Utilization Trends of Cervical Disc Replacement in the US: A Population Based Study

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Disclosures

Nothing to disclose
Introduction: Cervical Disc Replacement (CDR)

• Advantages over ACDF:
  • Complete Segmental Stabilization AND
  • Preservation of Natural Biomechanical and Kinematic Properties

• FDA Approval:
  • Single level in 2007
  • Two level in 2013

• No official guidelines

• Recommendations from CNS

OFF-LABEL Use of CDR in Literature

- In US:
  - Hybrid Surgery: CDR and ACDF/ PCF
  - Multi-level disc replacement

- In other countries:
  - Congenital Cervical Stenosis
  - Traumatic Disc Herniation

Inclusion & Exclusion Criteria

• Years: January 1\textsuperscript{st} 2004 – December 31\textsuperscript{st} 2013

• ICD 9 codes for
  • CDR (became effective in October 2004)
  • ACDF
  • Posterior Cervical Fusion

• Categorized into Stand-alone (CDR alone) or hybrid procedure (Concurrent ACDF or PCF)

• Age <18 excluded
Results

• CDR performed b/w 2004 and 2013:
  • Total: 22,282
  • Elective: 20,002 (89.7%)
  • Emergent: 2,280 (10.3%)

• Elective:
  • Stand-Alone: 16,426 (73.71%)
  • CDR plus Anterior Fusion: 5596 (25.11%)
  • CDR plus Posterior Fusion: 135 (0.6%)

• Emergent:
  • Stand-Alone: 1,484 (65.04%)
  • CDR plus Anterior Fusion: 662 (29.03%)
  • CDR plus Posterior Fusion: 43 (1.8%)
Weighted Frequencies of Elective CDR Procedures by Procedure Group

- Stand-Alone CDR
- CDR with Anterior Cervical Fusion or Re-fusion (no posterior cervical fusions)
- CDR with Posterior Cervical Fusion or Re-fusion (no anterior cervical fusions)

Data points:
- 2004: 24,437.67, 56,794.63, 24,546.37
- 2005: 32,846.05, 209,163.35, 4,263.34
- 2006: 61,062.01, 470,526.65, 14,621.12
- 2007: 1133, 450,857, 9,339.01
- 2008: 2225, 1027, 10.362.67
- 2009: 2427, 1027, 9.394.04
- 2010: 2226, 1027, 9.394.04
- 2011: 1910, 1027, 9.394.04
- 2012: 1495, 1027, 9.394.04
- 2013: 1765, 1027, 9.394.04

Arrows indicate significant changes in procedure frequencies.
## Indications and Off-Label use

### ELECTIVE

<table>
<thead>
<tr>
<th>Indications</th>
<th>N (%)</th>
<th>Off Label-Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical disc displacement</td>
<td>2902 (20.5%)</td>
<td>Dislocation of vertebra</td>
</tr>
<tr>
<td>Cervical Spondylosis</td>
<td>1177 (7.6%)</td>
<td>Cervical Post-Laminectomy Syndrome</td>
</tr>
<tr>
<td>Degenerative Disease</td>
<td>854 (6.03%)</td>
<td>Traumatic Spondylopathy</td>
</tr>
<tr>
<td>Spinal Stenosis</td>
<td>290 (2%)</td>
<td>Cervical Spine Fracture</td>
</tr>
</tbody>
</table>

### EMERGENT

<table>
<thead>
<tr>
<th>Indications</th>
<th>N (%)</th>
<th>Off Label-Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical disc herniation</td>
<td>290 (12.7%)</td>
<td>Cervical spine fracture</td>
</tr>
<tr>
<td>Cervical Spondylosis</td>
<td>73 (3.2%)</td>
<td>Dislocation of cervical vertebra</td>
</tr>
<tr>
<td>Degenerative Disease</td>
<td>50 (2.2%)</td>
<td>Cervical spinal cord injury</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Traumatic spondylopathy</td>
</tr>
</tbody>
</table>
Conclusions

• Overall prevalence of CDR has rapidly increased the first five years after market introduction in the U.S. followed by a decline after 2009 and a plateau till 2013.

• A considerable number of cases were accompanied with anterior or posterior cervical fusion, both in the elective and the emergent setting reflecting the use of the technique in an off-label manner.