

So what do you expect with a cervical lesion?

- Quadriplegia or quadriparesis
- Bowel/bladder retention (spastic)
- Various degrees of breathing difficulties
- Neurogenic and/or spinal shock

Case scenario

- 22 y/o female
- Motor vehicle accident (hit a pole at 60mph)
- Short term loss of consciousness (10')
- Not able to move or feel her legs
- No bladder / bowel control or sensation
- Sensory level at the umbilicus

Thoracic injuries (T2-L1)

- Paraparesis or paraplegia
- UMN (upper motor neuron) signs

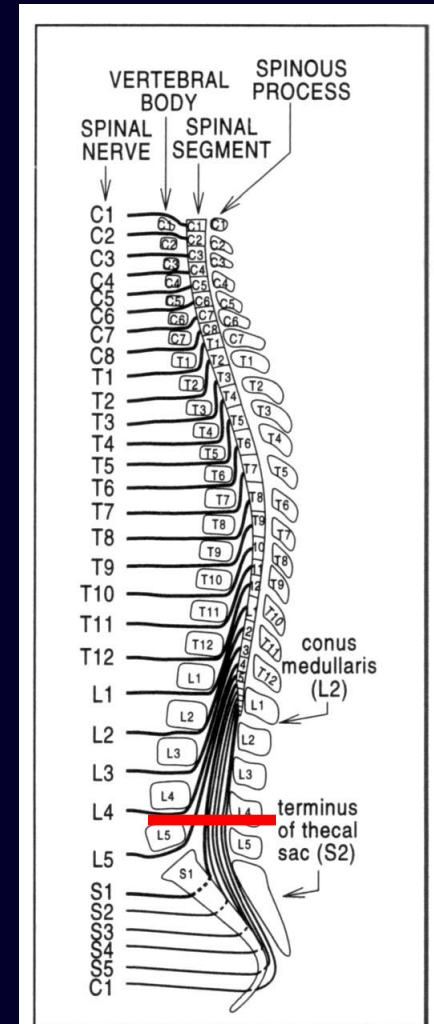
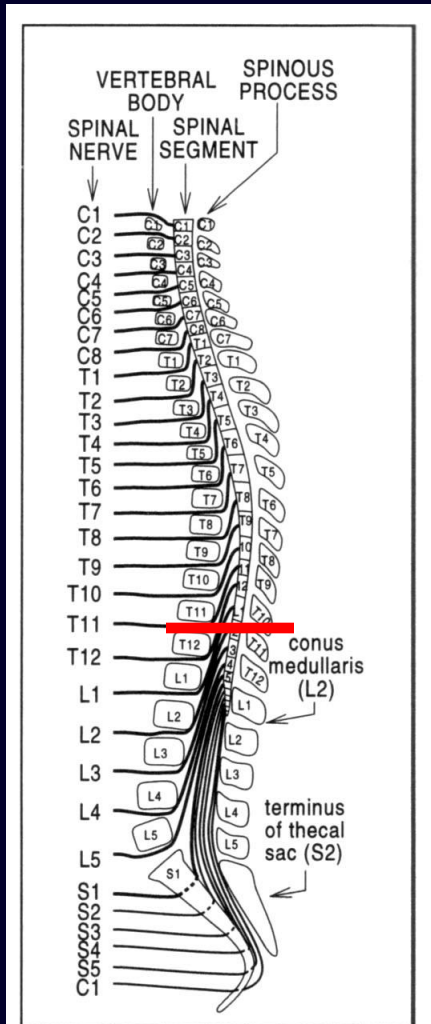
Case scenario

- 22 y/o female
- Motor vehicle accident
- Not able to move or feel her legs below the knee
- Could flex thighs against gravity
- No bladder / bowel control or sensation
- Sensory level above the knee on L, below the knee on R

Cauda equina injuries (L2 or below)

- Paraparesis or paraplegia
- LMN (lower motor neuron) signs
- Thigh flexion is almost always preserved to some degree

What is the difference between cauda equina and conus medullaris syndrome?



Goal of spine trauma care

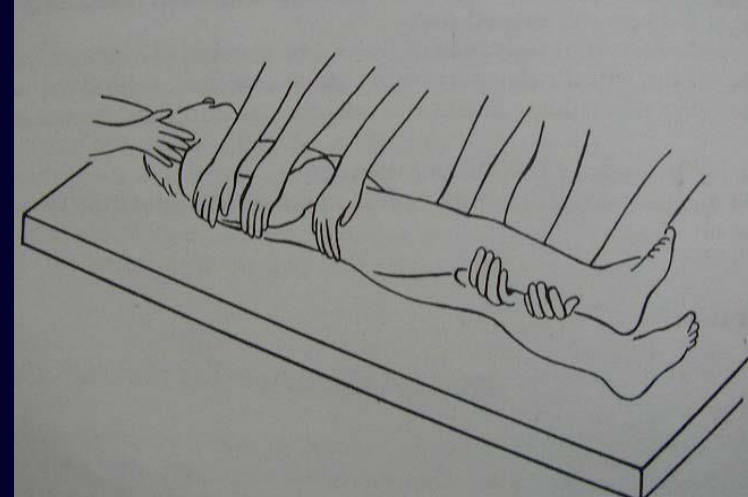
- **Protect further injury** during evaluation and management
- **Identify spine injury** or document absence of spine injury
- Optimize conditions for maximal neurologic recovery

Suspected Spinal Injury

- High speed crash
- Unconscious
- Multiple injuries
- Neurological deficit
- Spinal pain/tenderness
- **Up to 15% of spinal injuries have a second (possibly non adjacent) fracture elsewhere in the spine**

Initial Management

- **Immobilization**
 - Rigid collar
 - Sandbags and straps
 - Spine board
 - Log-roll to turn
 - **Prevent hypotension**
 - Pressors: Dopamine, not Neosynephrine
 - Fluids to replace losses; do not overhydrate
 - **Maintain oxygenation**
 - O2 per nasal canula
 - If intubation is needed, do NOT move the neck
- Advance Trauma Life Support (ATLS) guidelines**



Management in the hospital

- **NGT to suction**
 - Prevents aspiration
 - Decompresses the abdomen (paralytic ileus is common in the first days)
- **Foley**
 - Urinary retention is common
- **Methylprednisolone (Solu-Medrol)**
 - Only if started within 8 hours of injury
 - Exclusion criteria
 - Cauda equina syndrome
 - GSW
 - Pregnancy
 - Age <13 years
 - Patient on maintenance steroids

Radiologic evaluation

X-ray Guidelines (cervical)

AABBCDS

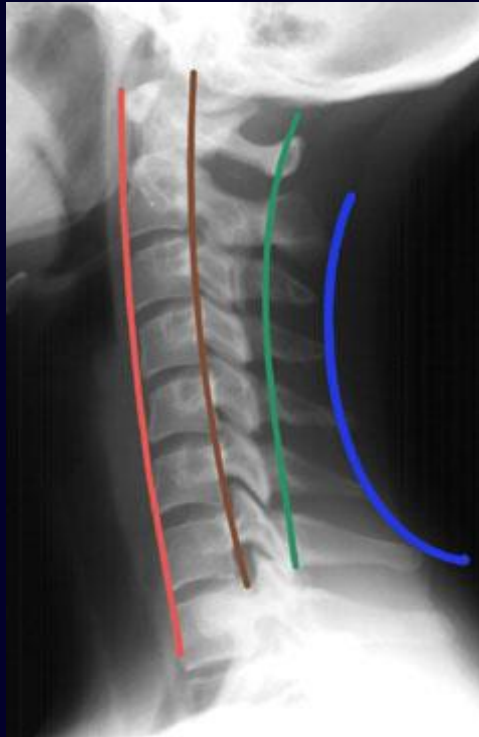
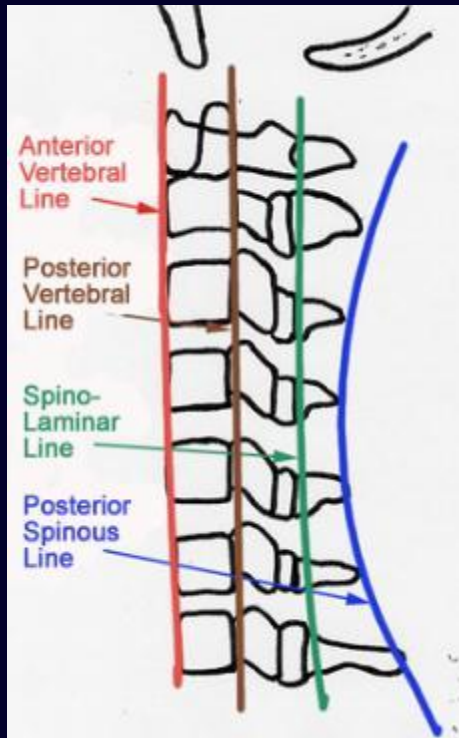
- **A**dequacy, **A**lignment
- **B**one abnormality, **B**ase of skull
- **C**artilage
- **D**isc space
- **S**oft tissue

Adequacy

- Must visualize entire C-spine
- A film that does not show the upper border of T1 is inadequate
- Caudal traction on the arms may help
- If can not, get **swimmer's view** or CT



Alignment



- The anterior vertebral line, posterior vertebral line, and spinolaminar line should have a smooth curve with no steps or discontinuities
- Malalignment of the posterior vertebral bodies is more significant than that anteriorly, which may be due to rotation
- A step-off of $>3.5\text{mm}$ is significant anywhere

Lateral Cervical Spine X-Ray

- Anterior subluxation of one vertebra on another indicates facet dislocation
 - **< 50%** of the width of a vertebral body → unilateral facet dislocation
 - **> 50%** → bilateral facet dislocation



Bones



Disc



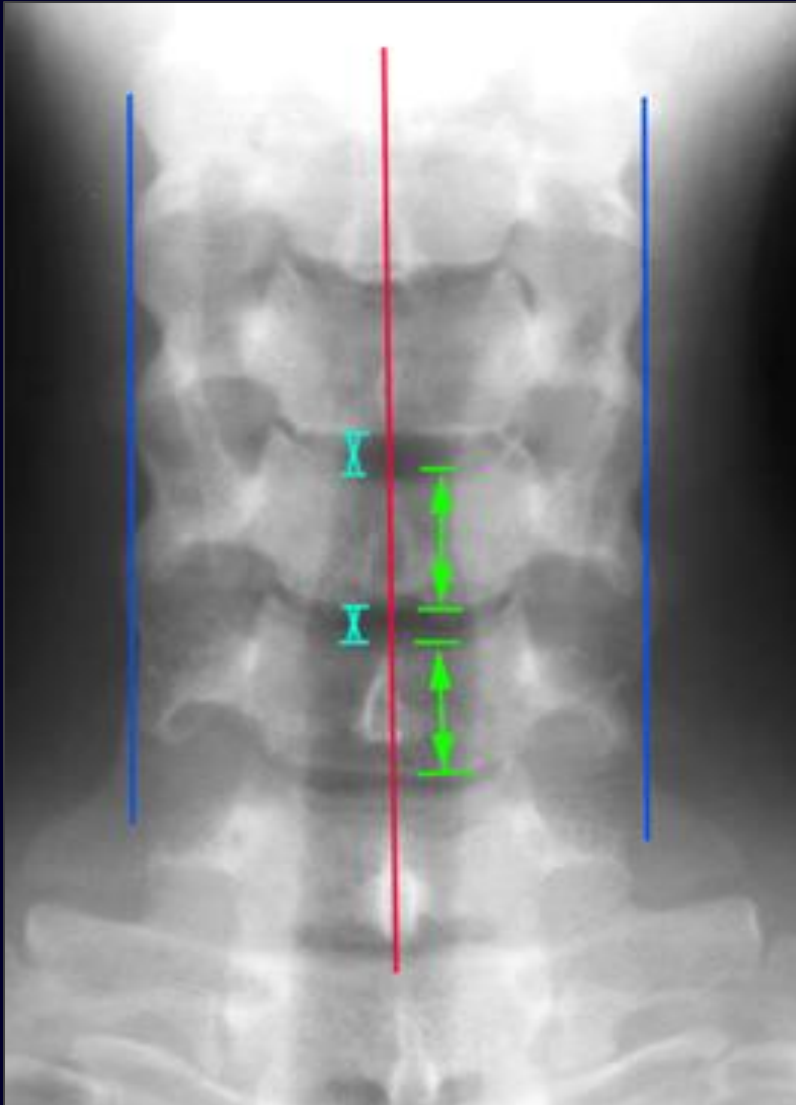
- **Disc Spaces**
 - Should be uniform
- **Assess spaces between the spinous processes**

Soft tissue



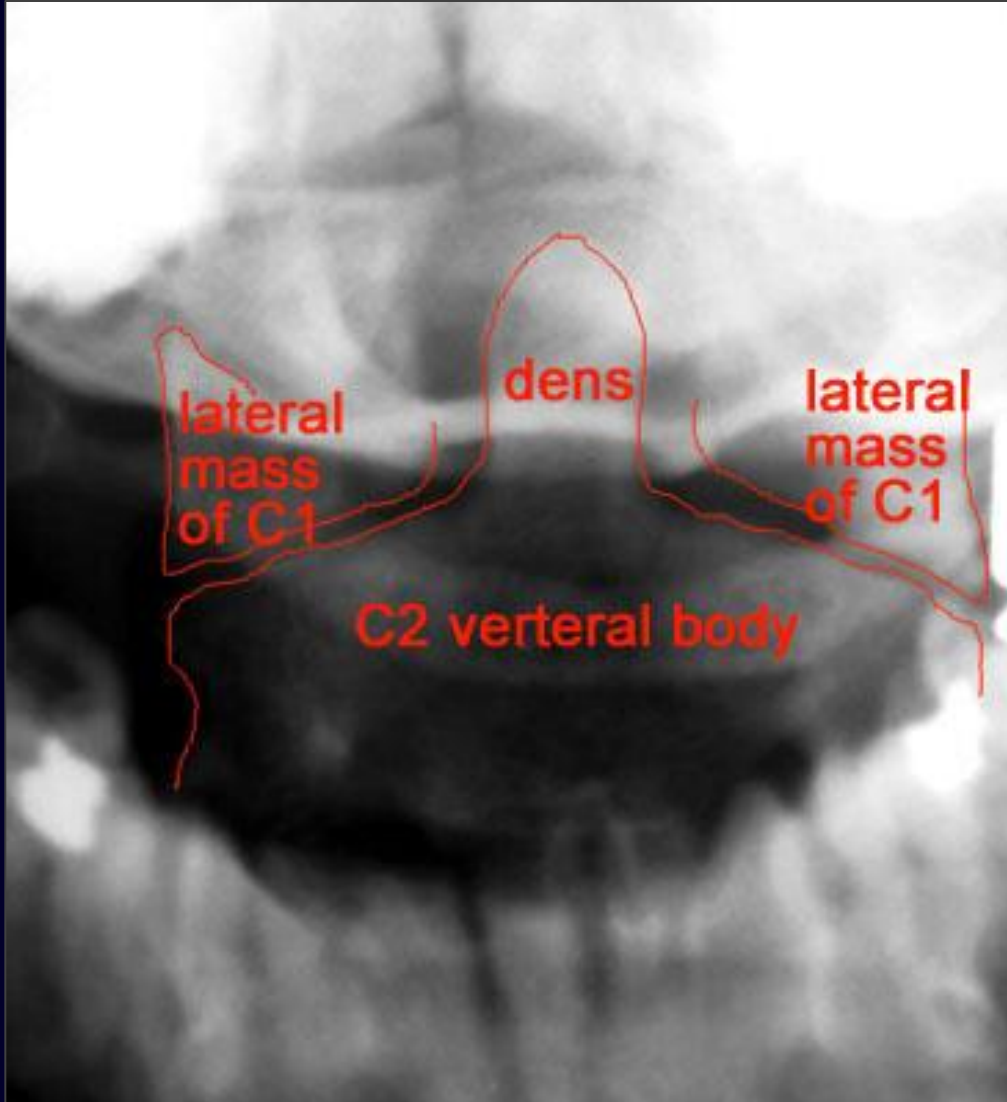
- **Nasopharyngeal space (C1)**
 - 10 mm (adult)
- **Retropharyngeal space (C2-C4)**
 - 5-7 mm
- **Retrotracheal space (C5-C7)**
 - 14 mm (children)
 - 22 mm (adults)

AP C-spine Films



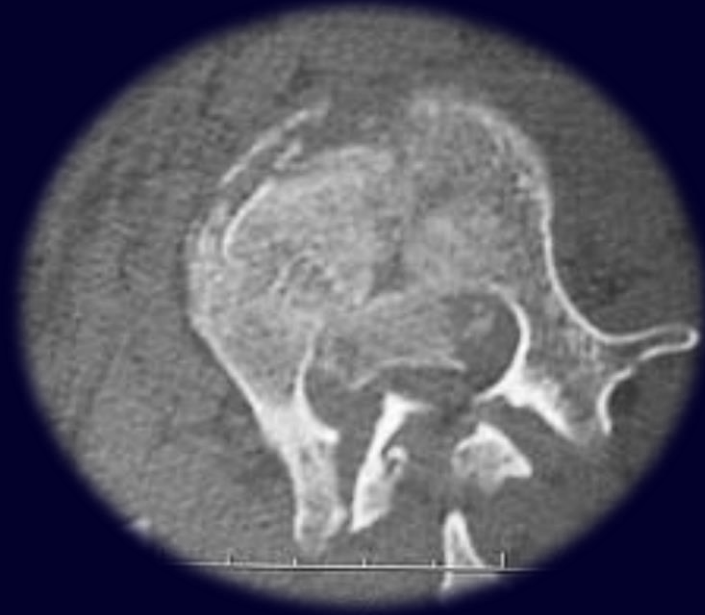
- **Spinous processes** should line up
- **Disc space** should be uniform
- **Vertebral body** height should be uniform. Check for oblique fractures.

Open mouth view



- **Adequacy:** all of the dens and lateral borders of C1 & C2
- **Alignment:** lateral masses of C1 and C2
- **Bone:** Inspect dens for lucent fracture lines

CT scan



- Good in acute situations
- Shows bone very well
- Sagittal reconstruction is mandatory
- Soft tissues (discs, spinal cord) are poorly visualized
- Do NOT give contrast in trauma patients (contrast is bright, mimicking blood)

MRI



- Almost never an emergency
 - Exception: cauda equina syndrome
- Shows tumors and soft tissues (e.g., herniated discs) much better than CT scan
- May be used to clear c-spine in comatose patients

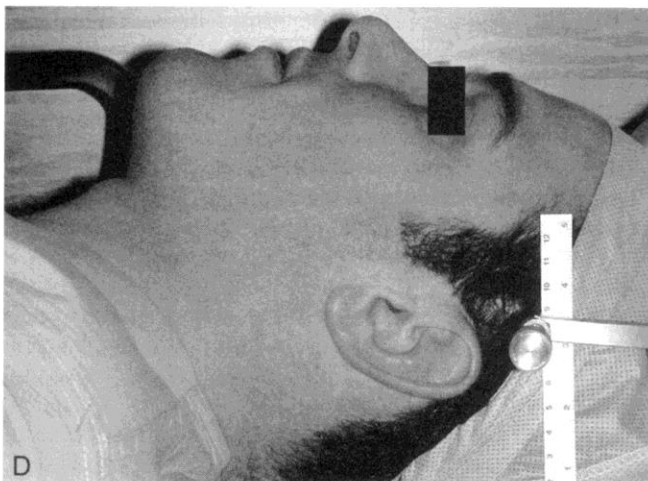
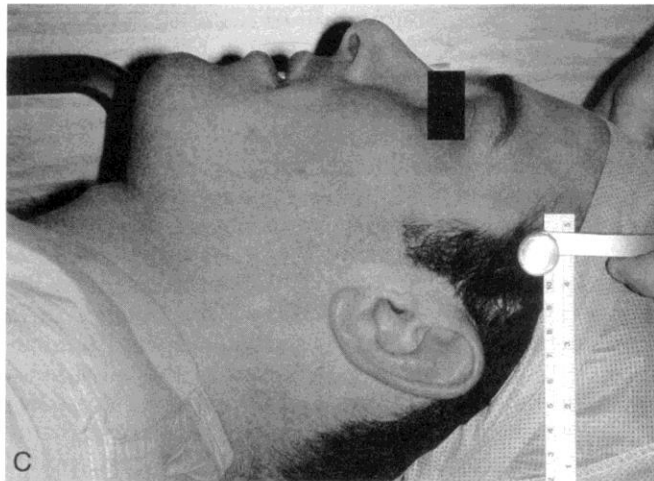
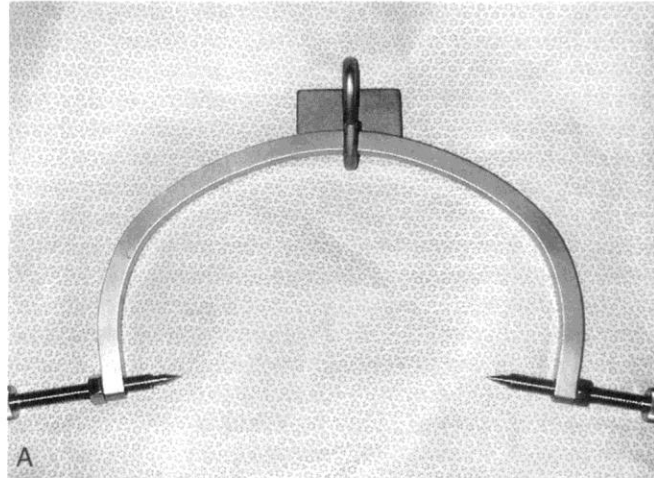
Lumbar Puncture

- Sedate the patient and make your life easier
- Measure opening pressure with legs *straight*
- Always get head CT prior to LP to r/o increased ICP or brain tumor

Cervical Spine Clearance

- Occiput to T1 need to be cleared
- ER, Neurosurgery or Orthopedics physician
- If the patient
 - Is awake and oriented
 - Has no distracting injuries
 - Has no drugs on board
 - Has no neck pain
 - Is neurologically intactthen the c-spine can be cleared clinically, without any need for X Rays
- CT and/or MRI is necessary if the patient is comatose or has neck pain
- Subluxation >3.5mm is usually unstable

Gardner-Wells tongs



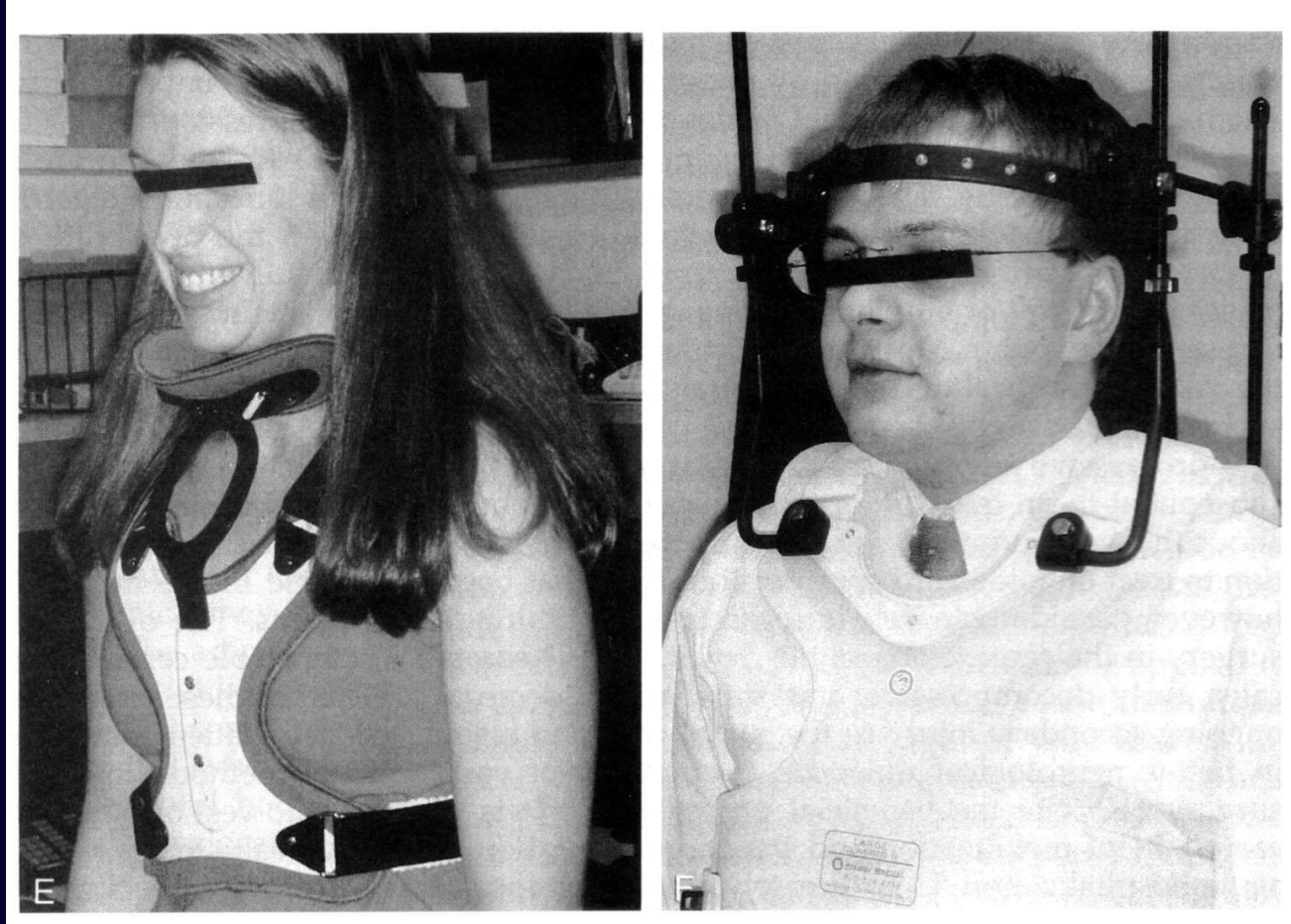
Cervical Traction

- Gardner-Wells tongs
- Provides temporary stability of the cervical spine
 - Contraindicated in unstable hyperextension injuries
- Weight depends on the level (usually 5lb/level, start with 3lb/level, do not exceed 10lb/level)
- Cervical collar can be removed while patient is in traction
- Pin care: clean q shift with appropriate solution, then apply povidone-iodine ointment
- Take X Rays at regular intervals and after every move from bed

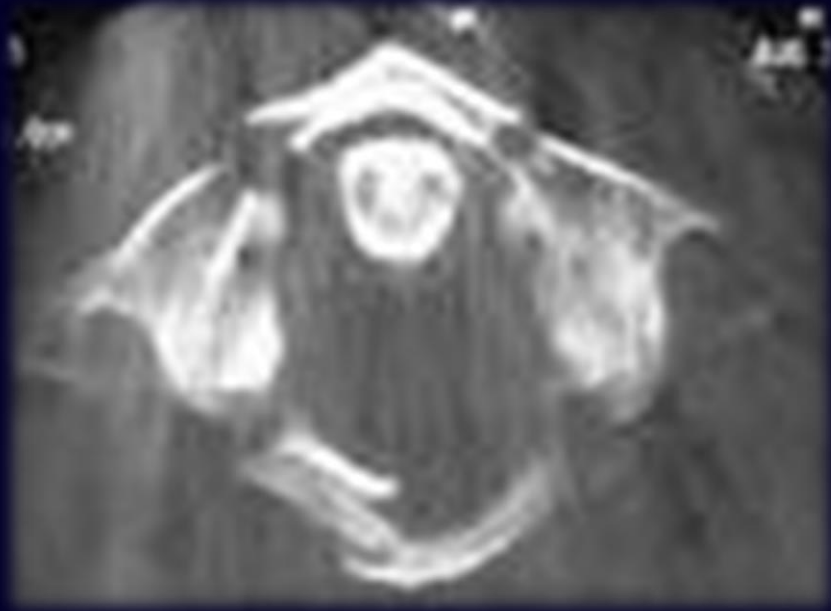
Soft and hard collars



Minerva vest and halo-vest



Jefferson Fracture



- Burst fracture of C1 ring
- **Unstable fracture**
- Increased lateral ADI on lateral film if ruptured transverse ligament and displacement of C1 lateral masses on open mouth view
- Need CT scan

Burst Fracture



- Fracture of C3-C7 from axial loading
- Spinal cord injury is common from posterior displacement of fragments into the spinal canal
- **Unstable**

Clay Shoveler's Fracture



- Flexion fracture of spinous process
- C7>C6>T1
- Stable fracture

Flexion Teardrop Fracture



- Flexion injury causing a fracture of the anteroinferior portion of the vertebral body
- **Unstable** because usually associated with posterior ligamentous injury

Bilateral Facet Dislocation



- Flexion injury
- Subluxation of dislocated vertebra of greater than $\frac{1}{2}$ the AP diameter of the vertebral body below it
- High incidence of spinal cord injury
- Extremely **unstable**

Hangman's Fracture

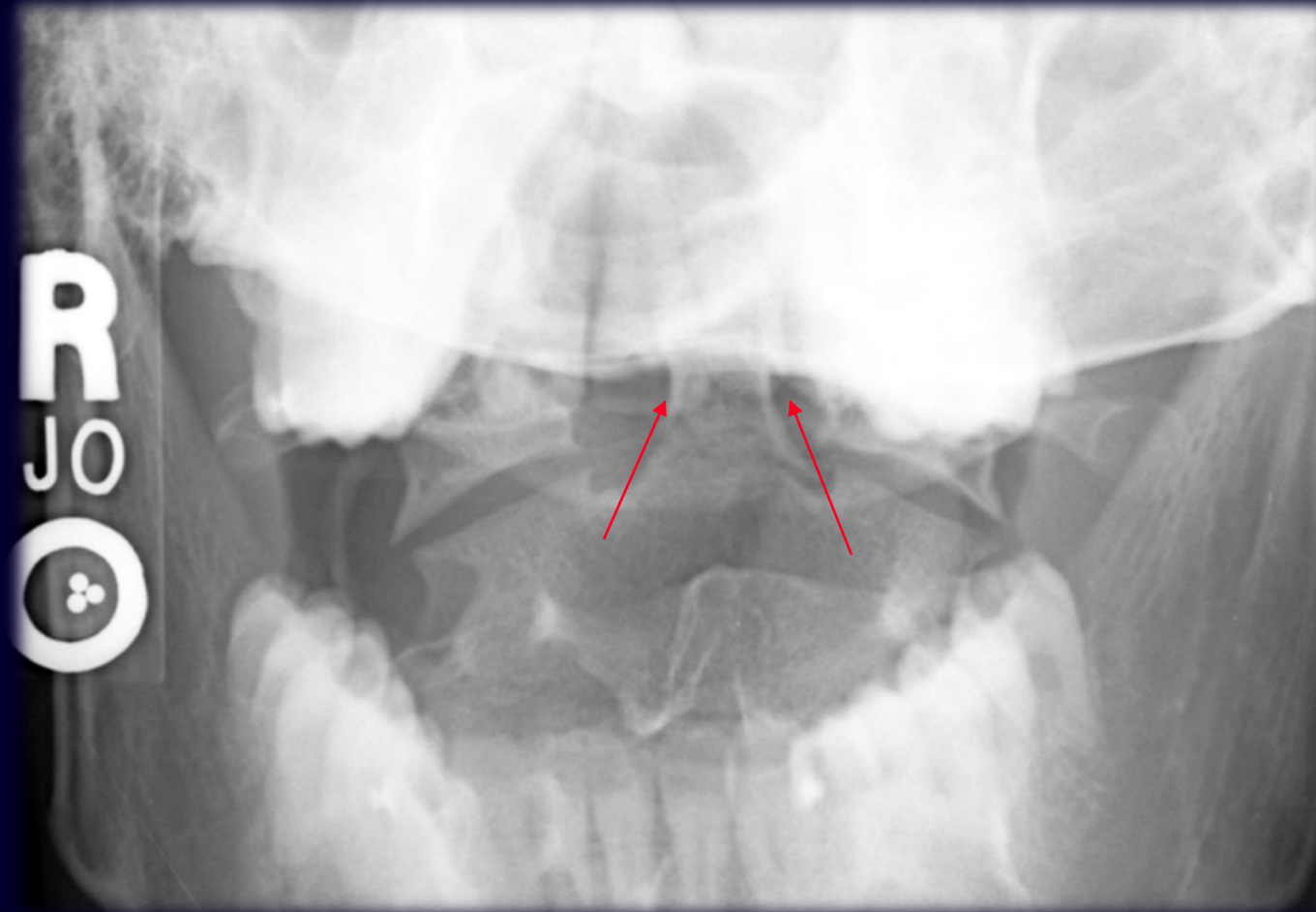


- Extension injury
- Bilateral fractures of C2 pedicles (white arrow)
- Anterior dislocation of C2 vertebral body (red arrow)
- **Unstable**

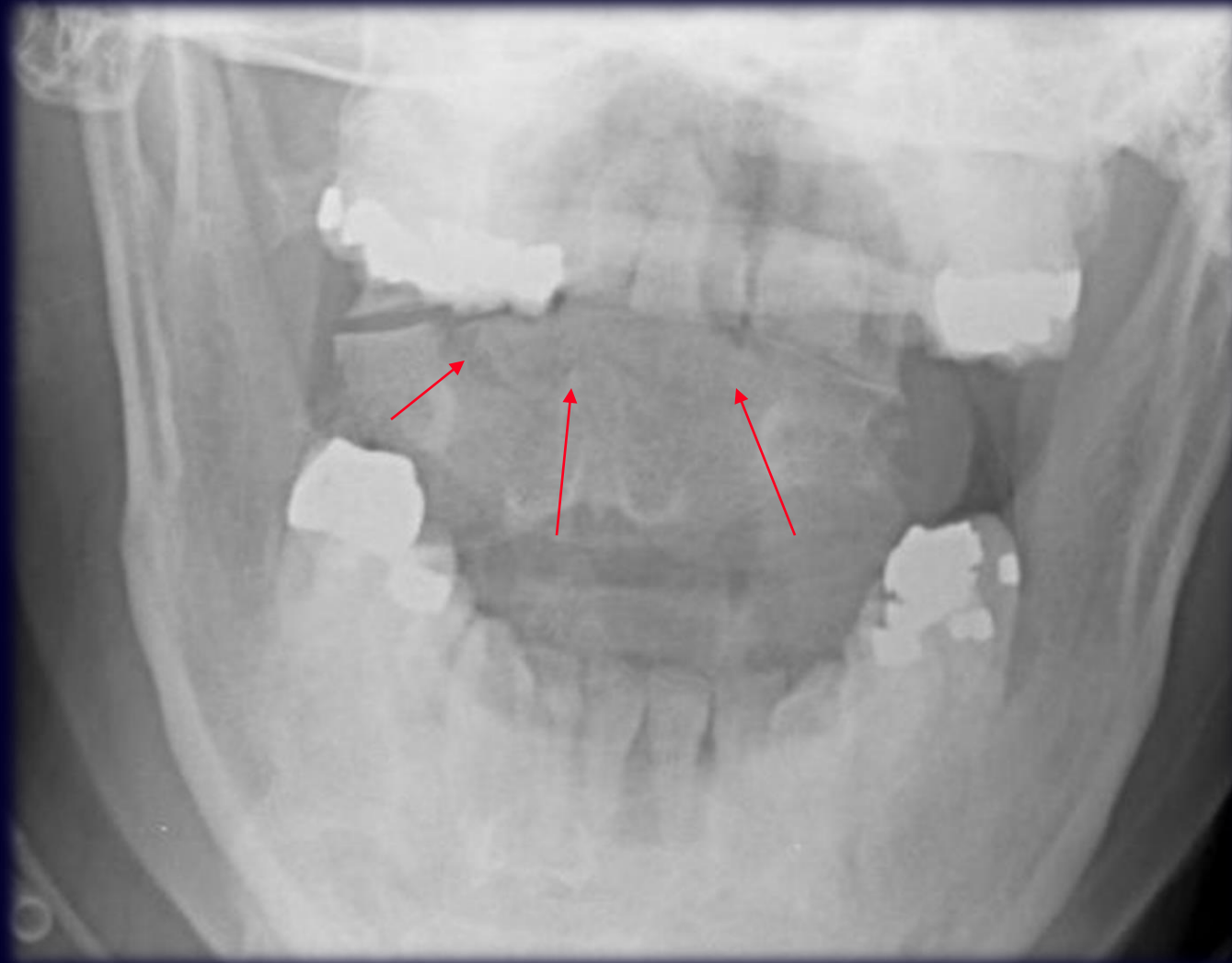
Odontoid Fractures

- Complex mechanism of injury
- Generally **unstable**
- Type 1 fracture through the tip
 - Rare
- Type 2 fracture through the base
 - Most common
- Type 3 fracture through the base and body of axis
 - Best prognosis

Odontoid Fracture Type II



Odontoid Fracture Type III



Surgical Decompression and/or Fusion

- **Indications**
 - **Decompression of the neural elements (spinal cord/nerves)**
 - **Stabilization of the bony elements (spine)**
- **Timing**
 - **Emergent**
 - **Incomplete lesions with progressive neurologic deficit**
 - **Elective**
 - **Complete lesions (3-7 days post injury)**
 - **Central cord syndrome (2-3 weeks post injury)**

Long term care

- Rehab for maximizing motor function
- Bladder/bowel training
- Psychological and social support