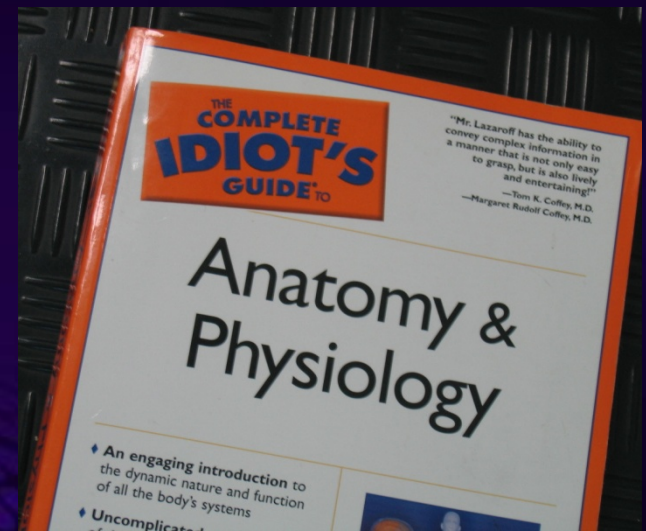


# REPEAT AFTER ME

**ANATOMY** WILL NEITHER  
MAKE SENSE NOR BE  
RETAINED UNTIL IT 'HOOKS  
UP' WITH MORE  
PRAGMATIC KNOWLEDGE.

**DIAGNOSTIC IMAGING** LEADS  
THE TRANSITION FROM  
PAGE TO PATIENT.

**REPETITION** IS THE KEY TO  
RETRIEVABLE LEARNING.



## **GROSS ANATOMY:**

**LEARNING THE INDIVIDUAL NOTES  
AND INSTRUMENTS WITHOUT  
HEARING THE ORCHESTRA**

## **RADIOLOGY:**

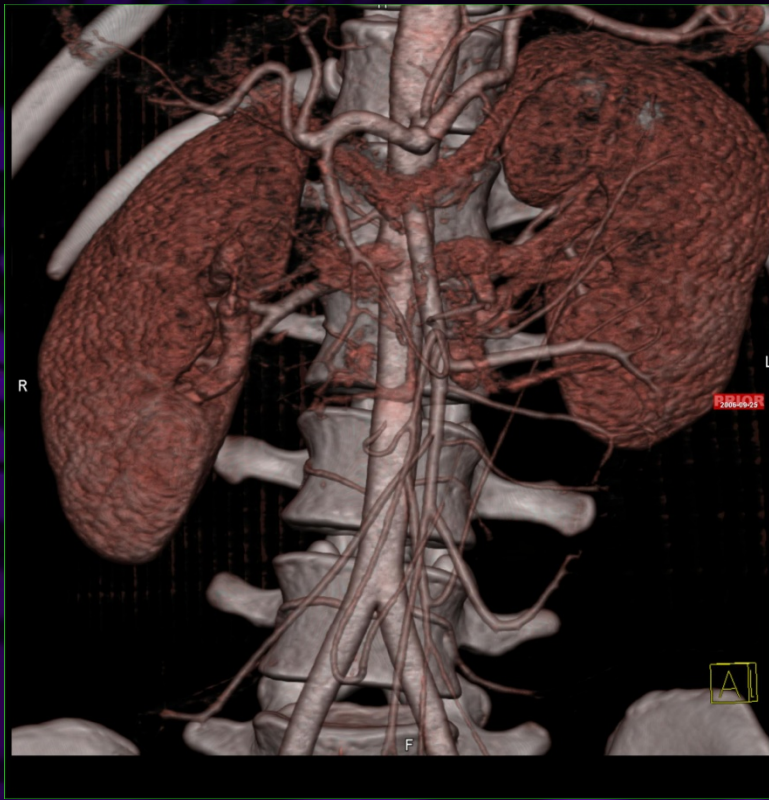
**DECONSTRUCTING THE  
ORCHESTRA TO UNDERSTAND  
THE INDIVIDUAL COMPONENTS**

# THE BONY PELVIS:

**ANATOMY:** MORE THAN YOU *EVER*  
WANTED TO KNOW OR MEMORIZE.

**RADIOLOGY:** WHY IT'S *GREAT* TO  
KNOW THIS STUFF.

(“The femoral head is the seat of the soul...”)



# WHAT HAS IT DONE FOR ME LATELY??

**SUPPORT** STAND, SIT; MOVE; GRAVITY

**WEIGHT TRANSFER** SPINE → LEGS

**BALANCE AND GAIT:** FLEXIBLE YET STABLE;  
EXPANDED SURFACE AREAS FOR HUGE MUSCLES

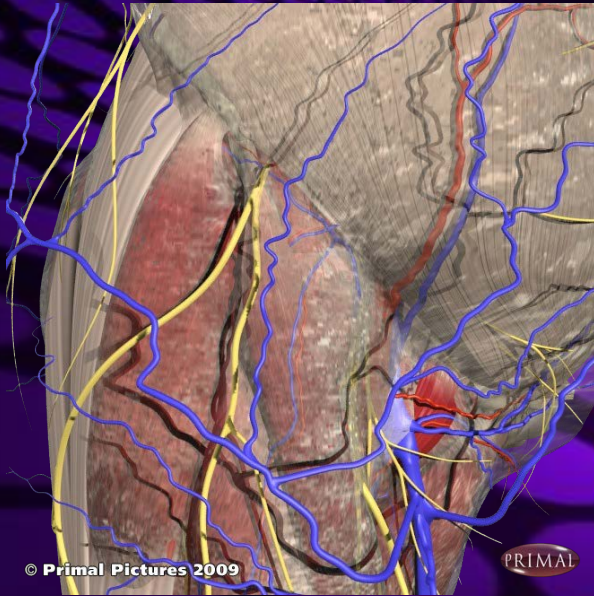
**PROTECTION OF MANY ORGAN SYSTEMS  
AND TISSUES** GI, GU, NEUROVASCULAR...

**FETAL SUPPORT/PROTECTION**

AND AUTO-MODIFYING FOR DELIVERY

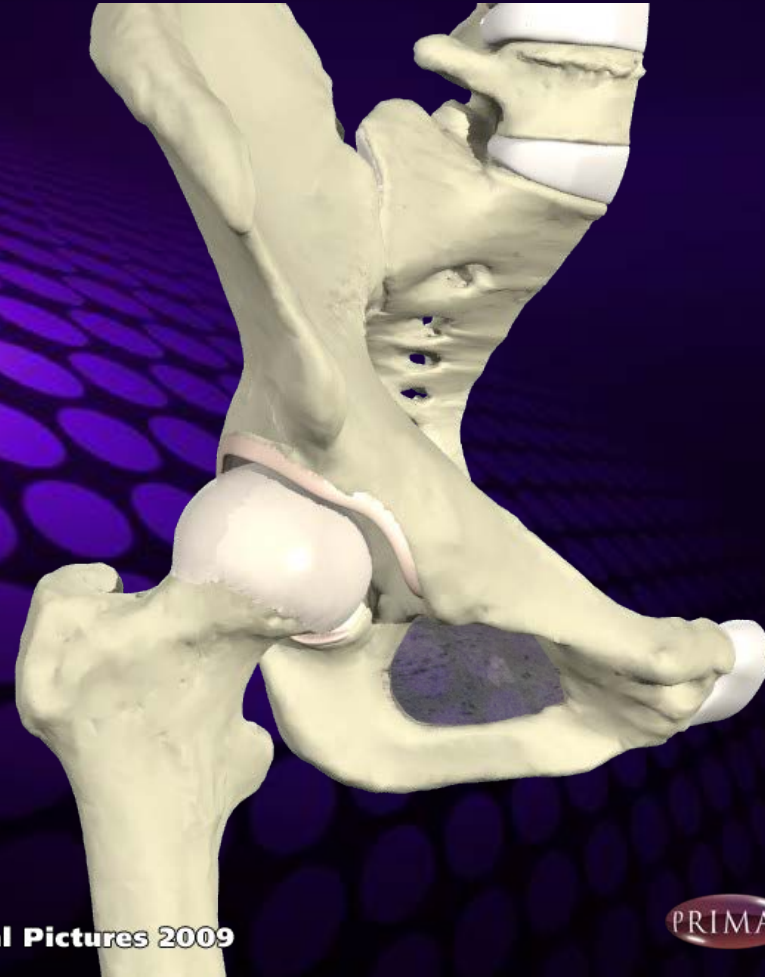
**MARROW PRODUCTION**

# THE BONY PELVIS: HIPS HIPS HOORAY!!



© Primal Pictures 2009

PRIMAL



© Primal Pictures 2009

PRIMAL

# NORMAL: 11yo vs. 18yo



# **BONES TALK** (WOLFFE'S LAW)

→ DATING ONSET OF ABNORMALITIES



- **CONGENITAL**
- **IN CHILDHOOD**
- **NOT UNTIL ADULT**





# WEIGHT BEARING: ARCH



**STRUCTURALLY SOUND CURVES AND ARCHES ARE INHERENTLY STRONG AND STABLE** (pelvis, skull, ribs, foot...)  
**(CAN BEAR, TRANSFER MORE WEIGHT)**

# SI (sacroiliac) JOINT STABILITY

MINIMAL INHERENT BONY  
INTERLOCK;  
STRONGEST LIGAMENTS  
IN BODY BIND SI JOINTS,  
RING TOGETHER

**TRAUMA:** PELVIC INSTABILITY  
(BY PHYSICAL EXAM OR  
IMAGING) IMPLIES *MASSIVE*  
INJURIES



# BIOMECHANICS AND LOAD

**BODY WEIGHT TRANSFER:**

TINY ACETABULAR ROOF →

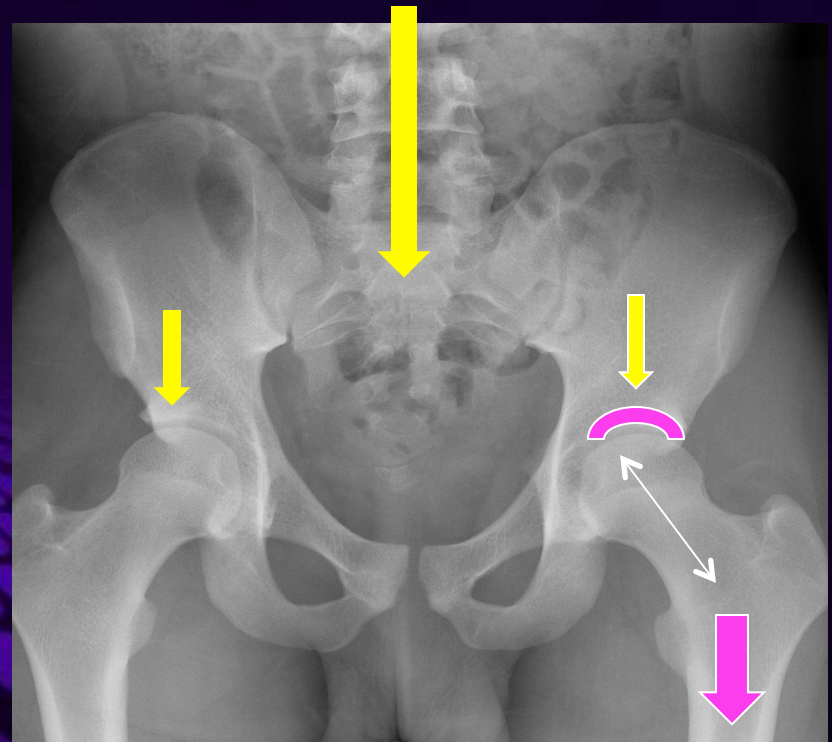
SUPERIOR POLE FEMORAL

HEAD (ditto) → FEMUR

**100 lb LOAD** FEM. HEAD

BECOMES **+800 lb** RACING DOWN STEPS

FOCAL COMPRESSIVE LOAD MAY REACH **\*1200\*** lb  
AT MEDIAL SUBTROCHANTERIC FEMUR!!





# “BONES TALK”: WOLFFE’S LAW

**BONE** (OSTEOCYTES- ‘blasts, ‘clasts)

**CONSTANT WORK-IN-PROGRESS**

- **PRODUCE and REPAIR**
- **DESTROY or REMODEL**
- **GRAVITY, MOTION, etc. MODIFY  
PREDETERMINED GENETIC  
BLUEPRINT (‘NATURE vs NURTURE’)**

# THE PELVIC RING

**RINGS: 'FX. IN TWO PLACES AT ONCE'**



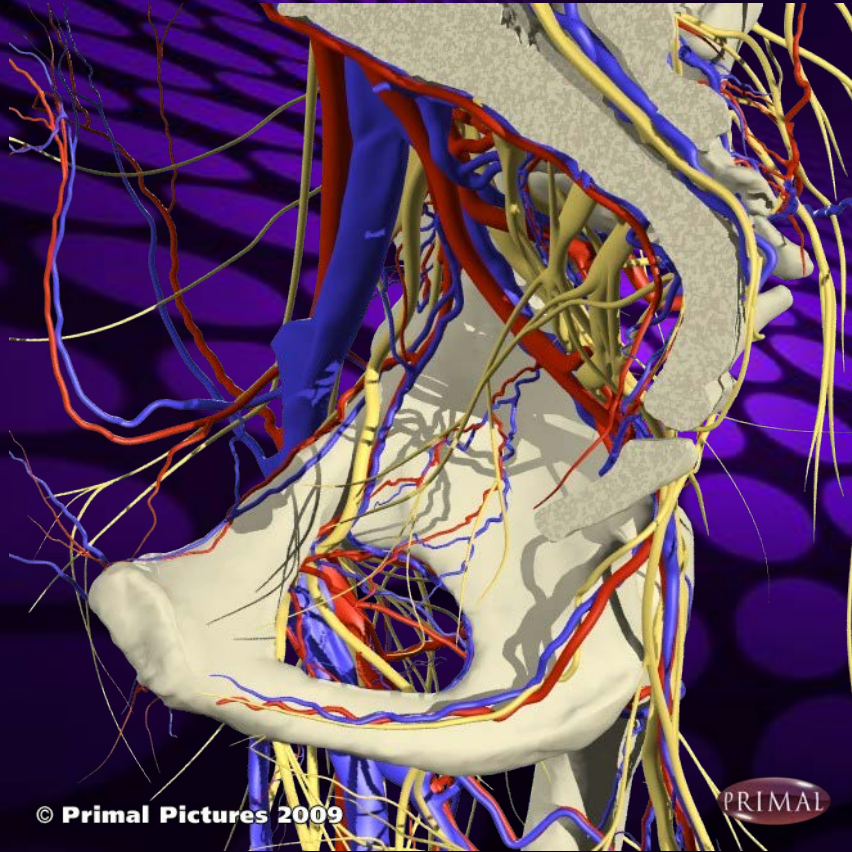
**THINK 'STALE BAGEL', NOT 'PRETZEL'**

**(MAY GIVE WAY, DEFORM, A *BIT* WITHOUT BREAKING; RIGID BUT NOT BRITTLE)**

# PELVIC RING: 'OPENS IN 2 PLACES' (BUT NOT ALWAYS...)

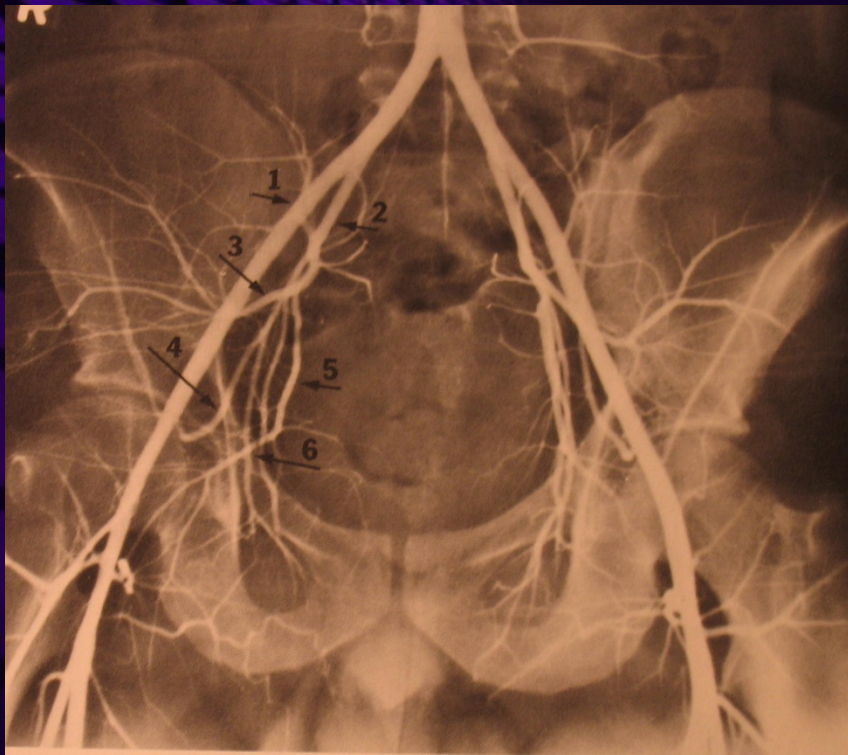


# BONY PELVIS: TRAUMA





# PELVIC RING FRACTURES



**SMALL % OF ALL FXS.**

**BUT**

**3<sup>RD</sup> CAUSE OF DEATH  
IN POLYTRAUMA**

**GI (GASTROINTESTINAL)**

**GU (GENITOURINARY)**

**NEUROVASCULAR  
SHOCK HEMORRHAGE**

# PELVIC RING DISRUPTION

- **Enormous force**, esp younger, to disrupt
- Therefore **multiple associated injuries**
- **Intensely vascularized** → exsanguinate

Average transfusions = 6 Units blood

Anterior-Posterior (‘open book’) can = 15 U

2% → embolization (**Rads**: transart. rescue)

Retroperitoneum holds 4 L ‘til tamponades

- Rectosigmoid, urethra, bladder, major vessels/nvs, kidneys, hemidiaphragm, L-S

# PELVIC RING FRACTURES

- **> half = in elderly**; usually = fall from stance, less force → 95% are minor
- Greatest morbidity/mortality involve high forces (**MVC, ped-x, fall from height**)
- **3-20% mortality**: hemorrhage, multi-organ, PE
- **PE**: hemorrhage, marrow, pain, immobility
- **Long-term**: GI, GU, Gyn, infections, pain
- **Ob**: infertility, abortion, obligatory C-Section  
Sexual dysfunction, chronic pain

# 'HIP' FRACTURES AKA PROXIMAL FEMUR FRACTURES



## UBIQUITOUS MISUSE

'HIP' =S PROX. FEMUR +  
ACETABULUM

'HIP FX' =S PROXIMAL  
FEMORAL NECK  
FRACTURES

PROX. FEMUR: 14% ALL FXS

BUT

>50% ALL FX COSTS

USA

# FEMORAL NECK FRACTURES

- 250,000/yr in US → \$10 billion
- Most relate to falls esp. elderly
- Assoc' d with osteoporosis (WF), anything increasing risk of fall: afib, hypoglycemia, seizures, neurologic deficit, diabetic neuropathy, slowed response time, decreased balance, deconditioning, diminished vision, ...

# PROXIMAL FEMUR FXS ( 'HIP' )

By 80 YO: 10% Female, 5 % Male

By 90 YO: 1/3 F, 1/6 M

## MORTALITY (DEATH):

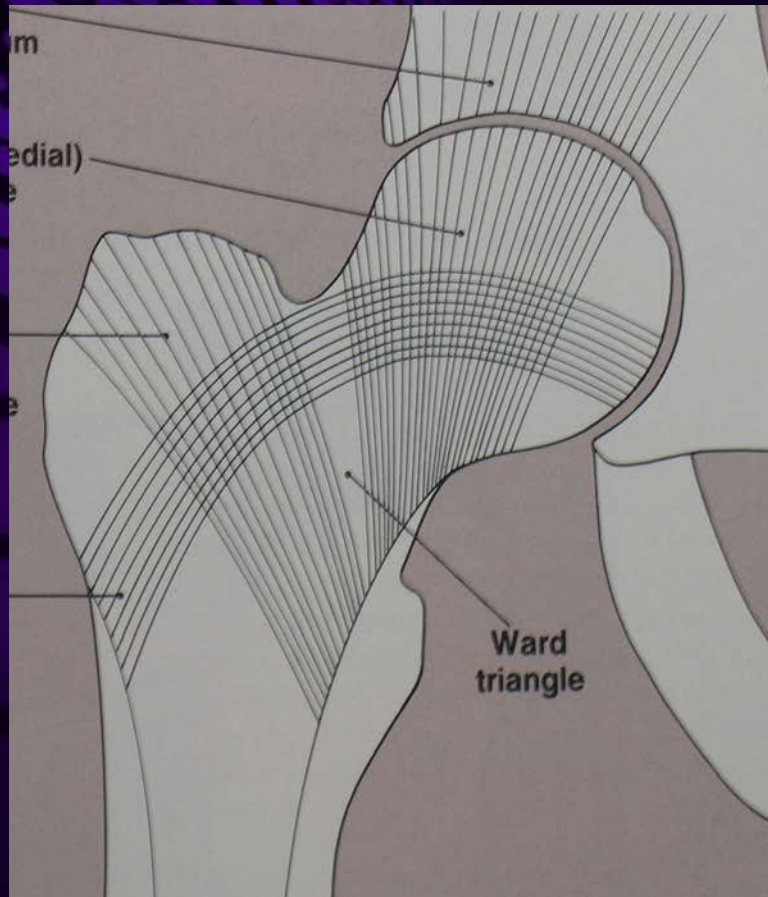
up to 20% FIRST YEAR

33% BY YEAR 2

50% BY YEAR 3

**HIGHEST RISK:** VERY OLDEST,IMMOBILE,  
INSTITUTIONALIZED, OTHER PROBLEMS (SEIZURE,  
ARRYTHMIA),DEMENTIA

# WEIGHT-BEARING TRABECULAE



Greenspan, A. Orthopedic Imaging, 3<sup>rd</sup> Ed.

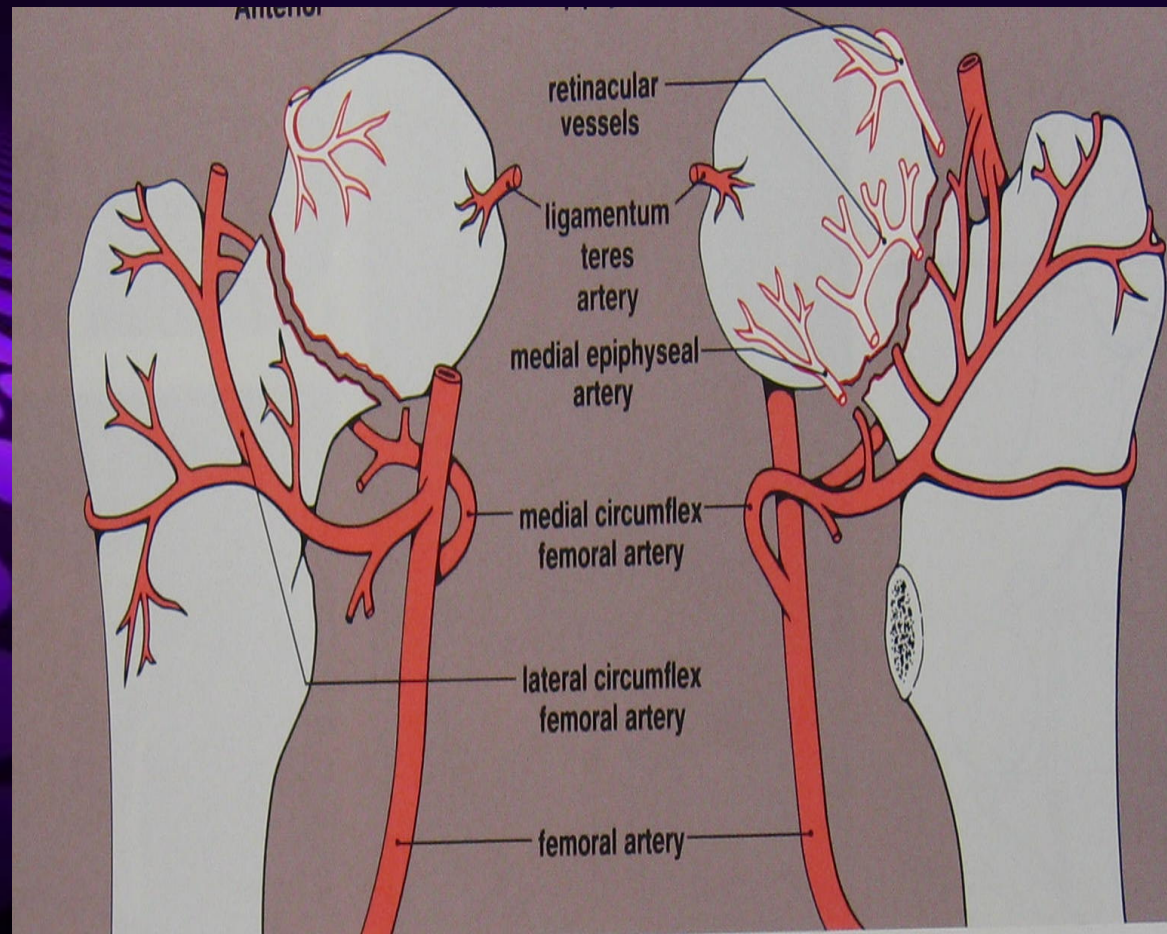
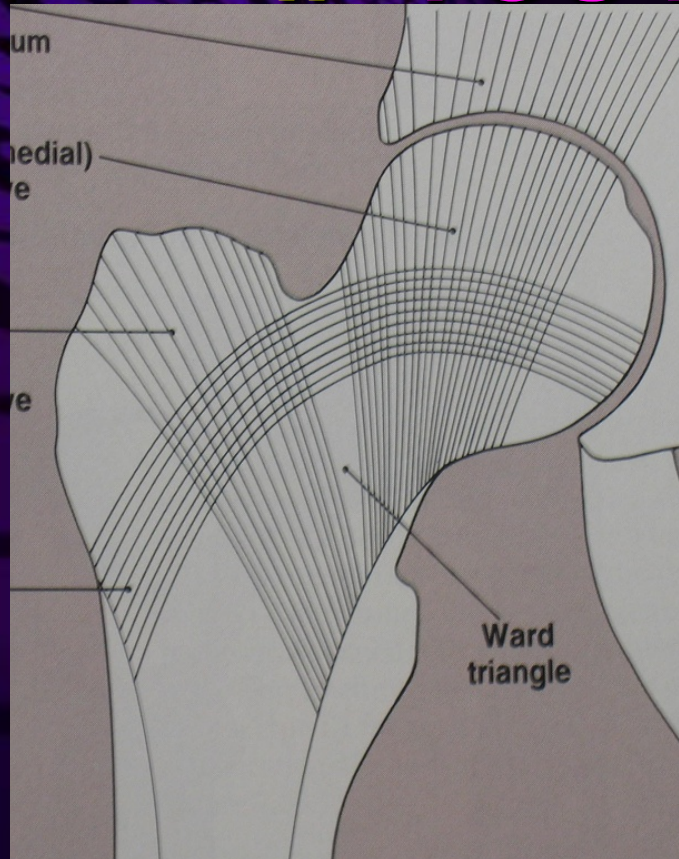
# BIOMECHANICS IS DESTINY

- **“PEANUT SHAPED”** bones fracture through the waist when flexed
- **FEMORAL NECK** is biconcave or ‘peanut shaped’
- **DOUBLE WHAMMY:** retrograde blood supply





# DIAGNOSIS AND TREATMENT- **IF** YOU KNOW ANATOMY!



Greenspan, A. Orthopedic Imaging  
3rd Ed.

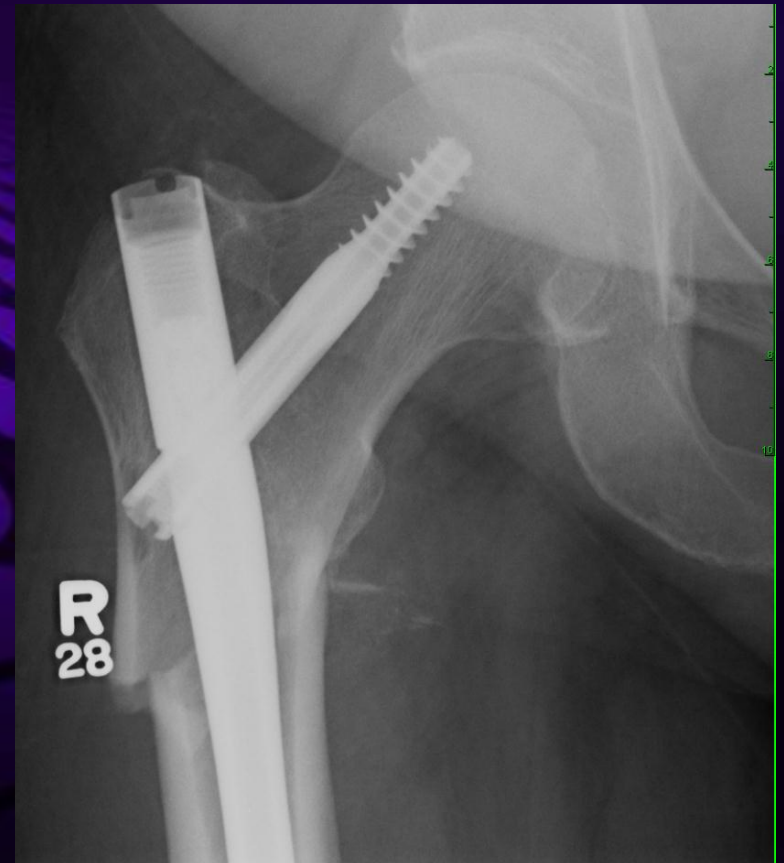
# PROGNOSIS and TREATMENT



# BLOOD SUPPLY → SURGERY



# VASCULARITY DICTATES HEALING POTENTIAL

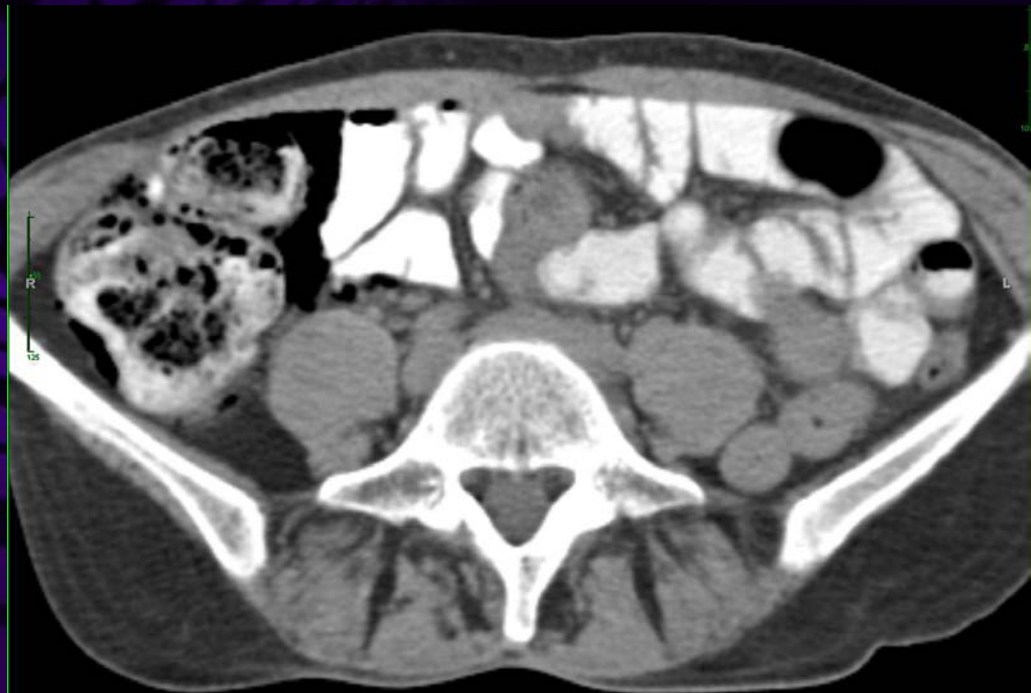


# VASCULARITY IS DESTINY



**FX. HEALING:** NON-WEIGHT-BEARING →  
PARTIAL WB<sub>g</sub> → (GRADUAL) FULL USE

- **IMMOBILIZED PT (STROKE, POLYTRAUMA):**  
PHYSICAL THERAPY SIMULATES NORMAL  
USE: 'REMIND' MUSCLE, BONE OF END-  
GOAL; GUIDE NEW BONE FORMATION,  
HEALING, REMODELLING
- **DISUSE, NON WB<sub>g</sub>** LEAD TO BONE  
LOSS (REVERSES W' S LAW)







# RADIOLOGY is the SUN!!



[www.TeamRads.com](http://www.TeamRads.com) from Google, Firefox, Armstrong ...  
keep comments coming!!

**THANK YOU!**

**COMING SOON TO AN ANATOMY CLASS NEAR YOU:**

**Urogenital (UG) Thurs. 9/8**

**Lower Extremity (LE) Tues. 9/13**



# CASES

- What was mechanism of injury? Where was pt. sitting? What are vectors of disruption?
- What other organs were in path of destruction?
- What are the emergent, urgent, and eventual considerations/risks?

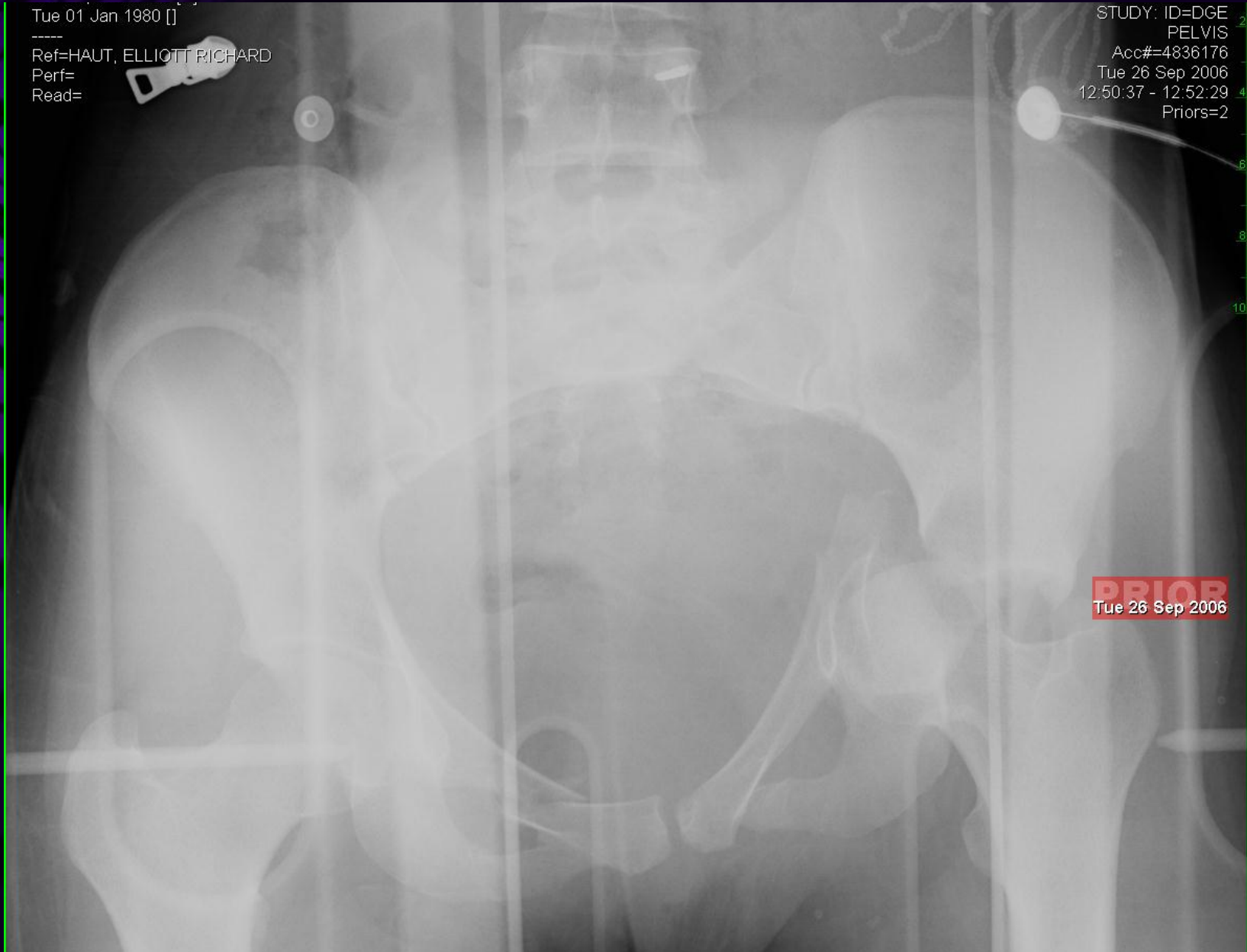


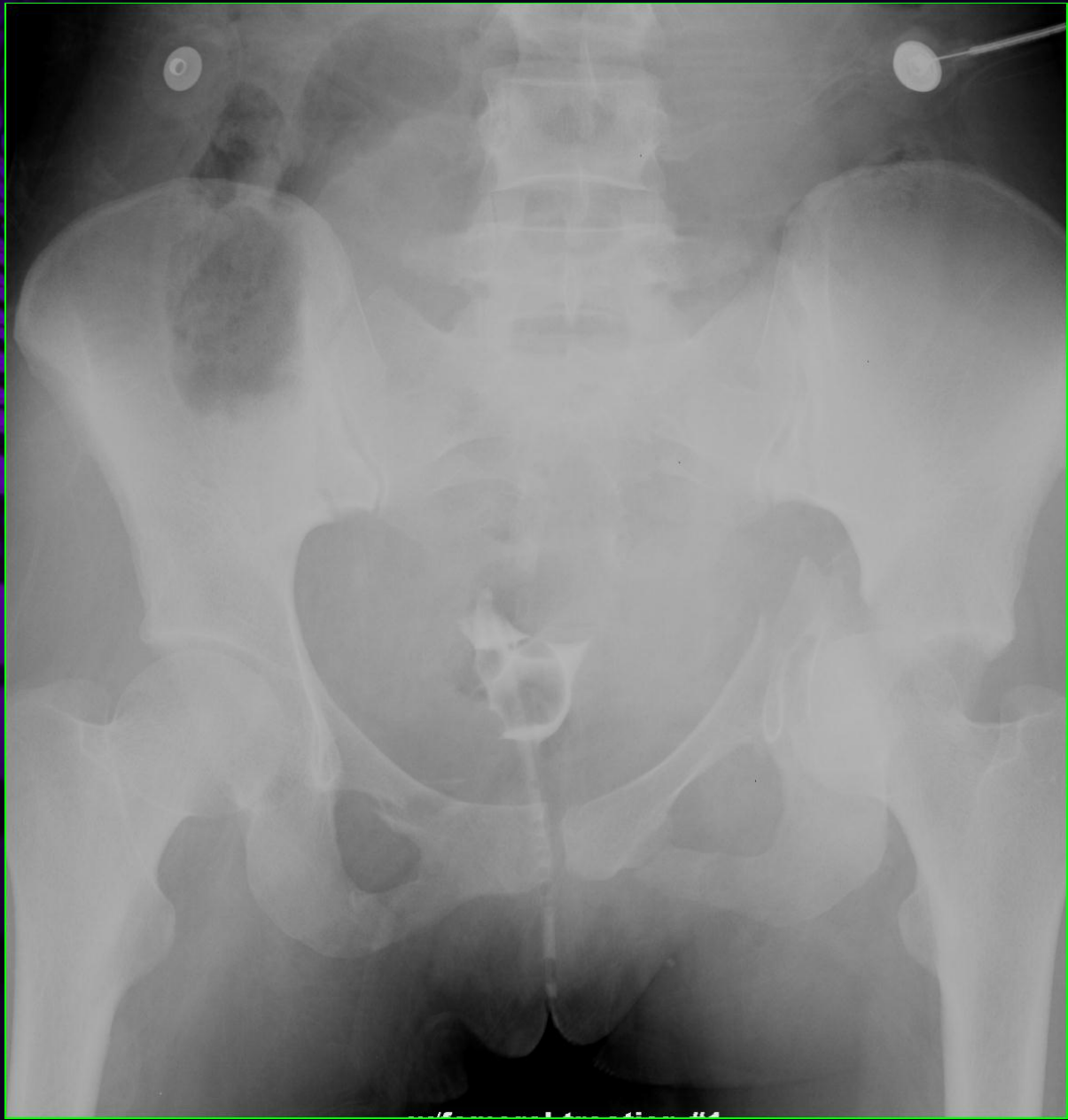
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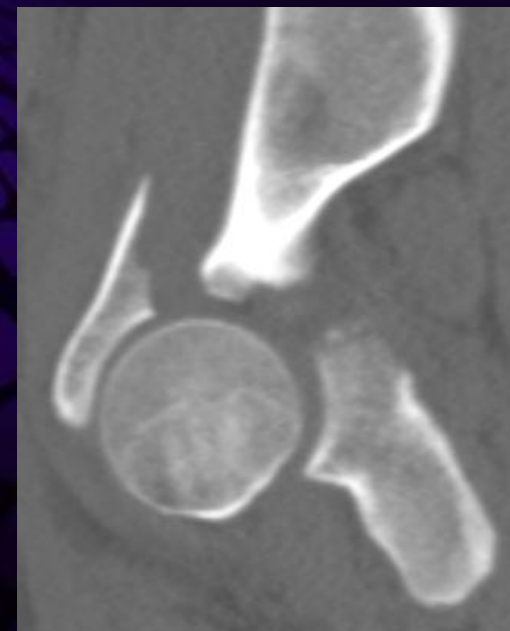
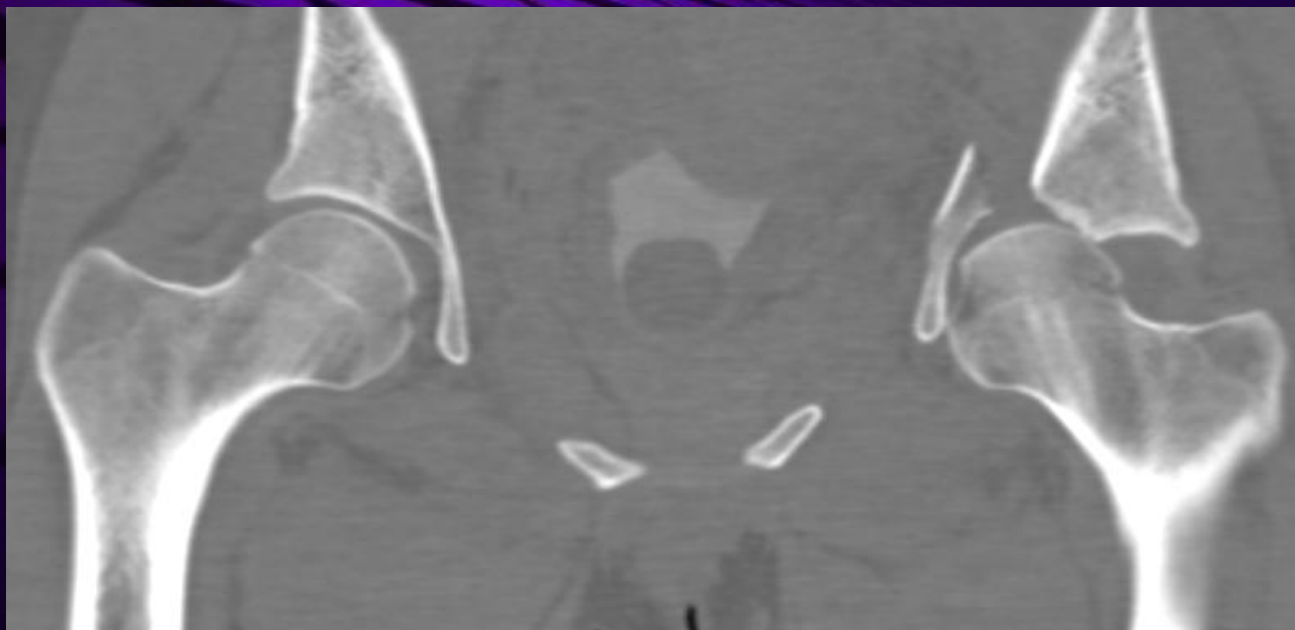
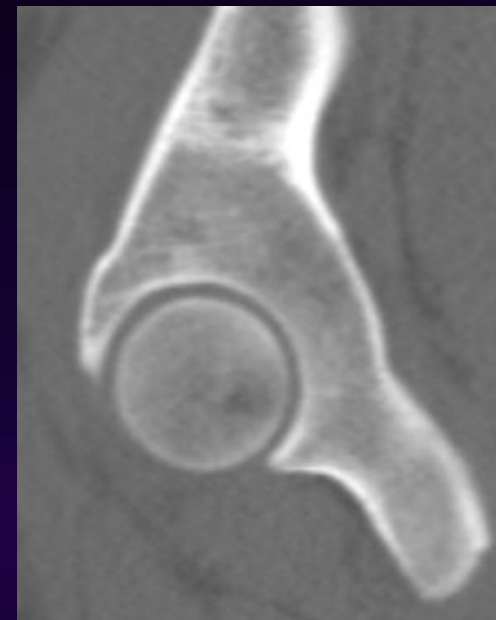
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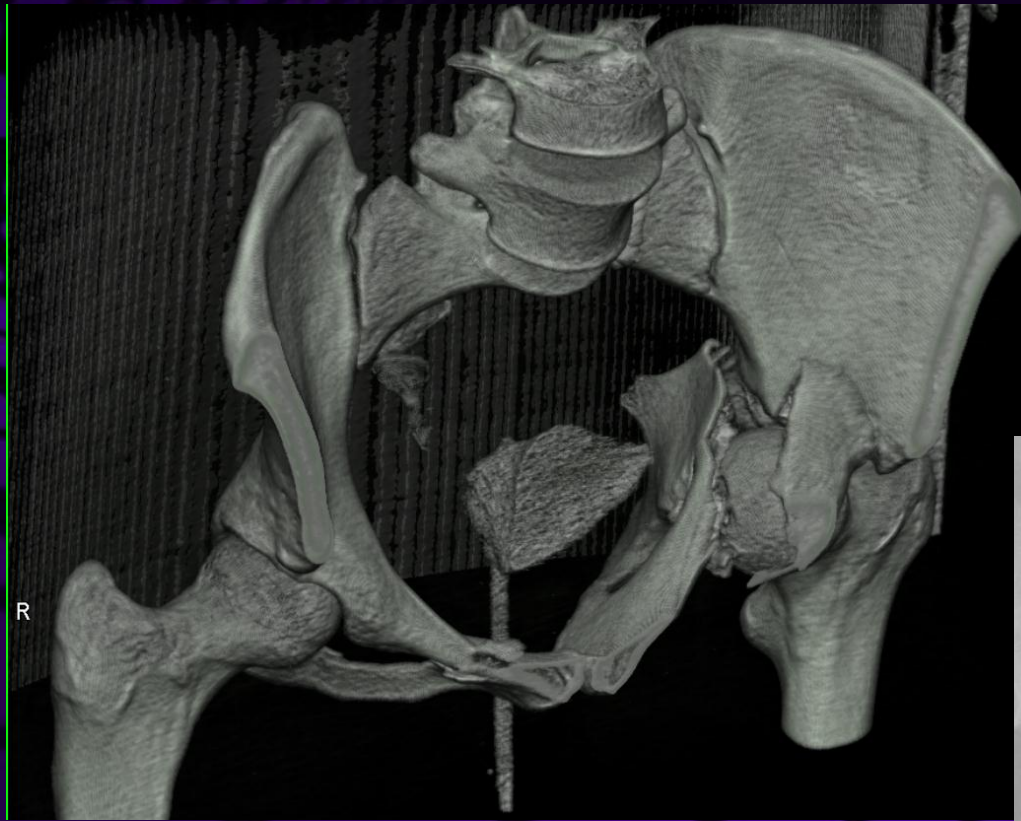
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**PRIOR**  
Tue 26 Sep 2006











# WHICH MAY HEAL FASTER?





**PRIOR**  
Medical



