Cervical Alignment Comparative Analysis of Fixed Irreducible and Reducible Atlantoaxial Dislocations

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Disclosures

No financial disclosures to report.
Atlanto-Axial Dislocation Overview

- The Atlantoaxial Joint stabilizes the neck and skull during activities and at rest.

- Dislocation is often caused by direct trauma or musculoskeletal disorders such as osteoporosis, rheumatoid arthritis, and ankylosing spondylitis.[1]

- Dislocation is often associated with significant complications, including quadriplegia and significant neurologic injury.[2,3]
Atlanto-Axial Dislocation Treatment

• Patients with atlantoaxial dislocation (atlantodens interval >5mm; AAD) first undergo a trial of reduction with cervical traction intraoperatively.

• If reduction fails, transoral anterior atlantoaxial release can be performed prior to posterior fixation (fixed irreducible AAD patients).

• The effect of transoral anterior atlantoaxial release on cervical sagittal alignment has not been well characterized and compared with patients who have reducible AAD who only require posterior fixation (fixed reducible AAD patients).

Purpose: To compare cervical alignment changes in patients with fixed irreducible and fixed reducible AAD after surgical treatment.
Materials & Methods

• **Design**
  – Retrospective Review of a prospectively-collected, single institution database

• **Inclusion**
  – Patients included had pre-operative and 6-month post-operative radiographs
  – Sagittal alignment parameters were assessed utilizing patient radiographs.

• **Outcome Measures**
  – Demographic variables including *Age* and *Sex*
  – Radiographic parameters including **McGregor's slope, C2-C7, T1-CL, cSVA, and C1-C2.**

• **Statistical Analysis**
  – Baseline and postoperative cervical radiographic measurements were compared
  – Student T-tests elucidated significance for continuous variables.
  – Chi-Square analysis determined significance for categorical variables.
Materials & Methods

• Treatment Groups
  – Two groups
    • Fixed Irreducible AAD – Received transoral anterior release prior to posterior fixation.
    • Fixed Reducible AAD – Did not receive transoral anterior release prior to posterior fixation.
Results

• 25 patients were included
  – 17 Fixed Irreducible: mean age 52.1, 53% female
  – 8 Fixed Reducible: mean age 47.1, 13% female

• Fixed Irreducible AAD patients had significantly higher baseline T1slope – cervical lordosis mismatch (7.06° vs. -2.63°)

• Fixed Irreducible AAD patients were surgically realigned, showing significant postoperative improvement in respect to C1-C2 (-25.4° vs -15.0°).
## Results

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Preoperative</th>
<th>postoperative</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Irreducible</td>
<td>Reducible</td>
<td>Irreducible</td>
</tr>
<tr>
<td>C1-C2 lordosis</td>
<td>-23.59</td>
<td>-15.00</td>
<td>-22.94</td>
</tr>
<tr>
<td>McGregor- C2 lordosis</td>
<td>15.82</td>
<td>9.00</td>
<td>14.59</td>
</tr>
<tr>
<td>T1Slope</td>
<td>21.59</td>
<td>22.38</td>
<td>22.12</td>
</tr>
<tr>
<td>T1 slope – CL mismatch</td>
<td>7.06</td>
<td><strong>-2.63</strong></td>
<td>7.59</td>
</tr>
<tr>
<td>cSVA</td>
<td>26.3759</td>
<td>13.3863</td>
<td>25.0306</td>
</tr>
</tbody>
</table>

* Significant difference between Irreducible and Reducible
** Significant difference between postoperative and preoperative for Reducible
*** Significant difference between preoperative and postoperative for Irreducible vs Reducible
Results

• Surgically realigned C1-C2 in **Fixed Irreducible AAD** patients resulted in higher postoperative C2-C7 lordosis (-28.38° vs. -14.53°, p=0.020) with relatively decrease in T1 slope compared to Fixed Reducible AAD patients, although this value didn’t meet statistical significance (5.5° vs. 0.52°, p=0.177).

• **Fixed Reducible AAD** patients had no statistically significant changes in sagittal profile after surgery.
Discussion/Summary Points

- Transoral anterior release prior to posterior fixation results in focal sagittal realignment of the upper cervical spine.

- **Fixed Irreducible AAD** patients undergo reciprocal compensatory changes in the subaxial spine and cerviocothoracic junction compared with **Fixed Reducible AAD** patients.

- Transoral release plays a role in restoring the overall sagittal cervical alignment in otherwise **Fixed Irreducible AAD** patients.