Cervical Deformity

Important structural components that are involved in deformity developing

- Muscular
- Bony
- Ligamentous
- Innervation
Muscular Function

- Innervated by segmental spinal nerves
- Damaged/disrupted/non-functioning after posterior surgery
- Limit width of exposure
- Retract muscles gently
Bony Function

- Structural support
- Protection of spinal contents
- Articulate with adjacent vertebrae
- Musculoligamentous attachment!!!
Ligamentous Function

- Attach vertebrae to each other
- Attachment muscles to bone
- Provide the mobility of the spinal column
- More importance than recognized
Nerve Function

- Innervation of the muscles
- Tone and soft tissue support
- Tactile sensation
- Position sense
- Pain sensation
Post-laminectomy Kyphosis

- Child > adult
- 30-40% change postop
- > 4mm anterior translocation
- 20° flexion deformity
- “mechanical neck pain”
- “flat neck pain”
- loss of lordosis

Guigui, Spine 1988
Predisposing Factors

Alignment

Normal
Straight
Reverse
Swan Neck
“Normal” Lordotic Curve

20° Curve or >
Analysis of Cervical Spine Curvature in Patients with Cervical Spondylosis

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FIG. 1. Plot of a typical cervical spine radiogram showing the lines constructed to derive quantitative data for spinal curvature analysis.
Laminectomy for Central Cord Syndrome

Mechanical Subluxation?
- Evaluate with Flexion/extension

Prevention?
- Select correctly aligned patients
- Do reduction and fusion for kyphosis
- Limited muscle dissection
- Preserve facet capsules
- Preserve adjacent segment
Deformity Symptoms

- Neurologic symptoms - rare
- Progressive postural deformity
- ↓↓ ROM
- “chin on chest”
- Posterior paraspinal pain
Indications for Cervical Deformity Correction

- Neurological progression
- Deformity Progression
- Pain intolerance
- Fixed Severe Postural Deformity
Surgical Correction of Deformity

- Anterior correction
- Posterior Correction
- Anterior and Posterior correction
Anterior Cervical Deformity Correction

Vertebrectomy
- limited correction of kyphosis
- maximum 15° for each level
- ideal loading characteristics

Discectomy
- less correction for each level
- 5-10 for each level
- can maintain sagittal correction
Posterior Cervical Deformity Correction

- Previously limited correction due to non-constrained instrumentation
- New constrained instrumentation may offer some improvement in correction
- Bony structure may be limiting factor
- Structural limits if hardware/bone to maintain correction
Anterior and Posterior Deformity Correction

- Needed to make major intervention in cervical deformity
- Posterior osteotomies with decompression to gain correction
- Anterior column support to maintain correction
- Posterior tension band
- Still evolving these techniques in the cervical spine
Early Attempts at Cervical Deformity Correction
More Contemporary Attempts at Cervical Deformity Correction
Ankylosing spondylitis and fixed flexion-rotation deformity
CT 3D Reconstruction
Axial and Sagittal CT Scans
Mr B.L.

- 58 yo male with progressive myelopathy
- No axial or radicular pain
Mrs R.R.
Active 80 yo
Severe Neck Pain
Mild non-progressive myelopathy
69 yo female with mild gait imbalance

No neck pain

C4,5,6 degeneration
Swan Neck Deformity

Complex case and planning

How would you do this case now?

Front-back?

Back-front?

Back-front-back?
Conclusions

• Anterior correction has good load bearing
• Posterior correction has good tension band effect
• Anterior and Posterior correction has best success for major correction and maintaining the correction
What happens at the segments adjacent a fusion?
Forestier’s Disease Associated with a Retro-odontoid Mass Causing Cervicomedullary Compression

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Introduction

Forestier’s Disease Synonyms

- Diffuse Idiopathic Skeletal Hyperostosis (DISH)
- Spondylosis Hyperostototica
- Ankylosing Hyperostosis
Introduction

Forestier’s Disease

- Progressive skeletal disorder
- Males
- 6th or 7th decade of life
- Marked calcification of the ALL
- Absence of other degenerative changes
Radiology

- Calcification along 4 contiguous vertebral bodies
- Absence of apophyseal joint ankylosis
- Absence sacroiliac joint sclerosis
Patient Population

- 5 patients
  - 4 males, 1 female
- Mean age: 73yrs, range: 56-86yrs
- No co-existing rheumatological, post-traumatic, or degenerative processes
- All patients were studied with pre and post-operative plain x-rays, CT scans, and MRIs
Fig 1. Preoperative x-ray showing marked calcification of the ALL.
Fig 2. Preoperative axial CT scan showing a retro-odontoid soft tissue mass.
Fig 3. Preoperative MRI revealing marked cervicomedullary compression.
TABLE 1. PATIENT PRESENTATION

<table>
<thead>
<tr>
<th>SIGNS/SYMPTOMS</th>
<th>NUMBER OF PATIENTS</th>
<th>%</th>
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<tbody>
<tr>
<td>Pain</td>
<td>4</td>
<td>80</td>
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<tr>
<td>- neck</td>
<td>2</td>
<td>40</td>
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<tr>
<td>- arm</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>- leg</td>
<td>3</td>
<td>60</td>
</tr>
<tr>
<td>Gait Disturbance</td>
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<td>100</td>
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<tr>
<td>Dysphagia</td>
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<tr>
<td>Weakness</td>
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</tr>
<tr>
<td>- upper extremities</td>
<td>5</td>
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<tr>
<td>- lower extremities</td>
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<tr>
<td>Numbness</td>
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<tr>
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<td>60</td>
</tr>
<tr>
<td>- lower extremities</td>
<td>3</td>
<td>60</td>
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<tr>
<td>PATIENT</td>
<td>CVJ CANAL DIAMETER</td>
<td>CALCIFIED LEVELS</td>
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<tr>
<td>---------</td>
<td>--------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>1</td>
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<tr>
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<tr>
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<td>C3-C6</td>
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<tr>
<td>5</td>
<td>4mm</td>
<td>C3-C6</td>
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</table>
Operative Procedure

- Transoral odontoidectomy
- Resection of the hypertrophic pannus
- Posterior occipitocervical fusion
Fig 4. Postoperative MRI revealing decompression of the CVJ.
Fig 5. Postoperative x-ray after occipitocervical instrumentation.
Pathology

- Odontoid: Normal bony architecture
- Fibrillation of hyaline and fibrocartilage
- Chondrocyte hyperplasia
- Chronic inflammation and fibrosis
- Granular calcification/ dystrophic ossification
Pathomechanics of Forestier’s Retro-odontoid Pannus

- Chronic strain on supporting tissues
  - Recurrent microtears: surrounding soft tissues
  - Continual microtears: periodontoid ligaments

- Healing Process
- Degenerative Response
- Inflammatory Response
  - Soft Tissue Growth
  - Ligamentous Hypertrophy
  - CVJ Compression Syndrome
Conclusions

- Forestier’s Disease may be associated with a retro-odontoid mass which can cause cervicomedullary compression.
- High index of suspicion for CVJ compression in patients with FD presenting with myelopathy.
- Transoral decompression and occipitocervical fusion is effective treatment for severely myelopathy.
- Posterior occipital-cervical fusion can be used in patients with no/minimal myelopathy.