Impact of Cervical Osteophyte Level and Size on Dysphagia-Related Symptom Severity

Noah Thornton, BS[1,2], Arpitha Shenoy BS[3], Aleeza Leder Macek, MD[1], Ryan Stepp, BS[1], James Daniero, MD[1] , Vanessa Torrecillas, MD[1]

[1]Department of Otolaryngology – Head and Neck Surgery, University of Virginia
[2]Lewis Katz School of Medicine, Temple University
[3]School of Medicine, University of Virginia

1. Background

- Anterior cervical osteophytes (ACOs) occur in **20–30% of adults >60 years of age.** [1,2]
- Can cause **dysphagia, aspiration, globus, dysphonia, and dyspnea**. [1,3]
- Prior studies suggested link between **osteophyte size, cervical level, and aspiration**, but findings inconsistent.[4]
- **Objective:** Determine how osteophyte **size and level** affect dysphagia severity, aspiration risk, and outcomes.

Hypothesis:

- Larger osteophytes → worse dysphagia.
- High cervical (C1–C5) → aspiration
- Low cervical (C6–C7) → solid food dysphagia.

Figure 1: Videofluoroscopic Swallow Study (VFSS) in a Patient with an ACO

Figure 1: Lateral fluoroscopic views during VFSS demonstrate a prominent cervical osteophyte causing posterior pharyngeal wall bulging and disruption of bolus transit.

2. Methods and Material

- Retrospective review (2014–2024) of patients with reported **Dysphagia + radiologically confirmed ACO.**
- Excluded patients with stroke, cervical spine surgery, trauma, malignancy, neuromuscular disorders contributing to dysphagia.

Data Collected:

- Demographics, comorbidities, symptoms, osteophyte size/level, interventions.

Imaging measurement:

- Maximum anterior–posterior (AP) projection of osteophyte on CT, x-ray, or fluoroscopy **(Figure 2).** [3]

Swallowing assessment:

- Penetration–Aspiration Scale (PAS): validated 8-point scale rating depth of airway invasion and patient response (1=material does not enter airway; 8=silent aspiration below the vocal folds) [5]
- MBSImP (Modified Barium Swallow Impairment Profile): standardized assessment of swallowing physiology

Contact: Noah Thornton; Noah.Thornton@temple.edu

2. Methods and Material (continued)

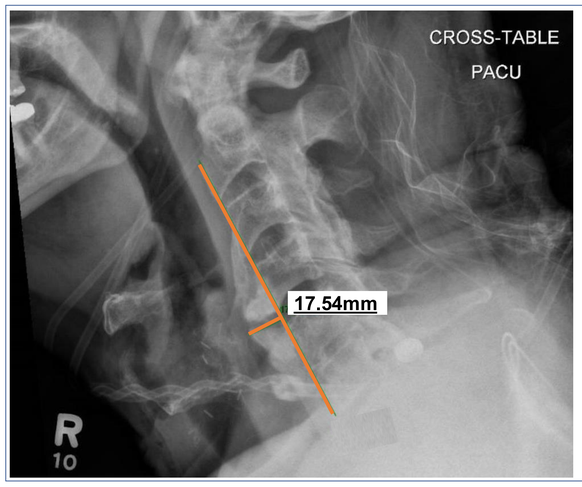


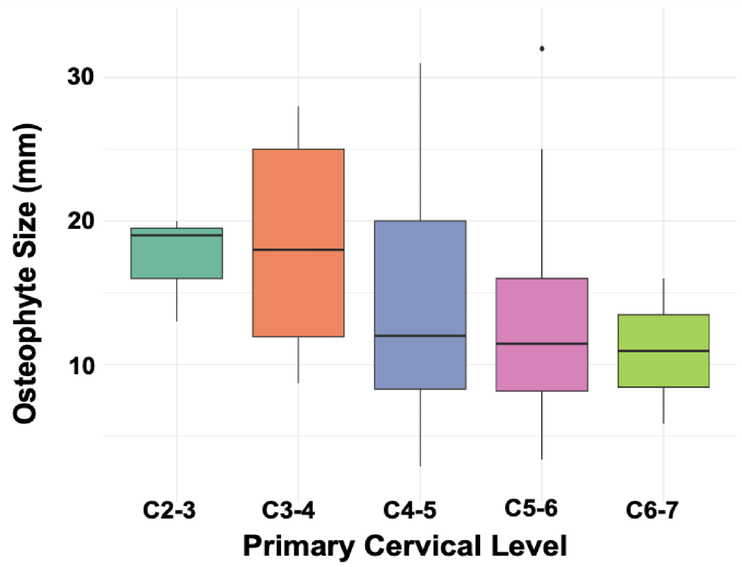
Figure 2: Measurement of Anterior Cervical Osteophyte Size

Osteophyte size was defined as the maximum anterior–posterior (AP) projection from the vertebral body, measured on sagittal CT, lateral x-ray, or fluoroscopic imaging. This standardized measurement was used across all patients to quantify osteophyte burden for analysis.

3. Results

- Cohort: 43 patients; 77% male, mean BMI 30.4.
- Most common level: C4–5 (52%).
- 18 patients (41.9%) **high cervical (C1–C5).**
- 25 patients (58.1%) **low cervical (C6–C8).**
- Mean size: 16.2 mm (range 2.9–52.0).

Figure 3: Osteophyte Size Distribution by Cervical Level



- There was no statistically significant variation in osteophyte size based on the cervical level. **(Figure 3)**

Key findings:

- **Larger osteophyte size** was significantly associated with **higher PAS scores** for thin (β=0.091, p=0.03) **(Figure 4)** and thick liquids (β=0.127, p=0.0007).
- ROC → 20 mm cutoff predicts PAS ≥5 (AUC 0.667, p=0.027).
- Size **≥20 mm → 7.3x more likely to aspirate** with thin liquids (PAS ≥5).
- **High cervical** (C1–5) → **higher PAS** with thin liquids (3.7 vs 1.75, p=0.006).
- Symptoms: reflux, globus, dysphonia, aspiration events are common but not predictive of aspiration risk or dysphagia severity.
- Interventions: No association between size/level and need for PEG, dilation, or ACDF/PCDF.

3. Results (continued)

Figure 4: Correlation between Osteophyte size and Penetration-Aspiration Scale (PAS)

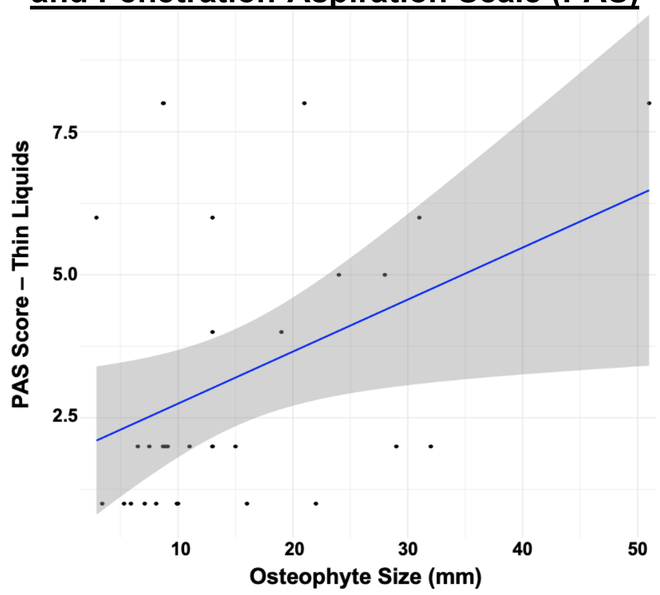


Figure 4: Scatterplot showing the relationship between maximum osteophyte size (mm) and PAS scores for thin liquids. Linear regression (blue line) demonstrates a positive correlation, with larger osteophytes associated with higher PAS scores, indicating greater aspiration risk (β=0.091, p=0.03). Shaded region represents the 95% confidence interval.

4. Discussion

- First study to use standardized PAS/MBSImP while excluding confounding conditions.
- **Size ≥20 mm** = reliable, radiographic **threshold for aspiration risk.**
- High cervical osteophytes → greater airway compromise due to impaired epiglottic inversion and laryngeal elevation. [6]
- **Symptoms alone are unreliable** → highlights role of imaging + objective swallow studies
- Surgical decision-making likely influenced by multiple factors beyond size/level.

5. Conclusion

- **Osteophyte size ≥20 mm** and **high cervical location** predict aspiration on VFSS.
- **Patient-reported symptoms** unable to predict objective deficits and severity.
- Recommend **radiographic measurement + functional swallow testing** in suspected ACO-related dysphagia.

6. References

1. Granville LJ, et al. Anterior cervical osteophytes as a cause of pharyngeal stage dysphagia. J Am Geriatr Soc. 1998;46(8):1003-1007. doi:10.1111/j.1532-5415.1998.tb02757
2. Seidler TO, et al. Dysphagia caused by ventral osteophytes of the cervical spine: clinical and radiographic findings. Eur Arch Otorhinolaryngol. 2009;266(2):285-291. doi:10.1007/s00405-008-0735-4
3. Seo JW, et al. Anterior cervical osteophytes causing dysphagia and paradoxical vocal cord motion leading to dyspnea and dysphonia. Ann Rehabil Med. 2013;37(5):717-720. doi:10.5535/arm.2013.37.5.717
4. Strasser G, et al. Cervical osteophytes impinging on the pharynx: importance of size and concurrent disorders for development of aspiration. AJR Am J Roentgenol. 2000;174(2):449-453. doi:10.2214/ajr.174.2.1740449
5. Borders JC, Brates D. Use of the penetration-aspiration scale in dysphagia research: a systematic review. Dysphagia. 2020;35(4):583-597. doi:10.1007/s00455-019-10064-3
6. Matsuo K, Palmer JB. Anatomy and physiology of feeding and swallowing: normal and abnormal. Phys Med Rehabil Clin N Am. 2008;19(4):691-707. doi:10.1016/j.pmr.2008.06.001