Questions to ponder….

- What is a “soft tissue injury”?
- Is the treating doctor screening for symptom embellishment?
- Do patients really need narcotics? And if so for how long?

How Good is Your Narrative Report?

- Do you define the injury mechanism?
- Do you site literature?
- Do you have a bibliography page?

Myths, junk science, and pseudo experts

- Property damage is related to the risk for (and severity of) injury. It says:
  - Crashes without property damage are safe
  - Injury risk and injury severity are directly proportional to crash damage
  - More property damage equals greater injury
- The facts: this relationship does not exist and is without a scientific basis

  At low speeds, crashes can be highly elastic, resulting in proportionately greater energy transfer

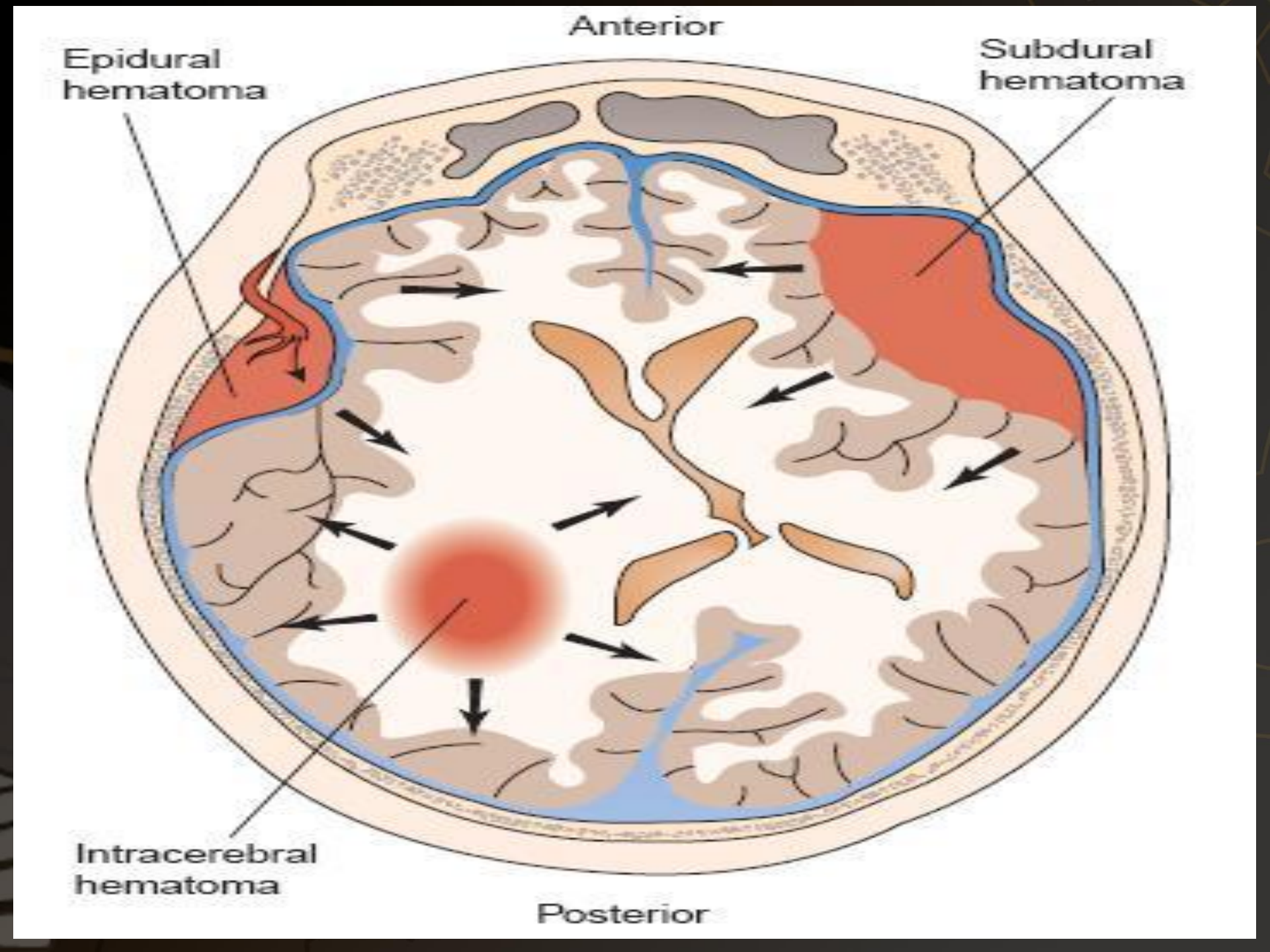
- Richter et al. (11) (delta V in rear impacts)
  - 23.2% of collisions were under 6.2 mph
  - 29.5% were from 6.8 mph to 12.4 mph
  - 42% of CAD-injured persons were in the under 6.2 mph delta V category
- Tests show that some cars can withstand crash speeds of 8-12 mph without sustaining crush damage
  - Resulting range of delta V would be 5-9 mph
- Therefore, a large fraction of injuries occur without property damage

Injury Mechanisms

- Accelerations
  - shear
  - torque
- Compression
- Blunt Force Trauma
  - contusions
  - fractures
- Lacerations

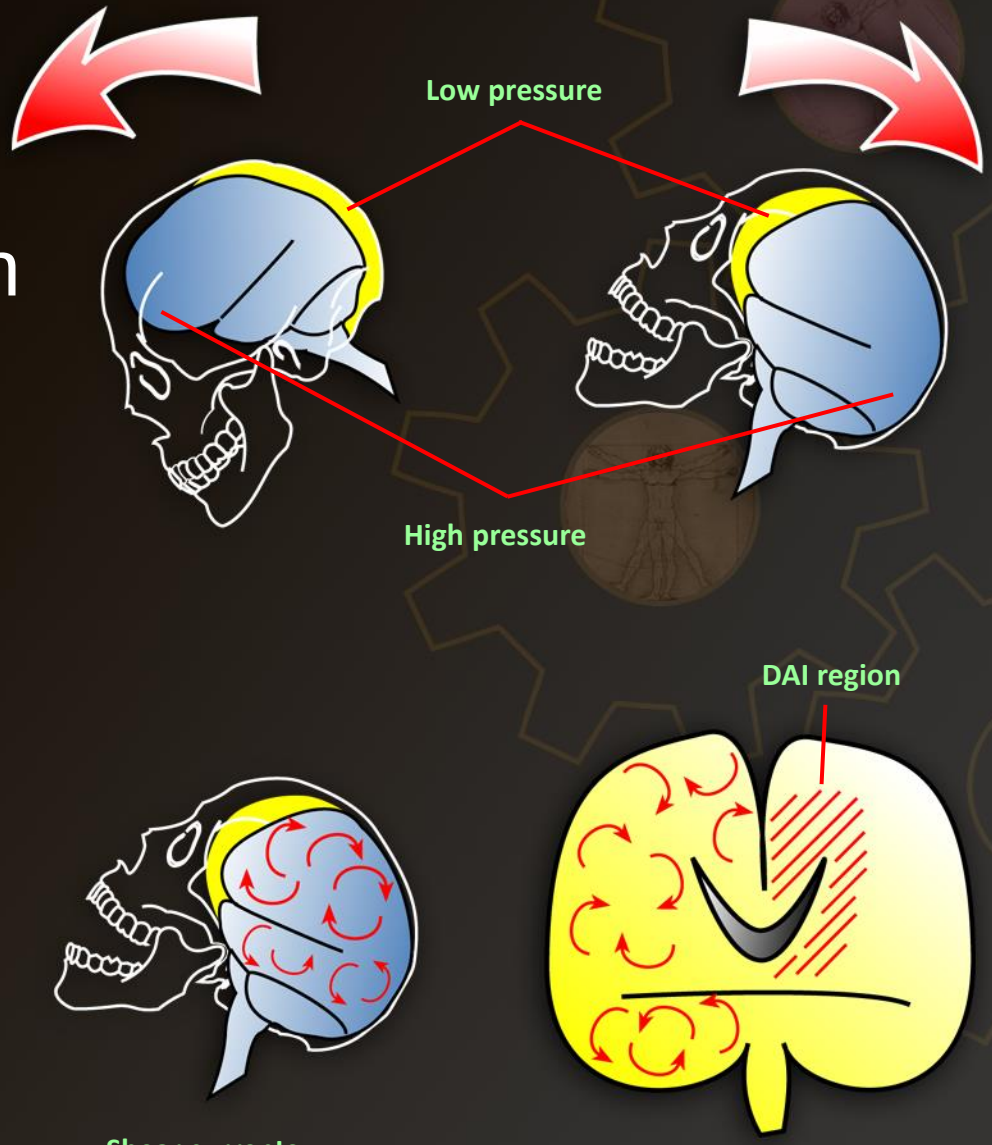
Occupant Placement

- Drivers and passengers will have predictable injuries from contact due to PDOF
- Look for signs of body contact with vehicle- on the body and vehicle interior
- Hair, skin and blood
- Hematomas


Anterior
Epidural hematoma
Subdural hematoma
Intracerebral hematoma
Posterior

Concussion and brain injury

- Mild traumatic brain injury (MTBI)
  - Caused by acceleration-induced pressure gradients
  - Shear currents develop
  - Sets up a cascade of events resulting in neuronal death
  - Cognitive problems are common in CAD (50-56)



Acceleration is time dependent

When the duration of a crash is long, acceleration will be low (with delta V held constant)

$$a = \frac{\Delta v}{\Delta t}$$

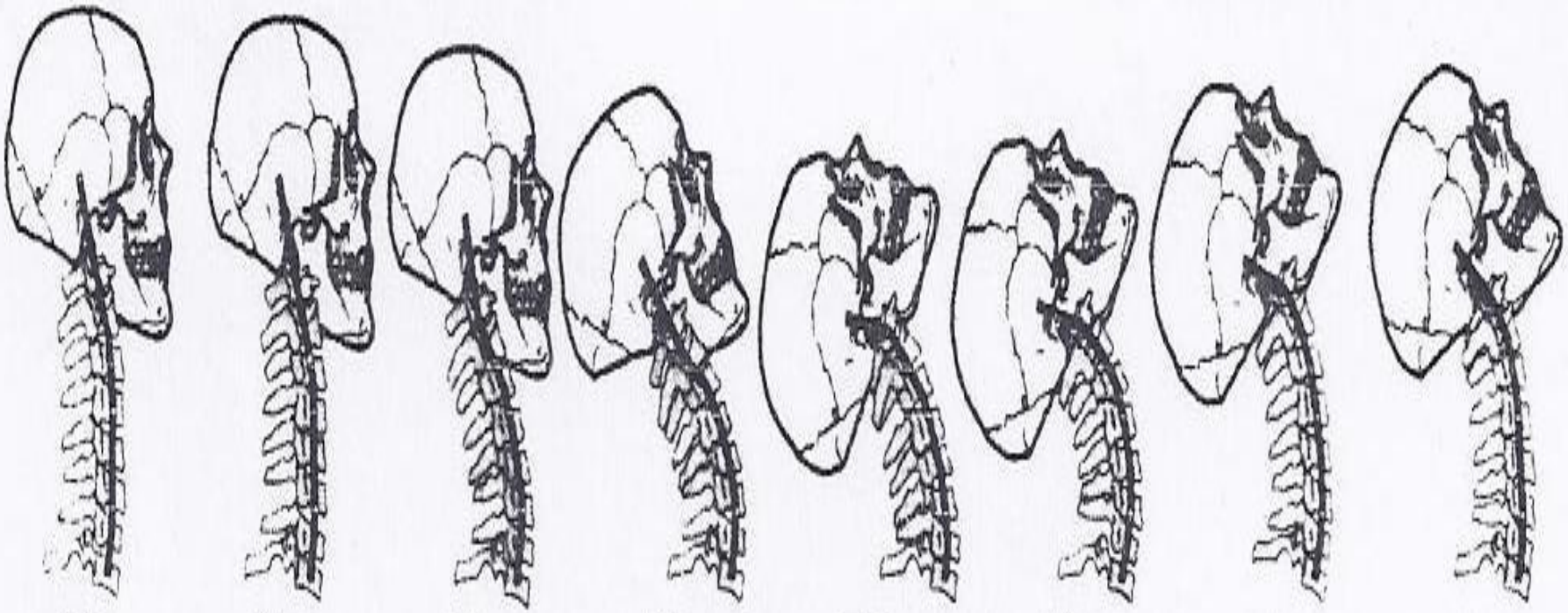
When the duration of a crash is brief, acceleration will be high (with delta V held constant)

$$a = \frac{\Delta v}{\Delta t}$$

Whiplash Produces an S-Shaped Curvature of the Neck With Hyperextension at Lower Levels

JN Grauer, MM Panjabi, J Cholewicki, J Nibu, J Dvorak

- Study Design: "A bench-top trauma sled was used to apply four intensities of whiplash trauma to human cadaveric cervical spine specimens
- Measure intervertebral rotations using high-speed cinematography…
- The trauma classes were 2.5g, 4.5g, 6.5g, and 8.5g. Significance was defined at $P < 0.01$…


NP
25 ms
50 ms
75 ms
100 ms
125 ms
150 ms
175 ms

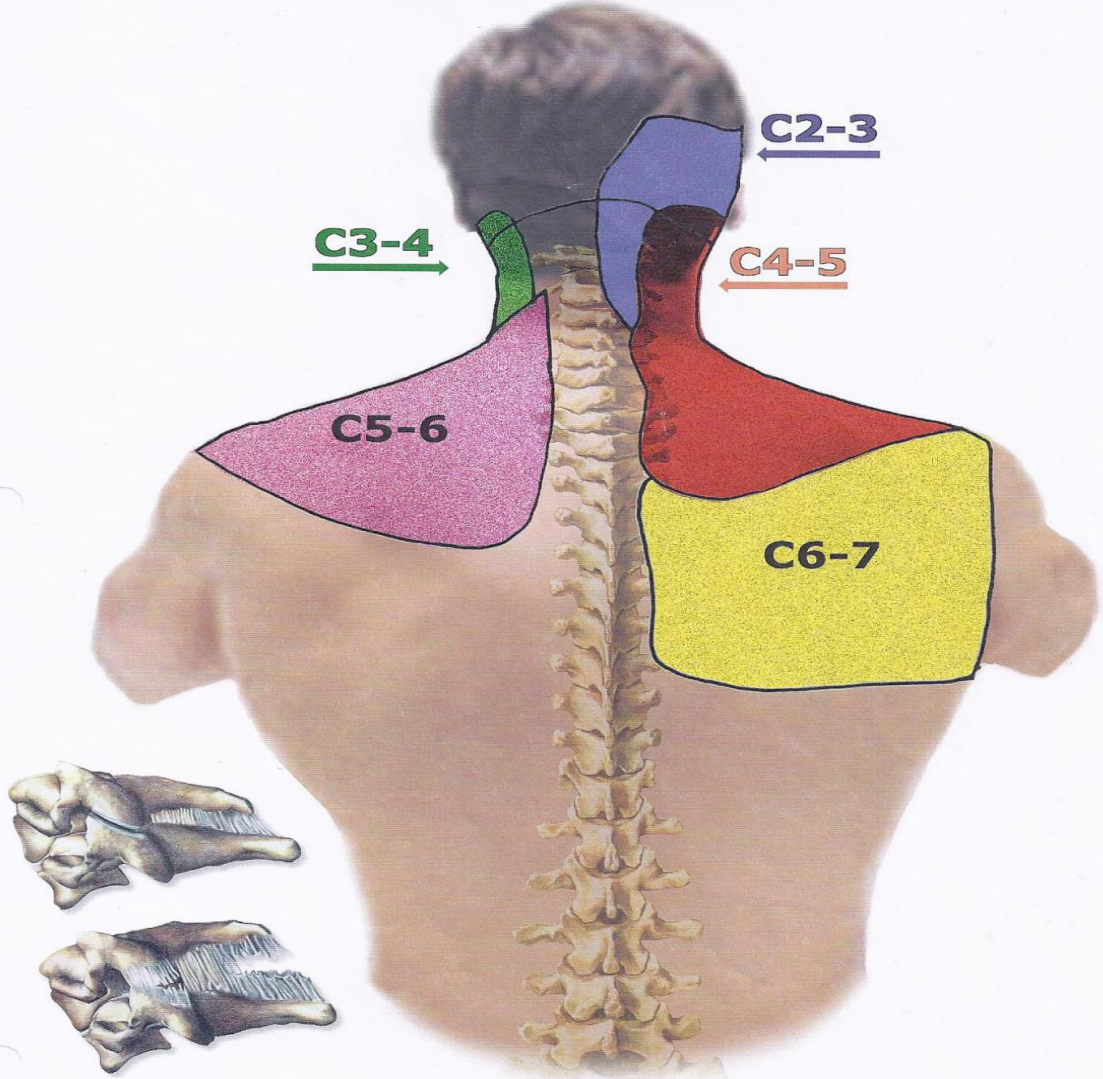
“It’s only a soft tissue injury”

- It is chiefly the spinal structures that are injured
  - Disc
  - Ligament
  - Facet joints
  - End plates
- Muscles, however, are where we often feel the pain

Referred *Pain* Chart

Why patients have continued pain from areas involved.

The chart depicts pain patterns produced by injecting different z-joints with hypertonic saline and the pain pattern that results.



Dwyer A, Aprill C, Bogduk N. Cervical zygapophyseal joint paint patterns. Spine 1990;15:453-7.