Overview of Spine Fixation

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Spinal Injuries

- Nearly half "multi-trauma"
- USA - 50 people in 1 million per year
- Still a mortality associated with spinal injuries
  - Survival chances increasing
    - Mortality from respiratory failure
- Death rate now approaching that of normal population

Spinal Fractures

- Most common cause
  - Motor vehicle accident in younger people
  - Falls in the elderly
- Delays in diagnosis common
  - Decreased levels of consciousness
  - Comatose patients
  - ** High clinical suspicion **

- A – Airway
- B – Breathing
- C – Circulation
- D – Do the damned CT

The Goals

Background

- Fixation vs Fusion
  - Fixation - implantation of metal-work
  - Fusion – "bone grafting"
  - Fixation occurs at surgery
  - Fusion will take 4 weeks to 6 months
- Additional adjuncts to fusion
  - BMPs

One patient's experience of spinal fusion surgery

Treatment Goals

- Realign the spine
- Prevent loss of function
- Improve neurological recovery
- Obtain and maintain spinal stability
- Obtain early functional recovery

The Dreaded Skull Tongs

- Gardner-Wells tongs
- Clinical monitoring essential
- 10 pounds weight applied
  - Weight added in 5-pound increments
  - Lateral x-rays after each addition
  - General guideline
    - 10 pounds for the head
    - 5 pounds for each level

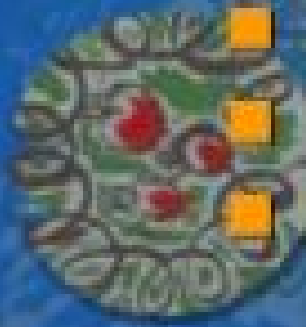
He doesn't look too happy does he?

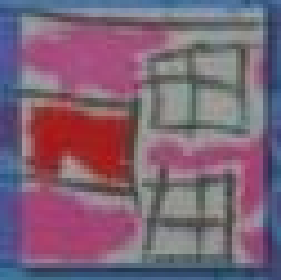
The Halo-Thoracic Vest

- First used by Perry and Nickels 1959
  - Poliomyelitis
- Complications in up to 30%

Complications of HTV

- **Complications (%)**
- Pin loosening 36
- Pin infection 20
- Pin site pain 18
- Pressure sores 11
- Disfiguring scars 9
- Nerve injury 2
- Dysphagia 2
- Bleeding at pin site 1
- Dural puncture 1





Spinal Fixation – Cervical Spine

- Unstable injuries require operation !!!
  - Reduction and internal fixation
  - Anterior, posterior, or combined approaches
  - Allows rapid mobilization
  - Healing within 8 to 12 weeks
  - In spinal cord compression – decompression indicated

Fracture Anatomy

- CT scan
  - Boney/Fracture details

- MRI scan
  - Determine disc/ligamentous/cord integrity

Basic Principles in the C-Spine

- The injury must be clearly defined
- Laminectomy has a limited role
- Cord compression anterior – requires an anterior approach onto the spine
- Posterior ligamentous or bony instability – requires posterior stabilization

Timing of Surgery

- Controversial
  - Progressive neurological deficit - emergency decompression
  - Complete spinal cord injuries or static incomplete spinal cord injuries - ? Delayed surgery
  - No conclusive evidence in the literature
  - Most surgeons adopt the 'as soon as sensibly possible' attitude

Specific Fracture Patterns

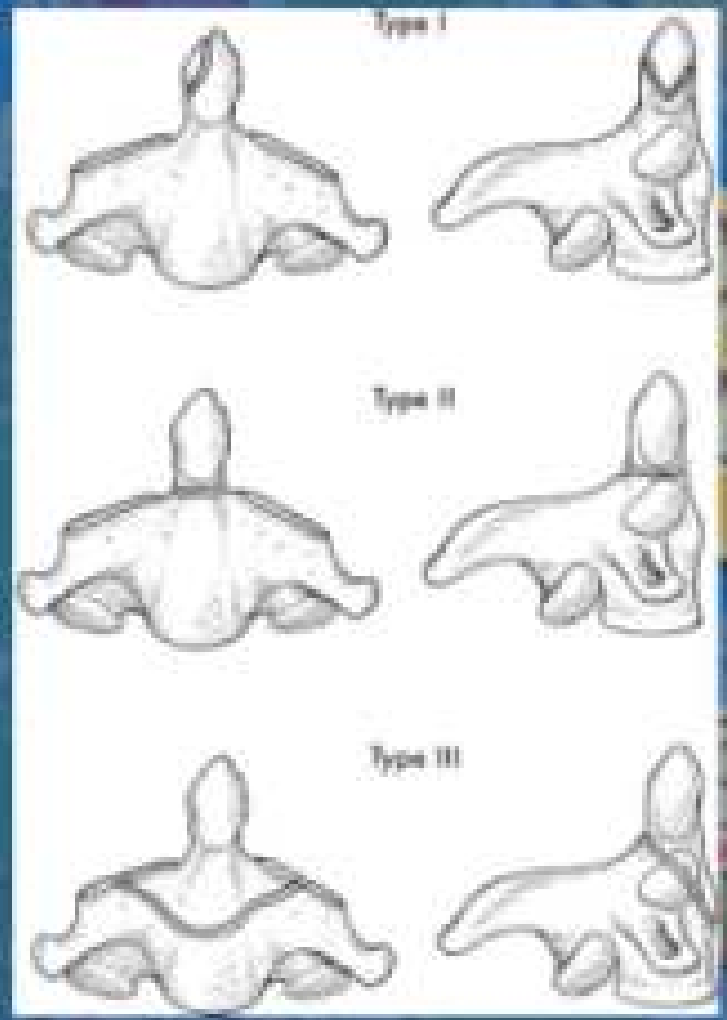
- Atlantooccipital joint dislocations (C0-C1)
  - Uncommon
  - Many patients die immediately
  - Reduction of the dislocation
  - Stabilization of atlantooccipital joint
  - Early surgical stabilization

C1 Fractures

- Jefferson 1920
  - Axial loading
  - 53% other cervical fractures
- Most fractures can be treated with immobilization

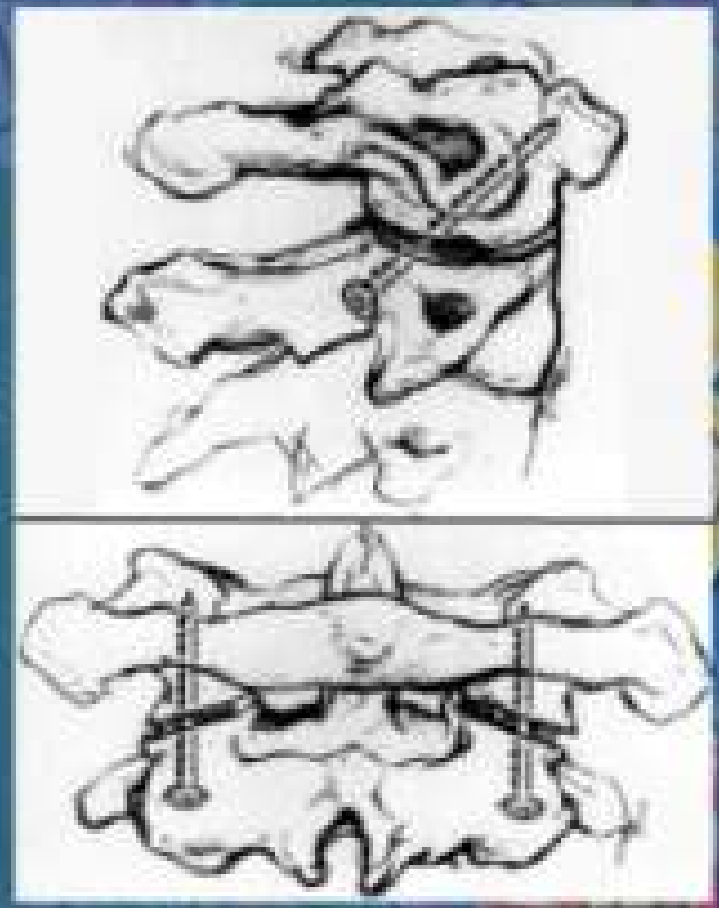
Peg Fracture

- aka Dens Fracture
- Anderson and D'Alonzo classification
  - Type I – stable
  - Type II (most common)
    - 36% nonunion rate
  - Type III - heal without surgery in 90%
- Displacement and angulation determine prognosis



Surgery for Peg Fractures

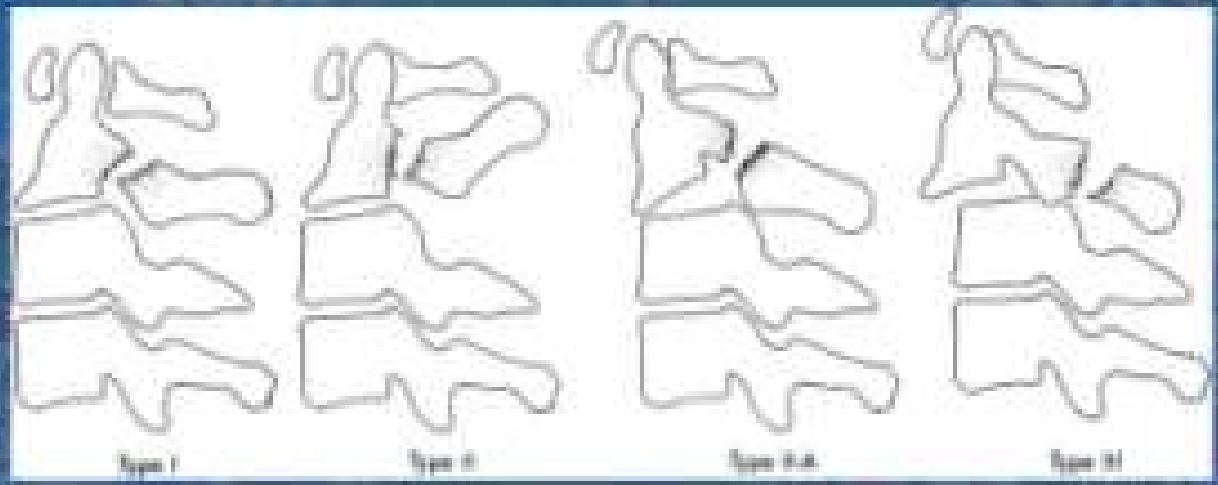
- **Transarticular C1-2 Screw Fixation**
  - Complex anatomy
  - 98% fusion rate
  - Screw across C1/2 joint
  - Doesn't address the fracture per se



- **Anterior Screw Fixation**
  - Screw(s) across the fracture
    - Anterior approach

Hangman's Fracture

- Most common cause - motor vehicle accidents
- 4 different patterns
  - type III injuries are the only type that commonly require surgical stabilization

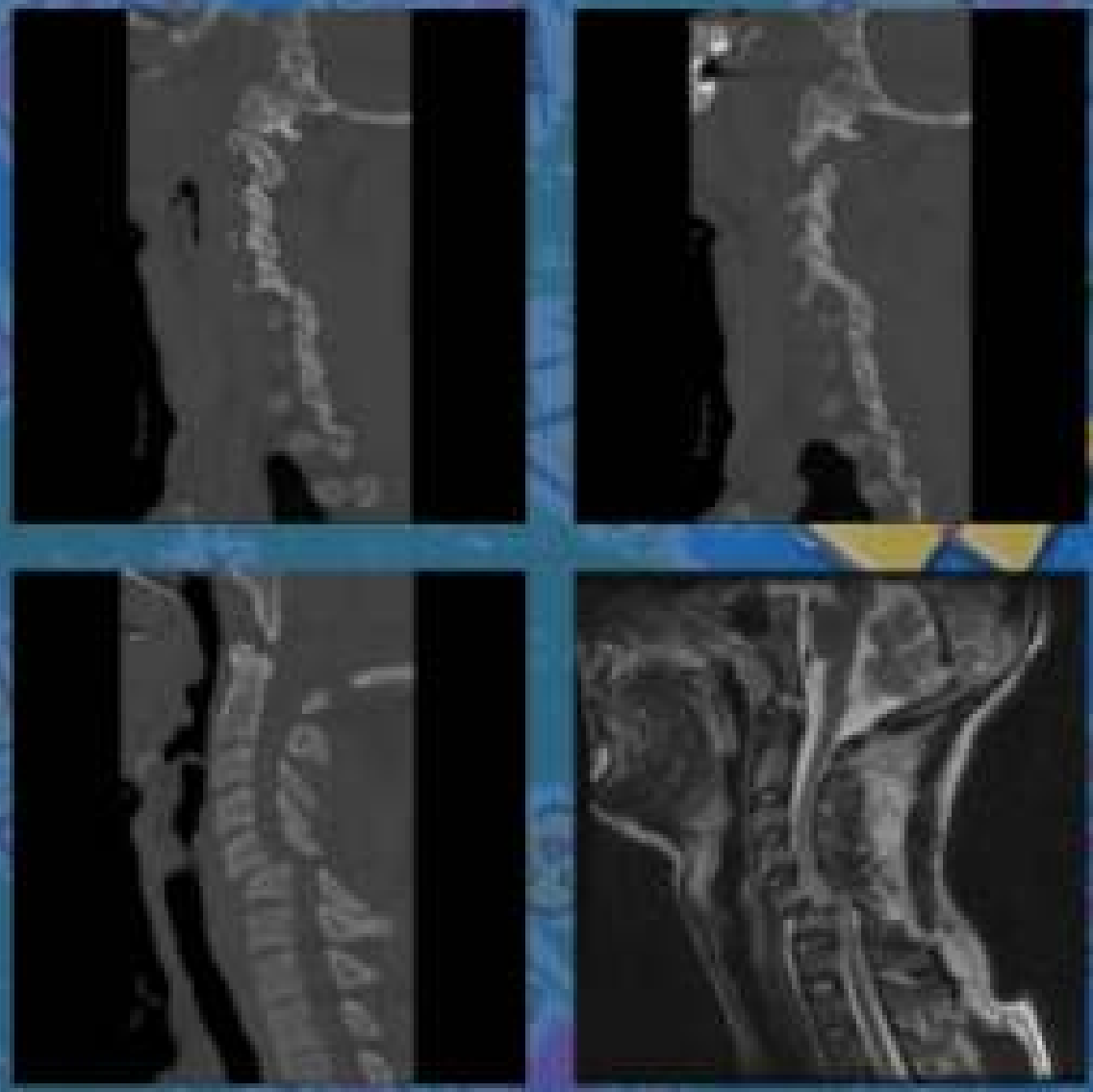


Injuries to Lower Cervical Spine (C3-7)

- Posterior Ligamentous Injury.
  - Distraction and flexion
  - Widening of the interspinous process space
  - Purely ligamentous injury
    - Healing unlikely with external immobilization

Facet Dislocation

- Unilateral facet dislocations
  - Flexion and rotation
  - Reduction in only 50%
  - Internal fixation if irreducible
- Bilateral facet dislocations
  - 50% anterior subluxation
  - Neurological sequelae common

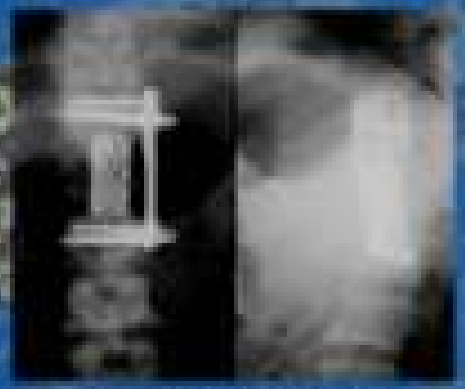


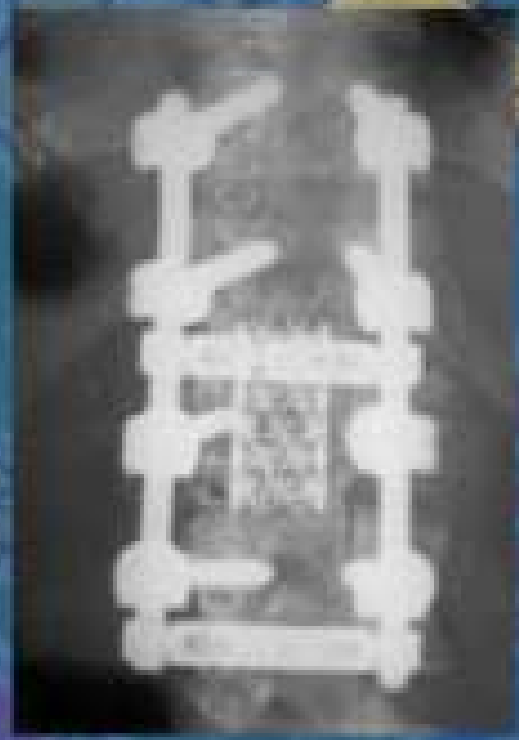
Cervical Fractures

- Compression fractures
- Burst fractures
  - Decompression of the spinal cord
    - Bone strut from iliac crest
    - Screw/Plate device
    - +/- posterior stabilization

Thoracic and Lumbosacral Fractures

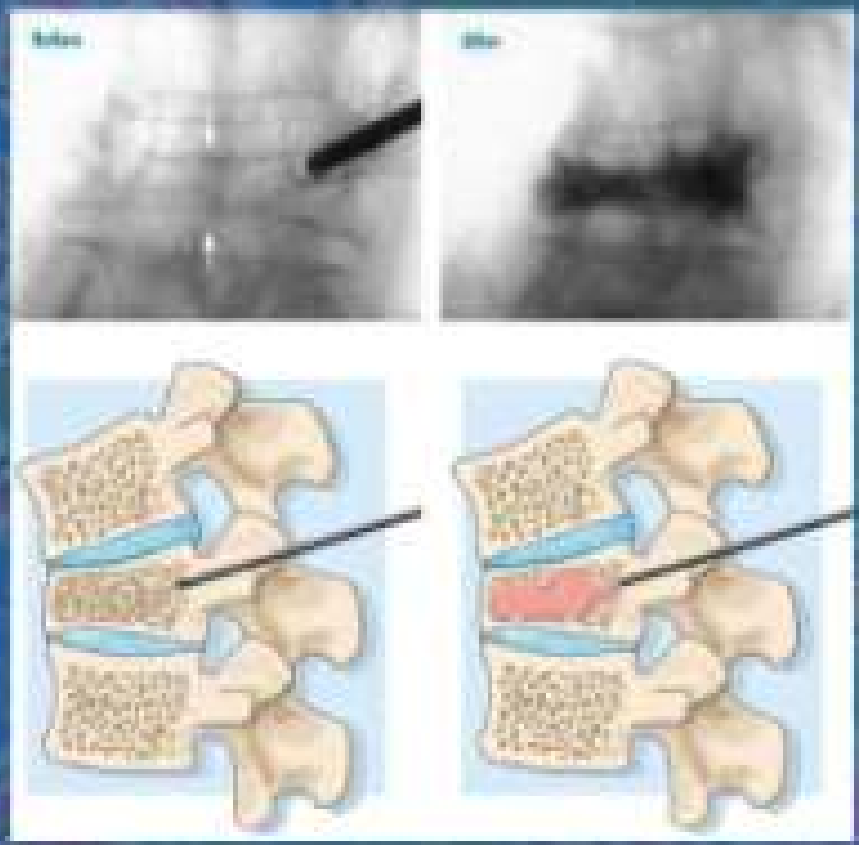
- Much more difficult to decompress from an anterior approach
  - Heart/lungs/aorta and intestine/liver/stomach
- Otherwise posterolateral approach
- Different fixation devices



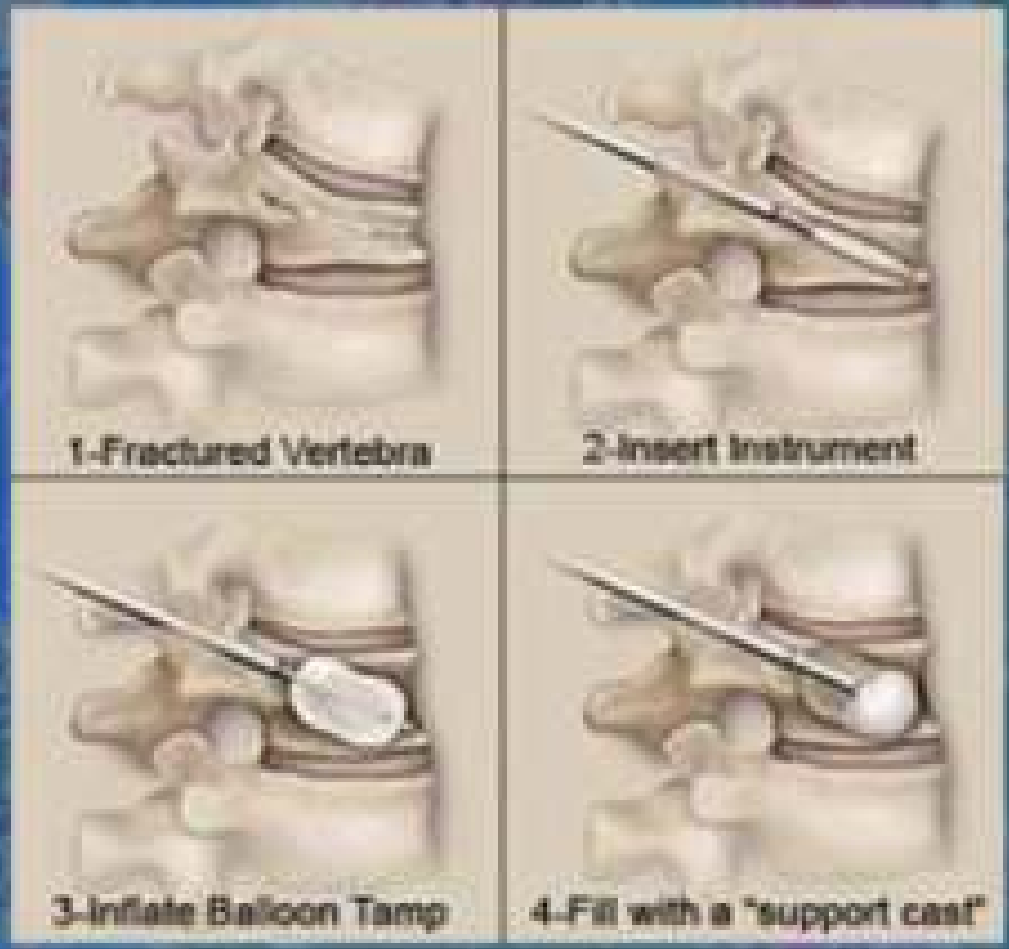


Vertebroplasty

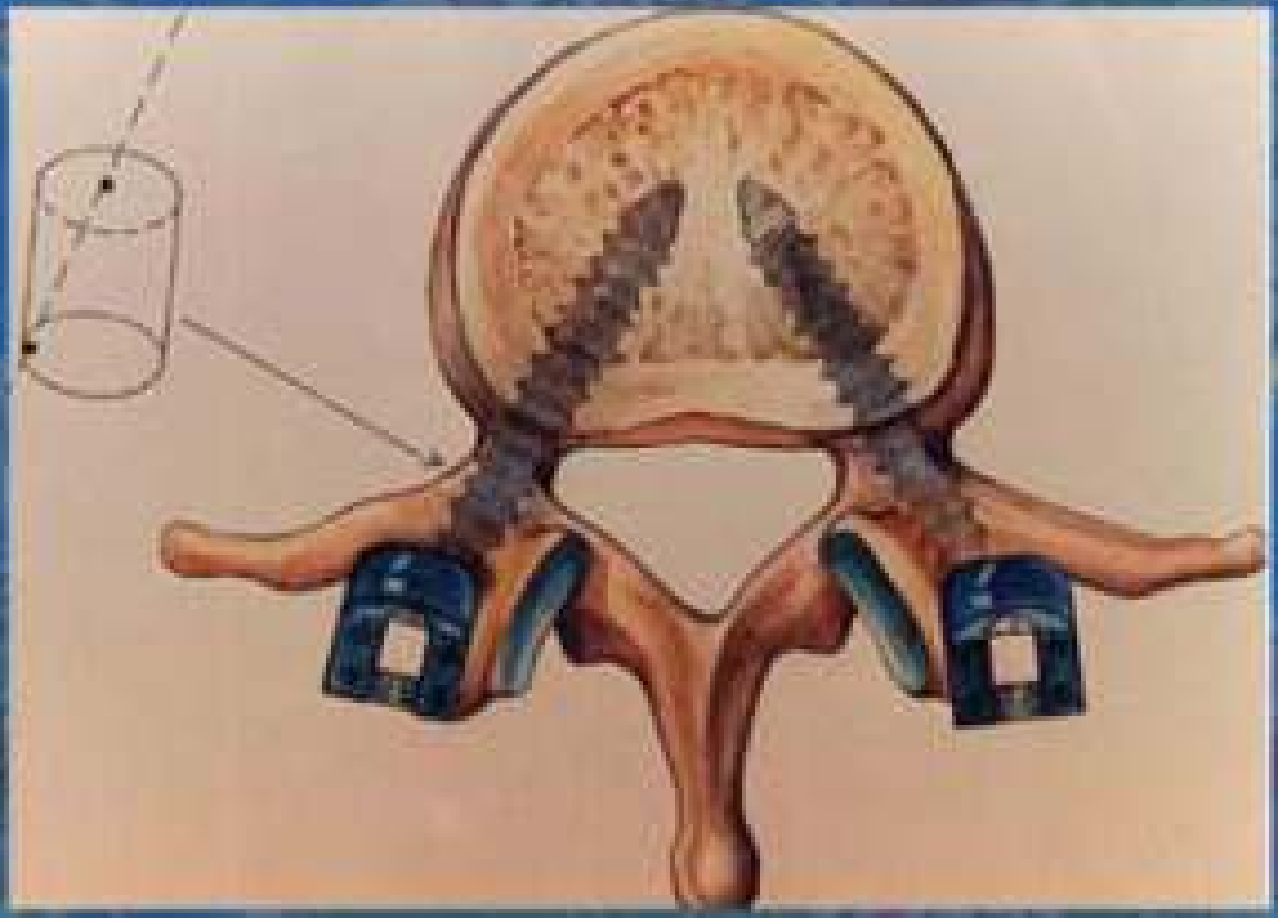
- Indicated in persisting pain or deformity
- Radiologically or surgically



Kyphoplasty



Pedicle Screws



Mishaps

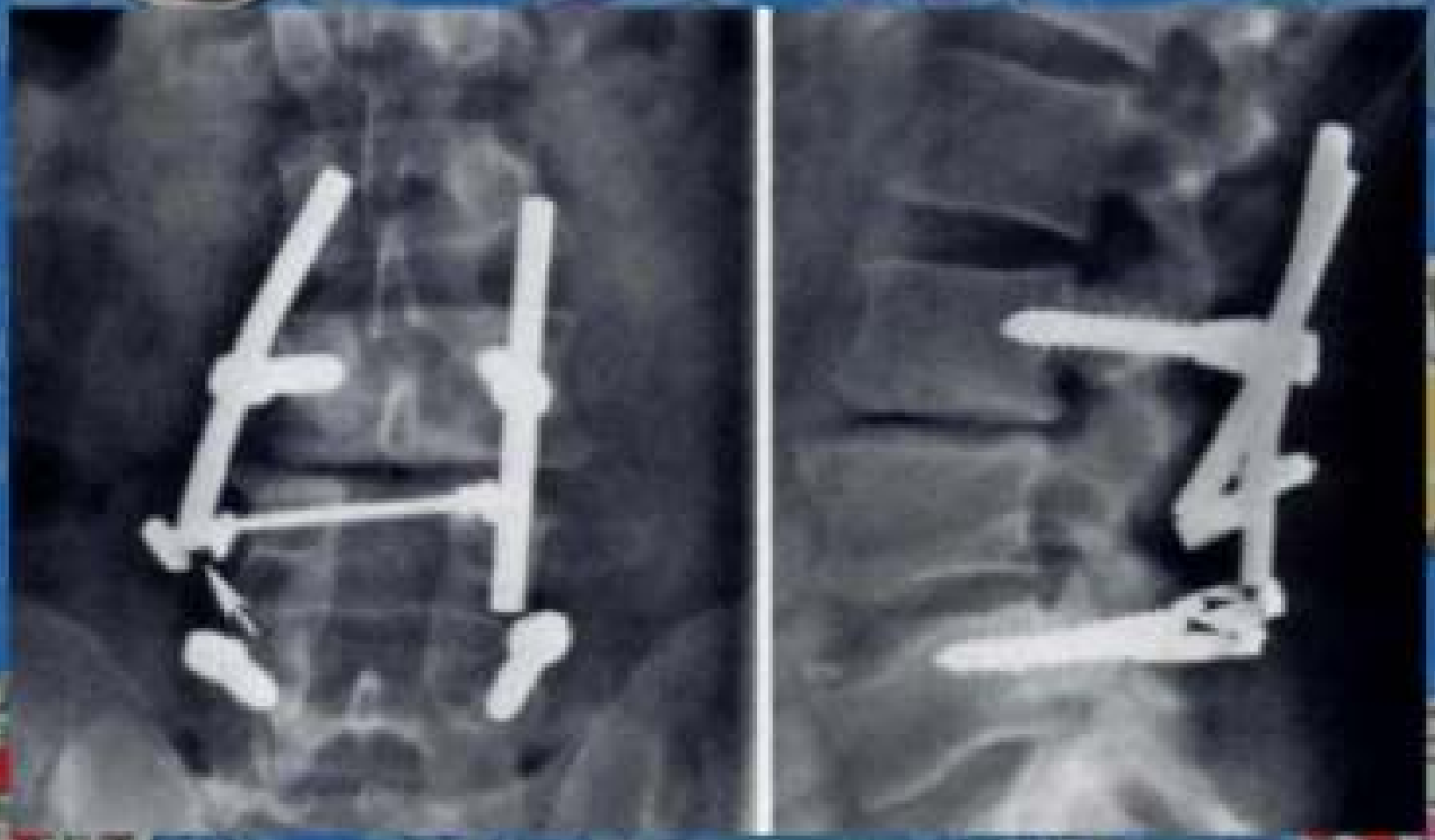
Gallic Fusion gone Wrong

Screw Back out

Screw too long

Construct Failure

Fibula Strut Graft
Extrusion



The Migrating Rods

- Of Course none of these screws were mine !!!