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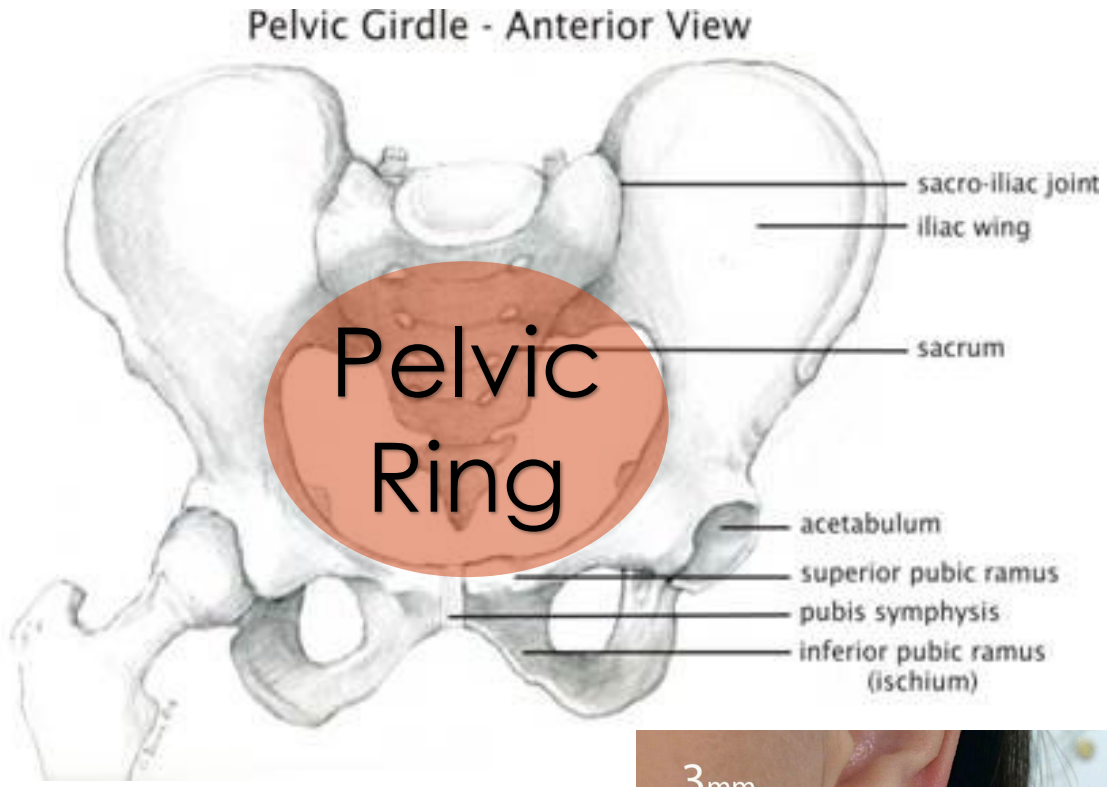
PELVIC ANATOMY



http://www.aast.org/pelvis-injuries

Superior and Inferior Pubic Rami: Infinity Sign	• Our "sit bones"
Acetabulum: the "socket" of the hip	• holds the ball of the femur
Iliac Wing: or iliac crest	• Attaches to the sacrum via the sacroiliac joints
Sacrum: Lowest part of spine	• Connects to iliac wings
Symphysis Pubis: Cartilage joint, symphysis means "growing together"	• Avascular: many compressive forces pass through this joint • 4-5 mm apart

WHAT DO THESE TWO HAVE IN COMMON?

PELVIC INJURIES

The pelvis supports the bladder, intestines, the rectum, the prostate in males and the uterus in females.

Many nerves run through the pelvis and injury can result in permanent bowel, bladder, and sexual dysfunction.

Fractures are uncommon but can be deadly: only 10% of blunt trauma results in a pelvic fracture

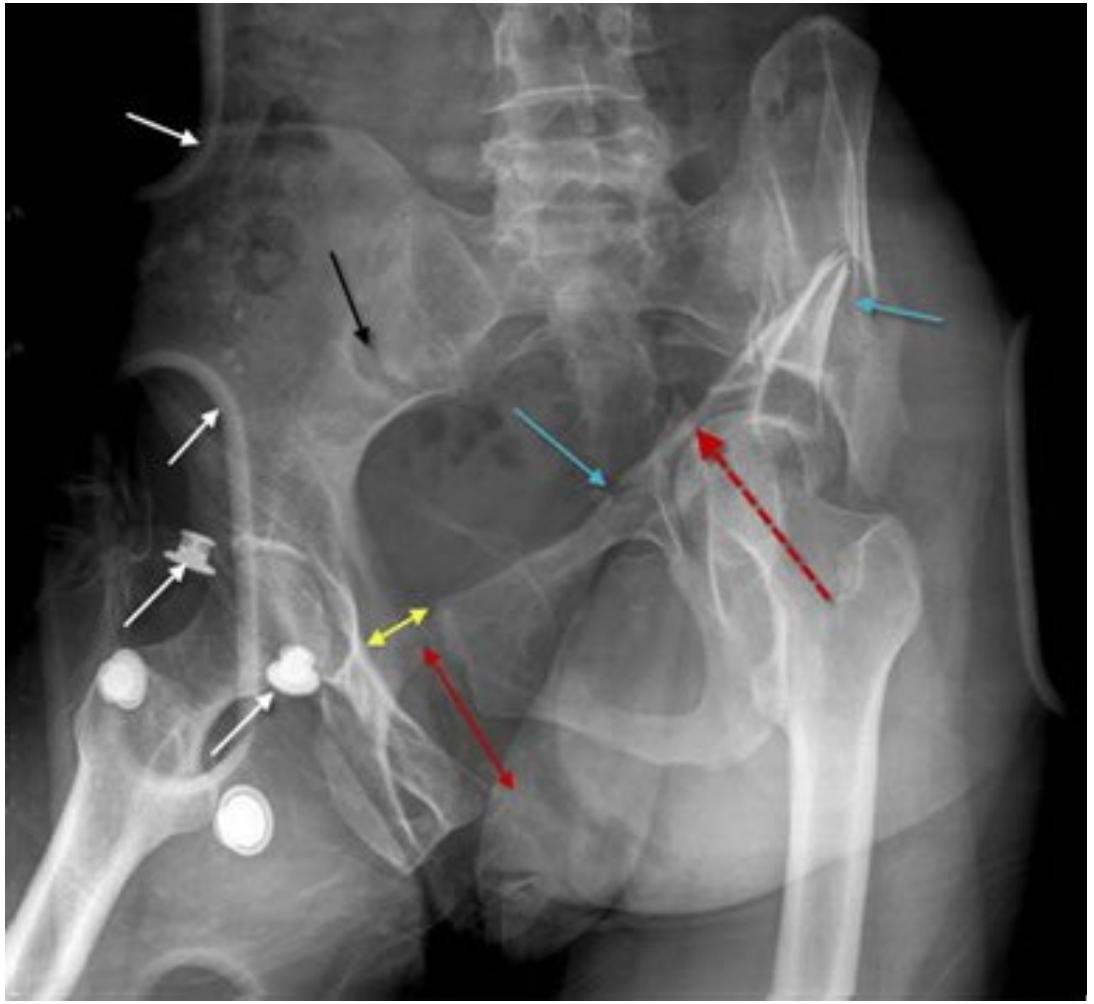
The pelvic ring requires a force equivalent to instantly coming to a stop from 30 MPH (less in elderly or those with weaker bones)

Frequently associated with head, chest, abdominal, or spinal injuries due to the force needed to cause a pelvic injury

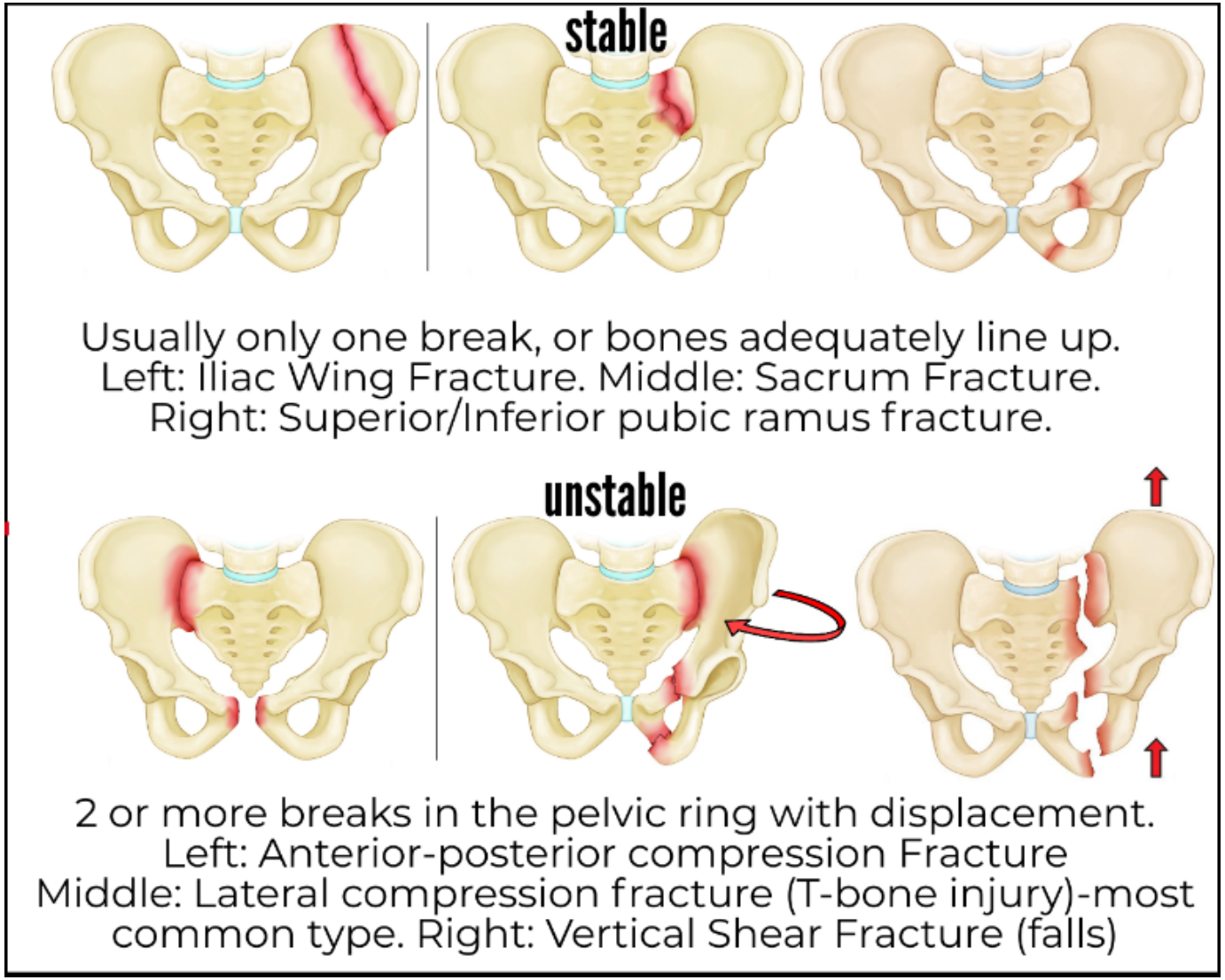
Hemodynamic instability from a pelvic fracture has a 60% mortality rate

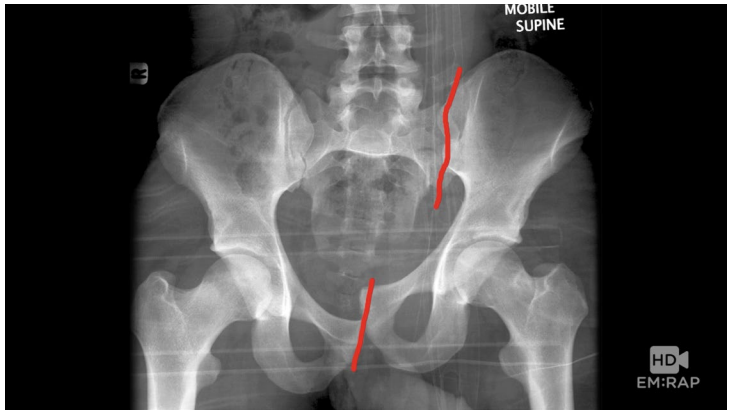
https://www.ncbi.nlm.nih.gov/books/NBK598968/

- Pelvic Fracture from a high speed MVC



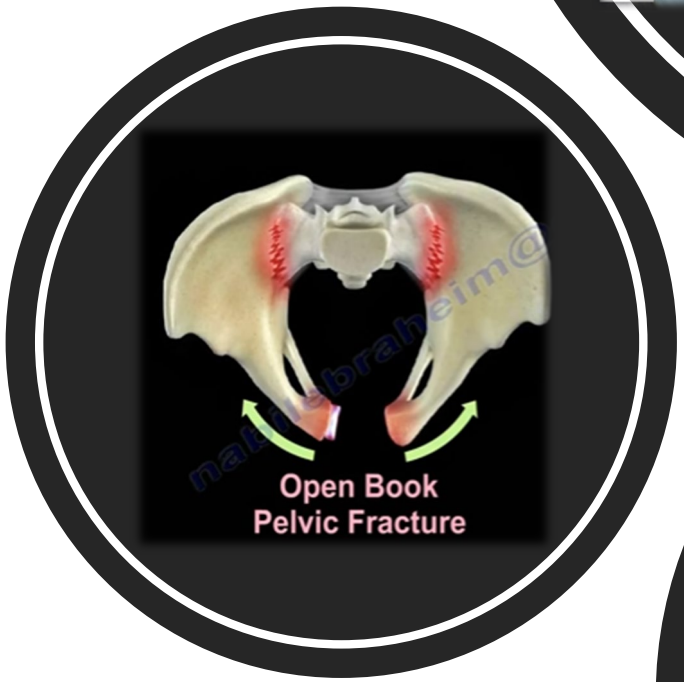
STABLE VS. UNSTABLE

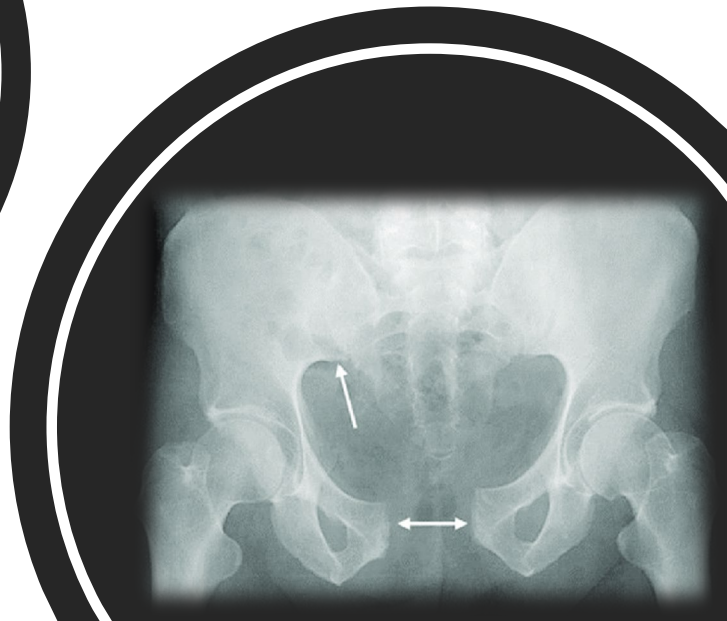




OPEN BOOK PELVIC FRACTURE

- Associated with significant morbidity and mortality due to the associated vascular injuries
- Pubic Symphesis widens past "stretch point", or 2mm, of cartilage
- Happens with anteroposterior compression injuries
- Bilateral outward angulation of knee/ankle





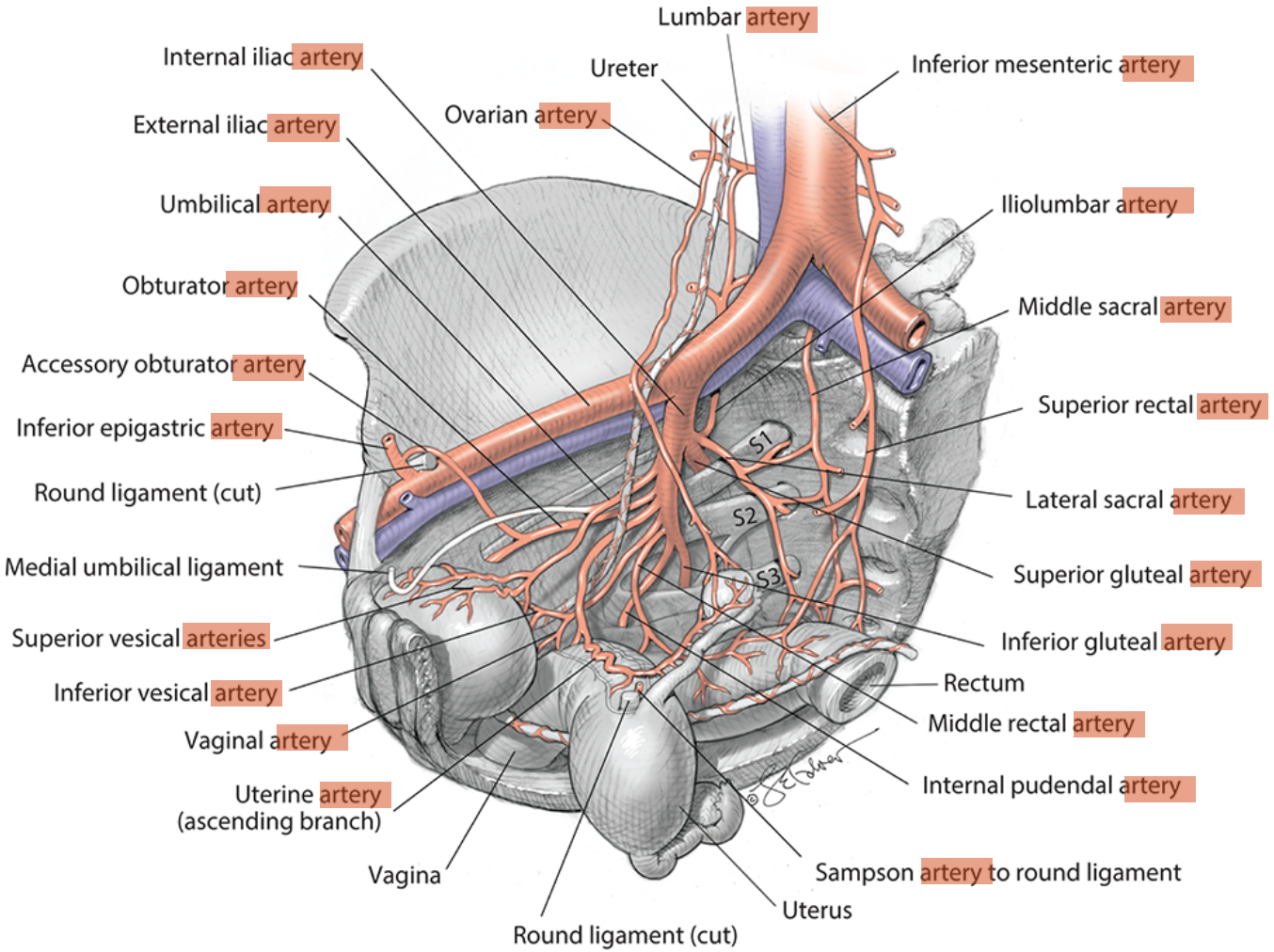
PELVIC ARTERIES

How many liters of blood can the pelvis hold?

4-6 Liters

How many liters of blood are in the human body?

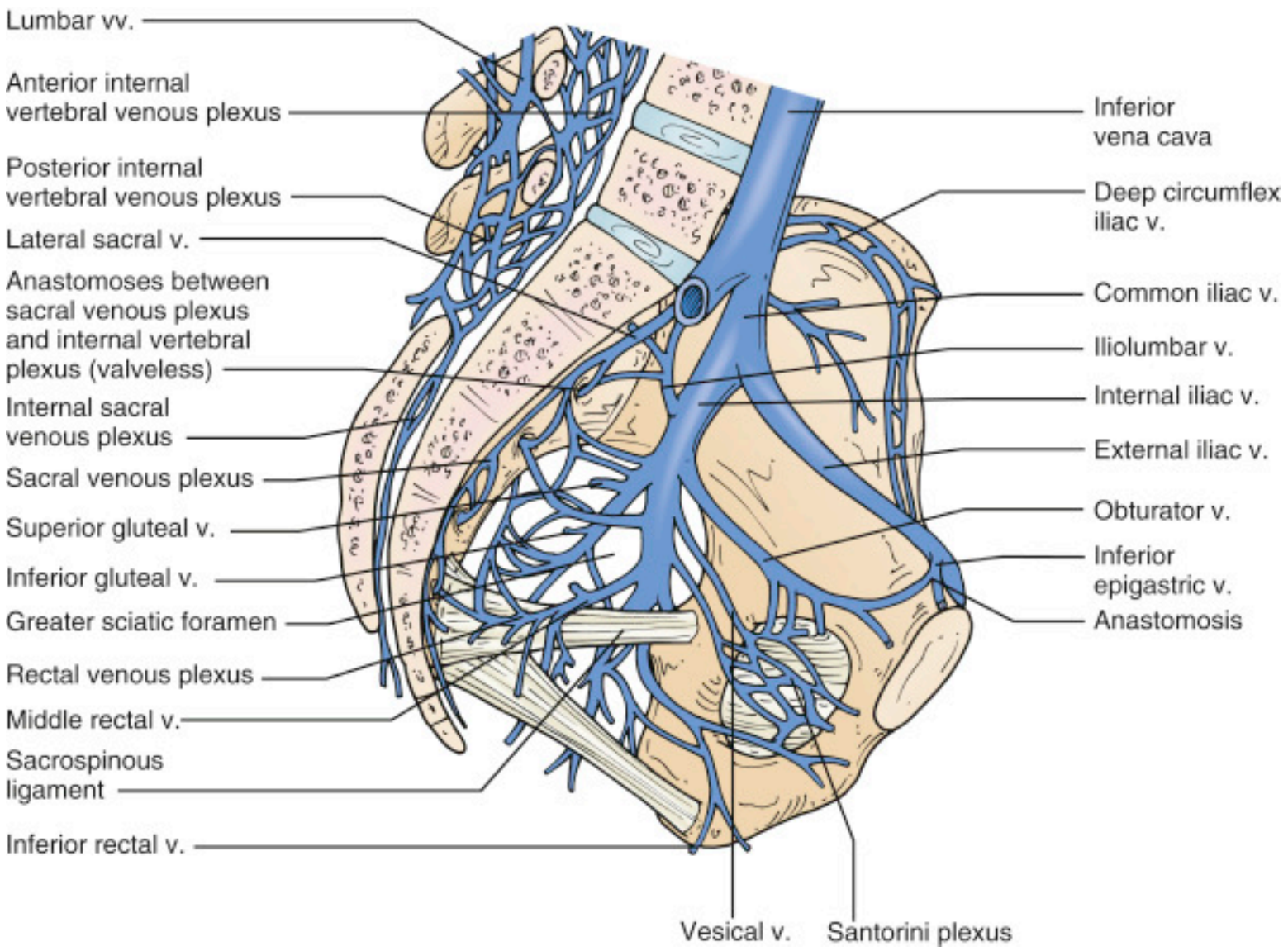
4-6 Liters



Source: Jennifer R. Butler, Laura E. Fitzmaurice, Alpesh N. Amin, Christine M. Kim: *OB/GYN Hospital Medicine: Principles and Practice*

PELVIC VEINS

85% of retroperitoneal hemorrhages from a pelvic fracture are from veins, not arteries.



https://www.jems.com/2014/12/02/critical-management-deadly-pelvic-injuri/

HOW DO WE ASSESS IN THE FIELD?

- What was the injury?
- High force or Low?
- Hip fracture vs. pelvic fracture?
- Check the pelvis for stability? "Rocking" the pelvis.
  - If obvious fracture, we do not need to do this.
  - Proved to be unreliable technique as it only detects the most severe pelvic disruptions
  - May be dangerous as it can further displace fracture fragments and dislodge formed blood clots, resulting in worsening hemorrhage.
  - What can we do instead?
- Scoop Stretcher
- Do not log roll

https://www.jems.com/2014/12/02/critical-management-deadly-pelvic-injuri/

SIGNS & SYMPTOMS

- Main Symptom: Pain in the groin, hip, or lower back that gets worse with walking or moving the legs
- Abdominal Pain
- Numbness/Tingling in the groin or legs
- Bleeding from urinary meatus
- Difficulty urinating, usually accompanied with the sensation of a very full bladder
- Difficulty walking or standing
- Leg length discrepancy
- Bruising over the flank, pelvis, pubis, perineum or scrotum
- Loss of bowel/bladder control (nerve)

https://www.cedars-sinai.org/health-library/diseases-and-conditions/p/pelvic-fracture.html

PELVIC BINDER VS. SPLINTING

ALTERED LOC

HEMODYNAMIC INSTABILITY

OBVIOUS SIGNS OF PELVIC INJURY/INSTABILITY ON EXAM

SIGNS OF HEMORRHAGIC SHOCK AND REPORTS OF LOW BACK PAIN

WORKS BEST FOR ROTATIONALLY UNSTABLE INJURIES (OPEN BOOK PELVIC FRACTURE)

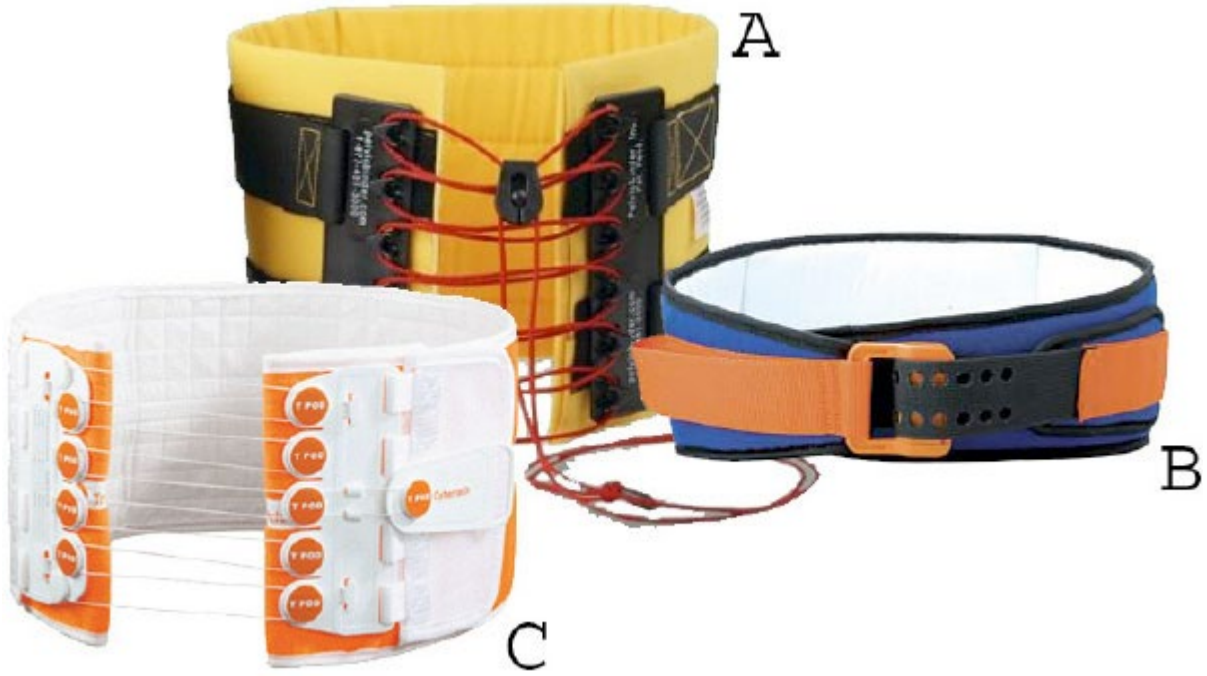
- Hemodynamically stable patients
- Alert and Oriented with no distracting injury
- Unsure if hip or pelvic fracture

What if unconscious?

https://www.ncbi.nlm.nih.gov/books/NBK598968/

PELVIC BINDERS

- Reduces intra-pelvic volume
- Prevents additional vascular and tissue injury from fracture fragment movement
- Reduces blood loss by tamponading bleeding vessels and bones
- Improves pelvic ring stability
- Use as you would a tourniquet
- Tape feet together, why?

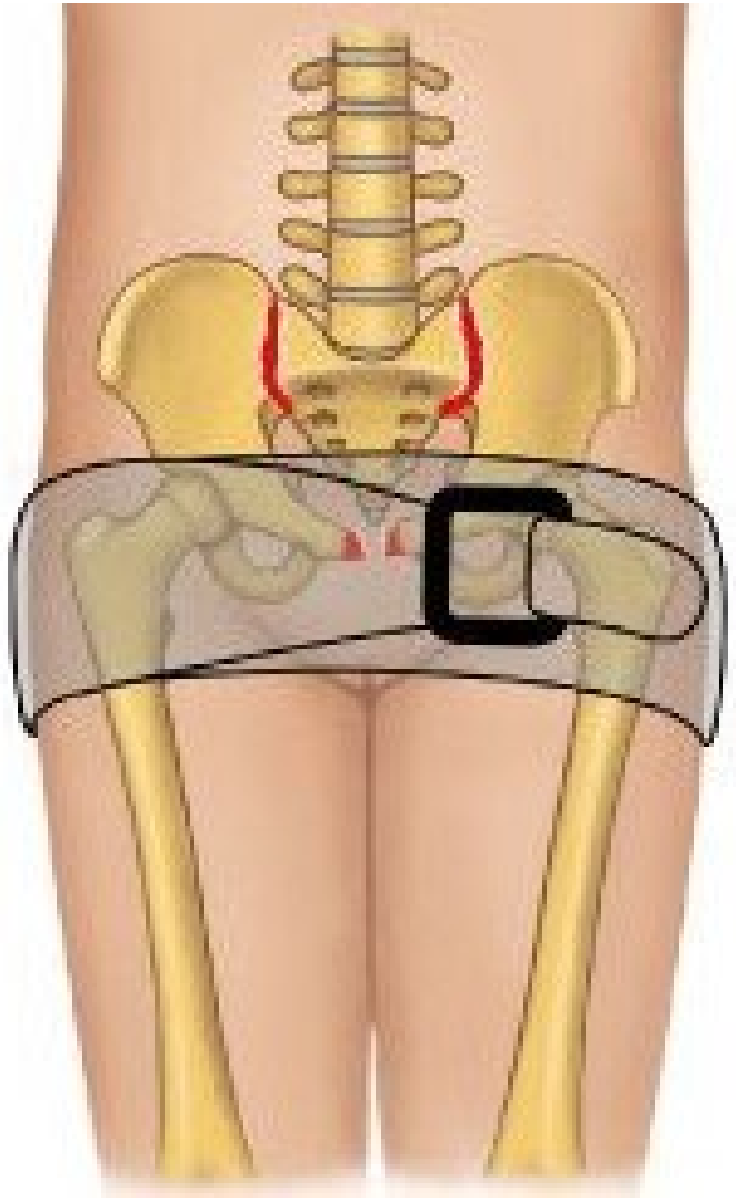


SAM Pelvic Sling: Force-Controlled, has an "autostop" buckle that acts to avoid over or under-tightening of the pelvic sling. Once optimal compressive force is achieved, two prongs activate, clicking to confirm the correct application.

https://www.ncbi.nlm.nih.gov/books/NBK598968/

CORRECT PLACEMENT

- 22 mm (size of a nickel) fracture reduction when pelvic binder was placed above the greater trochanters
- Can we "over-stabilize" a pelvic fracture? How can we tell?
- Most Pelvic Binders are not placed low enough and are not placed tight enough.
- Place over greater trochanters, NOT over iliac crests.



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SHEETS FOR BINDING?

- Is this effective?
- Very difficult to obtain the correct reduction force to “close” the pelvic fracture
- Is better than nothing if it’s all we have

WHAT IF YOU DON'T HAVE A BINDER OR A SHEET?

FURTHER TREATMENT IF UNSTABLE

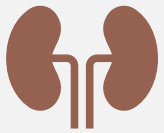
- Frequently assess vitals
- Rapid Transport
- 2 large bore IVs
- Pain Control
- Fluid resuscitation- permissive hypotension. What is this?

https://www.jems.com/2013/03/27/permissive-hypotension-trauma-resuscitat/

PERMISSIVE HYPOTENSION

Maintaining a BP lower than standard physiological levels in a patient suffering hemorrhagic blood loss from trauma (SBP 80-90's and MAP 50's). Goal is 500-1000mL.

Restrict the amount of fluids administered while the patient is actively bleeding rather than aggressively hanging fluids until blood products can be administered.



This allows adequate vasoconstriction and organ profusion while preventing coagulopathy, hypothermia and acidosis. It also stops additional blood loss by stopping vasodilation.

HOW DOES PERMISSIVE HYPOTENSION WORK?

Patient is losing whole blood (red blood cells, white blood cells, water, electrolytes, clotting factors, proteins, glucose, etc).

Infusing large amounts of fluids essentially dilutes what is left of the patient's circulating blood, rendering the patient's clotting agents less effective.

More fluids = more hemorrhage.

The liver is stimulated to release additional clotting factors during hypotensive states.

More fluids (normotensive) = less clotting factors released by the liver.

Higher MAPs lead to increased pressure behind newly formed blood clots, increase cardiac output and reduce vasoconstriction.

More fluids = vasodilation and pressure causing dislodging of clots and hemorrhage to resume.