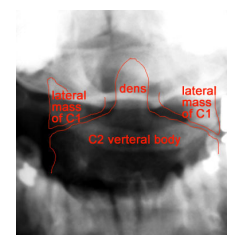
- AP view
- Spinous processes should line up.
- Disc space should be uniform
- Vertebral body height should be uniform. Check for oblique fractures.



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Interpretation of Lateral Plain Film

- Open mouth (Odontoid view)
- Adequacy: all of the dens and lateral borders of C1 & C2
- Alignment: lateral masses of C1 and C2
- Bone: Inspect dens for lucent fracture lines



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COMPARTMENT SYNDROME

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Compartment syndrome

Common cause

- Tibia and forearm fractures
- Vascular and bony injuries
- Injuries immobilized in tight dressings or casts
- Severe crush injuries to muscle
- Burns

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Compartment syndrome

Signs and Symptoms

- Pain
- Disproportionate
- Passive stretch
- Tense compartments
- Asymmetry
- Paresthesia
- Tissue pressures > 35 to 45 mm Hg

First sign = PAIN

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Compartment syndrome

- Whiteside technique measurement



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Compartment syndrome

- Management
 - Early consultation
 - Remove external pressure : cast, splint
 - Fasciotomy



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INFECTION

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Septic Joint/Septic Arthritis

- ❖ Inflammation of a synovial membrane with purulent effusion into the joint capsule
- ❖ Usually monoarticular
- ❖ 2-10 cases per 100,000 in general population
- ❖ **Gonococcal** vs **nongonococcal**
- ❖ 80% are from **gram-positive aerobes** (*S aureus*, beta-hemolytic streptococci, and *Streptococcus pneumoniae*)

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Septic Joint - Etiology

- Direct inoculation
- Trauma
- Iatrogenic
- Hematogenously
- Adjacent osteomyelitis
- Soft tissue infection



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Septic Joint- Location

- Knee- 40-50%
- Hip- 20-25%*
- Hip is the most common in infants and very young children
- Wrist- 10%
- Shoulder, ankle, elbow- 10-15%



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Septic Joint - Risk Factors

- Prosthetic joint
- Skin infection
- Joint surgery
- Rheumatoid arthritis
- Elderly
- Diabetes Mellitus
- IV drug use

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Septic Joint - Signs and Symptoms

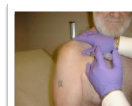
- Rapid onset
- Joint pain
- Joint swelling
- Joint warm
- Joint erythema
- Fever
- Decreased range of motion



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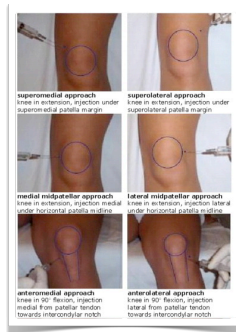
Septic Joint- Treatment

- IV antibiotics
- Drainage
- Repeated aspirations
- Consider lavage



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Knee joint aspiration



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Septic Joint - Treatment

- Open surgical drainage indications
 - Difficult joint aspiration
 - Persistent fever and symptoms >24 hours
 - Leukocytosis persists >48-72 hours
 - Positive repeat blood or joint cultures >48 hours
 - Infected joint prosthesis

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Septic Joint - Complications

- Rapid destruction of joint with delayed treatment (>24 hours)
- Degenerative joint disease
- Soft tissue injury
- Osteomyelitis
- Joint fibrosis
- Sepsis



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Conclusion

- Fracture & Dislocation
 - Open fracture
 - Neuro-vascular assessment
 - Reduction of dislocated joint
- Spinal cord injury: Incomplete
- Compartment syndrome
- Infection

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