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 disturbances
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.
- Normal is 3mm.
- >10 – 12 mm = complete disruption.
- Not reliable – May decrease as odontoid moves superiorly.
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

- McGregor’s line.
- Line from hard palate to occipit.
- 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.
Complication
Complication
Complication
### Surgical Outcomes

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<th>Year</th>
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<th>#patients</th>
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<th>Neuro. Improv %</th>
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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