Postoperative C5 palsy in consequence of anterior cervical discectomy and fusion (ACDF)

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Introduction

• Postoperative C5 palsy after cervical decompression surgery is common knowledge.

• C5 palsy after ACDF is thought as rare, detail is still unclear. Previous reports are mainly about the surgery with corpectomy; only a few reports investigate the complication after ACDF.

• This study aim to clarify C5 palsy after ACDF.
Materials and Methods (1)

• Patient population
  ◆ 158 cases (2006.01-2010.12)
  ◆ Sex: Male 108, Female 50
  ◆ Age: mean 54.0±12.7yrs
  ◆ Number of fusions
    1 level: 57 cases
    2 levels: 87 cases
    3 levels: 14 cases
    273 fusions/ 158 cases

◆ Number of each levels
  C3/4: 20
  C4/5: 66
  C5/6: 125
  C6/7: 62
Materials and Methods(2)

• **Main pathology of patients**

  Cervical spondylotic myelopathy (CSM): 51 cases
  Cervical spondylotic radiculopathy (CSR): 74 cases
  Cervical spondylotic amyotrophy (CSA): 3 cases
  Cervical disc herniation (CDH): 30 cases

• **Evaluation**
  - Pre- and post-operative deltoid and biceps brachii muscle (MMT)
  - Pre- and post-operative radiological findings
    - Cervical alignment on preoperative X-p
    - Preoperative intramedullary T2 high signal
    - Postoperative intramedullary change
    - Decompression of nerve root and cord
Materials and Methods (3)

• **Surgical strategy**
  
  - In principle, the responsible level is operated.
  
  - **Severe degenerative levels** are also operated to prevent adjacent level disorder in nearly future, although that is not responsible for symptom.
  
  - Osteophyte and/or herniated disc is removed enough for decompression of cord and nerve root.
  
  - Surgical procedure; under operative microscope.
  
  - Box type titanium cages were used for fusion.
Results(1)

- C5 palsy: 3/158 cases (1.9%)
- Description of postoperative C5 palsy cases

<table>
<thead>
<tr>
<th>Case</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age/Sex</td>
<td>43/F</td>
<td>63/F</td>
<td>47/M</td>
</tr>
<tr>
<td>MMT(pre op)</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>MMT(post op)</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Onset</td>
<td>3POD</td>
<td>6POD</td>
<td>1POD</td>
</tr>
<tr>
<td>Pathology</td>
<td>CSM</td>
<td>CSR</td>
<td>CSR</td>
</tr>
<tr>
<td>ACDF level</td>
<td>C4/5, C5/6 &amp; C6/7</td>
<td>C4/5, C5/6 &amp; C6/7</td>
<td>C4/5 &amp; C5/6</td>
</tr>
<tr>
<td>Pre op alignment</td>
<td>straight</td>
<td>lordotic</td>
<td>kyphotic</td>
</tr>
<tr>
<td>Pre op T2 high signal</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>New post op intramedullary lesion</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Therapy</td>
<td>Conservative</td>
<td>Conservative</td>
<td>ACF (C5 corpectomy, 7POD)</td>
</tr>
<tr>
<td>Recovery</td>
<td>Full (34POD)</td>
<td>Full (91POD)</td>
<td>Full (10POD)</td>
</tr>
</tbody>
</table>
Results(2)

- C4/5; included in ACDF vs. not

\[ p = 0.039 \]

<table>
<thead>
<tr>
<th>Included</th>
<th>Not Included</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>included</td>
<td>3</td>
</tr>
<tr>
<td>not included</td>
<td>0</td>
</tr>
</tbody>
</table>

Including C4/5: 4.5% (3/63)  
Not including C4/5: 0% (0/92)

- 3 levels fusion vs. 1/2 levels fusion

\[ p < 0.001 \]

<table>
<thead>
<tr>
<th>Levels</th>
<th>Included</th>
<th>Not Included</th>
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</thead>
<tbody>
<tr>
<td>3 levels</td>
<td>2</td>
<td>143</td>
</tr>
<tr>
<td>1/2 levels</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

3 levels: 14.3% (2/14)  
1/2 levels: 0.7% (1/144)
Results(3)

- Significantly affecting for postop. C5 palsy
  - including C4/5 level as fusion level
  - 3 levels fusion

- Not relating for postop. C5 palsy
  - pathology for surgery (CSM, CSR,…)
  - preoperetive cervical alignment
  - preoperative intremedullary T2 high signal intensity
Result(4)

- Clinical course in the 3 cases with postop. C5 palsy
  - C5 palsy occurred in 3, 6, 1 postoperative day; not immediate post operation.
  - For one case, with residual osteophyte, followed by C5 corpectomy and fusion.
  - The other cases were treated conservatively.
  - C5 palsy was completely disappeared in all cases.
Discussion(1)

- Frequency of C5 palsy after anterior cervical surgery
  - 8.5% (17/199, Hashimoto, 2010)
  - 4.3% (1.6-12.1%, review, Sakaura, 2003)
  - 3.2% (18/563, Ikegami, 2005) etc…

However, most literatures describe about surgeries with corpectomy and fusion. 
If it is limited to ACDF:
  - 0.8% (1/134, Yonenobu, 1991)
  - 1.9% (present study)

There is few previous report.
Discussion(2)

• Risk factor of C5 palsy

  in literatures
  • Multi level surgery
  • C3/4 or C4/5 as the most stenotic level
  • moderate~severe myelopathy

  In this study:
  ◆ Multi level surgery is supported as risk factor. Even on whom most stenotic level was not C3/4 or C4/5 C5 palsy occurred.
  ◆ Myelopathy, high age and kyphosis were not shown as risk factor.

• Etiology of C5 palsy
  • inadvertent injury to the nerve root during surgery
  • tethering effect
  • spinal cord lesion like re-perfusion injury

Case 1, 2
Case 3
Conclusion

• Postoperative C5 palsy occurred in 1.9% (3/158 cases) of ACDF.
• Including C4/5 fusion, and 3 levels fusion are thought as the risk factor of postoperative C5 palsy from this study.
• Our cases support tethering theory and reperfusion injury theory as etiology of postoperative C5 palsy.

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