



433 Teams
ORTHOPEDICS

Lecture (9)

Orthopedic Emergencies

(Open fracture, fracture with NV compromise & pelvic fracture)

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Objectives:

- To be able to **identify and diagnose** patients with an open fracture, a fracture with nerve or vascular injury and poly-trauma patients with pelvic injuries.
- To be **knowledgeable** about the **pathophysiology and morbidity** associated with these injuries.
- To be able to **apply the principles of management** of these injuries at the site of accident and in the emergency room.

1-Open fractures

Definition:

- A fracture that **at some point communicated with the environment**. (Also, called compound fracture).
- An open fracture does not always communicate with the skin. Pelvic fractures may communicate with the rectum or vagina; maxillofacial fractures may communicate with the buccal cavity.
- It is not necessary for the bone to come out of the skin to be called an open fracture and the bone may or may not be visible within the wound at the time of the presentation i.e. sometimes all what we can see is a small skin opening while the bone is inside (see the picture).
- An open joint is managed similarly. In open joints, it is enough to have a skin opening only without any fractures e.g. a nail was inserted into the knee and then it was removed.
- Open fracture usually requires higher injury trauma but not always! (e.g. a 90-year-old thin osteoporotic lady with very delicate skin who just got tripped she might easily break her bone and since her skin is not elastic the result will be an open fracture).
- Sometimes it can be missed.
- Commonly occurs in bones with minimal soft tissue coverage. (e.g. Anterior part of Tibia)
- Usually higher energy is required in deep bones. (e.g. Femur).



Pathology:

- It starts with traumatic energy to the soft tissue and bone.
- Leads to inoculation of organisms. (Normal flora of the skin contaminates the exposed bone).
- There will be some necrotic tissue e.g. torn and dead muscle. (The necrotic tissue will act as a source of infection).
- **Injury to vessels and microvasculature**. (Less blood delivered to the tissue > (decreased O₂ transfusion and nutrient > ischemia and lack of immune response).
- Raised compartment pressure which will lead to compartment syndrome. (due to swelling).

- Ischemia and lack of immune response.
- Because of the above, the patient is at higher risk to develop an **infection**. (because it makes a good environment for bacteria to grow).

Common scenario:

A patient came with an open fracture of the femur, initial management was done and the patient was taken to the OR, fixation and immobilization using a plate was achieved. However, the patient wasn't managed properly with antibiotics. 2 years later, the patient came with chronic osteomyelitis (very complicated to be managed at this stage, around 6 to 10 operations are needed).

Infection in the presence of a fracture:

- Difficult to eradicate.
- Prolonged antibiotics.
- Multiple surgeries.
- Significant morbidity.
- Significant costs. (You will take the patient 5-6 times to the OR if you missed it at the first time)
- The fracture will not heal thus you will be obliged to cast him for a long time > **leads to muscles wasting and joint stiffness**

Important points:

- An open fracture is usually a **"red flag"** warning of significant trauma ➔ Detailed assessment of the patient is necessary.
- An open fracture is associated with significant morbidity ➔ Must act quickly. (earlier treatment is associated with less complications).
- A delay in management is proven to increase the likelihood of complications.
- Give urgent priority while triaging. e.g. open fracture is ER triage code 1 (patient needs immediate care), while closed fracture is code 3 (patient can wait for 30 minutes), provide initial management and consult urgently. The patient should be taken to the OR preferably within 6 hours.

Diagnosis:

- Sometimes it's obvious!
- Other times, subtle; be observant (sometimes the wound is very small, it is important to have high index of suspicion).
- **wound close to a fracture is potentially an open fracture until proven otherwise!** Even if the wound is not at the same level as the fracture, you have to examine it. (So how to

say if this is an open fracture or a simple skin cut? One sign that is often helpful is the presence of continuous slow venous bleeding.

- Whenever a fracture is diagnosed, go back and check the skin. (You do not want to miss it!).
- How do you know if the break in the skin is an opening between the outside environment and the bone? **A small wound continuously oozing blood** (even after applying pressure with a gauze it keeps bleeding), especially if you see **fat droplets** within the blood (like oil within the blood, it is diagnostic, but rarely seen), it is an open fracture! (it came from the bone marrow).
- Not always close to the fracture. (E.g. if a deep bone like the femur gets fractured, the bone must travel a distance because it is covered in soft tissue such as muscles and it breaks through the skin away from the site of the fracture). (the deeper the bone → the more coverage of soft tissue around it → the far the skin opening).
- Don't probe!! **Because it might introduce infections** (probe: is a slender surgical instrument used for exploring the depth or direction of a wound).
- If in doubt, use good light, if there is a break in the dermis or fat is seen, call it an open fracture.
- Better to overcall than miss it!
(If you think that it might be an open fracture, it probably is and should be treated as such. Over treatment is better than under treatment in this case).

- Big wound but no fracture → not an open fracture, managed as soft tissue injury.
- Fracture + skin abrasion "a superficial damage to the skin, not deeper than the epidermis" → not an open fracture.
- Fracture + a wound continuously oozing blood → open fracture.

Algorithm:

- Assess and stabilize the patient, ATLS principles (ATLS = Advanced Trauma Life Support).
- Assess the condition of the soft tissue and bone to help grade the open fracture.
- Manage the wound locally. (try realignment)
- Stabilize the fracture.
- IV antibiotics.
- Tetanus status.

Assessment:

A. If polytrauma, apply ATLS principles.

B. If isolated injury, **take a brief history** about the following:

1. Mechanism and circumstances of injury. (Form the patient or -if he was unconscious- ask the bystanders or the Red Crescent paramedics).
2. Time since injury. (important for planning the surgery). (The management is different between an open fracture that occurred 1 hour ago and 12 hours ago).

3. Past Medical Hx/ Past Surgical Hx/
Allergies/Drugs/Smoking/when was his last meal. (Smoking delays healing and increases the risk of infection). (Recent last meal requires different type of intubation).
4. Tetanus vaccination status.

Then **examine the affected region** for:

1. Soft tissue:

- Degree of contamination. (clean cut with scissors vs. leg crashed under a bulldozer in a farm).
- Necrotic and devitalized tissue.
- Size of wound.
- Coverage loss (the presence of skin loss might need a graft).
- Compartment syndrome (if some compartments are opened and the others are closed. E.g. the leg has four compartments, if two compartments are cut and opened by the accident, there is still two other compartments that could get swollen and increases in pressure).



Fig. 28-40 Fasciotomy closure device being used to close a large fasciotomy over a period of 1 week; (a) immediately postfasciotomy; (b) 4 days later; and (c) after healing.

2. Bone:

- Comminution (simple vs. fragmented).
- Stripping of bone periosteum (the periosteum will affect the infection rate as well as the healing and growth because it has blood vessels on its surface, so if a bone is exposed and stripped from everything it is worse than a bone that is still attached to soft tissues and to periosteum).
- Away from injury to joint above and below.
- X-rays to joint above and below.

3. Neurovascular status distally:

- On arrival and post reduction and splinting later. (Document everything to avoid any medico-legal issues).

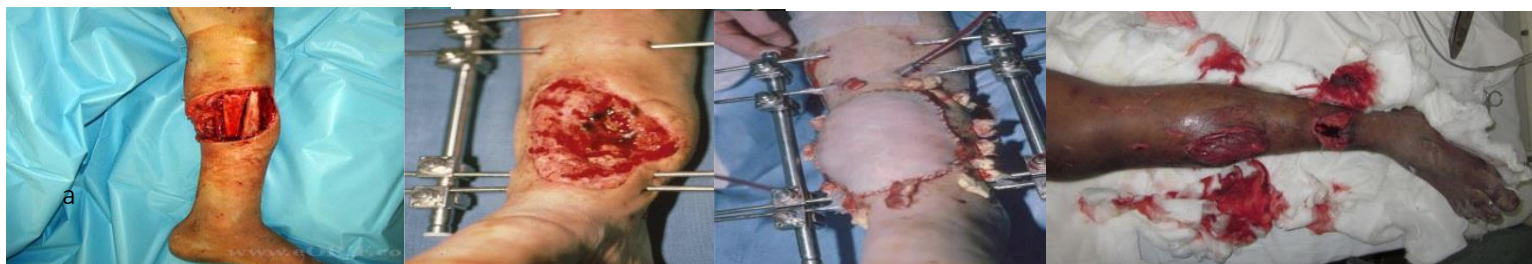
Open fracture grades (*Gustilo classification*):

(Important)

- Open fractures are described by the Gustilo and Anderson classification. It's based on the amount of energy of the injury, the degree of soft-tissue damage and the presence of vascular compromise.
(take a full Hx to grade it correctly)
- **Grade 1:** (all the following parameters must be present to consider it grade1)
 - **Less or equal to 1 cm**, clean (not grossly contaminated, no dirt, the patient was not swimming at the time of the injury), non-segmental nor severely comminuted fracture and **less than 6 hours** since injury.
- **Grade 2:**
 - **>1cm wound and usually less than 10 cm**, not extensive soft tissue injury or contamination, non-segmental nor severely comminuted fracture, no bone stripping and with adequate soft tissue coverage (could be 20 cm but clean cut and no extensive soft tissue loss). Same as Grade 1 but the wound is > 1 cm.
- **Grade 3:** (anything that does not apply to grade 1 or 2) wound is > 10 cm.
 - **3A:** Any size with extensive **soft tissue contamination** (farm wounds or if the wound was immersed in fluids) or injury but not requiring soft tissue coverage procedure, or with a segmental or severely comminuted fracture, or late presentation **more than 6 hours**.
 - **3B:** Any open fracture that requires **soft tissue coverage procedure**. (there is soft tissue loss that requires a skin flap).
 - **3C:** Any open fracture that requires **vascular repair**. (patient came with deformed limb such as wrist drop).
- If combined conditions always take the worst which is 3C (e.g. a patient came with an open fracture that needs both soft tissue coverage in addition to vascular repair, it is grade 3C).
You can't differentiate between 3A and 3B in the ER, we do it in the OR.



Examples on open fractures grading:



It is more than 1 cm and it **requires soft tissue coverage**. So, it is either grade 3B or 3C. how to know? if there is a **pulse** then it is 3B, if there is **No pulse** then it is 3C.

It **requires soft tissue coverage**. So, it is either grade 3B or 3C. how to know? if there is a **pulse** then it is 3B, if there is **No pulse** then it is 3C.

Differs depending on the scenario:

- If the injury occurred <6 h ago, it is grade 2.
- If the injury occurred >6h ago, then it is grade 3A.
- If there is a vascular injury, it is grade is 3C.

Management:

First, you should do what we said before from stabilization to grading.

1- Locally: (done under conscious sedation).

- Take a picture! (You don't want to the wound to be opened every time another physician wants to examine it because each time you open it you risk contamination).
- If dirty, irrigate with normal saline to remove gross contamination (don't go deep). do not use water even if it was sterile. (Because osmolality of the water is more so the tissue will loss fluid due to the concentration gradient. Just irrigate, if there is a big piece of contamination you can remove it with sterile equipment's).
- If the bone is sticking out, try to reduce it gently then immobilize (with a splint) and re-check neurovascular status.
- Cover with sterile wet gauze. (Wet because a dry gauze will stick to the wound and cause more injury when it is removed).
- If there is bleeding apply direct pressure on the wound. **Never use a tourniquet; it will compromise the blood supply.**
- No culture swabs in ER. (Some studies said it is useless).
- Do x-ray

2- Antibiotics: (most imp. Step in managing open fractures grade 3A)

- First generation Cephalosporin for gram positives (Ex: Cefazolin) in all open fractures.
- Aminoglycoside to cover gram negatives (Ex: Gentamicin) sometimes not required in grade 1 but in general it is safer to give in all grades. **Gram + is most common but you can't guarantee it is only gram +.** So, if it is a grade 1 open fracture and you said I will

only cover gram+ or you said I will cover both positive and negative, both answers are correct.

- In daily practice, we give both antibiotics to cover both gram positive and negative in grade 1 and 2 open fractures.
- Add penicillin or ampicillin or clindamycin (for anaerobes) for clostridium in grade 3 open fractures and all farm and soaked wounds. (even if it was a grade 1 open fracture but happened in a farm or it was soaked in water for a long time → add penicillin).

Grade 1: give 1st generation cephalosporin
 Grade2: give 1st generation cephalosporin + gentamicin
 Grade 3: give 1st generation cephalosporin + gentamicin + penicillin or ampicillin
 If the patient is allergic to penicillin, give him metronidazole.

3- Tetanus prevention: (it depends on the wound type) (Important)

A- Clean wounds criteria:	B- Other wounds
<6 hours from injury	Any wound does not apply to type A
Not a farm injury	
No significant devitalized tissue	
Non-immersed wound	
Non-contaminated wound	

Clean wounds		Other wounds					
Completed vaccination		Not Completed or Unknown		Completed vaccination		Not Completed or Unknown	
Booster < 10 years	Booster > 10 years	Td 0.5 ml IM		Booster <5 years	Booster > 5 years	TIG 250U and Td 0.5ml IM	
nothing	Td 0.5ml IM			nothing	Td 0.5ml IM		

Tetanus toxoid (Td) considered as active immunity. While immunoglobulins (TIG) are passive immunity. Called in Arabic الكزاز. Ask about vaccination status. In KSA, most patients will be " not completed or unknown".

As soon as the patient is stable, alert the OR, and get a consent from the patient for surgery.

- Plan: Irrigation (usually we use about 15L of normal saline), debridement of necrotic tissue (because it is a source of infection) and fracture stabilization.
- The sooner the irrigation and debridement → the less risk of further morbidity.

4- In the OR: move to the OR as soon as the patient is stable enough.

- Extend wound if necessary. If it was a small wound, we need to extend it until we can reach the bone.
- Thorough irrigation.






- Debride all necrotic tissue.
- Remove bone fragments without soft tissue attachment except **articular fragments** (i.e. floating bone fragments which are not attached to any periosteum or soft tissue → remove them because they are considered a source of infection. However, if the bone fragments were near a joint and attached to cartilage → keep them even if they are contaminated because the morbidity of taking them out is worst).
- In the OR, if there was no necrotic tissue, no contamination and the cut was simple & clean → stabilize the fracture & close the wound (no need to bring the patient to the hospital again).
- But if you find necrotic tissue → do debridement & leave the wound open (no suture yet only gauze & bandage) → recheck again in 48-72 hour for necrotic tissue.
- Usually requires second look or more every 48-72 hours (i.e. a second visit to the OR).
- Generally, **do not close open wounds on first look** unless it is clean and tension free. (when is not closed surgically, we only cover it, and then put external fixation).

5- Fracture management:

- Generally, avoid internal fixation (plate and screw) **unless it is completely clean**.
- Generally external fixator is used.
- **Femur and tibia fractures** can usually be treated immediately with Intra Medullary nail except severe injuries and contamination. (studies showed that it is appropriate to use internal fixation in these cases).
- Observe for compartment syndrome post-operatively.
- If all principles applied: (in an ideal scenario, where the patient was transferred immediately to the hospital, and the management was immediate and proper).
 - 2% complication rate in grade 1
 - 10% complication rate in grade 2
 - **Up to 50% complication rate in grade 3**

Summary of open fractures classification and management

(from <http://www.orthobullets.com/>)

Gustilo Type	I	II	IIIA	IIIB	IIIC
Images					
Energy	Low energy	Moderate	High	High	High
Wound Size	< 1 cm	1-10 cm	>10cm	>10cm	>10cm
Soft Tissue	Minimal	Moderate	Extensive	Extensive	Extensive
Contamination	Clean	Moderate contamination	Extensive	Extensive	Extensive
Fracture Pattern	Simple fx pattern with minimal comminution	Moderate comminution	Severe comminution or segmental fractures	Severe comminution or segmental fractures	Severe comminution or segmental fractures
Periosteal Stripping	No	No	Yes	Yes	Yes
Skin Coverage	Local coverage	Local coverage	Local coverage	Requires free tissue flap or rotational flap coverage	Typically requires flap coverage
Neurovascular Injury	Normal	Normal	Normal	Normal	Exposed fracture with arterial damage that requires repair
Antibiotics	1st generation cephalosporin.	1st generation cephalosporin + Aminoglycoside	1st generation cephalosporin for gram positive coverage. + Aminoglycoside (such as gentamicin) for gram negative coverage in type III injuries. Penicillin should be added if concern for anaerobic organism (farm injury) for any grade.		

Management of open fractures: (The British Orthopedic Association (BOA) guidelines)



2-Fractures with nerve or vascular injuries

A- Vascular injury:

- Don't miss it! (associated with high morbidity).
- Always perform an accurate assessment at presentation, post manipulation and reduction, post-surgical fixation and serially until condition stabilizes.
- Serial examination helpful in deciding line of treatment.
- Serial examination helps avoid confusion
- High correlation between vascular injury and nerve injury → due to Proximity (e.g. if the patient injured the brachial artery, suspect a median nerve injury).

Mechanisms:

- Penetrating trauma (sharp object).
- High-energy blunt trauma (pedestrian hit by car from side).
- Significant fracture displacement.
- Keep in mind tissue recoil at presentation

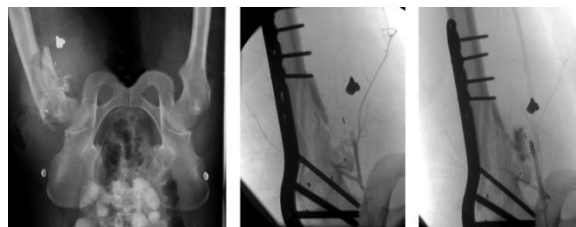
(it means that it can go back to its normal place at the time of imaging after injuring the Vessel).



Vascular injury:

by two mechanisms:

- Direct laceration (easier to repair).
- Traction and shearing.



Assessment of vascular injury:

- Always check the following:
 - Pulse, Color of the limb, Capillary refill, Temperature, Compartment pressure.
 - Check both sides: If one limb is affected → it is a vascular injury.
 - If both limbs are affected → shock.
- Keep high index of suspicion in case of the following:
 - High energy trauma.
 - Associated nerve injuries.
 - Fractures/ Dislocations around the knee (Dangerous! Measure ABI).

Algorithm:

- Hard signs of a vascular injury > Realignment of limb and Splinting > If persistent → Vascular intervention.
- Hard signs > Realignment of limb > Improved → Close observation (i.e. Serial examination)

Why we do realignment? Because Realignment can result in unkinking of vessels (vessels can kink = bent & close off), lowering compartment pressure, relaxation of arterial spasm. So, if you did your vascular exam and you did not find the pulse > best thing to do is realignment of the fracture. In case of open fracture around the knee > Hard signs > realignment of limb > improved → Do ABI test.

- ABI (the ankle brachial index) is the ratio of the blood pressure in the lower limbs to the blood pressure in the arms. Normal range (1.0-1.2). we do it because the presence of a pulse alone does not exclude vascular injury.
 - ABI < 0.9 is associated with vascular pathology.
 - Rarely can give false negative result (E.g. if Profunda femoris artery was obstructed, it might be missed because it is a deep artery and it does not contribute that much to the ABI).
 - Always used in high risk fractures (knee).
 - If positive > Urgent vascular intervention.
 - If vascular status didn't improve (ABI < 0.9) after limb realignment → do CT angiograph.
 - If there is a slight improvement → do ankle brachial index.
 - If it became abnormal (i.e. ABI < 0.9) ask for: Angiography is the Gold standard, CT angiography > but it has risks (be careful with patients who have renal failure or pre-renal failure).
- Vascular surgeon to arrange with interventional radiologist.

Table 1

Hard and Soft Signs of Vascular Injury Associated With Extremity Trauma

Hard signs

Pulselessness
Pallor
Paresthesia
Pain
Paralysis
Rapidly expanding hematoma
Massive bleeding
Palpable or audible bruit

Soft signs

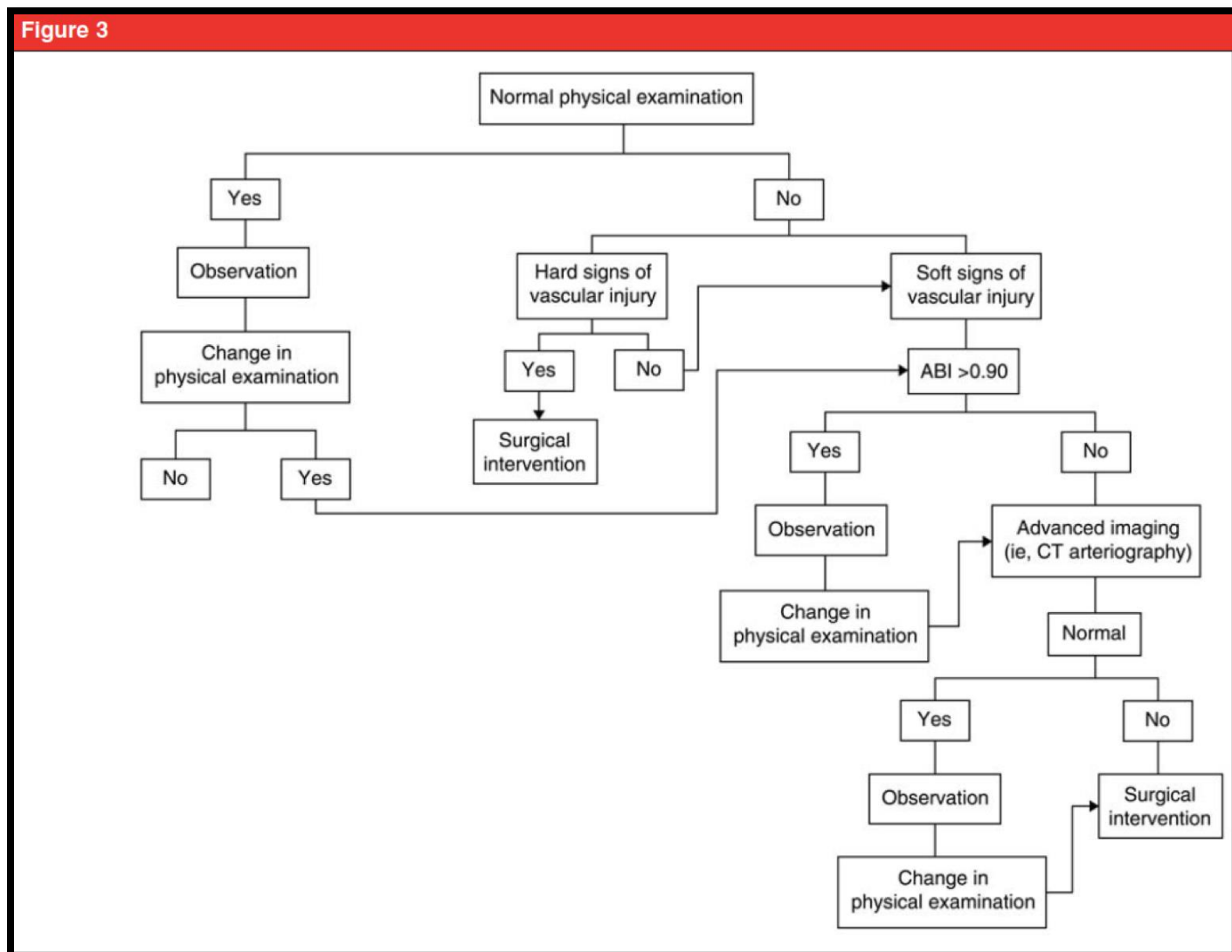
History of bleeding in transit
Proximity-related injury
Neurologic finding from a nerve adjacent to a named artery
Hematoma over a named artery

Management:

- Once vascular injury is confirmed (e.g. a patient has a fracture and absent pulse, you did ABI, you did realignment still abnormal).

Coordination between: Vascular + Orthopedic + General surgeons. The vascular surgeon cannot fix the vessel until the fracture is stabilized (usually temporarily with an external fixator). Because if they repair the vessel but the fracture is still mobile then that might injure the repair.

- Emergently re-establish perfusion and protect repair with skeletal stabilization. (The aim is to save the limb by reperfusion then protect it).
- Warm ischemia time dictates treatment (warm ischemia means that the limb is ischemic=no perfusion but it is still viable not necrotic) (cold ischemia is when the amputated part was in a bag ice. In cold ischemia, we can wait longer because the metabolic rate is decreased in the amputated part).
- Most times, a quick external fixator is applied, followed by vascular repair
- Avoid prolonging warm ischemia (to avoid prolonged warm ischemia we use external fixators which are fast to apply and stabilize the fracture temporarily).
- Prolonged warm ischemia >6 hours you must do Prophylactic fasciotomy. (due to reperfusion reaction, i.e. after repairing the vessel the reperfusion will cause edema in the muscle leading to increased pressure > compartment syndrome).
- Grade 3C open fractures (which require vascular repair) have the worst outcome.
- Amputation may be necessary in severe cases.



- Serial examinations are done every 30 minutes to check Pulse, Color of the limb, Capillary refill, Temperature, Compartment pressure.

B- Nerve injuries:

The most common type of nerve injury in bone fractures is Neuropraxia

- Cause of medico-legal concern.
- Accurate assessment and documentation at presentation, post reduction, post-surgery is essential.
- Remember to examine for motor and sensation prior to sedation.
- Closed fractures with nerve injuries usually does not require surgery: **why?** ➔ Usually they have good outcome >80% ➔ Usually managed conservatively in the early stages ➔ Recovery may take more than 6 months (**most of the time it will recover spontaneously**).
- **Intact nerve before reduction, absent after reduction:**
 - Controversial management.
 - Usually observe (**because most of the time it's neuropraxia**)
It is acceptable if you say I will redisplace the fracture when you discover that after reduction there was absence of nerve intact. But it has been proven that it is not always useful. Just observe.

Management:

A- Closed Fracture requiring surgery with nerve injury:

(what dictate the need of surgery is the fracture not the nerve injury)

- Limited exploration (**do not make another incision to explore the nerve along the whole course of the nerve to fix it. we do the surgery for fixation of the bone only, if the nerve is in the way we fix it, if not we don't do another incision to repair the nerve**).

B- Open fracture with nerve injury:

Explore, tag nerve ends for later repair. (**tagging is attaching colored sutures to the ends of the nerve to make it easier for the plastic surgeon to find the nerve and repair it later**).

Follow up:

Clinically: (Range of motion and motor activity)

- Electrodiagnostic assessment start **at 6 weeks** then serially every 6 weeks (**because if it was done before 6 weeks it is useless and it cannot be read**).
- If no improvement:
 - Nerve exploration: neurolysis / repair / grafting.
 - Tendon transfers to preserve function (**done when the nerve grafting is not expected to succeed or already failed. E.g. we take one of the plantar flexor tendons in case of foot drop**).
 - **In other words, some tendons are transferred to restore normal movement of a foot or an ankle that has lost function.**

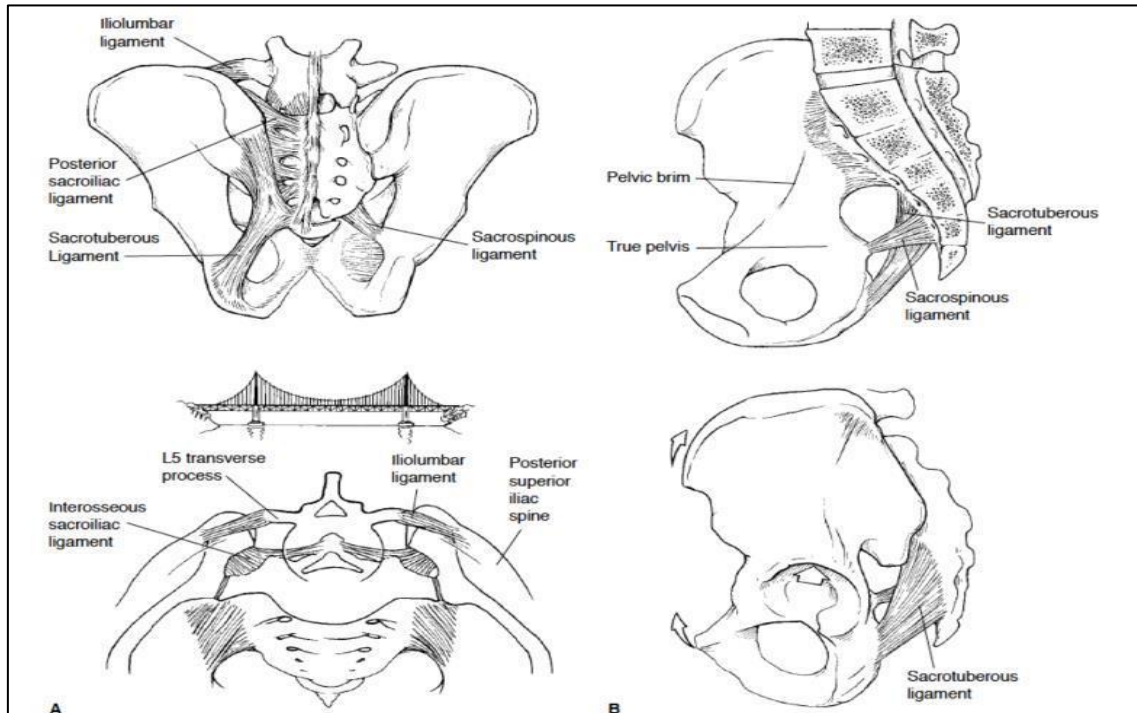
Common sites of nerve injury: (Important)

- Shoulder fracture / dislocation > Axillary nerve.
- Distal humeral shaft fracture > Radial nerve.
- Elbow fracture / dislocation > Median > Radial > Ulnar.
- Hip fracture / dislocation > Sciatic nerve.
- Knee fracture / dislocation > Peroneal nerve.

3-Pelvic Trauma (in the poly trauma patient)

Pelvis anatomy:

What make the pelvis stable? Ligaments



Pathology:

- We describe pelvic fractures according to the mechanisms of injury:
 - 1- Anterior to posterior compression force causing open book. (A, B, C).
 - 2- Fall on one leg causing vertical shears pelvic fracture (figure G). extremely unstable.
 - 2- Lateral compression force, e.g. car accident (figure D, E, F).

The survival is more with open book then lateral compression and the least survival is seen with the vertical.

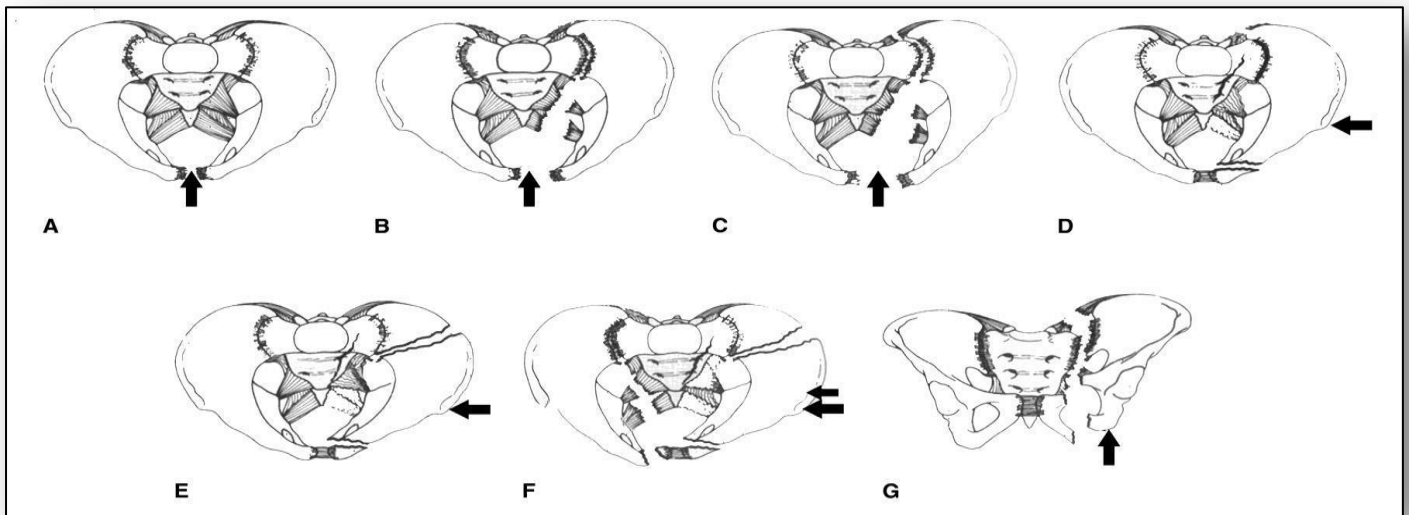


Figure A: Anterior force causing a small opening in the sacroiliac joint.

Figure B: Anterior force causing a small opening in the sacroiliac joint and instability.

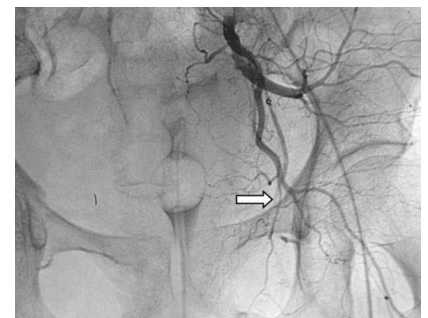
Figure C: more force caused open book pelvis. In this type of injuries, the left and right halves of the pelvis are separated at front and rear, the front opening more than the rear, i.e. like opening a book.

Figure D, E, F: lateral compression force. **Figure G:** vertical shear force pelvic fracture (most sever and unstable type).

- Pelvic fractures / instability may cause life threatening bleeding. Due to the proximity of the major vessels around the pelvis. The bleeding will be from the internal iliac artery and it will be retroperitoneal that's why it cannot be seen in US (FAST= Focused Assessment with Sonography in Trauma).
- So, if a patient comes after a high-energy trauma, we give him blood and his blood pressure will increase then after a while his BP will go down, so what to do? Give him fluid again the patient will response then the pressure will go down again. This will tell you that it is a matter of volume problem not cardiac or something else. So where is the fluid we are giving is going? You must suspect an **internal bleeding**.
- Diagnosing pelvic instability can save lives.
Pelvic fractures are classified into stable, horizontal instability & vertical instability.

Diagnosis:

- History: High vs. Low energy trauma.
- Mechanism of injury: Anterior vs. Lateral vs. Axial force.
- Pelvic skin contusion, bruising.
- Short extremity (leg length discrepancy usually means that the shorter limb that side of the pelvis had vertical shears).
- Careful neurologic assessment.
- **Primary survey:** (part of "C" circulation)
 - Assess **rotational** stability by gentle compression on the ASIS.



- Traction on the leg and assess pelvic instability (traction on leg while your hand at the iliac crest if it moves then it is a vertical shear fracture).
- **If unstable or painful: (mostly fractured)**
 - Apply sheet around hips and close the pelvis gently (around the trochanter used in case of compression fracture).
 - This results in decreased intra-pelvic volume leading to tamponading the bleeding usually it is venous bleeding from the venous plexus which responds well to tamponading, if the patient does not respond to tamponading, we suspect arterial injury and we do embolization (increasing the pressure around the vessels the blood pressure will rise).
 - Traction on the leg to stabilize vertical instability (apply skeletal or skin traction usually skeletal traction is used) (skin traction for kids & skeletal for adults, we do not like skin traction for adults because we must use so much weight, thus patient may develop blisters).
 - This minimizes ongoing vasculature injury and bleeding.
- **Rectal exam:**
 - Bone fragments (a pelvic bone fragment got inside the rectum and it could be sharp so be careful).
 - High riding prostate (it indicates urethral injury, a sign of pelvic fracture).
 - Bleeding.
- **Blood at the meatus.** (it indicates urethral injury)
- **Labial or scrotal ecchymosis.**
- **Vaginal exam.**

- Rotationally instable pelvic fracture →
Apply sheet around hips.
- Vertically instable pelvic fracture →
Apply Traction (usually skeletal).

If the fractured bone penetrates the bowel or vagina > it's an **OPEN PELVIC FRACTURE**

Management: (Important)

- Stabilize pelvis with binder or sheet.
- If vertically unstable apply traction.
- IV resuscitation. (initially with fluids then blood)
- Look for other injuries.
- Check response.
- If partial response, may require angiography for embolization of bleeders.
- May require external fixator and/or pelvic clamp (the patient is going to the OR for other procedures like abdominal laparotomy etc. we do external fixation).
- Early diagnosis:
 - Aggressive resuscitation → Coordinated team effort → Save lives.



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