High Energy Pelvic Trauma

John-David Black, MD

Director, Orthopaedic Trauma

Kadlec Regional Medical Center

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Disclosures

- I am a paid consultant of SI-Bone
- I also took this photo

Objectives

Understand	Identify	Recognize	Review	Laugh
Pelvic Anatomy Stable vs unstable pelvic rings	Clinical & radiographic characteristics of high vs low energy trauma	Markers of stability Initial management Treatment options	Review a case or two, some data as well	Laugh a little… or a lot!

Pelvic Ring Disruption:

- Marker for severe injury
- Overall mortality 6-10%
- Life threatening

Bone Anatomy

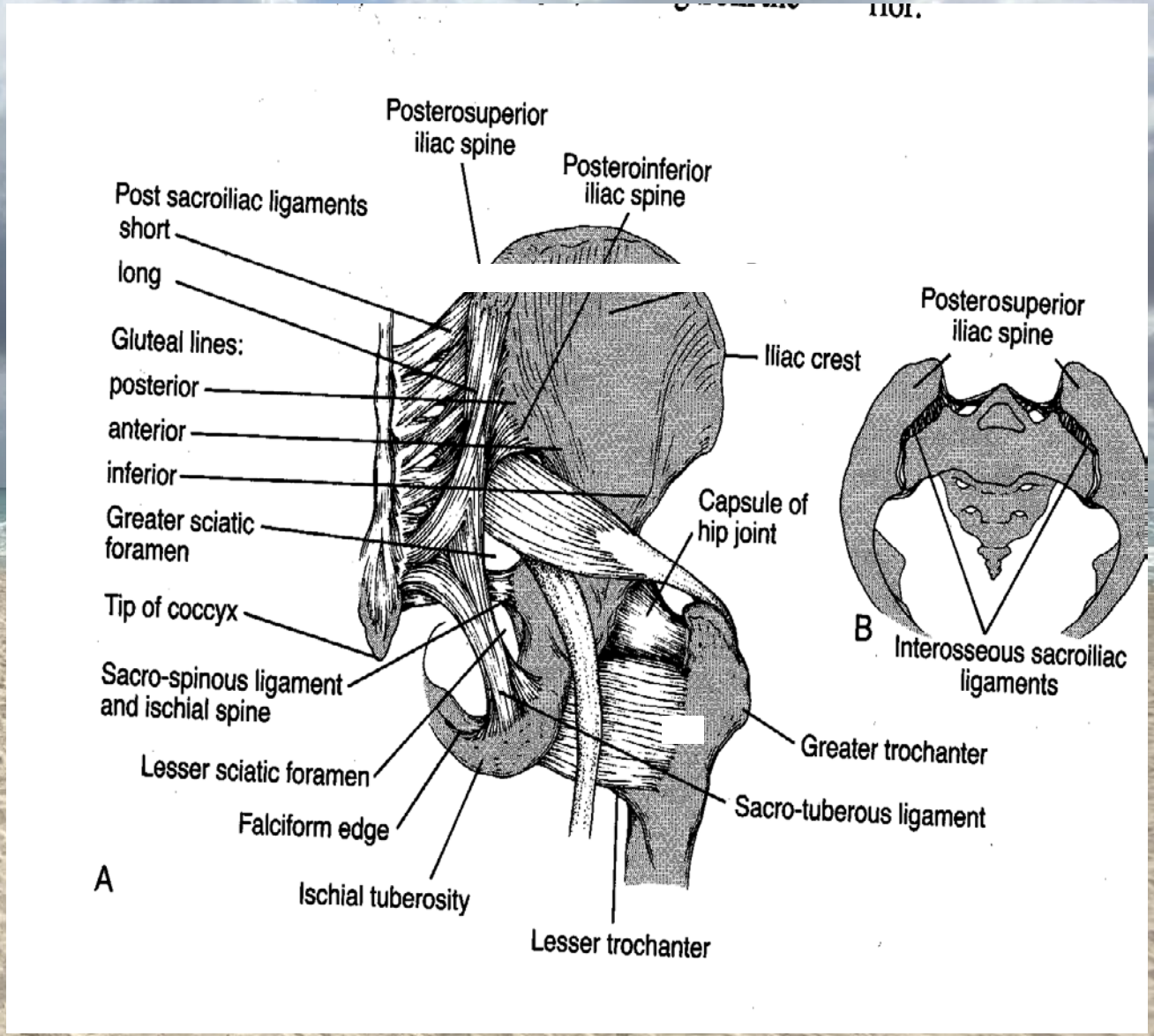
- Two innominate bones with sacrum.
- Ilium, ishium and pubis
  - 3 separate ossification centers fuse at ~16yo.
  - Coalesce at triradiate cartilage.
- Gap in symphysis < 5 mm
- SI joint 2-4 mm

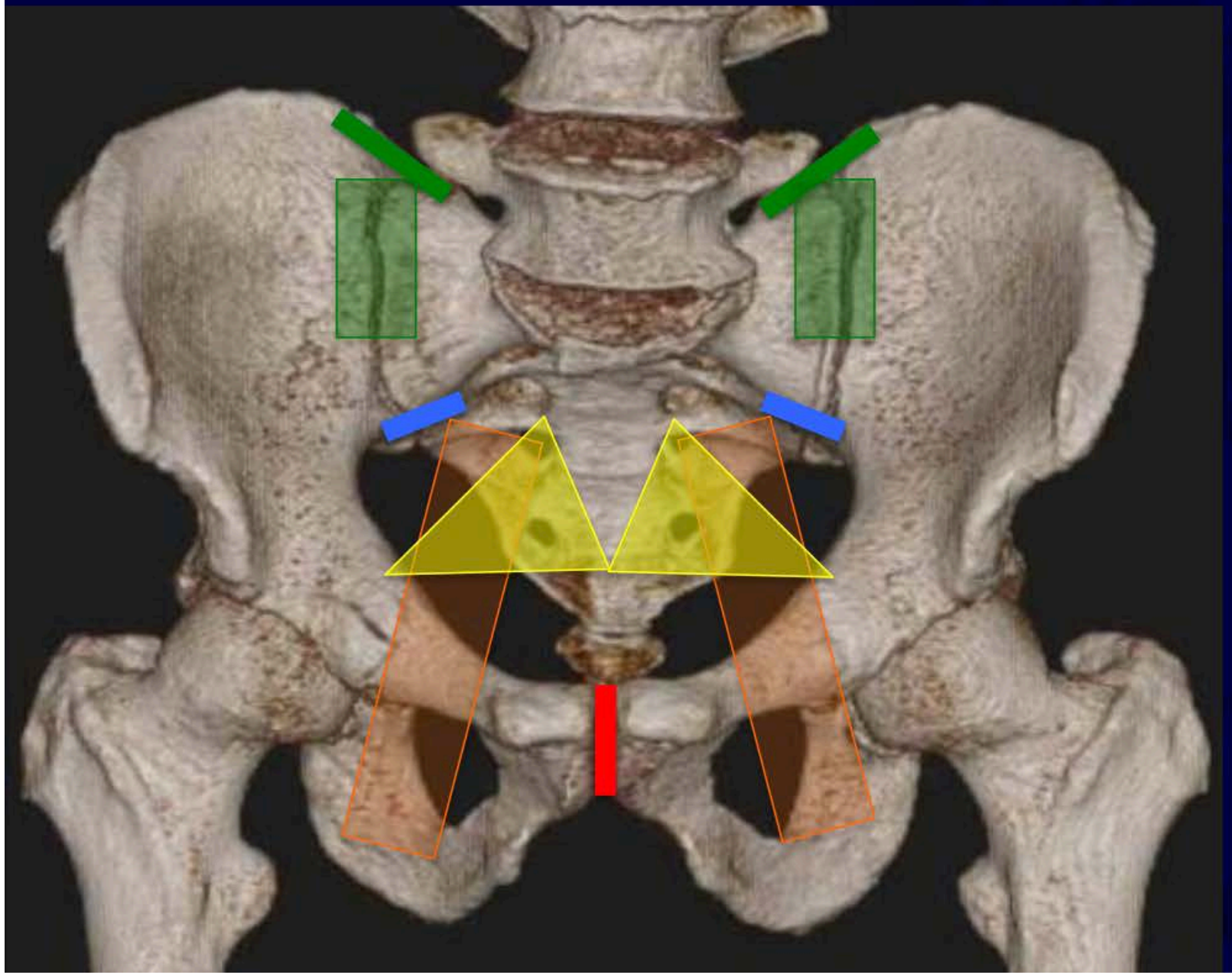
- Sacrum
- Iliac WIng
- Acetabulum
- Pubis

Osteology

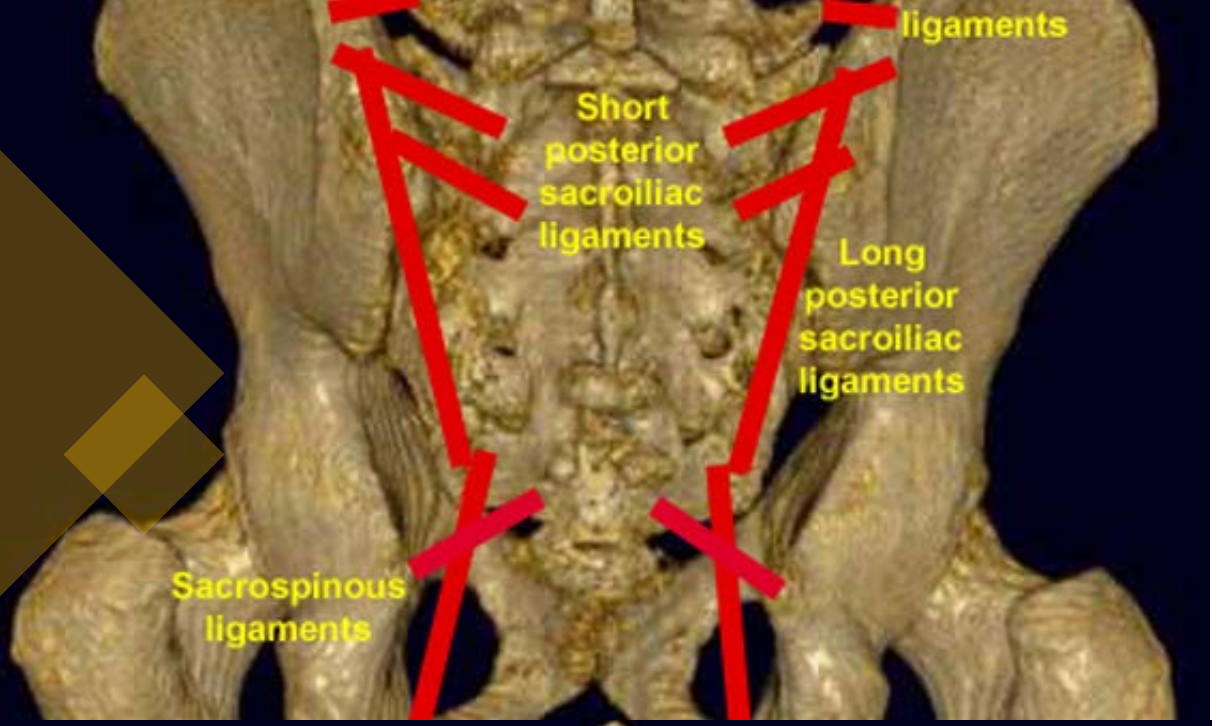
Ligamentous Anatomy

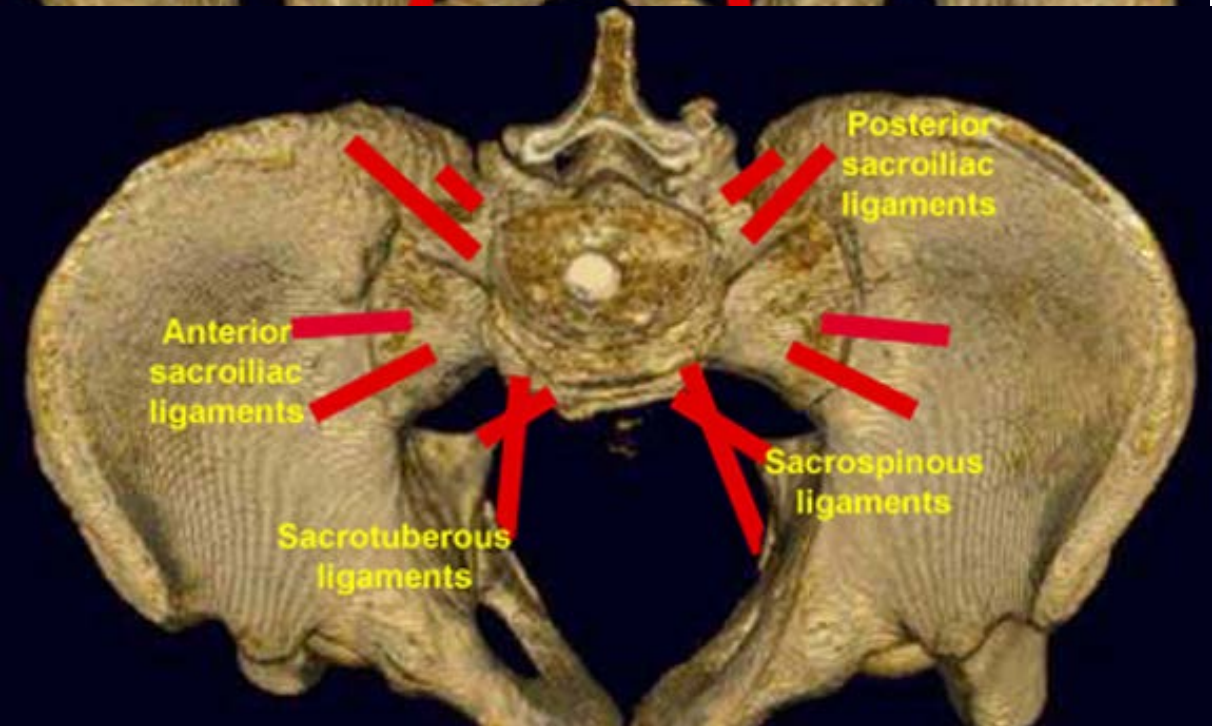
- Ligaments - posterior ligaments are stronger than anterior ligaments:
  - Posterior SI
  - Anterior SI
  - Interosseous ligaments
  - Pubic symphysis
  - Sacrotuberous
  - Sacrospinous





- Pubic Symphysis
- Anterior Sacroiliac Ligaments
- Posterior Sacroiliac Ligaments
- Sacrospinous Ligaments
- Sacrotuberous Ligaments





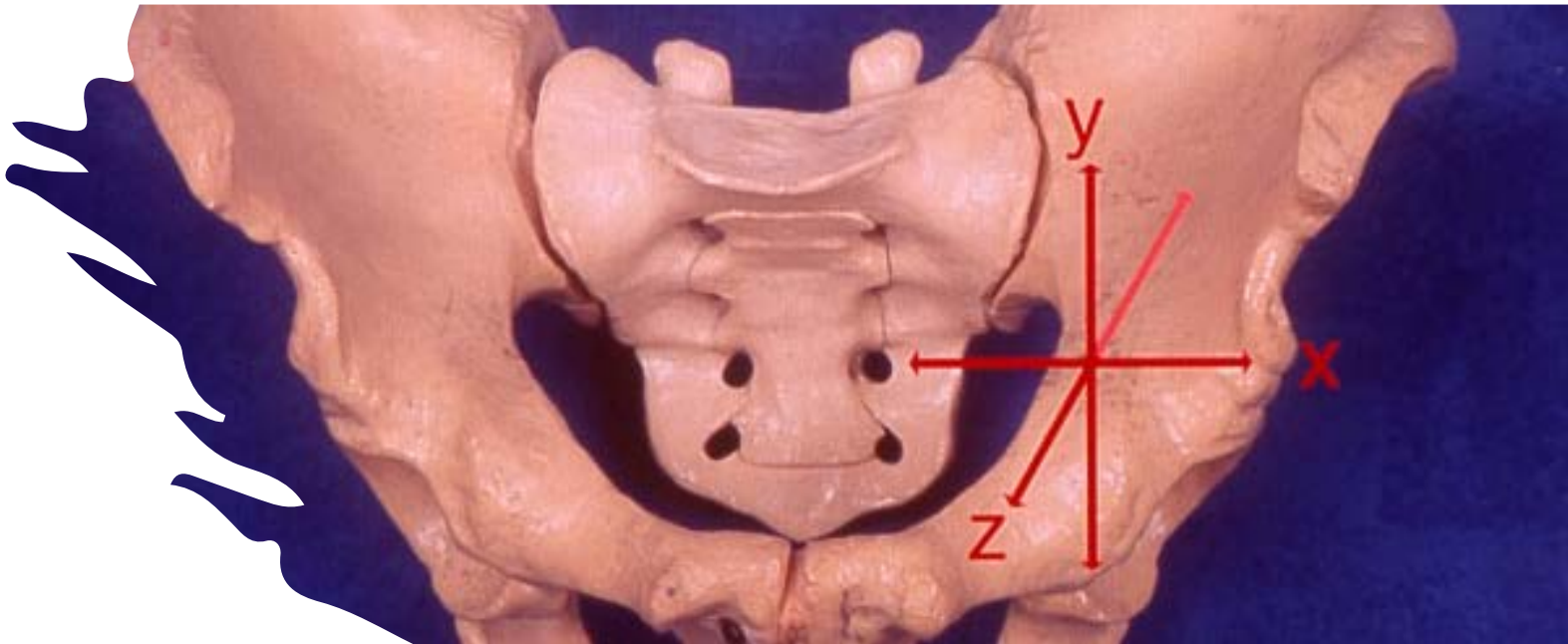
Posterior Ligaments

- Ant. SI Joint – resist ER
- Post. SI and Interosseous – posterior stability by tension band (strongest in body)
- Iliolumbar ligaments augments posterior complex

- Sacrotuberous (sacrum behind sacro-spinous into ischial tuberosily vertically) resists shear and flexion of SI joint
- Sacrospinous – (anterior sacral body to ischial spine horizontally) resists ER

Normal SI Joint Motion with Gait

- < 6 mm of translation
- < 6° rotation
- Intact cadaver resists 5,837 N (1,212 lbs)



Acute Trauma to the Pelvis

Pelvis is like a pretzel…..

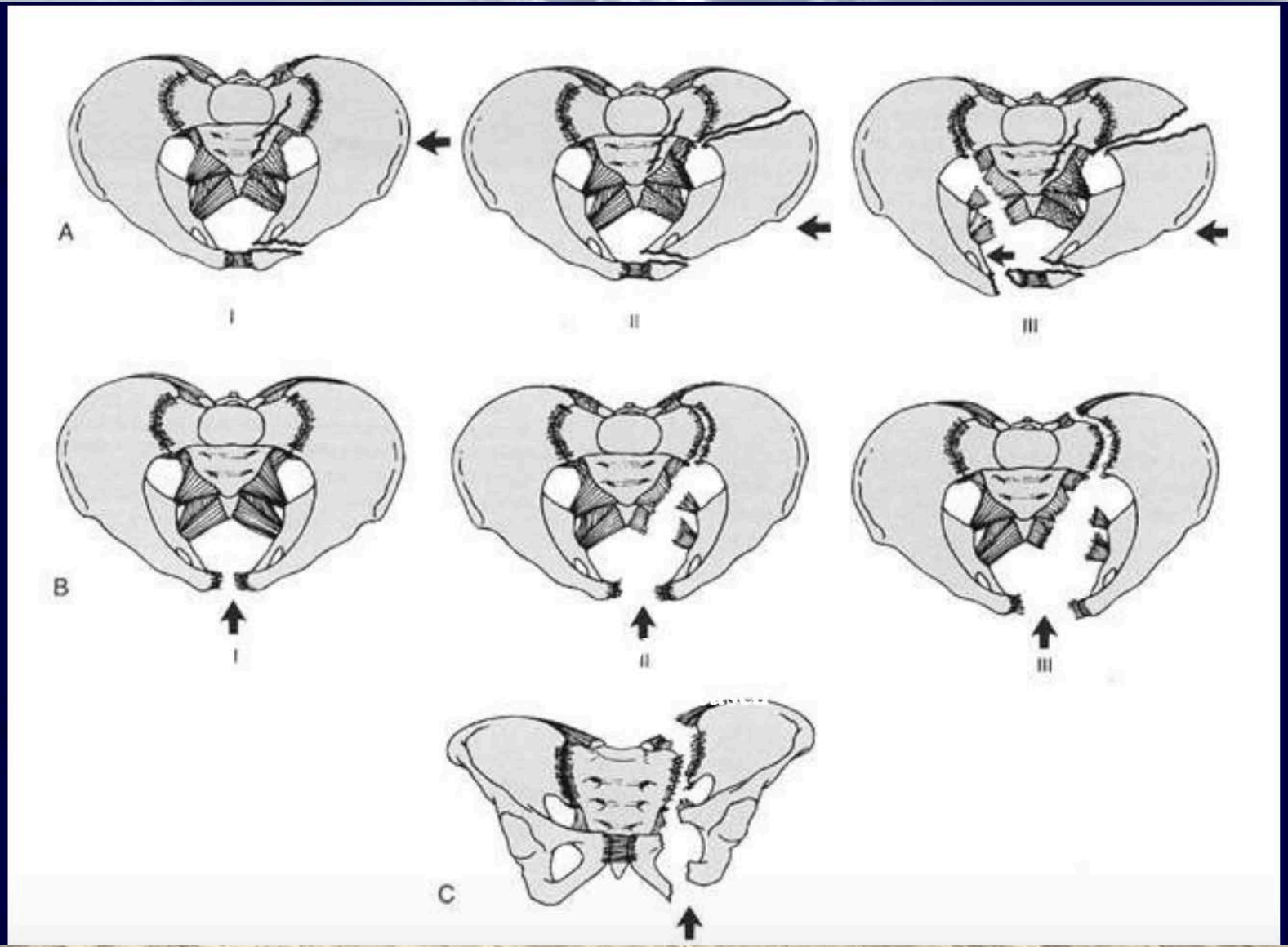
- It can’t break in just one spot…
  - Except in kids
- Where it breaks determines effect on pelvic stability

Young and Burgess Classification: Mechanistic description

Lateral Compression (LC)

Anteroposterior Compression (APC)

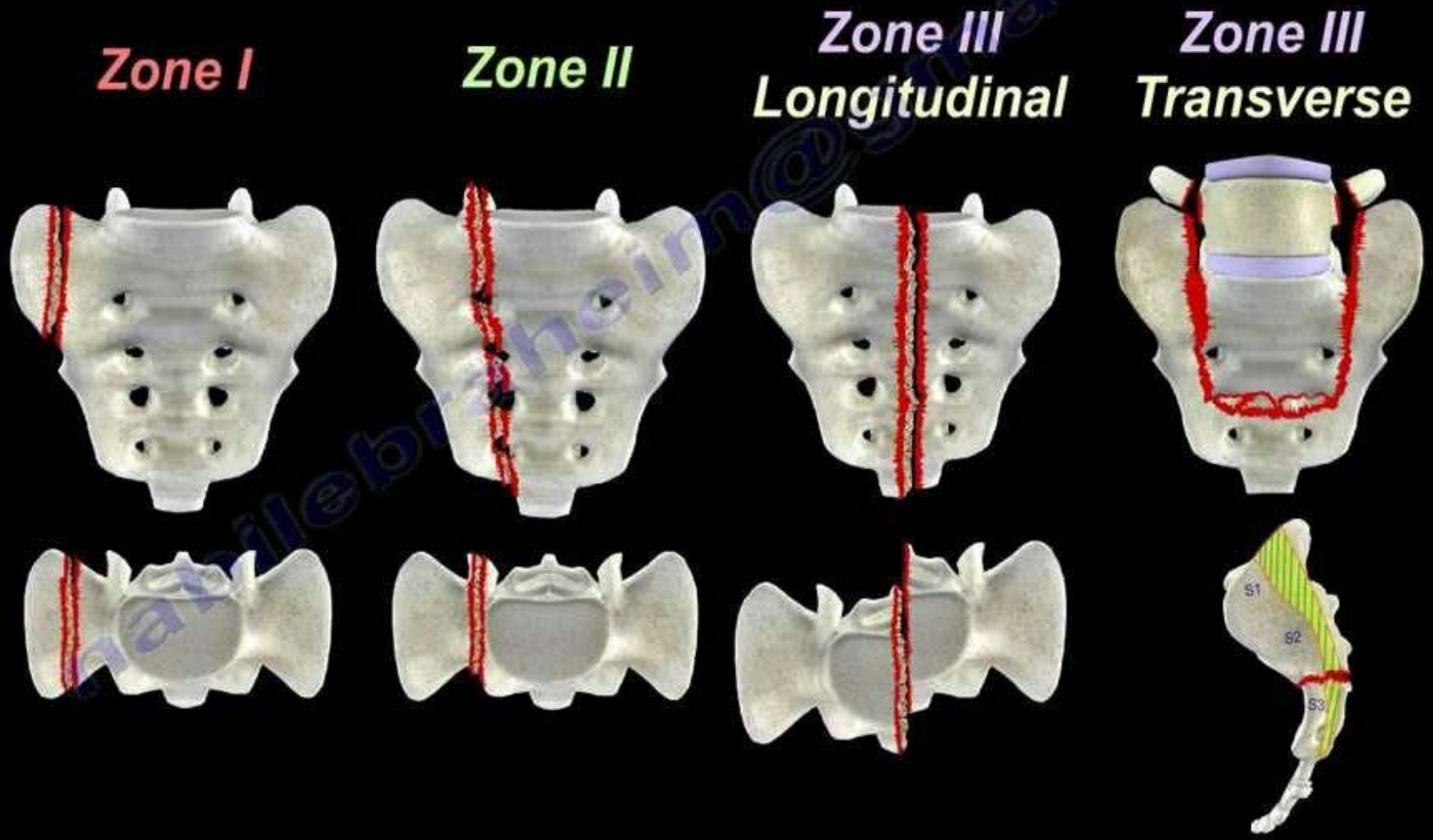
Vertical Shear (VS)



Sacral Fractures

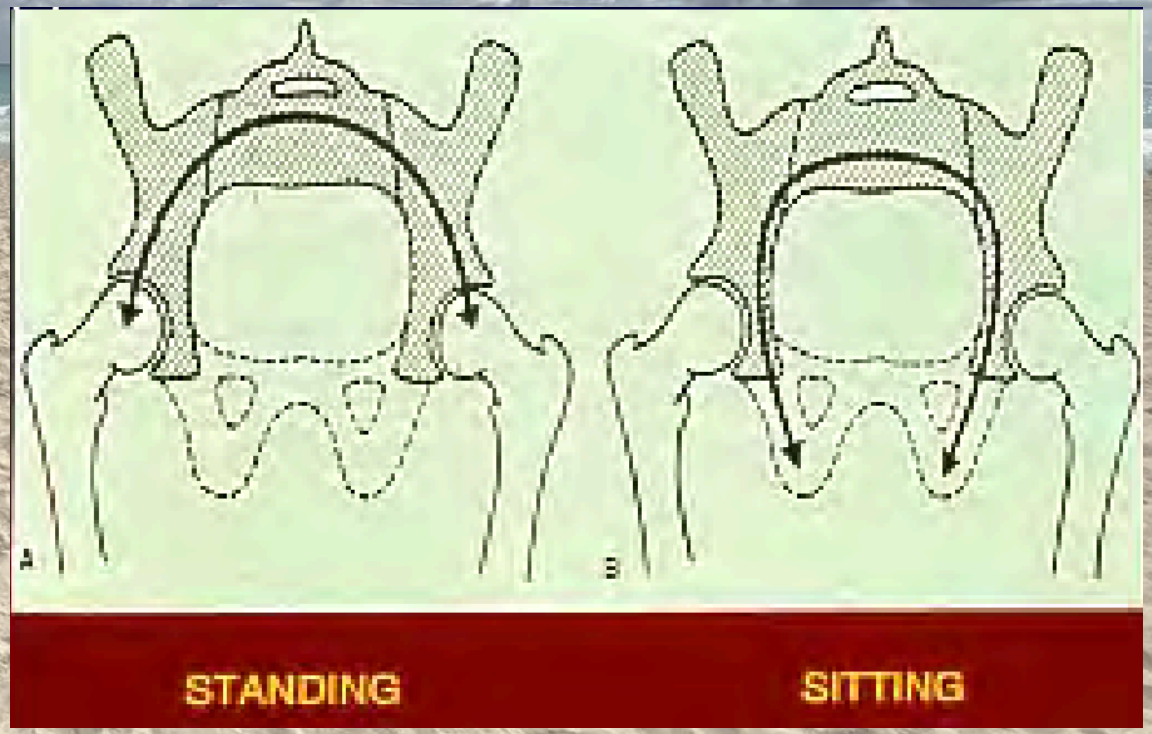
Types of Fractures of the Sacrum

Modified from the Denis Classification



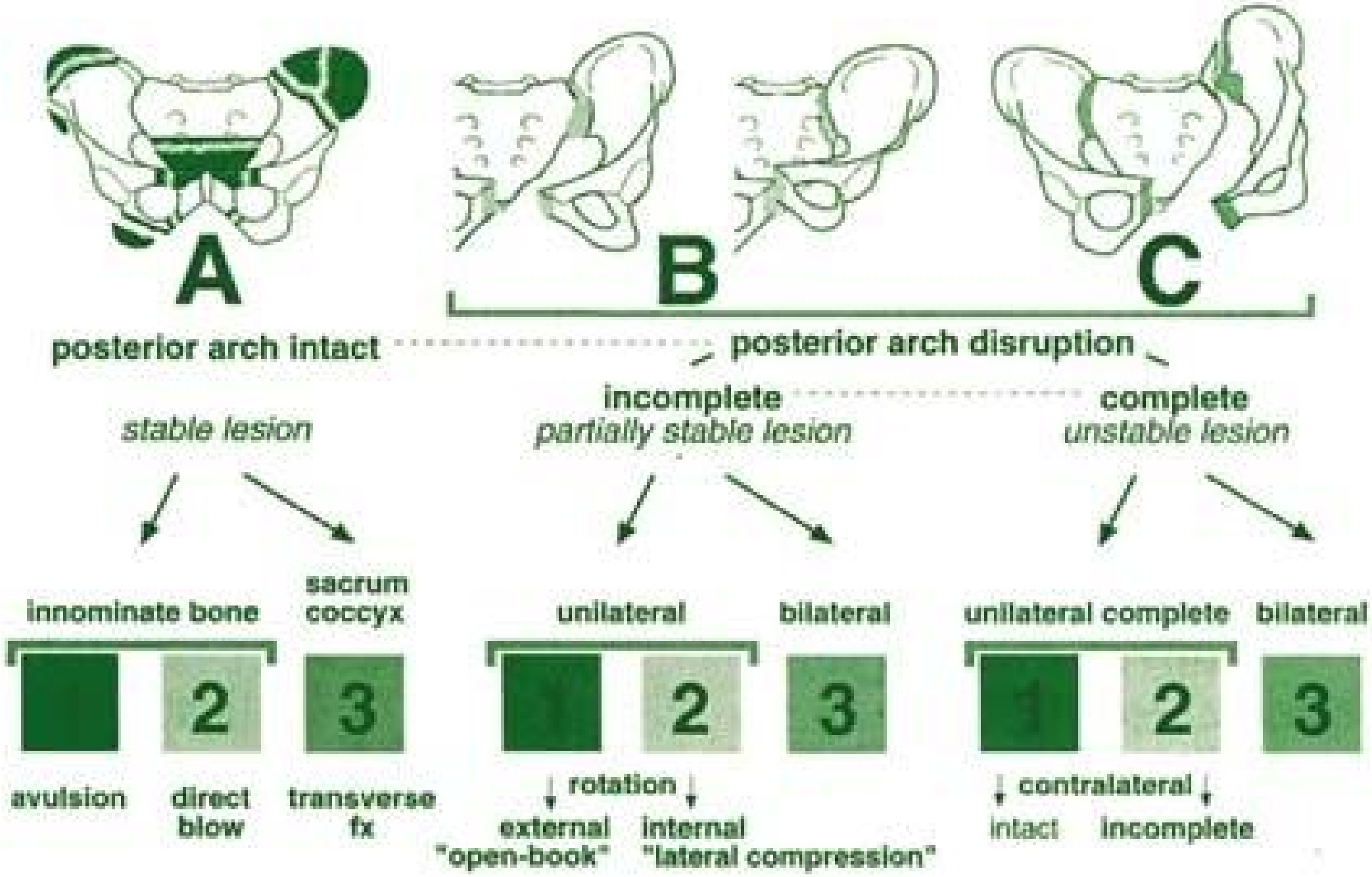
Is it stable?

- Stability = ability to support physiologic load
- Loads may be when sitting, side lying, standing, or otherwise per patient need
- Posterior Pelvic ring integrity is important in load transfer from torso to lower extremities

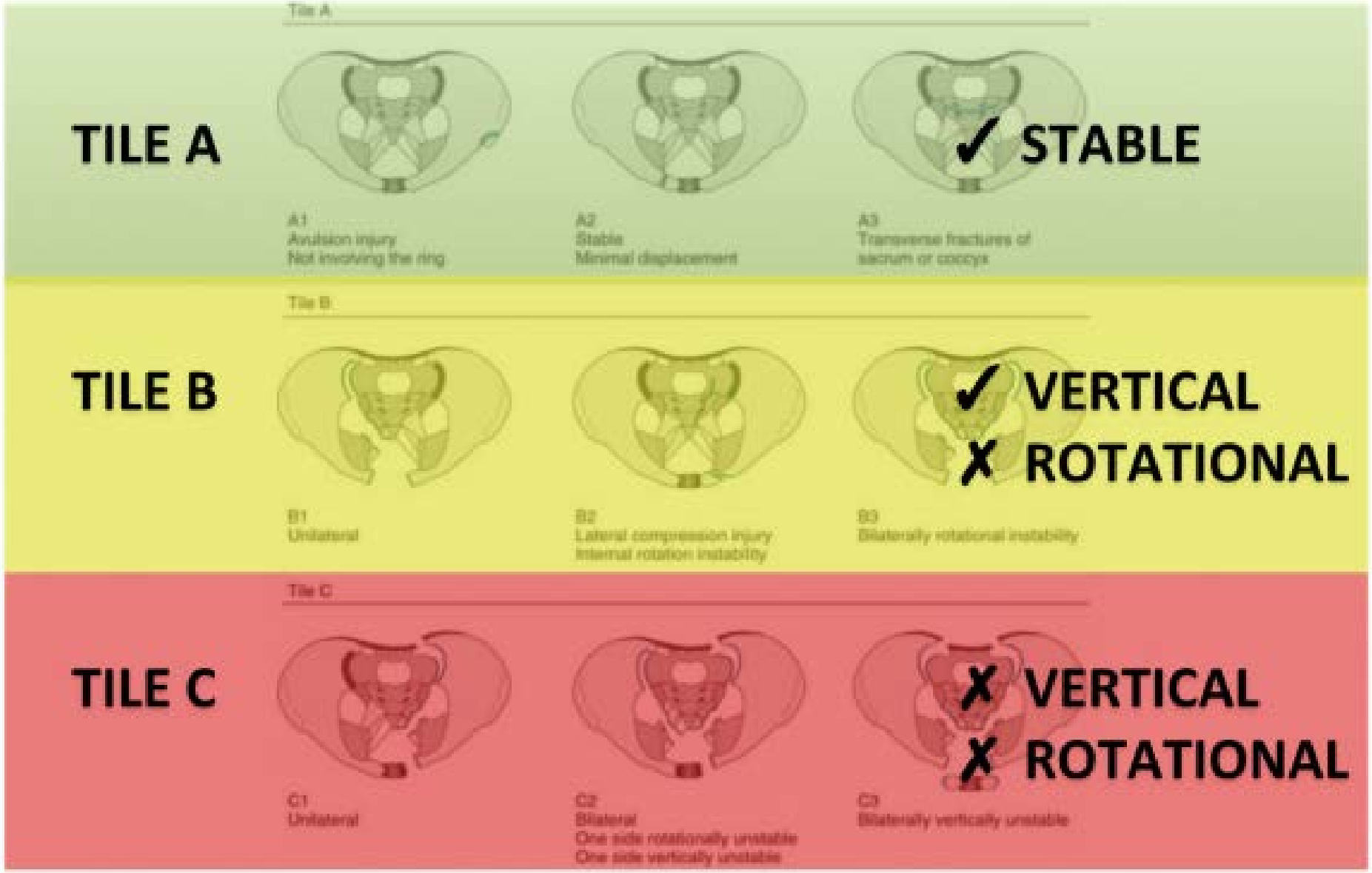


Instability Defined

- Loss of Posterior ring integrity *often* leads to instability
- Loss of Anterior ring integrity *may* contribute to instability, and *may* be a marker of posterior ring injury
- Tile classification
  - Based on instability patterns


A
B
C
posterior arch intact
posterior arch disruption
stable lesion
incomplete
partially stable lesion
complete
unstable lesion
innominate bone
sacrum
coccyx
unilateral
bilateral
unilateral complete
bilateral
1
2
3
1
2
3
1
2
3
avulsion
direct
blow
transverse
fx
rotation
external
"open-book"
internal
"lateral compression"
contralateral
intact
incomplete

Tile Classification



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  - Deformity on presentation predicts instability

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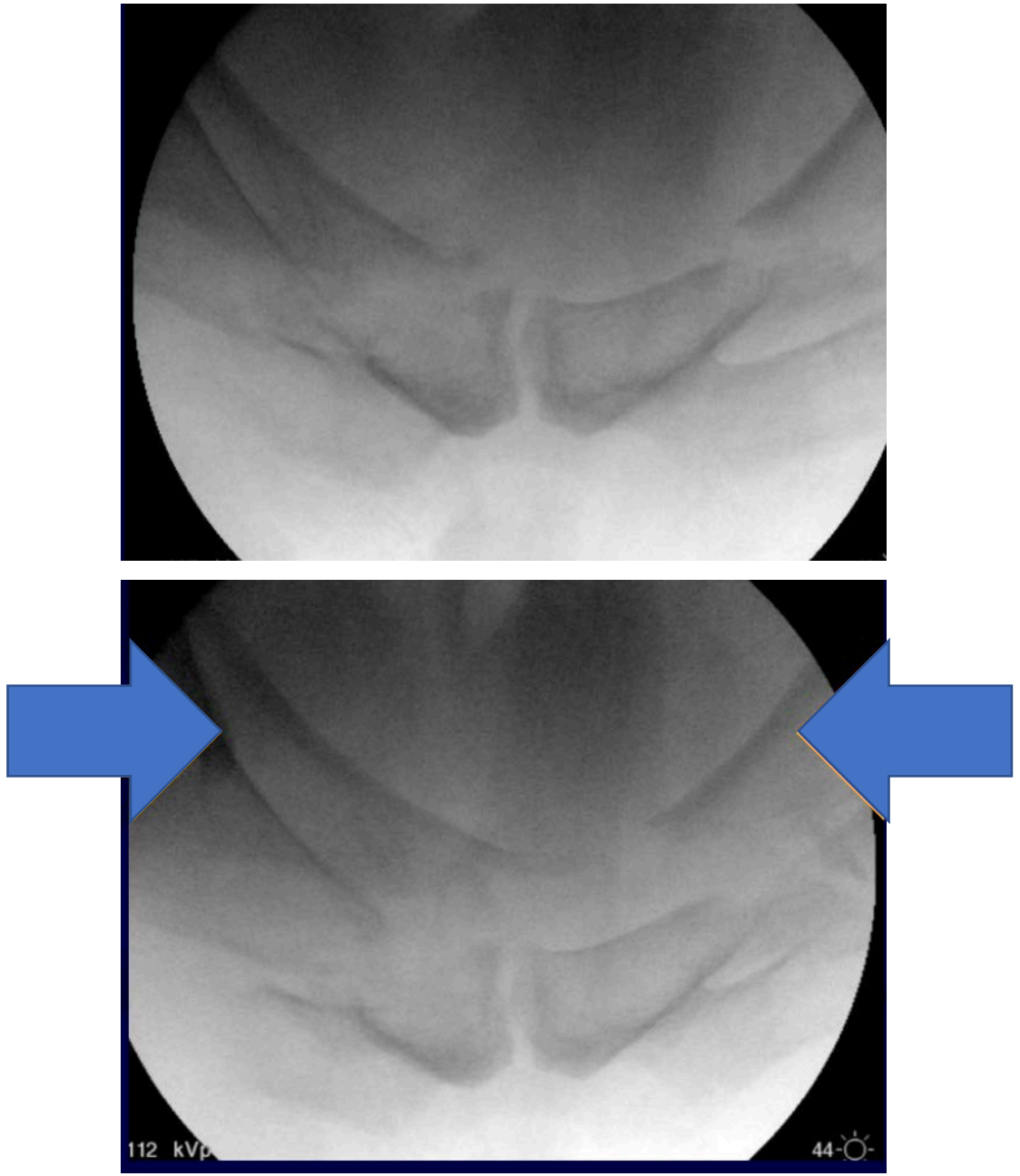
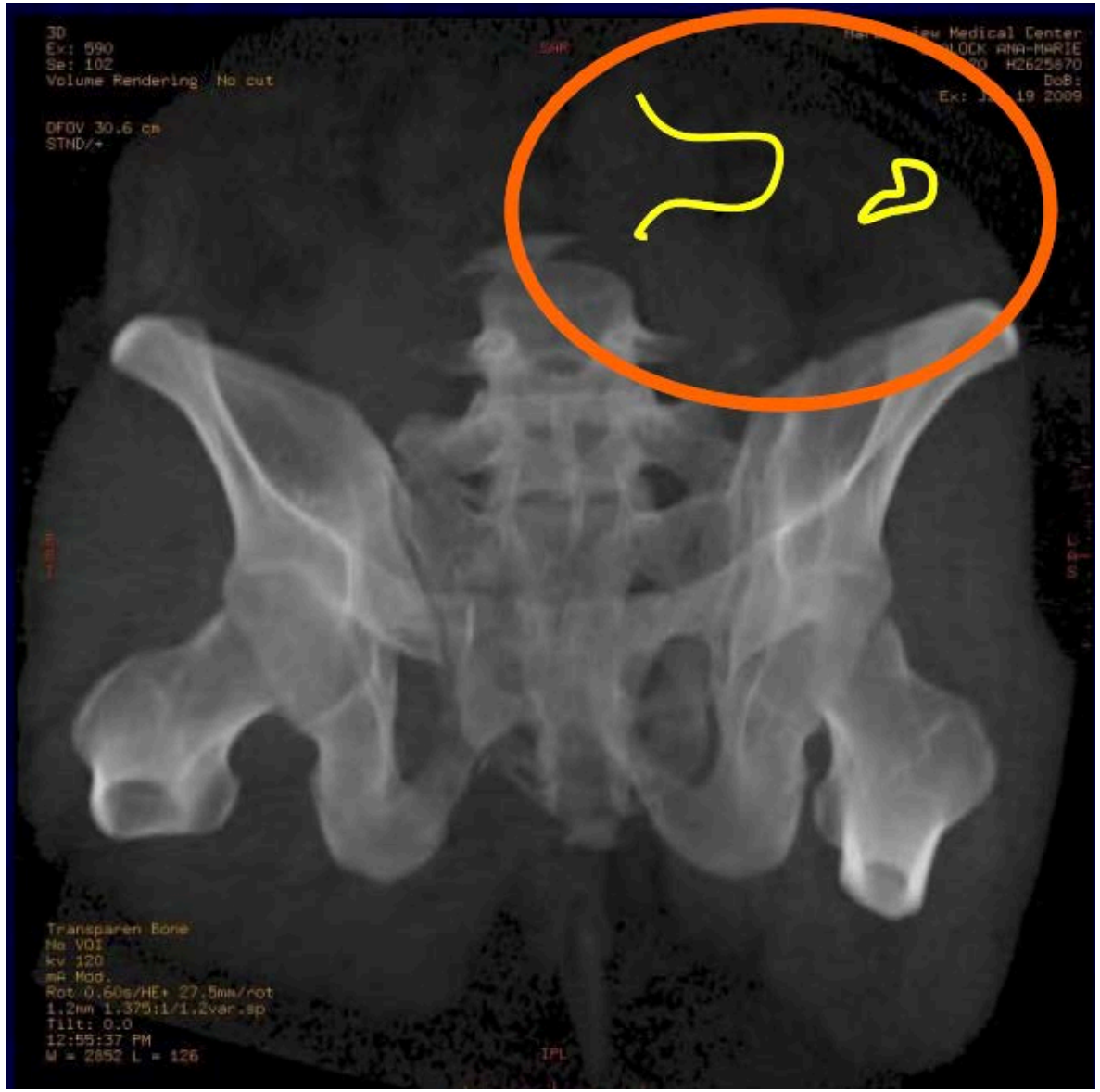


Is this stable?

- Is there deformity?
  - Deformity on presentation predicts instability
- Is the posterior pelvic ring intact?
- Stress test under fluoro
- Other clues to soft tissue injury?
  - Lumbar TP process fracture
  - Ischial spine avulsion
  - Lateral sacral avulsion



High energy vs Low energy: Abnormal Motion

TRAUMA

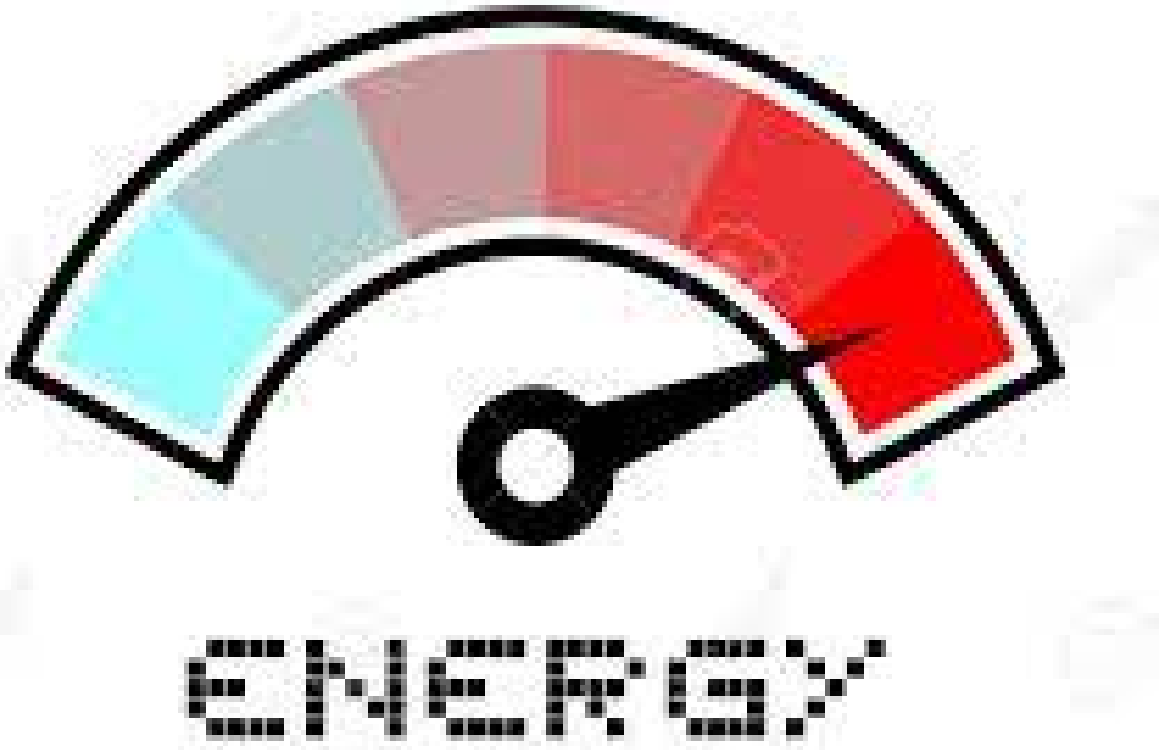
Sometimes, bad things happen to good people.
Sometimes, these "good people" also happen to be idiots.

#1 rule of Trauma:

Trauma ***<u>is not</u>*** a random disease!

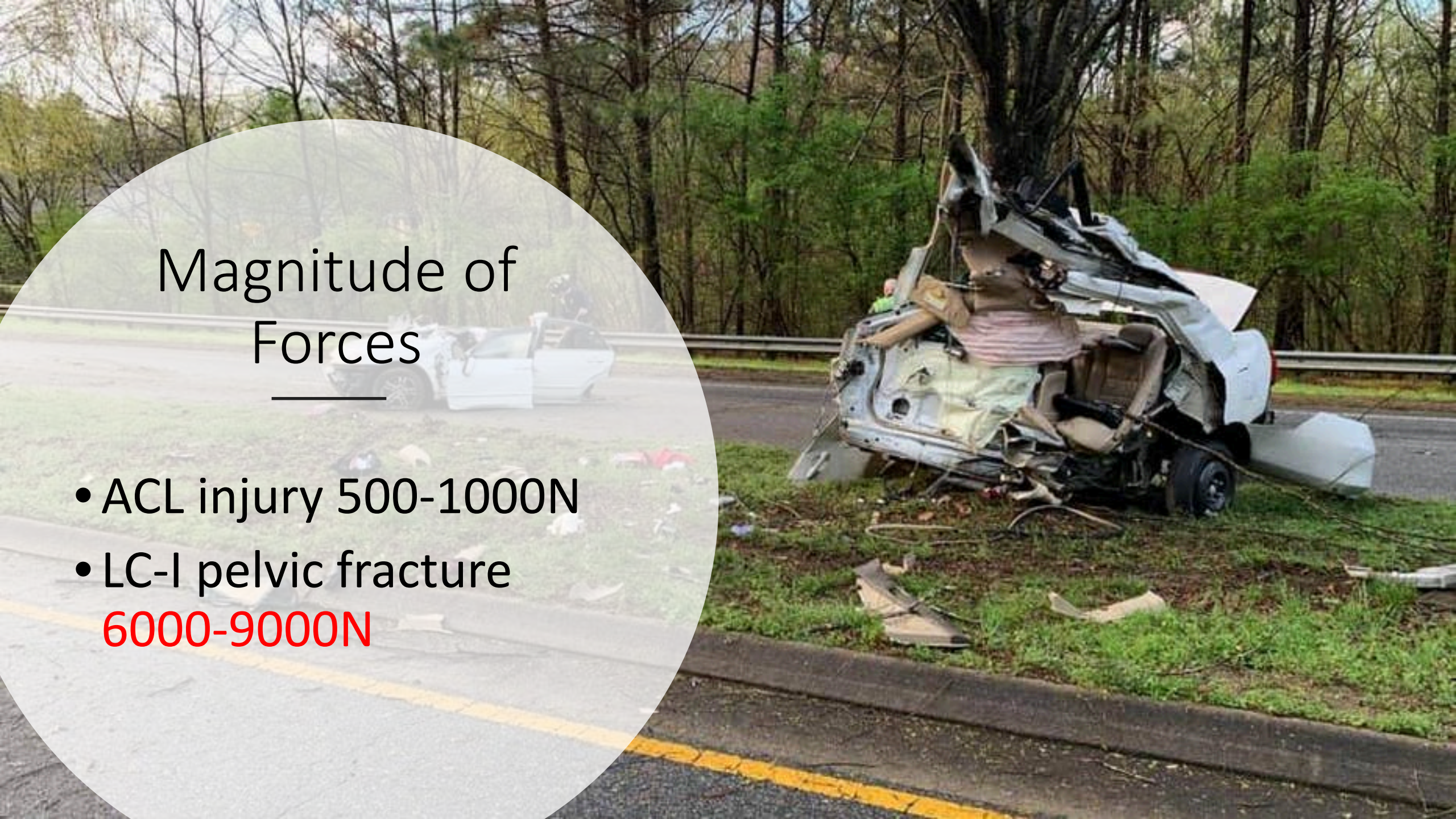

Trauma Surgeon
noun \traw-muh sur-juh n\
The first person you see after saying, "hold my beer and watch this."

Acute High Energy Pelvic Trauma



Pelvic Ring Injuries
Clinical considerations

- High Energy vs Low Energy
- Elevated Morbidity/mortality
  - Comorbid injuries
- Hemorrhage



Magnitude of Forces

- ACL injury 500-1000N
- LC-I pelvic fracture 6000-9000N

Initial management

- Treat the WHOLE patient!!!!
  - ***ATLS Protocol***
    - Good EMS report
    - Appropriate lines/fluids running
    - Team approach
  - Reverse/Treat correctible problems
    - Shock vs Hemodynamic instability
    - Stop/Address obvious sources of bleeding
    - Open fracture antibiotics, tetanus updated

Primary survey: ABC's

- Airway maintenance with cervical spine protection
- Breathing and ventilation
- Circulation with hemorrhage control
- Disability: Neurologic status
- Exposure/environment control: undress patient but prevent hypothermia

Some wounds can be tricky to find…… Be suspicious and look at the patient

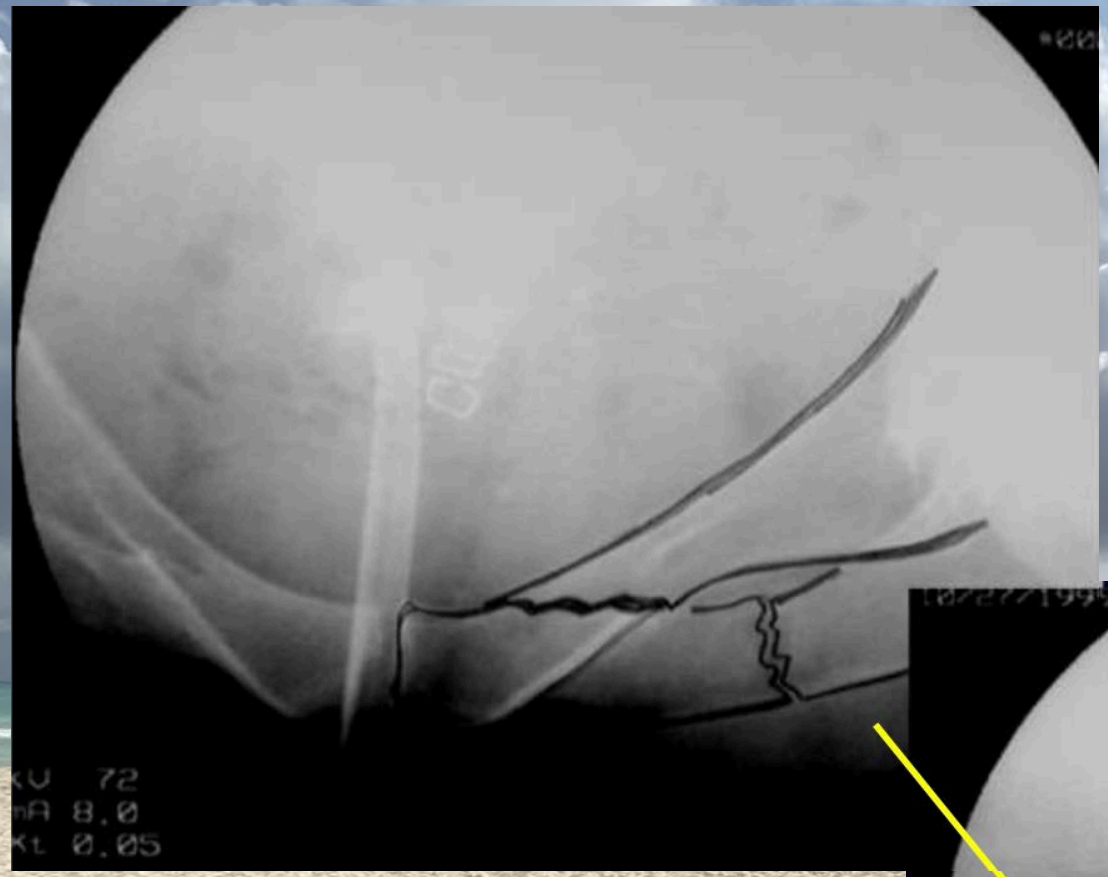
Physical Exam- Open Wounds

- May extend to other
  - Colon, rectum, per
- Grossly contaminate irrigation and debrid
- Repair of lacerations

Physical Exam:

- Swelling/ecchymosis
  - Scrotal/labial edema
- Degloving injuries
  - Fluid waves on palpation
- Limb shortening
- Limb rotation
- Open wounds

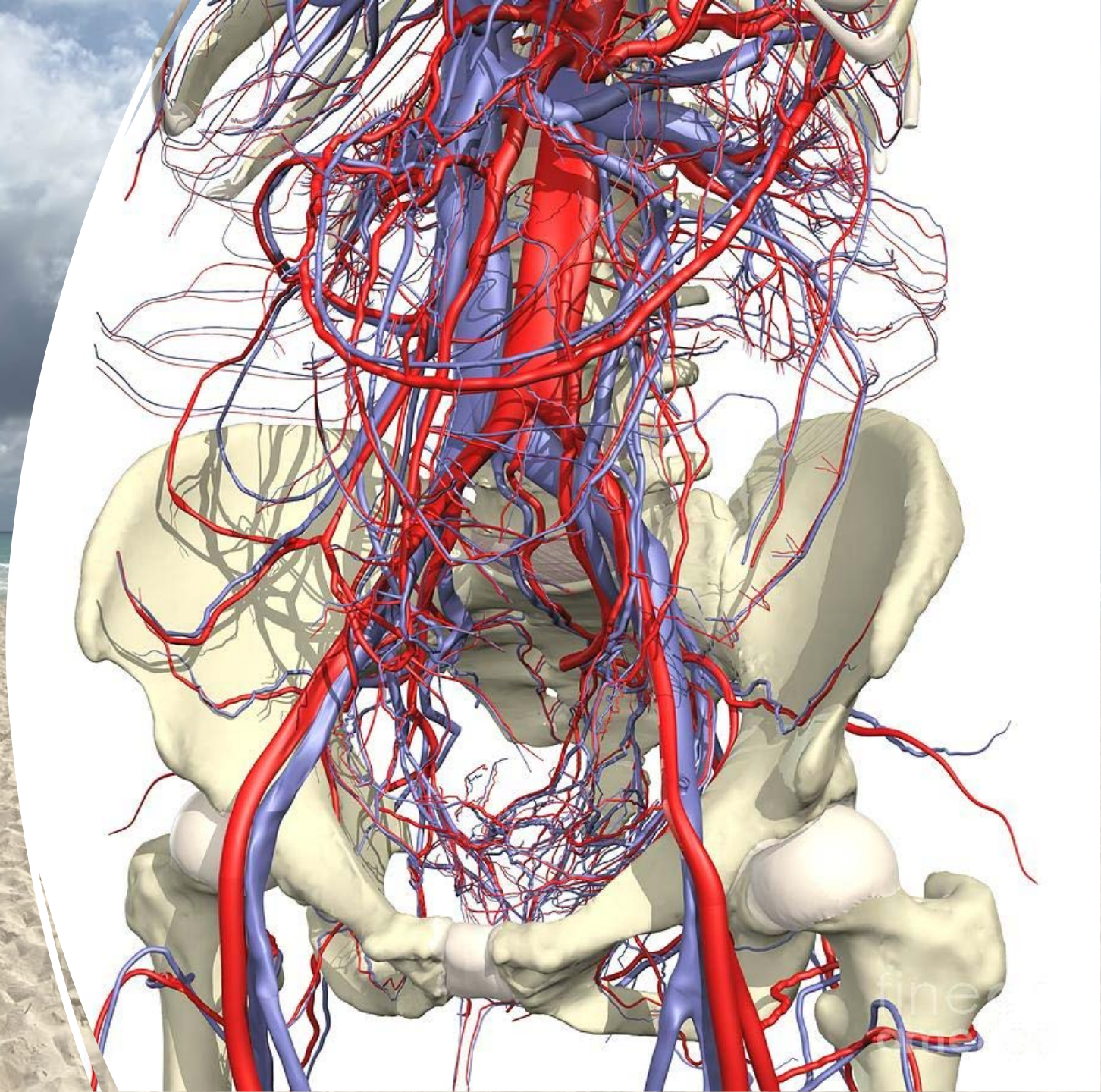
Physical Exam:



- Lateral compression
- Single examiner preferred
  - Preferably experienced

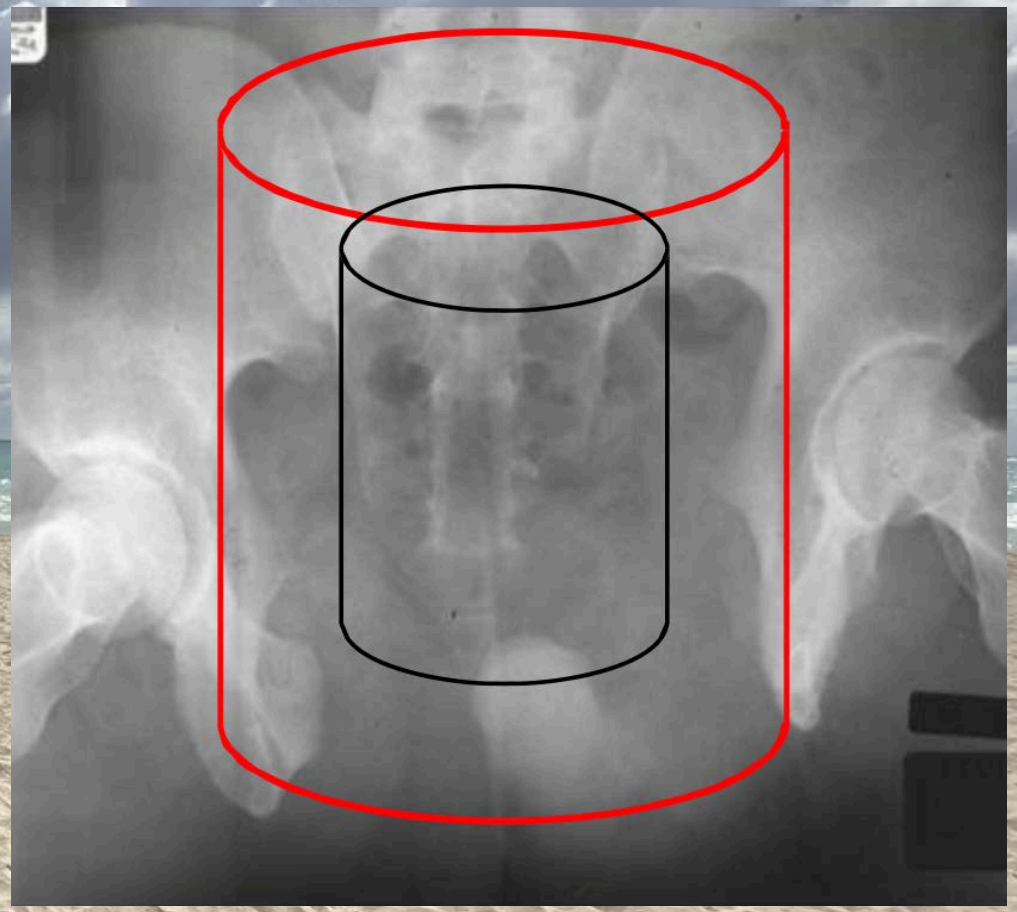
Intra-pelvic Hemorrhage Control

- Containment, close down space
  - Sheets
  - Binder
  - External Fixation
- Angiography
- Laparotomy and pelvic packing

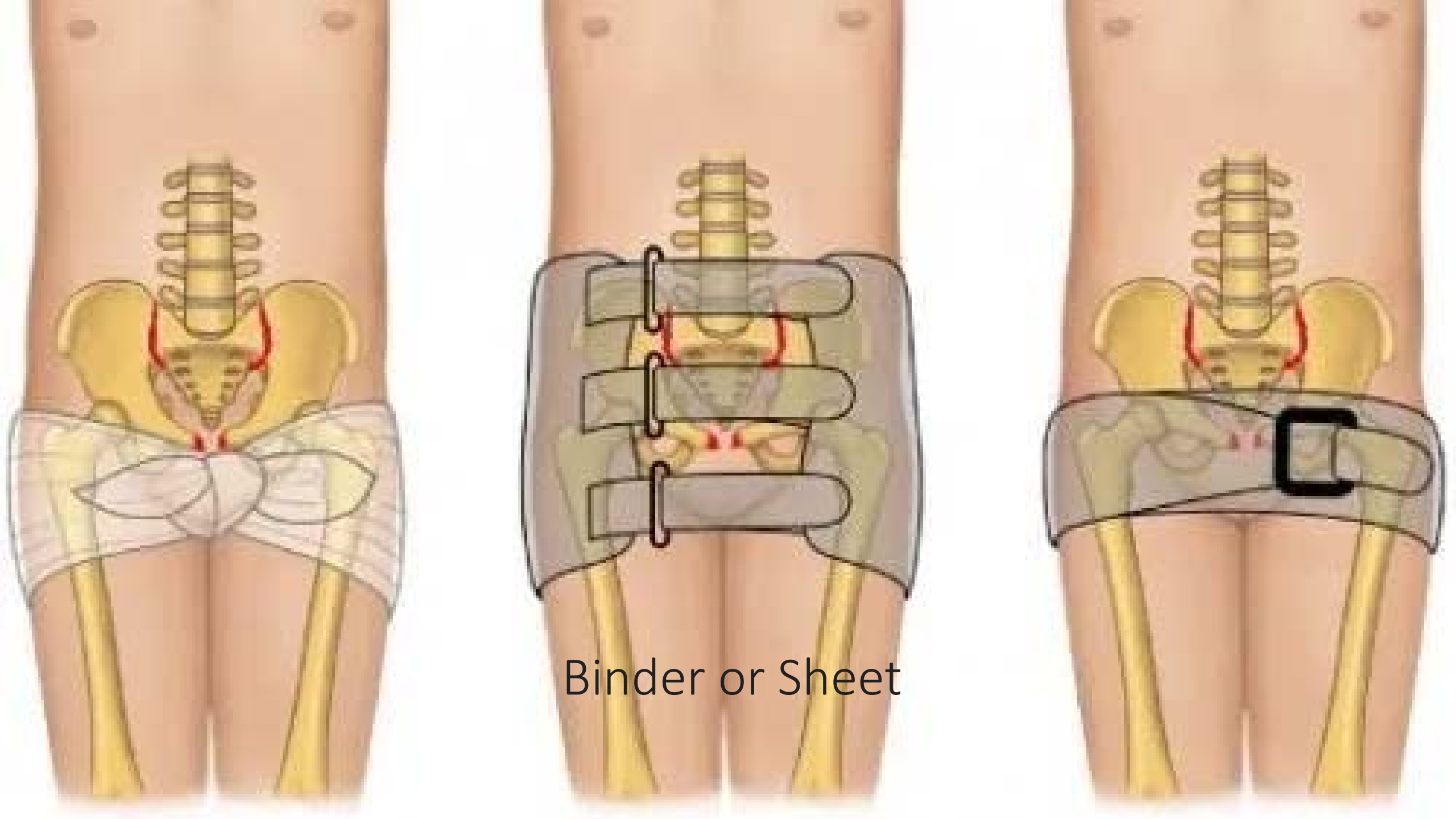


Pelvic Ring Injuries

- Unstable pelvic ring injury may allow hemorrhage to collect in the true pelvis
  - No constraint to provide tamponade



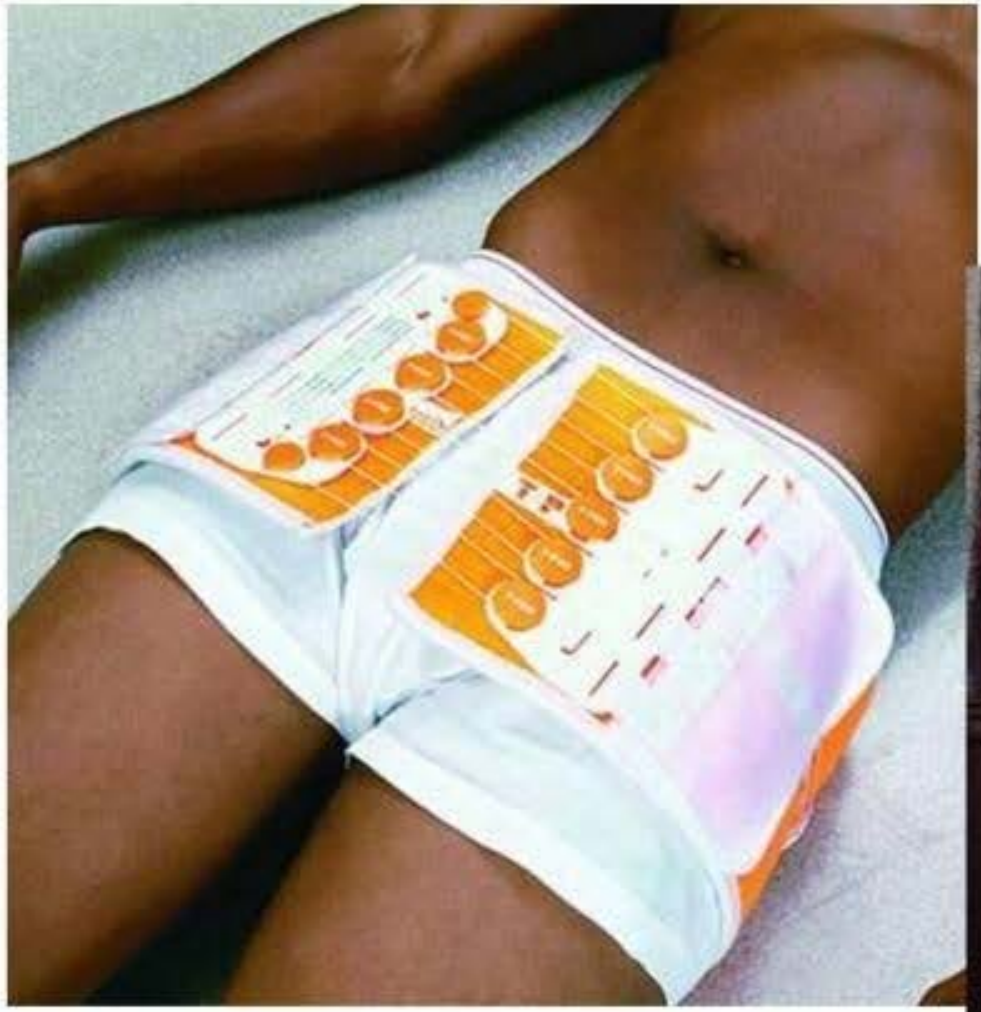
- Volume traditionally assumed to be akin to a cylinder: V=4/3πr^3
  - Principal is ⇧radius = ⇧$Volume^3$
- More accurate as a hemi-elliptical sphere



Binder or Sheet

PELVIC BINDERS

NO



YES

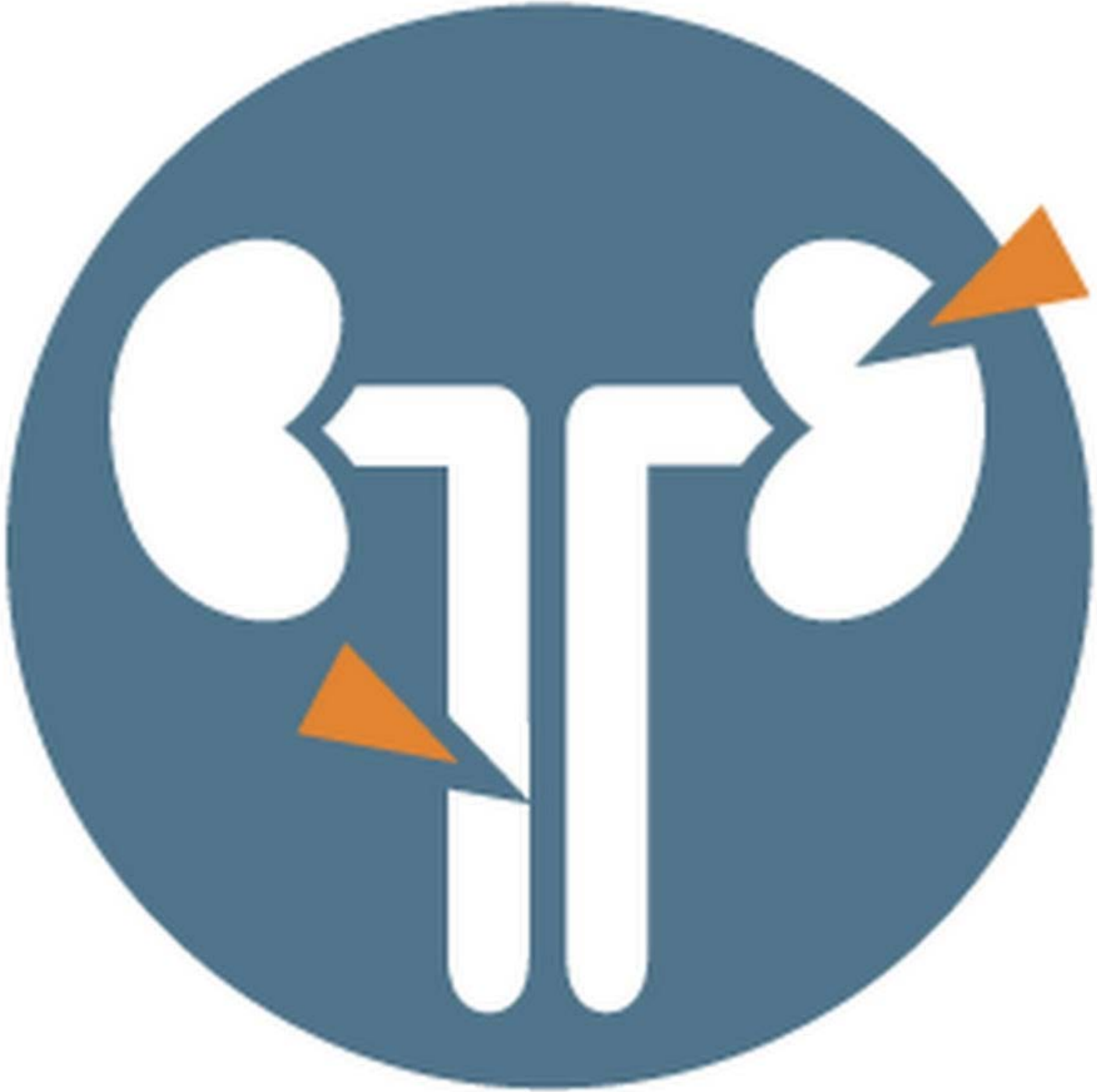
Coordination of Care

The Committee on Trauma

- Led by Trauma Surgeon
  - Depends on other injuries
  - Neurosurgery?
  - General surgery?
  - Urology?
  - OMFS?
  - Vascular?
  - Others?

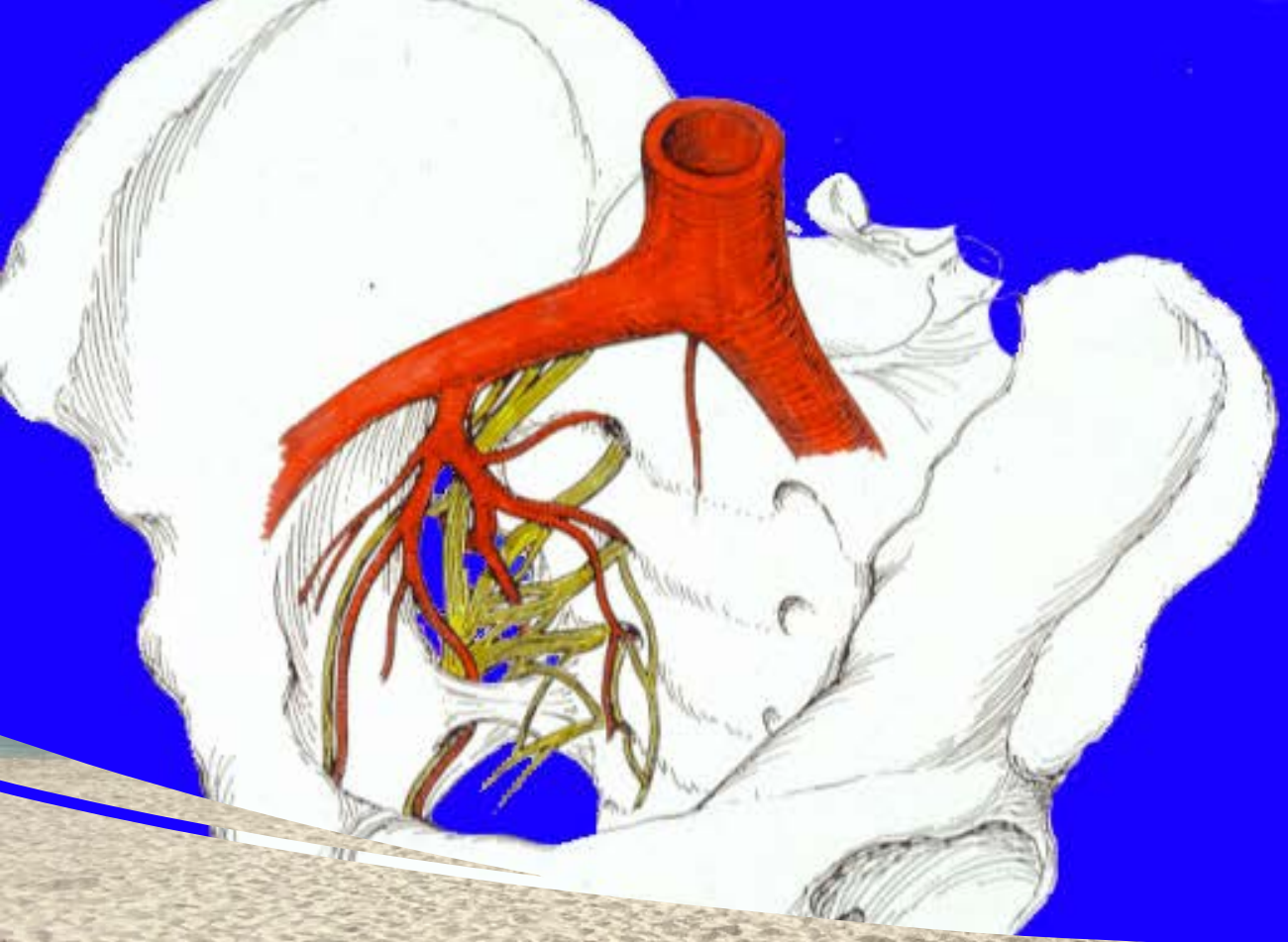
Beware of Urologic Injuries

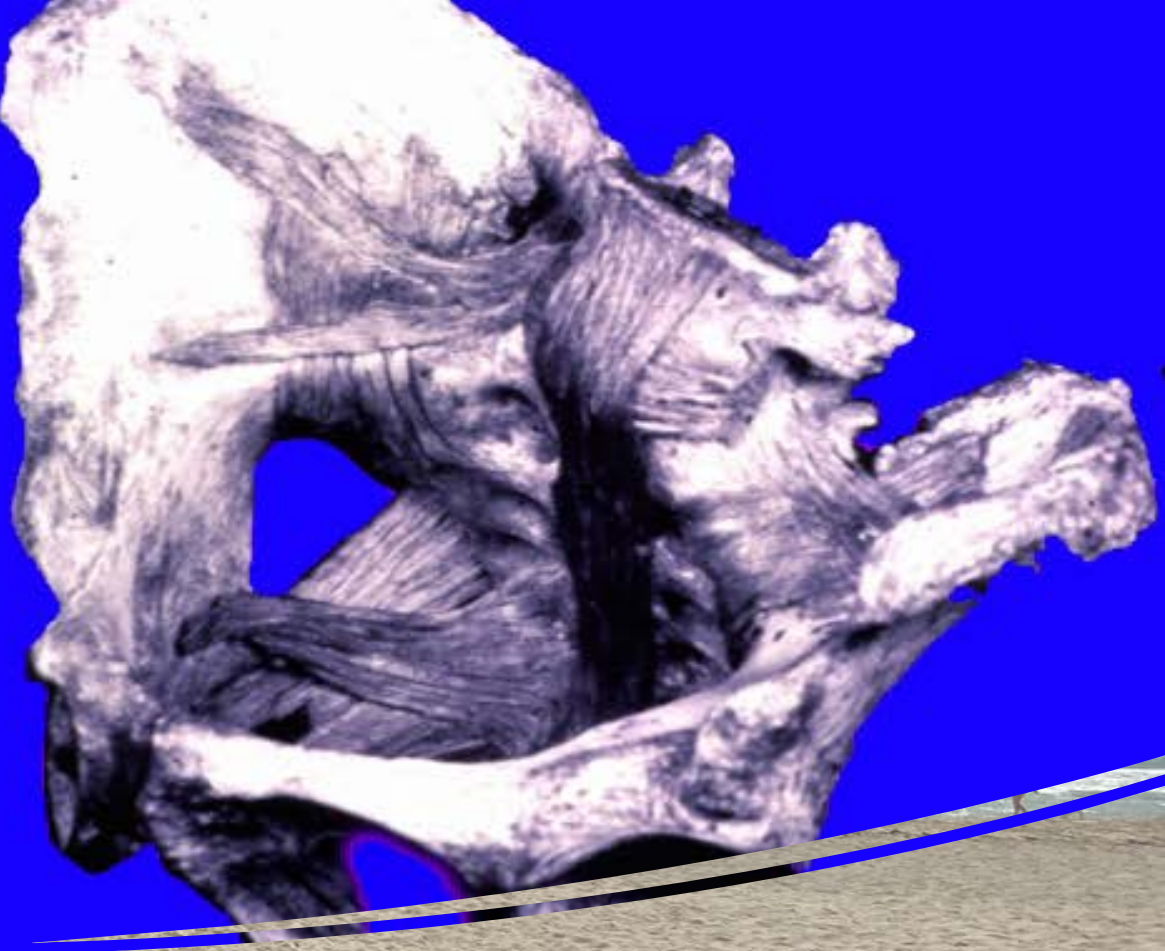
- 15% incidence
- Blood at meatus or high riding prostate
- Scrotal/labial swelling/edema
- If indicated, check a retrograde urethrogram
- CONSULT UROLOGY!



Magnitude of Forces

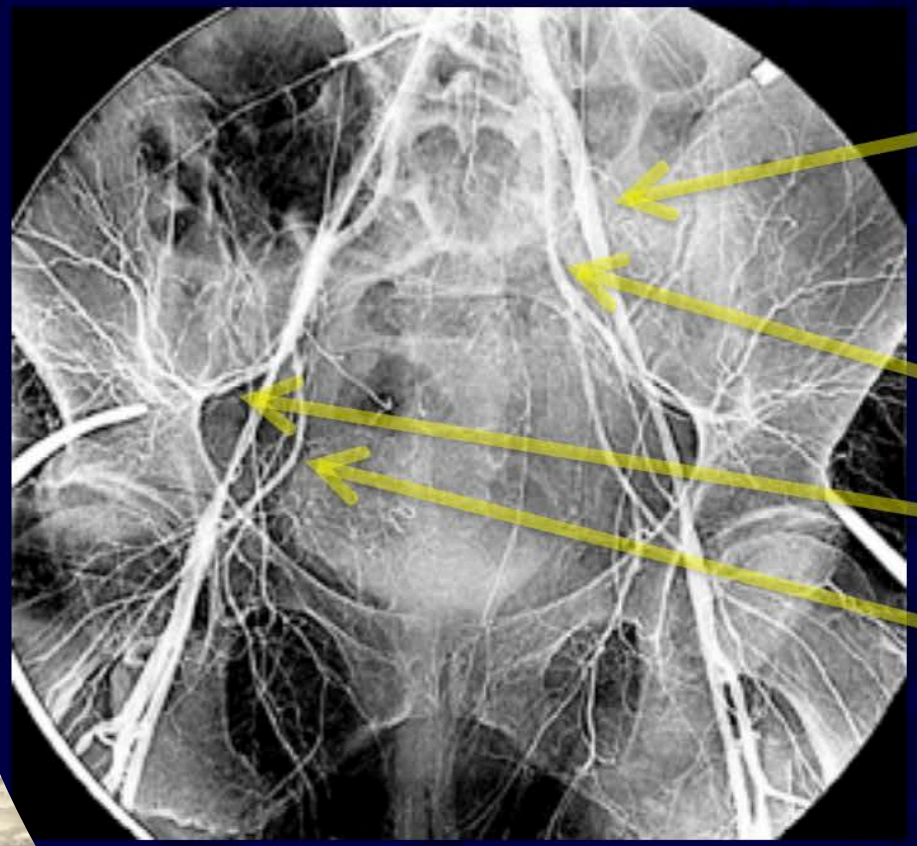
- When this happens, **what else might be going on**?
- Important to *know the relevant relationships*!





Relationships

Vascular Anatomy



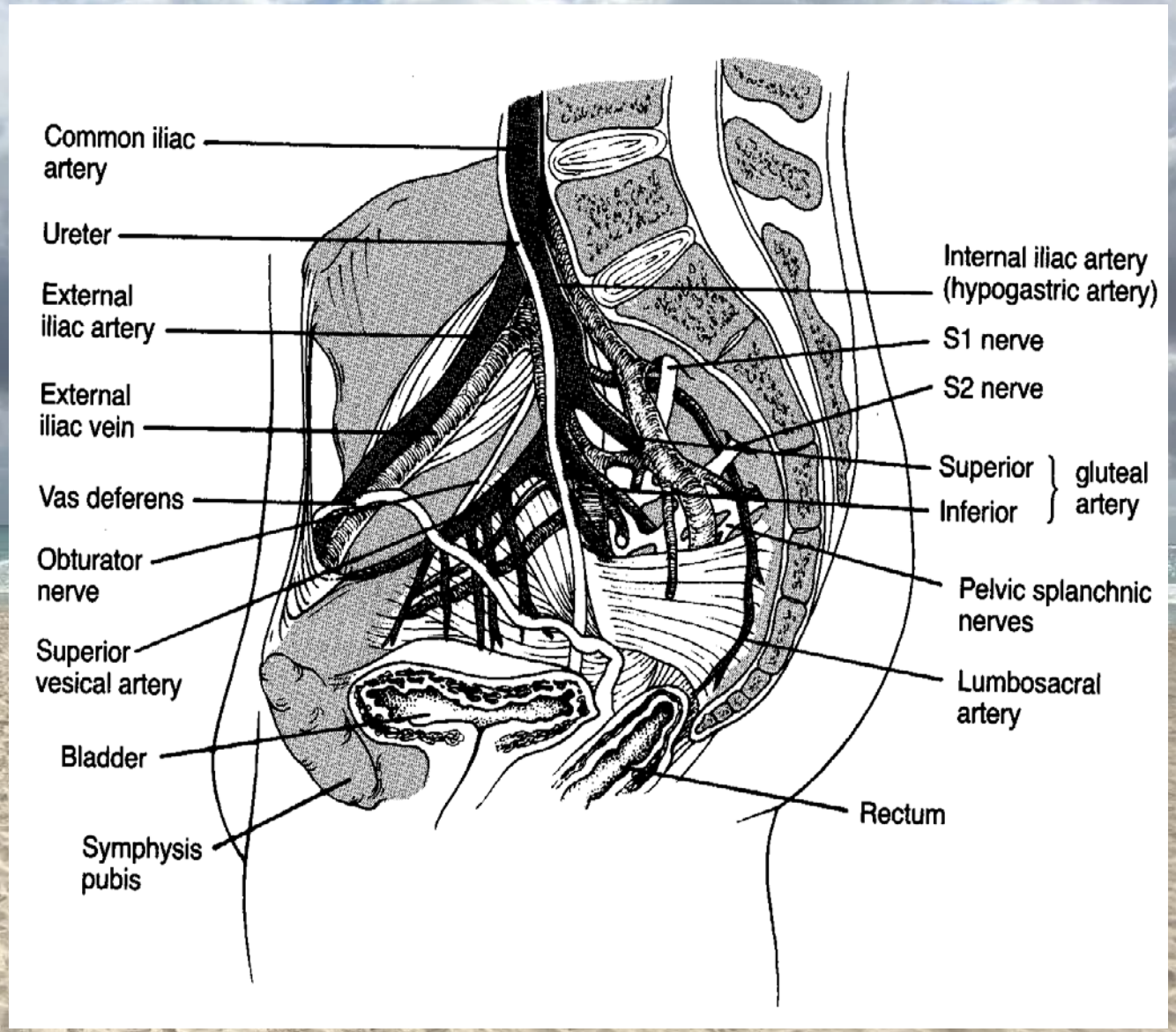
External Iliac System

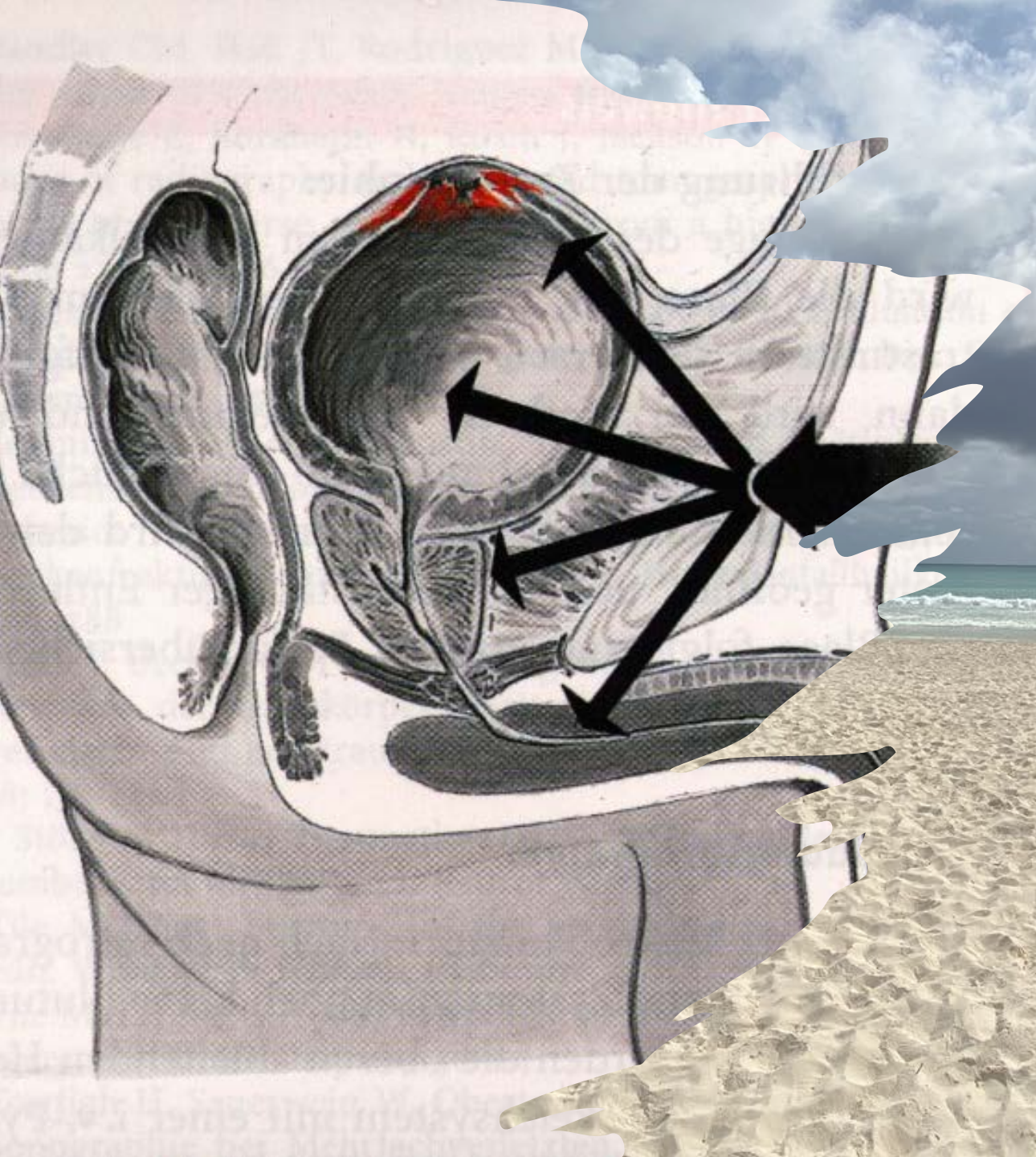
Internal Iliac System

- Posterior Division
- Anterior Division

Vascular Anatomy

- Internal iliac artery courses medial to the vein, splits into anterior and posterior branches.
- Posterior branch is more likely injured (SGA is largest branch).
- Usual bleeding is from venous plexus.





Potentially Damaged Visceral Anatomy

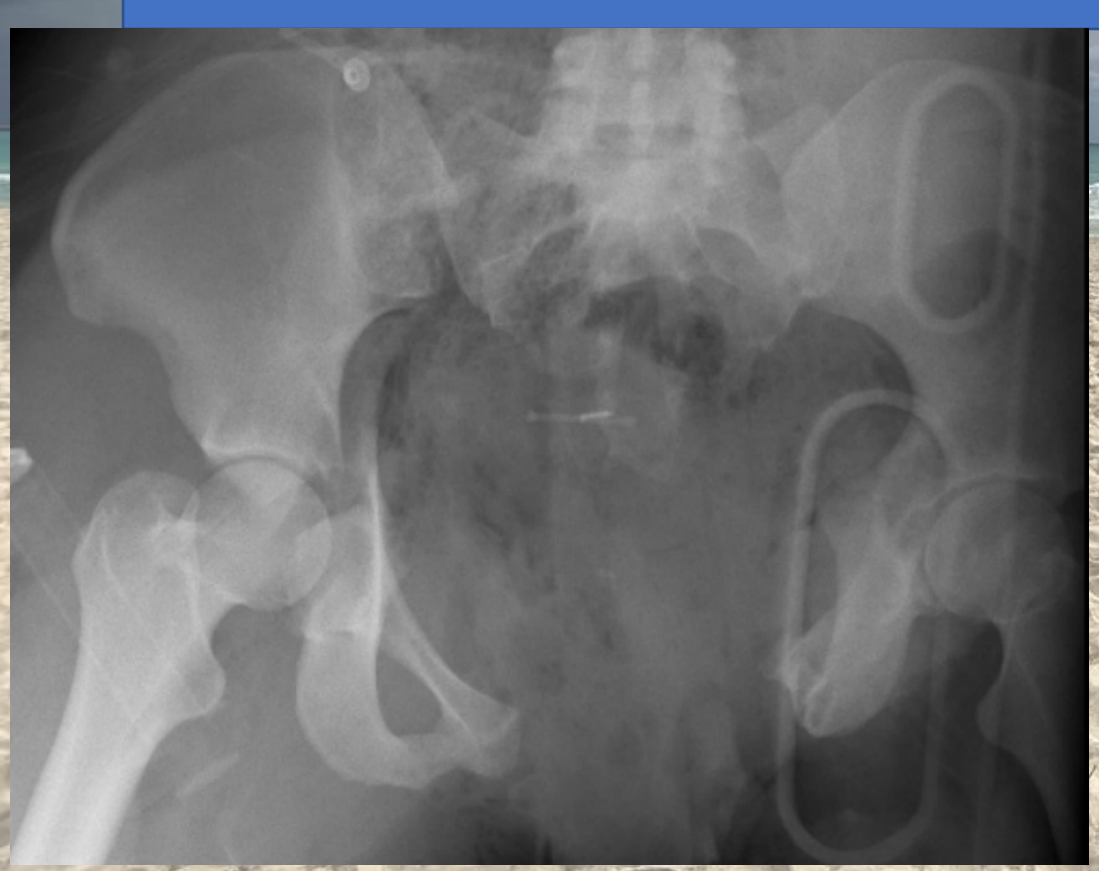
- Blunt vs. impaled by bony spike
  - Bladder/urethra
  - Rectum
  - Vagina
  - Uterus
  - Other

Considerations for Help… It's OK to transfer if needed

- What resources are available at your institution?
- Potentially life threatening
- What other injuries are present?
- What interventions can/should occur early?

Imaging

- Take your imaging into the context of the patient's presentation
- Trauma bay XR- AP Pelvis
  - Post-compression XR is important and can change the appearance of the injury
  - Documents effect of intervention



Stability Defined

- High energy:
  - Radiographic
  - Hemodynamic
  - Biomechanical/Mechanical
    - Skeletal motion eliminated/minimized

"Able to withstand normal physiologic forces without abnormal deformation"

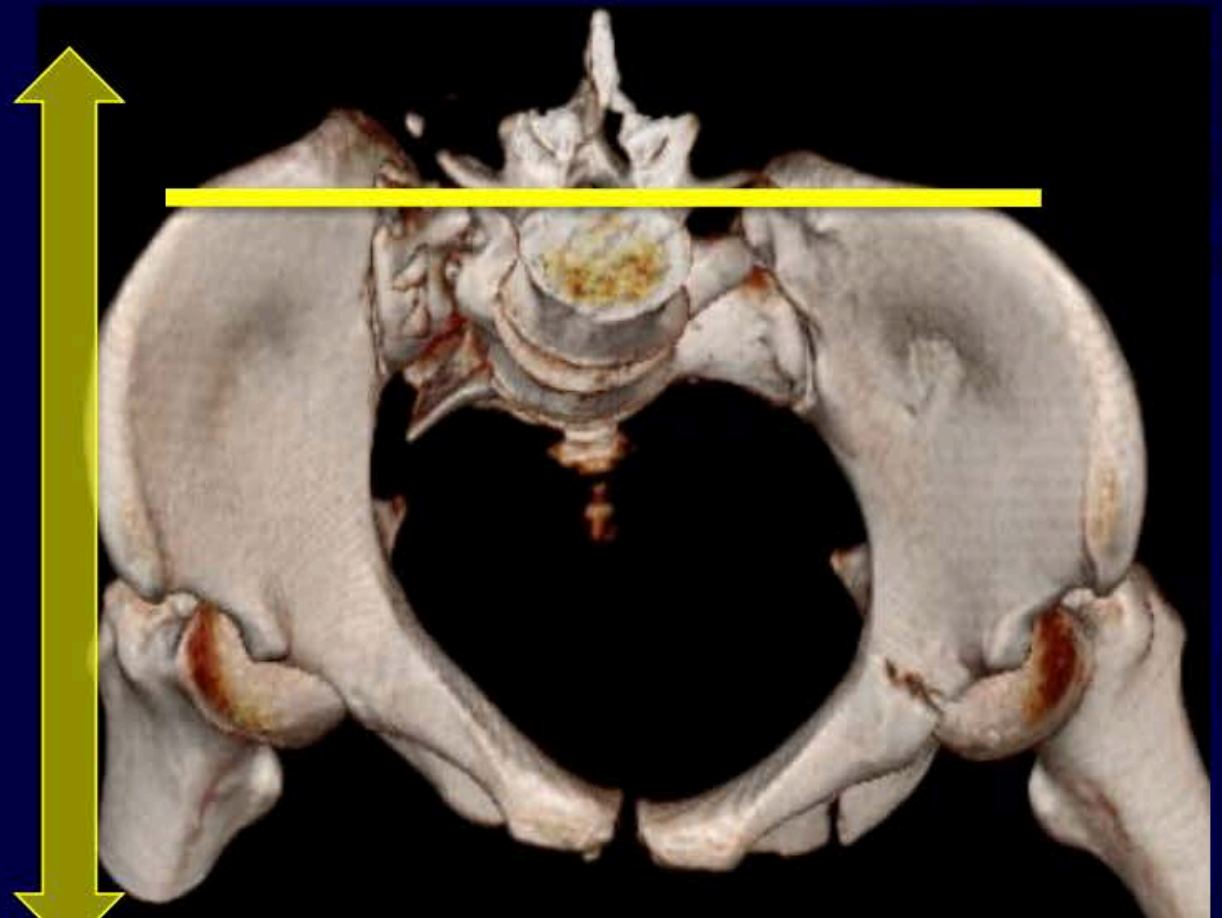
- Low energy:
  - Pain well controlled
  - Able to ambulate/participate in self care

AP Pelvis

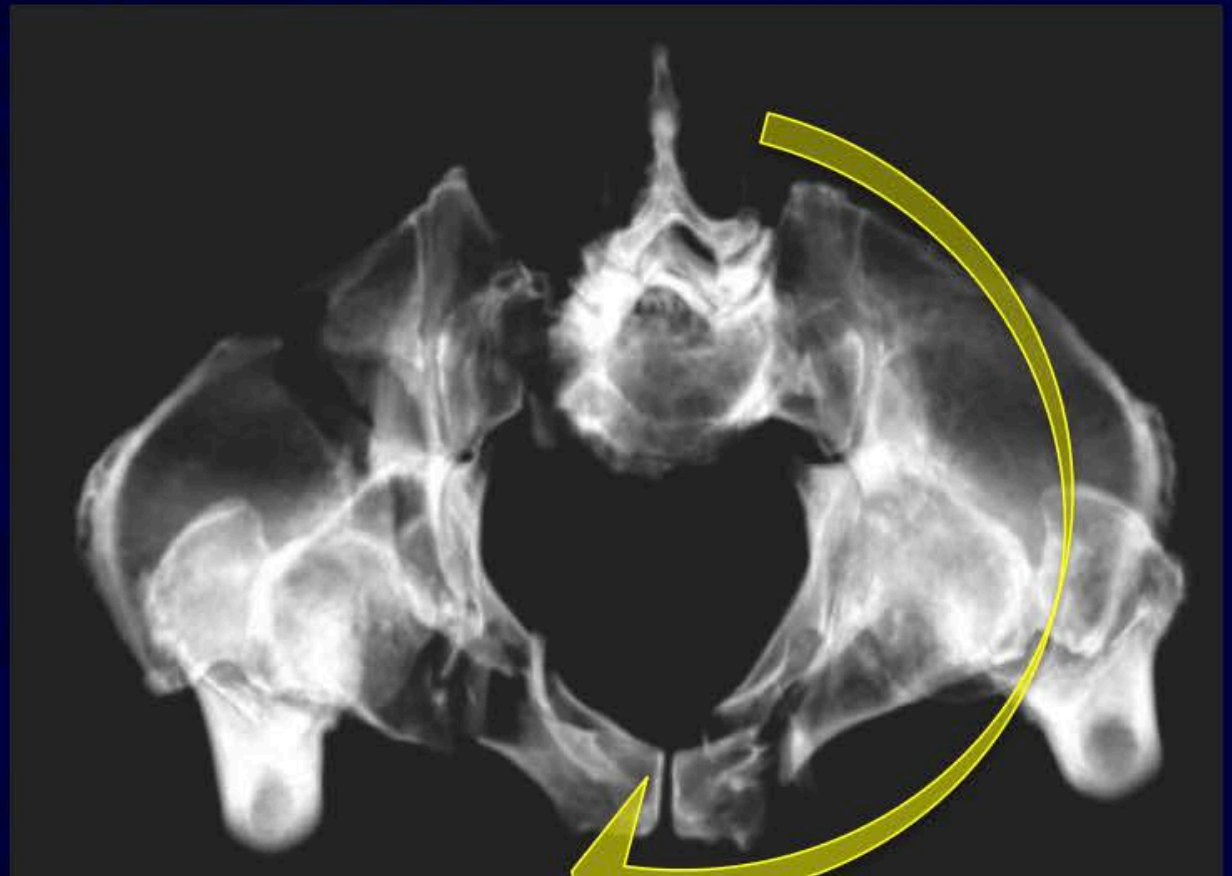
- General idea
  - Stable
  - Unstable
- Immediate interventions if needed
  - Circumferential compression
  - Reduction of hip dislocation

Inlet

Anterior / Posterior Displacement

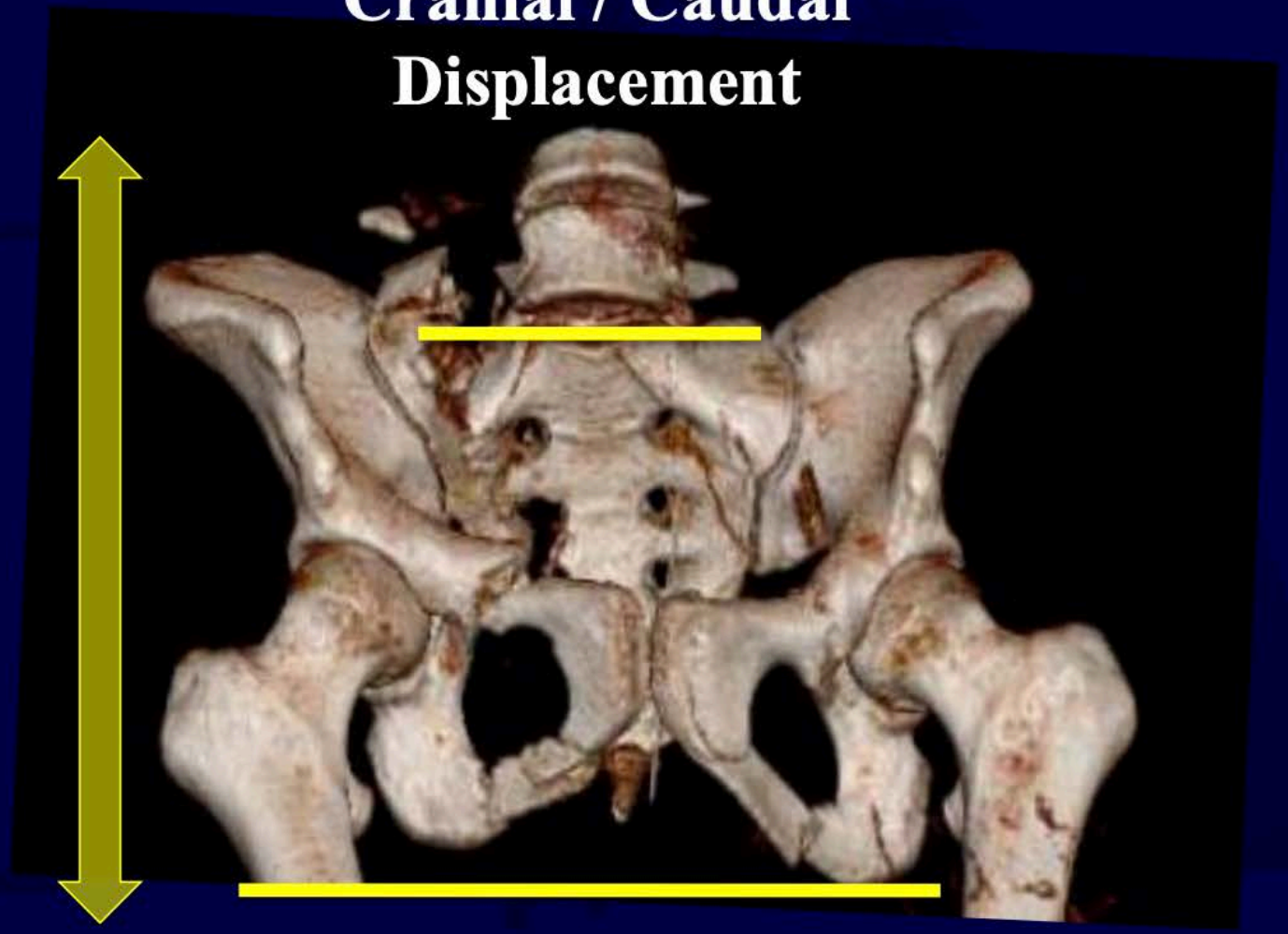


Internal / External Rotation



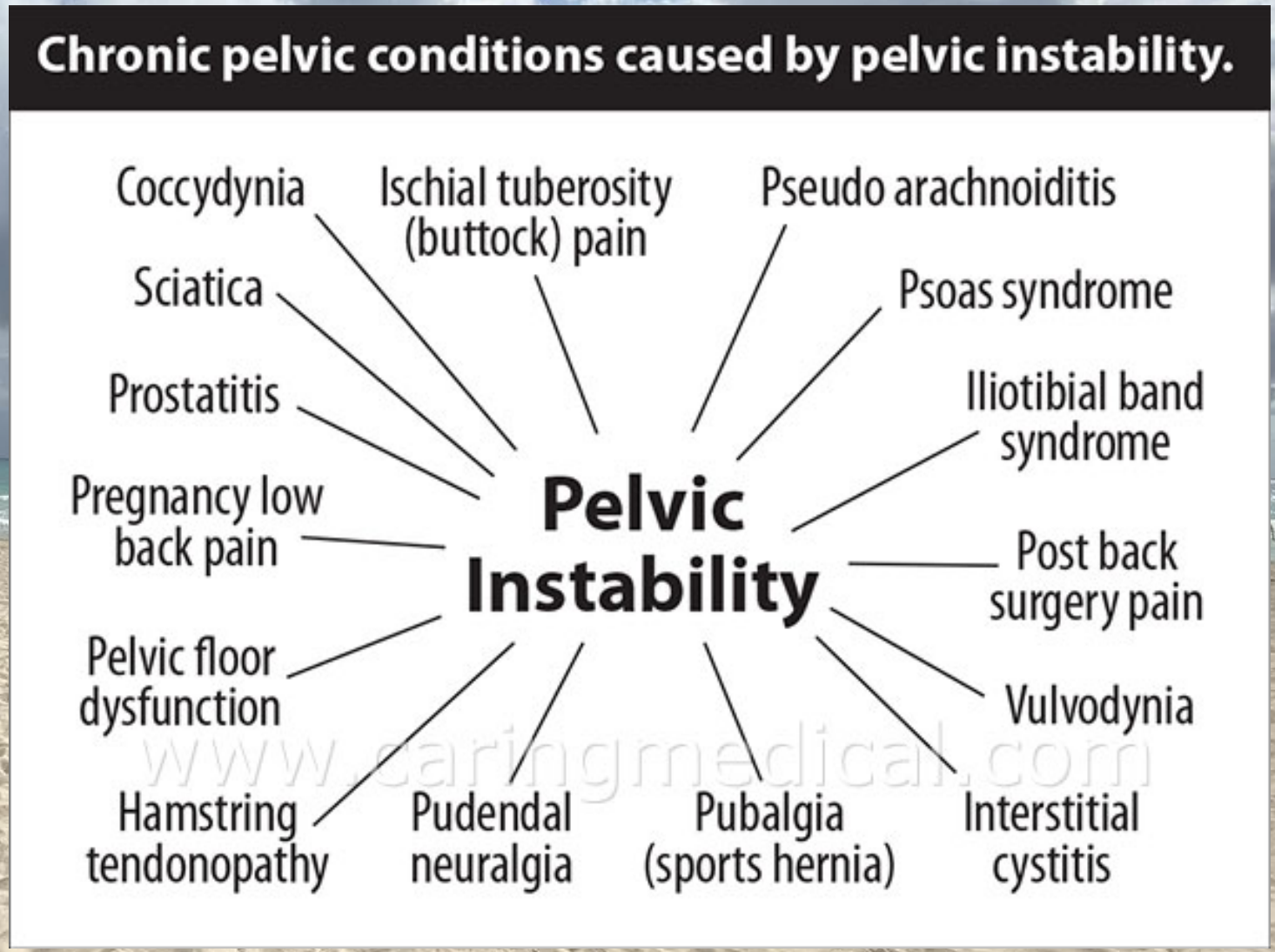
Outlet

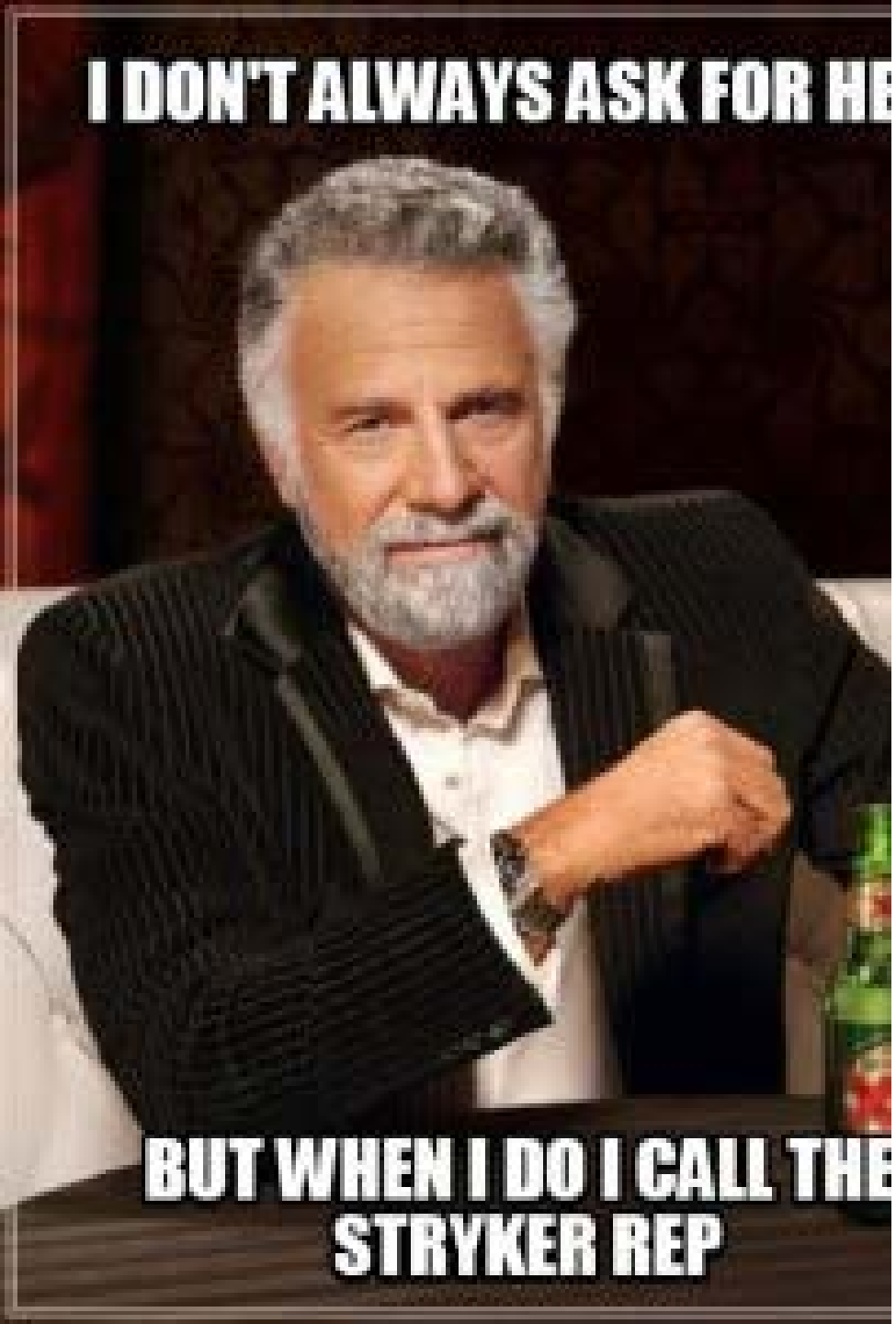
Cranial / Caudal Displacement



Radiographic Instability

- Sacroiliac joint displacement of 5mm in any direction
- Posterior fracture gap (instead of impaction)
- 5th Lumbar transverse process avulsion

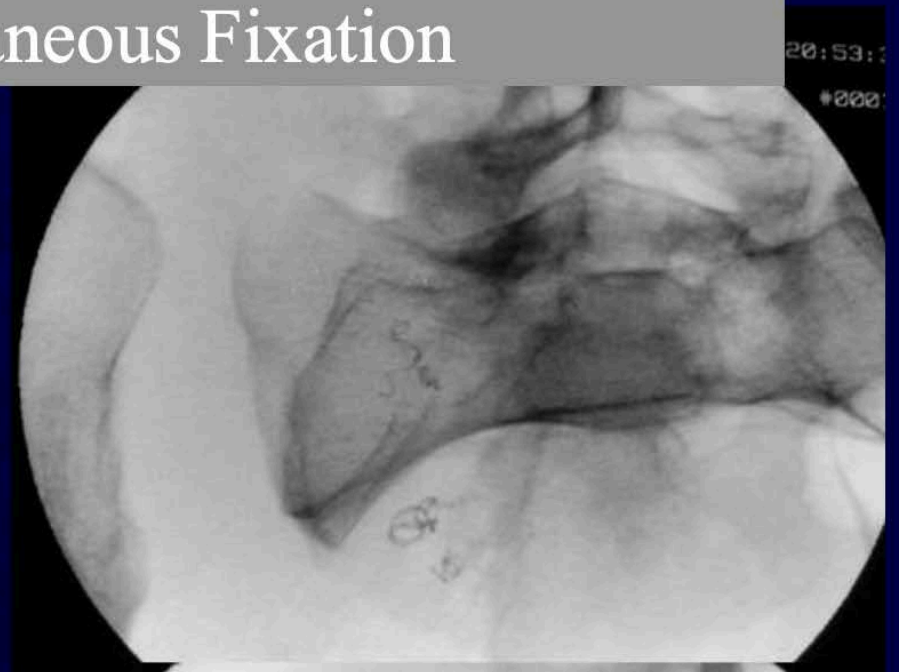


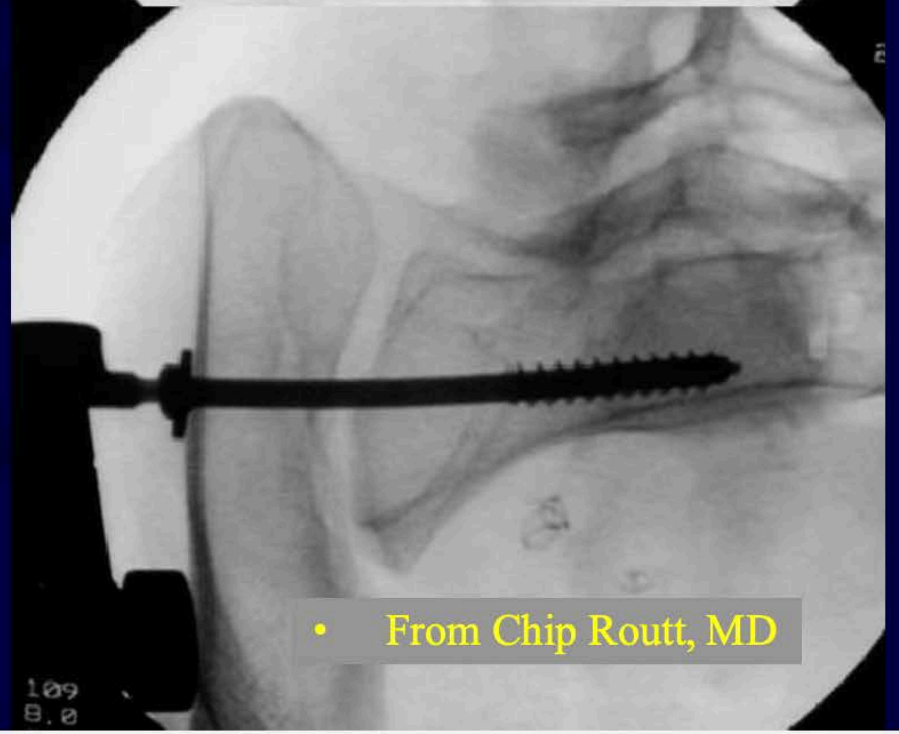


Operative Indications
i.e. What the surgeon is thinking about

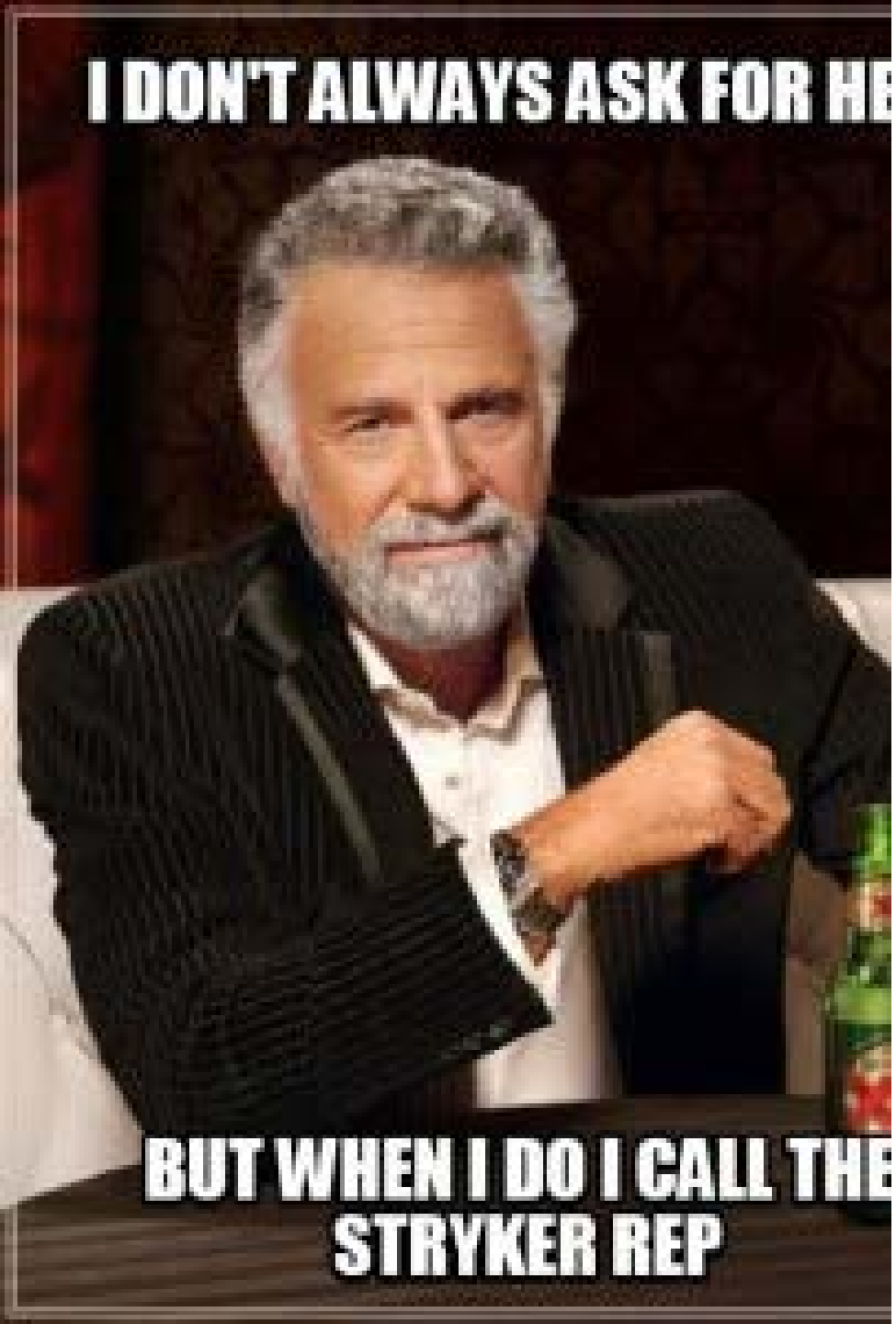
- Active resuscitation
  - Close down pelvic ring, conserve volume

Immediate Percutaneous Fixation





- From Chip Routt, MD



Operative Indications
i.e. What the surgeon is thinking about

- Active resuscitation
  - Close down pelvic ring, conserve volume
- Assist in mobilization
  - Decreased motion at the joint = decreased pelvic pain = increased mobility
- Prevent long term functional impairment
  - 30-50% average of post-traumatic SI joint dysfunction/pain after pelvic ring injuries

Non-operative Management

Lateral compression injuries with minimal (<1.5cm) displacement

Pubic rami fractures with no posterior displacement/injury

Minimal gapping of pubic symphysis

- No associated with SI joint disruption
- 2.5cm or less, no increased motion with stress testing
  - Not an absolute number, so ruling out SI joint pathology is critical!
  - There is significant physiologic motion in the peri-partum period, often resolving post-partum

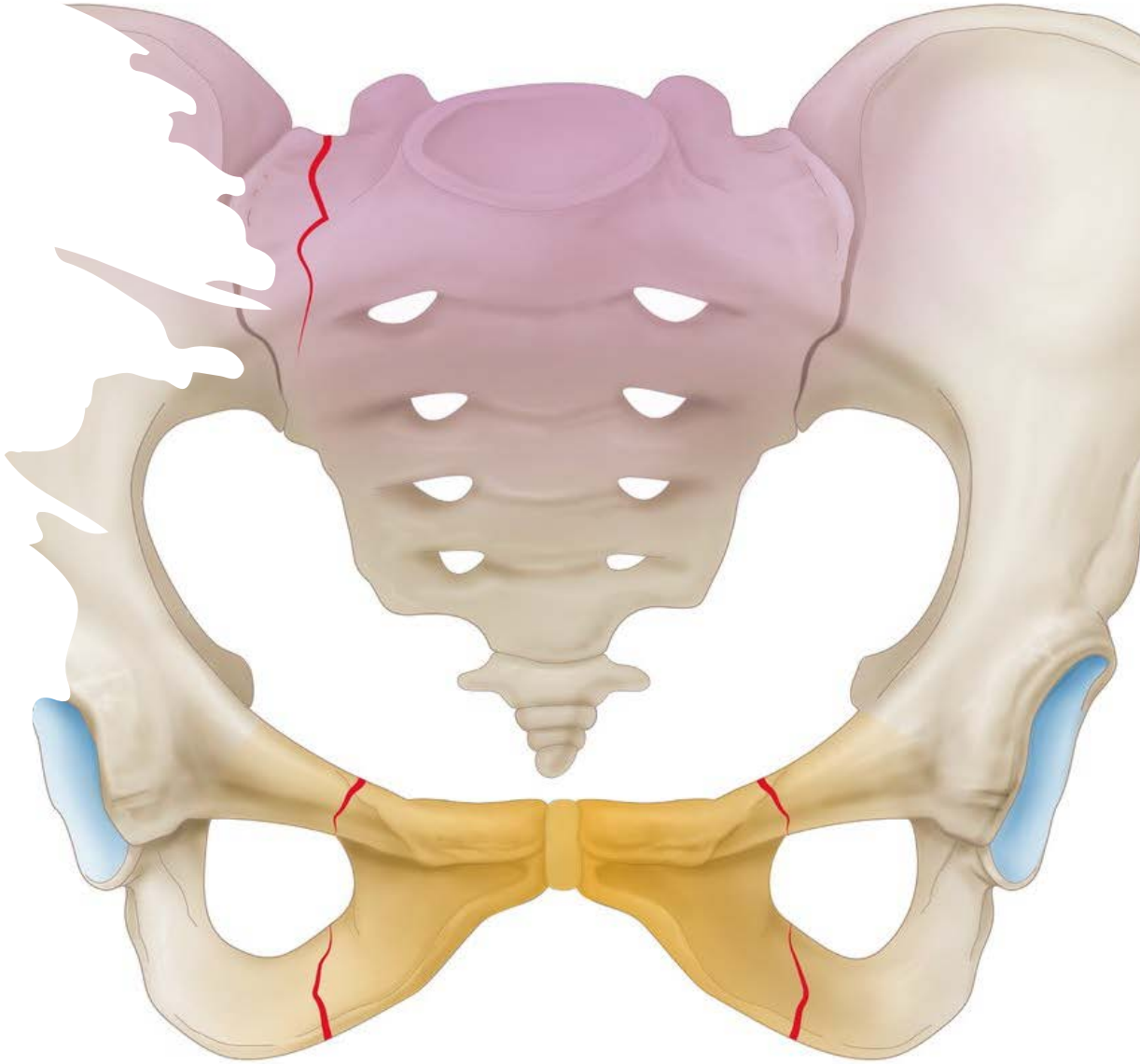
Non-Operative Considerations

- X-rays/CT are a static representation of a dynamic/fluid situation
  - Deformity may be worse than what is seen on imaging
    - Especially if binder/sheet was placed in the field
  - Stress radiographs may be helpful
  - Post-mobilization radiographs should be obtained in conservatively managed patients to ensure no significant changes
  - Look for evidence of instability
    - Lumber TP fxs
    - Sacrotuberous/sacrospinaous ligament avulsions
    - Etc.


IT'S THE TRAUMA

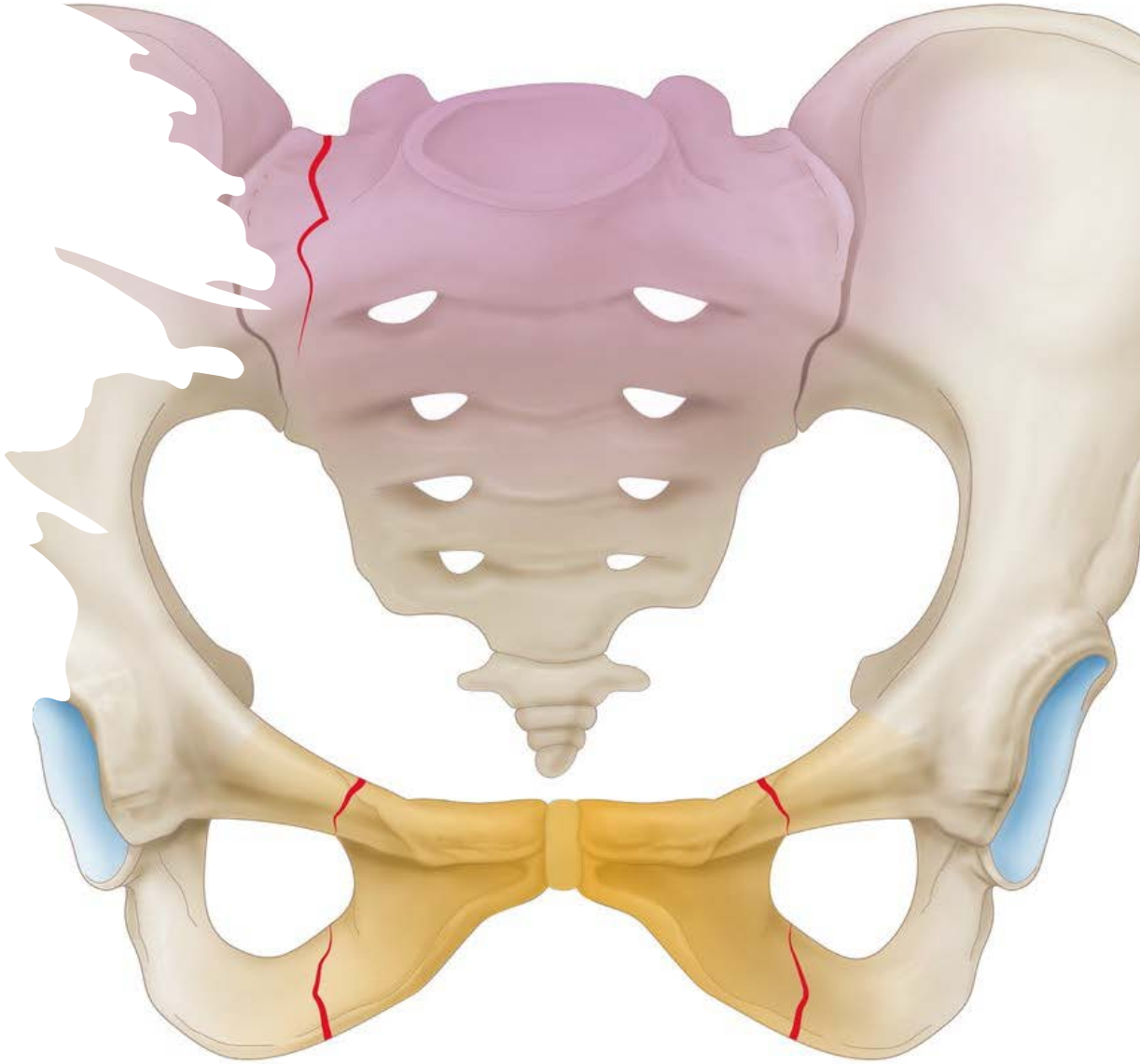
Principles of Operative Treatment

- Posterior ring structure is important
- Goal is restoration of anatomy and enough stability to maintain reduction during healing
- Most injuries involve multiple sites of injury
  - In general, more points of fixation lead to greater stability
  - This does NOT mean that all sites of injury need fixation



Principles of Operative Treatment

- Anterior ring fixation may provide structural protection of posterior fixation
- If combined open and percutaneous techniques are used, the open portion is often done first to aid in reduction of the percutaneously treated injury



Surgical Treatment: Preoperative Planning

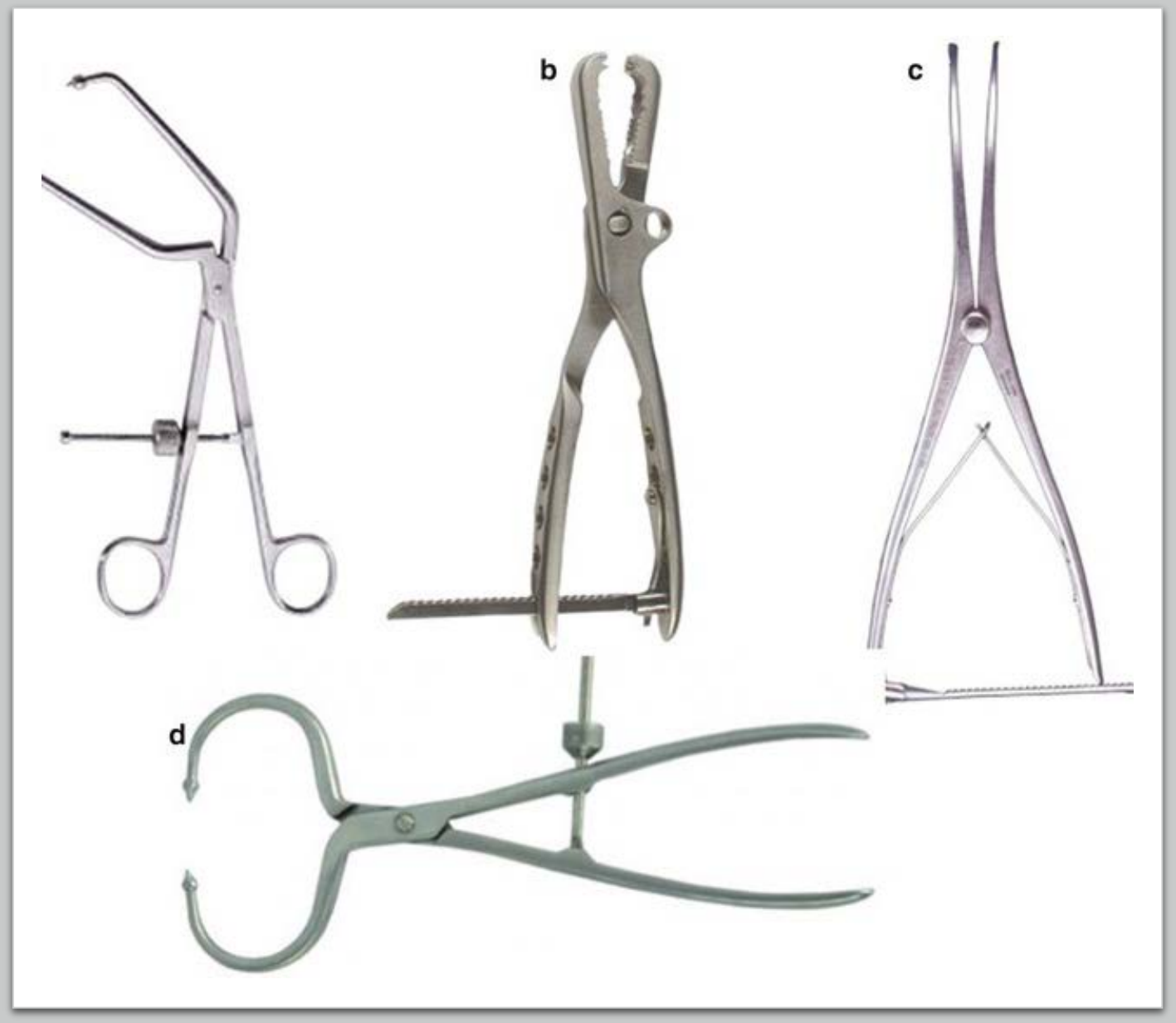
- Consider patient related factors
  - Surgical clearance, resuscitation
  - Coordination of care
    - Trauma surgeon, intensivist, neurosurgeon

Preoperative Planning

- Timing of surgery
  - Reduction may be easiest in first 24-48 hours
    - May aid in percutaneous reduction
  - Patients often not adequately resuscitated in first 24 hours
  - Potential for surgical “secondary hit” on post-injury days 2-5
    - May be a significant issue in open procedures

Preoperative Planning

- Intraoperative imaging
  - Radiolucent table
  - Fluoroscopy
  - Radiologic Technician and Surgeon understand C-arm views necessary



Preoperative Planning

- Reduction tools
  - Traction
  - Pelvic manipulator (e.g. femoral distractor)
  - Specialized clamps

Preoperative Planning

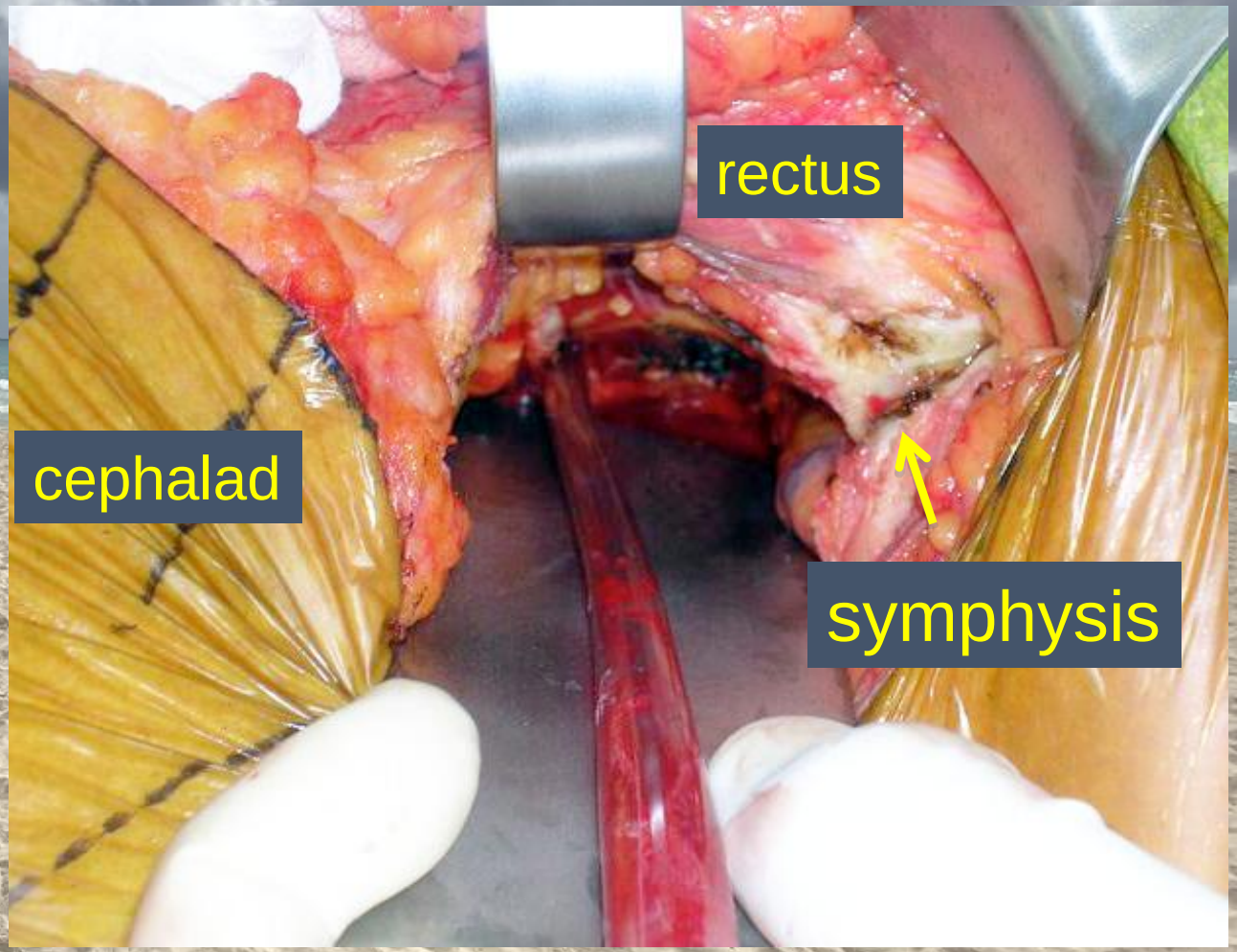
- Implants needed
  - Extra-long screws
  - Cannulated screws, often extra-long with appropriate instruments
  - Specialized plates for contourability (reconstruction plates)
  - External fixation

Preoperative Planning

- Surgical approaches planned
  - Soft tissues examined
  - Patient positioning planned
  - Prone vs Supine
    - Is it safe to prone patient?
    - Equipment/padding for safe prone positioning

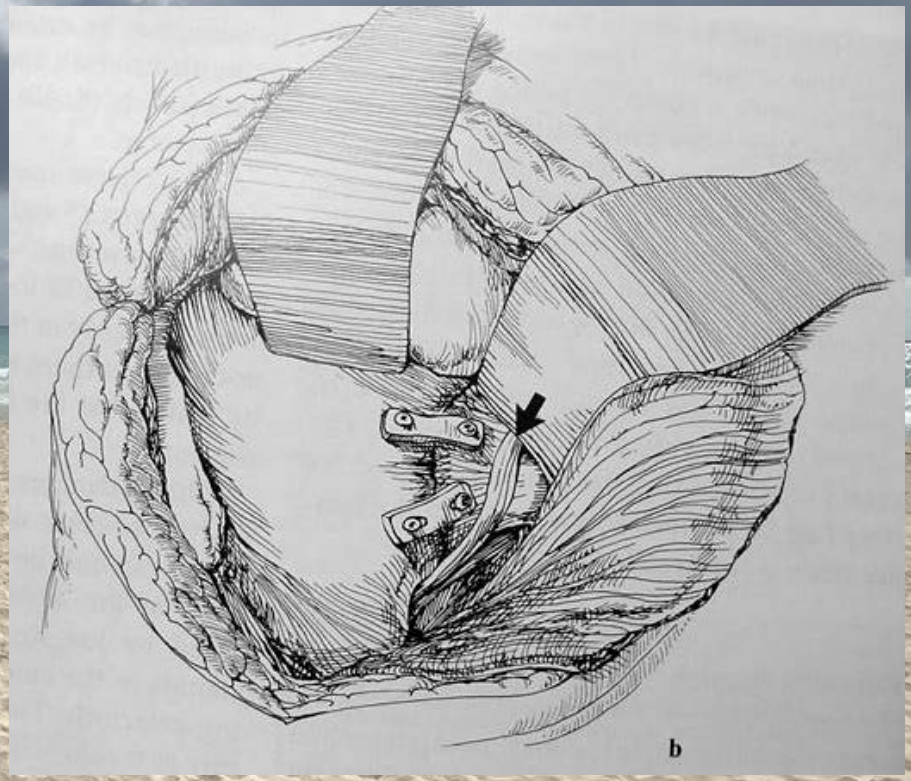
Surgical Approaches: Anterior Pelvic Ring

- Pfannenstiel
  - Exposure of symphysis pubis and pubic bones
- Stoppa extension
  - Exposes symphysis to SI joint along pelvic brim



Surgical Approaches: Posterior Pelvic Ring

- Anterior approach
  - Iliac window of the ilioinguinal
  - Exposure of SI joint



M Tile in Schatzker, Tile (eds). Rationale of Operative Fracture Care, Springer, Berlin, 1996, p221-270

Surgical Approaches: Posterior Pelvic Ring

- Posterior approach
  - Exposure of sacrum and posterior ilium
  - Sacral fractures
  - Iliac fracture dislocations of the SI joint (crescent fracture)

Reduction and Fixation Basic Principles

- Direct reduction
  - Open and morbid, but anatomically correct
  - Requires skills with clamp placement and knowledge of pertinent anatomy
  - Picture perfect

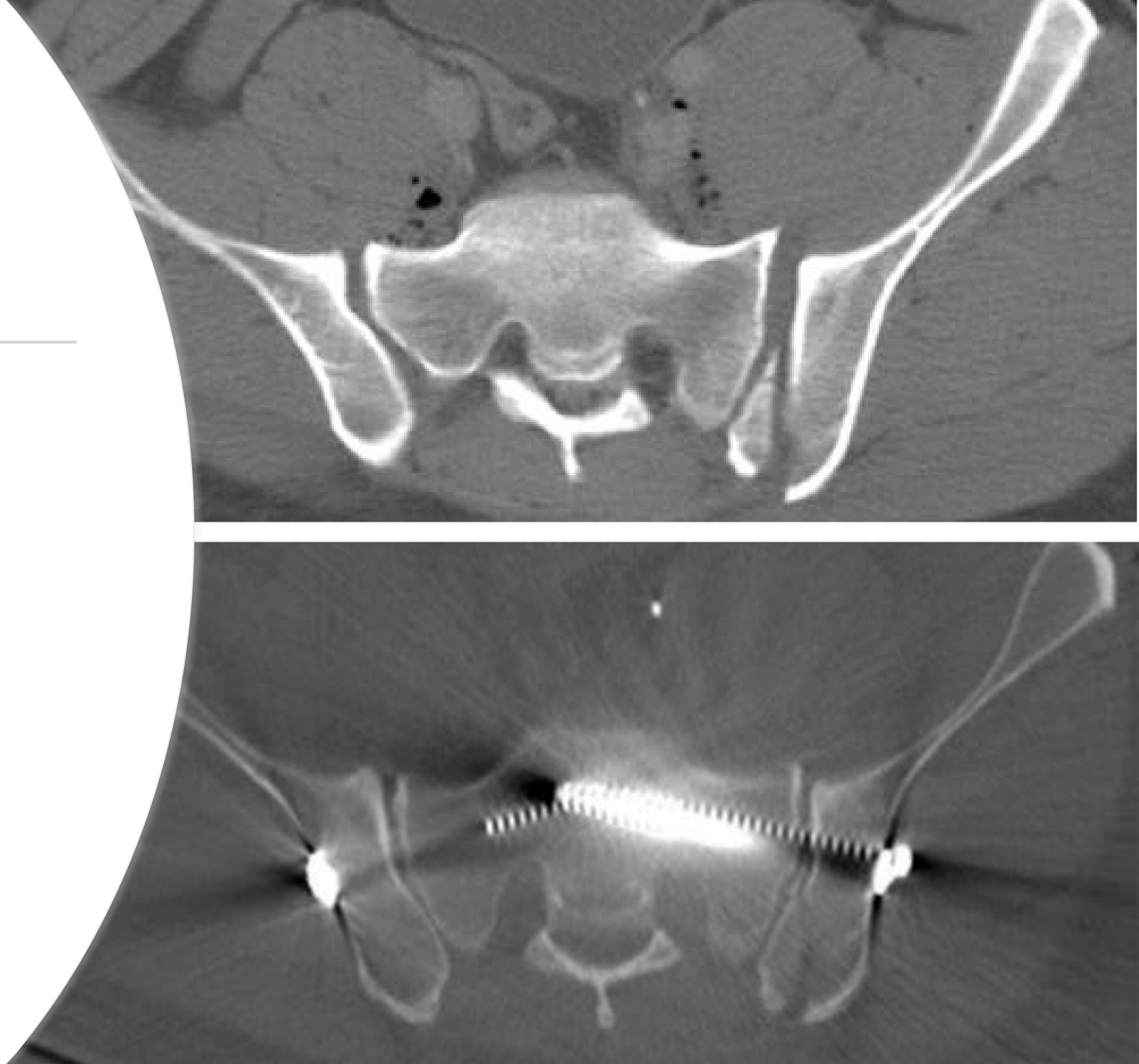
- Indirect reduction
  - Use implants and percutaneous techniques to facilitate reduction
    - Distractor
    - Traction
    - Reduce anterior pelvic ring
  - Space for imperfection>>> Fusion?

Reduction and Fixation: SI Joint Dislocation

- Plating
  - Need more than one plate to avoid linkage displacement
  - Can be used in tandem or with SI screw

Reduction and Fixation: SI Joint Fracture/Dislocation “Crescent Fracture”

- SI screw
  - If caudal segment is in the path of fixation screw
  - Opportunity for percutaneous treatment

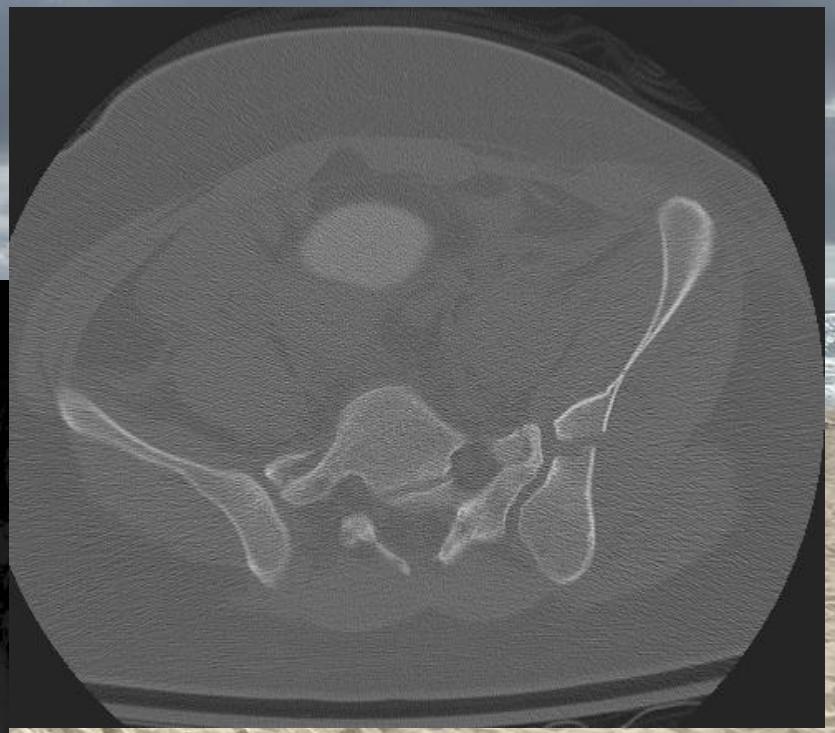


Reduction and Fixation: SI Joint Fracture/Dislocation "Crescent Fracture"

- SI screw and plate
  - Anterior ORIF if large fragment
  - Supplement as needed with SI screw

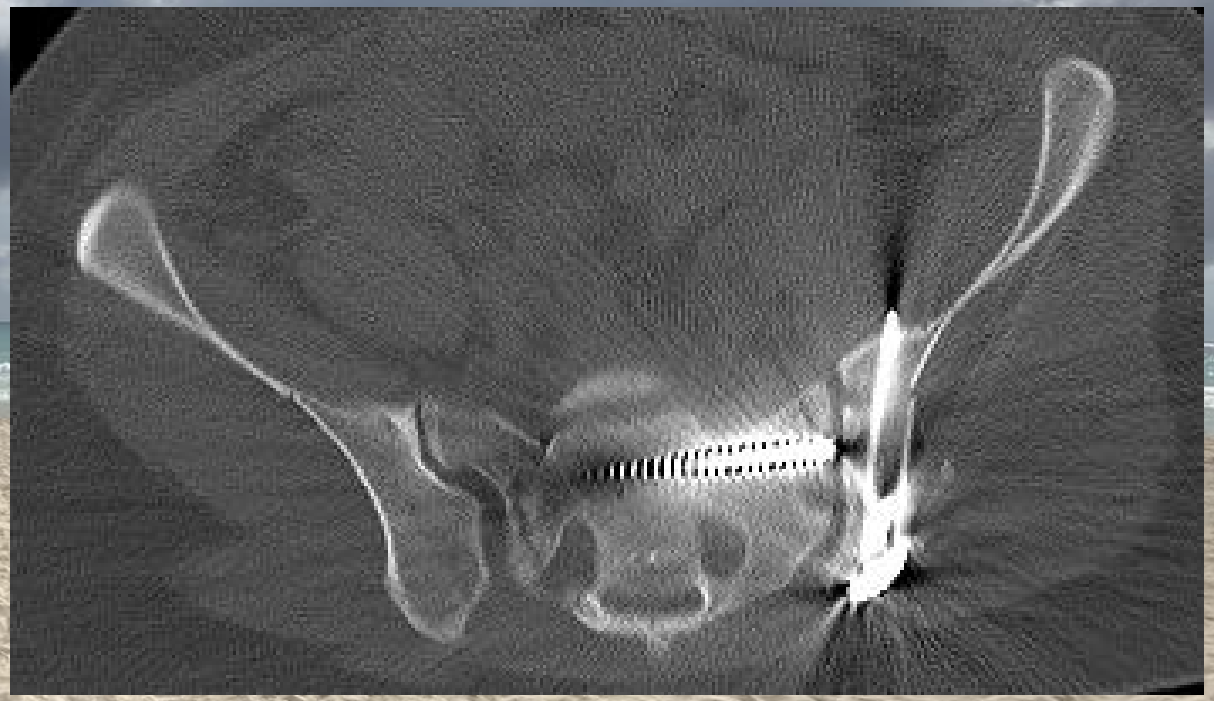
Reduction and Fixation: SI Joint Fracture/Dislocation "Crescent Fracture"

- ORIF with plate
  - Posterior approach



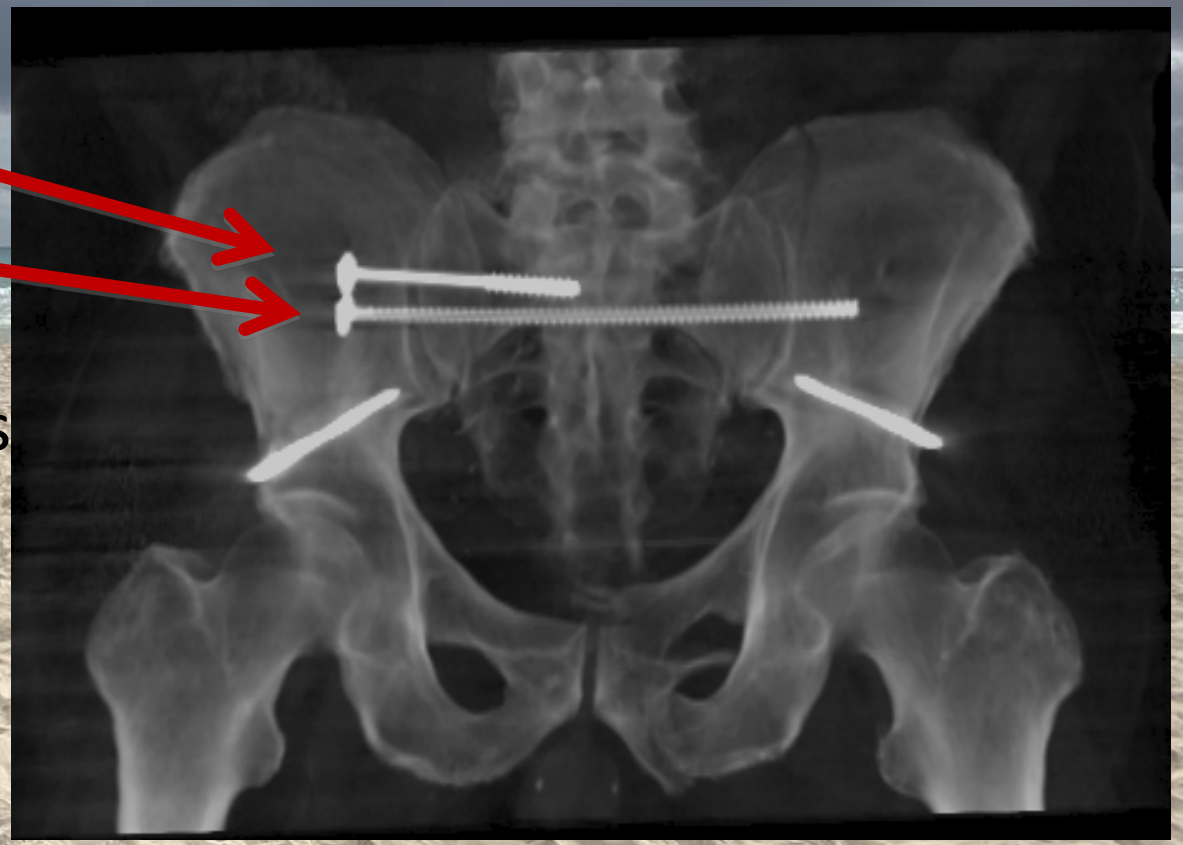
Reduction and Fixation: SI Joint Fracture/Dislocation "Crescent Fracture"

- ORIF with plate
  - Posterior approach



Reduction and Fixation: SI Joint Dislocation

- SI screw
  - Cannulated for ease of placement
  - Partially threaded for reduction
  - Fully threaded for improved fixation



  - Knowledge of anatomy and imaging is essential
  - Be aware of sacral dysmorphism

Iliosacral Screws: High Backout Rate

Eckardt et al (2017), Injury

- 50 non-traumatic sacral fracture patients
- Screw constructs:
  - 23 transiliac-transsacral
  - 27 ilio-sacral (16 single, 11 double)
- **9 reoperations (20%) for symptomatic loosening**
  - No loosening with two screws
  - 2/23 (8.7%) loose for transiliac-transsacral

Eckardt H, *et al. Injury*. 2017;48(12):2717–23.

When choosing surgical options….

Transiliac–Transsacral Screws: Lack Longer-Term Data

Walker et al (2018), J Ortho Trauma

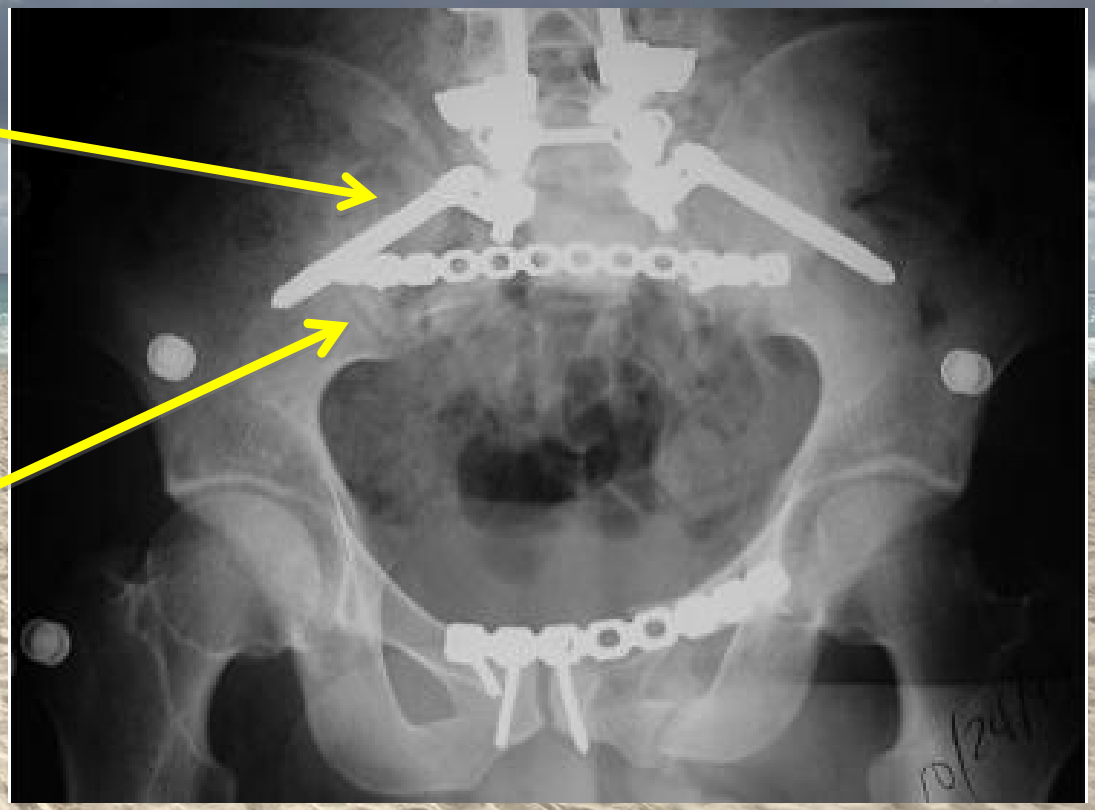
- “Percutaneous transiliac–transsacral screw fixation of sacral fragility fractures lessens pain, improves ambulation, and increases the rate of disposition to home."
- “Further investigation is needed to determine if surgical fixation provides benefit regarding medium- and long-term outcome variables.”

- Is there harm in crossing two joints if only one side is affected?

Walker JB. *et al. J Ortho Trauma.* September 2018; 32 (9): 452-456

Fixation: Sacral Fractures

- Lumbopelvic fixation
  - Vertical control
  - Can be useful in unstable H or Y type sacral fracture
- Trans-iliac plating
  - Rarely done now



Biomechanics of Pelvic Fixation:

- No clinical comparison studies exist
- Experimental biomechanical data exist
- In general, it seems that more points/planes of fixation provide better stability
- How much stability is enough is injury dependent

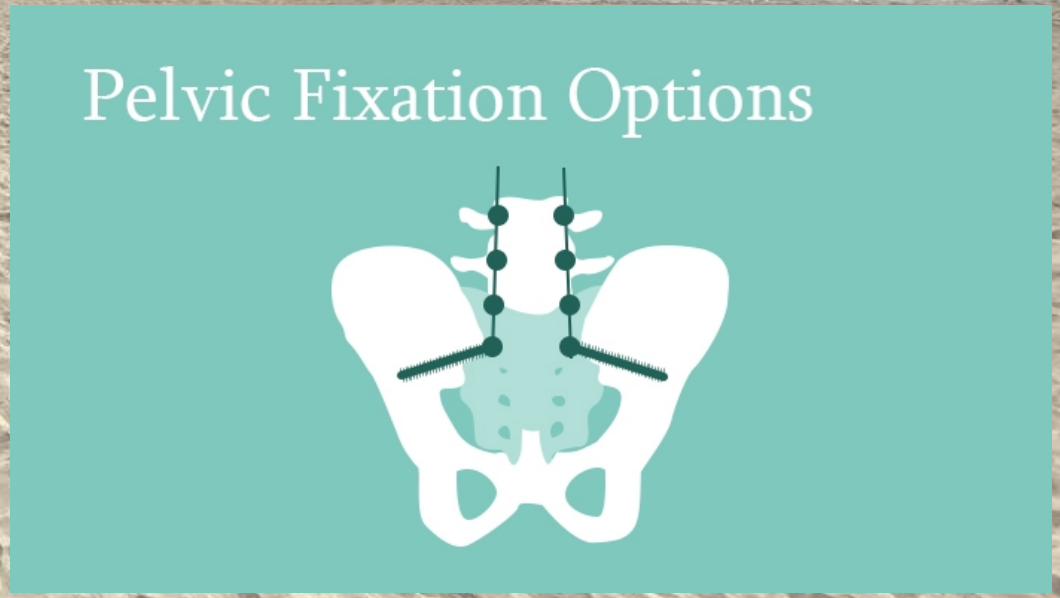
Biomechanics of Pelvic Fixation: Anterior Fixation

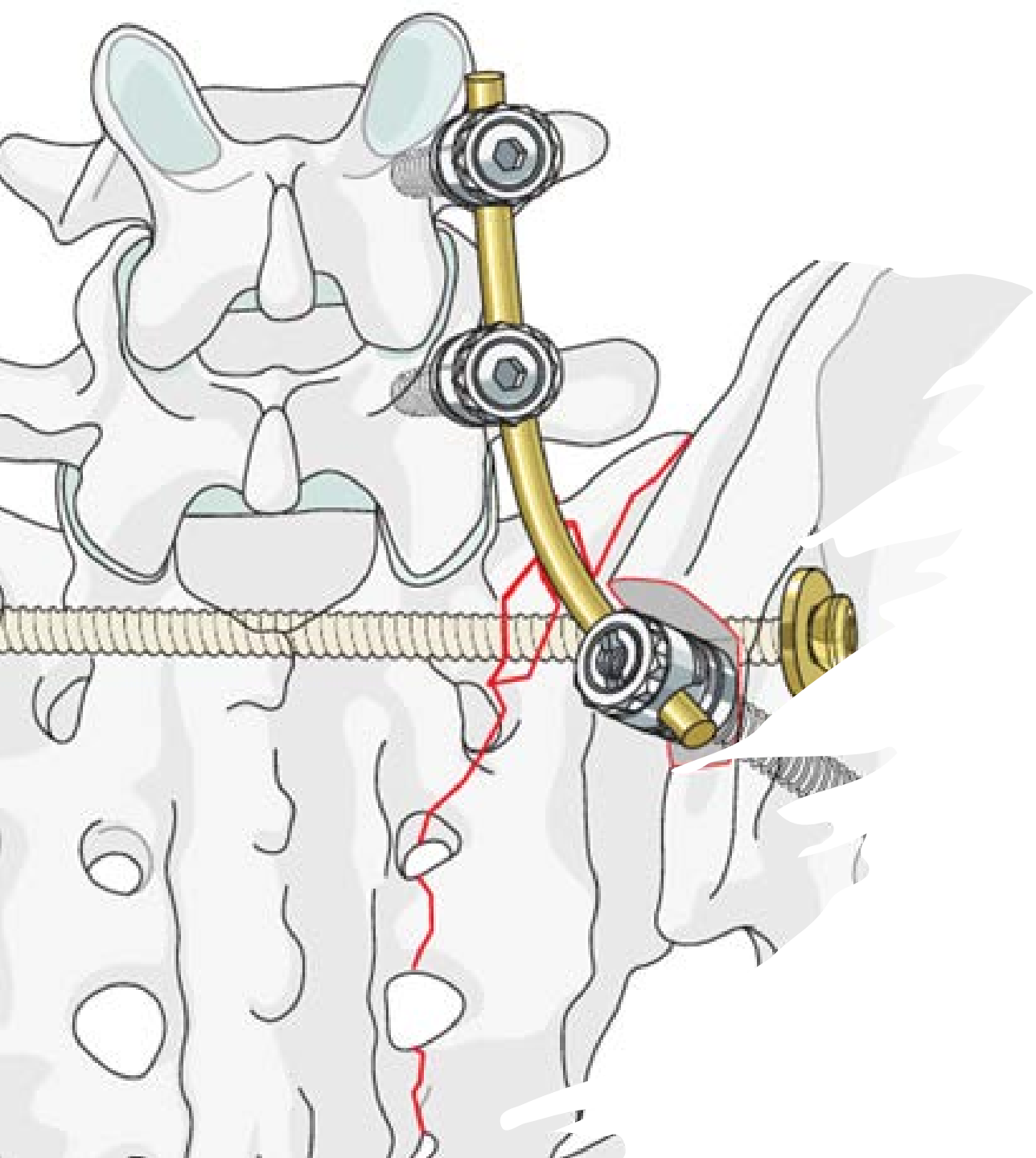
- Anterior plating superior to external fixation in internal/external rotation
- Neither technique very effective at control of vertical displacement
- Anterior fixation can “protect” posterior fixation from failure
- Retrograde pubic screw higher failure rate than antegrade

Biomechanics of Pelvic Fixation: Posterior Fixation

- Options include:
  - Single SI screw,
  - Multiple SI screws
  - Double plating of SI joint
  - Trans-iliac plate of sacral fracture
  - Plate plus SI screw fracture or SI dislocation

- Any of the above are more stable than single SI screw in unstable injuries
- What about primary fusion?





Biomechanics of Pelvic Fixation: Posterior Fixation

- Lumbopelvic fixation
  - Lumbopelvic dissociation (unstable Y, H, or U type sacral fractures)
  - Sacral fractures with significant instability
  - Can provide axial (vertical) stability that is not as dependent on fracture reduction/stability

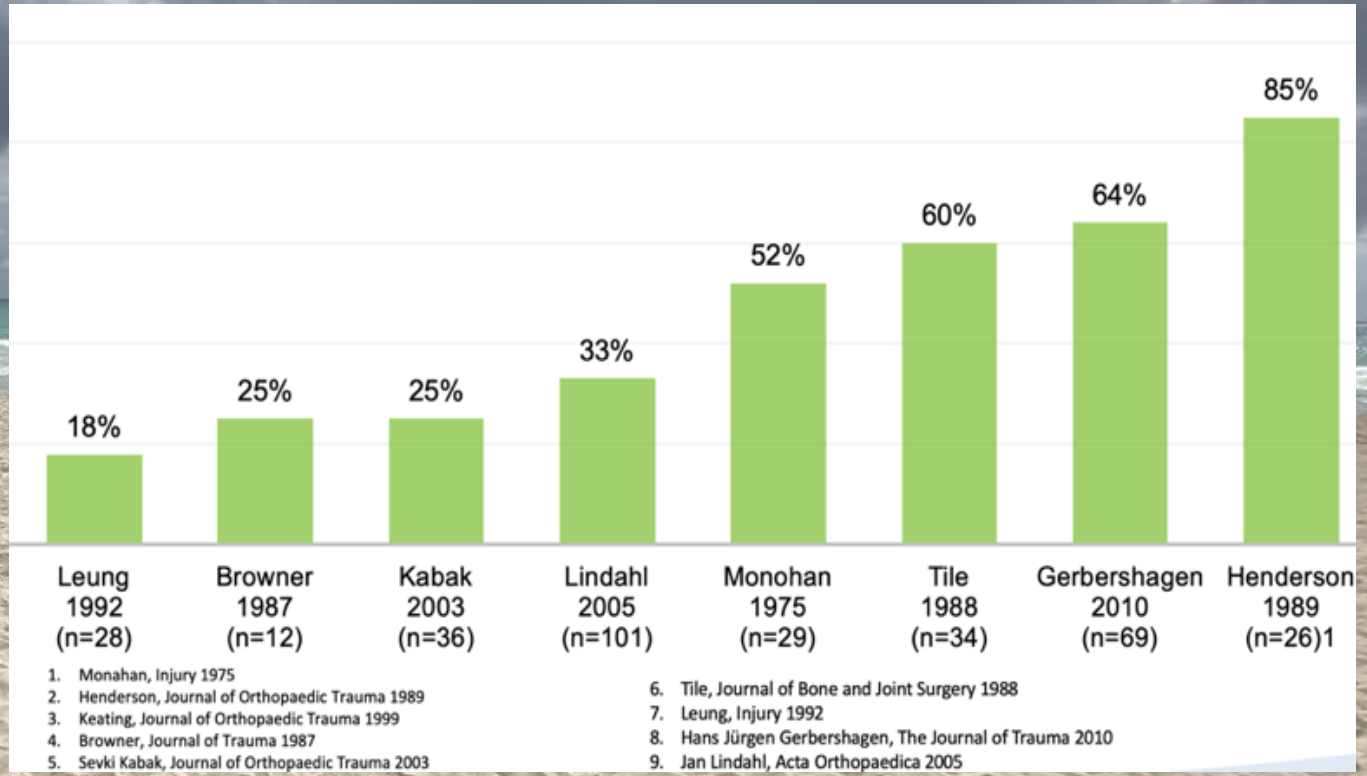
Outcomes

- Pain is common
- Improvement occurs for at least a year in most patients
- Neurologic injury most common predictor of poor outcome

Outcomes After High Energy Trauma

Papakostidis et al (2009), Int Orthop

- Systematic review over 30 yr period
- 27 papers, 1,641 patients
- 92% good-excellent reductions
- 18% - 85% still had pain
- 0% - 12% still had severe pain
- Disturbed gait 0 - 23%
- Wide range functional outcomes



Papakostidis C, *et al. Int Orthop.* 2009;33(2):329-338.

Outcomes

SI dislocations have poor tolerance for residual displacement

Sacral fractures have more tolerance for displacement, but parameters poorly understood

Injury Severity Score and fracture type do not correlate with functional outcome

Pure SI Joint Dislocations Have The Worst Outcomes

Dujardin et al (1998), JOT

- Only 21% have "good" functional results
- Only anterior plate or external fixation used (NO posterior stabilization)

Posterior lesion	Functional results				*p* value		
	Good	Fair	Poor	Total			
Fracture of iliac wing	10	0	0	10			
SI fracture–dislocations	10	4	1	15	0.11		
Fracture of sacrum	15	14	1	30		0.48	
Pure SI dislocations	7 *21%*	16 *48%*	10 *31%*	33	<0.001		<0.01
All	42	34	12				

SI, sacroiliac.

JOURNAL OF ORTHOPAEDIC TRAUMA

Dujardin FH, *et al. J Orthop Trauma*. 1998;12(3):145-150; discussion 150-151.

Micro-Instability Caused By Partial SI Injuries

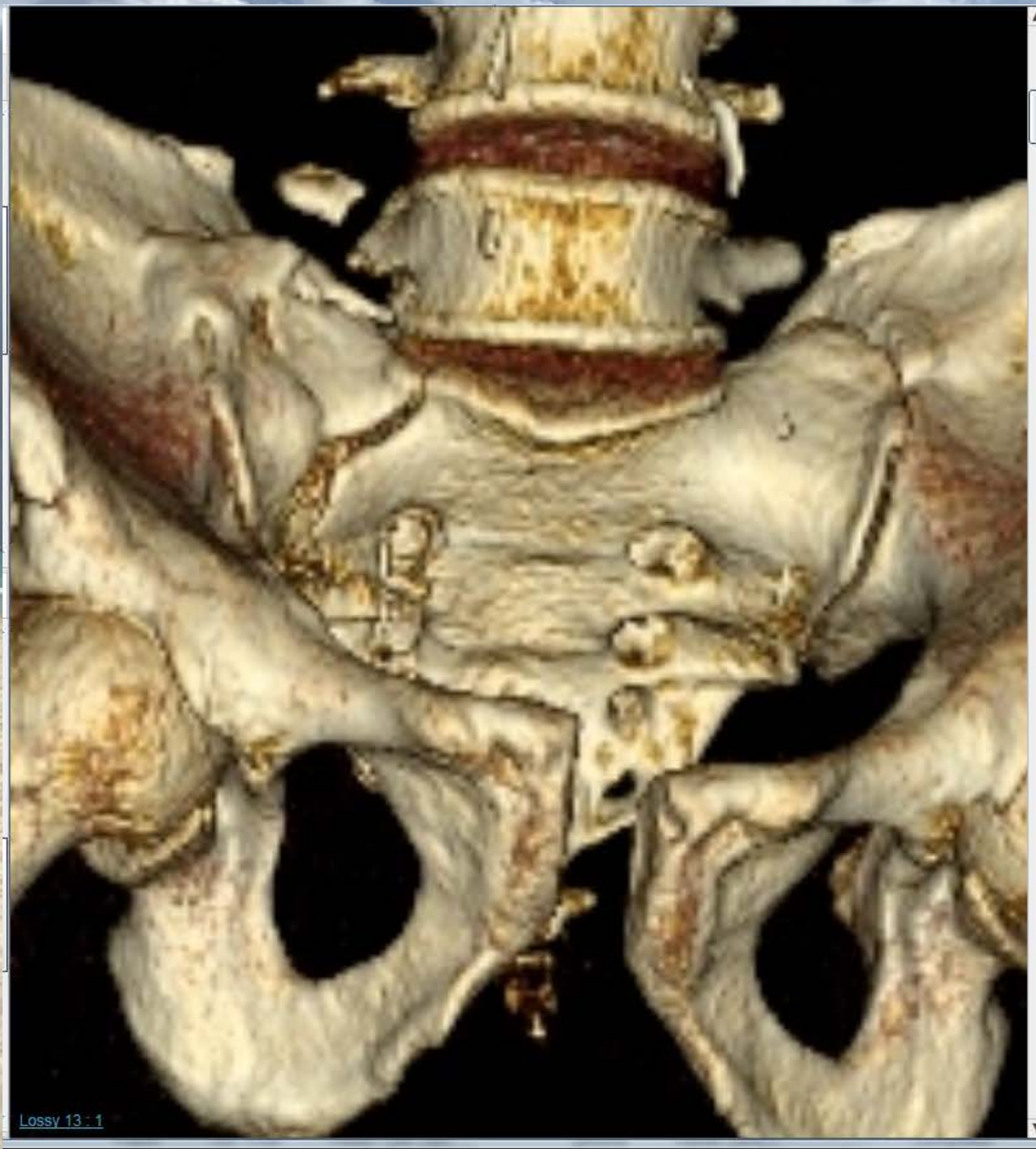
- Dujardin et al (2002), JOT
  - Not restored by ORIF of anterior ring
  - Can cause late dysfunction and degeneration of SI joint
  - “Larger spectrum of indications for SI Joint fixation”

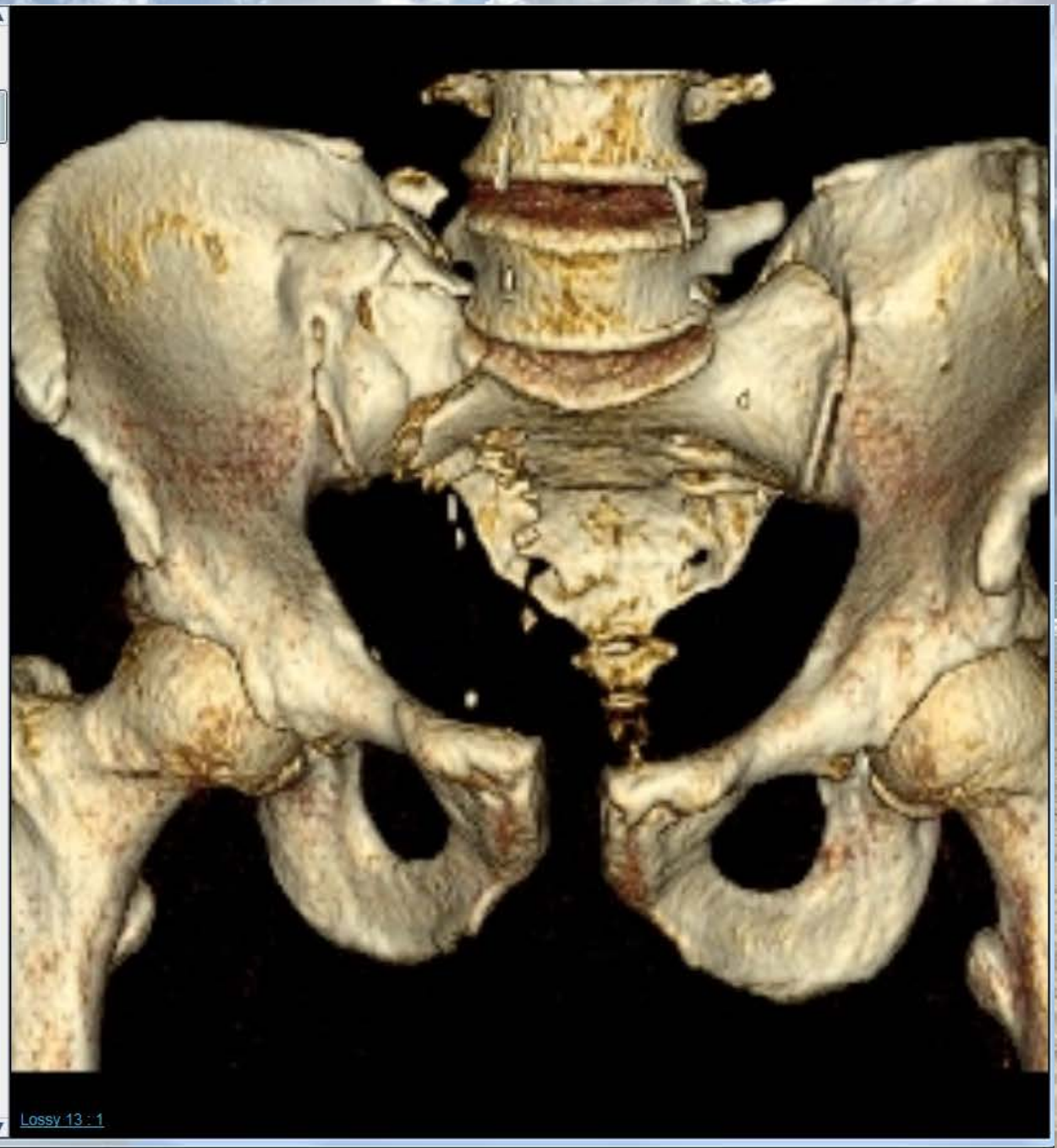
Dujardin FH, *et al. J Orthop Trauma.* 2002; 16(2): 99-103.

Conclusions: Pelvic Ring Injury

- Complex constellation of injuries
- Treatment based on comprehensive understanding of potential pelvic ring instability, displacement, and associated injuries
- Surgical techniques for reduction and stabilization continue to evolve

Wildfire + Smoke + Motorcycle = Pelvic trauma


Lossy 13 : 1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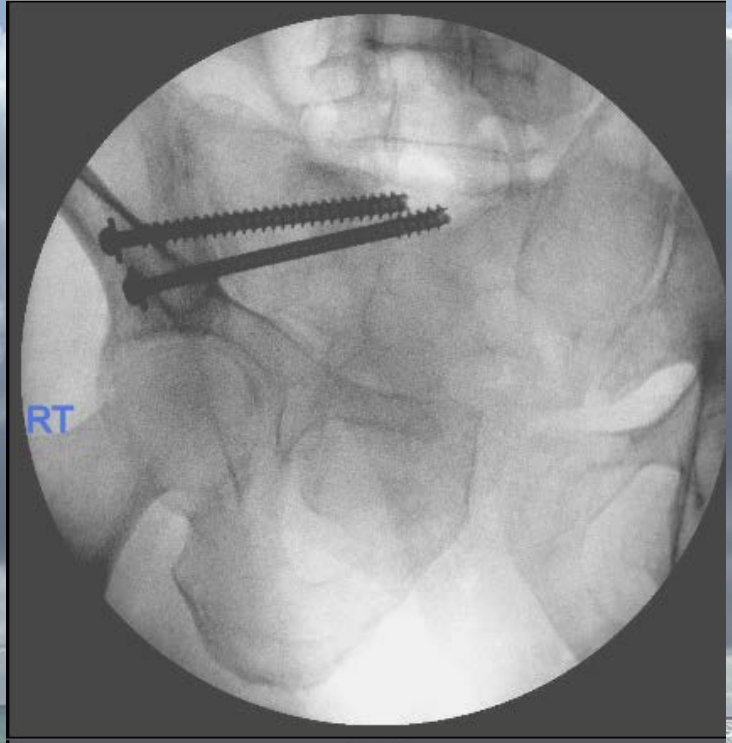
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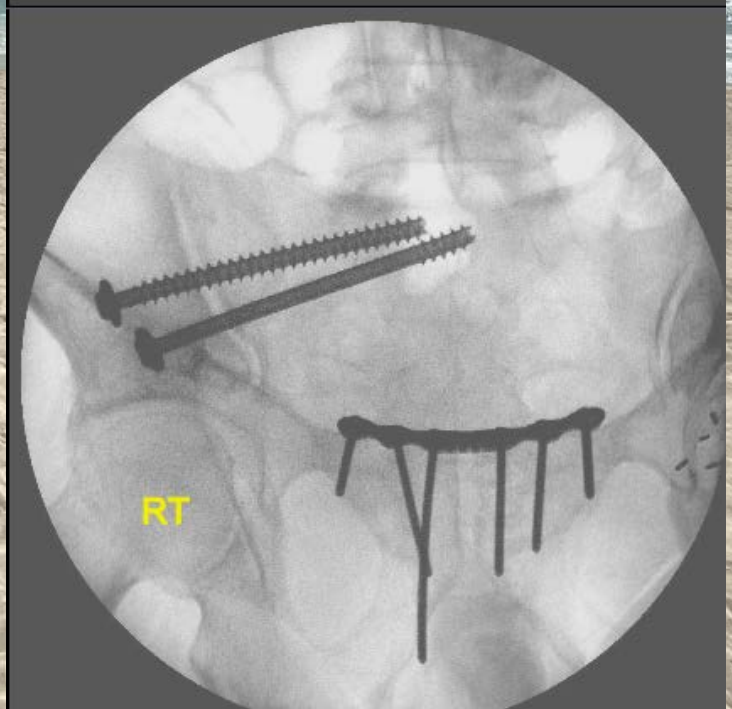
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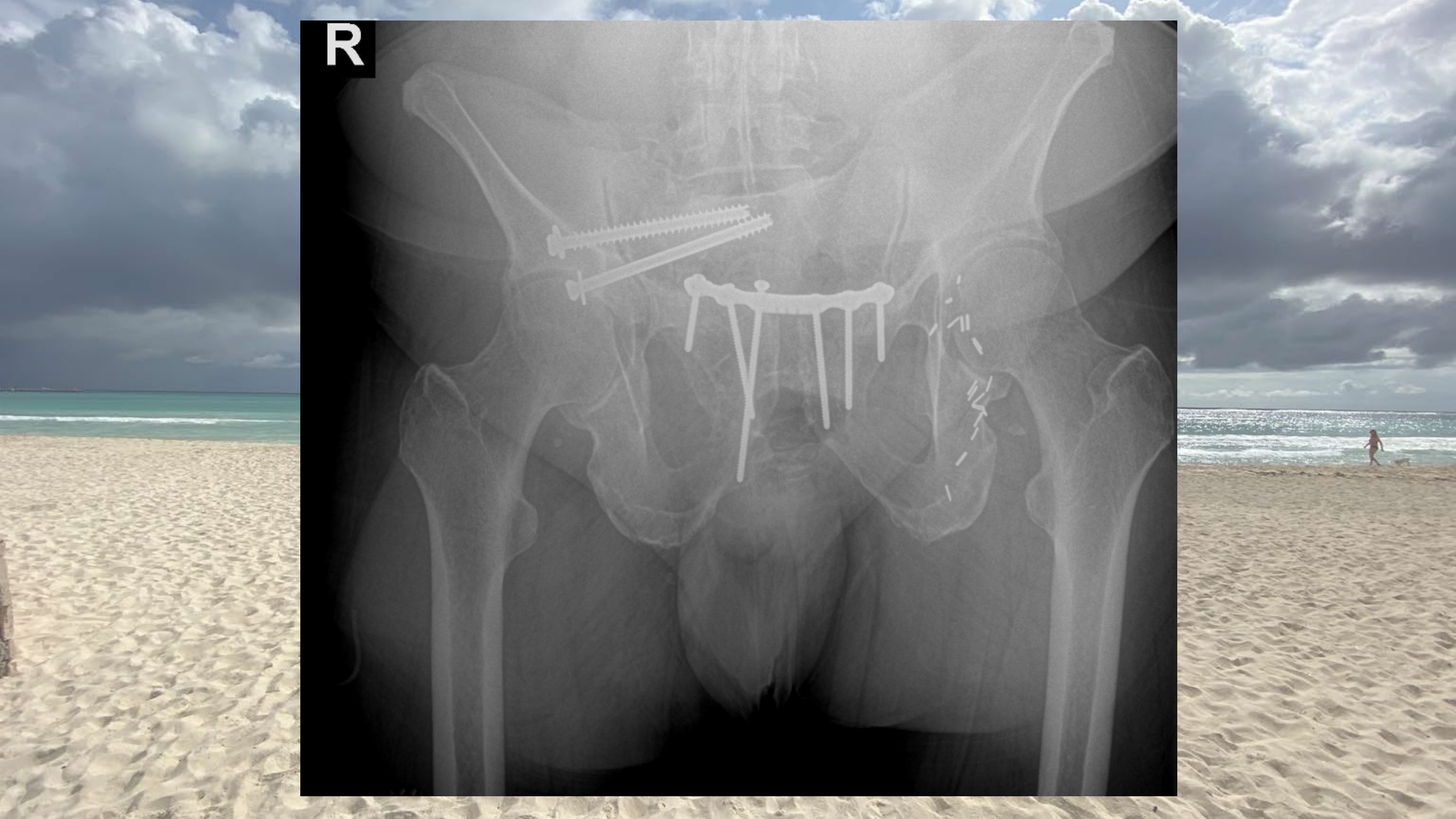
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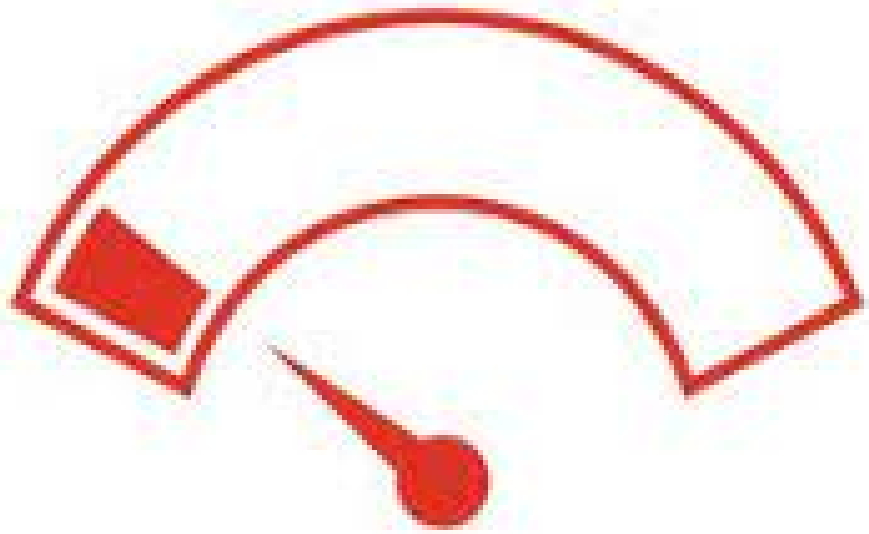
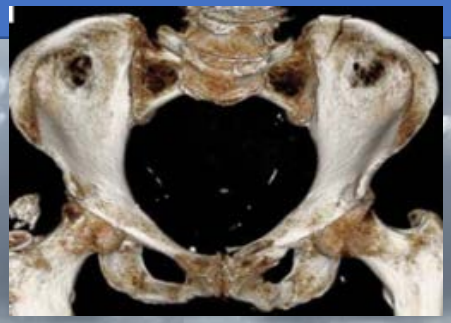
Low Energy Pelvic Trauma



Patient Care Continuum: Non-Traumatic Pelvic Fractures

Offending event

- Weak Bone + Minor Trauma

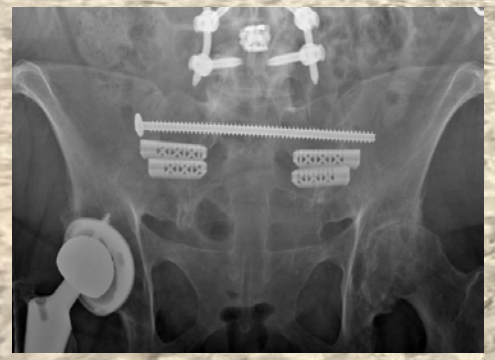


Patient presentation

- Pelvic/low back pain worse with ambulation
- Get imaging

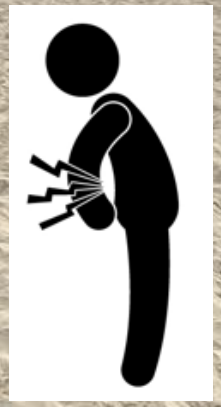
Observation

- 24 to 48-hour monitoring for pain and mobility



Minimally invasive surgery or conservative treatment

- Efficient return of mobility and degree of independence



Avoid Potential long-term sequelae

- Pelvic and/or back pain
- Recurrence or worsening of symptoms

Rommens PM, *et al. Injury.* 2013; 44: 1733–44.

Fractures Involving the SI Joint

Acute Fractures

- **Acute fractures (also called traumatic fractures) are caused by a recent direct blow or impact**

Non-Traumatic Fractures

- A **non-traumatic fracture** is a break of a weakened bone without any identifiable trauma or following a minor injury that would not ordinarily break a healthy bone

Incidence of Non-Traumatic Pelvic Fractures

US 1991 to 2007

- Incidence of pelvic ring fx **increased from 27 to 34 cases** per 100,000 capita

Rochester, MN 1968 to 1977

- Incidence of pelvic fx was 37 cases per 100,000 capita
- Increasing incidence with age, and greater for women vs men
- Maximum incidence was **446 cases per 100,000 capita in women 85 or older**

Germany 2008 to 2011

- Incidence rate of pelvic fx was 25 cases per 10,000 person-years
- **Average age with first pelvic fx was 80 y/o**
- **82% of cases were women**

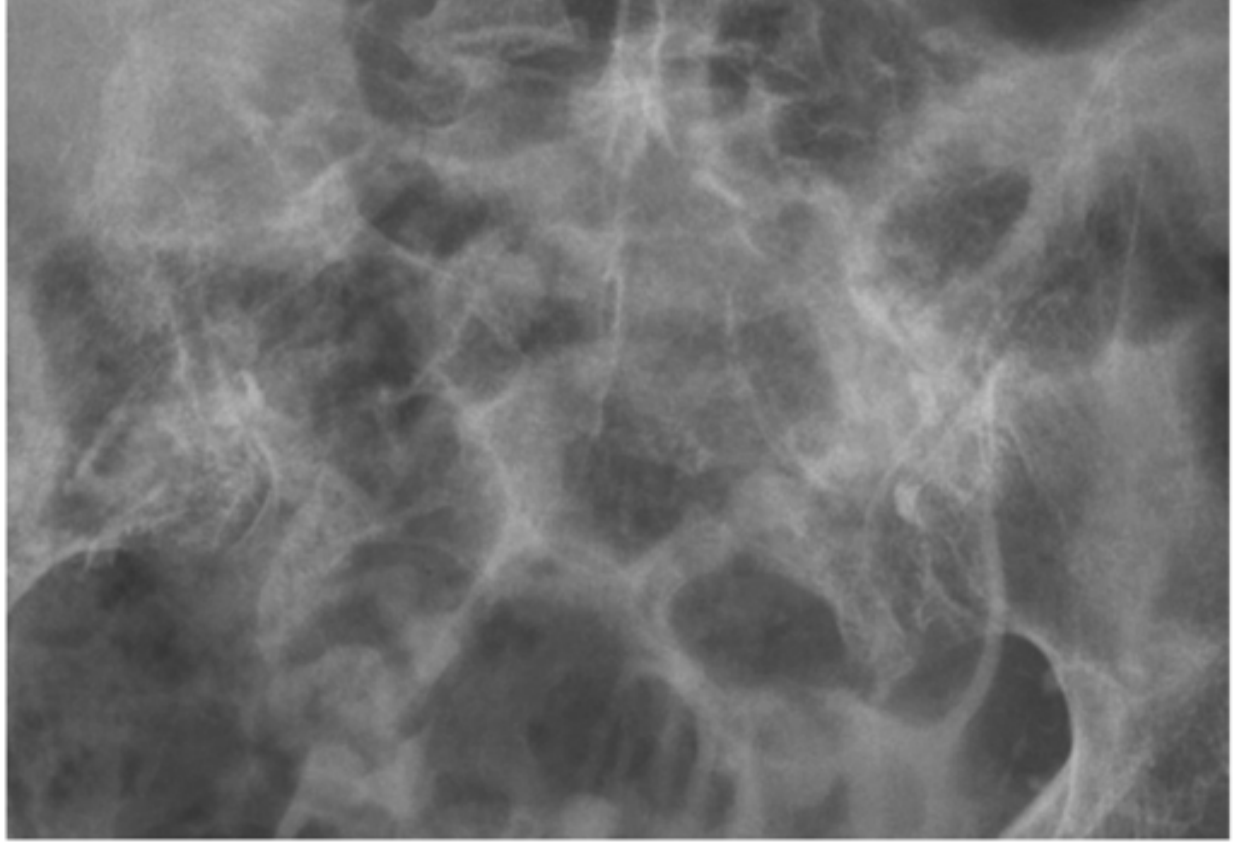
Buller LT, *et al. Geriatric Orthopedic Surg & Rehab.* 2016, Vol 7(1) 9-17.
Melton LJ, *et al. Clin Orthop Relat Res.* 1981 Mar-Apr;(155):43-7.
Andrich S, *et al. PLoS One.* 2015;10:e0139078.

Non-Traumatic Fractures Are Often Occult

- Few are identified with plain X-ray
- CT and MRI are more sensitive
- Can also consider bone scan
- 70% of patients with pubic rami fx also have sacral fx

Lyders EM *et al. Amer J Neurorad* 2010;31(2): 201-210.

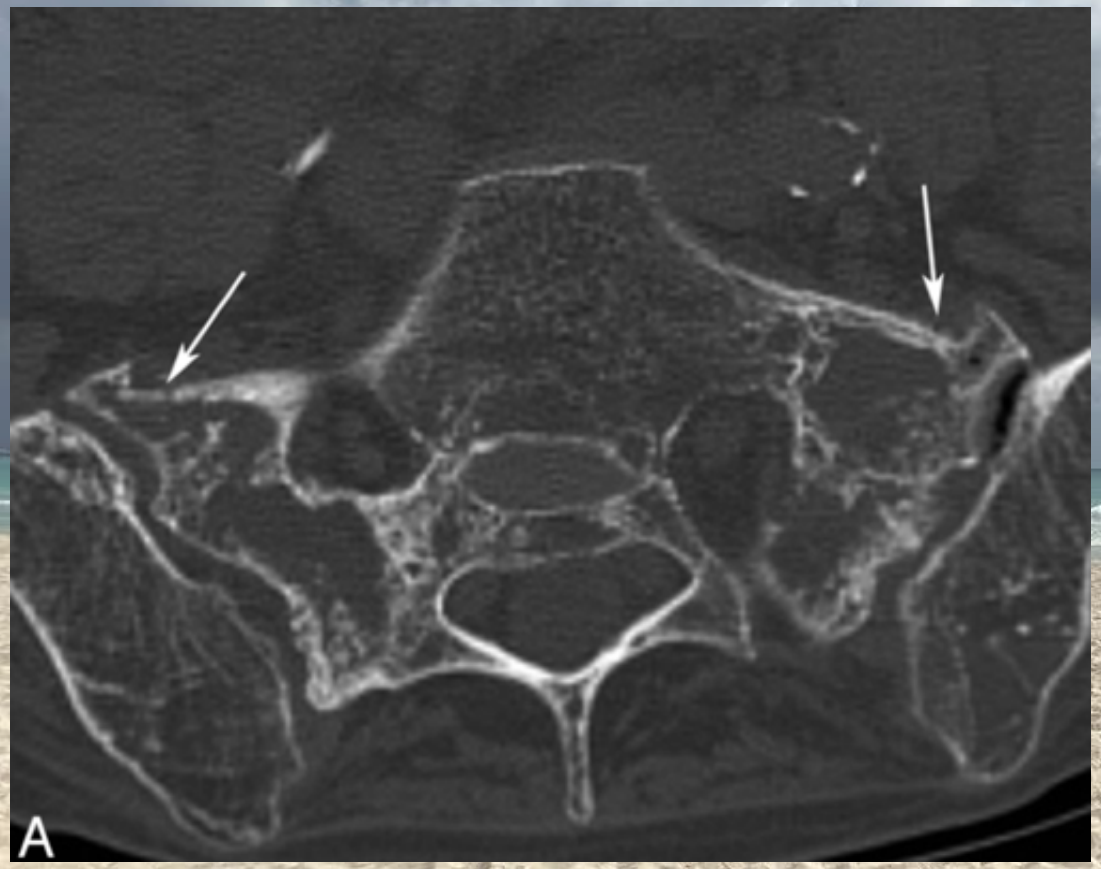
Sahota O, *et al. FFN Meeting.* 2019; Abstract 249.

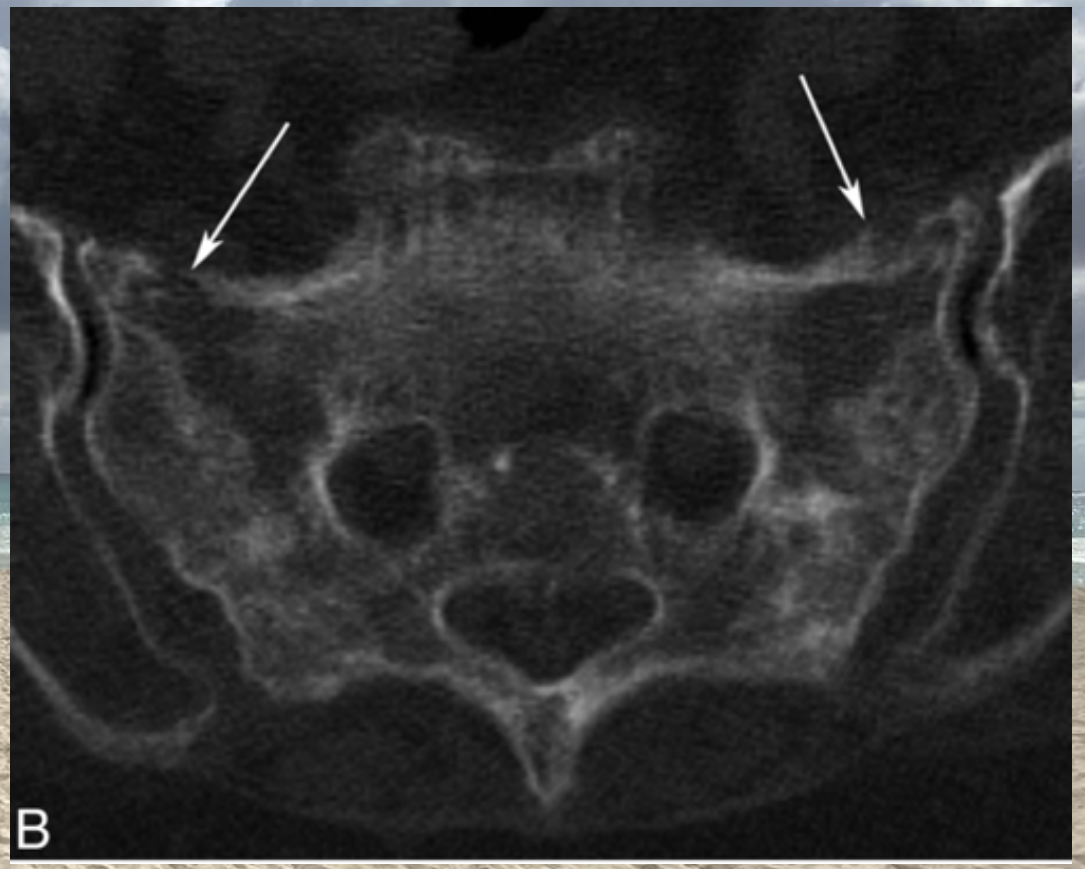


Plain Films are 20-38% Sensitive

- Lyders EM *et al. Amer J Neurorad* 2010;31(2): 201-210.

CTs are 75% Sensitive

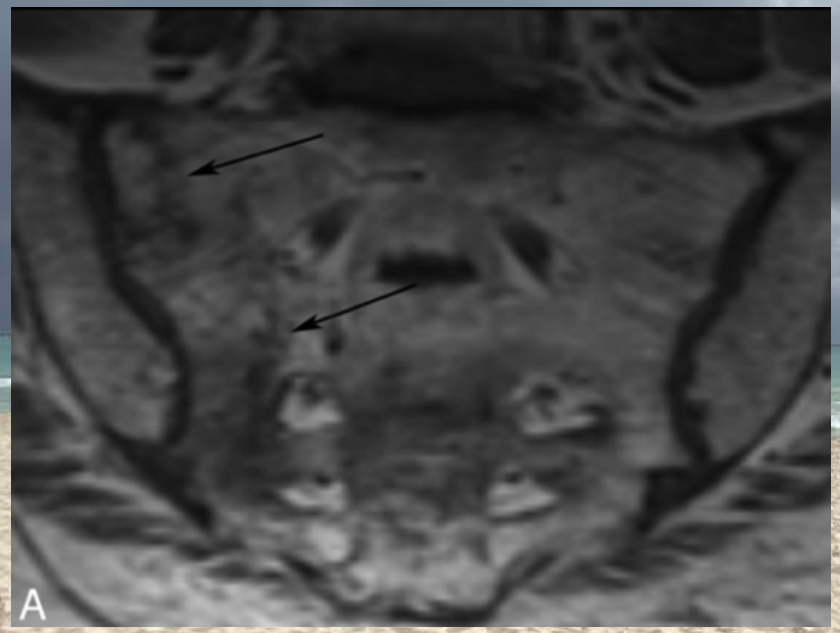


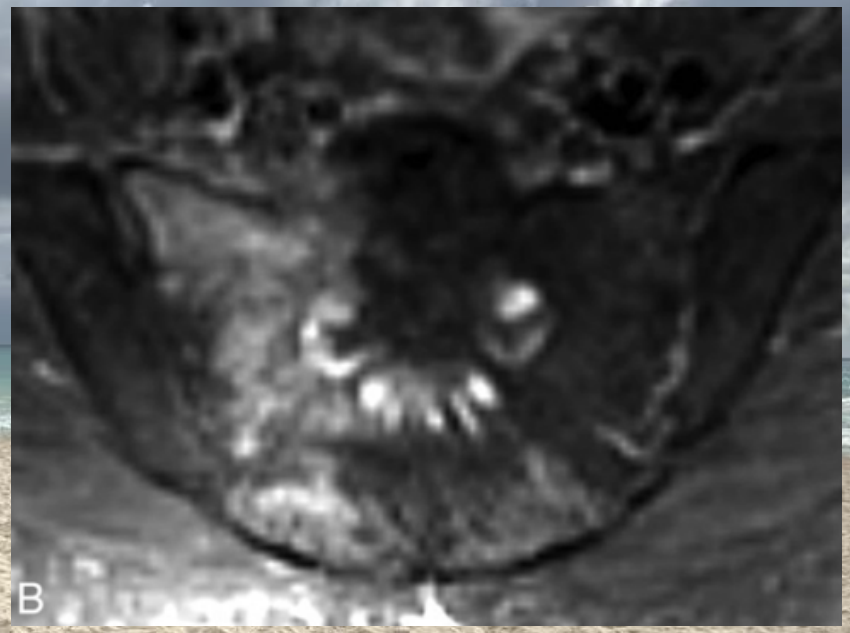


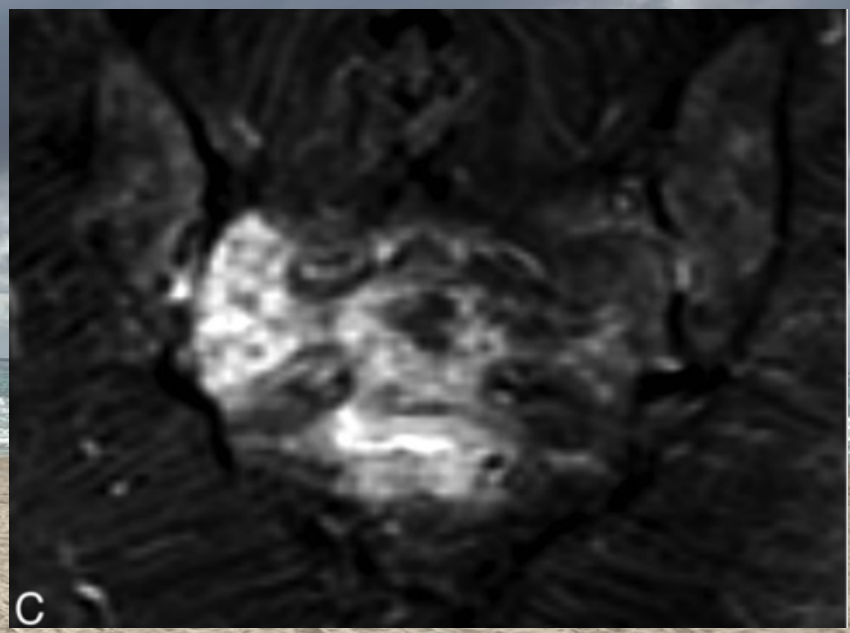
Axial CT scans of the pelvis in 2 different patients demonstrate bilateral non-traumatic sacral fractures (*white arrows*) with mottled sclerosis/lucency and cortical breaks.

Lyders EM *et al. Amer J Neurorad* 2010;31(2): 201-210.

MR is 100% Sensitive





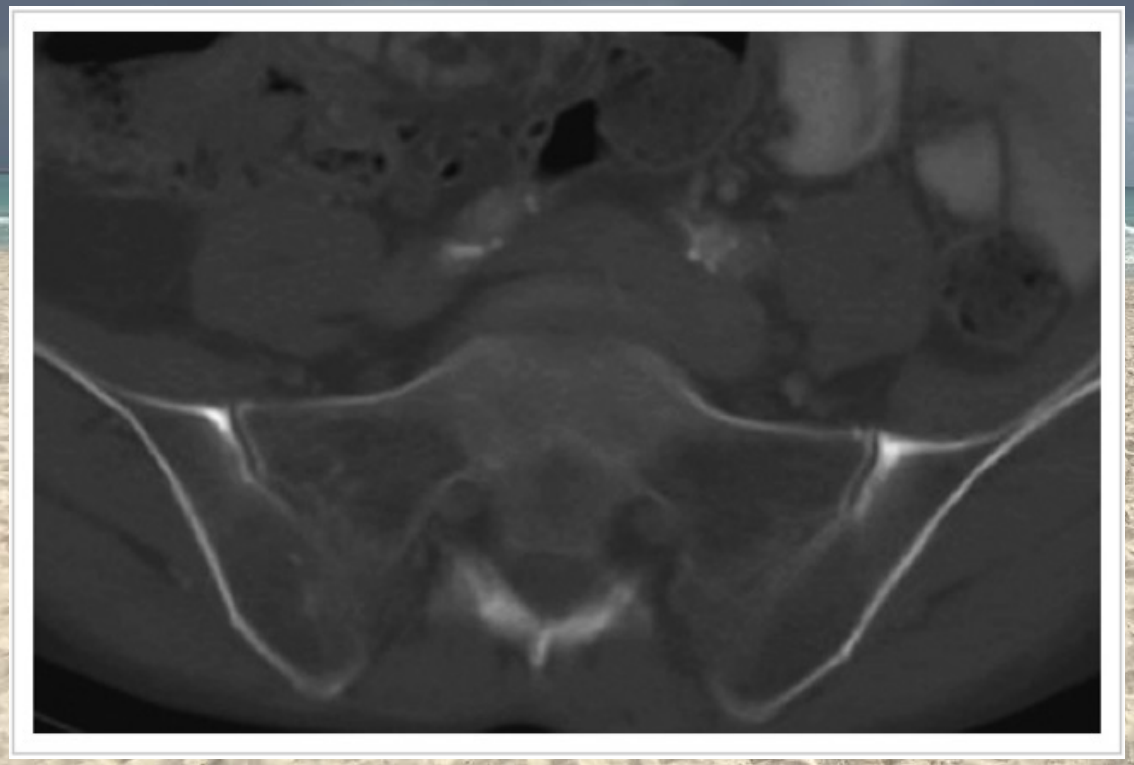


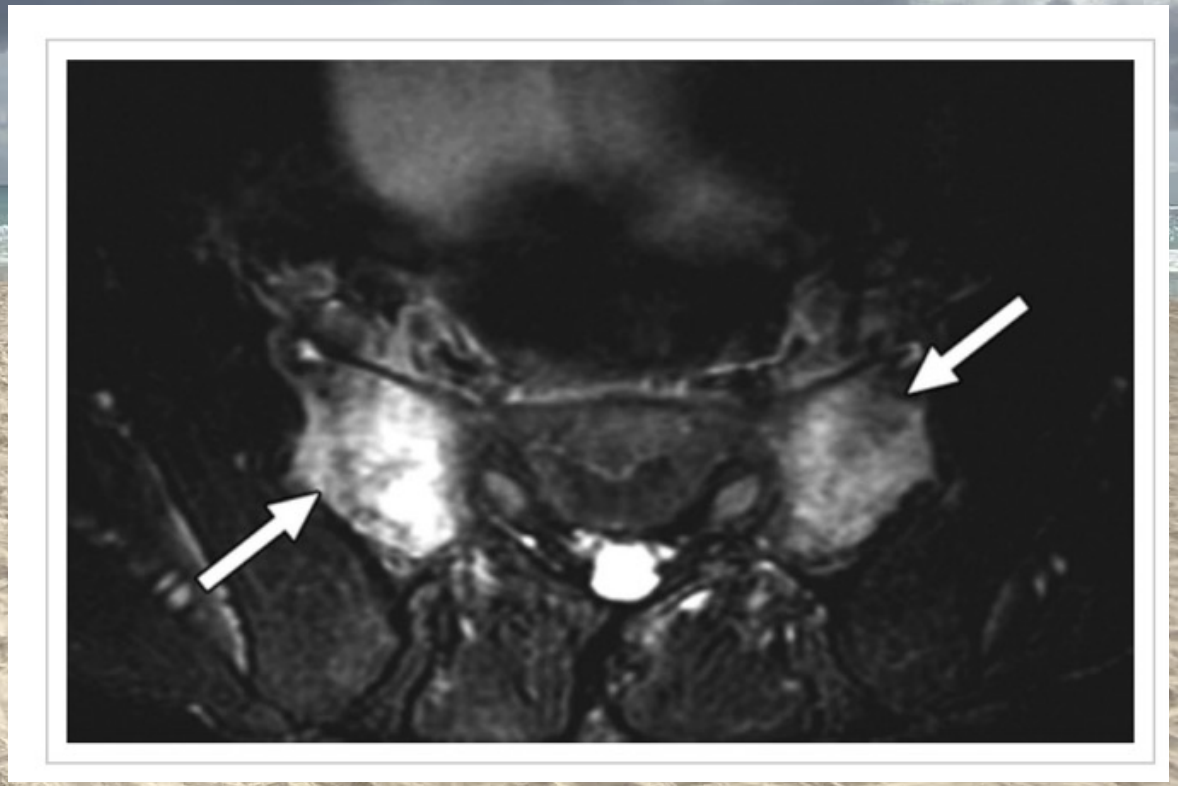
MR images in different patients with non-traumatic sacral fractures. *A*, Coronal oblique T1-weighted image demonstrates patchy low-signal intensity edema and a hypointense fracture line. *B* and *C*, Coronal oblique inversion-recovery images demonstrate high-signal-intensity edema within the lateral sacrum. Note a horizontal component involving the sacral bodies in *C*.

Lyders EM *et al. Amer J Neurorad* 2010;31(2): 201-210.

CT vs MR Imaging

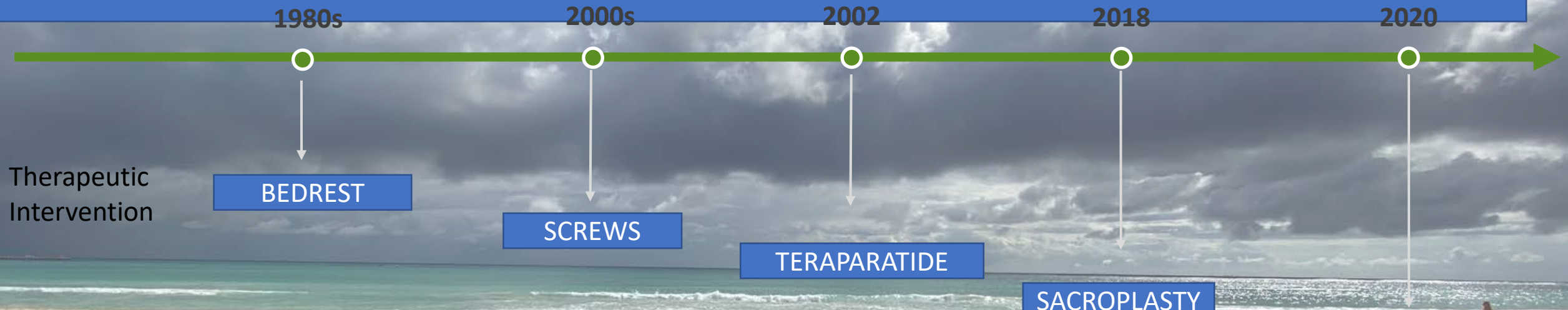
- MRI was substantially better than CT in detecting non-traumatic fractures
- Two or more non-traumatic fractures were frequently present





Cabarrus MC, *et al. American Journal of Roentgenology.* 2008;191: 995-1001.

Various Treatments Now Available for Non-Traumatic Fx



Complications/ Technological Drawbacks	14-27% mortality at 1 year[1-3]	20% back-out/revision[4] Low surface area in sacrum No bioactivity	Expensive Monthly injections 2 years only	32% extravasation[5] No osseous healing	Published data not yet available in the trauma setting

1. Taillandier J, *et al. Joint Bone Spine*. 2003;70 (4):287–289.
2. Breuil V, *et al. Joint Bone Spine*. 2008;75:585–8.
3. Morris R, *et al. Postgrad Med J*. 2000;76 (900):646.
4. Eckardt H *et al Inury*. 2017;48:2717-2723.
5. Bastian JD *et al Acta Orthop Belg*. 2012;78(1):100-5.

Non-Surgical Treatment: Complications

Thromboembolic disease:

- DVT in up to 61%
- PE from 2% to 12%, Fatal PE in 0.5%-10%

Muscle strength decline:

- 1%-3% per day, or 10%-15% per week

Cardiac function:

- Stroke volume and cardiac output decrease
- 20 to 72 days to restore pre-bed rest cardiac function

Pulmonary disorders:

- Ciliary clearance and the coughing mechanism are impaired
- Atelectasis, secretions, and pneumonia

Genitourinary disorders:

- Calculus, UTI, urosepsis, retention, and incontinence

Predisposition to pressure ulcers

Neurosensory disorders

The Controversy Surrounding Sacral Insufficiency Fractures: To Ambulate or Not to Ambulate?

Babayev Marietta MD; Lachmann, Elisabeth MD; Nagler, Willibald MD

American Journal of Physical Medicine & Rehabilitation. 79:p 404-409, July-August 2000.

Babayev M, *et al. Am J Phys Med Rehab*. 2000;79:404-09

Non-Surgical Treatment: High Mortality (up to 27%)

Postgrad Med J 2000;**76**:646–650

Closed pelvic fractures: characteristics and outcomes in older patients admitted to medical and geriatric wards

Robert O Morris, Adeniyi Sonibare, Desmond J Green, Tahir Masud

148 patients (126 women) were studied:

- 83% (n=123) of patients suffered a pelvic fracture in low energy trauma
- Mean (SD) length of hospital stay was 21.3 (17.6) days
- Inpatient mortality was 7.6% and at one year was 27%
- There was a marked adverse effect on the mobility of survivors with all patients using at least a walking stick at discharge and 51.1% (n=70) needing assistance for mobility
- Rates of institutionalization rose from 20.9% (n=31) at admission to 35.8% (49/137) of survivors at discharge

Morris R, *et al. Postgrad Med J.* 2000;76 (900):646.

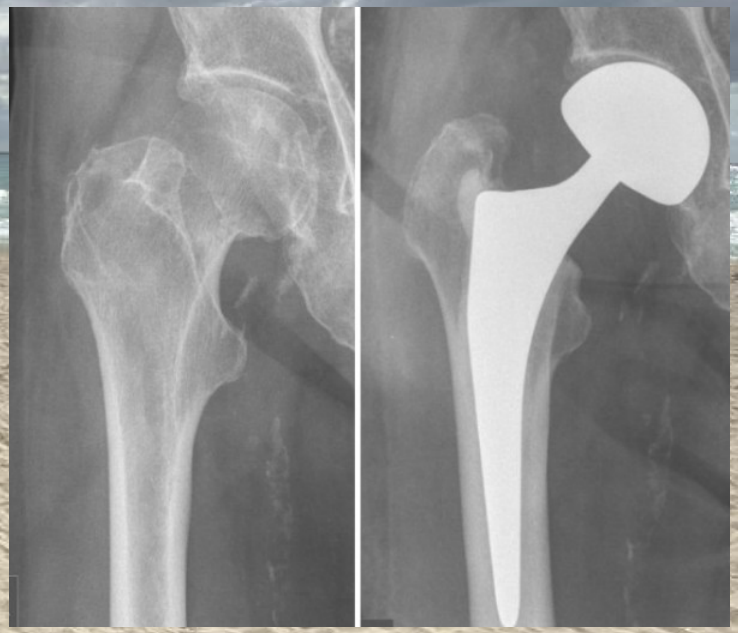
Evolution of Nonop Care to Surgical Intervention

Analogous to Non-Traumatic Hip Fractures

Bedrest - Former standard of care

Now rarely used because of poor outcomes and prolonged hospital stay[1]

Most hip fractures are treated surgically[1]



Ossendorf, C *et al. Patient safety in surgery.* 2010.4.16.10.1186/1754-9493-4-16.

1. Parker M, *et al. BMJ.* 2006 Jul 1; 333(7557): 27–30.

Transiliac–Transsacral Screws: Lack Longer-Term Data

Percutaneous Transiliac–Transsacral Screw Fixation of Sacral Fragility Fractures Improves Pain, Ambulation, and Rate of Disposition to Home

Examined whether percutaneous transiliac–transsacral screw fixation improves pain, ambulation, length of stay, and the rate of disposition to home in patients with sacral fragility fractures.

- Decreased pain, improved ambulation, and increased the rate of disposition to home.

Walker JB. *et al. J Ortho Trauma*. September 2018; 32 (9): 452-456

Iliosacral Screws: High Backout Rate

Treat with variety of screw constructs:

- 23 single transiliac-transsacral screws
- 27 ilio-sacral screws (16 single, 11 double)

9 reoperations (20%) for symptomatic loosening

- No loosening if two screws
- 2/23 (8.7%) loose for transiliac-transsacral screws

1-year mortality 10%


Injury, Int. J. Care Injured 48 (2017) 2717–2723

Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

Good functional outcome in patients suffering fragility fractures of the pelvis treated with percutaneous screw stabilisation: Assessment of complications and factors influencing failure

Henrik Eckardt[a,*], Alexander Egger[a], Rebecca Maria Hasler[a], Christoph J. Zech[b], Werner Vach[a], Norbert Suhm[a], Mario Morgenstern[a], Franziska Saxer[a]

Eckardt H, *et al. Injury*. 2017;48(12):2717–23.

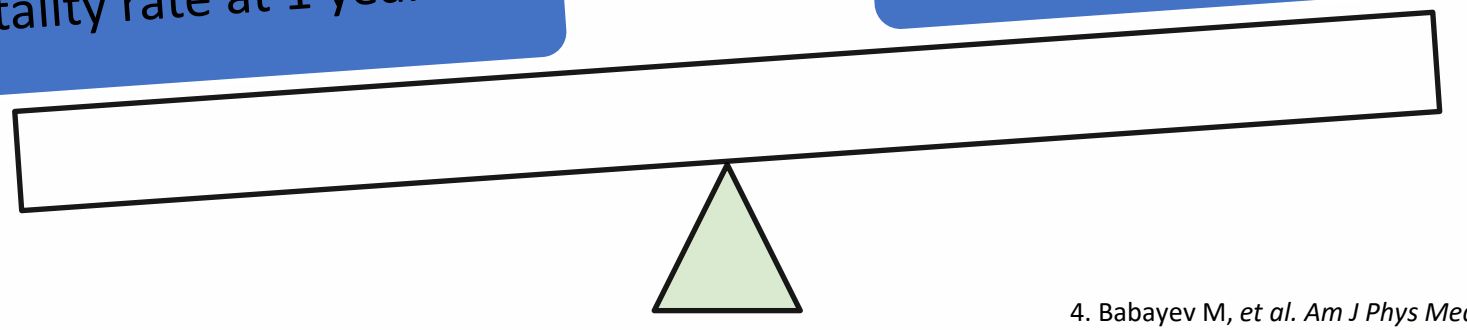
Non-Traumatic Sacral Fx Complications

Nonsurgical management:

- 14-45 day avg. hospital stay[1-3]
- 29-61% risk of thromboembolic disorder [4,5]
- 14-27% mortality rate at 1 year[1,3]

Surgical management:

- Risk of iliosacral screw backout[6]
- 32% risk of extravasation in sacroplasty procedures[7]



1. Taillandier J, *et al. Joint Bone Spine*. 2003;70 (4):287–289.
2. Breuil V, *et al. Joint Bone Spine.* 2008;75:585–8.
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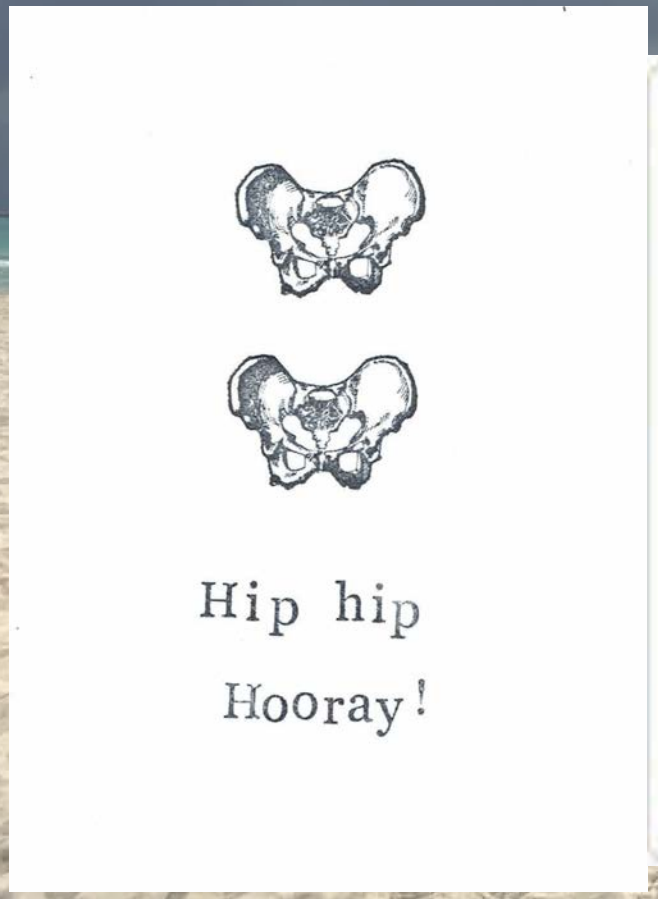
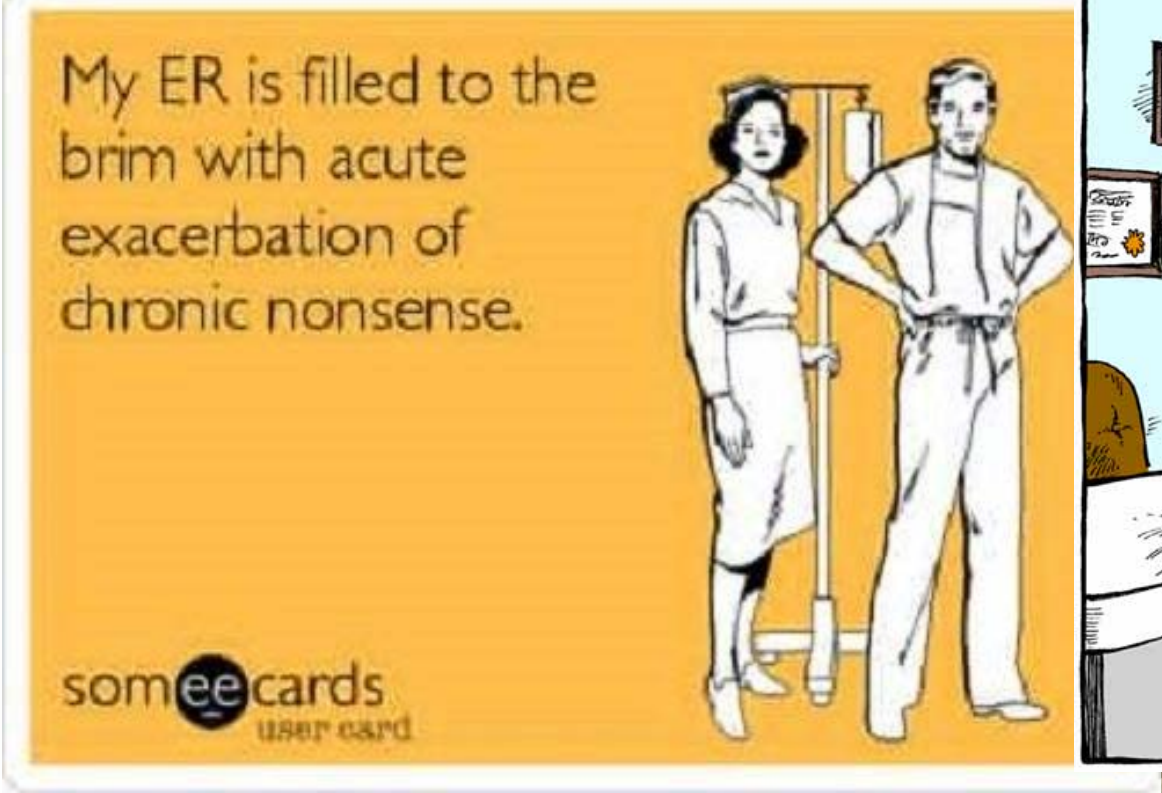
4. Babayev M, *et al. Am J Phys Med Rehab*. 2000;79:404-09
5. Geerts WH, *et al. N Engl J Med*. 1994;331:1601-6.
6. Eckardt H, *et al. Injury*. 2017;48(12):2717–23.
7. Bastian JD, *et al. Acta Orthop Belg.* 2012 Feb;78(1):100-5

What is next?

Summary

- Learned Anatomy
- Acute Considerations
- Treatment Options



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JUST DO IT
JUST DID IT

Thank you