

## Original Article

## Incidence of dysphagia after odontoid screw fixation of type II odontoid fracture in the elderly

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## Abstract

**Background:** Although surgery may reduce mortality rates from type II odontoid fractures in the elderly population, post-operative dysphagia resulting from screw fixation remains a serious complication.**Methods:** We retrospectively performed a chart review of patients over 65 years of age who underwent odontoid screw placement for type II odontoid fractures (2009-2014) and sustained post-operative dysphagia. The severity of dysphagia was determined based on the requirements for modified diets, PEG tubes, and prolonged length of stay (LOS), while costs were based upon discharge disposition (e.g. home vs. rehabilitation facilities) and total hospital costs.**Results:** The incidence of postoperative dysphagia was 80%; 33% required feeding tubes, and 35% warranted PEG placement. The mean LOS for patients with dysphagia was 5 days longer and the total hospital costs averaged \$50,000 higher.**Conclusions:** Age over 65 is a significant predictor of post-operative dysphagia in patients undergoing type II odontoid screw fixation. Notably, with each additional year above 65, the likelihood of post-operative dysphagia increased by 12%. Furthermore, postoperative dysphagia statistically increased the LOS and total costs.**Key Words:** Dens fracture, dysphagia, non-union, odontoid fracture, odontoid screw

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## INTRODUCTION

Fractures of the axis are the most common cervical spine fracture in the elderly population.<sup>[1]</sup> The Anderson and D'Alonzo classification system, most commonly applied to these fractures, identify Type II odontoid fractures at the junction of the odontoid process with the body of the second cervical vertebra.<sup>[1]</sup> These fractures account for approximately 9% of all cervical spine fractures and the incidence increases with age.<sup>[1]</sup> Despite controversy over the optimal management of type II odontoid fractures, there has been an increase in the operative management reported.<sup>[5]</sup>

Here, for patients >65 years of age with type II odontoid fractures treated with screw fixation, the authors

documented the incidence of postoperative dysphagia, its complications, and costs. Dysphagia was most typically attributed to; hematoma formation, retropharyngeal swelling, fracture displacement, and/or cervical

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immobilization that impaired swallowing.<sup>[4]</sup> Increasing age appears to contribute to the incidence of dysphagia after cervical fractures.

Post-operative dysphagia following anterior odontoid screw fixation frequently resolves, but occasionally requires feeding tubes and/or percutaneous endoscopic gastrostomy (PEG) resulting in more prolonged length of stay (LOS) and hospital costs. This complication of the anterior approach may prompt more surgeons to alternatively consider posterior cervical fixation for type II odontoid fractures in the elderly.<sup>[6]</sup>

This study evaluated 40 patients undergoing anterior odontoid screw fixation, and assesses the incidence of post-operative dysphagia along with increased LOS, and hospital costs.

## MATERIAL AND METHODS

Forty patients over the age of 65 underwent odontoid screw fixation for type 2 odontoid fractures (2009-2014). Shortcomings of the study design included; surgeons' independent decision to utilize odontoid screw fixation (no fixed criteria), the failure to document dysphagia preoperatively and the retrospective design of the study (e.g. data obtained from patients' medical records). Although multiple clinical variables were assessed (see Table 1), those related to swallowing were isolated (e.g. degree of dysphagia, barium swallow evaluations, and feeding methods). Additionally, costs related to patient's length of stay and discharge disposition were evaluated.

### Statistical Analysis

Frequency distributions and summary statistics were used to describe demographic and medical history data (see Table 1). Comparisons between independent groups were performed using two-sample t-tests

for continuous variables, or Chi-square tests for dichotomous or categorical variables. Odds ratios with 95% confidence intervals were reported where applicable. The usual  $P < 0.05$  was required for statistical significance.

## RESULTS

80% of patients undergoing anterior type II odontoid fracture fixation exhibited post-operative dysphagia; 72% underwent a postoperative barium swallow. 44% of those with dysphagia required PEG tube insertion.

### Older age correlated with increased dysphagia following anterior odontoid fixation [Table 1]

Older age correlated with a higher risk of dysphagia; for 32 patients with dysphagia the average age was 86.2, for the 8 without dysphagia it was 79.6 years. For each added year of age over 65, the risk of post-op dysphagia increased 12% (odds ratio = 1.12, 95% confidence interval: 1.001, 1.258).

### Dysphagia increased LOS [Table 1]

Dysphagia clearly increased the average length of stay. The mean LOS for the dysphagia group was 11.9+/- 5.99 versus 7.0+/- 3.55 days for those without dysphagia ( $P = 0.035$ ).

### Dysphagia diagnoses increased discharges to skilled nursing facilities [Table 1]

Regardless of dysphagia status, patients were discharged to either skilled nursing facilities (53%) or home (40%) with or without home health care services. The number of patients requiring tube feedings was too small to assess their impact on discharge disposition.

### Dysphagia increased hospital costs [Table 1]

Dysphagia significantly increased hospital costs. Inpatient hospital costs were almost \$50,000 greater for those with

**Table 1: Characteristics of 40 elderly patients undergoing anterior odontoid fixation for type II odontoid fracture**

	n (%)	Dysphagia (n=32)		n (%)	No Dysphagia (n=8)		P
		Mean (SD)	Min, Max		Mean (SD)	Min, Max	
Age		86.2 (7.65)	68, 101		79.6 (7.63)	70, 91	0.037
LOS <sup>a</sup>		11.9 (5.99)	5, 28		7 (3.55)	2, 14	0.035
Average inpatient costs <sup>e</sup>	(n=31)	\$126,136 (86,853)	\$49,044, \$471,167		\$75,516 (26,412)	\$38,725, \$122,539	0.009
Discharge disposition							0.49
HH/Rehab <sup>d</sup>	11 (34)			5 (62.5)			
SNF <sup>d</sup>	18 (56.3)			3 (37.5)			
LTACH <sup>d</sup>	2 (6.3)			0 (0)			
Expired	1 (3.1)			0 (0)			
		PEG <sup>b,c</sup> n=14 (35%)			No PEG n=26 (65%)		
LOS		13.4 (3.9)	7,23		9.0 (6.19)	2,28	0.019
Average inpatient costs <sup>e</sup>	(n=14)	\$137,332 (69,747)	\$77,998, \$352,740		(n=25) \$103,667 (85,164)	\$38,725, \$471,167	0.22

<sup>a</sup>LOS: Length of stay in days. <sup>b</sup>PEG: Percutaneous endoscopic gastrostomy tube. <sup>c</sup>Includes all patients who required PEG tube before discharge. <sup>d</sup>HH: Home health, Rehab: Outpatient rehabilitation, SNF: Subacute nursing facility, LTACH: Long term acute care hospital. <sup>e</sup>Calculated from admission to discharge. Does not include costs incurred after discharge from inpatient hospital status

post-operative dysphagia; they were \$38,000 higher for those requiring PEG tube placement.

## DISCUSSION

The elderly population (e.g. over the age of 65) experiencing type 2 odontoid fractures is increasing.<sup>[7]</sup> Recent studies demonstrated a survival benefit to operative stabilization.<sup>[2]</sup> Nevertheless, the choice of surgical approach, anterior vs. posterior, remains controversial.<sup>[3]</sup> The anterior odontoid screw procedure maximizes rotational motion at the C1-C2 segment and is largely considered less painful.

This study reviewed the incidence of post-operative dysphagia following 40 anterior screw fixation procedures performed in patients over the age of 65 with type II odontoid fractures. Here we documented an 80% incidence of postoperative dysphagia; 67% required tube feeds during the admission, 32% still required tube feeds upon discharge, while 35% required PEG tube placement. Older age correlated with an increased incidence of dysphagia; the 32 patients with dysphagia averaged 86.2 years of age, while the 8 without dysphagia averaged just 79.6 years old. With each year above 65, the risk of post-operative dysphagia increased by 12%.

Dysphagia correlated with a longer LOS; 11.9 with vs. 7 days without dysphagia, while those requiring PEG had an average LOS of 13.4 days vs. 9 days without. Furthermore, hospital costs were significantly higher for those with post-operative dysphagia; the total cost of an inpatient stay was approximately \$50,000 higher, regardless of need for PEG tube placement.

## CONCLUSION

The incidence of post-operative dysphagia was 80% for 40 patients over the age of 65 undergoing anterior screw fixation for type II odontoid fractures. Postoperative dysphagia, requiring feeding tubes and/or PEG placement, significantly increased the LOS and average inpatient hospital costs by more than \$50,000.

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## Conflicts of interest

There are no conflicts of interest.

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