Surgical correction of rigid spinal deformities

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The challenge – Management of Rigid Spinal Deformities

Difficulties in:
- Release
- Correction
- Balanced 3D
- Prevention of neural injury
Background

- 2 series in the literature on the role of osteotomy - each with 7 patients

- No clear management recommendations for types of osteotomies for a given deformity

Shimode et al: 2002
Kawahara et al: 2001
Osteotomies – Type I

Frontal Plane Deformities
  Scoliosis

Wedge corrective osteotomy
  Convexity Based
  (Single / Multiple)
  Osteotomy of Fusion mass

Osteotomies - Type II

Sagittal Plane Deformities
  Kyphosis

Wedge Corrective osteotomy
  Dorsally Based
  (Single / Multiple) with posterior arch shortening
Osteotomies - Type III

Sagittal Plane Deformities

- Lordosis

*Posterior approach*

*Corrective osteotomy*

*Ventrally Based*

with anterior spine shortening and posterior arch straightening

Osteotomies - Type IV

Complex Plane Deformities

- Kyphoscoliosis
- Kyphosing Scoliosis

*Complex wedge corrective osteotomy:*

- Front (corpectomy) + Back (wedge osteotomy)
- Back (corpectomy + 2 plane osteotomies)
Osteotomies - Type V

Localized Deformity
  - Wedge Vertebra
  frontal / sagittal planes
Decancellation Osteotomy
(Egg shell procedure)

Osteotomies - Type VI

Angular Kyphotic Deformities
  - Congenital Kyphosis in MMC
Kyphectomy
33/186 underwent osteotomies (18%)

- Mean age at surgery 10.9 (2-25)

- Congenital deformities - 23 pts.
  (Scoliosis -13, Kyphosis - 9, Lordosis -1)

- Neuromuscular Scoliosis - 8 pts.

- Other - 2 pts.
Types of osteotomies

- **Type I** (frontal plane) - 7 pts.
- **Type II** (sagittal- kyphosis) - 2 pts.
- **Type III** (sagittal – lordosis) - 1 pt.
- **Type IV** (complex plane – A + P) - 14 pts.
- **Type V** (egg shell) - 3 pts.
- **Type VI** (kyphectomy) - 8 pts.
## Radiographic analysis

<table>
<thead>
<tr>
<th></th>
<th>Pre-op (mean)</th>
<th>Post-op (mean)</th>
<th>Improvement (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scoliosis</strong></td>
<td>68°</td>
<td>37°</td>
<td>31° (46%)</td>
</tr>
<tr>
<td><strong>Kyphosis</strong></td>
<td>98°</td>
<td>34°</td>
<td>64° (65%)</td>
</tr>
<tr>
<td><strong>Pelvic obliquity</strong></td>
<td>11.5°</td>
<td>4.5°</td>
<td>7° (61%)</td>
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</tbody>
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<tr>
<td><strong>Sagittal Balance</strong></td>
<td>3.1</td>
<td>0.9</td>
<td>2.2 cm (71%)</td>
</tr>
<tr>
<td><strong>Coronal Balance</strong></td>
<td>2.6</td>
<td>1.2</td>
<td>1.4 cm (54%)</td>
</tr>
</tbody>
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*Plumb line offset (C7-S1)*
Complications

- 5 (15%) - wound related problems
- 2 (6%) - neurological
  1 - radiculopathy - resolved
  1 - mild paraparesis, ending in full recovery
- 6 (18%) - hardware related problems, requiring removal or shortening (5/6)
- 3 (9%) - new skin related problems
Summary

- A comprehensive approach towards spinal osteotomies
- Tailored osteotomies for each deformity
- Six subtypes
- Good clinical outcomes with an acceptable complication rate
- Learning curve substantial, these cases best suited for experienced centers