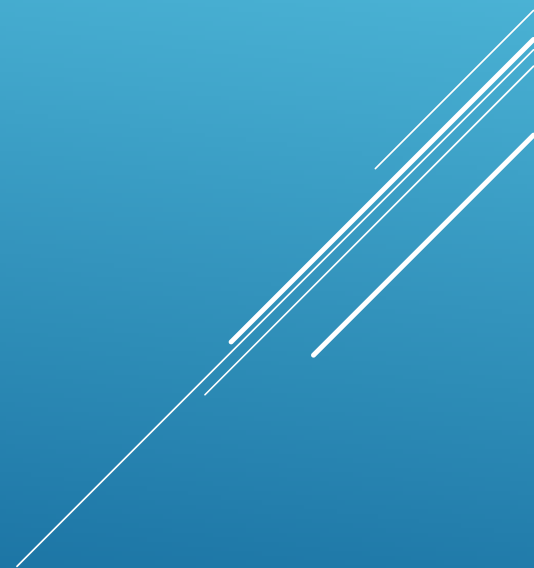


UNSTABLE PELVIC INJURIES A LIFE OR DEATH EMERGENCY WITH A CASE PRESENTATION

Timothy S. Arnett BS, NREMT-P

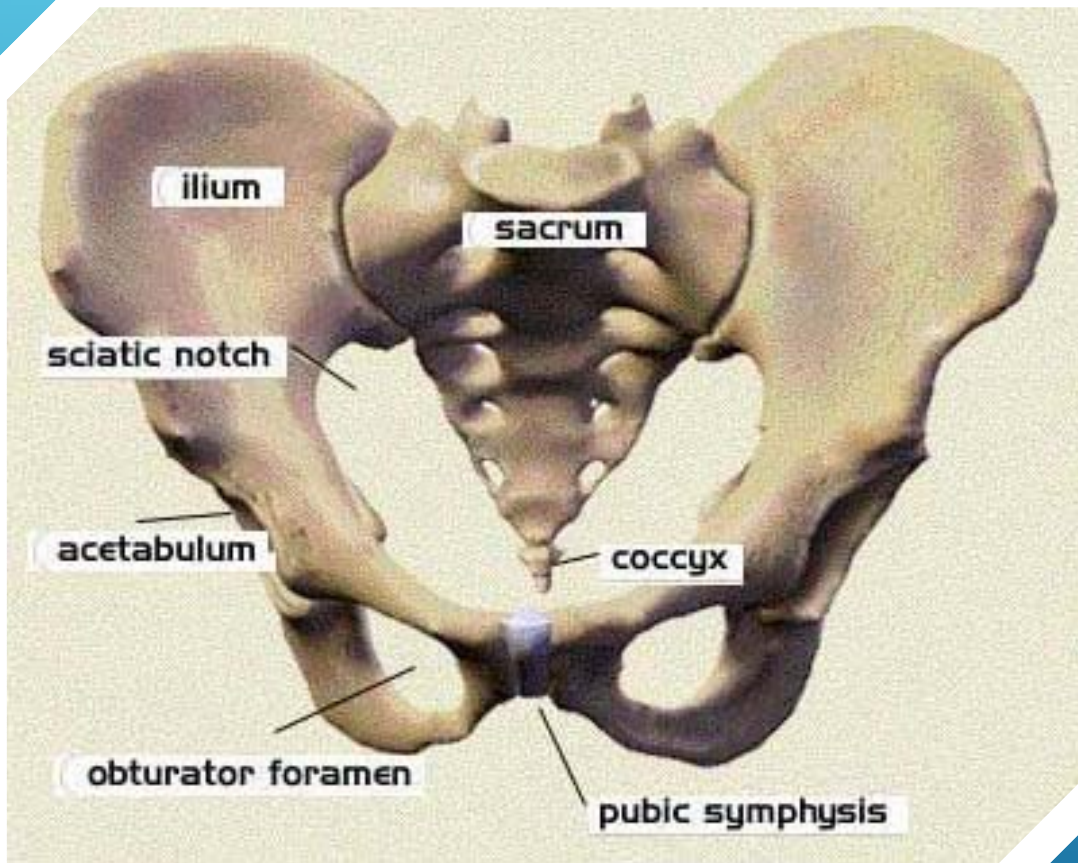
Captain, Anne Arundel County Fire Department

Mechanism of Injury

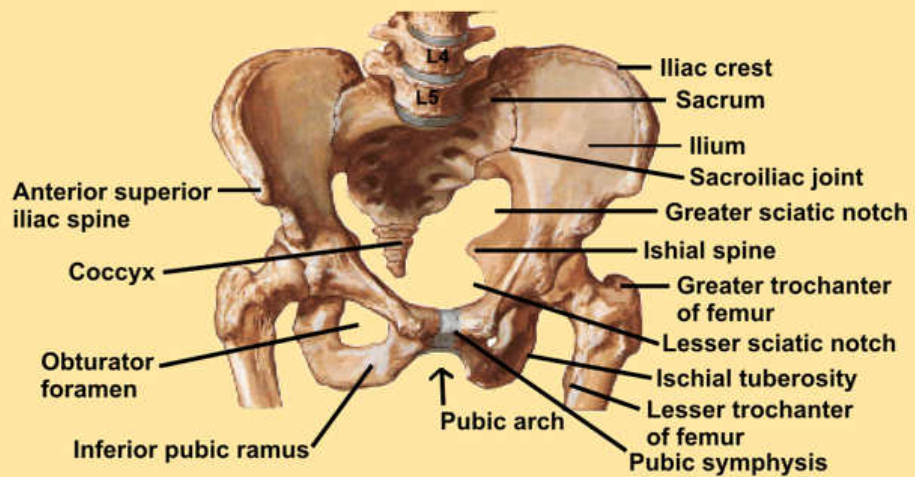


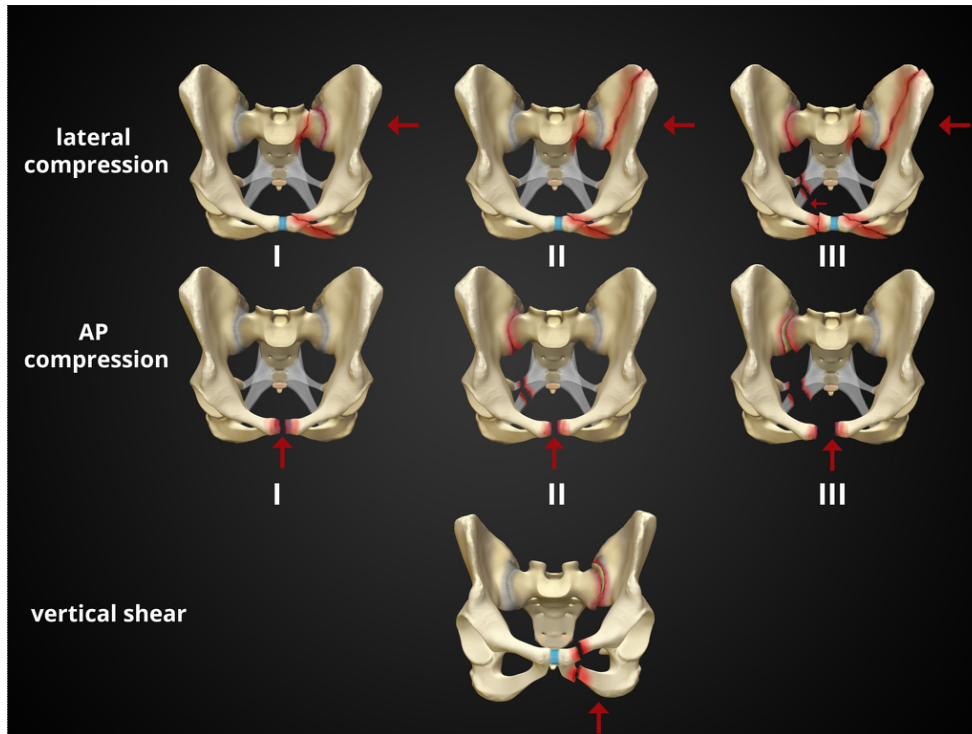
- Review anatomy of the pelvis and the vessels that pass through it
- Identify the different types of pelvic fractures and how they are caused.
- Discuss the traumatic nature of pelvic injuries and why they are a life or death emergency.
- Discuss the pelvic binder and it's proper placement
- Identify the treatment of pelvic injuries both pre-hospital and at the trauma center.
- Katelyn Morrison case study

OBJECTIVES



The Sacrum & Pelvis





TYPES OF PELVIC FRACTURES

▶ **RED** arrow shows the direction of force applied.

▶ Lateral compression fractures are most likely seen in falls and vehicle crashes

▶ AP compression fractures are more likely to be motorcycle, ATV, bikes crashes or vehicle crashes where the force is from a specific object

▶ Vertical shear fractures are most likely the result of severe impact to one leg or another. This could come from falls where they land on their feet or crashes where the patient had their feet and legs elevated

H

RES/CROP/SHADE/SURF



Sacral Fracture

R

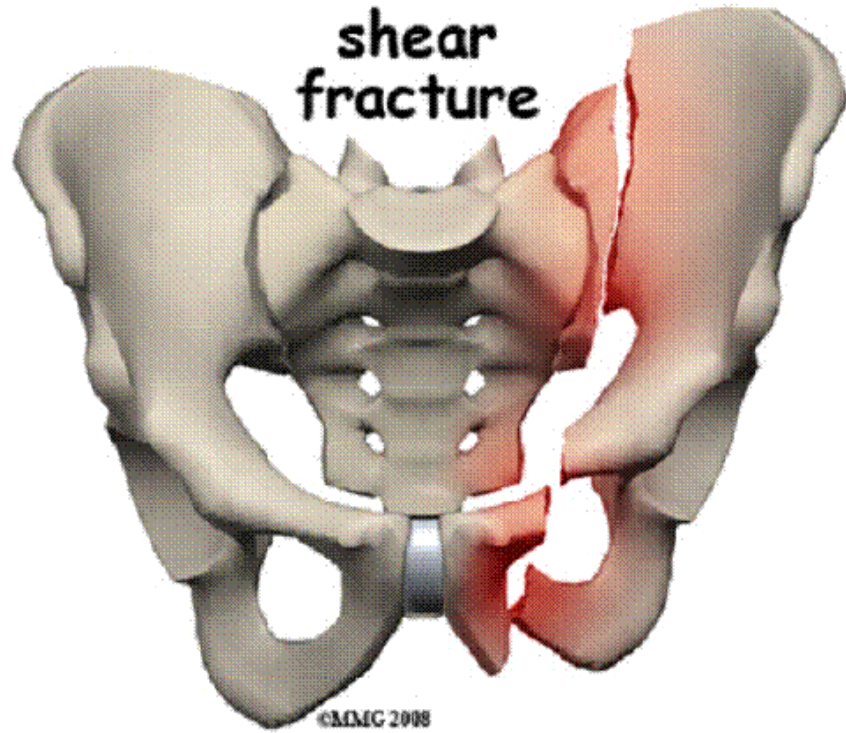
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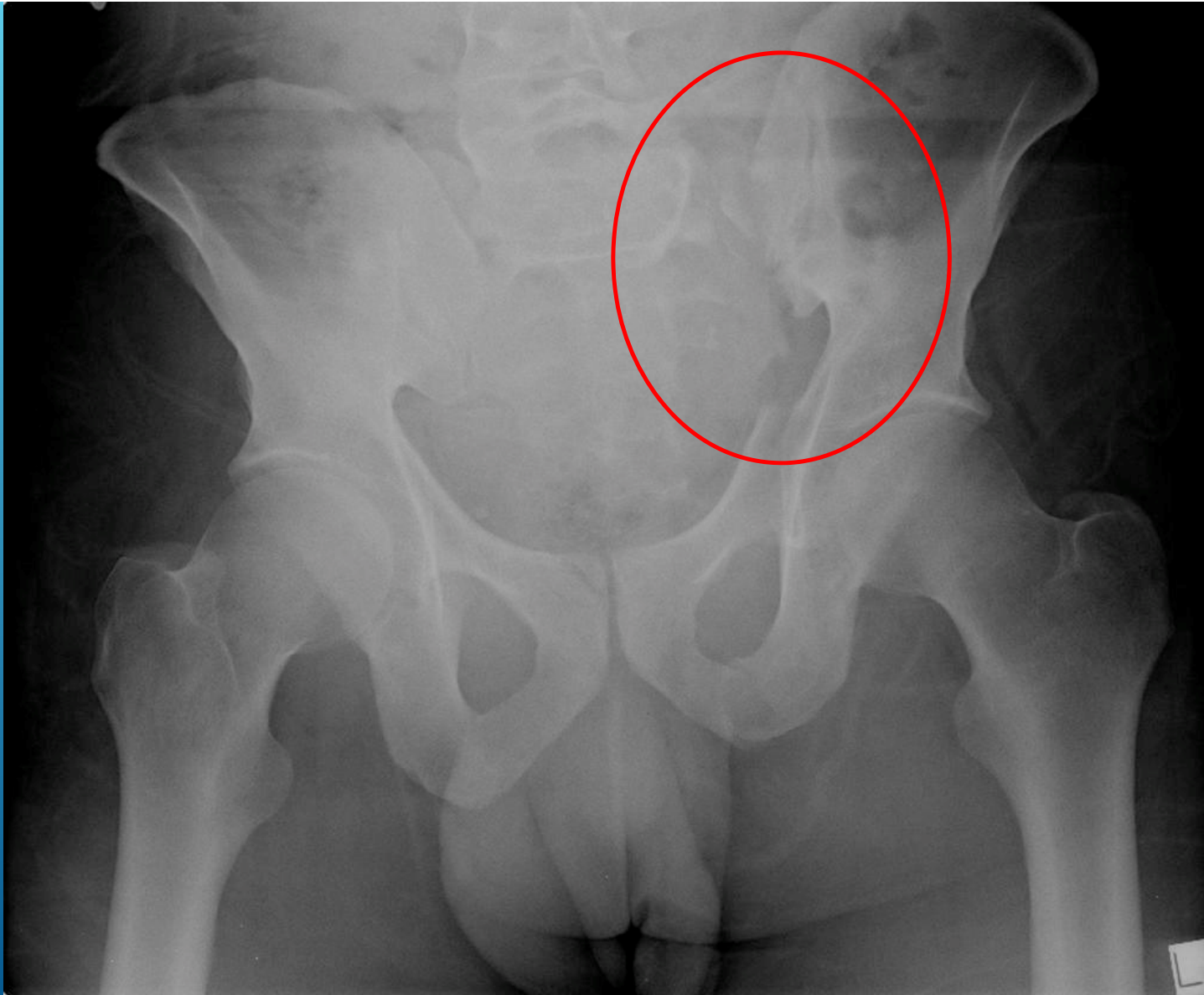
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F

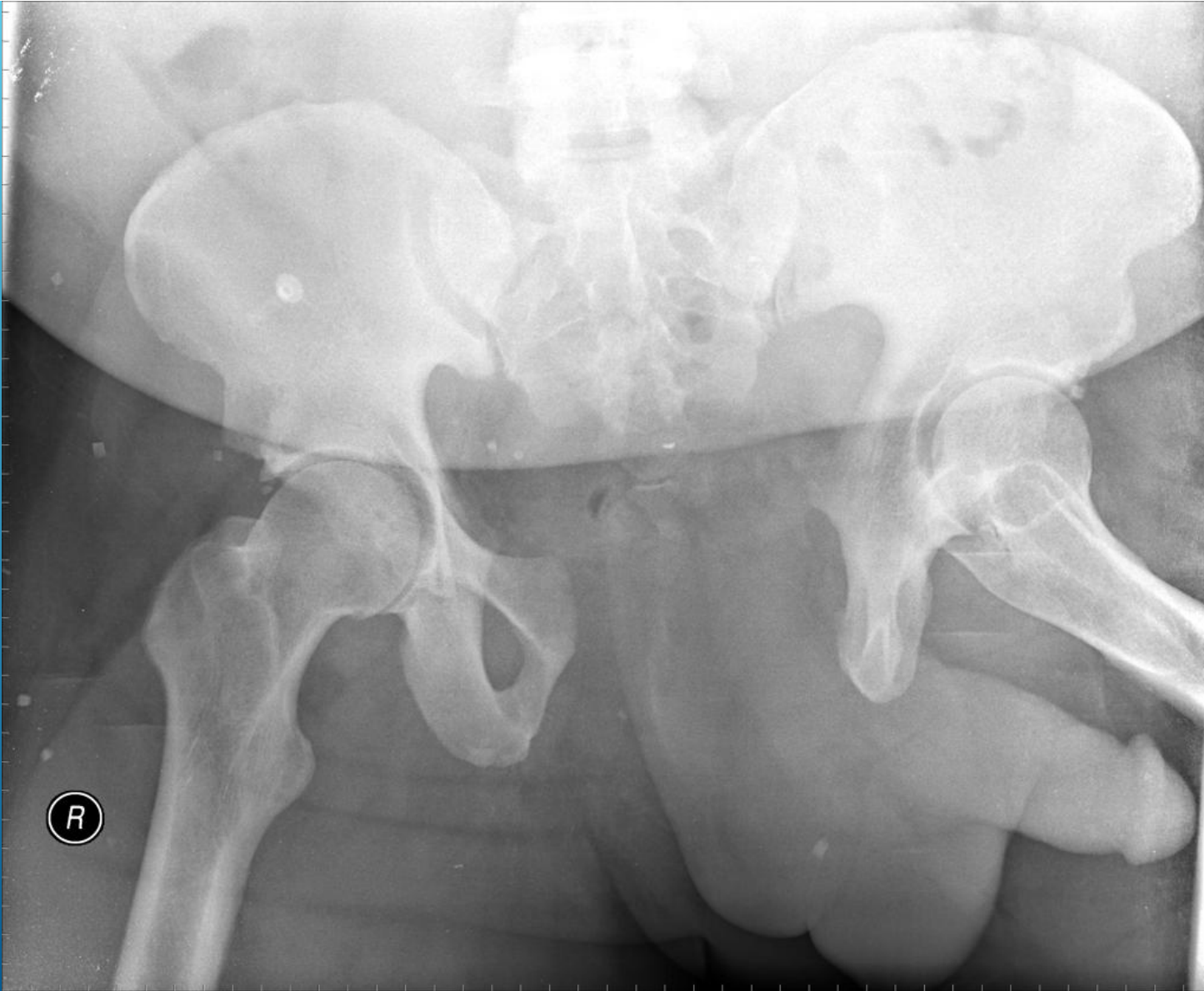
Vertical shear fracture



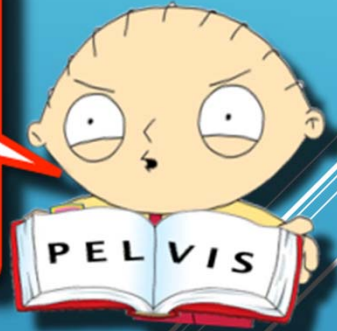
©MMG 2008



Malgaigne fracture is an unstable type of pelvic fracture, which involves one hemipelvis, and results from vertical shear energy vectors.



I See
Your
Pelvis
is Like
an
Open
Book!

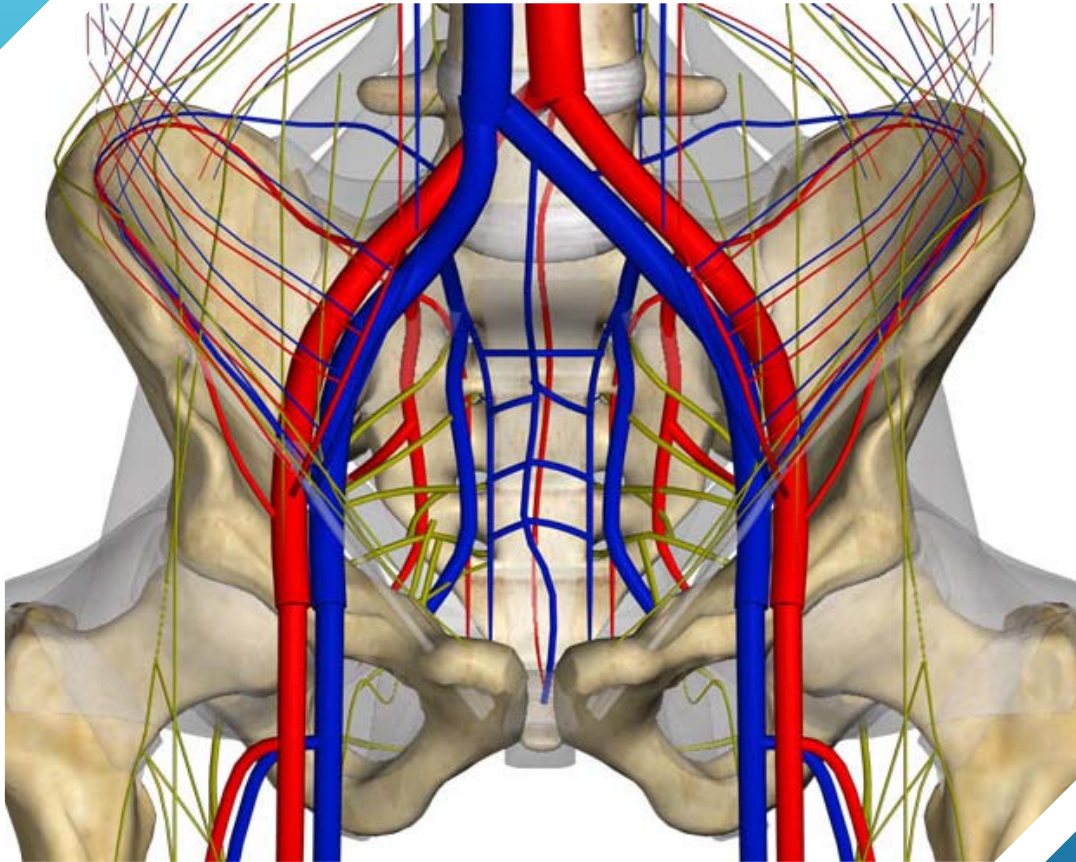


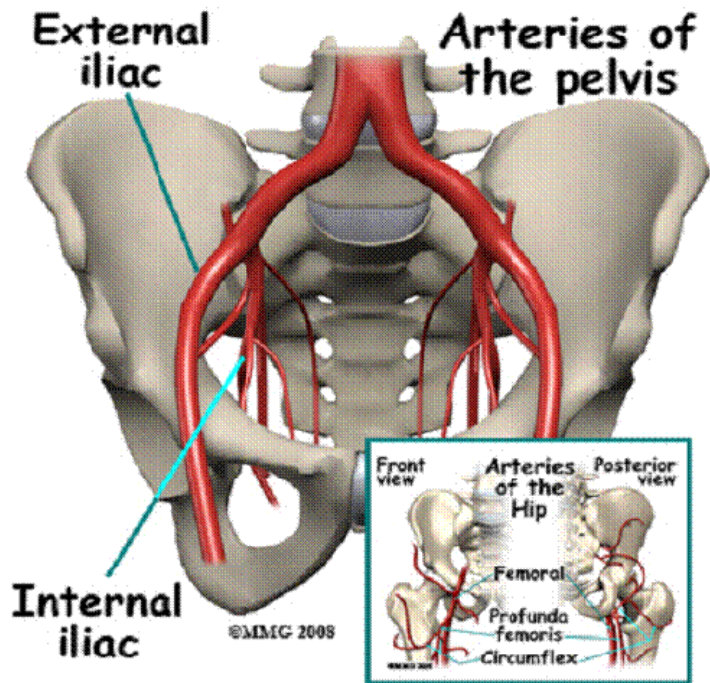
- Organs near pelvis
 - Parts of digestive system
 - Reproductive organs
 - Bladder and urethra
- Blood Vessels run through and around
 - Right and left iliac arteries from off aorta
 - Right and left iliac veins returning from legs
 - Blood vessels supplying pelvis and tissues around pelvis

ANATOMY AROUND PELVIS

VASCULATURE AND NERVES

- ▶ Many arteries and veins both pass through as well as feed the pelvic area.
- ▶ Many nerves coming from the spinal cord pass through as well as terminating in the pelvic area.
- ▶ Most of these vessels and nerves sit in areas where fractures are most commonly seen.





- ▶ Arteries bleed extensively and are hard to tamponade
- ▶ Surgery is the definitive care for these patients
- ▶ Most pelvic areas will hold the majority if not all of the patient's blood volume.

ARTERIES AND FRACTURES

- ▶ Shock is a medical emergency in which the organs and tissues of the body are not receiving an adequate flow of blood. This deprives the organs and tissues of oxygen (carried in the blood) and allows the buildup of waste products. Shock can result in serious damage or even death.

PELVIC TRAUMA AND SHOCK

Signs of Shock

Fracture	Blood Loss (mL)
Single rib	125
Radius or ulna	250–500
Humerus	750
Tibia or fibula	500–1000
Femur	1000–2000
Pelvis	Massive

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Slide 3

PELVIC TRAUMA AND SHOCK

- ▶ The definitive care for patients with pelvic trauma involving one or more arteries is the operating room
- ▶ Pelvic binders simply tamponade the bleeding in an effort to help the patient survive the trip to the operating room.

Assessment of Stages of Shock

% Blood Volume Loss	< 15%	15 – 30%	30 – 40%	>40%
HR	<100	>100	>120	>140
SBP	Normal	Normal to slight drop, orthostatic	↓	↓
Pulse Pressure	Normal or ↑	↓	↓	↓
Cap Refill	< 3 sec.	> 3 sec.	> 3 sec. or absent	Absent
Resp	14 - 20	20 - 30	30 - 40	>35
CNS	Anxious	Very Anxious	Confused	Lethargic
Treatment	1-2 Liters Crystalloid and Maintenance	2 Liters Crystalloid, Re-evaluate	2 Liters Crystalloid, Re-evaluate, replace blood loss 1:3 crystalloid, 1:1 colloid or blood products.	

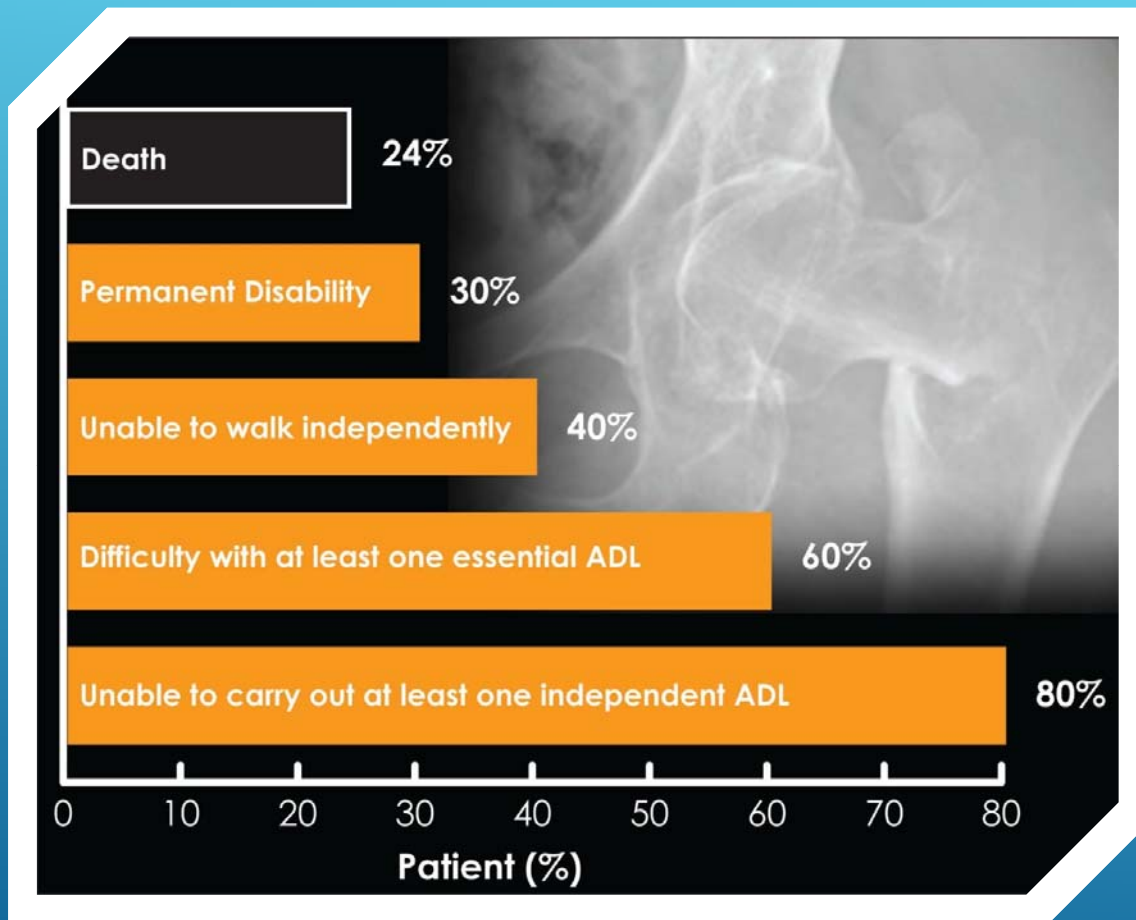
▶ **Most common mechanism of pelvic fractures:**

- ▶ MVC 58%
- ▶ Falls 30%
- ▶ Pedestrian struck by vehicle 22%

▶ **Associated injuries with pelvic trauma:**

- ▶ Venous hemorrhage 38%
- ▶ Visceral injury 17%
- ▶ Nerve deficits 15%
- ▶ Bladder/Urethra injury 6%
- ▶ Thoracic aorta rupture 1%

STATISTICS ON PELVIC TRAUMA



MORBIDITY AND MORTALITY ASSOCIATED WITH PELVIC TRAUMA

- ▶ Pelvic fractures represent approximately 3% of skeletal injuries
- ▶ Overall mortality of pelvic fractures ranges from 5%-16%
 - ▶ Acetabular fractures 3%
- ▶ **Unstable** pelvic fractures have a rate of approximately 8%
 - ▶ Open pelvic fractures are associated with a rate of up to **45%**
 - ▶ These comprise of 2%-4% of all pelvic fractures
 - ▶ Most fatalities stem from associated internal injuries

- ▶ **ABC's & initial stabilization** (IV access, crystalloid, blood products)
- ▶ Application of **Pelvic Sheet/Binder/External fixator** (open-book with intact posterior ligaments has most potential for benefit)
- ▶ **Adjuncts:** Foley (but not if blood at meatus)
- ▶ **FAST** to assess for intraperitoneal injury (and help with disposition – laparotomy vs. angio)
- ▶ **AP pelvis**
- ▶ ABX (Ancef) and Tetanus if open.

PELVIC FRACTURE MANAGEMENT OF THE UNSTABLE PATIENT



STABILIZATION

- **Pelvic Binder**
 - Commercial device that can be used for prehospital and emergent stabilization of pelvic fractures.
 - In APC (“open-book”) fractures, use of a pelvic binder will close the ring and tamponade *venous bleeding*.
 - An **improvised binder** can be made using a sheet to provide circumferential compression around the pelvis.
- **Skeletal Traction** – May be used to correct vertical displacement of the hemi-pelvis.

SAMPelvic Sling™ II



STABILIZATION

- ▶ One of the commercial devices being widely used in MD.
- ▶ Comes in 3 sizes
 - ▶ Small: 27"-47"
 - ▶ Standard: 32"-50"
 - ▶ Large: 36"-60"
- ▶ Standard size fits 98% population
- ▶ **Radiolucent (allows for x-rays without removal)**
- ▶ Reusable

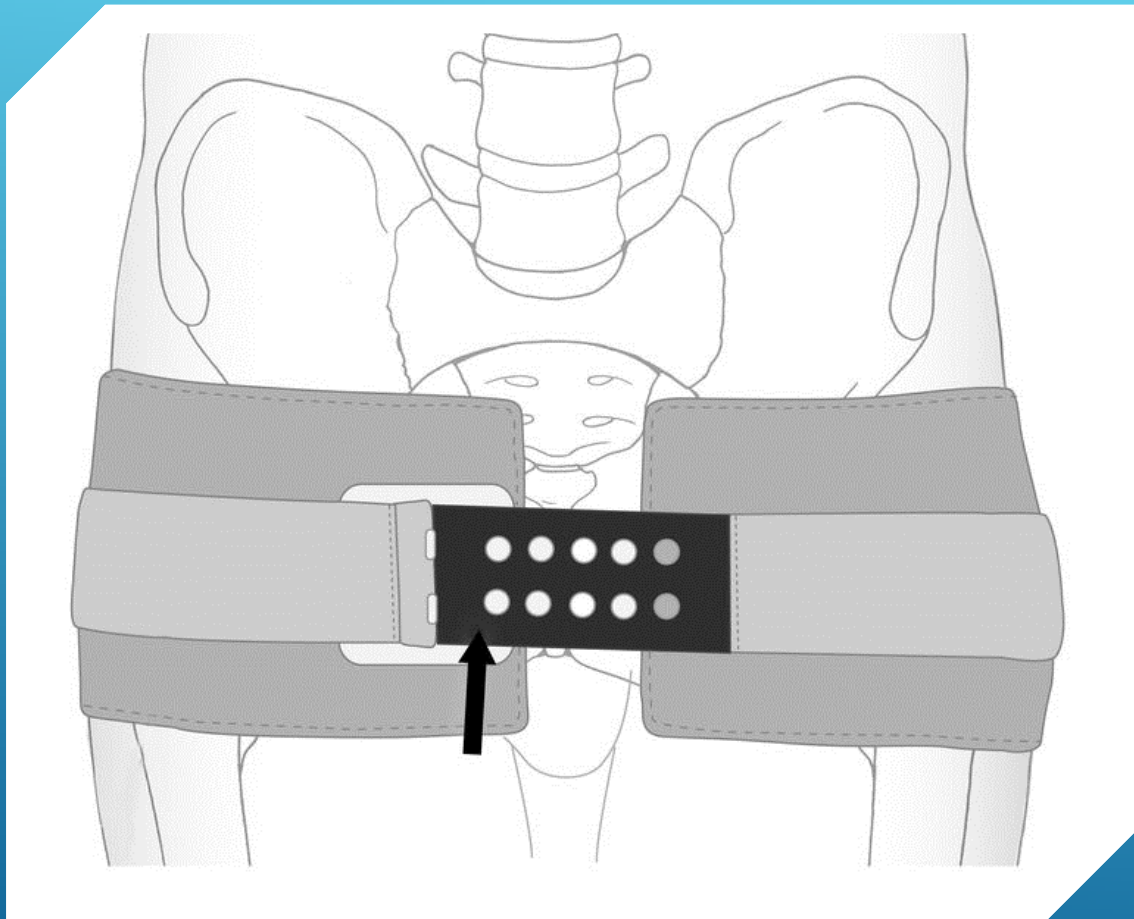
- ▶ In 2002 The Journal of Orthopedic Trauma, Vol. 16 No.6, pp 367-373 published a study- **Noninvasive Reduction of Open-Book Pelvic Fractures by Circumferential Compression.**
- ▶ The objective was to determine the efficacy and optimal application parameters of circumferential compression to reduce external rotation-type pelvic fractures.
- ▶ Used cadavers as subjects
- ▶ The conclusion was significant;
 - ▶ Application of circumferential compression to the pelvic soft tissue envelope with a pelvic strap was an efficient means to achieve controlled reduction of external rotation-type pelvic fractures. This study derived application parameters with direct clinical implication for noninvasive emergent management of traumatic pelvic ring disruptions.

STABILIZATION USING THE PELVIC BINDER

▶ Still a pilot program.

▶ http://www.miemss.org/home/Portals/0/Docs/EMS_News/Protocols-2016-FULL-V3Web.pdf?ver=2016-06-20-140649-900

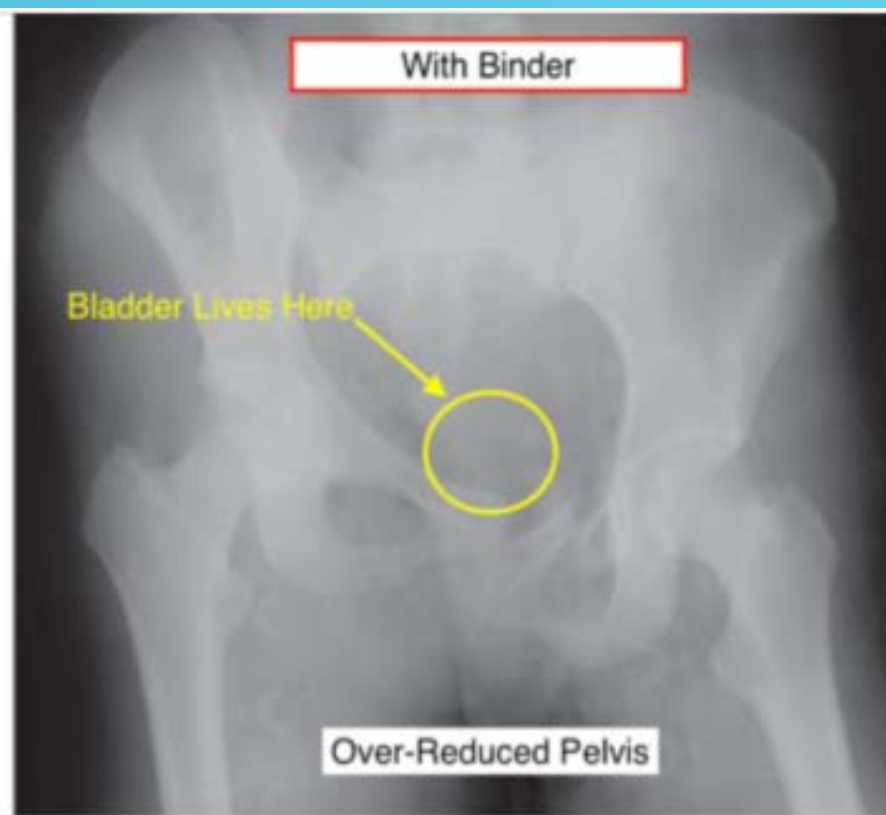
MARYLAND PROTOCOL



PELVIC BINDER PLACEMENT

- ▶ Should be centered at the level of the greater trochanter
- ▶ This also the lower 1/3 of the pelvis.
- ▶ Patient needs to be in a supine position
- ▶ The binder can be placed on a backboard prior to placing the patient on the board to reduce movement and disruption of the pelvic fracture.
- ▶ The binder should be tightened to manufacturer's instructions for that specific device.
- ▶ Once the device is placed it is not to be removed until directed to do so by the physician.

Incorrect Placement



CASE STUDY:

KATELYN MORRISON 18 YOF

Motorcycle Crash August 14, 2015

Ritchie Highway/ Cedar Hill Lane

Glen Burnie, MD

- ▶ Katelyn was the rear passenger on a motorcycle driven by her boyfriend.
- ▶ Left the traffic light at the prior intersection at a high rate of speed (estimated by the boyfriend at between 80-90 mph)
- ▶ After cresting a hill there was a passenger vehicle stopped in the road to make a U-turn.

INCIDENT BACKGROUND



- ▶ Dispatched at 2137 hrs. for an MVC
- ▶ No initial or additional information that this involved a motorcycle while en-route.
- ▶ Even after arrival of 1st due units there was no update as to the seriousness of the crash or that it involved a motorcycle.

DISPATCH



ARRIVAL

- ▶ We arrived at 2144 hrs. (9 min after the 911 call)
- ▶ This was the 1st vehicle we saw, pulled into the entrance to a cemetery.
- ▶ As we got closer to the scene we were able to see a patient lying in the road being cared for by the 1st due paramedic unit.
- ▶ Quick scene survey and communication with the paramedics caring for the patient in the road.



MOTORCYCLE VS. CAR

- ▶ Left the previous red light at a high rate of speed.
- ▶ Estimated by the driver of the MC at 80-90 MPH
- ▶ Crested the hill and did not see the stopped vehicle in time.
- ▶ Struck the right rear of the vehicle ejecting both riders.

- ▶ The initial patient (male) was surrounded by a large amount of blood but was being cared for.
- ▶ We were told that there was a second patient further down the road being cared for by the 1st due engine company (BLS only).
- ▶ Due to the distance to the patient, I asked that the medic unit be moved closer.
- ▶ This distance was later estimated at greater than 150'
- ▶ Our patient was lying in the road also, with the BLS providers attempting to splint an open FX to the left forearm.
- ▶ Wide-eyed look by all providers on scene.

THE PATIENT

- ▶ Initial visual survey found an approx. 18 yo patient with multiple extremity fractures.
- ▶ Approach was from the feet of the patient and due to the position of both legs (90 degrees to pelvis) the appearance was that this was a male patient with injuries to his genital area.
- ▶ Initial patient contact found a responsive **female** patient in an extreme amount of pain with multiple critical injuries
- ▶ The most critical being an obvious pelvic injury as evidenced by the current position of both legs. There were no distal pulses in either leg.
- ▶ Her injuries required immediate intervention

THE PATIENT

- ▶ A set of vitals was obtained by the BLS providers as Fentanyl was being prepared for administration by my partner
- ▶ 50 mcg Fentanyl was given intra-nasally. This wasn't the optimum dose for the patient but time was critical but this was an immediate dose prior to relocation of her legs.
- ▶ A long board was placed next to the patient with a pelvic binder in place on the board.
- ▶ Both legs were grasped and pulled back to midline and down to a neutral position with pulses restored to both legs.
- ▶ The pelvic binder was placed due to the legs wanting to separate at the pelvis and the patient was moved to the board.

THE PATIENT

- ▶ The patient was loaded and a driver taken from the engine company in order for both providers to be with the patient.
- ▶ Shock Trauma was approx. 10-12 miles away.
- ▶ IO location was difficult due to fractures to almost all extremities
- ▶ Vitals at 5 min intervals
- ▶ BP dropping along with consciousness and respiratory effort
- ▶ LR hung running WO. Pressure bag on.
- ▶ O2 via NRB with BVM ready for use if needed
- ▶ HR increasing
- ▶ Expedited report via EMRC with expectations of patient being in possible cardiac arrest upon arrival.

THE PATIENT

- ▶ Turned over to Bed #1
- ▶ Second pelvic binder placed immediately by shock trauma over our binder.
- ▶ FAST exam and assessment
- ▶ And a whole lot more.....

ARRIVAL AT SHOCK TRAUMA

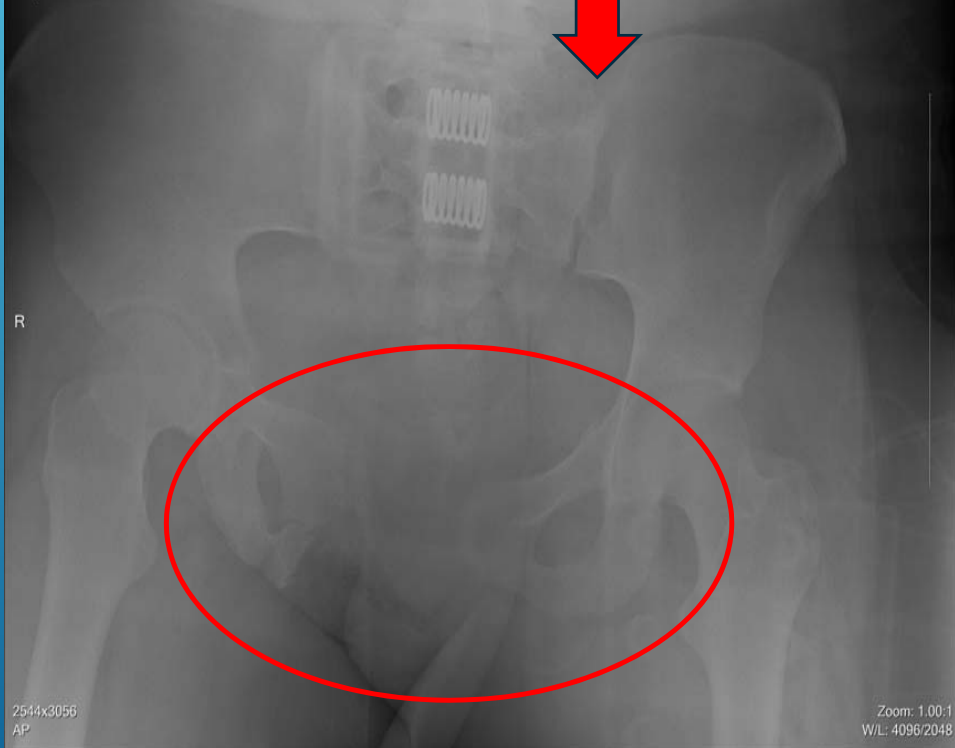
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MRN: 2262926
Acc #: 12820847
DOB: 19970205
Sex: F
Site: UNIVERSITY OF MARYLAND
Model: DRX-1
Body Part: PELVIS

H

Image: 1 of 1
Series: 2
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SUPINE



MORRISON, KATELYN JEAN
MRN: 2262926
Acc #: 12820848
DOB: 19970205
Sex: F
Site: UNIVERSITY OF MARYLAND
Model: DRX-1
Body Part: PELVIS

H

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SUPINE



MORRISON, KATELYN JEAN
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Sex: F

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Body Part: WRIST

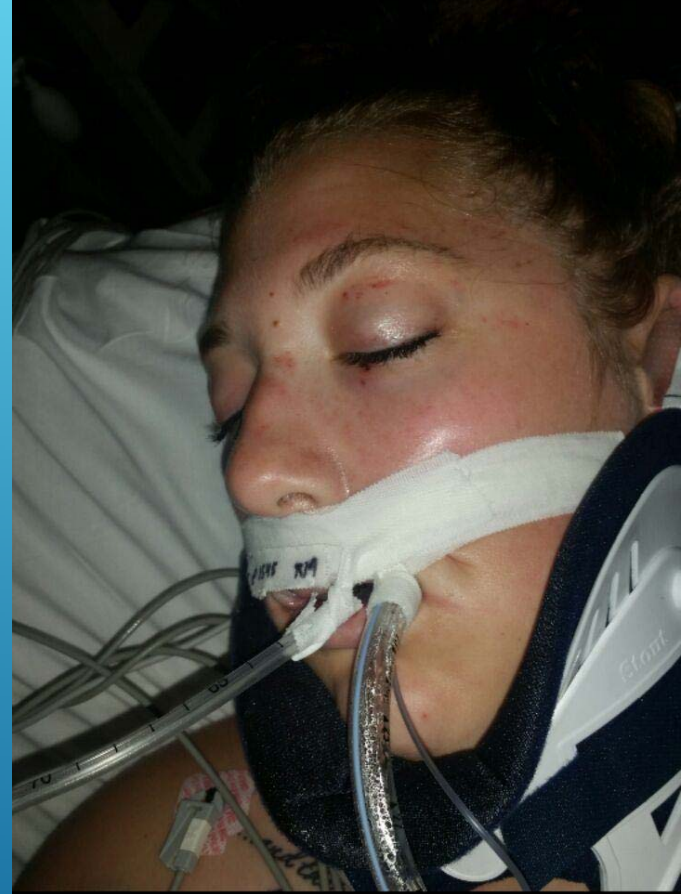
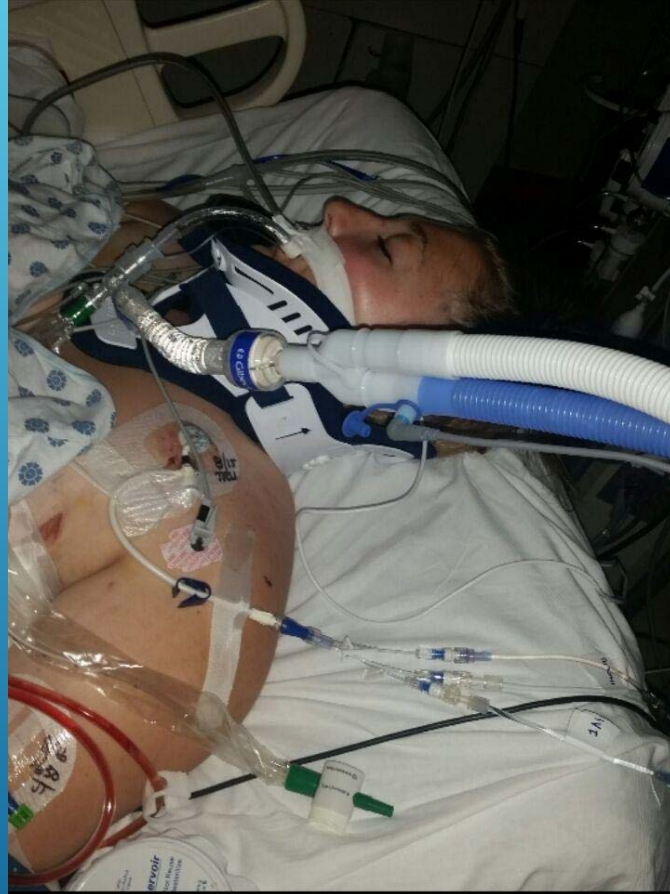
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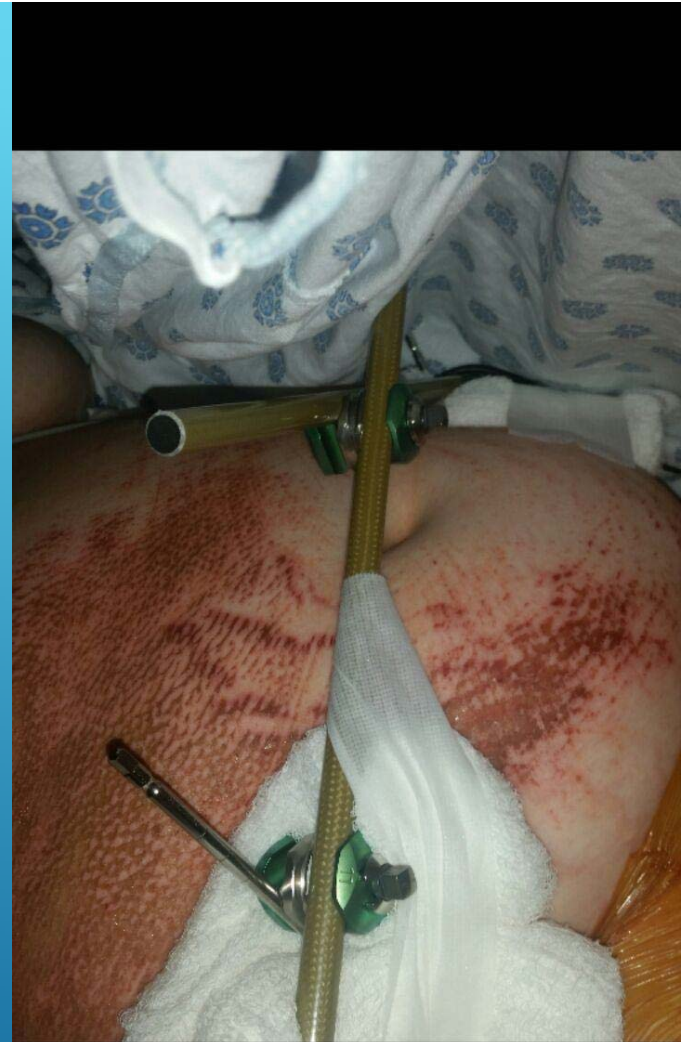
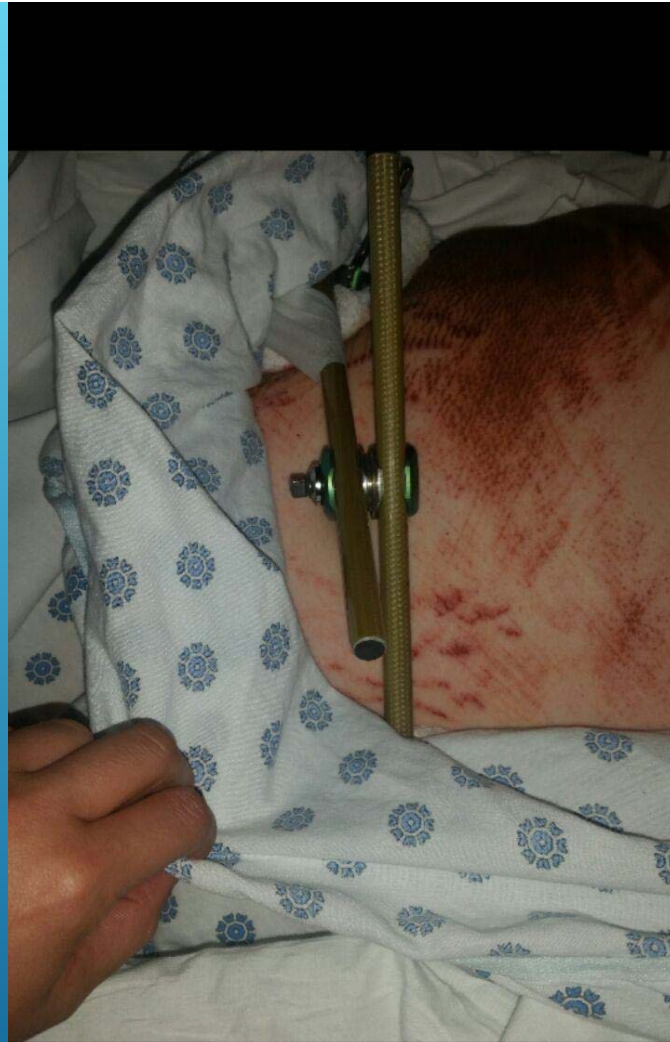
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LATERAL

Zoom: 1.00:1
W/L: 4096/2048



- ▶ **Chest:** Lateral fractures of the left ribs 3-9. Lateral fractures of the right ribs 4-6 without significant dislocation. Left pneumothorax. Contusions of the left upper lobe. Atelectasis in both lower lobes.
- ▶ **Pelvis:** Anterior-posterior compression type fracture of the pelvis with 5.5 cm dehiscence of the symphysis, bilateral dislocation pubic rami fractures and right SI joint dehiscence.
- ▶ **Thoracic Spine:** Fractures of T3, T10, T11 and burst fracture of T12 with ventral dislocated fragments of the anterior vertebral body and into the spinal canal.
- ▶ **Upper Ext:** Comminuted mid diaphyseal fractures of the radius and ulna on the left arm. Comminuted fracture of the distal radial metaphysis with shortening. A radially displaced fracture of the fifth metacarpal neck.
- ▶ **Lower Ext:** Posteriorly displaced fracture of the right lateral malleolus.

INJURIES AFTER INITIAL WORK-UP



MORRISON, KATELYN JEAN
MRN: 2262926
Acc #: 12829260
DOB: 19970205
Sex: F

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PORTABLE



20

R

3055:2544
TOWIE VIEW

Zoom: 1.00:1
W/L: 4096/2048

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MRN: 2262926
Acc #: 13324624
DOB: 19970205
Sex: F
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Model: DigitalDiagnost
Body Part: LSPINE
Exposure: 147

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AP

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Sex: F

F

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PA

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Exposure: 6

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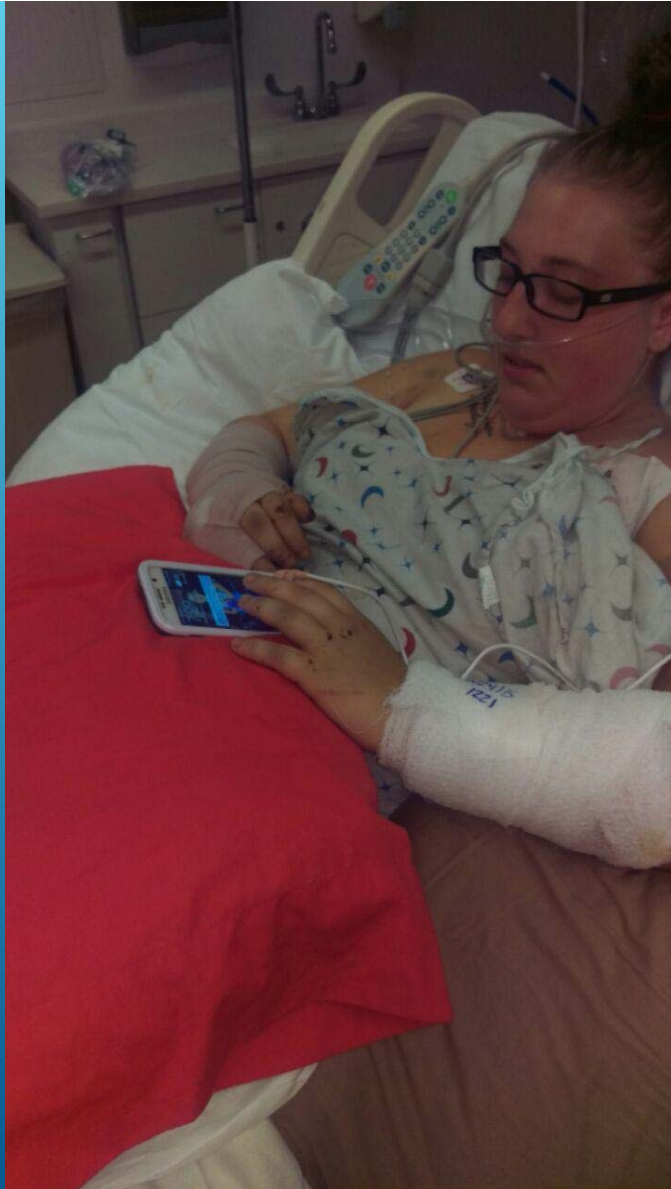
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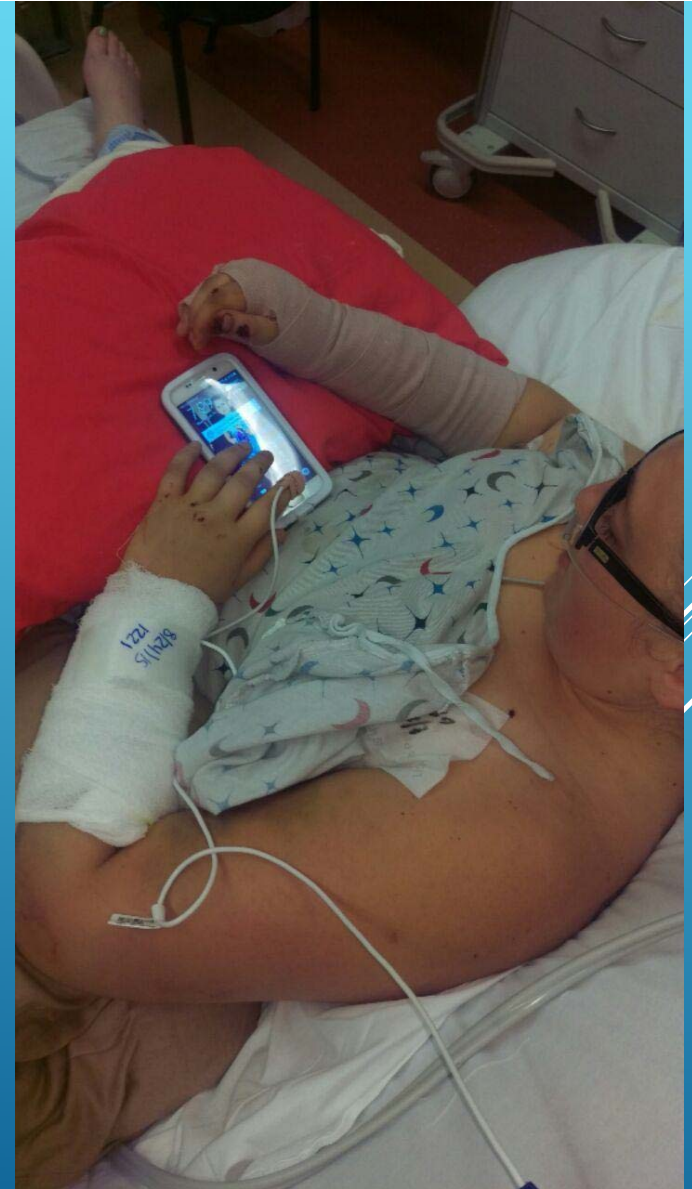
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Could this really be the same patient we expected to have a fatal outcome?



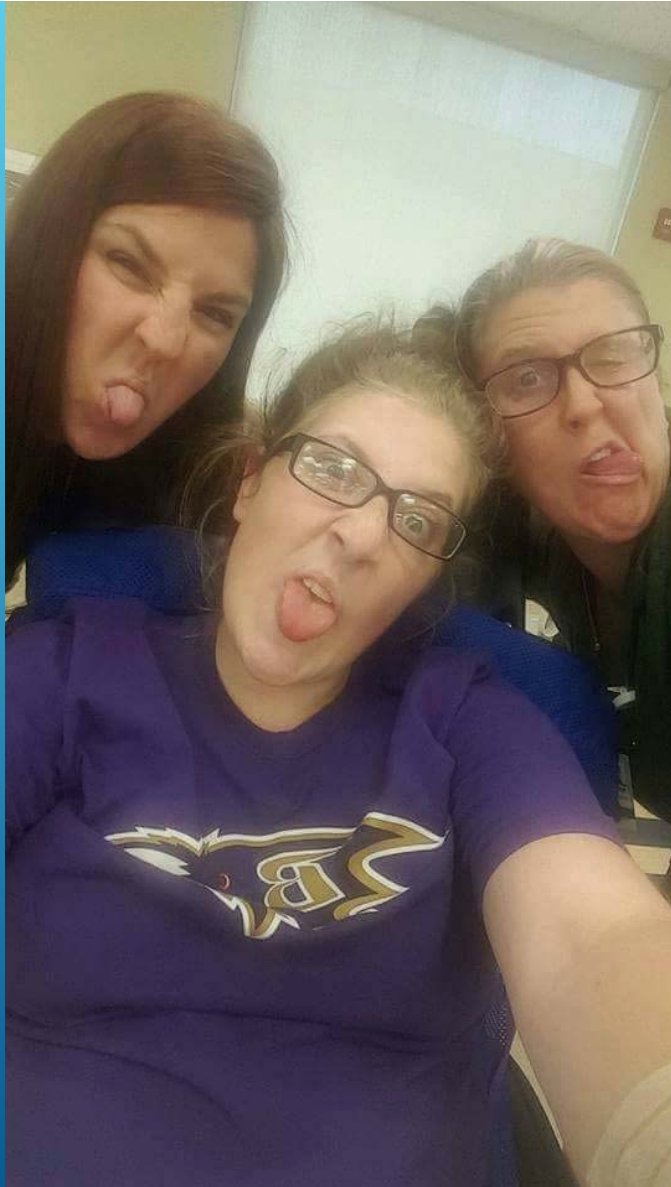
LOTS OF HARD WORK
TO COME!











Thank you!

- Of course you & Denise
- Jessica Manning - ICU Nurse
- Kate Heikes - ICU Nurse
- Melissa Perry - OT therapist at Rehabilitation
- Jessica Lewis - PT therapist at Rehabilitation
- Karla Morrison - Mother
- Amy Partin - Aunt / RN
- Ryan Neal - Boyfriend

- 1) Pelvic Trauma, Atlas of Pelvic Fractures. Beth Israel Deaconess Medical Center. Dorothy Tamayo, MS3 and Dr. Gillian Lieberman, MD. 2011.
- 2) EMS Magazine. The Pelvic Fracture, Stabilization in the Field. Michael Bottlang, PHD and James C. Krieg, MD. 2003
- 3) Pelvic Ring Fractures. Orthobullets. Author: Brian Weatherford. Topic updated 7/31/16.
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- 6) Mosby's Paramedic Textbook, 4th Edition. Authors: Mick J. Sanders, Kim McKenna, Lawrence M. Lewis, Gary Quick. 2010
- 7) Fractures of the Acetabulum and Pelvis – Campbell's Operative Orthopaedics. Guyton, James L., Perez, Edward A. Published January 2, 2013. Pages 2777-2828.
- 8) The Maryland Medical Protocols for Emergency Medical Service Providers. MIEMSS. Effective July 1, 2016.
- 9) Non-Invasive Reduction of Open-Book Fractures by Circumferential Compression; Bottlang, M., Simpson, T., Sigg, J., Krieg, J.C., Madey, S.M., Long, W.B.; Journal of Orthopedic Trauma; 16:6, 367-73, 2002.
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