



Novel techniques for prevention of post-operative pharyngocutaneous fistula in locally advanced laryngeal and hypopharyngeal cancers

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Abstract

Background. Pharyngocutaneous fistula is one of the most common complications following total laryngectomy. It increases hospital stay and the financial burden on patients, and prolongs nasogastric feeding. This paper presents novel techniques for prevention of pharyngocutaneous fistula.

Method. A retrospective study was conducted at a tertiary referral centre to assess the effectiveness of continuous extramucosal pharyngeal suturing and the hydrogen peroxide leak test in prevention of pharyngocutaneous fistula in 59 patients who had undergone total laryngectomy with or without partial pharyngectomy for locally advanced cancers of the larynx and hypopharynx.

Results. The incidence of pharyngocutaneous fistula in our study was 6.8 per cent, which is considerably lower than the incidence reported in various previous studies.

Conclusion. The continuous extramucosal suturing technique provides watertight closure of the neopharynx and can be recommended as a reliable method for neopharyngeal closure post total laryngectomy to reduce the occurrence of pharyngocutaneous fistula.

Introduction

Although the management paradigms in total laryngectomy are now shifting towards organ preservation surgeries, total laryngectomy still remains the mainstay of treatment in locally advanced laryngeal and hypopharyngeal cancers and salvage cases. Pharyngocutaneous fistula is one of the most common complications post total laryngectomy and is a matter of concern to head and neck surgeons. It increases the hospital stay and financial burden on patients, delays oral feeding, causes discomfort to patients because of the feeding tube, has a significant psychological impact on a patient who is already traumatised by the loss of voice and smell, delays the initiation of adjuvant treatment and can rarely result in major complications such as rupture of the carotid artery. Hence, its prevention is vitally important.¹

Every head and neck surgeon uses the best possible techniques to achieve the maximum five-year survival and fewest complications, especially pharyngocutaneous fistulas. The literature reflects a wide variation in the rate of fistula formation, ranging from 3 to 65 per cent.^{2,3} This study analysed the clinical records of 59 patients who had undergone total laryngectomy for locally advanced laryngeal and hypopharyngeal cancers at our institute and found the incidence of pharyngocutaneous fistula to be 6.8 per cent, i.e. 4 out of 59 patients developed pharyngocutaneous fistula.

Although significant advances have occurred in laryngectomy since it was first performed in the 18th century,⁴ there is no comprehensive literature elaborating surgical techniques for pharyngeal suturing. This study presents a novel technique of continuous extramucosal pharyngeal mucosal suturing and hydrogen peroxide leak testing employed at the Department of Otorhinolaryngology and Head and Neck Surgery, Goa Medical College that assisted in lowering the incidence of pharyngeal leaks post total laryngectomy. The type of suturing technique employed for closure of the anterior pharyngeal wall is conceivably one of the most important factors determining the development of pharyngocutaneous fistula.

Technical description

A total of 59 patients who underwent total laryngectomy for locally advanced cancers of the larynx and hypopharynx at the Department of Otorhinolaryngology and Head and Neck Surgery, Goa Medical College, from January 2012 to March 2022 were included in the study.

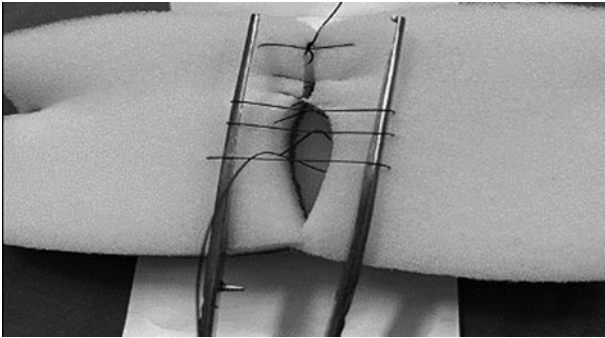


Figure 1. Demonstration of the continuous extramucosal suturing technique of pharyngeal closure.

A retrospective analysis of clinical records was done from the hospital database, and the approval of the institutional ethical committee was sought for conducting this study. All patients underwent standard pre-operative clinical assessment, which included a detailed history and clinical examination, a blood workup, a contrast-enhanced computed tomography (CT) scan from the skull base to the thorax, a biopsy of growth for histopathological confirmation, an assessment of nutritional status and pre-operative counselling.

Standard surgical steps for total laryngectomy were followed. Following delivery of the laryngeal specimen, the pharyngeal mucosal closure was done in 'Y' fashion using the continuous extramucosal suturing technique, which was further reinforced by another layer of constrictor muscle. In this technique, the needle was inserted extramucosally 1–2 mm from the edge of the pharyngeal mucosa and brought out extramucosally from the contralateral side with intermittent locking to prevent laxity along the suture line (Figures 1 and 2). The closure was performed over an 18-Fr nasogastric tube. The pharyngeal mucosal seal was confirmed using the hydrogen peroxide leak test, wherein dilute hydrogen peroxide was pushed into the neopharynx from the oral cavity using an infant mucus sucker and any leak was noticed from the neopharyngeal suture line in the form of effervescence or air bubbles. This test ensures that the pharyngeal mucosal closure is

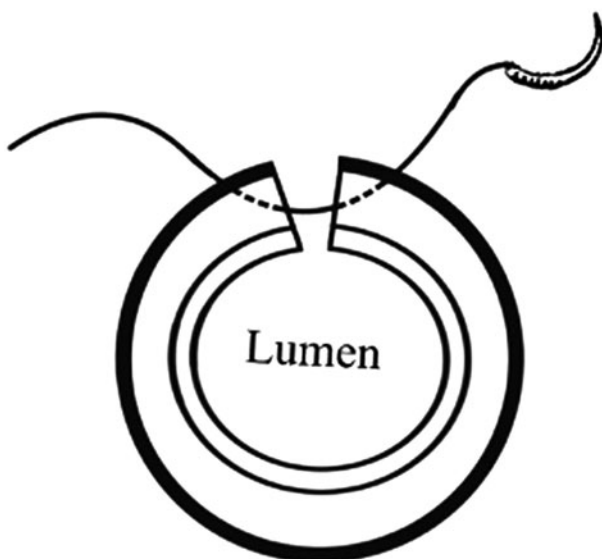


Figure 2. Schematic illustration of the pharyngeal mucosal closure using the continuous extramucosal suturing technique.

technically adequate.⁵ Any leaks were immediately addressed by inserting additional sutures. Skin was closed in two layers with the placement of two suction drains. In all cases where a pectoralis major myocutaneous patch flap was used, extraluminal sutures were placed, ensuring perfect approximation of the mucosa and skin raw areas.

Post-operatively, all patients received standard care, which included parenteral antibiotics (third-generation cephalosporins and metronidazole), adequate analgesia, stomal care and nutritional support. A routine CT scan of the neck with oral contrast was carried out on all patients on post-operative day 10 to detect pharyngeal leaks, but the diagnosis of pharyngocutaneous fistula was predominantly clinical. The early signs of fistula formation were erythema of the skin flap, oedema of the skin flap, fever, tachycardia and an obvious salivary leak.

Four out of 59 patients (6.8 per cent) developed pharyngocutaneous fistula. In 2 patients, pharyngeal leaks developed between the 8th and 10th post-operative days, and in 1 patient a delayed leak on the 21st post-operative day was noted. The site of the leak was the lateral aspect of the stoma or along the suture line above the stoma. Four out of 59 patients in our study had undergone salvage laryngectomy (post-radiotherapy), of which 3 developed pharyngocutaneous fistula ($p < 0.0001$). Three patients with pharyngocutaneous fistula were managed conservatively and one required reconstruction with a deltopectoral flap. A holistic approach was followed prior to addressing the fistula directly, including controlling co-morbid conditions, debriding necrotic tissue and providing adequate nutrition by enteral feeding. The conservative management included daily dressing with appropriate debridement, adequate drainage, compression, an appropriate antibiotic and lateralisation of the fistulous tract.

The goal of conservative management of fistulas is to promote healing by secondary intention. One patient underwent endoscopically assisted curettage of the fistulous tract, followed by compression dressing. All three patients with pharyngocutaneous fistula managed conservatively had satisfactory healing within two weeks and were started on oral feeds within two weeks.

Discussion

Pharyngocutaneous fistula is one of the most common complications post total laryngectomy and a matter of concern to all head and neck surgeons. As the incidence of pharyngocutaneous fistula reported in our study was considerably low (6.8 per cent) as compared to the reported incidence in the literature, we believe the type of suturing technique used by the head and neck surgeons at our hospital has played a pivotal role in the prevention of leaks.

Closure involves two components: the closure line and the suturing technique. The closure line implies the direction of pharyngeal closure sutures, which can be horizontal, vertical or T-shaped. There are differing opinions in the literature on the association of pharyngocutaneous fistula with the pharyngeal closure line.^{6–8} This disagreement indicates that the pharyngeal closure line might not play a critical role in pharyngocutaneous fistula formation.

Connell, continuous interlocking, Lembert and Gambee are four techniques described in the literature that can be used for manual closure of the pharynx.⁹ Surgeons modify these techniques according to their preferences, but there is not enough literature describing the details of suturing techniques.

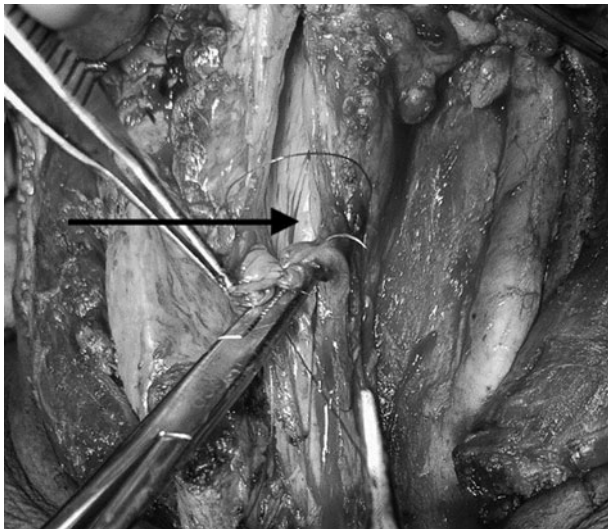


Figure 3. Extramucosal needle insertion and extraction in the pharyngeal closure, black arrow showing neopharyngeal lumen.

The Connell suture consists of two bites from the ipsilateral mucosal edge: the first bite comes from the outside of the mucosa through the inside of the mucosa and the second bite goes from the inside to the outside of the mucosa. This is then repeated on the opposite side. Gambee's suture is an interrupted suturing pattern in which one knot is left at the end of each stitch, which helps to prevent mucosal inversion. This method of suturing requires sufficient mucosal thickness near the stitch point. It is sometimes difficult to perform this suture accurately because of the inadequate thickness of the pharyngeal mucosa. In Lembert sutures, a far outside in and near inside out pattern on one wound edge and a near outside in and far inside out pattern on the corresponding side are applied. Penetration of the submucosa but not the mucosa is the characteristic feature of the Lembert suture. In this technique, with the subsequent sutures, the wound edges are merged to form a spontaneous inversion on a single plane.¹⁰

In the continuous extramucosal suturing technique followed at the Goa Medical College and Hospital, the pharyngeal closure is made in a 'Y' shape and is reinforced by a further layer of constrictor muscle. In this technique, the needle is inserted extramucosally, 1–2 mm from the edge of the pharyngeal mucosa, and brought out extramucosally from the contralateral side with intermittent locking (Figure 3)

- Pharyngocutaneous fistula is the most common complication post total laryngectomy, with a reported incidence between 3 and 65 per cent
- Various techniques of pharyngoplasty in total laryngectomy have been described in the literature
- A novel technique of extramucosal continuous suturing of neopharynx in prevention of pharyngocutaneous fistula is presented, which has an easy learning curve, provides a water tight seal and prevents mucosal ischaemia and necrosis
- The dilute hydrogen peroxide leak test for intraoperative diagnosis of pharyngeal leak and its management is described

The main advantage of this technique is that it allows spontaneous inversion of mucosal edges, thus facilitating a watertight seal. The advantage over Connell's suture is that it is completely extramucosal, hence there are fewer chances of mucosal ischaemia followed by necrosis, which can occur with Connell's suture because it fits tightly over the mucosal edge. In continuous extramucosal suturing technique, there are fewer knots along

Table 1. Incidence of pharyngocutaneous fistula in various studies

Source	Number of cases	Incidence of fistula (%)
Aires <i>et al.</i> ¹¹	94	21.3
White <i>et al.</i> ¹²	259	21
Qureshi <i>et al.</i> ⁷	1415	11.9
Markou <i>et al.</i> ¹³	377	13
Smith <i>et al.</i> ¹⁴	223	55
Grau <i>et al.</i> ¹⁵	472	19
Current study	59	6.8

the suture line, reducing the chances of developing a foreign body reaction. We compared the incidence of pharyngocutaneous fistula in our study with various other studies, as shown in Table 1, and found that the incidence of fistula in our study was substantially lower. From these observations, it can be concluded that the extramucosal continuous suturing technique is an effective method of pharyngoplasty.

The second technique that we recommend for the prevention of pharyngeal leaks is the dilute hydrogen peroxide leak test. This technique, which was described by Tysome *et al.*,⁵ involves instilling 1.5 per cent hydrogen peroxide in the oral cavity and looking for leakage or effervescence along the pharyngeal closure line. It is an effective method to ensure watertight closure of the pharynx, and any leak that occurs intra-operatively can be addressed immediately.

The technique of pharyngeal closure described in the current study has a simple and short learning curve, and can be reliably incorporated into surgical training. Thus, the hydrogen peroxide leak test and the continuous extramucosal technique of pharyngeal closure are reliable means to achieve watertight closure of the neopharynx post laryngectomy.

Competing interests. None declared

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