

Musculoskeletal trauma

- **85% of blunt trauma patients end up with some sort of musculoskeletal injury**

PRIMARY SURVEY:

- **AIRWAY** may be compromised by a posteriorly dislocated clavicle
- **CIRCULATION** is really the key issue:
 - **Long bone fractures and pelvic fractures bleed a lot:**
 - 3 litres from pelvis
 - 2 litres from femur
 - 750ml from tibia or humerus

ADJUNCTS TO PRIMARY SURVEY:

- **Xray the fractures**
- **IMMOBILIZE THE FRACTURES:**
 - Reduce, apply in-line traction, and immobilize in a plaster or splint
 - If the fracture is open, don't be shy about poking bits of bone back into the wound- its going to theatre for washout anyway
 - Some immobilizations and reductions can effectively control hemorrhage

SECONDARY SURVEY:

- **MECHANISM OF INJURY** is the key issue:
 - Position in the car- driver, passenger?
 - Ejected from vehicle?
 - Seat belt in use?
 - Airbag deployed?
 - Deformation to the vehicle
 - Internal damage to the vehicle eg. bent steering wheel
 - Distance of the fall (if they fell)
 - Were they crushed? Where, for how long?
 - Was there any explosion?
 - If pedestrian: what kind of car hit them?
- **ENVIRONMENT**
 - **EXPOSURE TO TEMPERATURE EXTREMES**
 - **EXPOSURE TO TOXIC FUMES**
 - **Glass fragments**
 - **Sources of contamination, eg. fell into open sewer**
 - **Position the patient was found in**
 - **How much blood was at the scene**
 - **Delays in extrication process**
- **PHYSICAL EXAMINATION**
 - **THE USUAL STUFF;** wounds, gross distortion, pulses of all limbs
 - **Loss of sensation in a glove or stocking distribution is an early sign of vascular compromise**
 - **Xray everything.**
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MAJOR PELVIC DISRUPTION:

- Hypotension + pelvic fracture = higher mortality; 5-30%
- The only sign of pelvic hemorrhage may be otherwise unexplained hypotension
- Xray of the pelvis needs to happen quickly in a major pelvic trauma, especially pedestrian
- Hemorrhage control is the primary goal
- This is achieved with pelvic compression devices and slings

MAJOR ARTERIAL HEMORRHAGE:

- Pulseless limb is your main guide to an internally disrupted artery
- A tourniquet may be applied to any severed limbs
- Direct pressure should be applied to all external wounds
- If you can see a vessel, you can try to clamp it with artery forceps

CRUSH INJURY:

- Crush injury of a significant muscle mass, eg. a thigh or a calf, can produce rhabdomyolysis
- Some recommend to alkalinize the urine to reduce the precipitation of myoglobin

VASCULAR INJURY

- Muscle does not tolerate an interruption to blood flow longer than 6 hours.
- Nerves die even sooner
- AMPUTATED BODY PARTS:
 - Wash with isotonic solution
 - Wrap in sterile gauze
 - Gauze should be soaked in penicillin
 - Wrap whole thing in sterile towel
 - Transport with the patient in a plastic bag, in a cooling vessel

COMPARTMENT SYNDROME:

- Injuries at risk of developing this include
 - Tibial fracture
 - Forearm long bone fracture
 - Severe muscular crush injury
 - Localized, prolonged pressure on an extremity
 - Oedema which forms as part of reperfusion injury
 - Burns
- SIGNS:
 - Increasing pain out of proportion to the stimulus
 - Palpable tenseness of the compartment
 - Asymmetry of the muscle compartment
 - Pain on passive stretch of the muscle compartment
 - Altered sensation
 - **ABSENCE OF A DISTAL PULSE IS UNCOMMON IN COMPARTMENT SYNDROME**
 - **i.e. don't wait for the limb to get pulseless**
 - **THE LOWER THE SYSTOLIC PRESSURE, THE SOONER THE COMPARTMENT BECOMES A PROBLEM**

MANAGEMENT

- release any binding splints or casts
- monitor for about 30-60minutes
- if no improvement in the limb occurs, you need to do a fasciotomy
- this is a time dependent injury: the longer you wait, the worse the damage

NEUROLOGICAL INJURY SECONDARY TO FRACTURE-DISLOCATION

- Dislocations cause this more frequently than fractures; eg. sciatic nerve injury with pelvic fracture dislocation, or axillary nerve injury due to anterior shoulder dislocation

IF YOU DON'T KNOW WHAT YOU'RE DOING,

- Immobilize the limb IN THE DISLOCATED POSITION and call a surgeon

IF YOU THINK YOU KNOW WHAT YOU'RE DOING,

- Try to carefully reduce the fracture. Call the surgeon anyway.

FRACTURE → NERVE INVOLVED → MOTOR LOSS → SENSORY LOSS

Elbow → ulnar nerve → index finger abduction → little finger sensation

Wrist dislocation → median nerve → thenar contraction → index finger sensation

Anterior shoulder dislocation → musculocutaneous → elbow flexion → lateral forearm

Distal humeral shaft → radial nerve → finger extension → first dorsal web space

Proximal humeral shaft → axillary nerve → deltoid → lateral shoulder

Pubic ramus → femoral nerve → knee extension → anterior knee

Obturator ring → obturator nerve → hip adduction → medial thigh

Knee dislocation → posterior tibial → toe flexion → sole of foot

Knee dislocation or fibula neck fracture → superficial peroneal → ankle eversion → lateral dorsum of the foot

Fibular neck fracture → deep peroneal → ankle dorsiflexion → dorsal first web space

Posterior hip dislocation → sciatic nerve → dorsiflexion → foot sensation

Acetabular fracture → superior gluteal nerve → hip abduction →

Acetabular fracture → inferior gluteal → gluteus maximus, hip extension

CONTUSIONS AND LACERATIONS:

- A laceration extending through the fascia requires surgical repair
- Contusions usually just need ice packs
- Everyone gets a tetanus shot

JOINT INJURIES:

- Unless it's dislocated, it's probably not limb threatening
- If the limb is neurovascularly normal, this can wait

FRACTURES:

- Immobilise the joint above and below
- If the limb is neurovascularly intact and the fracture is not displaced, this can wait. Otherwise, it may need to be reduced

Principles of immobilisation:

- SPINE → Long spine board = whole body splint
- FEMUR → traction splint; pulls on the ankle
- KNEE → immobilise in 10 degrees of flexion; long leg cast