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Pharyngeal pouch: associations and complications

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Abstract The aetiopathogenesis of pharyngeal pouch remains obscure. This review highlights the associations and complications of pharyngeal pouch to better understand the pathogenesis and management of the pouch. A search of the MEDLINE was conducted to identify studies that looked at associations and/or complications of the pharyngeal pouch. The Medical Subject Headings (MeSH) included Zenker's diverticulum and hypopharyngeal diverticulum. A total of 64 papers were included for the analysis. They consisted mainly of single case reports, case series and review articles and one case control study. A summary of evidence from the literature is discussed. This review shows the various associations and complications that can occur with pharyngeal pouches. It is important to be aware that pharyngeal pouch can co-exist with other pathologies and treatment needs to be altered to incorporate the treatment of the associated pathology too. Surgeons should also be aware of the complications that can occur within and outside the pouch.

Keywords Pharyngeal pouch · Zenker's diverticulum · Hypopharyngeal diverticulum · Complications

Introduction

Pharyngeal pouch was first described by Ludlow as a 'preternatural' bag in 1764. Approximately a century later, in 1877, Zenker and Von Ziemsen published the first series of 27 patients and described it as a protrusion of the mucosa and submucosa through the muscular fibres of the oesophagus [1, 2]. The diverticulum develops by herniating through a potential weakness called the Killian's dehiscence formed between the oblique fibres of the inferior constrictor muscle and the transverse fibres of the cricopharyngeus [3] (Fig. 1).

Pharyngeal pouch is an acquired condition that presents in the elderly population with an incidence of 2 per 100,000 per year in the United Kingdom [4]. It typically presents with intermittent and progressive high cervical dysphagia, regurgitation of undigested food, noisy deglutition, weight loss and halitosis. Oropharyngeal regurgitation frequently results in aspiration and chest infection. The diagnosis is confirmed by barium swallow (Fig. 2). Surgery is the mainstay of treatment for symptomatic pouches [5]. Endoscopic examination reveals a dividing bar that separates the anterior true lumen of the oesophagus from the pharyngeal pouch that is positioned posteriorly (Fig. 3).

Despite a further century of research, much controversy still surrounds this condition with regard to its aetiology and pathophysiology. Zenker explained the pathogenesis of the pouch to be due to 'forces within the lumen acting against a restriction' [2]. Since then several hypotheses, each with supporting evidence, have explained the pathogenesis of the pouch. These include achalasia or spasm of the cricopharyngeus with resultant herniation through the weakened area [6, 7]. Negus postulated the causes of the achalasia to be due to chronic inflammation, stenosis, neurosensory deficits or idiopathic. Other theories include in-coordination of the muscles, congenital weakness and traction diverticulum [9, 10, 11]. Several studies on the cricopharyngeal sphincter have shown divergent results. The most widely accepted theory at present is that there is normal relaxation, but inadequate opening of upper oesophageal sphincter (UES). Cook et al. showed that pharyngeal pouch is the result of reduced compliance of the cricopharyngeus causing incomplete opening of the UES and high intrabolus pressure across the UES. This was also endorsed by histological studies that showed the presence of inflammation and fibrosis of the

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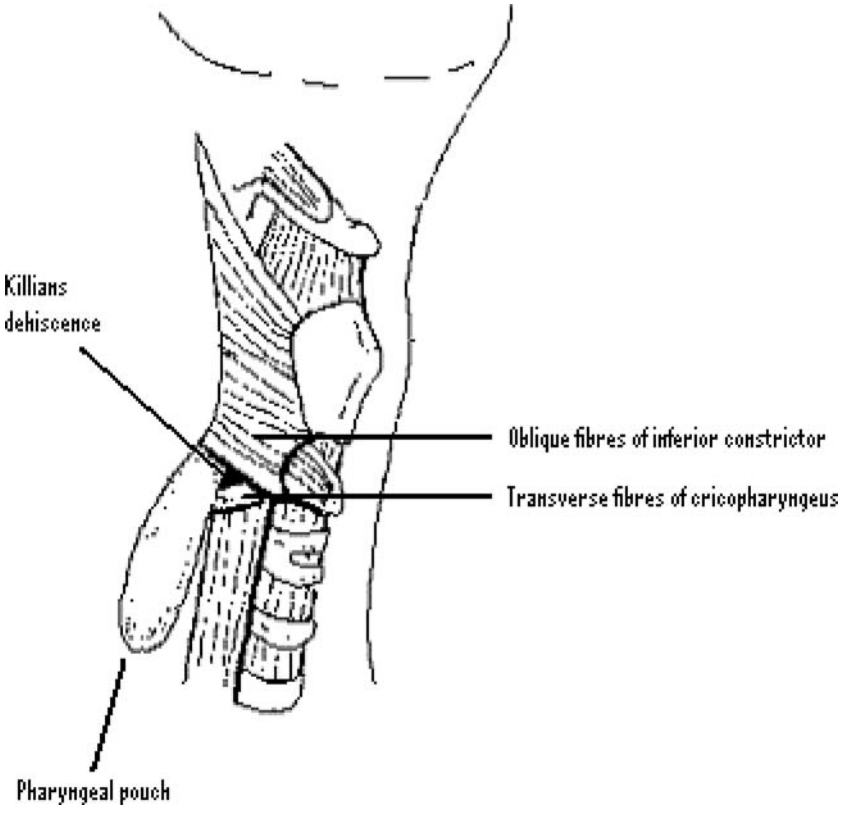

Fig. 1 Showing the anatomy of the posterior pharyngeal wall, Killian's dehiscence and the position of the pharyngeal pouch

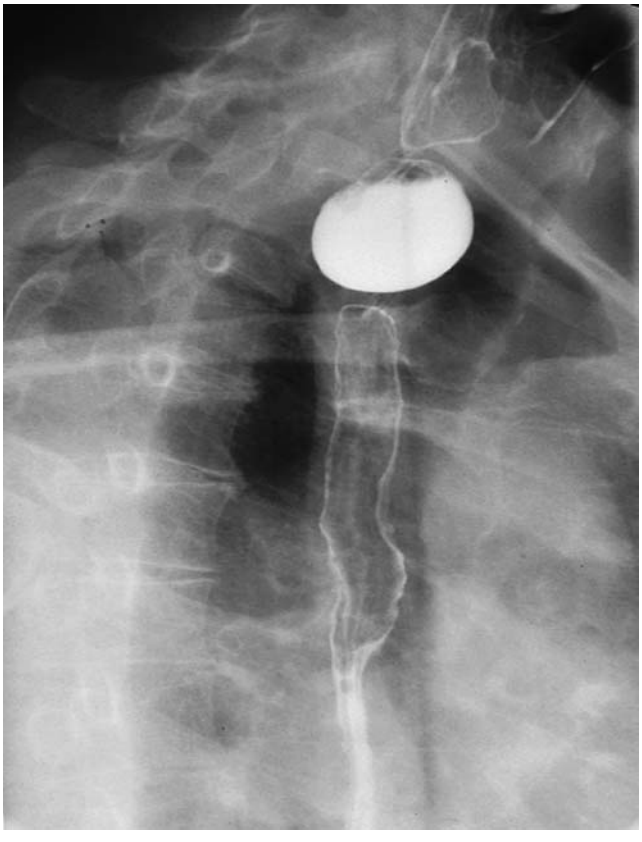

Fig. 2 Barium swallow showing a pharyngeal pouch

cricopharyngeus [12, 13]. This review summarizes the associations and complications of the pharyngeal pouch. The relation of the associations to the pathogenesis of the pouch is stressed where appropriate.

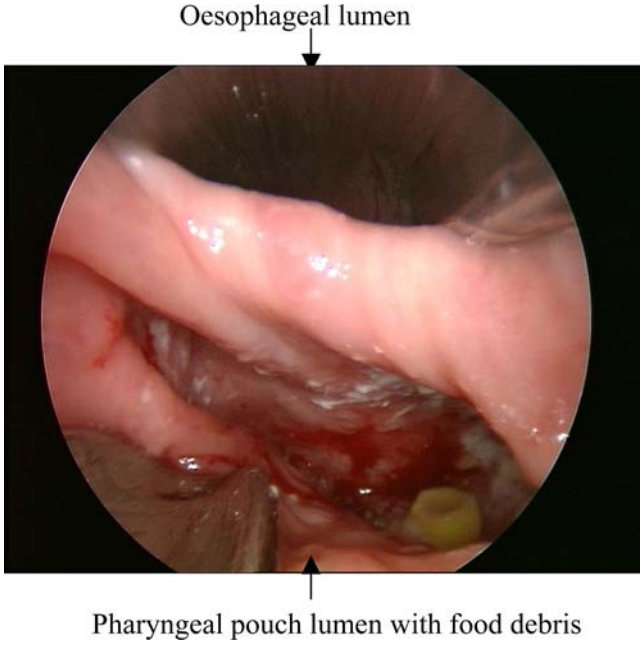

Fig. 3 Endoscopic appearance of a pharyngeal pouch showing the *dividing bar* between the pouch and oesophageal lumen

Materials and methods

For the literature search, reports published from 1966 to June 2005 were retrieved. We also screened bibliographies of the collected articles to identify pertinent reports. Appropriate articles that were published at an earlier date were also scrutinized.

Results

A total of 64 papers were included for the analysis. They consisted mainly of single case reports, case series and review articles and one case control study. A summary of evidence from the literature is discussed.

Discussion

Anatomical variations

Though this a disease of the geriatric age group, there are a few reports of congenital pharyngeal pouch and family history suggesting a congenitally larger Killian's triangle [14, 15, 16, 17]. The relatively high prevalence of the pharyngeal pouch in North Europeans is also explained by the anatomical difference of the Whites having long necks compared to Asians [10].

The pharyngeal pouch is typically seen protruding to the left side. Only 10% is seen on the right side. Anatomically, this may be explained by the potential space between the concavity of the cervical oesophagus and the left carotid artery compared to the right side [18]. However, it has also been found to be determined by the handedness of the patient [19].

The pouch normally has a single opening into the oesophagus. However, anatomical variations can occur. There are six reports of bilobed pharyngeal pouches described in the literature. There are three distinct types of bilobed pouches: the bilobed pouch with a single opening [20, 21, 22], two separate pouches with two necks [23] and a bilobed pouch separated by a septum with two necks [24, 25]. Four of these underwent diverticulectomy while one underwent successful stapling and another was managed conservatively.

Associations with other pathologies

Pharyngeal pouch may also present with co-existent intraluminal pathologies. It has been associated with a laryngocoele in an elderly lady. Both the laryngocoele and the pouch were excised [26]. Benign tumours of the pharynx and oesophagus have also been associated with the pouch [27]. These associations suggest that the underlying mechanism leading to the creation of the pouch may be intramural, resulting in in-coordinated propulsion power.

Pharyngeal pouch has also been documented in polymyositis. In this inflammatory myopathy, the cricopharyngeus undergoes constriction and fibrosis, accounting for the loss of compliance of the UES and the resultant increased intrabolus pressure [28]. Cervical oesophageal web was found in 50% of a series of 12 patients with pharyngeal pouch. Cervical oesophageal webs are a potential source of postoperative dysphagia [29, 30].

Extrapharyngeal neck pathologies have also been reported to be associated with pharyngeal pouch [31]. They include low-grade thyroid lymphoma, metastatic supraclavicular paraoesophageal lymph nodes and recurrent multinodular goitre. Though a direct cause-effect cannot be established for the association, it is important to look for these associations as they can complicate pharyngeal pouch surgery.

Carotid body tumour has also been reported in association with pharyngeal pouch [32]. The simultaneous occurrence of these conditions should be suspected as an alternative cause of dysphagia in patients with carotid body tumours in whom dysphagia cannot be explained by oropharyngeal compression or lower cranial nerve palsies.

Pharyngeal pouch secondary to operative procedures

There are two case reports of the development of pharyngeal pouch following anterior cervical fusion [33, 34]. In both cases traction on the posterior pharyngeal wall from scar tissue and adhesions resulted in the development of the pharyngeal wall. Though the pouch is always considered a pulsion diverticulum, these cases suggest that traction can also contribute to its pathogenesis.

Pharyngeal pouch secondary to stenosis

A stenosis of the upper oesophagus has been reported with a pharyngeal pouch [35]. It may be that the stenosis might have caused a predisposition to the development of the pouch. This supports Negus's theory of stenosis-induced increased intraluminal pressure and secondary protrusion [8]. This association supports Negus' theory of stenosis-induced increased intraluminal pressure and secondary protrusion. The stenosis was left in place and a short circuit was created between the pouch and the oesophagus below the stenosis.

Gastrooesophageal reflux

Several anecdotal reports of the association of hiatus hernia with pharyngeal pouch have been supported by a case control study that showed the incidence of hiatus hernia to be significantly higher in patients with pharyngeal pouch compared to controls [36, 37, 38]. It is therefore imperative that barium studies should include

the lower oesophagus, stomach and duodenum to look for other abnormalities.

The exact nature of this link is not clear. Three mechanisms have been postulated: it may be that hiatus hernia increases the resting cricopharyngeal pressure and thereby contributes to the development of the pharyngeal pouch. Another mechanism may be that both the pharyngeal pouch and hiatus hernia are the result of the degenerative aging process affecting the upper and lower oesophageal sphincter, respectively. Resouly et al. noted that the two conditions might be manifestations of generalised oesophageal dysmotility [39]. The most widely accepted explanation is that the two conditions may be the result of gastric reflux disease. Several investigators have found a positive correlation between gastro-oesophageal reflux and pharyngeal pouch [37, 39, 40, 41, 42]. A recent study hypothesized that acid reflux induces longitudinal oesophageal shortening, which in turn increases the risk for the development of herniation [42]. Sher et al. and Bates et al. prescribe anti-reflux medications to all patients following endoscopic stapling to decrease the recurrence rate [43, 44]. However, not all authors accept that reflux plays a significant role in the pathogenesis of the pouch [45].

Complications within the pouch

Bezoar

Bezoar is the accumulation of foreign material. This may include phytobezoars (plant material), trichobezoars (hair) lactobezoars (seen in low birth weight babies fed with concentrated formula) and medications and food bolus bezoar. There are two case reports in the literature of bezoar in the pharyngeal pouch [46, 47]. Both bezoars were food bolus bezoars in elderly patients with long-standing dysphagia and giant diverticula.

Fistula

There is one case report of a benign spontaneous fistula between the pharyngeal pouch and the trachea and vocal cord paralysis [48]. As pharyngeal pouch is a geriatric disease, the possibility of a malignancy should always be ruled out. Even in the absence of malignancy, patients with a fistula from the pouch should have the fistula excised and the defects closed and reinforced with a muscle flap. A fistula connecting a pharyngeal pouch to the prevertebral ligament resulted in cervical osteomyelitis. This was reported probably to be due to iatrogenic perforation of the pouch during difficult gastric intubation in a 56-year-old comatose patient [49].

Haemorrhage

Chronic irritation and inflammation of the pharyngeal pouch mucosa from retained food material can lead to bleeding from the pouch [50]. More frequently, it can result in ulceration of the pouch. Multiple ulcers occurring in a pharyngeal pouch have been reported, and the authors attributed it to peptic ulceration of the diverticular mucosa secondary to acid reflux disease [51]. Massive haemorrhage from an ulcerated pouch, probably precipitated by a retained aspirin tablet in the neck of the pouch, has been reported [52].

Carcinoma

Carcinoma arising in the pouch is uncommon, but a real risk [4]. The incidence is probably between 0.4 and 1.5% [53]. A review of squamous cell carcinoma occurring within the pouch identified 45 cases and 9 cases of carcinoma in situ [4, 53]. The two entities present distinctly. Carcinomas usually arise in large and long-standing pouches, suggesting that chronic irritation and inflammation may predispose the pouches to malignancy. Of the nine cases of carcinoma in situ, eight of them were also seen in large pouches. However, the pouches were not necessarily long standing.

The clinical presentation of carcinoma arising from the pouch has characteristic features unlike carcinoma in situ. There is usually a sudden change in the severity of symptoms: more marked dysphagia and regurgitation of bloody contents. Carcinoma of the pouch may present as haematemesis [54, 55]. A lump in the neck and pain are more suggestive of malignancy [53]. Patients with carcinoma in situ tend to present with an uncomplicated diverticula with no change in symptoms.

Barium studies of carcinoma of the pouch shows a filling defect usually in the lower two-thirds. An inspissated food bolus can mimic the appearance. However, a constant filling defect that alters the smooth contour of the pouch is typical of malignancy. A carcinoma of the pouch was radiologically diagnosed preoperatively in 29.8% of the cases in the literature [53]. However; carcinoma in situ does not alter the pouch outline and is therefore not picked up by barium studies or even oesophagoscopy. The diagnosis of carcinoma in situ is usually made incidentally by the pathologist.

The definitive treatment of pouch with carcinoma is one-stage diverticulectomy. Treatment with radiotherapy alone is not associated with a good prognosis. Pouches found to have carcinoma intraoperatively should also be converted to one-stage diverticulectomy.

However, carcinoma in situ poses a problem as they are diagnosed postoperatively. Patients with anticipated long-term survival should undergo a subsequent diverticulectomy. With the advent of endoscopic interventions for pharyngeal pouch, more patients are managed endoscopically. Residual pharyngeal pouches following stapling have an inherent risk of malignancy. As the radiological appearance of the residual pouch does not correlate with the symptom relief gained by stapling, it is often regarded as an unnecessary postoperative investigation. However, only long-term follow-up of these

Table 1 Summary of associations and complications of pharyngeal pouch

Associations
Laryngocoele
Leiomyoma
Polymyositis
Cervical oesophageal web
Carotid body tumour
Anterior cervical fusion
Stenosis of upper oesophagus
Hiatus hernia
Gastrooesophageal reflux
Complications
Bezoar
Tracheal fistula
Vocal cord paralysis
Cervical osteomyelitis
Peptic ulceration
Retained foreign body
Carcinoma

patients will help identify the risk of carcinoma in these residual pouches [4]. Table 1 shows a summary of the associations and complications of pharyngeal pouch.

Conclusion

This review shows the various associations and complications that can occur with pharyngeal pouches. Awareness of co-existing pathologies and complications that could occur in a pharyngeal pouch would benefit surgeons in better management of these conditions.

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