Cervical Spine Surgery –
For Patients with Rheumatoid Arthritis

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Bones and Spine

Outline

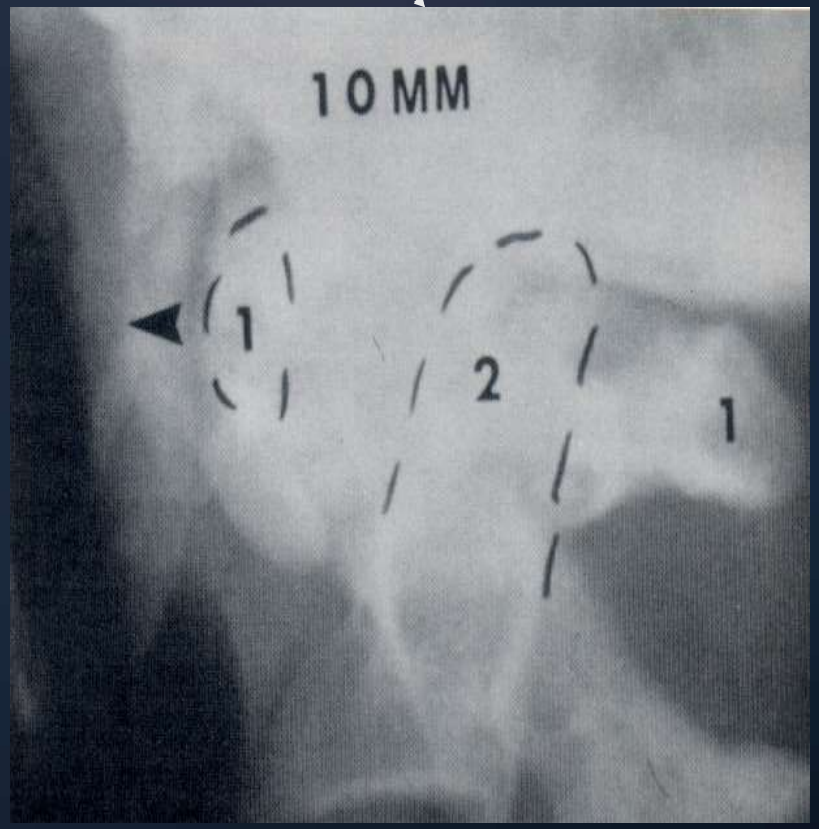
- The most common abnormalities.
- Clinical Presentation.
- Radiological Evaluation.
- Natural History.
- Predictor of progression and recovery.
- Indication for surgery
- Surgical Considerations

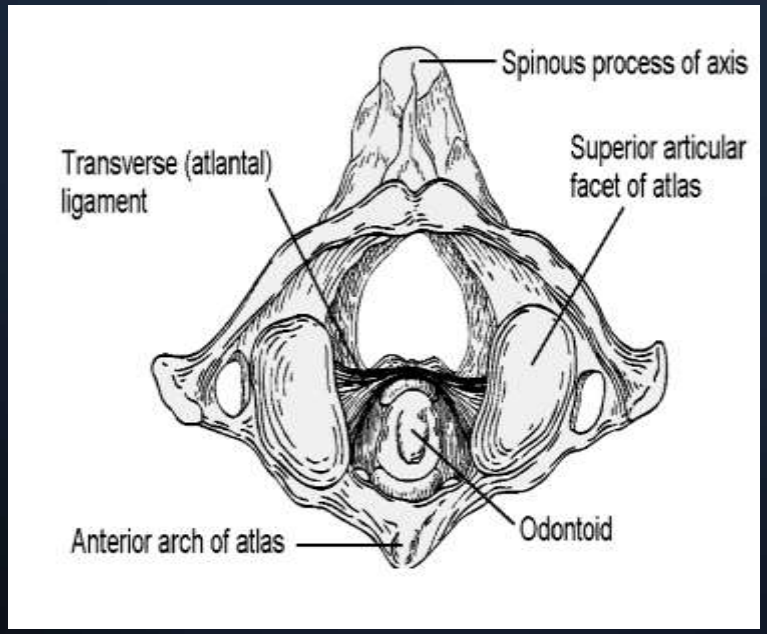
Incidence

- RA affects **1%** of adult population in US.
- C-spine is the **second** most common skeletal manifestation (15-86%).
- Up to **26%** of in-patients with RA may need surgical intervention.
- Three most common abnormalities:
  - **1. AAS**
  - **2. AAI**
  - **3. SAS**

Atlantoaxial Subluxation (AAS)

- Most common
  - (43 -86%)
- Transverse ligament.
- Ant, lateral, posterior.





Atlantoaxial Impaction

- Second most frequent
  - (5-34%)
- Other names
  - Basilar invagination
  - Cranial settling
  - Vertical subluxation
  - Superior migration.
- Joint incompetent: Result from bone and cartilage loss.
- Impinge on the brain stem.

Subaxial Subluxation

- 10-25%.
- Most frequent:
  - C23, C34.
- Incompetent ligaments,facets.
- “Staircase”

Clinical Presentation

- #1: Pain(40-88%)
- #2: Neuro(7-34%)
- #3: Sudden death (10%)
- *Earliest signs*
  - Pain & neck stiffness
- High index of suspicion
  - Change in ambulation.
  - Long tract sign.
  - Vertebrobasilar SX.
    - Loss of equilibrium
    - Tennitus,vertigo,diplopia
    - Visual distrubances

Sudden Death in RA

- **Post mortem study- 11** consecutive cases of atlanto-axial dislocation (104 patients total).
- **Sudden death**
  - 7 out 11
- **Correct diagnosis**
  - 2 out 11
- **Spastic SX**
  - only in 4/11 patients.
- **Conclusion:**
  - 1. 10% incidence of fatal medulla compression.
  - 2. Neurological signs are not helpful to point out the risk of fatal cord compression.

Miculowski et al., Acta Med. Scand, 1975

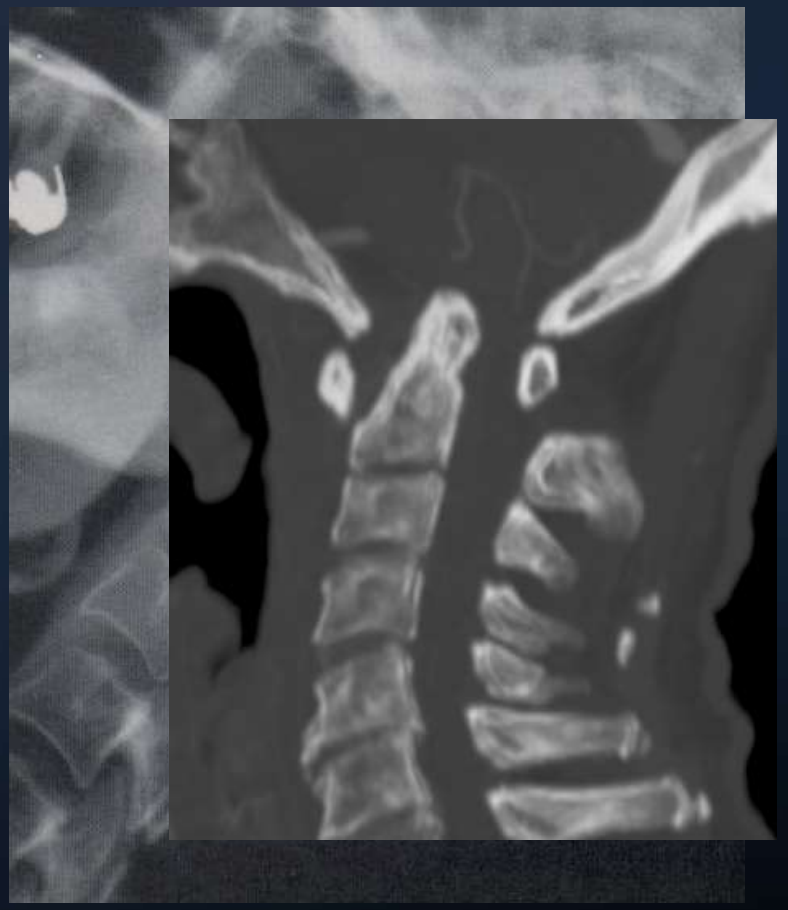
Ranawat Classification

- I No neural deficit.
- II Subjective weakness/dysesthesia
- III Objective weakness/long-tract signs.
  - IIIA ambulatory
  - IIIB not ambulatory

Ranawat et al, JBJS 1979 Vol 61A-7

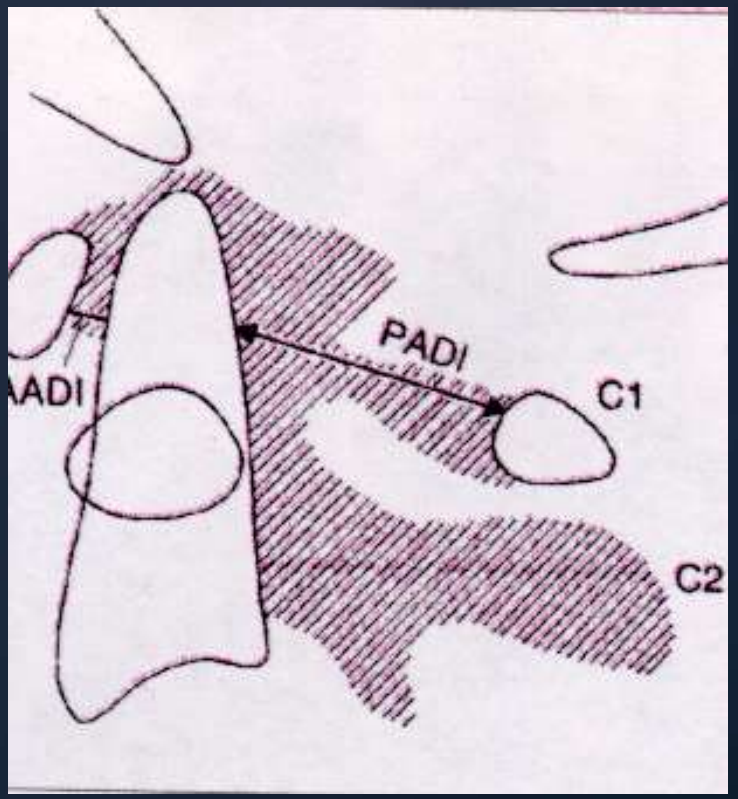
Radiological Eval - AAS

- Need flexion lateral.



Radiologic Eval - AAS

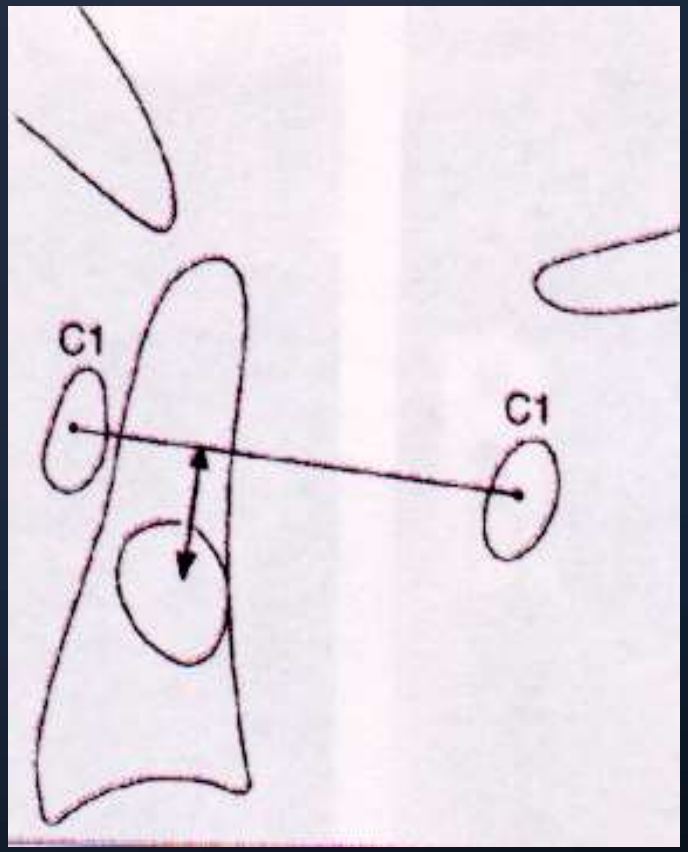
- PADI
- >14 mm = 94% negative predictive value.
- Different than space available for the cord.



Radiologic Eval – AAS
MRI
neutral vs. flexion

Radiologic Eval - AAI

- Ranawat's distance-
  - distance between transverse axis of C1 and middle of pedicle of C2.
- Abnormal if:
  - Male < 15mm.
  - Female < 13 mm.

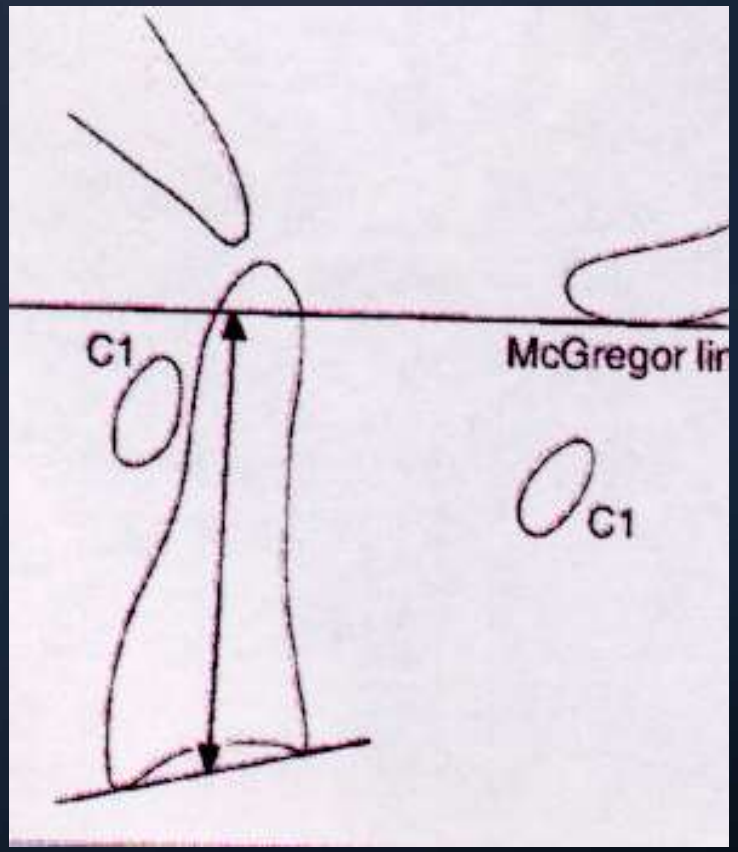


Radiologic Eval. - AAI

- McGreggor's line.
- Line from hard palate to occipt.
- Abnormal if dens > 4.5mm above the line.

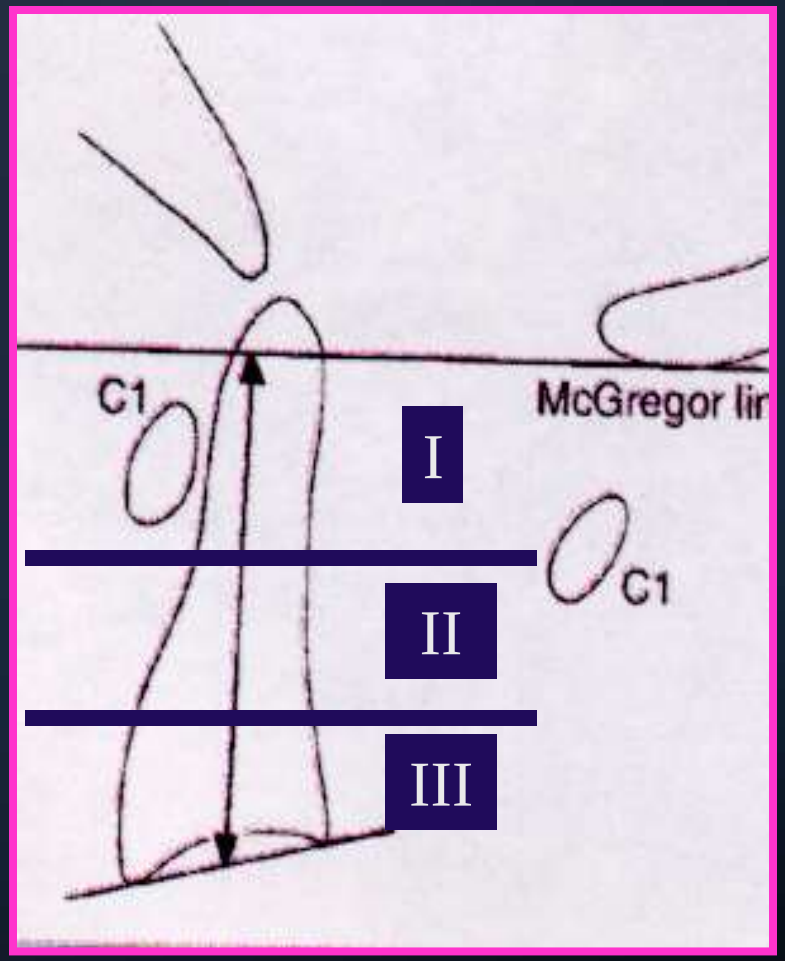
Radiologic Eval - AAI

- Redlund-Johnell
- Distance between McGregor's line and inferior end plate of C2.
- Abnormal if male < 34 mm and female < 29mm.



Radiologic Eval - AAI

- Clark Station
- Divide C2 into thirds on sagittal plan.
- Abnormal if the middle or lower third of C2 is at the level of arch of C1.



Radiologic Eval - AAI

- ***The most specific:***

  Redlund-Johnell (76%)

- ***The most sensitive***:

  Clark Station (83%)

- ***To achieve > 90% sensitivity+specificity***
  - Use combination of Clark station + Redlund-Johnell + Ranawat
- ***When in doubt***
  - get a MRI.

Riew et al. JBJS 83A(2). 2001

Natural History

- Without cervical myelopathy

- With Cervical myelopathy.

Natural History – without myelopathy

- Prospective Study of 106 patients over 5 years.
- 80% had radiographic progression.
- 36% had neurologic deterioration.
- Only 10% required surgery.

Pellicci et al. JBJS 63A(3) 1981

Natural History – with myelopathy

- **Sunahara**, Spine 22(22), 1997
- 21 pt with AAS, refused surgery.
- All patients bedridden within 3 years.
- 7 patients had sudden death.

- **Meijers,** Clinical and Exp Rheu, 1984
- 9 patients.
- All 9 patients died within a year.
- 4 due to consequences of cord compression.

Natural History

- Without cervical myelopathy

Good

- With Cervical myelopathy.

Bad

Predictor

Predictor of Paralysis

- PADI < 14mm.
- Cervicomedullary angle less than 135 degree.
- SAC < 13 mm on MRI
- Cord diameter < 6 mm.

Predictor of Recovery

- **Boden:**
  - No recovery if PADI < 10mm.
  - At least one neuro. Class improvement if PADI > 10 mm.
- **Klein:**
  - Duration of SX.
- **Casey:**
  - Pre-op neuro. Function, cord area, degree of AAI.

Indications for Surgery

- **Accepted:**
  - Intractable pain.
  - Progressive neurologic impairment.
  - Presence of myelopathy
- **Controversial:**
  - impending neurologic deficit.
    - Arguments for and against.

Surgical Consideration

- Frail.
- Malnourished.
- Osteoporotic.
- Immunosuppressed.

Preoperative Cervical Traction

- Used for AAI and severe subluxation.
- Goal: reduce subluxation and relieve compression.
- Advantages.

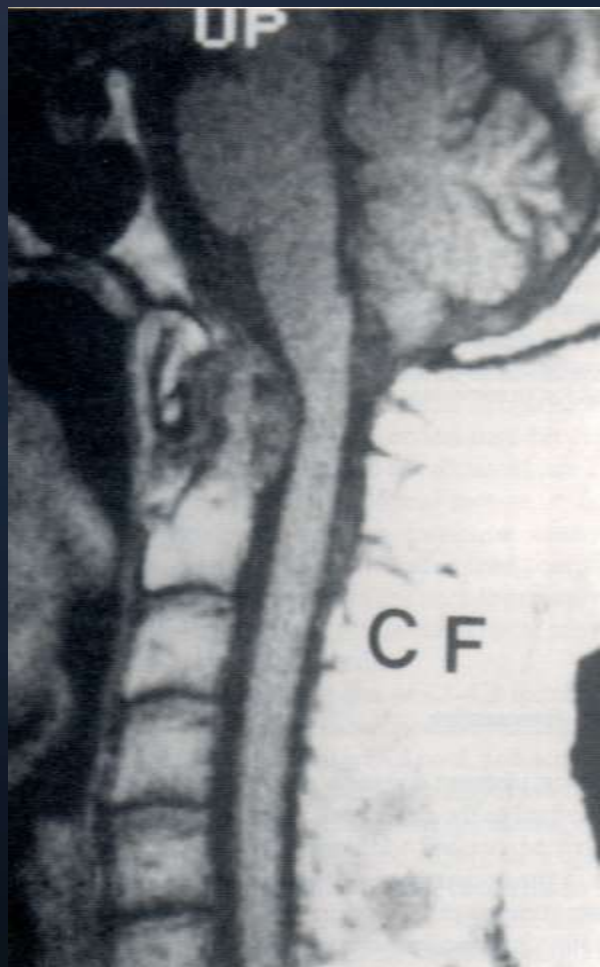
Airway Management

- Awake fiberoptic-assisted intubation Vs. traditional.
- 128 patients with RA.
- Upper-airway obstruction after extubation decrease from 14% to 1%.

Wattenmaker et al. JBJS 76-A(3), 1994

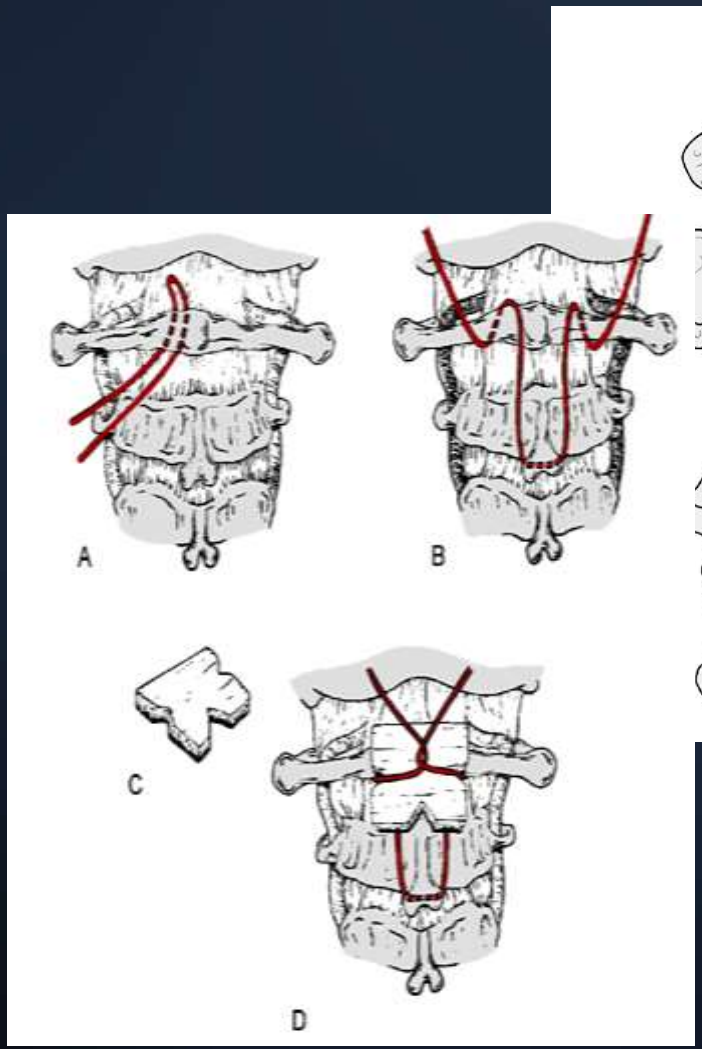
Decompression

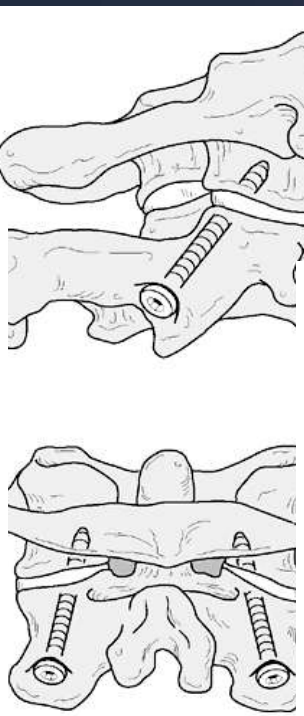
- Persistent neurologic deficit despite traction.
- Level depend on location
  - of cord impingement.
- Controversial.

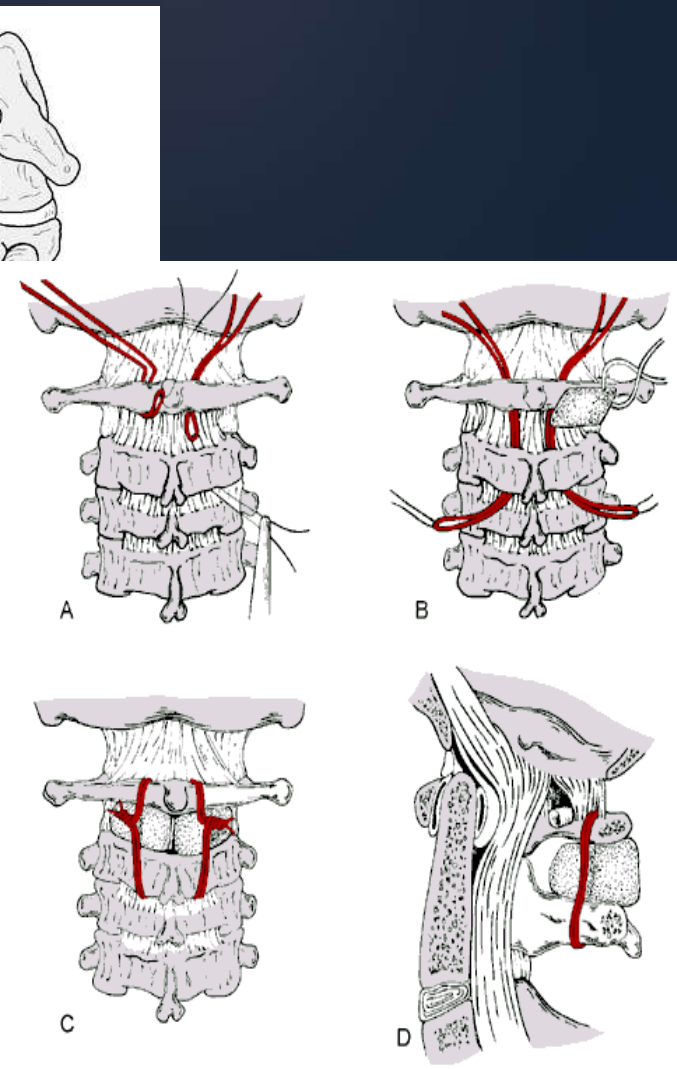


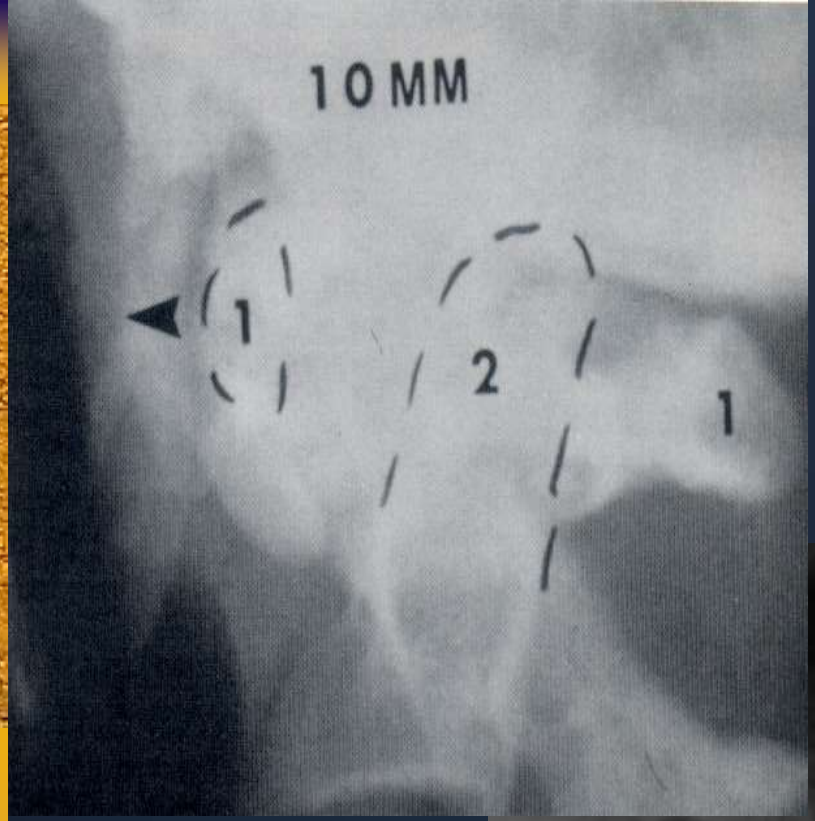
Stabilization

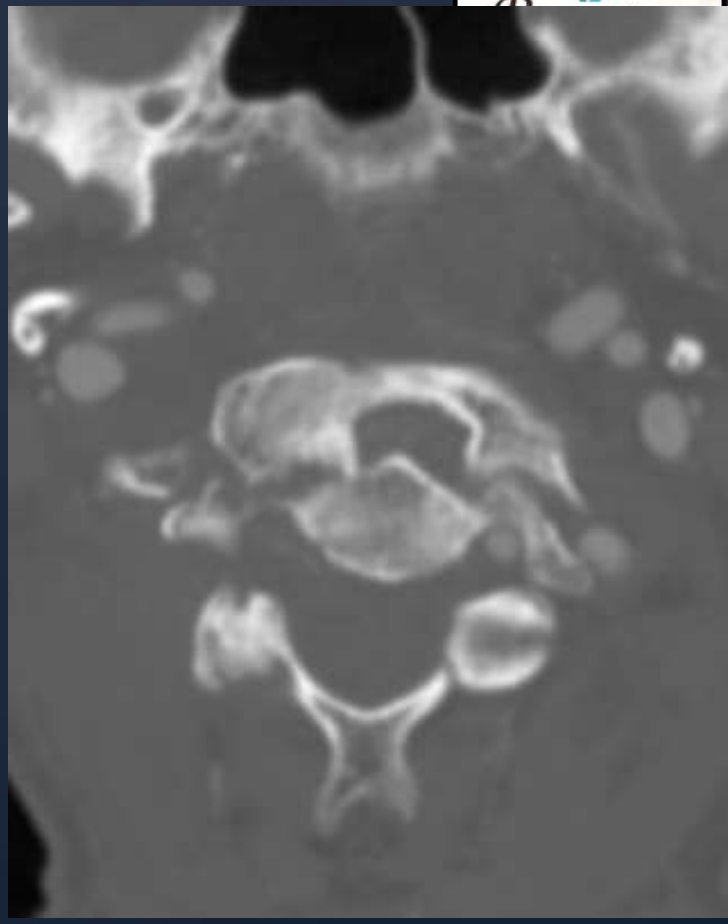
Include all unstable levels.



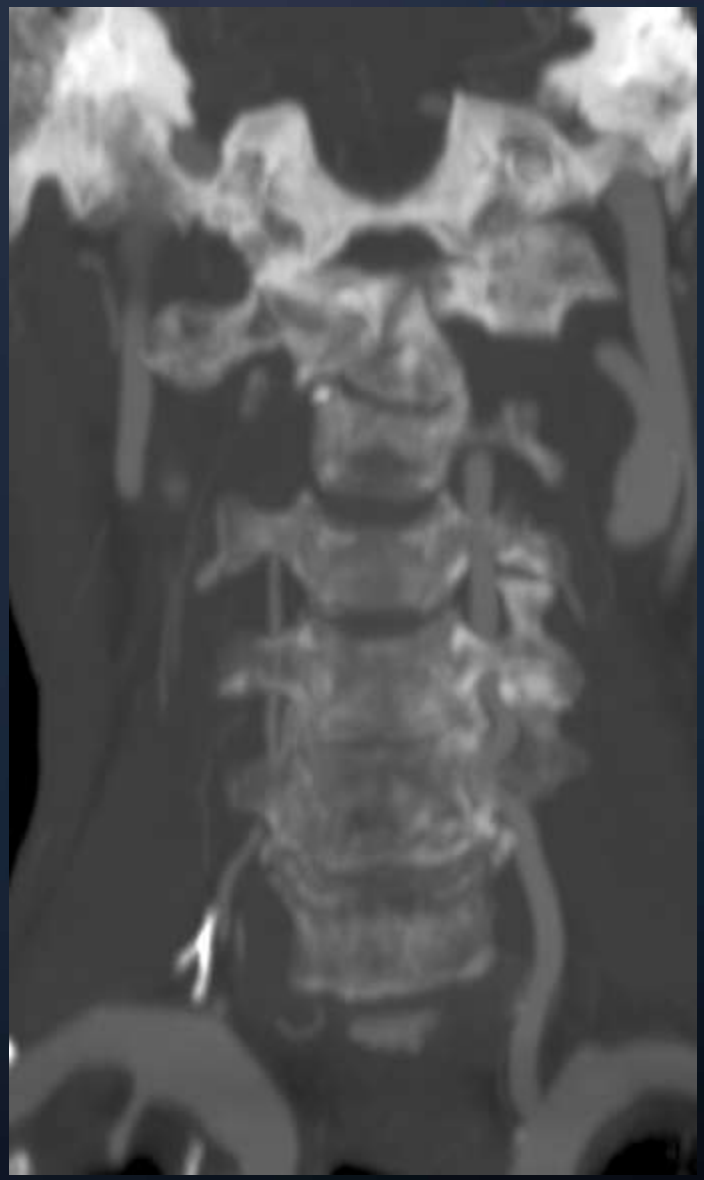


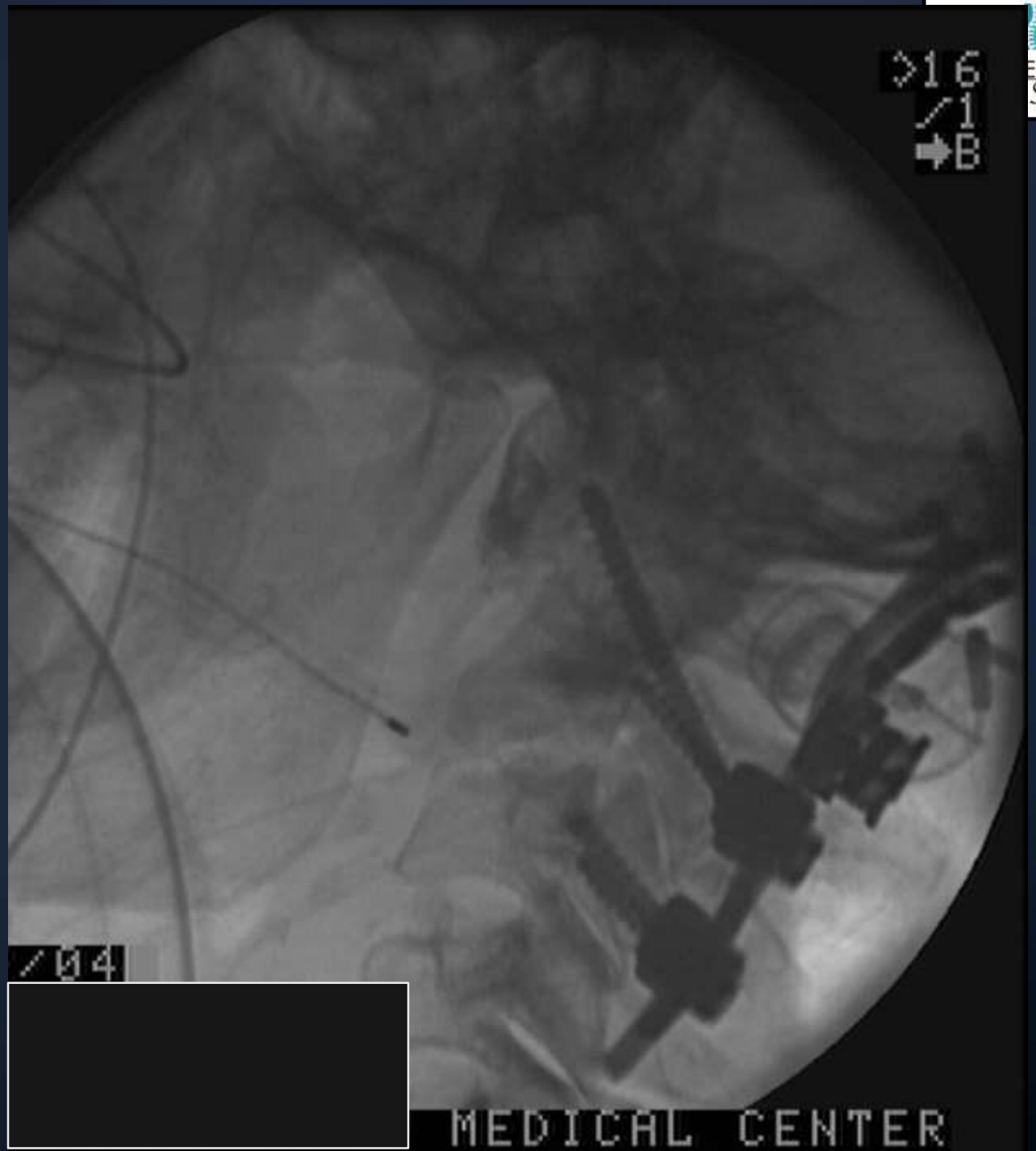



10 MM
1
2
1



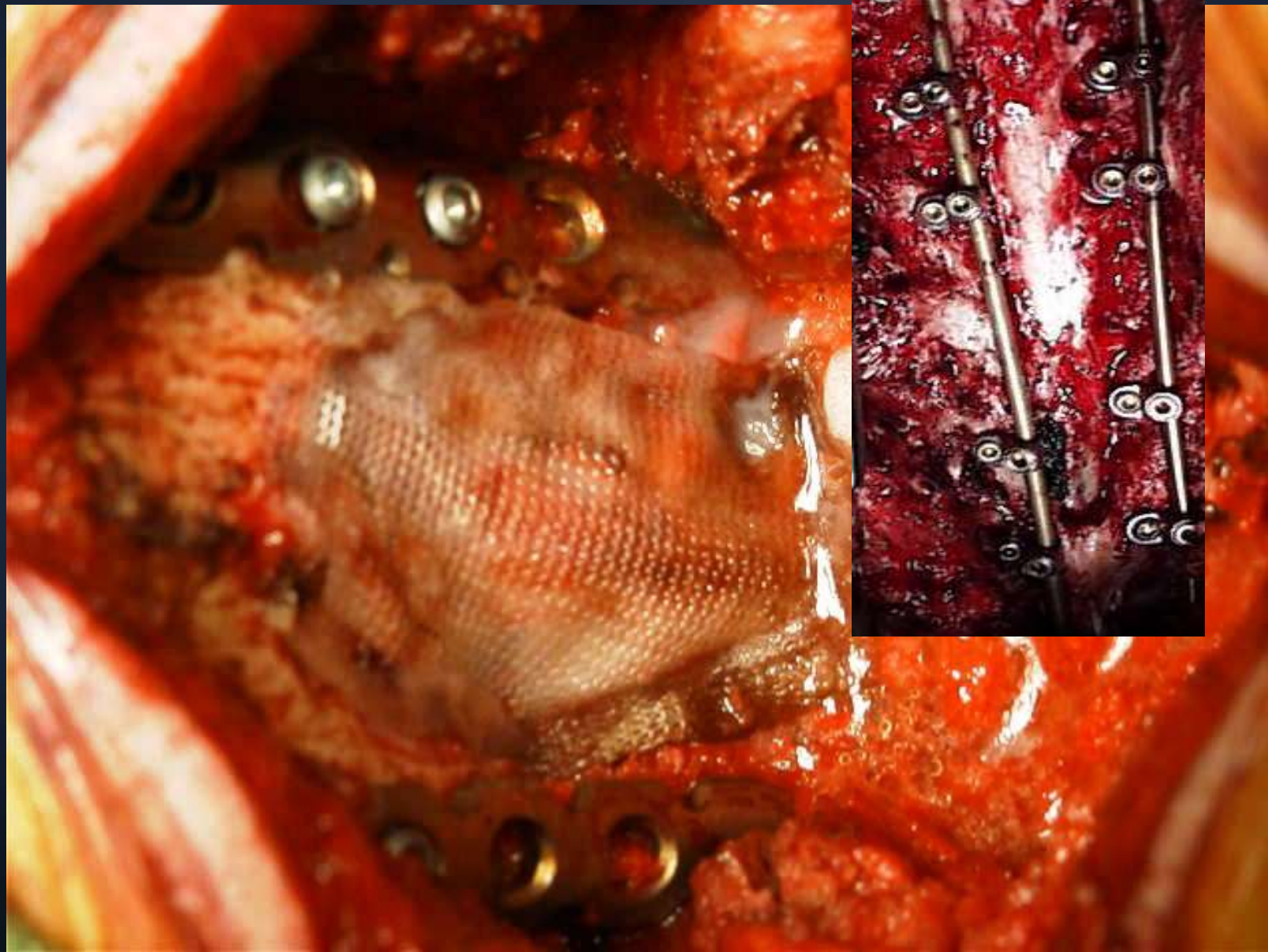

"FOR CERVICAL TRA

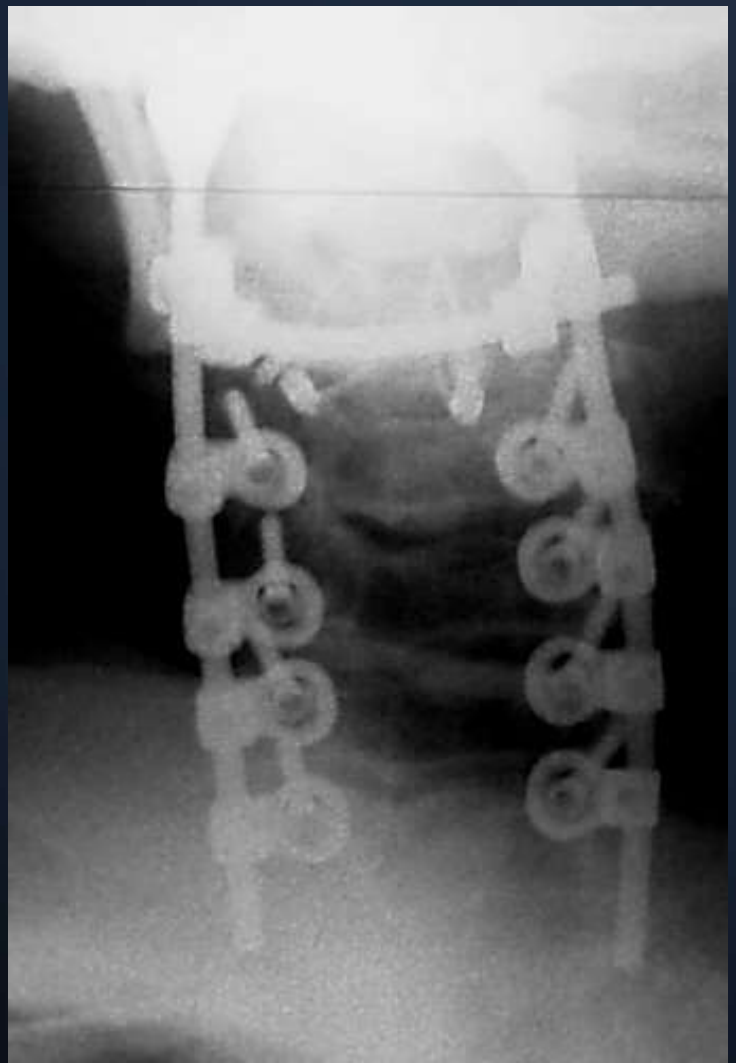


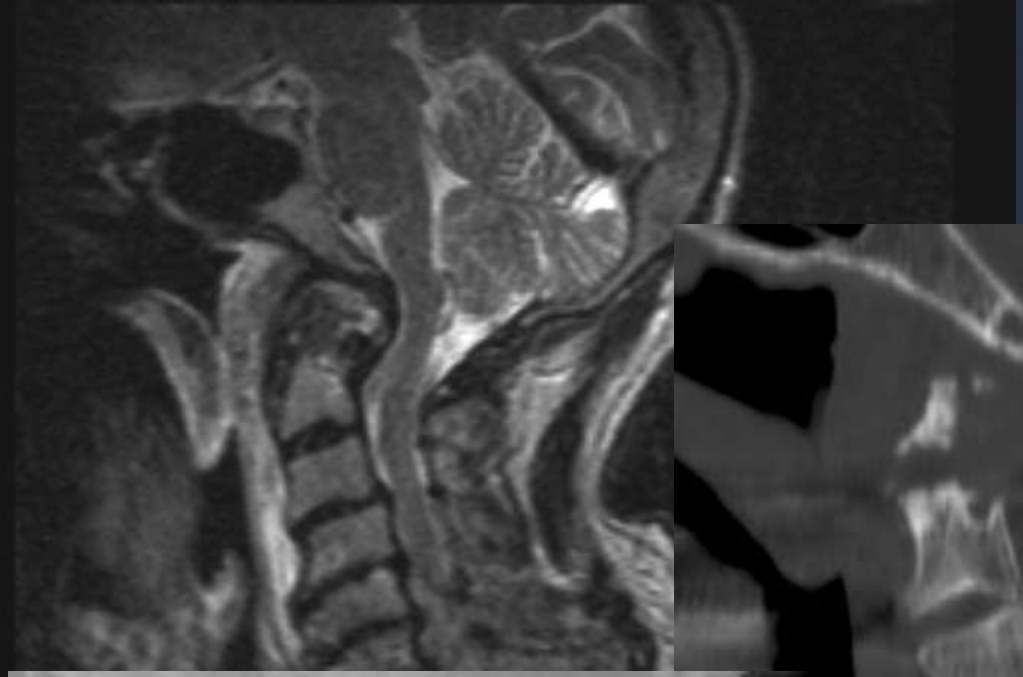


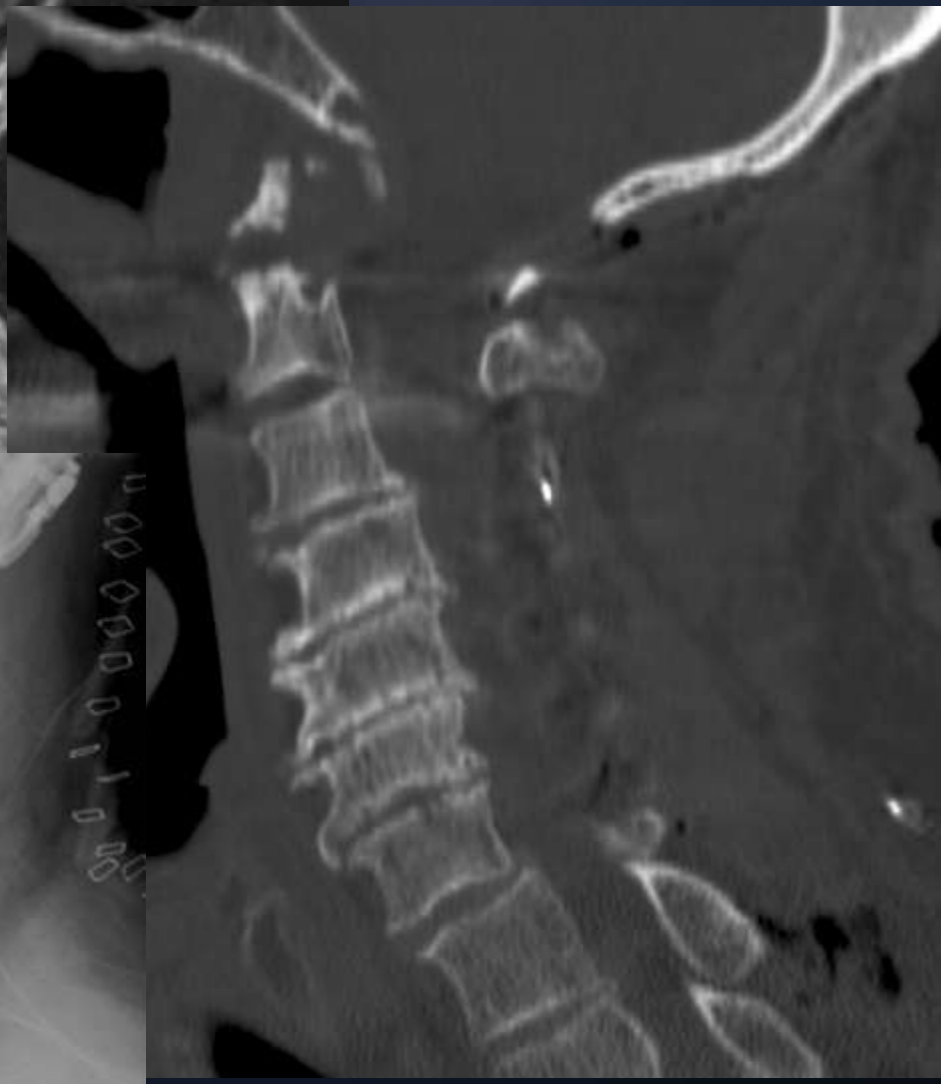
Surgery


Rom 10
RT 23









Bones & Spine Surgery

Complication

Complication

Complication

Surgical Outcomes

Year	Author	#patients	Pain relief%	Neuro. Improv %
2001	Asselt	31	62%	67%
1999	Grob	39	96	77
1998	Eyres	26	92	89
1998	Mori	25	96	67
1989	Clark	41	91	27
1987	Sakou	16	100	100
1985	Menezes	45	100	100

CONCLUSION

- High index of suspicion
- Majority of RA does not require surgery.
- Surgical indication:
  - Intractable pain
  - Progressive neurologic deficit
  - Myelopathy
  - Impending neurologic deficit?
- Careful surgical planning/team approach.

THANK YOU