

# Hypopharyngeal and Esophageal Injury after Anterior Cervical Discectomy and Fusion

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## Abstract

### OBJECTIVES/HYPOTHESIS:

The primary objective of this study was to evaluate presenting symptoms, workup and management of hypopharyngeal and esophageal injury associated with anterior cervical spine fusion.

### STUDY DESIGN:

Retrospective consecutive case series in an academic institution.

### METHODS:

Inclusion criteria included all patients with esophageal injury and dysphagia after ACDF that presented to the OHSU head and neck clinics from January 1, 2006 to July 1 2011, (N = 10). Outcomes reviewed include time to presentation, presenting symptoms, method of repair and oral intake status.

### RESULTS:

Of 10 patient records reviewed, 4 patients presented with dysphagia, hoarseness, neck pain or abscess within a week after ACDF. 3 patients presented >1year after ACDF with abscess, aspiration pneumonia or stridor. 3 patients had a delay in diagnosis with >1year between presentation of dysphagia and final diagnosis. Management of these patients was variable except for removal of fusion plate which occurred in 9/10 patients as either a staged procedure or concurrent with esophageal repair. Conservative treatment without reinforcing tissue was successful in 3 patients. These 3 patients had no evidence of esophageal injury or only a small perforation in initial endoscopy. One patient underwent successful repair with SCM flap alone. Six patients underwent free tissue transfer with one requiring salvage with SCM flap and two with persistent fistulas (one patient continued to take PO against medical advice, one patient with massive chordoma resection). On post treatment modified barium swallow, 4/10 developed small, asymptomatic and stable diverticulums (two treated conservatively, one free tissue transfer and one SCM flap). 7/10 patients were taking PO at 1wk-9mos post treatment. Of the remaining three patients, 2 died of other causes and one patient was a premorbid quadriplegic with longterm PEG use.

### CONCLUSIONS:

In patients with a history of ACDF (recent or remote) and complaints of dysphagia, clinicians should maintain a high index of suspicion for extraordinarily morbid complications such as esophageal perforation. Patients with 3 months of mild to moderate dysphagia would benefit from a modified barium swallow. Patient with severe symptoms for a similar length of time may need to undergo MBS, CT scan and endoscopy for complete evaluation. In cases of esophageal perforation, fusion plate must be removed prior to or in conjunction with repair. Placement of posterior plate can be performed in those with unstable spines. Our study and literature review indicate that majority of patients will resume oral intake.

## Introduction

Anterior cervical discectomy and fusion is one of the most common spinal procedures. Review of the Nationwide Inpatient Sample Database from 1992-2001 shows that ACDF represented 932,009 (0.3%) of all hospital discharges (1). From 1992-2005, there was a 206% increase in the rate of cervical spine fusion in Medicare beneficiaries (Figure 1) (2).

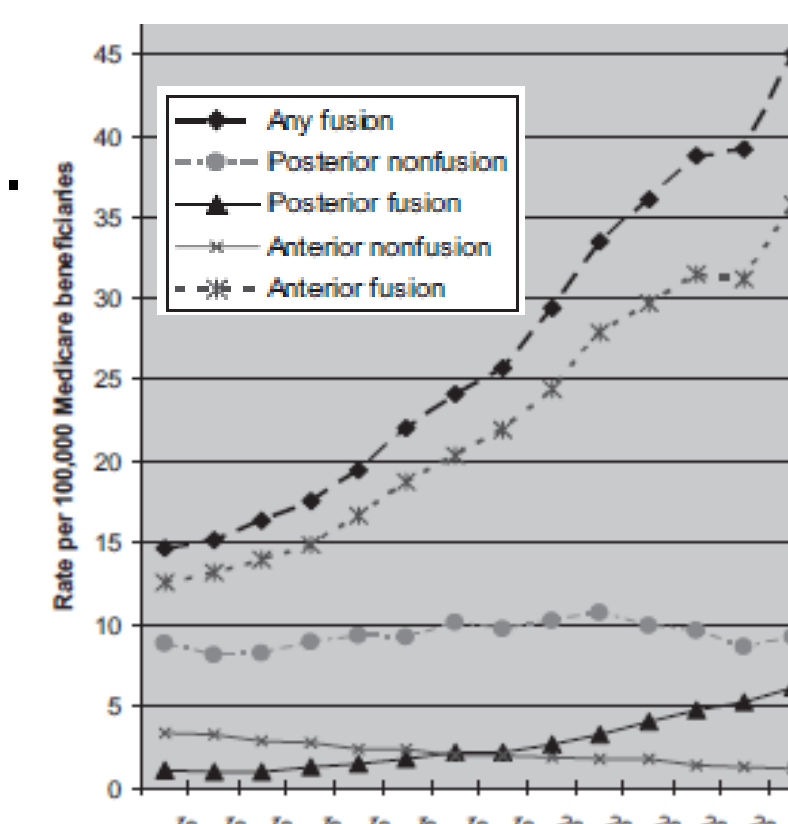


Figure 1 (2)

Indications for undergoing ACDF include disc herniation, stenosis, cord compression, trauma, tumor. Complications after ACDF include RLN palsy, homers syndrome, pharyngeal or esophageal laceration, great vessel injury, epidural hematoma, seroma, dural laceration, spinal cord contusion,

CSF leak, bone graft or plate extrusion. Rates of these complications vary with or without plate placement, with varying levels of fusion, with age (Figure 2) (3, 4).

Proposed etiologies of dysphagia after ACDF can be divided into immediate or delayed (Table 1) (5).

Immediate	Delayed
<ul style="list-style-type: none"> <li>Intraoperative <ul style="list-style-type: none"> <li>Pharyngeal plexus disruption</li> <li>Direct Injury</li> <li>Instrumentation</li> <li>Ischemic pressure necrosis from surgical tools, retractors, ETT</li> <li>RLN injury</li> </ul> </li> <li>Perioperative <ul style="list-style-type: none"> <li>Esophageal ischemia/reperfusion injury</li> <li>Local soft tissue swelling</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Hardware failure and screw migration</li> <li>Tissue edema</li> <li>Traction diverticulum</li> <li>Mass effect of plate</li> <li>Chronic pressure necrosis and tissue ischemia from prominent hardware</li> </ul>

A high index of suspicion and various imaging and endoscopy techniques can help with diagnosis of dysphagia and hypopharyngeal/esophageal injury (Table 2).

Imaging/Endoscopy	Findings
<ul style="list-style-type: none"> <li>Esophagram</li> <li>Plain radiographs</li> <li>CT scan with contrast</li> <li>MRI</li> <li>Panendoscopy</li> </ul>	<ul style="list-style-type: none"> <li>Diverticulum, blush or frank leak</li> <li>Pneumomediastinum or air in retropharyngeal/prevertebral space</li> <li>Abscess or air</li> <li>Cervical alignment, status of spine fixation</li> <li>Perforation, pharyngotomy, hardware, granulation</li> </ul>

## Methods

This was a retrospective review of all patients with esophageal injury and dysphagia after ACDF between 2006-2011 at a tertiary care center, Oregon Health and Science University, N=10.

Outcomes evaluated include 1) time to presentation 2) presenting symptoms 3) mode of diagnosis 4) repair (free tissue transfer vs. pedicled flap 5) postoperative PO status.

## Results

Pt	Time to Symptoms	Diagnosis	Presenting Symptom	Workup	Management	Outcome	Cofactors
1	Immediate	1yr	Neck abscess	CT	1. Remove plate 2. I&D 3. IV antibiotics	• PEG out @ 1 month • MBS: small diverticulum	
	8mo	4mo	Dysphagia	MBS: large traction diverticulum MBS: large pouch	1. Endoscopic diverticulectomy 2. Revision diverticulectomy, esophagoplasty 3. Radial Forearm FTT		
2	3yrs	3yrs	Abscess	CT	1. Remove plate 2. I&D (no obvious tear, corn kernel noted)		
	2wks	3mo	Neck Erythema	MBS: Fistula	1. PEG 2. 6 weeks antibiotics		
	3mo	6mo	Neck Erythema	MBS: Fistula	1. Fistula closure 2. Radial Forearm FTT 3. antibiotics	• Patient continued to take PO. • Found dead at home, likely narcotic overdose	Non-compliant with NPO restrictions IV drug abuse
	8mo	8mo	PC fistula	MBS: Fistula	1. Fistula closure 2. other Radial Forearm FTT 3. antibiotics		
3	7 days	7 days	Abscess	Resp distress	1. Trach 2. I&D		
	1wk	3mo	Dysphagia	MBS: Normal	1. Fistula closure 2. Anterolateral Thigh FTT 3. 6 weeks antibiotics	Died from progression of chordoma 8 mo after plate exposure	Revision chordoma resection at time of plate placement
	3mo	6mo	Dysphagia	MBS: Normal	1. Start PO		
4	Immediate	Immediate	Dysphagia	Esoph injury noted during procedure	1. PEG 2. NPO 3 mo 3. 3mo MBS neg so PO		
	3mo	2mo	Dysphagia, Neck Pain	CT: air over spine	1. Remove plate 2. Radial Forearm FTT 3. 4wk MBS neg so PO	• PEG out 5mo • MBS: no pouch	
5	6yrs	6yrs	Aspiration Pneumonia	During routine PEG change, ETT and screw seen	1. Remove plate 2. Anterolateral Thigh FTT	• Continued PEG use • No Recreational PO	Distant history of CS-6 Trauma (Quadriplegic)
6	6-8mos	2yrs	Dysphagia	Esophagram: Fistula	1. Remove plate but no perforation seen 2. PEG 3. 4 wk IV antibiotics	• PEG out 2 mo • MBS: small diverticulum	
7	5 days	5 days	Aspiration, Neck Abscess	1. CT 2. DL: 1cm PPW perforation	1. Remove plate 2. I&D 3. primary esophagoplasty 4. 12 wk antibiotics	• PEG out @5mo • MBS: no pouch	
8	10 yrs	10 yrs	Dysphagia, Stridor	DL: exposed plate	1. Remove plate 2. SCM flap 3. PEG	• PEG out @3mo	
	2 mo			MBS: diverticulum	1. Endoscopic diverticulectomy		
9	Immediate	Immediate	Dysphagia, Hoarseness	FFL: airway edema	1. Seroma evacuation		
	1mo	2mo	Dysphagia	MBS: normal	1. Remove plate 2. soft diet	• PEG out @9 mo • MBS: no pouch	
	4mo	4mo	Pt found down, Hoarseness	FFL: Unilateral VC paresis	1. Posterior plate placed 2. trach, PEG 3. Cymetra injection		
10	2wk	6yrs	Dysphagia, hoarse	1. CT 2. DL: head of screw seen and surrounded by pyogenic granuloma	1. Remove plate 2. esophagoplasty, pharyngoplasty, CP myotomy, 3. Radial Forearm FTT 4. PEG	• PEG out @ 2 mo • MBS: small diverticulum	

MBS – modified barium swallow; FTT – Free Tissue Transfer; FFL: Flexible Fiberoptic Laryngoscopy

## Conclusion

- In patients with history of ACDF (recent or remote) and complaints of dysphagia, would have **high index of suspicion** to obtain MBS or esophagram as well as endoscopy to identify highly morbid complications such as esophageal perforations.
- In esophageal perforation, always remove the plate and replace with a posterior if needed.
- Most patients will eventually resume PO intake.

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## Outcomes

### 1. Time to symptoms

- Immediate: 60% presented with dysphagia, hoarseness, neck pain or abscess within 1-2 weeks after ACDF
  - Case 4: Esophageal injury was noted during primary procedure in only one case
  - Case 9: Seroma evacuation in OR with subsequent airway edema
- Delayed: 40% present with symptoms 6months to 10 years after ACDF
  - 3/4 (75%) of these presented >1yr after ACDF with abscess, asp pneumonia or stridor.
- Three patients had a delay in diagnosis with >1yr between presentation of dysphagia and final diagnosis.
  - Case 10 - 6 yr delay: fluctuating voice and serviceable swallow. Diagnosed with VC paresis, stricture and acute esophagitis. Finally DL demonstrated screws (Figure 3) and pyogenic granuloma (Figure 4)
  - Case 6 – 14 mo delay: “saw a specialist who advised her to modify her diet and that it was due to scar tissue”

### 2. Initial Presenting Symptoms

- Dysphagia 50% (both immediate and delayed)
- Abscess 40% (both immediate and delayed)
- Hoarseness 20%
- Aspiration PNA 20%
- Stridor 10%
- Neck Pain 10%

### 3. Method of Repair

- Conservative treatment without reinforcing tissue was successful in 3 patients.
  - These 3 patients had no evidence of esophageal injury or only a small perforation in initial endoscopy.
- One patient underwent successful repair with SCM flap alone.
- Six patients underwent free tissue transfer
  - one requiring salvage with SCM flap
  - two with persistent fistulas
    - Case 2: patient continued to take PO against medical advice
    - Case 3: patient with massive chordoma resection.

### 4. ACDF plate removed in 9/10 pt

- One pt with unstable spine due to chordoma

### 5. Post-treatment MBS:

- 4/10 developed small, asymptomatic and stable diverticulums (two treated conservatively, one free tissue transfer and one SCM flap). (Figure 5)

### 6. PEG vs. PO

- 7/10 patients were taking PO at 1wk-9mos post treatment.
- Two patients died of other causes
- One patient was a premorbid quadriplegic with longterm PEG use.

