



Cervical osteophytosis and spine posture: contribution to swallow disorders and symptoms

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Purpose of review

The article reviews the effects of cervical osteophytosis and spine posture on swallowing, and how they can cause dysphagia.

Recent findings

Cervical osteophytosis which is a bony overgrowth of the cervical spines, it affects the swallowing through different mechanisms, including direct mechanical compression of the pharynx and esophagus, disturbances of normal epiglottic tilt over the inlet of the larynx by the osteophytes at C3–C4 level, inflammatory reactions in the tissues around the esophagus and cricopharyngeal spasm. Also, cervical spine posture in normal individuals could affect the swallowing mechanism by disturbance of the sphincteric action of the larynx and upper esophageal sphincter.

Summary

Cervical osteophytosis and abnormal cervical curvature may be overlooked by the Otolaryngologists as causes of swallowing disorders. The diagnosis is usually confirmed by radiologic study for the cervical spine. Cervical abnormality should be kept in mind while we are investigating patients with swallowing problem, and postural modification may help in treatment of such cases.

Keywords

cervical osteophytosis, dysphagia, spine posture, swallowing disorders

INTRODUCTION

Swallowing is an important physiologic process that enables the ingestion of different types of food and fluids needed to maintain normal biologic functions in the body [1]. It's a complex activity involving the activation of some brain and brainstem regions and the coordinated movement of head and neck muscles in order transfer food from the mouth through the pharynx and esophagus to the stomach [2]. The process of deglutition is divided into four stages: the oral preparatory stage, in which chewing occurs allowing food boluses to be formed; the oral propulsive stage, in which food boluses are moved by the tongue to the pharynx; the pharyngeal stage, in which food boluses are passed into the esophagus and the esophageal stage, in which food moves through the esophagus to the stomach [3]. Dysphagia is considered a relatively common symptom, occurring in about 3% of the general population and its frequency increases with age, affecting approximately 10% of adults older than 65 years [4,5]. It increases healthcare costs as patients with dysphagia have an increased risk of hospital admission, delayed discharge and dependence on health services [6,7].

Anatomically the nasopharynx is related to the first cervical vertebra C1, the oropharynx is related to C2–C3 and the hypopharynx is related to C4–C5 and the esophagus to C6–C7 [8]. Owing to this, any structural abnormalities affecting the area of cervical spines can encroach on the propulsion of food during swallowing causing dysphagia [9]. Different cervical spines pathologies have been reported to cause dysphagia namely cervical spondylosis with osteophyte formation [10[¶]], diffuse idiopathic skeletal hyperostosis (DISH) syndrome [11[¶]], postural changes of cervical spine curvature [12], inflammatory spondyloarthropathies [13], spinal trauma [14], anterior spinal surgery [15] and neoplastic spinal lesions [16].

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KEY POINTS

- Cervical osteophytosis is not a rare cause of dysphagia in elderly patients.
- Globus sensation in elderly patients may be due to the presence of cervical osteophytes.
- The diagnosis of cervical pathology is mainly confirmed by radiologic study.
- Cervical spine posture could affect the swallowing mechanism by disturbance of the sphincteric action of the larynx and upper esophageal sphincter.
- Postural modification may help in treatment of swallowing disorders due to cervical pathology.

CERVICAL OSTEOPHYTES AND DYSPHAGIA

Osteophytes which are bony overgrowths of the cervical spines are estimated to affect about 10–30% of the general population. Spinal osteophytosis is more frequent in the elderly; more than 75% of people aged 65 years and older may have cervical spine degenerative changes [17]. They can be isolated or diffuse, however, they may occur as part of DISH syndrome, cervical spondylosis, posttraumatic or following spinal surgery [10¹].

Anterior cervical osteophytes tend to be asymptomatic; however they can cause dysphonia, dyspnea and/or dysphagia [17]. Patients with osteophytes of the cervical spine (C3/4/5) might complain of recurrent coughing and choking. However, the most frequent level of involvement related to dysphagia is C5–C6 followed by C4–C5, with C2–C3 being the least common-level affected [12]. They cause dysphagia through different mechanisms, including direct mechanical compression of the pharynx and esophagus, disturbances of normal epiglottic tilt over the inlet of the larynx by the osteophytes at C3–C4 level, inflammatory reactions in the tissues around the esophagus and cricopharyngeal spasm [18].

Cervical spondylosis is a degenerative disease affecting the cervical spines and is one of the most common diseases among the elderly population. It commonly coexists with dysphagia, however, adequate and precise investigations should be carried out to avoid misdiagnoses, other causes such as tumors, esophagitis, webs, strictures and neuromuscular disorders should be excluded [19,20]. Mosher [21] was the first to describe dysphagia caused by cervical osteophytes. Later, case reports have been described the symptoms in patients with cervical spondylosis caused by anterior

cervical osteophytes [10¹,22–27]. DeRogatis and Issack [10¹] reported a case of a middle aged female with cervical spondylosis presented with dysphagia, cervical radiographs demonstrated degenerative disc disease most marked at C5–C6 with osteophytes projected anteriorly impinging on the outline of the esophagus.

DISH, also known as Forestier's disease, is a chronic noninflammatory skeletal disorder characterized by new bone formation in the region of the spine and peripheral skeleton [28]. The reported prevalence of DISH varies, ranging from 3 to 30% [25], and is more found in the elderly with an estimated incidence of 12–30% in men over 65 years [29]. It was first described by Forestier and Rotes-Querol [30] and usually presents as an asymptomatic ossification of the paraspinal connective tissues, the peripheral portion of the annular disc and the anterior longitudinal spinal ligament, with bridging ossifications that resemble flowing candle wax in the lateral view [29]. Clinical manifestations include spinal stiffness, neck–shoulder pain, globus sensation, dysphagia or nonspecific symptoms such as weight loss. Complications such as intubation difficulties, dysphonia, aspiration pneumonia, stridor or dyspnea are extremely rare but can be life threatening [31]. The diagnosis is primarily radiological in the form of flowing calcification and ossification within the anterior longitudinal ligament involving four or more contiguous vertebral bodies, minimal to no degenerative disc changes and absence of apophyseal joint ankylosis and sacroiliac erosion [32]. The last criterion was made to distinguish DISH from degenerative spondylosis.

Some authors refer to the dysphagia secondary to DISH as DISHphagia. Most patients experience sense of foreign body or globus sensation in pharynx or esophagus. Dysphagia typically begins with difficulty in swallowing of solids and progressing to liquids [18,33,34]. This condition has an impact on health and quality of life, especially in cases of undesired weight loss, malnutrition and/or aspiration [25]. Case reports describing dysphagia with DISH syndrome are numerous in the literature. Osteophytes were in the form of one single bony overgrowth involving two or more vertebrae [17,25,35–38], or multiple osteophytes projecting at a multilevel cervical spine distribution [31,34,39–44]. Dysphagia was the sole presentation [36] or associated with other symptoms as dysphonia [43], stridor [31,40], dyspnea [41,43] and even bilateral vocal cord paralysis [41]. However, osteophytes could be asymptomatic and only be discovered intraoperatively causing difficult intubation [45]. Patients with dysphagia caused by cervical



FIGURE 1. A sagittal computed tomography shows a large diffuse cervicothoracic osteophytosis.

osteophytes should undergo thorough clinical otolaryngologic and endoscopic examination (Flexible nasopharyngoscopic video file is attached to this article, <http://links.lww.com/COOH/A36>). Also, simple radiograph cervical spines as well as computed tomography scan (Fig. 1), MRI, barium swallow and endoscopy (Fig. 2) are beneficial. In 2017, we investigated 139 patients with DISH for swallowing disorders and we found 23 of them (16.5%) having the problem. The patients were assessed both subjectively using the eating assessment tool (EAT-10) and objectively using fiber-optic endoscopic evaluation of swallowing [11^{*}]. The study demonstrated that swallowing disorders are not rare among patients with DISH, and the otolaryngologists should be aware of the disease on dealing with old patients complaining of dysphagia.

Mild symptoms of cervical osteophytes are mainly managed with conservative treatment in the form of speech and swallowing therapy, anti-inflammatory drugs, steroids, muscle relaxants, anti-reflux medication and diet modification avoiding

solid food and ingesting soft semisolid food in a small bolus instead [40]. However, operative intervention in the form of osteophylectomy may be considered in cases with severe dysphagia and airway obstruction refractory to conservative therapy [46]. Some authors recommend cervical osteophylectomy to be considered in all patients with cervical osteophytes causing chronic dysphagia and dyspnea because of the possible progression to acute respiratory distress. Maiuri *et al.* [47] reported a case of a patient with a 2-year history of dysphagia who suffered sudden severe respiratory distress requiring emergency tracheotomy.

Significant improvement of dysphagia both postoperative and on long-term follow-up after osteophyte resection was reported by many studies [34,40,48,49^{*},50]. However, radiological recurrence of osteophytes occurred on follow-up in one case series at 6–13-year follow-up evaluations (mean: 9 years), with an average rate of regrowth of 1 mm/year [51], while other studies reported no radiological recurrence on follow-up [36,46,51,52].

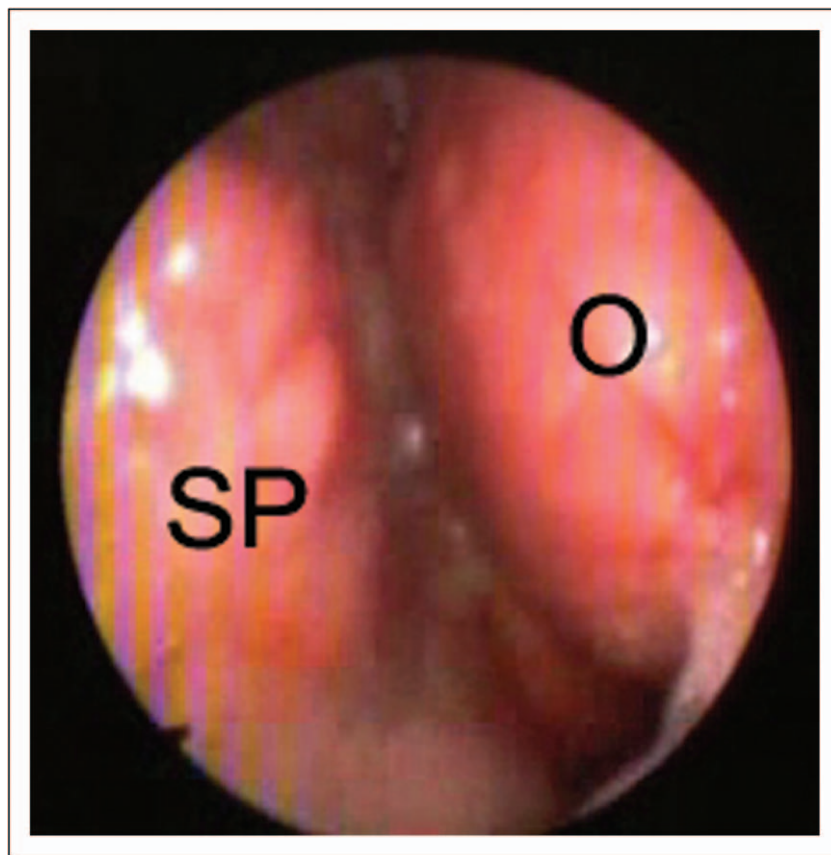


FIGURE 2. An endoscopic view of the nasopharynx shows large cervical osteophyte projecting against the soft palate.

SPINE POSTURAL CHANGES AND SWALLOWING

Different body postures can affect the subjective perception of swallowing difficulty. A study in 2017 by Alghadir *et al.* [53^{***}] observed the effect of different body postures on the self-perceived difficulty of swallowing in 186 normal healthy individuals. Participants were asked to swallow 25 ml of water in one go in four body postures; while sitting upright, sitting with head/neck flexed, head/neck extended and lying supine and then they rated their subjective swallowing difficulty on a scale of 0–10, 0 being most easy and 10 being most difficult. They found that self-perceived difficulty swallowing was least for subjects while in the sitting upright position ($P < 0.001$). Maximum difficulty in swallowing was found while sitting with head and neck in extension in which there is widening of the vestibule of larynx and narrowing of valleculae, leading to decreased relaxation and difficult closure of upper esophageal sphincter. They concluded that postural modification may help in treatment of dysphagia.

Cervical and upper thoracic spines are in anatomical proximity with the oropharynx and esophagus. Cervical spines normally show C-shaped lordosis owing to the taller anterior compared with

the posterior aspect of the vertebrae with a normal lordotic curve between 20 and 60° curvature. The functions of cervical spines include transmission of axial load from the cranium, maintenance of horizontal gaze, and protection of important neurovascular structures such as spinal cord, nerve roots, and vertebral arteries [54]. Cervical spine deformities are postural defects that can limit the normal function of the neck and diminish the patient's quality of life [55]. Subaxial cervical deformities most often occur in the sagittal plane, primarily as kyphosis and less commonly hyperlordosis [56].

Cervical kyphosis (reversal of normal lordosis) is the most common cervical spine deformity. Cervical kyphotic deformities can occur at any age and may be associated with thoracic or lumbar deformities [57]. They may be iatrogenic as in cases of corrective surgery of the spine [58]; due to cervical spondylosis [12]; in osteoporosis with wedging and collapse of vertebral bodies [59]; congenital with birth defects [60,61], posttraumatic; in ankylosing spondylitis, infections or cervical tumors. They may present with neck pain, humping of the back, loss of height, pain in the back and referred spinal nerve root pain [12]. Also they may cause myelopathy and sensorimotor deficits due to compression of the neural

elements and impaired cord perfusion from an over-stretched spinal cord. If the kyphotic deformity is severe (i.e. chin-on-chest deformity, dropped head syndrome, etc.), patients can have significant difficulty with swallowing and maintaining horizontal gaze [55]. Several studies have reported an association of cervical kyphosis with dysphagia [54,58,59,62[■]]. In a study published by Kim *et al.* [54], they investigated 51 patients with cerebral stroke for the rate of recovery from dysphagia. Twenty-seven patients were with cervical kyphosis and 24 with normal cervical lordotic curve. After 4 weeks following the stroke, the rate of recovery from dysphagia was worse in the cervical kyphosis group particularly as regards aspiration. They mentioned that the cause may be weakness of the deep cervical neck and pharyngeal muscles before the stroke due to kyphosis, which increased after the stroke. They concluded that a considerable number of stroke patients had cervical kyphosis at the time of illness; in those patients, the recovery of swallowing function is usually delayed.

Randall *et al.* [62[■]] conducted a retrospective study of all video fluoroscopic swallowing study (VFSS) done in their institute along 1 year duration to evaluate the association between cervical kyphosis and the objective measures of swallowing dysfunction. Thirty-six patients with cervical kyphosis-exceeding two SDs beyond established age-specific normal ranges were identified, in addition to 36 patients with normal cervical curvature. The fluoroscopic studies recorded were pharyngeal constriction ratio, hyoid elevation, laryngeal elevation, pharyngeal transit time and hypopharyngeal transit time. Patients with cervical kyphosis showed alterations in nearly all parameters and a significant portion of them aspirated during fluoroscopy compared with controls ($P=0.014$). They stated that kyphosis may be a structural change that serves as a marker for abnormal deglutition, a risk factor for aspiration, decreases sensation and impairs airway protection.

Hyperlordosis is increased normal lordotic curve of the cervical spines. Osteoporotic thoracic kyphosis is a major contributor to cervical hyperlordosis in the elderly causing the head to be moved backward to preserve forward gaze, resulting in cervical hyperlordosis. An osteoporotic 80-year-old woman with a history of progressive dysphagia was hospitalized for aspiration pneumonia. She had thoracic kyphosis and cervical hyperlordosis. On VFSS, the hyperlordotic curvature of the cervical spine prevented epiglottic closure and bolus passage, which resulted in supraglottic pooling and aspiration of food residues [63]. Also, a case of congenital cervical lordosis in a young adult presented with severe dysphagia,

aspiration, cough and globus sensation due to bulge of the posterior pharyngeal wall has been reported [64]. Iatrogenic hyperlordosis in patients treated with halo vests for cervical vertebral fractures is commonly associated with dysphagia due to hyper-extended neck position causing narrowing of the pharyngo-esophageal junction and a delay in the pharyngeal transit time of the bolus [65]. However, Scoliosis of cervical spines may be a cause of dysphagia as reported in a 43-year-old woman with familial dysautonomia presented with increasing dysphagia, coughing and pneumonia due to aspiration. She had severe lordoscoliosis and barium swallow showed a double impression on the esophagus at the upper part of the scoliosis due to 'sandwiching' between the spine and the aortic arch proximally, and between the spine and the descending aorta distally [66].

CONCLUSION

Cervical osteophytosis is not a rare cause of swallowing disorders especially in elderly. The diagnosis is usually confirmed by radiologic study. Also, abnormal cervical curvature and posture could affect the swallowing mechanism. Cervical spine pathology should not be overlooked as a cause of dysphagia, and postural modification may help in treatment of such cases.

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Conflicts of interest

There are no conflicts of interest.

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- of outstanding interest

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