Head & Spine Injury

Lessons Learned

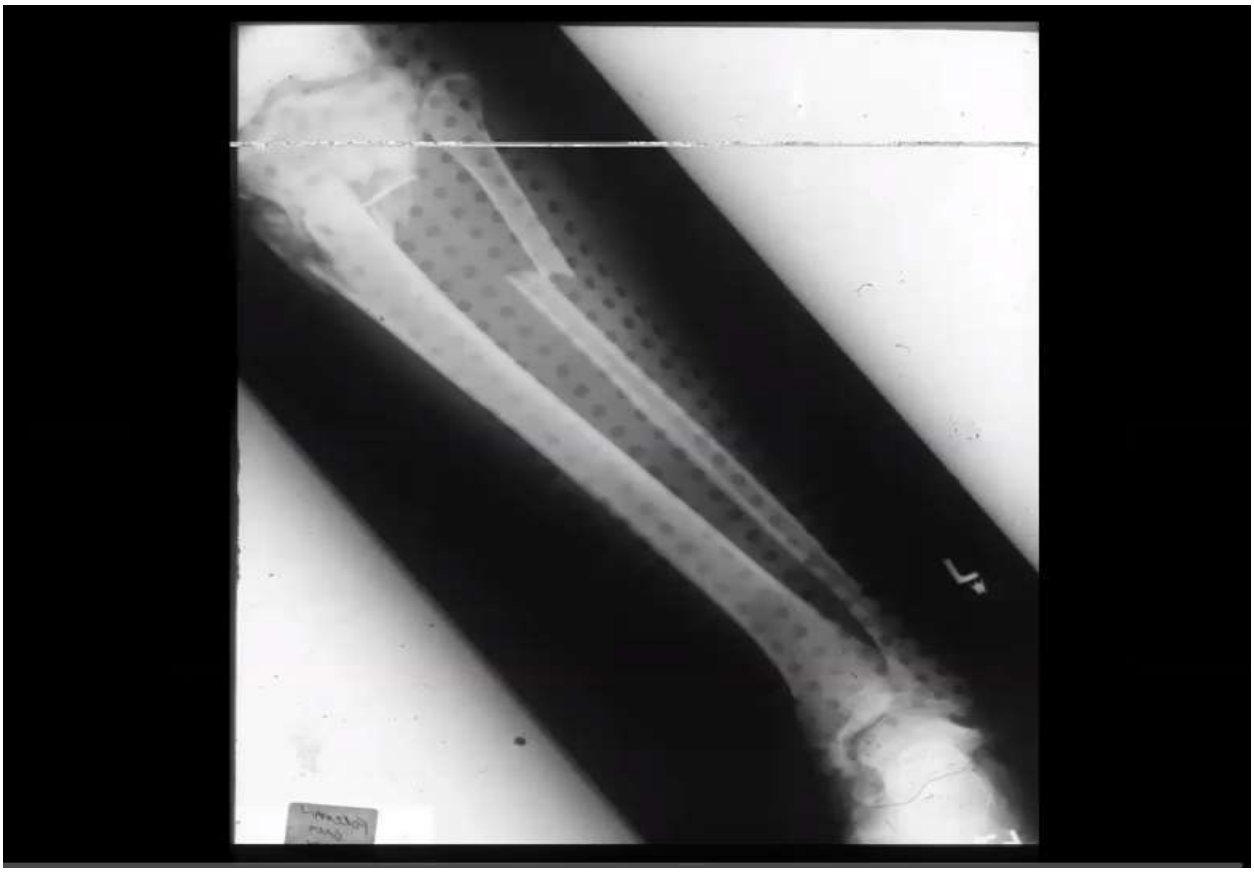
Dr. Anna Ledgerwood

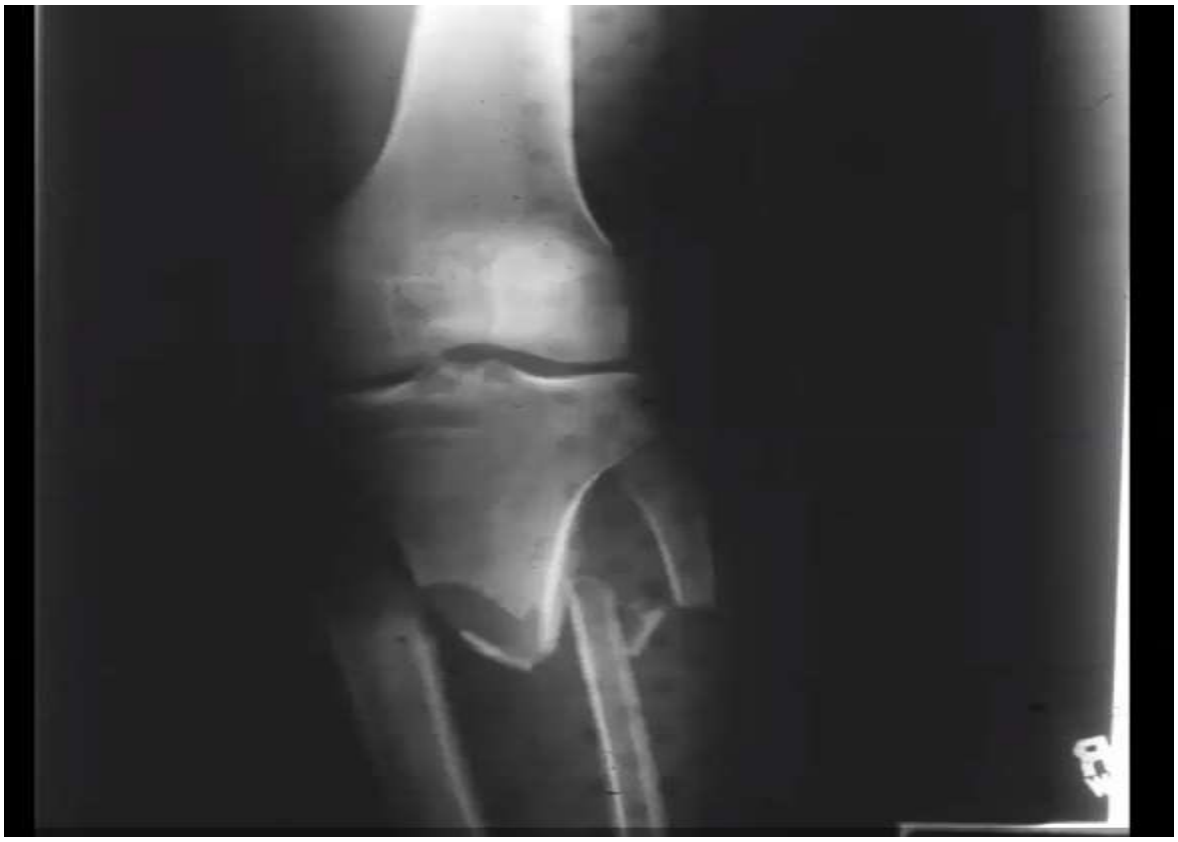
TRAUMATIC BRAIN INJURY

- 27 year old male pedestrian hit by a car - arrives at 0240 - awake, alert, no LOC
- BP 112/70 P 96 RR 20 GCS 15
- Both lower legs in splints - "open fractures"
- Property: $360

TRAUMATIC BRAIN INJURY

- Bilateral tibia - fibula fractures - open
- Decreased pulse left foot
- Hgb 13.3 fell to 9.3 after 2.8 liters saline
- Ortho team: "want to take to OR now for washout of open fractures"
- Chief Surgical Resident is insecure about possibility of other injuries - calls attending



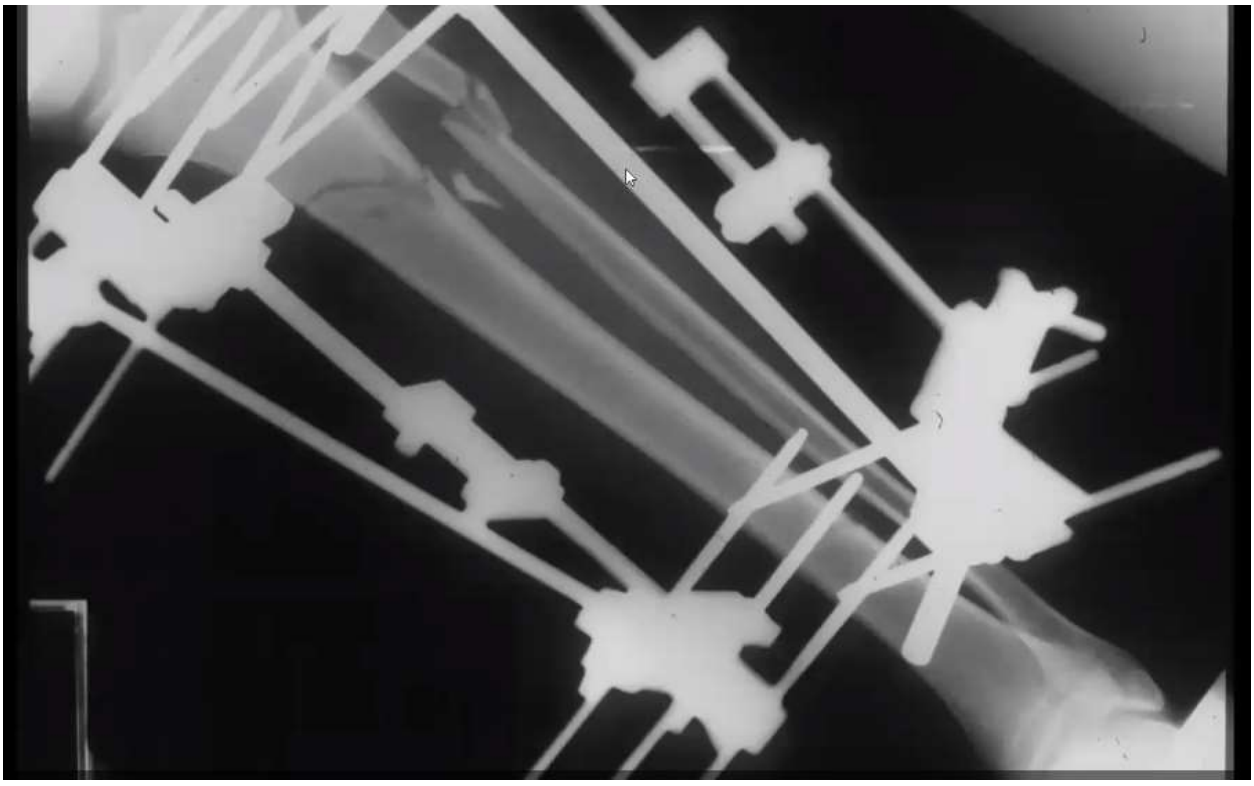


ATTENDING STAFF EVALUATION

- "Where were you going?" "I wish I could tell you"
- "Where had you been?" " I wish I could tell you"
- " Who were you with?" "Where are my kids? Are my kids okay?"

TRAUMATIC BRAIN INJURY

- ETOH: negative Drug Screen: negative
- DPL: negative
- Neck, Chest & Pelvis films: normal
- Bilateral angiograms: normal
- No other injuries identified
- To OR with ortho for washout and external fixation



TBI - HISTORY PID #7

- Manager Little Caesar's Pizza - closed up at 0130
- Wife & 3 children came to pick him up
- Car had dead battery - given jump by Fern-dale police
- Car quit when trying to make U-turn on eight mile to get to bank to make night deposit

TBI - History PID #7

- Wife steering - Patient was pushing car while waving other cars to pass
- Patient hit from behind & head struck his trunk
- Scalp laceration & broken tooth
- Attending Staff Asks: "Do you remember what happened? NG tube? Foley? A-Gram? DPL? Signing OR permit?" NOOO!

TRAUMATIC BRAIN INJURY

- CEREBRAL CONCUSSION: A process whereby billions of neurons suddenly lose and then rapidly regain function
- Shaking or jarring of the head
- Loss of memory - recent events
- GCS 15: Know Who, Where and WHY

Glasgow Coma Scale

continued.

Eye-Opening	Points
Spontaneous eye-opening	4
Eye-opening to command	3
Eye-opening to painful stimulus	2
No eye-opening	1

Best Motor Response	
Follows command	6
Localizes painful stimuli	5
Withdrawal from pain	4
Abnormal flexion to pain (decorticate)	3
Abnormal extension to pain (decerebrate)	2
Gives no motor response	1

Glasgow Coma Scale

cont

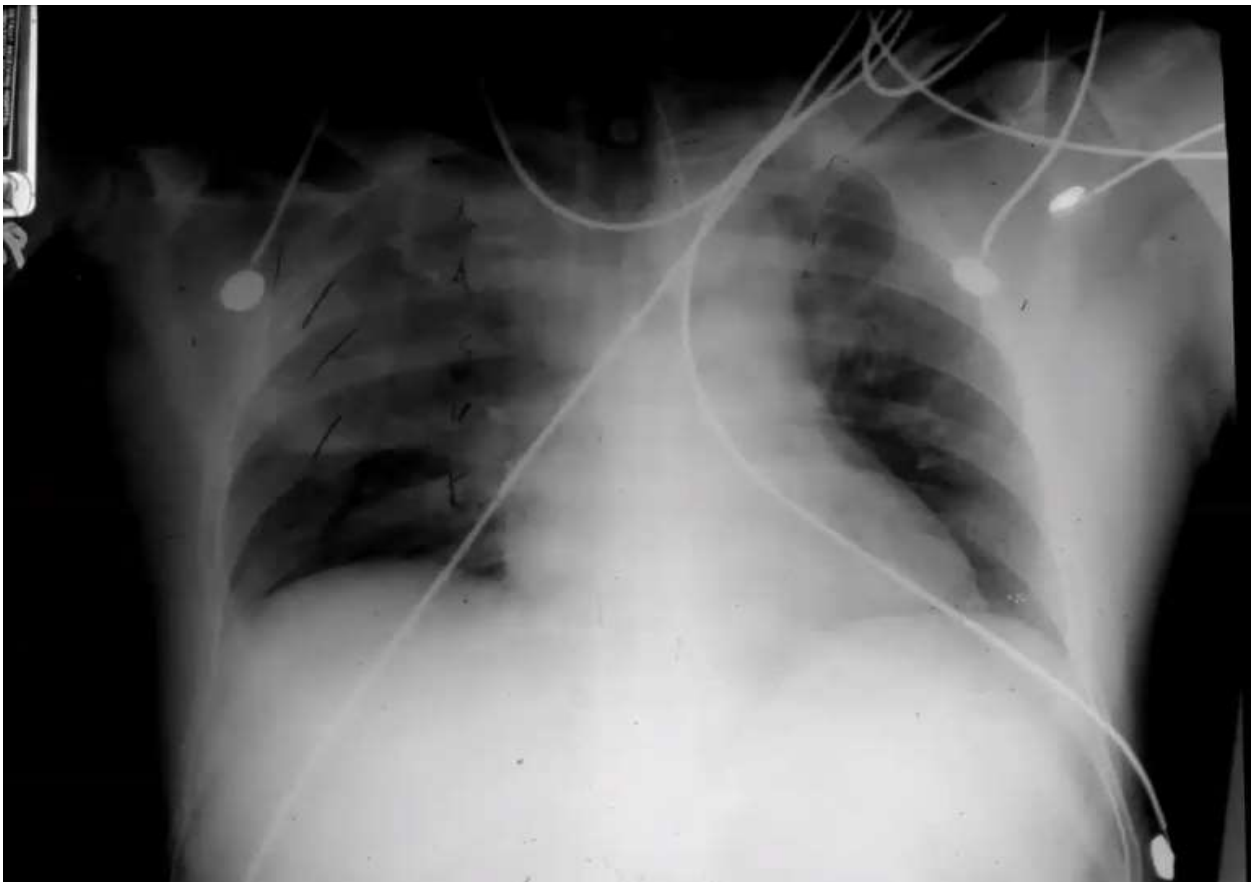
Best Verbal Response	Points
Answers appropriately (oriented)	5
Gives confused answers	4
Inappropriate response	3
Makes unintelligible noises	2
Makes no verbal response	1
TOTAL SCORE:	3 - 15

TRAUMATIC BRAIN INJURY

- 44 year old male involved in high-speed rollover MVC at 8 mile & I-75 with extensive vehicle damage
- Patient found at side of road - moaning
- Arrives at DRH at 1815 - BP 160/100 P 83 RR 30 Pulse Ox 94% GCS ? 12 - patient speaks Arabic - speech seems "appropriate"

TRAUMATIC BRAIN INJURY

- Contusions and abrasions right face with torn R. earlobe, R. hemotympanum
- Large R. retrobulbar hematoma
- Tenderness right chest wall
- Abdomen and pelvis normal
- Moves all four extremities - no fractures
- Rectal exam normal



TRAUMATIC BRAIN INJURY

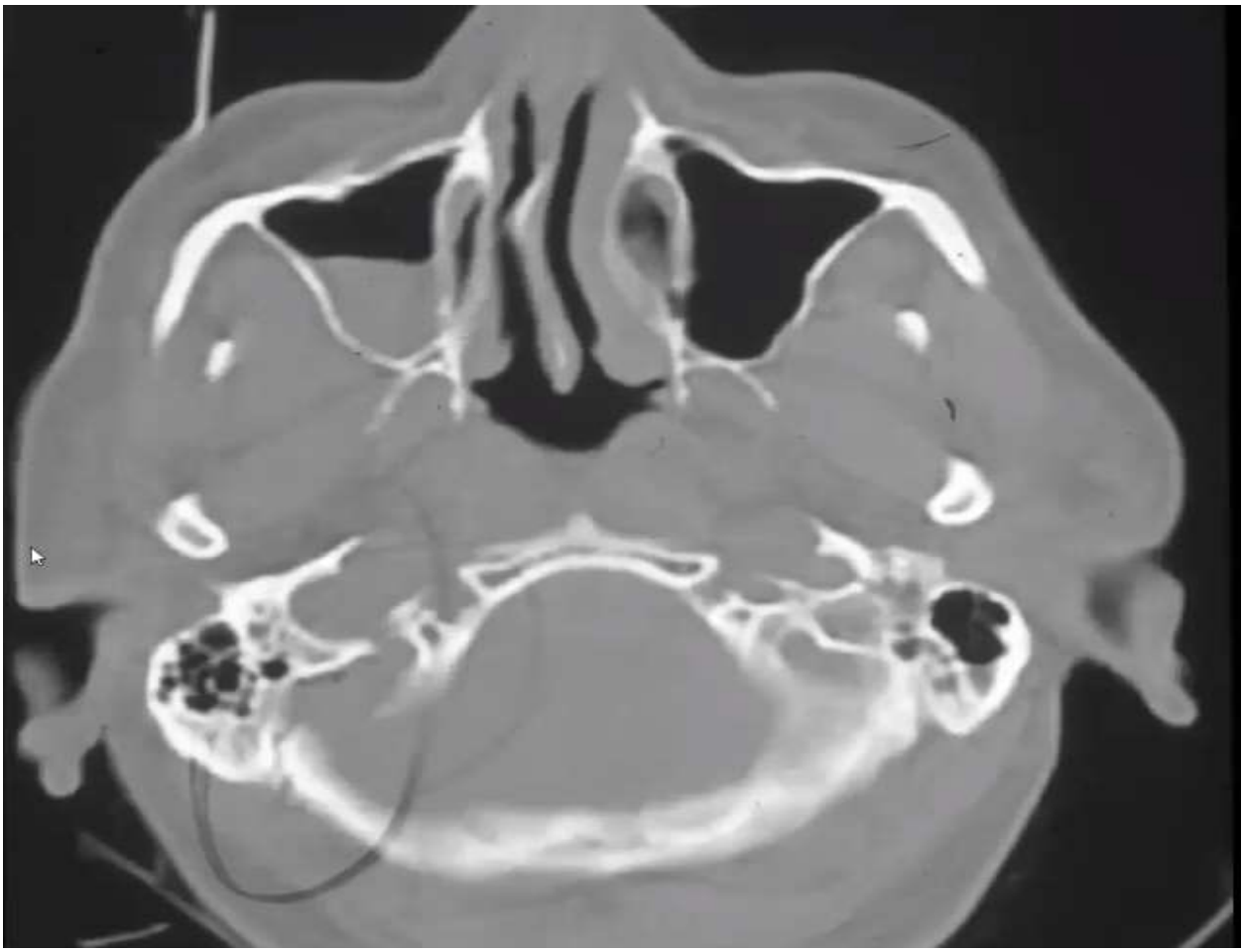
- C-spine film: Incomplete (C1 - C5 only)
- Chest film: Fractures R. Ribs 2-7
- Pelvis film: Normal
- FAST Abdomen: Normal
- VS (1830): BP 168/100 P 78 RR 30
- GCS 12 "Need CT Head, Neck, Chest, Abdomen, Pelvis"

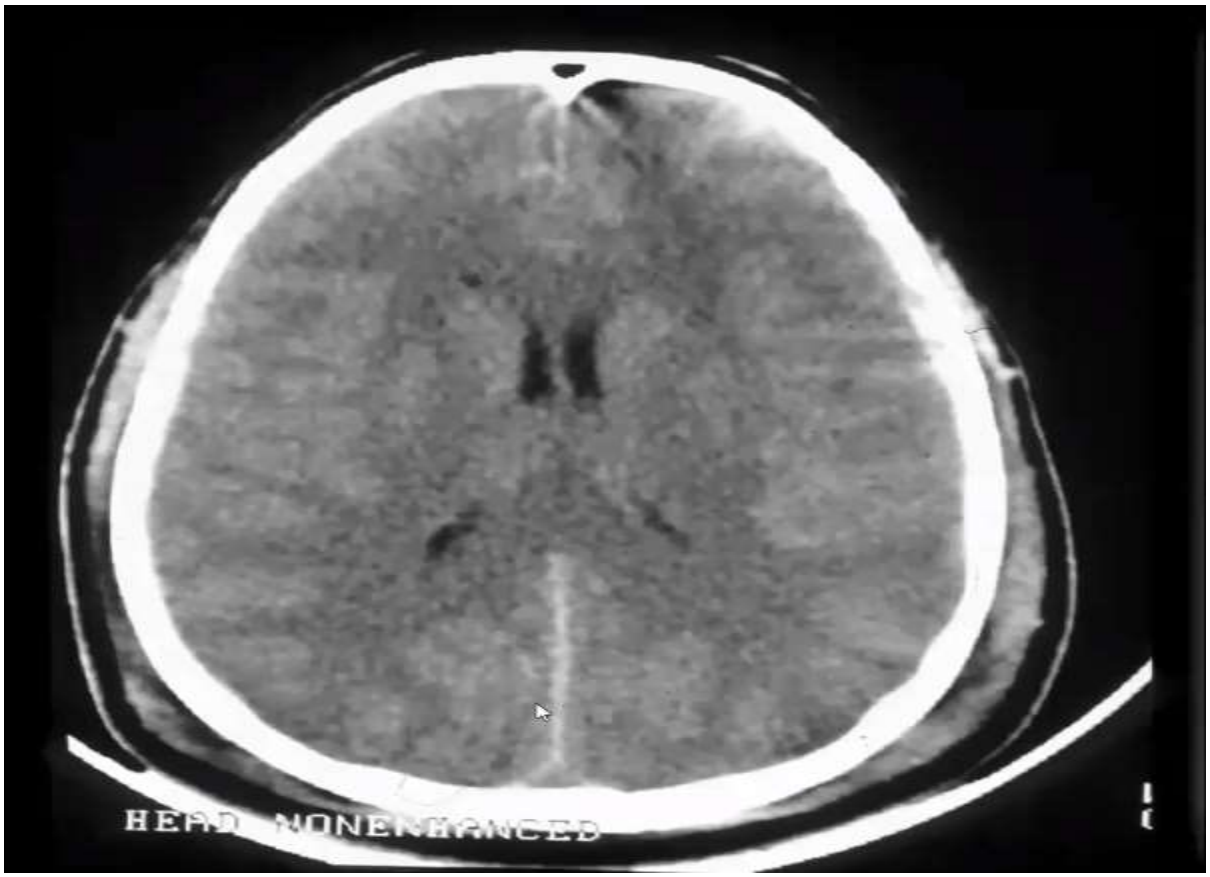
TRAUMATIC BRAIN INJURY

- 1910 - placed in CT scanner
- 1918 - nurse notes patient is "combative, uncooperative, pulling at lines, refuses to lie still and attempts to get off the scanner"

TRAUMATIC BRAIN INJURY

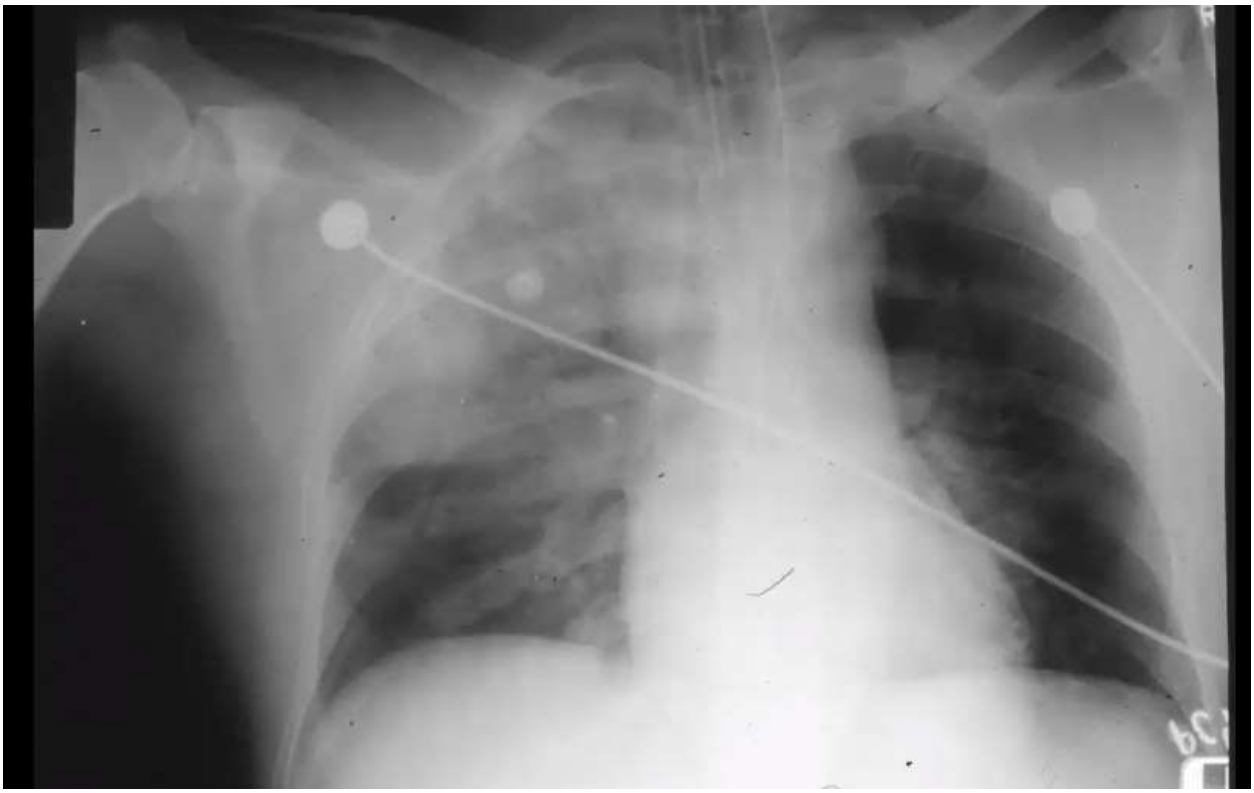
- PGY 3 Surgery Resident: "we need scan - give him 2 mg Ativan IVP q 5 minutes - titrate until sedated"
- Patient received 8 mg Ativan over 15 min
- CT Head: Diffuse brain injury with cortical and brain stem contusion, basilar skull fracture and SAH





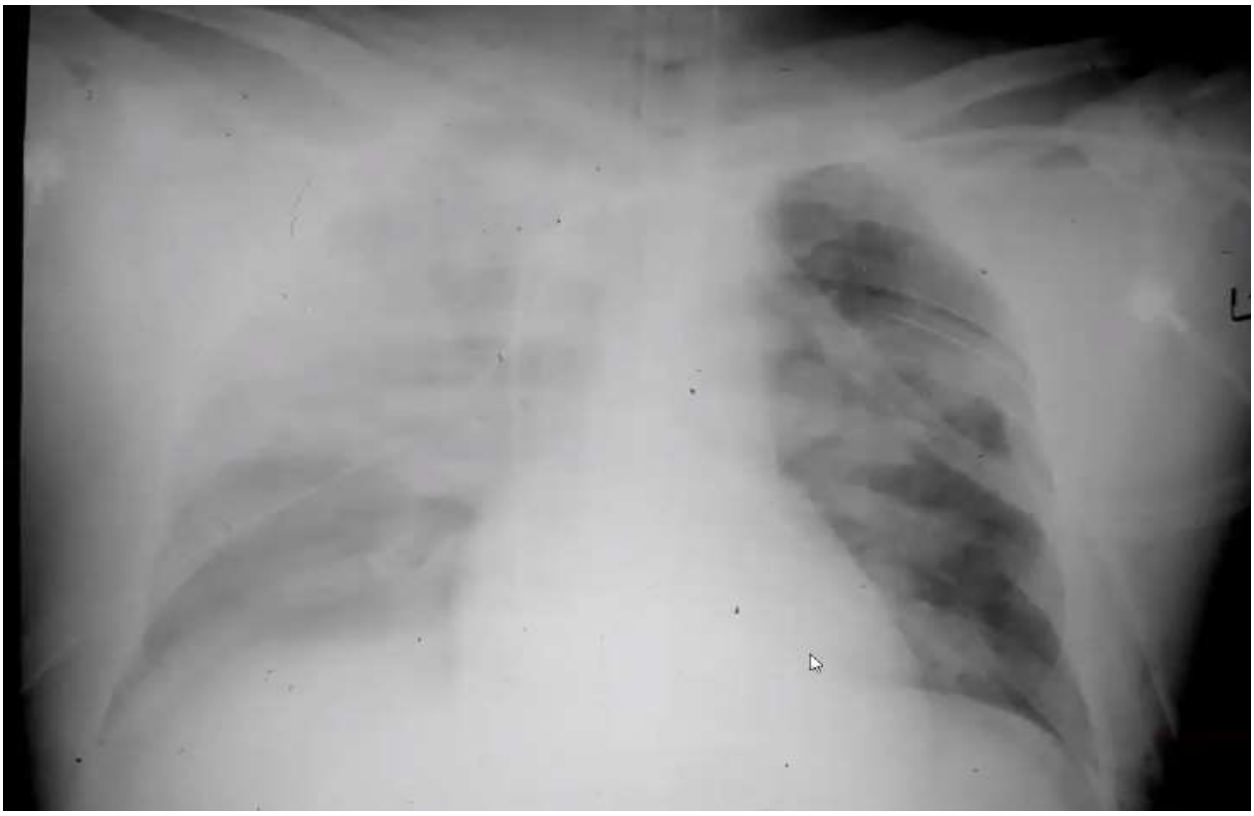
TRAUMATIC BRAIN INJURY

- 1955: Nurse notes RR 10 - patient removed from CT scanner & intubation attempted
- 2007: pH=7.09 pO2=32 pCO2=79 Oxygen Saturation=49%
- 2015: Anesthesia intubates
- DPL negative, bilateral chest tubes placed, bronchoscopy done & patient taken to ICU



TRAUMATIC BRAIN INJURY

- ETOH and Drug Screens - negative
- ICP >50
- Requires vasopressors for hypotension
- O2 Saturation continues to decrease
- Ventilatory pressures increase and unable to ventilate



TRAUMATIC BRAIN INJURY

- Patient expires in 48 hours
- Autopsy: epidural hemorrhage, cerebral contusions, SAH, linear skull fracture, herniation, right rib fractures 2 to 10, right clavicle fracture - ME notes - "HYPOXIA MAY HAVE INCREASED BRAIN SWELLING"

PROBLEMS

- Failed to recognize severe head injury - inappropriately considered speech to be normal
- Failed to recognize need for immediate intubation and ventilatory support in patient with 9 rib fractures & RR 30
- Failed to monitor Pulse Oximetry in CT Scan

PROBLEMS

- Failed to intubate prior to sedation
- Sedation without intubation requires agreement by all members of the team - **INCLUDING THE NURSE**
- If doctor insists and nurse disagrees - have doctor administer the medication

TRAUMATIC BRAIN INJURY

- 38 year old male was brought to ED by police at 0230 - he had just been arrested for attempting to break into a house
- CC: "drunk, fell, head injury"
- BP=134/70 P=61 RR=16 GCS=15
- A & O X 1 3.5 cm occipital laceration
- No Neuro deficits - C-collar placed

TRAUMATIC BRAIN INJURY

- Scalp laceration sutured
- Nurses note patient sleeping but arousable
- 0430: ETOH level = 102
- 0750: BP = 140/64 P = 62 - Nurse notes "patient given discharge instructions and understands" - Discharged to DPD

TRAUMATIC BRAIN INJURY

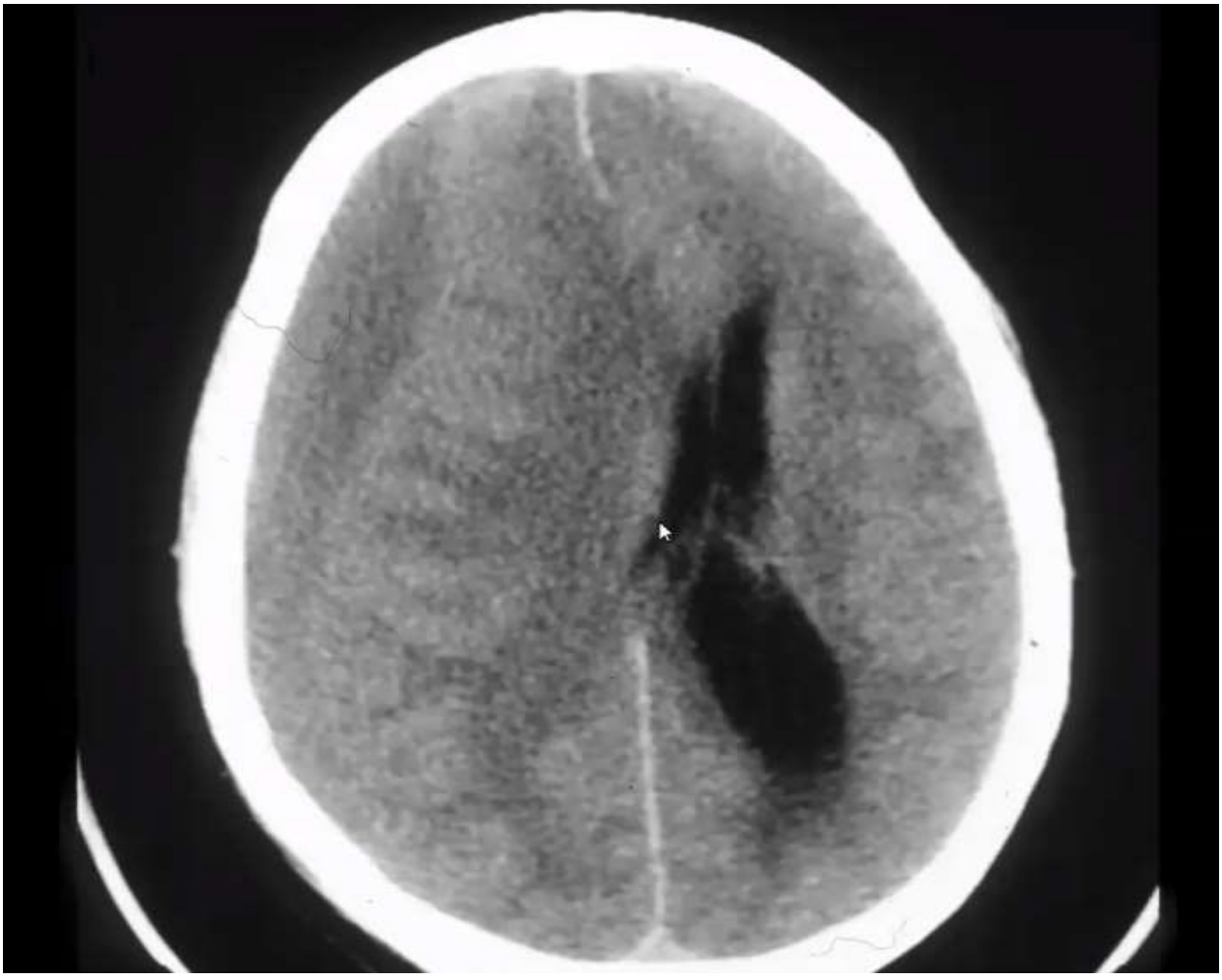
- Police officer notes patient dizzy when walking to holding cell in ED and nearly fell - brought back to module and put on cart
- BP = 116/56 P = 61 RR = 18
- 1140: IV started
- Patient sleeping but arousable

TRAUMATIC BRAIN INJURY

- 2105: EM physician notes patient alert and oriented to name only - always falls to the left
- EM physician orders CT head

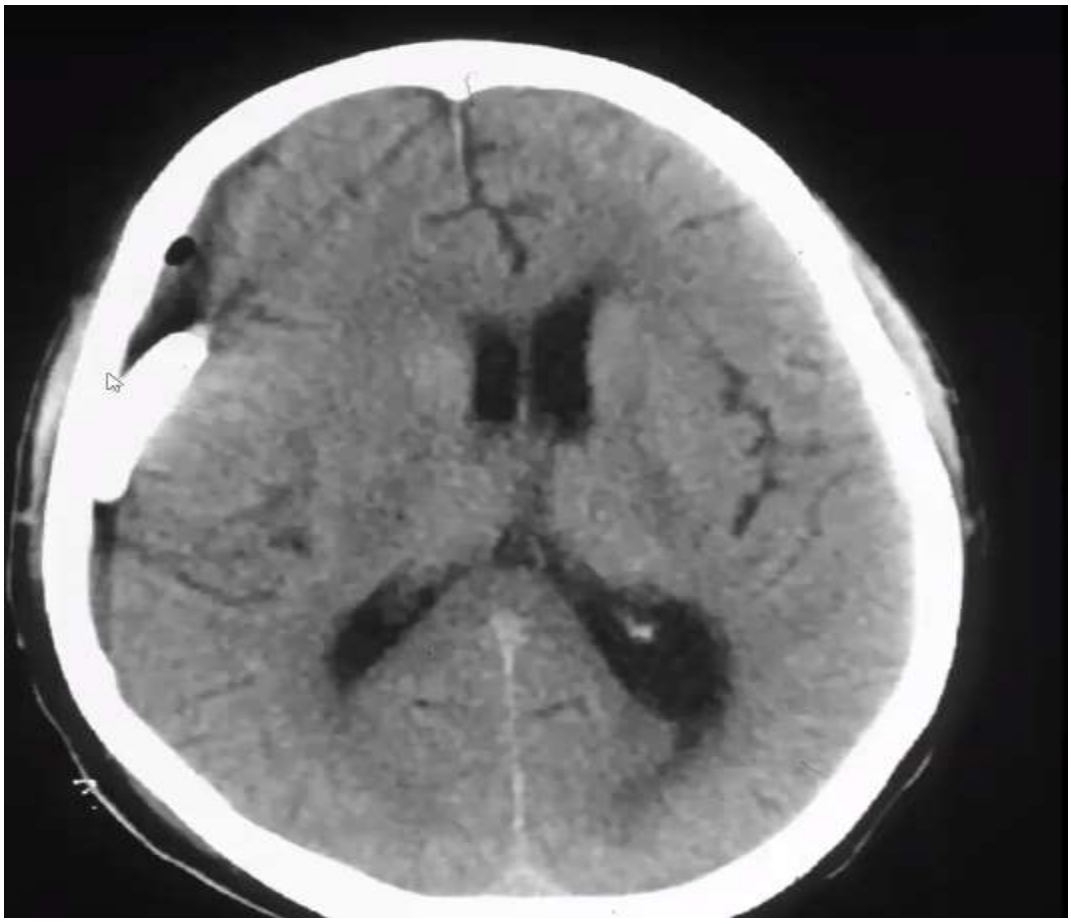
TRAUMATIC BRAIN INJURY

- 1545: IV dc'd and patient discharged to DPD custody - hospital staff notes patient has steady gait
- 1600: DPD officer thought gait unsteady and takes patient back to module and places on cart



TRAUMATIC BRAIN INJURY

- Neurosurgeon consulted - history of motor-cycle crash 6 months ago with tibia fracture and intermittent confusion, irritability and severe headaches
- OR: two burr holes - "xanthochromic fluid and motor oil fluid and clot"
- Acute and chronic SDH



PROBLEMS

- Many patients, same scenario - no injuries
- GCS is needed on all injured patients and certainly in those with head trauma
- GCS = 15: Know WHO, WHERE, WHY
- Injury (lac) + ETOH + GCS<15 -- NEEDS CT SCAN OF HEAD
- Hydrate - admit for observation

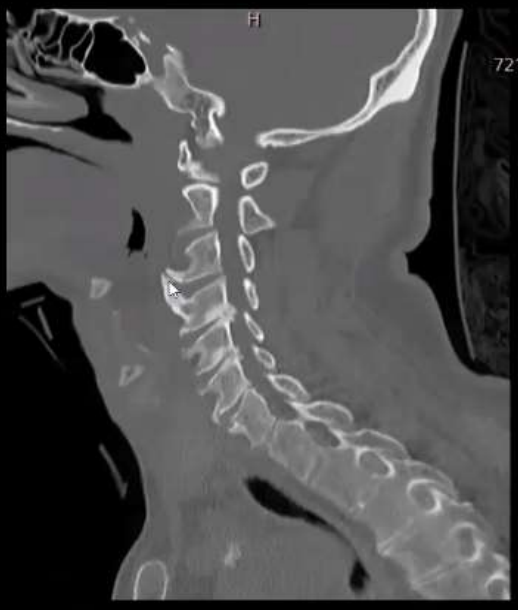
ASSAULT - DRUNK

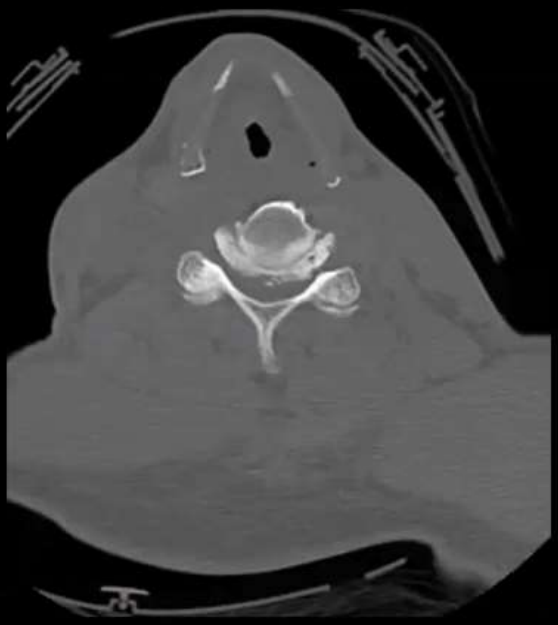
- 63 Yr old male – homeless – assaulted with fists and shoved to the ground striking his face
- Had all of his belongings in his backpack
- Transported by EMS – non-ambulatory on scene
- C/O pain head, neck and back – cannot move his legs – states "I'm Paralyzed"
- PMHx: Multiple ED visits for foot pain, back pain, lice, crisis center (schizophrenia), HTN

ASSAULT - DRUNK

- BP 159/110 P 84 R 18 T 36.7 GCS 14
- Abrasions forehead, knees, hands, pain to palpation entire spine
- Cannot lift legs off bed or flex hips, does withdraw slightly to pain, full ROM arms with grip 5/5
- Hgb 15.4 ETOH 121
- Chest/Pelvis films – wnl
- "He is faking it – wants a 'hot & a cot' – observe"

ASSAULT - DRUNK





Severe Degenerative disc disease of mid to lower c-spine with large anterior vertebral body osteophytes at C3-C4

ASSAULT - DRUNK

- EM Resident: given 800 mgm motrin, re-eval several times awaiting sobriety
- 4 hours after arrival noted pt had no neck pain and full neck flexion and extension and lateral rotation – C-collar removed

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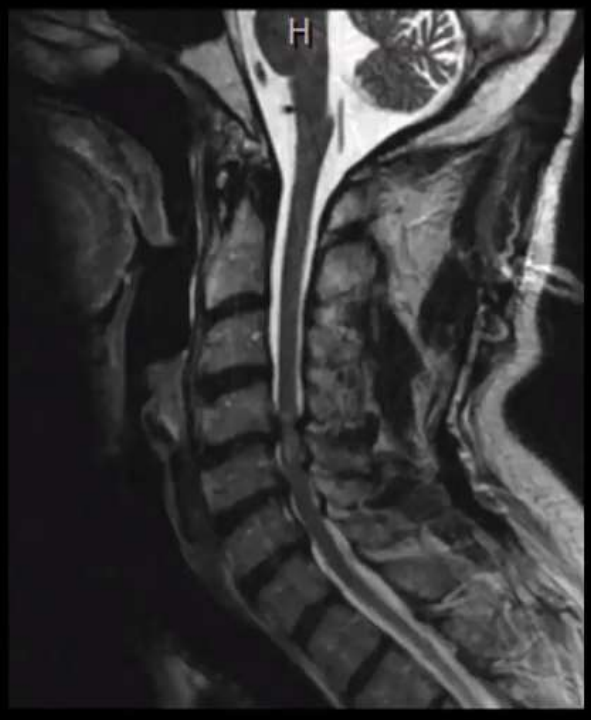
- 4 hours after arrival noted pt had no neck pain and full neck flexion and extension and lateral rotation – C-collar removed
- 5 hours after arrival states he cannot extend his arms and they are numb
- "Concern for central cord syndrome" - trauma team called for re-evaluation

ASSAULT - DRUNK

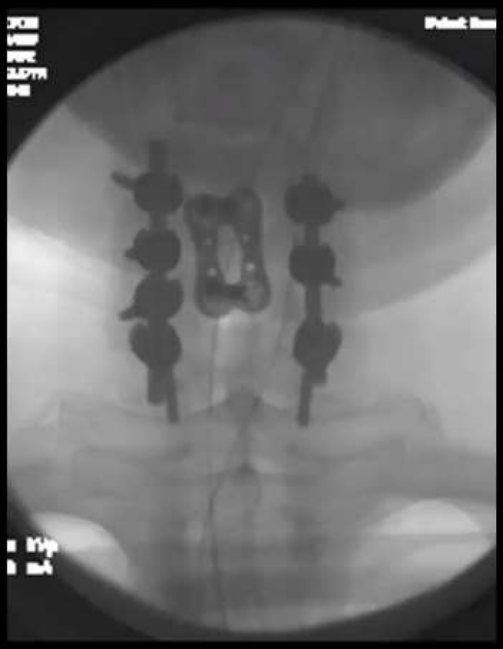
- Trauma team: admit observation over night and consult spine service
- Spine service: "needs collar & MRI"
- Neuro status unchanged

ASSAULT - DRUNK



- Mod stenosis spinal canal C3-C6 with mass effect on ventral and dorsal margins of cord contour

ASSAULT - DRUNK



- PID 2: Anterior decomp.
- PID 8: Posterior decomp. & fusion
- PID 11: Discharged to SAR – could feed himself but unable to walk, had neurogenic bladder

ASSAULT - DRUNK

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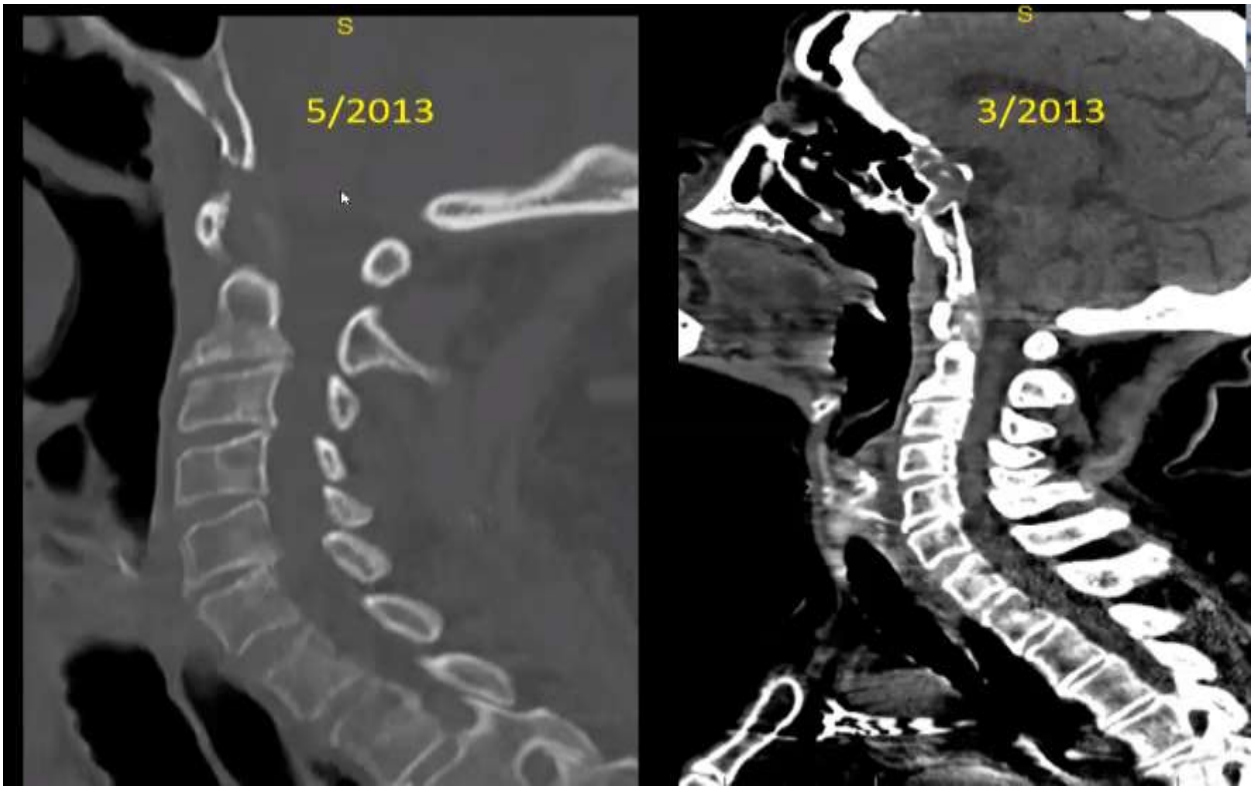
- 4 hours after arrival noted pt had no neck pain and full neck flexion and extension and lateral rotation – C-collar removed

GERIATRIC FALL

- 83 Yr old lady found lying on floor in bathroom by her family who heard a loud thump
- Arrives by EMS as "medical code" - SOB
- BP 115/84 P80 RR 22 T36 O2Sat 95%
- PMH: COPD on 2L O2, DVT &PE on Coumadin, CHF & AICD, a-fib on digoxin, seizures on Keppra, dementia
- PE: Large frontal scalp hematoma, wheezing, A & O X3, poor motor strength - ?effort, Lt wrist swollen & ? tender



GERIATRIC FALL

- C-collar placed
- BiPAP, albuterol, solumedrol
- INR 2.46
- CT head, c-spine, x-ray Lt wrist
- Grade 1 retrolisthesis of C5 on C6 not seen on prior imaging - Head and wrist ok
- N/S Consult: "A & O to Person, Need MRI spine, hold anticoagulants, check with family if need to intubate"

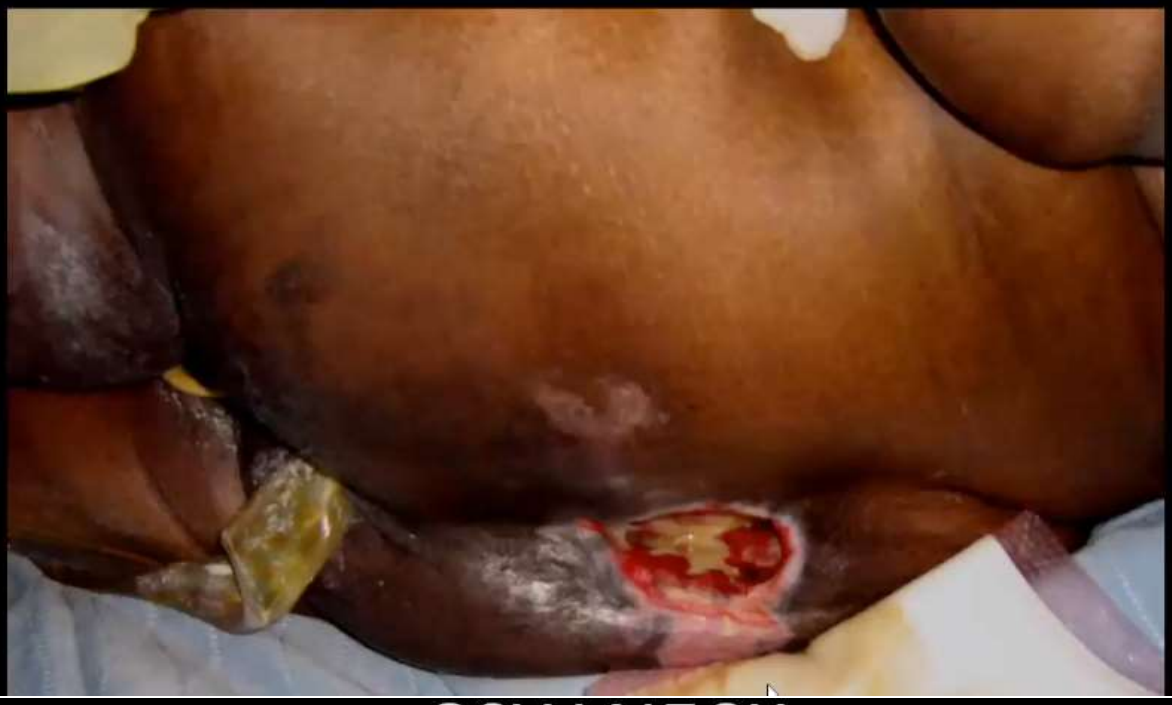
GERIATRIC FALL

- Intubated by anesthesia with glidescope for MRI
- Can't do MRI – Pt has AICD
- Trauma surgery consulted 4 hours after ED arrival
- Admited MICU – Extubated HD#2 – developed stridor and reintubated
- Trach & PEG went to LTAC on HD #22

GERIATRIC FALL - PI

- EM, NS, Anesthesia all agreed – need to be sure can get MRI before intubation and know the pros and cons of intubation for procedure
- Patient breathing okay but had long standing COPD & previous difficulty swallowing - thus prior CT of c-spine
- Patient still in LTAC 4 months later on PEG feeds
- TS should have admitted – earlier Trach/PEG

GERIATRIC FALL



GSW NECK

- 26 Yr old male arrives with GSW right anterior neck – no exit– denies difficulty breathing
- BP 76/55 P 60 O2 Sat 91% on RA RR 27
- PE: GSW lower right neck with air bubble with each breath – no hemoptysis or blood in oral cavity - no sensation below the nipples – cannot move his legs

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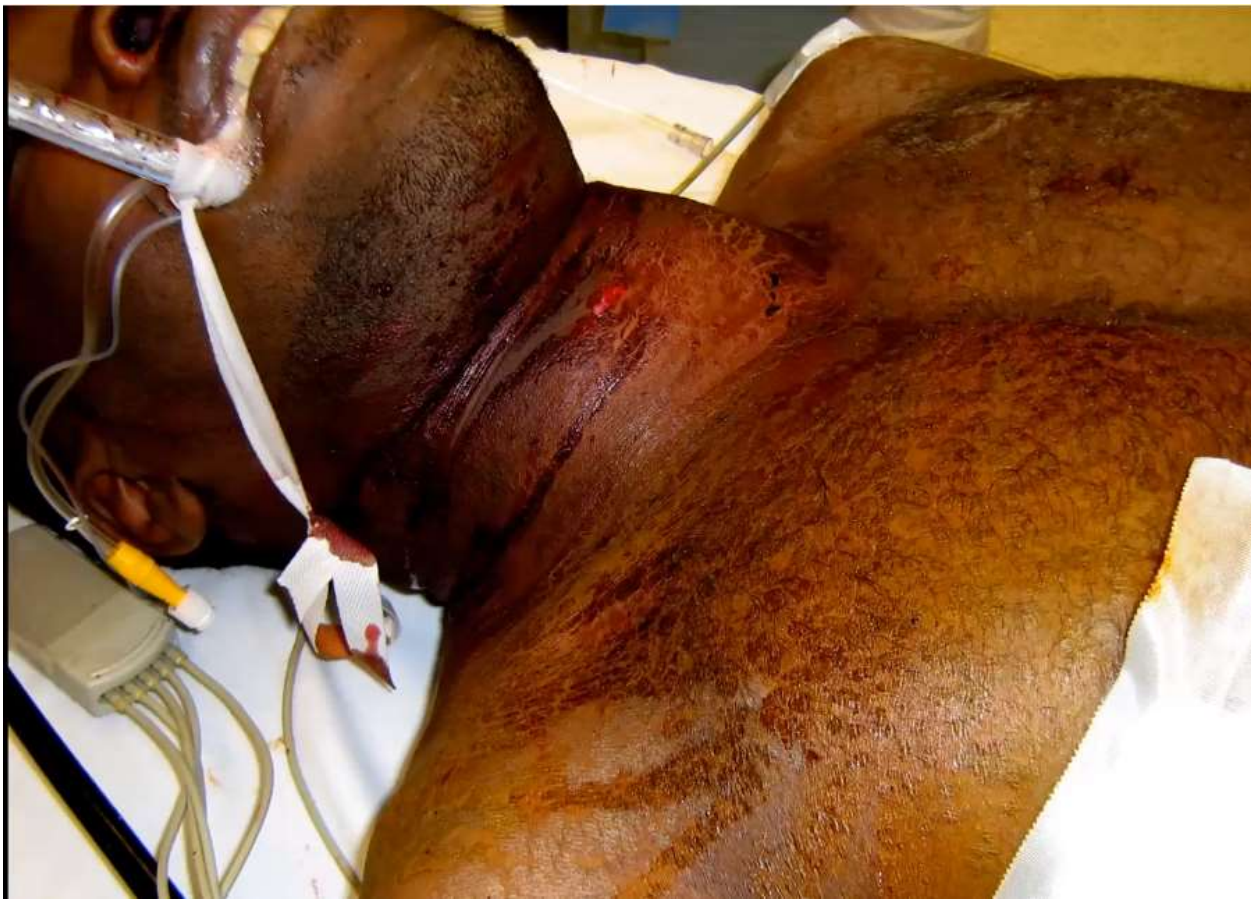
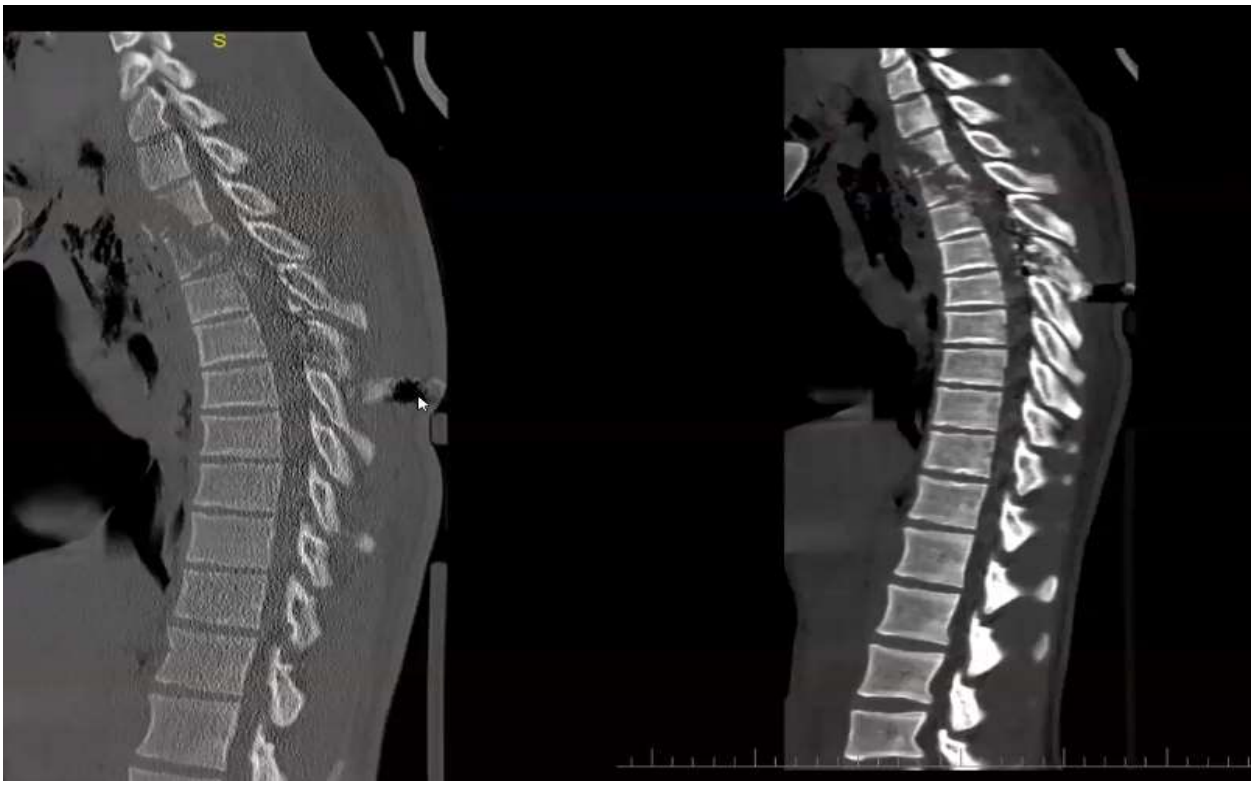
STOPS BREATHING – FOAMING AT THE MOUTH

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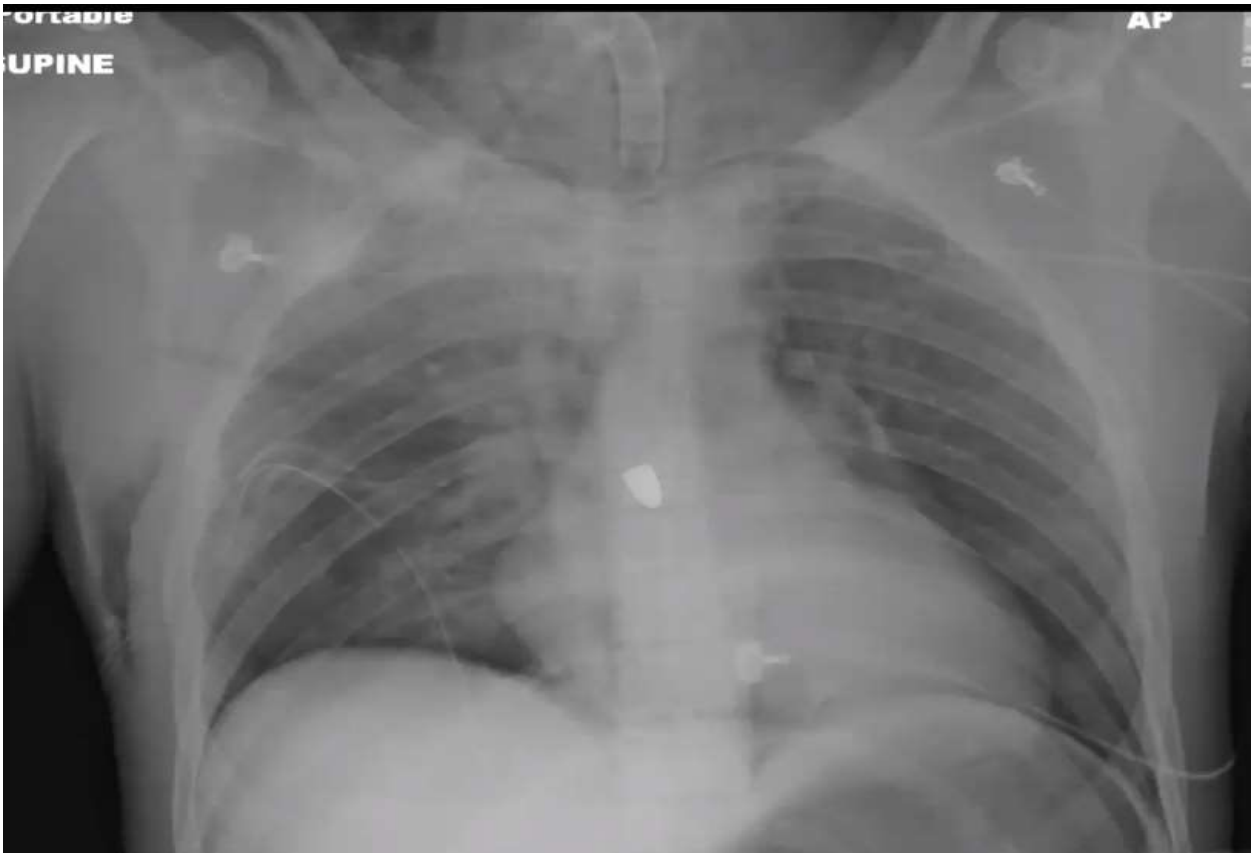
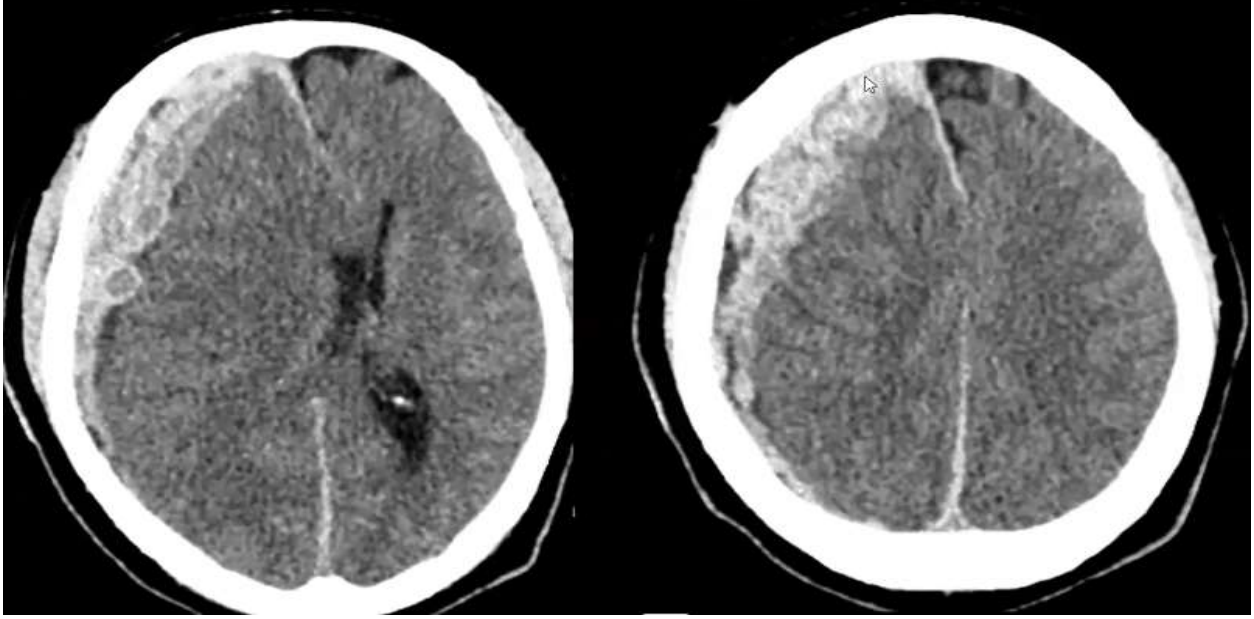

AP
UPINE

Trauma Multidisciplinary Peer Review
Morbidity Review

- 44 Yr old male ? Brought by EMS ?unit/comp. with no runsheet/no trauma team activation after a MVC (unrestrained passenger, ? Speed)
- Seen by EM physician – noted to be quite talkative and disinhibited – ambulated to bathroom with slightly unsteady gait (no GCS)
- CT head ordered – Pt uncooperative and refused to get on CT table
- ETOH - 225

MVC – UNRESTRAINED PASSENGER
CT HEAD 2 HRS AFTER ARRIVAL



TRAUMA MORBIDITY/MORTALITY MORBIDITY REVIEW

- No call to communications – no record of who brought the patient - ? EMS unit
- Emerg Phys: no GCS – when pt refused scan – should have been a clue something not right
- RT SDH identified – to resuscitation - attempted intubation by EM (resident X2, attending X1) – anesthesia called and intubated (O2 Sat dropped to 80's)
- N/S called/ TS called - EM admitted to NICU

TRAUMA MORBIDITY/MORTALITY MORBIDITY REVIEW

- N/S takes to OR 3 ½ hrs after arrival for crani-ectomy – pt in NICU
- Heavily sedated - Develops DVT - bilateral LE and IVC filter place by IR – also anticoagulated
- Extubated but needed reintubation for sepsis, shock , MSSA pneumonia, Acinetobacter pneumonia – Rx with Vancomycin for 14 days
- Renal failure requiring CRRT

TRAUMA MORBIDITY/MORTALITY MORBIDITY REVIEW

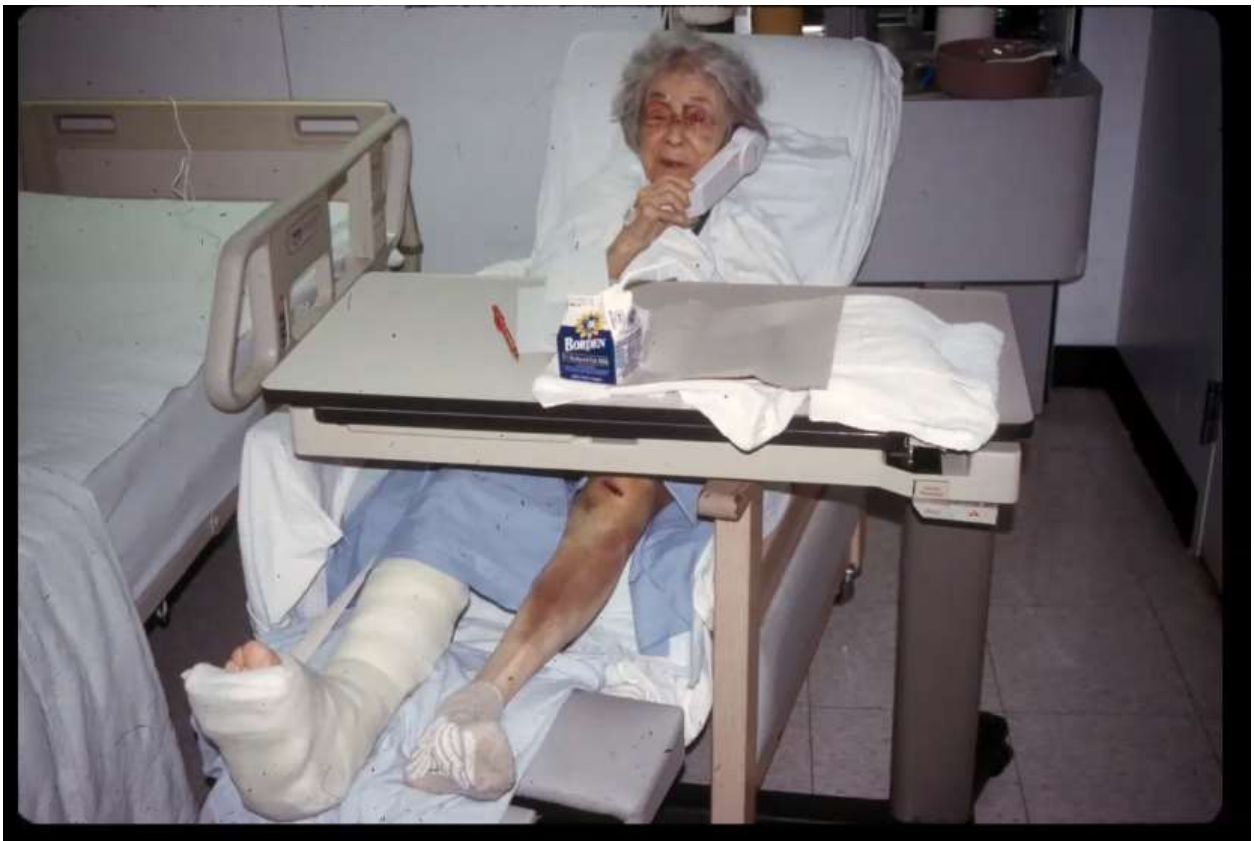
- Case discussed at weekly trauma round X 4 weeks where all complications presented – then weekly by RIM rep while at RIM
- Presented at M/M for attending input/loop closure and documentation

TRAUMA MORBIDITY/MORTALITY TRAUMA MORBIDITY

- How and when did patient arrive?
- Failure to recognize compromised pt and document GCS by EM and get CT scan head
- Failure to activate trauma team when SDH identified
- Difficulty with intubation – needed anesthesia
- DVT – IVC filter placed ? Did he need anticoag-ulation – (bled from trach site)

TRAUMA MORBIDITY/MORTALITY]
TRAUMA MORBIDITY

- Extubated – reintubated - delay to trach
- MSSA & Acinetobacter pneumonia – Rx with Vancomycin X 14 days
- Renal Failure - required CRRT

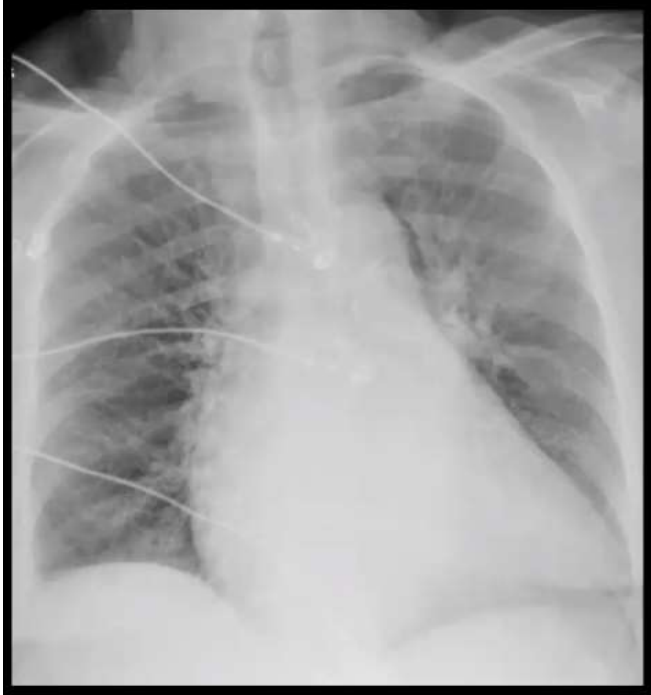


? HEAD INJURY OR ? DEMENTIA

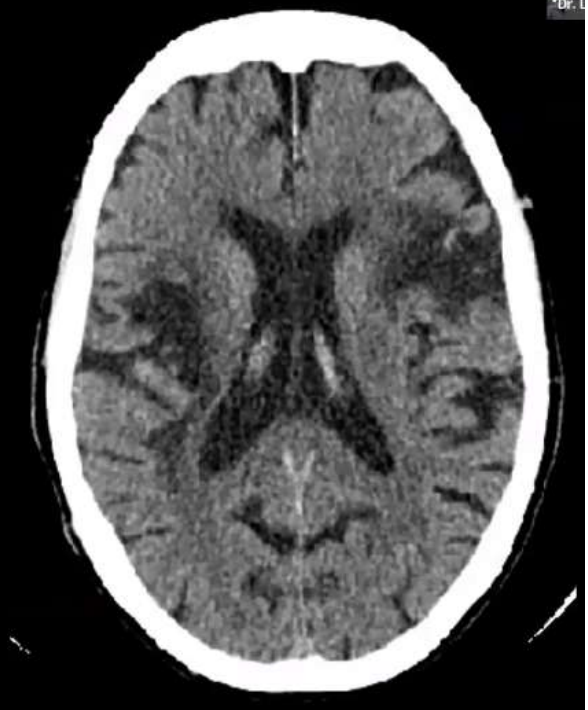
TRIP & FALL – EYE DOCTOR

- 83 Yr old lady was driven 60 miles by grand-daughter to see eye doctor – eyes dilated – patient thought she was done – walked out to parking lot/tripped on curb – LOC X 10 min
- Trauma code at 11:38 BP 145/74 P69 slurring of speech, swollen lip & face bruising
- Hx DM, Lt stroke Lives with son & family
- Coumadin 8 mgm/d for atrial fibrillation, insulin for diabetes

TRIP & FALL - EYE DOCTOR



Chest – Cardiomegaly

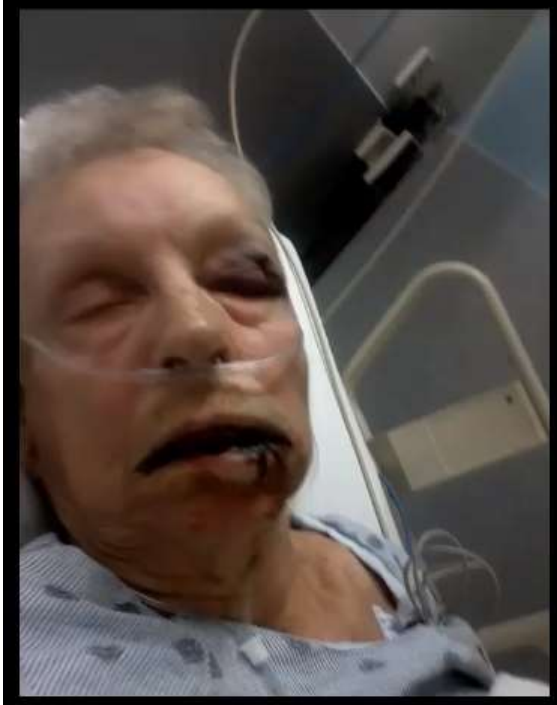


Lt Cephalomalacia

TRIP & FALL – EYE DOCTOR

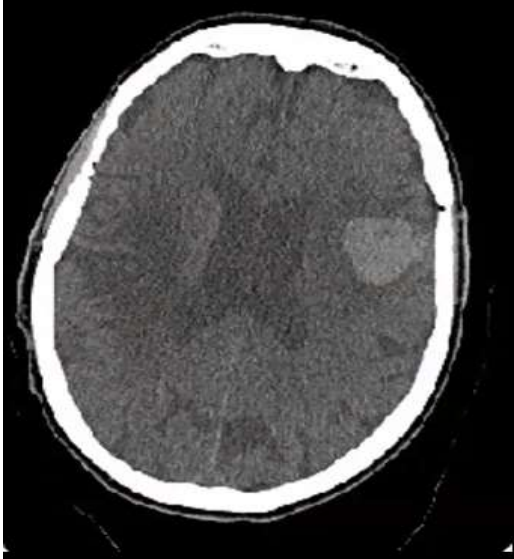
AM "HUDDLE": "Ledgerwood you failed to order DVT prophylaxis!"

TRIP & FALL – EYE DOCTOR

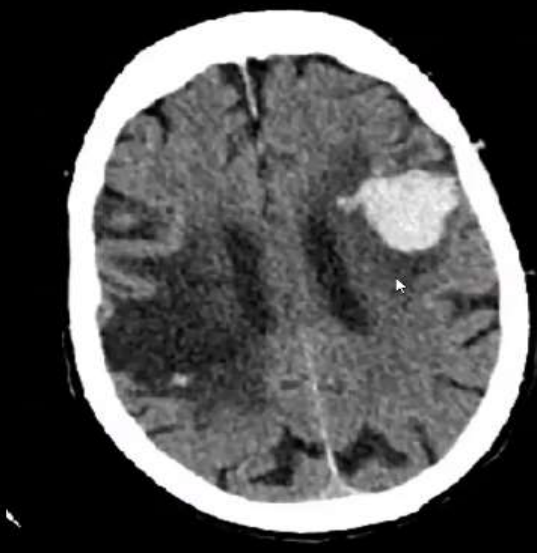


- INR 2.13 Hgb 11.8
- Granddaughter states slurs speech due to xanax given for trip
- Wants to go home but nurses note she has trouble swallowing
- Repeat CT Scan Head

TRIP & FALL – EYE DOCTOR

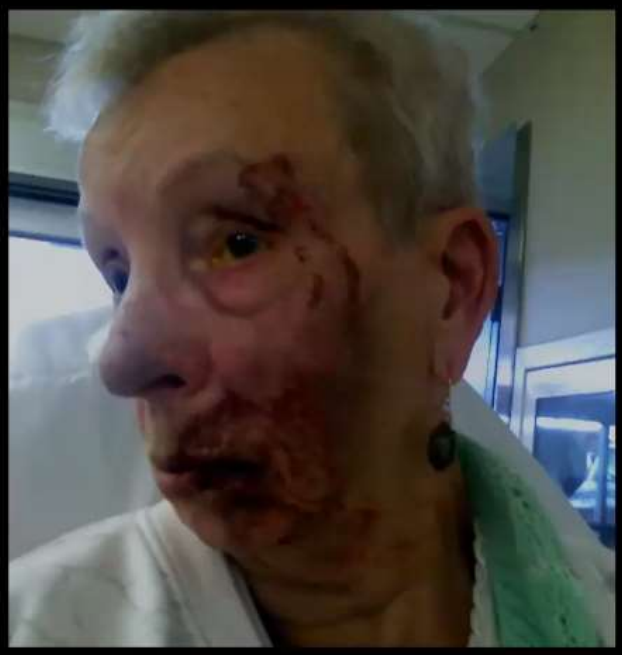


CT at 36 Hours



CT at 40 Hours

TRIP & Fall – EYE DOCTOR



- Discharged to SAR on PEG feeds because could not swallow
- "Quality" concerns seem to relate only to 3rd party payor

TRIP & FALL – EYE DOCTOR
Quality Issues at Trauma Rounds

- Should have given 2 units FFP on patient arrival due to Hx coumadin and GCS <15
- Someone needs to stay with elderly patients who have eyes dilated as vision impaired
- Eye Institute informed of patient's injury and misadventure

DIFFICULTY SWALLOWING, ASPIRATION

BUS vs WALL

- 58 year old female was restrained driver of a bus which hit a wall - I75/E.7mile
- EMS called 1015 - on Scene - 1031 Found patient lying on side inside of bus c/o face, back and left thigh pain - pt reports going 40 - 45mph - lac bridge of nose - no other obvious injuries - BP 140/90, P 120, RR 24, GCS 15 - depart scene 1106 (extrication)

BUS vs WALL

- EMS arrives DRH 1133 (no notification)
- Triage: BP 150/90, P 80, Pulse OX 96%, VAS =8, PMHx = Diabetes, HTN
- To Module - EM Physician: "states after accident she fell out of her chair and into the stairwell of the bus" - "denies neckpain, numbness, paralysis - has severe lumbar pain - moves all 4 extremities"

BUS vs WALL

- X-Rays ordered: LS Spine, pelvis and both knees
- 1300: given TT and 10 mgm Morphine (IV)
- 1320: unresponsive - CPR
- 1344: Pronounced dead

BUS vs WALL AUTOPSY

- 5' 3" tall - 336lbs - Purple contusions on mid-chest wall with hematoma L breast, R thigh and L knee
- Complete transection T Spine at T3/4 & T10/11 with spinal cord injury
- Fx Right Ribs 2-8 and Left Ribs 3-9 lateral
- Severe atelectasis and lung contusion

BUS vs WALL AUTOPSY

- Heart - 600 gms with 60% occlusion LAD
- Liver - 3100 gms and cirrhotic
- Spleen - 150 gms

BUS vs WALL - PI

- Pre-hospital providers failed to follow protocol in notifying hospital
- ED triage failed to follow protocol in calling trauma team activation
- ED treated pain without adequate assessment
- Did patient really move her legs in ED?
- Letter sent to pre-hospital providers – and ED trauma representative discussed at ED PI meeting

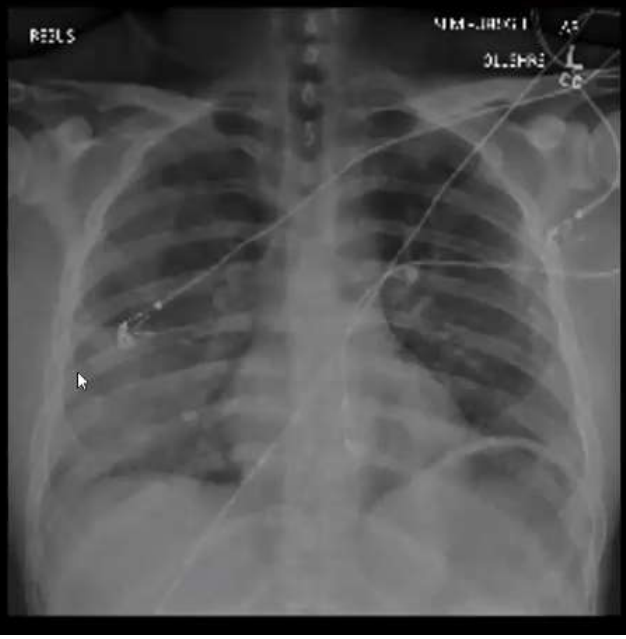
"GSW FACE"

- 38 yr old male found lying on his back in the street outside a club with bleeding from face and back of head – per police on scene - patient was shot in the head – transport by EMS who states patient is alert but continues to pray out loud
- Arrives 0l00 c/o chest pain and SOB – able to state his name but will not/cannot tell what happened to him

"GSW FACE"

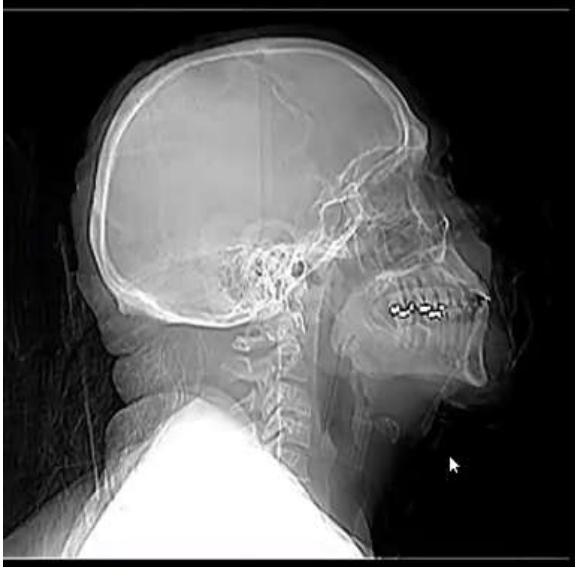
- BP 99/69 P 110 RR 20 O2Sat 82% on 15L
- Moves all extremities – able to state his name
- Avulsion skin of chin & blood in mouth
- Stellate laceration back of head – no palpable skull fracture
- Abrasion left anterior chest wall

"GSW FACE"



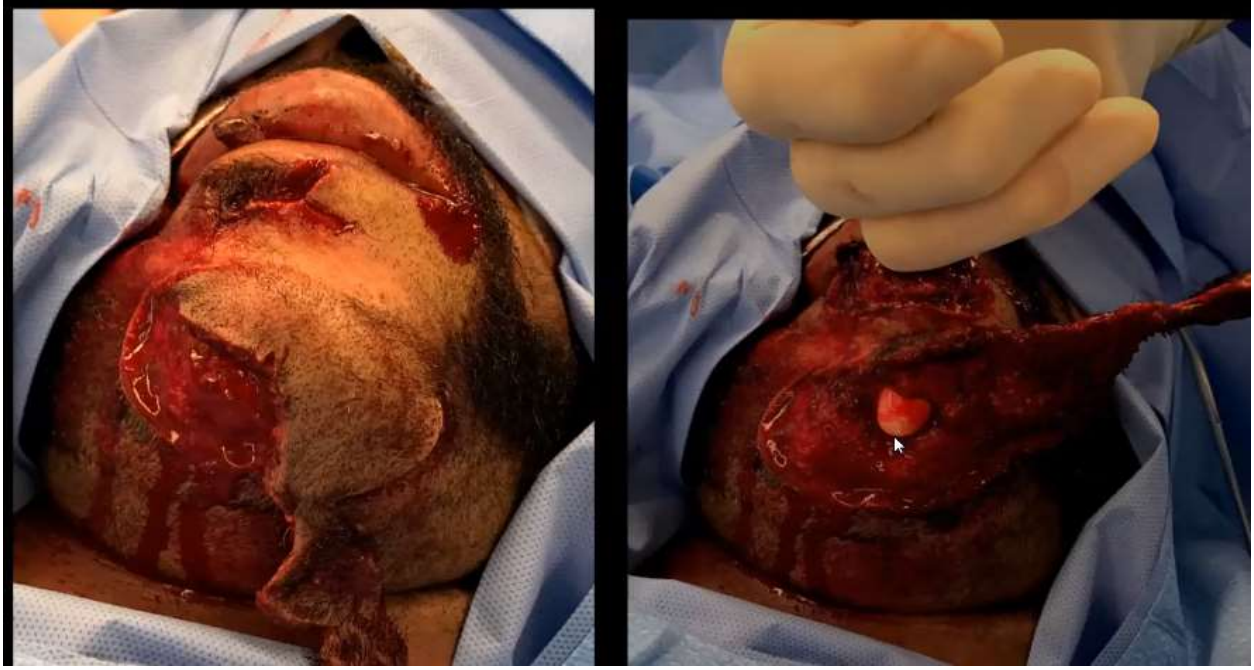
- EM wants to intubate
- PGY 4 Surgery: "he is maintaining his airway"
- Attending has trouble visualizing path of the bullet

"GSW FACE"

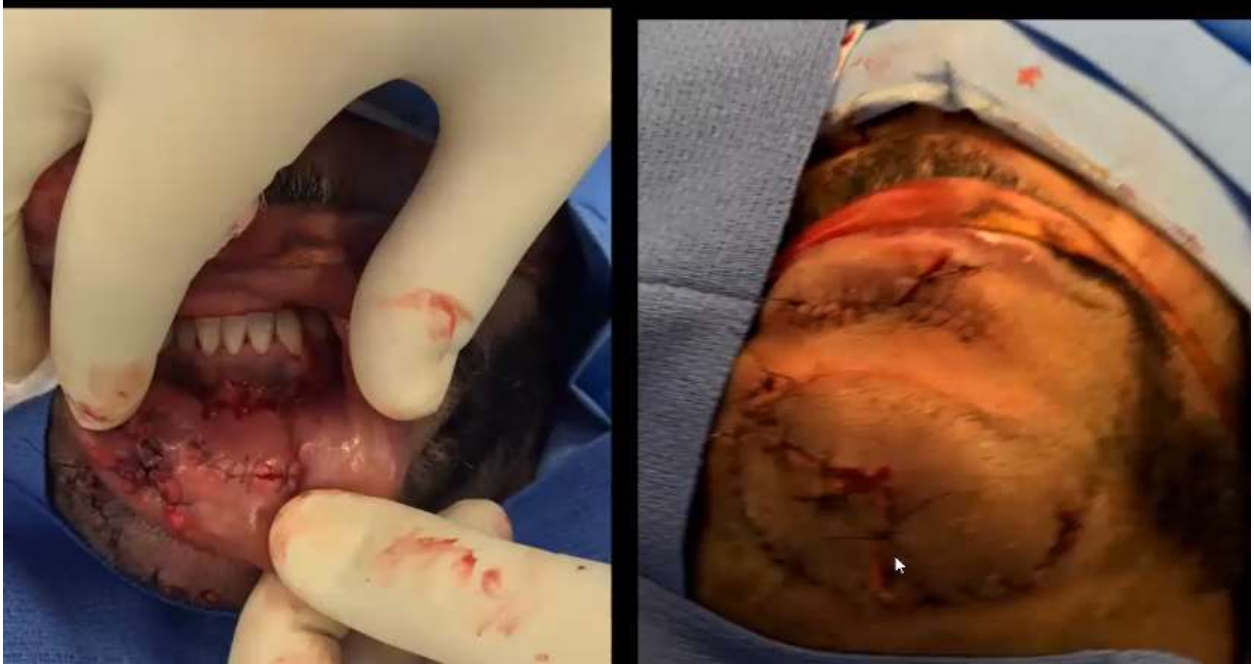


- No bullets in head
- No intracranial bleed
- No facial fractures
- EM wants to intubate

“GSW FACE”



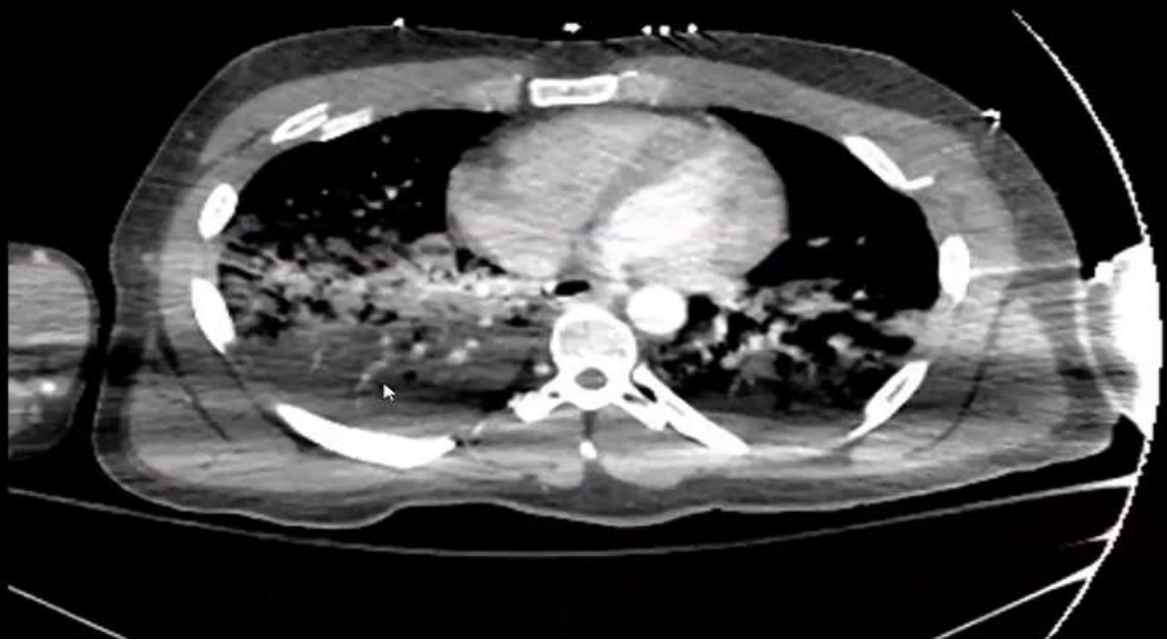
“GSW FACE”



GSW FACE

- Detective arrives in OR & asks “Was he shot”
- Surgery team: no bullets
- Detective: “Scene video shows patient run over by a pickup truck”
- CRNA: “leave intubated?”

“GSW FACE”



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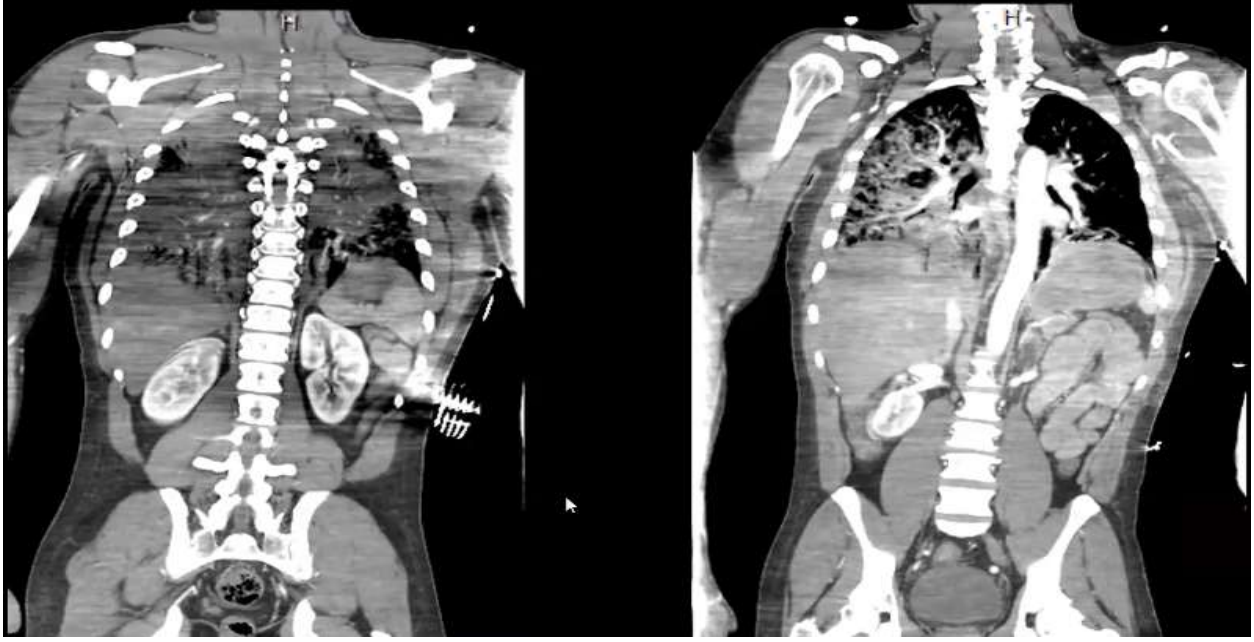
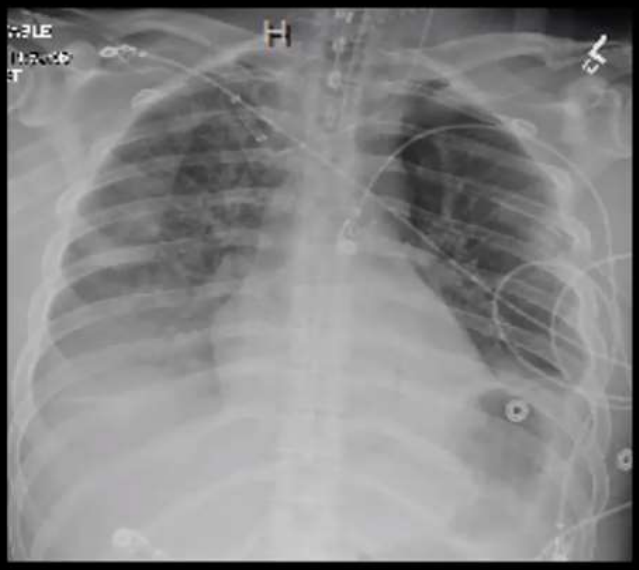


"GSW FACE"

- Pt extubated – CT shows multiple (Rt 3,4,5,9 and Lt 4,5,6,7,9,10,11) rib fractures and 20% left pneumothorax
- PO 4 hours: splinting, desaturating Hgb 15.6 and appears in respiratory distress
- Re-intubated & Left Tube Thoracostomy
- ? Tube Feed ? Antibiotics

"GSW FACE"

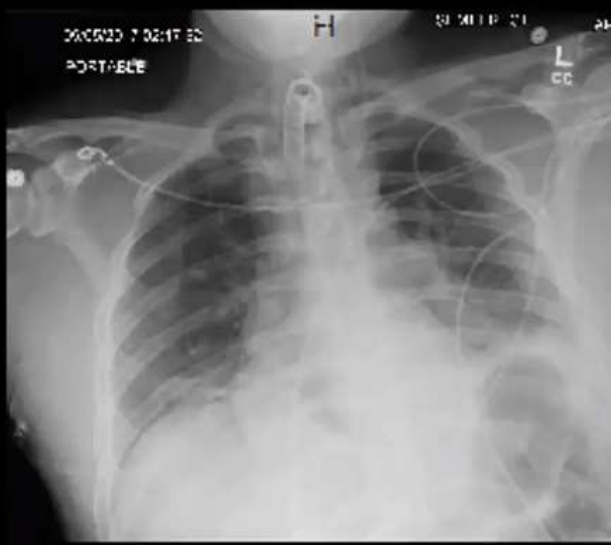


- Desaturated – 100% FiO2 + 10 cm PEEP
- Ceftriaxone & TPN
- POD 4: Trach & Bronch
- POD 6: Severe Paranoia (nurses throwing his things away)
- POD7: Improved on Haldol

POD#2:

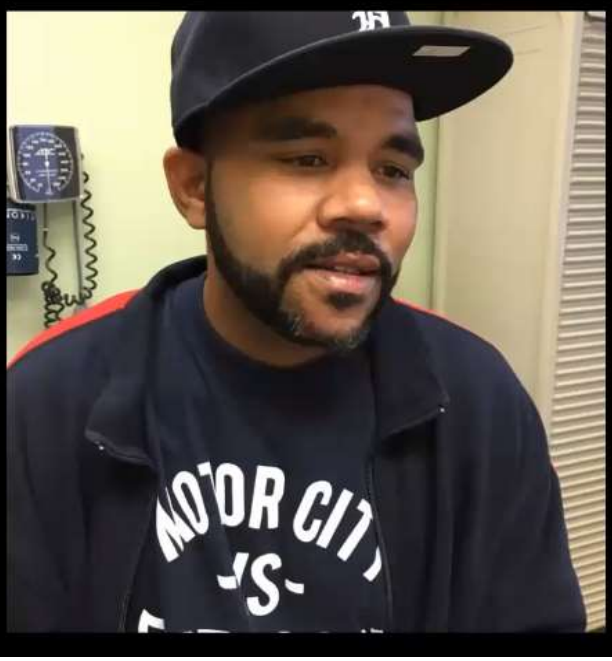
"GSW FACE"

- POD 7: BAL grew Moraxella Catarrhalis
- POD 9: Chest tube out and trach capped
- POD 12: Trach out and Regular die
- POD 13: Home



POD 10

"GSW FACE"



- Seen in Office with "CM" ~ 2 Mos post injury
- Had been seen in ED at OSH 3 wks ago for Rt ankle pain – told had fx fibula – Rx with a boot
- OSH told him he had abnormal chest x-ray – needed to have w/u for CA of lung

Head & Spinal Cord Injuries

- Do a GCS – a real one – no guesses
- GCS 15: Knows Who, Where, AND WHY!
- Protect the Airway
- Intubate before Sedation
- Listen to the Patient - "Can't Move Legs"
- Think about Central Cord
- Rx uncooperative Pt as Compromised
- Is it Dementia or Head Injury?