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Cervical esophageal webs: association with gastroesophageal reflux

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Abstract
Background: We investigated whether there is a significant association between cervical esophageal webs and gastroesophageal reflux on pharyngoesophagography.
Methods: We studied 50 patients with cervical esophageal webs on pharyngoesophagrams and 50 control subjects. The control group was matched to the webs group for age, sex, and symptomatology. Patients with cervical esophageal webs and controls were compared to determine the prevalence of gastroesophageal reflux, hiatal hernias, reflux esophagitis, and abnormal esophageal motility. Pearson's chi-square test was used to determine any statistically significant differences in the frequencies of these findings between groups.
Results: Thirty-nine (78%) of 50 patients with cervical esophageal webs versus 27 (54%) of 50 patients in the control group had gastroesophageal reflux ($p = 0.01$). When patients were classified based on degree of gastroesophageal reflux, 22 (44%) of 50 patients with cervical esophageal webs versus 21 (42%) of 50 controls had mild reflux ($p = 0.84$), whereas 17 (34%) of 50 patients with webs versus six (12%) of 50 controls ($p < 0.009$) had moderate/marked reflux. Thus, the prevalence of moderate/marked gastroesophageal reflux was significantly greater in patients with webs than in the controls. However, no significant differences were found in the prevalence of mild gastroesophageal reflux, hiatal hernias, reflux esophagitis, or abnormal esophageal motility.
Conclusion: We found a significant association between cervical esophageal webs and gastroesophageal reflux independent of age, sex, or symptomatology. Radiologists should be aware of this association, so that patients with cervical esophageal webs on pharyngoesophagography are evaluated for gastroesophageal reflux at the time of the barium study or advised to undergo further testing for gastroesophageal reflux disease.

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Key words: Cervical esophageal webs—Esophageal webs—Gastroesophageal reflux—Gastroesophageal reflux disease.

Esophageal webs are thin membranes that arise from the anterior wall of the esophagus and are composed of normal or hyperkeratinized squamous epithelium. Depending on their size and extent, esophageal webs can cause asymmetric or, occasionally, circumferential luminal narrowing [1–3]. Most have been found in the cervical esophagus, usually within 1–3 cm from the cricopharyngeus [3, 4]. Although the true incidence of esophageal webs remains uncertain, it has been estimated that they occur in up to 10% of the general population in the United States [2, 5]. For reasons that are unclear, cervical esophageal webs are considerably more common in women than in men [3]. Most patients with webs are asymptomatic, but some may develop dysphagia if the webs encroach sufficiently on the esophageal lumen [2–6].

Cervical esophageal webs develop in patients with epidermolysis bullosa dystrophica and benign mucous membrane pemphigoid because of scar tissue that forms when the cervical esophagus is involved by these rare bullous diseases [7–11]. The development of cervical esophageal webs also has been associated with the Plummer–Vinson syndrome [12], radiation therapy [13], and, rarely, heterotopic gastric mucosa in the upper esophagus [14]. In most cases, however, the cause of these webs is unknown. Webs also have been shown to occur in the distal esophagus in patients with peptic strictures [1, 15, 16]. Yet to our knowledge, no studies have documented a relationship between cervical esophageal webs and gastroesophageal reflux. The purpose of this investigation was to determine whether there is a significant association between these conditions.

Table 1. Clinical characteristics of 50 patients with cervical esophageal webs and 50 control subjects

Characteristic	Cervical esophageal webs (*n* patients)	Controls (*n* patients)
Sex		
Men	11	11
Women	39	39
Indications for examination		
Dysphagia	31	32
Reflux symptoms	7	7
Other complaints	12	11
Mean age (range)	59 (21–81) years	58 (17–85) years

Materials and methods

Between 1988 and 2000, a computerized search of the radiology archives in our department showed 79 patients with cervical esophageal webs on pharyngoesophagrams. The procedures were performed by residents, fellows, or one of four attending gastrointestinal radiologists, and all studies were interpreted by the attending radiologists. The examinations included video recordings (77 patients) or rapid sequence imaging (two patients) of the pharynx and cervical esophagus in frontal and lateral projections and radiographic evaluation of the thoracic esophagus (including double-contrast spot images in the upright left posterior oblique projection and/or single-contrast spot images in the prone right anterior oblique projection). Eight of the original 79 patients with cervical esophageal webs were excluded from our study because the radiology reports did not specifically state whether gastroesophageal reflux was present during the radiographic examination. Another 10 patients were excluded because of previous surgeries to the esophagus or stomach that could have resulted in gastroesophageal reflux on an iatrogenic basis. Another 11 patients were excluded because of histories of radiation therapy to the neck or chest, a known cause of cervical esophageal webs [13]. The remaining 50 patients comprised our study group (Table 1).

It is important to distinguish true cervical esophageal webs from the more frequent postcricoid impressions caused by redundant mucosa on the posterior aspect of the cricoid cartilage [17]. Therefore, we reviewed the images from the barium studies in all 50 of these patients, which confirmed the presence of a cervical esophageal web as a thin indentation on the anterior or anterolateral aspect of the barium column that did not change in size or shape during swallowing (Fig. 1). In contrast, a postcricoid impression appears as a longer, undulating indentation on the anterior aspect of the barium column that has a variable appearance during swallowing.

A second computerized search of pharyngoesophagrams in our radiology archives from 1988–1994 generated the names of 108 consecutive patients without cervical esophageal webs who fulfilled the same inclusion criteria as the group with webs, as follows: (a) the radiology reports indicated that video recordings of the pharynx and cervical esophagus had been obtained (so the presence or absence of cervical esophageal webs could be adequately assessed), (b) the radiographic examination included evaluation of the thoracic esophagus, (c) the radiology reports specifically stated whether gastroesophageal reflux was present, (d) there was no previous surgery to the esophagus or stomach, and (e) there was no history of radiation therapy to the neck or chest.

Fig. 1. A 70-year-old woman with cervical esophageal web. Lateral view of pharynx from rapid imaging sequence shows anterior cervical esophageal web (*arrow*) in this patient with moderate/marked gastroesophageal reflux at fluoroscopy.

Criteria for the control group were modified because of additional variables (age, sex, and symptomatology) that could affect the prevalence of gastroesophageal reflux and skew our findings. Studies have shown that the frequency of gastroesophageal reflux increases with age [18] and that physiologic gastroesophageal reflux occurs more frequently in men than in women [19]. Gastroesophageal reflux also is more likely to be demonstrated at fluoroscopy in patients with reflux symptoms than in asymptomatic individuals. The patients in the control group therefore were matched to those with cervical esophageal webs in terms of age (within 5-year intervals), sex, and symptomatology by one of the authors who had no knowledge of the reflux status of these patients at pharyngoesophagography. Controls were selected randomly from the group of 108 patients without cervical esophageal webs and matched with each of the 50 patients with cervical esophageal webs. If a match was not possible, the unmatched control subject was excluded and another patient was selected randomly from the control

Table 2. Summary of radiographic findings in 50 patients with cervical esophageal webs and 50 control subjects

Finding	Cervical esophageal webs (*n* patients)	Controls (*n* patients)	*p*
Gastroesophageal reflux	39 (78%)	27 (54%)	0.01[a]
Mild	22 (44%)	21 (42%)	0.84
Moderate/marked	17 (34%)	6 (12%)	<0.009[a]
Hiatal hernia	20 (40%)	15 (30%)	<0.3
Reflux esophagitis	4 (8%)	4 (8%)	1
Abnormal esophageal motility	15 (30%)	10 (20%)	<0.25

[a] Statistically significant at $p < 0.05$

population until a match was found. As a result, the matched control group consisted of 50 patients (see Table 1).

The patients with cervical esophageal webs and controls were compared to determine the prevalence of gastroesophageal reflux, hiatal hernias, reflux esophagitis, and abnormal esophageal motility. Gastroesophageal reflux, when present, was classified as mild if the radiology reports described the reflux as minimal or mild or if wisps of reflux were observed only during provocative tests such as a Valsalva maneuver. Conversely, gastroesophageal reflux was classified as moderate/marked if the radiology reports described the reflux as moderate, marked, or severe with or without provocative testing at fluoroscopy. Pearson's chi-aquare test was used to detect any statistically significant differences in the frequencies of these findings between groups.

Results (Table 2)

Thirty-nine (78%) of 50 patients with cervical esophageal webs versus 27 (54%) of 50 patients in the control group had gastroesophageal reflux ($p = 0.01$). Thus, the prevalence of gastroesophageal reflux was significantly greater in patients with webs than in those without webs. When patients were classified based on the degree of gastroesophageal reflux (i.e., mild or moderate/marked), 22 (44%) of 50 patients with cervical esophageal webs versus 21 (42%) of 50 controls had mild gastroesophageal reflux ($p = 0.84$). In contrast, 17 (34%) of 50 patients with webs (Fig. 1) versus six (12%) of 50 controls had moderate/marked gastroesophageal reflux ($p < 0.009$). Thus, patients with webs had a significantly higher prevalence of moderate/marked gastroesophageal reflux than did controls, whereas no differences were seen in the prevalence of mild reflux between these groups.

No significant differences were found in the prevalence of hiatal hernias, reflux esophagitis, or abnormal esophageal motility for patients with cervical esophageal webs versus controls.

Discussion

Although cervical esophageal webs have been associated with a few rare medical conditions, the cause of these webs remains unknown in most cases. Several investigators have suggested that esophageal webs develop as a result of chronic trauma to the esophagus from gastroesophageal reflux [15, 20–22]. Smiley et al. proposed that refluxed acid in the cervical esophagus causes reflex contraction of the cricopharyngeus, with mechanical trauma to the overlying epithelium and subsequent web formation [21]. Alternatively, Chodosh postulated that cervical esophageal webs represent plications of the mucosa that develop as a result of direct injury to this region by refluxed acid in the cervical esophagus [22]. The rare finding of cervical esophageal webs in patients with heterotopic gastric mucosa in the upper esophagus supports that hypothesis; localized production of acid by the heterotopic gastric mucosa presumably accounts for the development of webs in these patients [14]. Histologic data also suggest a relationship between gastroesophageal reflux and cervical esophageal webs because the same histopathologic findings (i.e., basal cell hyperplasia and elongation of lamina propria) are found in the cervical esophagus in patients with cervical esophageal webs as in the distal esophagus in patients with gastroesophageal reflux disease [23].

Despite circumstantial evidence for the role of gastroesophageal reflux in the development of cervical esophageal webs, we are not aware of any prior studies documenting a relationship between these conditions. However, our data showed a significant association between cervical esophageal webs and gastroesophageal reflux ($p = 0.01$). When patients were classified based on the degree of reflux, patients with webs (Fig. 1) had a significantly higher prevalence of moderate/marked gastroesophageal reflux than did controls ($p < 0.009$), whereas no differences were seen in the prevalence of mild reflux between these groups. Thus, when considerable gastroesophageal reflux is present, the damaging effect of refluxed acid in the cervical esophagus might be a contributing factor in the development of cervical esophageal webs.

Our investigation has the inherent limitations of a retrospective study with small sample sizes. It also is limited by our reliance on the original radiologic reports without the opportunity to establish clearly defined, uniform criteria for the presence and degree of gastroesophageal reflux on pharyngoesophagography. Furthermore, barium studies have been shown to have low sensitivity in the detection of gastroesophageal reflux in comparison with 24-h pH monitoring [24], so that reflux might not be demonstrated radiographically in some patients with gastroesophageal reflux disease. In the future, pH monitoring studies might be performed to further elucidate the rela-

tionship between reflux of acid into the cervical esophagus and the development of cervical esophageal webs.

In conclusion, we found a significant association between cervical esophageal webs and gastroesophageal reflux independent of patient age, sex, or symptomatology. Radiologists should be aware of this association, so that patients with cervical esophageal webs on pharyngoesophagography are evaluated for gastroesophageal reflux at the time of the barium study or advised to undergo further testing for gastroesophageal reflux disease.

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