Voice and Swallowing Issues post Anterior Cervical Decompression and Fusion

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11th September 2015
Anterior Cervical Decompression and Fusion (ACDF) or Absolute Certainty of Difficulty Feeding
Overview

- Normal Swallow
- ACDF Surgery and potential structures involved
- Incidence and Severity in the literature
- Risk factors for dysphagia
- Post op dysphagia and dysphonia
- Cervical Orthoses
- Dysphagia Management
- POWH Cases

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Normal Swallow

Oral Phase

Pharyngeal Phase

Oesophageal Phase

- nose
- hard palate
- upper lip
- lower lip
- teeth
- salivary glands
- tongue
- soft palate
- pharynx
- epiglottis
- trachea
- oesophagus
Normal Swallow

Swallowing requires six cranial nerves
CN V, VII, IX, X, XI, XII
&
26 muscles -some of which include the pharyngeal constrictors, stylopharyngeus, levator veli palatini and cricopharyngeus
ACDF Surgery

https://www.youtube.com/watch?v=n-pjZxEy6Rw

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Recurrent Laryngeal and Superior Laryngeal Nerves

CNs and Muscles at Risk

Structures potentially at risk during cervical spinal surgery

• Glossopharyngeal and Hypoglossal nerves above C3
• Superior Laryngeal nerve at C3-4
• Recurrent Laryngeal nerve and Vagus trunk at C5-T1
• Cricopharyngeus muscle at C5-6

(Lee et al)
INSTRUCTIONAL REVIEW: SPINE

Dysphagia following anterior cervical spinal surgery

A SYSTEMATIC REVIEW

The Bone and Joint Journal
2013

S. K. Cho,
Y. Lu,
D-H. Lee

From Leni & Peter W. May Department of Orthopaedics,
Mount Sinai Medical Center, New York,
New York, United States
Dysphagia post ACDF

• Incidence of post-op dysphagia between 2% and 70%

• High incidence in the first weeks post surgery however decreases and plateaus out.

• Persistent dysphagia, potential for years after the surgery.

Yue et al 2005- 35% incidence 7.2yrs post
Olsson et al 2015- 26% incidence at 2.75yrs (33 months) post.
Severity of Dysphagia post ACDF

Bazaz-Yoo Dysphagia Questionnaire

<table>
<thead>
<tr>
<th>Symptom Severity</th>
<th>Liquid food</th>
<th>Solid food</th>
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<tbody>
<tr>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Mild</td>
<td>None</td>
<td>Rare</td>
</tr>
<tr>
<td>Moderate</td>
<td>None or rare</td>
<td>Occasionally (only with specific food)</td>
</tr>
<tr>
<td>Severe</td>
<td>None or rare</td>
<td>Frequent (majority of solids)</td>
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</table>

Yue et al, 2005
### Table 4 Preoperative and postoperative dysphagia

<table>
<thead>
<tr>
<th></th>
<th>Preoperative (%)</th>
<th>Early postoperative (%)</th>
<th>At review (%)</th>
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<tbody>
<tr>
<td>None</td>
<td>72 (97.3)</td>
<td>40 (54.1)</td>
<td>48 (64.9)</td>
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<tr>
<td>Mild</td>
<td>2 (2.7)</td>
<td>11 (14.9)</td>
<td>13 (17.6)</td>
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<tr>
<td>Moderate</td>
<td>0</td>
<td>18 (24.3)</td>
<td>12 (16.2)</td>
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<tr>
<td>Severe</td>
<td>0</td>
<td>5 (6.8)</td>
<td>1 (1.4)</td>
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Yue et al 2005

### Incidence and Severity of Dysphagia More Than 1 Year Postoperatively

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<tr>
<th>Dysphagia</th>
<th>No. (%)</th>
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<td>74 (74)</td>
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<tr>
<td>Yes</td>
<td>26 (26)</td>
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<td>Severity</td>
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<td>Rare</td>
<td>2 (8)</td>
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<tr>
<td>Mild</td>
<td>7 (27)</td>
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<tr>
<td>Moderate</td>
<td>12 (46)</td>
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<tr>
<td>Severe</td>
<td>5 (19)</td>
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</table>

Olsson et al 2015
Dysphonia post ACDF

Yue et al 2005

<table>
<thead>
<tr>
<th></th>
<th>Preoperative (%)</th>
<th>Early postoperative (%)</th>
<th>At review (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>72 (97.3)</td>
<td>51 (68.9)</td>
<td>60 (81.1)</td>
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<td>Mild</td>
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<td>8 (10.8)</td>
<td>5 (6.8)</td>
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<tr>
<td>Moderate</td>
<td>2 (2.7)</td>
<td>13 (17.6)</td>
<td>6 (8.1)</td>
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<tr>
<td>Severe</td>
<td>0</td>
<td>2 (2.7)</td>
<td>3 (4.1)</td>
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Risk Factors - Cho et al 2013

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<thead>
<tr>
<th>Risk Factor</th>
<th>Supporting study (study design, number of subjects)</th>
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<tr>
<td>Female gender</td>
<td>Lee et al⁴ (prospective, n = 348)</td>
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<tr>
<td></td>
<td>Bazaz et al² (prospective, n = 249)</td>
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<tr>
<td>Multiple level procedures</td>
<td>Lee et al⁴ (prospective, n = 348)</td>
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<td>Bazaz et al² (prospective, n = 249)</td>
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<tr>
<td></td>
<td>Riley et al¹⁹ (retrospective, n = 454)</td>
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<tr>
<td>Revision procedures</td>
<td>Lee et al⁴ (prospective, n = 348)</td>
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<td>Duration of procedure</td>
<td>Riley et al¹⁹ (retrospective, n = 454)</td>
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<tr>
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<td>Rihn et al¹⁸ (prospective, n = 94)</td>
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<td>Older age</td>
<td>Smith-Hammond et al²³ (prospective, n = 83)</td>
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<tr>
<td>Prominent plate profile</td>
<td>Lee et al¹² (prospective, n = 156)</td>
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<tr>
<td>rhBMP-2</td>
<td>Buttermann et al⁶ (prospective, n = 66)</td>
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<td></td>
<td>Vaidya et al²⁴ (retrospective, n = 46)</td>
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<td></td>
<td>Shields et al²¹ (retrospective, n = 151)</td>
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<tr>
<td>Neck pain</td>
<td>Riley et al¹⁹ (retrospective, n = 454)</td>
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</table>
Risk Factors for Dysphagia & Dysphonia

• Patient Factors
  Female
  Advancing age
  Smoking
  Neck pain

• Surgical characteristics
  multi level procedure- 3 or more levels
  Primary vs revision procedures
  longer surgery time
  cervical plate prominence
Dysphagia post ACDF

• MBS footage
Post Op Dysphagia and Dysphonia

- Impaired pharyngeal contraction
- Reduced laryngeal closure
- Reduced epiglottic deflection
- Reduced UES opening
- Neuropraxis of RLN and SLN
- Post op soft tissue oedema
- Post op haematoma
- Oesophageal injury

Leonard and Belafsky 2011
Fiberoptic Endoscopic Evaluation of Swallow

Normal endoscopic view

FEES Footage post ACDF

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Cervical Orthoses

- Subtle mechanical changes to the swallow
- Stambolis et al 2003- effect of cervical bracing on swallow in healthy volunteers (n=17).

Changes in parameters seen on MBS with bracing condition of SOMI brace and Halo vest
- point of swallow initiation
- presence & amount of pharyngeal residue
- change to bolus flow and laryngeal penetration
- reduced hyoid bone elevation
- no aspiration identified
Cervical Orthoses

1. Brace itself alters the natural movement during the swallow
2. Mandibular pads on a SOMI brace may restrict hyoid bone movement
3. Forced 90° head-spine alignment
4. Limits use of compensatory swallow strategies.

http://www.surgico.co.nz/products/s-o-m-i-brace/
Dysphagia Management post ACDF

• Compensatory Swallow Strategies
e.g. altered head positioning- head turn
  diet modifications
  mendelsohn manoeuvre
  effortful swallow/double swallow

• Rehabilitation Swallowing Exercises

• Surgical Management- referral to ENT
  VC medialisation
  cricopharyngeal myotomy / botox
<table>
<thead>
<tr>
<th></th>
<th>Sex</th>
<th>Cause</th>
<th>Sx</th>
<th>Level</th>
<th>SP IAx</th>
<th>Dysphagia</th>
<th>Dysphonia</th>
<th>Return to oral intake</th>
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<td>non trauma</td>
<td>NeuroSx Rt</td>
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<td>Ortho Lt</td>
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<td>D 3</td>
<td>severe</td>
<td>Y</td>
<td>Lt VC palsy</td>
<td>NBM PEG at 5mths</td>
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<tr>
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<td>F</td>
<td>trauma</td>
<td>NeuroSx Rt</td>
<td>C6-7</td>
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<td>Y</td>
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<tr>
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<td>Dysphonia</td>
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<td>N</td>
<td>Day 8</td>
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<td>C6-7</td>
<td>D 6</td>
<td>none</td>
<td>N</td>
<td>Day 6</td>
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</tbody>
</table>
Speech Pathology ACDF Cases

- Total 13 – 2:11 female:male
- Dysphagia incidence – 11/13
  Severity 4 severe dysphagia (3 NBM with PEG)
  2 moderate dysphagia
  2 mild-moderate
  3 mild dysphagia
  2 no dysphagia
- Dysphonia incidence – 7/13
  4/7 confirmed VC palsy
Acute on Chronic Dysphagia

• Syncope - fall and sustained C5/6 #
• C5/6 ACDF left sided approach
• Dysphonia- ENT consult- Left VC palsy
• Dysphagia on Speech Path Bedside Ax
• MBS
• Incidental finding of large osteophytes at C3-4
• MBS footage
Emerging Research

- DAISY Project - Jackie McRae, UK
  Dysphagia following Acute cervical Spinal cord injury
In Summary

- Critical structures for voice and swallow can be affected
- Dysphagia and dysphonia common immediately post op and longer term
- Incidence and severity is varied and often under reported
- Exact aetiology and specific risk factors are unclear