

# Head rotation as an effective compensatory technique for dysphagia caused by unilateral cervical osteophytes

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Minsu Seo  and Jin-Woo Park 

## Abstract

**Objective:** Dysphagia is common in patients with cervical osteophytes. We aimed to determine whether head rotation as a compensatory technique is effective for dysphagia caused by unilateral cervical osteophytes.

**Methods:** We retrospectively analyzed videofluoroscopic swallowing study (VFSS) data obtained in one university hospital. Patients whose VFSS showed pharyngeal stasis by mechanical obstruction due to cervical osteophytes were selected. They were divided into a unilateral skewed osteophyte group and a diffuse central osteophyte group as confirmed by laryngoscopy or computed tomography. The effect of head rotation on swallowing was investigated. Fisher's exact test was used for statistical analysis.

**Results:** Among 2876 patients who underwent VFSSs, we identified 48 patients with osteophyte-induced dysphagia. The osteophytes were centrally located in 36 patients and unilateral in the remaining 12. Ten of the patients with unilateral osteophytes showed improvement when they swallowed with head rotation toward the osteophyte side, but none of the patients with central osteophytes showed effective swallowing. A statistically significant relationship was found between swallowing with head rotation and skewed cervical osteophytes.

**Conclusion:** Swallowing with head rotation was safe, easy, and effective for patients with dysphagia caused by unilateral cervical osteophytes. We advise attempting this method prior to considering surgical approaches.

## Keywords

Geriatrics, osteophyte, deglutition disorders, conservative treatment, videofluoroscopic swallowing study, head rotation

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Department of Physical Medicine and Rehabilitation,  
Dongguk University Ilsan Hospital, Gyeonggi-do, Republic  
of Korea

## Corresponding author:

Jin-Woo Park, Department of Physical Medicine and  
Rehabilitation, Dongguk University Ilsan Hospital,  
27 Dongguk-ro, Ilsandong-gu, Goyang-si, Gyeonggi-do  
10326, Republic of Korea.

Email: [jinwoo.park.md@gmail.com](mailto:jinwoo.park.md@gmail.com)



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## Introduction

Vertebral osteophytes represented an age-dependent degenerative change in the spine.<sup>1,2</sup> Osteophytes are found in the cervical spine in approximately 20% to 30% of the elderly population. However, they are usually asymptomatic.<sup>3,4</sup> When osteophytes that protrude from the anterior margin of the cervical vertebrae compress the pharynx or esophagus, they can cause dysphagia, dyspnea, and dysphonia.<sup>5-7</sup> Dysphagia is a common symptom found in 75% of patients with cervical osteophytes.<sup>8</sup> The mechanisms of dysphagia include significant mechanical compression by a large osteophyte, obstruction at the level of the cricoid cartilage by a smaller osteophyte, and inflammation secondary to a local mass effect.<sup>9-11</sup>

Despite the high prevalence of dysphagia caused by cervical osteophytes, there is still no consensus on its treatment. Although surgical treatments for symptomatic osteophytes are often effective, they are associated with several complications and risks of osteophyte recurrence and dysphagia.<sup>12-16</sup>

Body or head postural changes are generally considered effective in improving swallowing function.<sup>17,18</sup> Head rotation has been used primarily in patients with unilateral pharyngeal weakness.<sup>19,20</sup> When pharyngeal peristalsis is weak, rotating the head toward the weaker side may help to narrow the swallowing tract on the weaker side and allow the bolus to move to the stronger side.<sup>21,22</sup> Thus, we hypothesized that if an osteophyte is asymmetrically skewed to one side, head rotation toward the osteophyte side might improve pharyngeal bolus passage and decrease residue by blocking the osteophyte side and allowing food to flow only through the other side. Therefore, the present study was performed to determine whether head rotation as a compensatory technique is effective for

dysphagia caused by unilateral cervical osteophytes.

## Materials and methods

### Study design

All data from videofluoroscopic swallowing studies (VFSSs) performed from January 2017 to April 2021 were retrospectively collected. Among the VFSSs, those showing pharyngeal stasis by mechanical obstruction due to cervical osteophytes were selected for inclusion in this study. The review of VFSSs was used to confirm whether swallowing with head rotation was effective for dysphagia caused by cervical osteophytes. The cases were divided into two groups based on whether the osteophytes were centrally or unilaterally located for statistical analysis.

This retrospective study was approved by the Institutional Review Board of Dongguk University Ilsan Hospital (No. 202107026004), and the reporting of this study conforms to the STROBE guidelines.<sup>23</sup> The requirement for informed consent was waived because of the retrospective study design. All patients' details have been de-identified.

### Data analysis

Data from the VFSSs were analyzed in a frame-by-frame manner using the INFINITT PACS M6 program (INFINITT Healthcare Co. Ltd., Seoul, Korea). First, in the lateral view, we identified cases in which liquid bolus stasis was seen or the pharyngeal passage was decreased because of osteophytes. Next, the changes in the amount of residue and pharyngeal passage were checked when swallowing with head rotation was performed in the anteroposterior view. The effectiveness of swallowing with head rotation was defined as reduced pharyngeal residue and improved

pharyngeal passage according to the video-fluoroscopic dysphagia scale.<sup>24</sup>

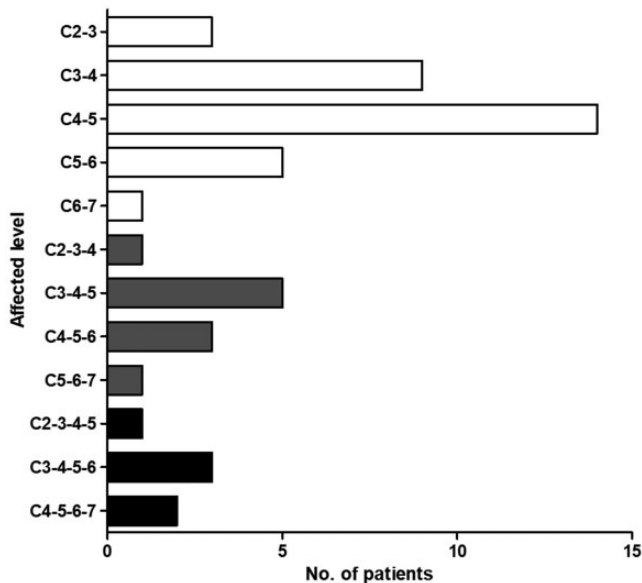
The patients were divided into two groups based on the osteophyte location to analyze the relationship between the effect of head rotation and the skewness of the osteophyte location. Cervical osteophyte location was confirmed by laryngoscopy (n = 12, 25%) or computed tomography scans (n = 36, 75%) as indicated in the medical records. Central osteophytes were defined as those for which the apex of the most severely protruding osteophyte was in the middle part of the vertebral body by dividing the length of the long axis of the vertebral body into three equal parts. Unilateral osteophytes were defined as those in which the apex was on the left or right side. The VFSSs and radiographs of all patients were reviewed by two clinicians (one who had more than 20 years of experience and another who had 5 years), and the conclusions were drawn by consensus.

### Statistical analysis

Fisher's exact test was used to determine whether there was an association between swallowing with head rotation and unilateral cervical osteophytes using R software version 4.1.0 (R Foundation for Statistical Computing, Vienna, Austria). Statistical significance was set at  $p < 0.05$ .

### Results

Among 2876 patients who underwent VFSSs, we identified 48 patients with osteophyte-induced dysphagia. The 48 patients comprised 42 men and 6 women ranging in age from 49 to 99 years (mean age, 76 years). Figure 1 shows the distribution of the cervical levels affected by osteophytes. Of the 48 patients, 32 patients had two levels involved, 10 had three levels involved, and 6 had four levels involved. According to the Resnick criteria,<sup>25</sup> 12.5% of the patients showed diffuse idiopathic skeletal hyperostosis (DISH).



**Figure 1.** Distribution of cervical levels affected by osteophytes. Thirty-two patients had two levels involved, 10 had three levels involved, and 6 had four levels involved.

The osteophytes were centrally located in 36 patients. In the remaining 12 patients, the osteophytes were unilaterally located (8 on the left side and 4 on the right side).

Table 1 presents the patients' characteristics and the effects of swallowing with head rotation according to osteophyte location. Ten patients in the unilateral osteophyte group showed improved pharyngeal bolus passage and a decrease in residue when they swallowed with head rotation toward the osteophyte side, whereas no effect was found in the central osteophyte group. A statistically significant relationship was present between swallowing with head rotation and skewed cervical osteophytes ( $p = 0.001$ ).

### Case presentation

A 78-year-old woman was referred for evaluation for swallowing difficulties. She was unable to swallow solid foods and could tolerate only a pureed diet. The VFSS revealed residue around the vallecular fossa and pyriform sinuses as well as aspiration caused by a cervical osteophyte (Figure 2(a)).

Computed tomography of the cervical spine showed a large anterior osteophyte unilaterally arising from the right side at the C4/C5 level (Figure 3(a)–(c)). Swallowing with right-side head rotation led to improved passage of boluses while

reducing the amount of residue (Figure 2 (b)). The patient thereafter continued to eat using this technique.

### Discussion

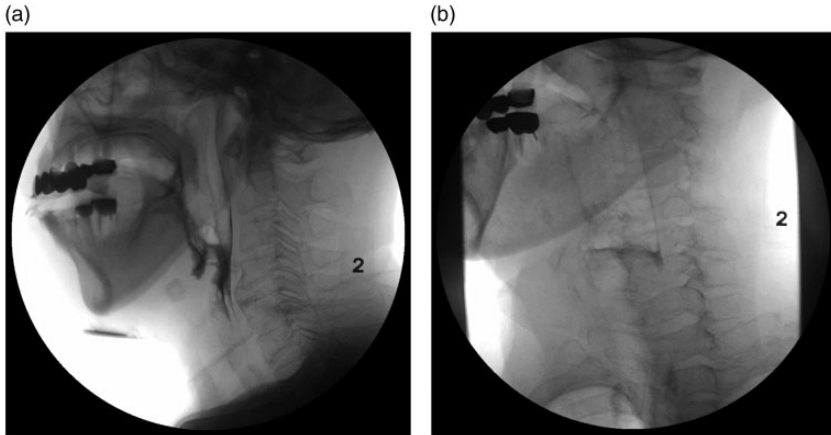
By analyzing the data from VFSSs, we tried to determine whether swallowing with head rotation is effective for dysphagia caused by cervical osteophytes. The primary finding of this study is that head rotation toward the osteophyte side improved pharyngeal bolus passage and decreased residue in patients with unilaterally located cervical osteophytes.

An osteophyte is an overgrowth of bone tissue and represents the body's attempt to compensate for degenerative changes of bone and ligament resulting from injury or aging.<sup>26</sup> Cervical osteophytes are estimated to affect proximally 20% to 30% of the population, especially elderly people,<sup>3,27</sup> and are associated with DISH, ankylosing spondylitis, and vertebral degenerative disease in older people.<sup>28</sup> Although most patients with cervical osteophytes are asymptomatic,<sup>8</sup> some osteophytes may compress the esophagus and/or the trachea, and patients may experience a variety of symptoms such as dysphagia, dysphonia, and a foreign body sensation. Dysphagia is one of the most common symptoms in people with cervical osteophytes.<sup>8</sup>

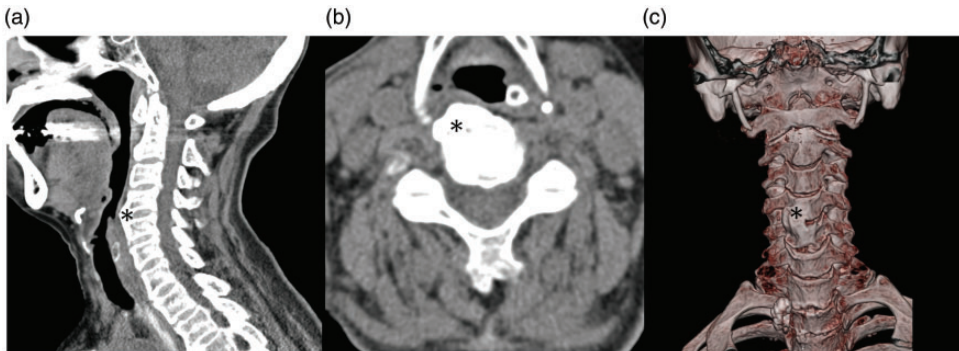
**Table 1.** Patients' characteristics and effect of swallowing with head rotation according to osteophyte location.

Osteophyte location	Central	Unilateral	<i>p</i> -value
Patients, n	36	12	
Age, years	75 ± 11 (48–98)	76 ± 11 (60–91)	
Sex			
Male	30	12	
Female	6	0	
Effect of head rotation			0.001
Yes	0	10	
No	36	2	

Data are presented as number of patients or mean ± standard deviation (range).



**Figure 2.** (a) Neutral position in the lateral view and (b) right-side head rotation in the anteroposterior view performed through a videofluoroscopic swallowing study. (a) Large amount of residue around the vallecular fossa and pyriform sinus and (b) Swallowing with right-side head rotation led to improved passage of boluses while reducing residue.



**Figure 3.** (a) Sagittal, (b) axial, and (c) three-dimensional sagittal reconstruction computed tomography of the cervical spine. Asterisk shows a large anterior osteophyte unilaterally arising from the right side at the C4/C5 level.

The most frequent level of involvement related to dysphagia is the C5/C6 level, followed by the C4/C5 level.<sup>29</sup> This condition occurs more frequently in men than in women, and it usually develops when patients are in their 60s.<sup>26</sup> Dysphagia caused by cervical osteophytes is usually more severe when ingesting solids than liquids. However, aspiration of liquids may occur more frequently than aspiration of solids.<sup>4</sup> Several mechanisms explain

dysphagia secondary to osteophytes, including direct impingement by large osteophytes, obstruction by local edema and inflammation, spasm of the adjacent cricopharyngeal structure, fibrosis and adhesions from tissue reactions near the protruding mass, and interference with epiglottal movement.<sup>10,30,31</sup>

Dysphagia related to cervical osteophytes can be managed conservatively or surgically. Previous studies have suggested

that the first-line treatment for patients with dysphagia should be diet modification and postural change during swallowing, muscle relaxants, and nonsteroidal anti-inflammatory drugs.<sup>12,32,33</sup> However, surgical treatment may be considered in cases of severe dysphagia despite conservative management.<sup>12,32-34</sup> Although no study has compared the efficacy of conservative and surgical treatments,<sup>35</sup> the literature suggests that osteophyte resection can be successful if conservative management fails.<sup>14,34-36</sup> In an updated systematic review, Harlianto et al.<sup>37</sup> reported that dysphagia with cervical DISH improved in 95.5% of patients following surgical treatment and that earlier surgical intervention was associated with complete resolution of dysphagia in patients with cervical DISH. Surgical treatment was chosen for 66% of patients, with the anterolateral approach most frequently used.<sup>37</sup>

It should be noted that surgical treatment for management of dysphagia in patients with cervical osteophytes remains controversial. First, surgical interventions carry the risk of complications including esophageal injury, vocal cord palsy, recurrent laryngeal nerve injury, Horner's syndrome, cervical instability, and infection.<sup>38,39</sup> Kolz et al.<sup>40</sup> reported that the overall complication rate in their cohort study was 42%. A recent review showed that the total complication rate after surgery was 22.1%, with 12.7% of complications occurring within 1 month after the intervention.<sup>37</sup> Furthermore, Miyamoto et al.<sup>12</sup> reported that 10 to 11 years after the initial surgery for cervical osteophytes, the osteophytes recurred and dysphagia developed in two of seven patients. In addition, the indications for surgical treatment have not been fully established.

Head rotation is a postural adjustment that can function as an effective compensation technique to improve swallowing. This

postural maneuver suggests that patients turn their heads toward the weaker side when unilateral pharyngeal paresis is present.<sup>19,21</sup> Narrowing of the swallowing tract on the side toward which the head is turned may facilitate an increase in the amount swallowed on the other side with less residue and a reduced risk of aspiration. We consider that cases in which a unilateral osteophyte mechanically blocks bolus passage are similar to cases in which unilateral paresis is present. If the osteophyte is asymmetrically skewed to one side, head rotation toward the osteophyte side might be beneficial in improving pharyngeal bolus passage and decreasing residue by blocking the osteophyte side and allowing food to flow only through the other side.

This method was beneficial for 10 of 48 patients with dysphagia due to osteophytes, and when limited to patients with unilateral osteophytes, the success rate was 83%. The head rotation technique is not difficult to perform, and there are no additional costs. Furthermore, the impact of head rotation can be easily checked by either fluoroscopic or endoscopic swallowing examination.

This study has several limitations. First, because the study design was retrospective, bias was inevitable. Additionally, the small sample size makes it difficult to draw clear conclusions. Finally, we were unable to evaluate the long-term effect of swallowing with head rotation. Additional prospective studies with larger sample sizes and longer follow-up periods are necessary to confirm the findings of this study.

The main strength of this study is that the topic is unique. Yoon et al.<sup>41</sup> reported the effectiveness of swallowing with head rotation for management of dysphagia related to a cervical spine osteophyte, but this was a single case report including only one patient. Although surgical treatment for patients with dysphagia secondary to DISH is the most useful treatment based on the current evidence, conservative

treatment is required for patients unsuitable for surgery.

This study established the effectiveness of swallowing with head rotation for dysphagia caused by unilateral cervical osteophytes. The head rotation technique is safe and might be beneficial for dysphagia caused by a unilateral cervical osteophyte. Thus, it is advisable to try this method prior to considering surgical approaches.

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The authors thank all of the study participants for their important contributions.

### Author contributions

J-W.P. contributed to the study conception and design. All authors contributed to the acquisition, analysis, and interpretation of data. M.S. drafted the manuscript, and J-W.P. revised it critically for important intellectual content. Final approval of the submitted version was obtained from all authors.


### Declaration of conflicting interest

All authors declare that they have no conflicts of interest.

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### ORCID iDs

Minsu Seo  <https://orcid.org/0000-0002-1583-5006>

Jin-Woo Park  <https://orcid.org/0000-0003-4989-2575>

### Supplemental material

Supplementary material associated with this article can be found in the online version.

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