

## Original Research Article

# A review of pharyngeal mucosal closure technique in total laryngectomy

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## ABSTRACT

**Background:** The purpose of this retrospective analysis was to review our single institute based experience with the pharyngocutaneous fistula following total laryngectomy and to determine the impact of pharyngeal closure technique in the development of PCF in our patients.

**Methods:** The medical records of the patients, who underwent total laryngectomy for squamous cell carcinoma of the larynx and hypopharynx in Government Royapettah Hospital, center for oncology between January 2010 and December 2017, were retrospectively reviewed.

**Results:** 26 patients were included in the study of which 25 were male and 1 was female. Mean age of the patients were 58 years. Horizontal closure was done in 9 patients (35%) and T closure was done in 17 patients (65%). PCF was observed in 1 of 9 patients in horizontal closure. Remaining 17 patients underwent T closure of whom 8 patients developed PCF ( $p=0.06$ ). Eight out of 18 patients (44%) developed PCF after salvage surgery after radiotherapy failure, Remaining 8 patients underwent primary laryngectomy for advanced stage cancers with cartilage involvement, of whom 1 patient developed PCF (12.5%) ( $p=0.11$ ). In salvage laryngectomy ( $n=18$ ), 1 of 6 cases developed PCF in horizontal closure and 7 of 12 cases in T closure technique ( $p=0.09$ ).

**Conclusions:** The incidence of fistula in our study was 34%. Horizontal closure was associated with decreased incidence of PCF when compared to 'T' closure of the defect. Prior radiotherapy had increased incidence of PCF.

**Keywords:** Laryngectomy, Pharyngocutaneous fistula, Pharyngeal mucosal closure

## INTRODUCTION

Indications for total laryngectomy (TL) have considerably declined due to organ preservation protocols and advances in organ-preserving surgeries, it is still the treatment of choice for tumors that are deeply infiltrative or destroying laryngeal cartilages, and in cases of chemo radiotherapy failure.<sup>1,2</sup> Following total laryngectomy, complications like wound infection, chyle leak, carotid rupture, and pharyngocutaneous fistula (PCF) may be seen in the early postoperative period. Pharyngocutaneous fistula is the leading complication prolonging hospital stay and delaying oral feeding and

adjuvant therapy after TL and causing nutritional deterioration of the patient, and severe life threatening complications such as rupture of the carotid artery.<sup>3</sup>

The incidence of PCF following TL is reportedly between 2% and 35%. Advanced primary tumor stage, preoperative radiotherapy, duration of surgery, transfusion requirement, patient comorbidities, prior tracheotomy, low perioperative albumin and hemoglobin, hypothyroidism, presence of tumor beyond resection margins, the type of the suture material, and the type of closure technique were implicated in the development of the PCF.<sup>4,5</sup>

The purpose of this retrospective analysis was to review our single institute based experience with the PCF following total laryngectomy and determine the impact of pharyngeal closure technique in the development of PCF in our patients.

### METHODS

The medical records of the patients, who underwent total laryngectomy/wide field laryngectomy for squamous cell carcinoma of the larynx and hypopharynx in Government Royapettah Hospital, Chennai between January 2010 and December 2017, were retrospectively reviewed. All patients with primary or recurrent carcinoma of larynx and hypopharynx who underwent total laryngectomy or wide field laryngectomy with or without partial pharyngectomy were included in the study. Exclusion criteria included patients who required pharyngo laryngoesophagectomy and flap closure for pharyngeal defect. Data regarding the age, gender, smoking habit, tumor stage, previous radiotherapy or chemotherapy, and the type of closure technique were collected.

Surgery (total laryngectomy / wide field laryngectomy with or without partial pharyngectomy) were accomplished by the senior surgeons in all patients. Mucosal defects were closed by primary sutures either using horizontal or T closure technique. Drain was kept for all patients and removed when drain output is less than 10 ml/day.

For statistical analysis, SPSS for Windows was used. Results were considered as significant at the level where  $p < 0.05$ .

### RESULTS

Twenty six patients were included in the study of which 25 were male and 1 was female. Mean age of the patients were 58 years range (range 50–69 years). Median follow up time was 22 months (range 6 months to 7 years). Twenty four out of 26 patients had history of smoking. 8 patients (30%) had history of diabetes mellitus. Of the 26 patients 8 patients (30%) underwent upfront laryngectomy and the remaining 18 patients (70%) underwent salvage laryngectomy for radiation failure (residue / recurrence).

Patients underwent total laryngectomy/ wide field laryngectomy with or without partial pharyngectomy. Of the twenty six patients, 17 patients (65%) underwent total laryngectomy, 6 patients (23%) underwent wide field laryngectomy, 3 patients (11%) underwent total laryngectomy with partial pharyngectomy. All 26 patients had primary closure. Of the 26 patients who underwent primary closure, horizontal closure was done in 9 patients (35%) and T closure was done in 17 patients (65%). Primary trachea esophageal puncture was done in one patient.

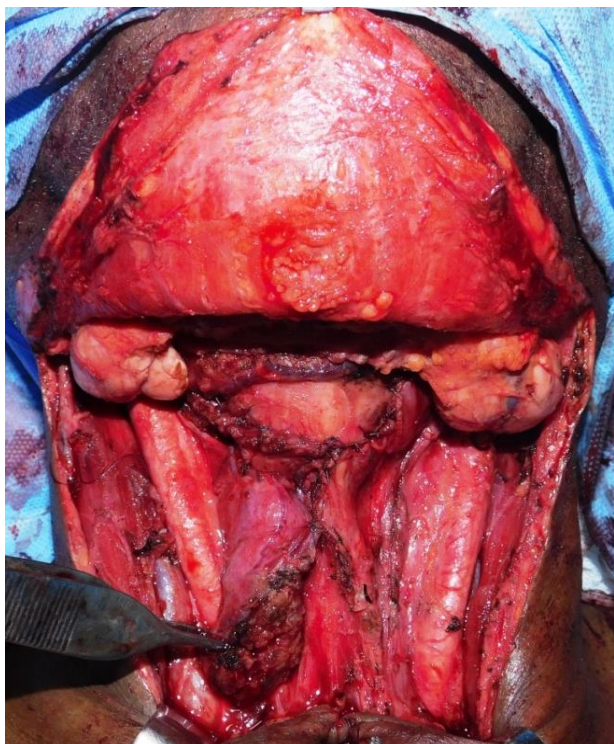
Pharyngocutaneous fistula was observed in 9 of 26 patients (34%). All patients were male. Fistula occurred in all patients within 10<sup>th</sup> post operative day. Spontaneous closure was seen in 8 patients (89%). Time for spontaneous fistula closure ranged from 25 days to 3 months. Suturing was done in 2 patients within 2 weeks but both patients developed fistula. One patient who had chronic fistula underwent PMMC flap reconstruction after 6 months. Carotid blow out was seen in one patient with PCF.

**Table 1: Characteristics of patients.**

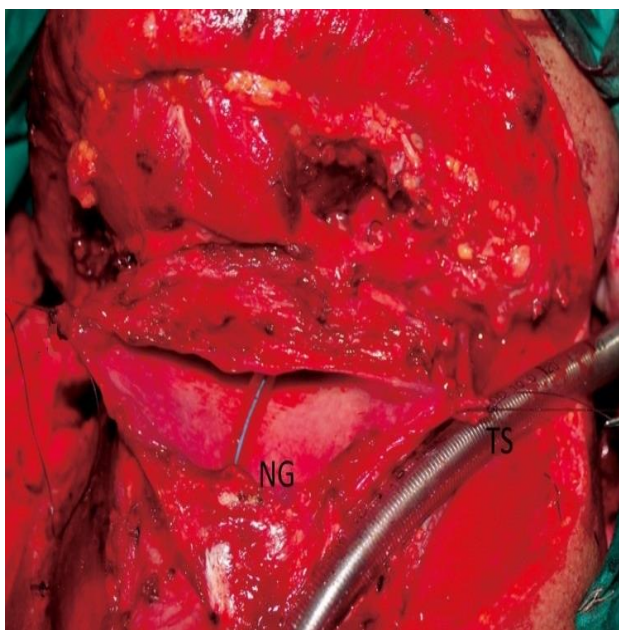
<b>Age (in years)</b>	Avg (range)	58 (50-69)	
<b>Sex</b>	Male	25	96
	Female	1	4
<b>Smoking</b>	yes	24	92
	No	2	8

**Table 2: Comparison of variables in PCF and non-PCF group.**

Variables		Pharyngo cutaneous fistula group N=9	Non pharyngo cutaneous fistula group N=17	P value
<b>Diabetes mellitus</b>	Present	4	4	0.271
	Absent	5	13	
<b>Prior Radiotherapy/ CRT</b>	Present	8	10	0.114
	Absent	1	7	
<b>Closure technique</b>	Horizontal	1	8	0.06
	T closure	8	9	



**Figure 1: Pharyngeal 'T' closure**



**Figure 2: Pharyngeal mucosa before horizontal closure.**

Nine patients underwent horizontal closure of pharyngeal mucosa with interrupted inverting sutures using 3-0 vicryl starting from the lateral ends of the defect. 'T' closure were done with interrupted inverting sutures using 3-0 vicryl. PCF was observed in 1 of 9 patients in horizontal closure. Remaining 16 patients underwent T closure of whom 8 patients developed PCF ( $p=0.06$ ).

Eight out of 26 patients had history of diabetes mellitus. Four of 8 patients with diabetes (50%) were in the PCF group and remaining 4 patients (30%) were in the non PCF group. Although the incidence of PCF was higher among the diabetic patients, the difference was not statistically significant ( $p=0.271$ ).

Eighteen patients underwent salvage surgery for post radiation failure. Radiation dose given ranged from 60-66 Gy. Time between completion of radiation and laryngectomy ranged from 3 months to 9 years (avg- 10 months). Of the 18 patients who underwent salvage surgery after radiotherapy failure, 8 patients developed PCF (44%). Remaining 8 patients underwent primary laryngectomy for advanced stage cancers with cartilage involvement, of whom 1 patient developed PCF (12.5%) ( $p=0.11$ ).

## DISCUSSION

The incidence of fistula formation is dependent on (1) tension on the pharyngeal suture line, (2) configuration of the pharyngeal closure (horizontal rather than a 'T' closure), (3) previous radiation or chemoradiation therapy, (4) nutritional status of the patient and (5) medical comorbidity such as anemia and diabetes.<sup>6</sup>

In our study we retrospectively analysed the risk factors in the development of pharyngocutaneous fistula (PCF). The presence of a comorbid medical condition including anemia, DM, COPD, cardiac illness and CRF was proposed to be a significant risk factor for the development of the PCF. In our study diabetic patients had slightly higher incidence of pharyngocutaneous fistula (50%) when compared to non diabetic patients (28%) but was not statistically significant ( $p=0.271$ ). No patients in our study had COPD, cardiac illness and CRF.

Prior radiotherapy or chemoradiation was associated with higher rates of wound complication and fistula. In study our study 41% of patients with prior RT/CRT developed PCF when compared to 14% of patients with no prior RT/CRT but was not statistically significant ( $p=0.114$ ). Incidence of PCF in salvage laryngectomies was significantly high ( $p=0.045$ ) with T closure (8/13) than horizontal closure (1/5).

In a retrospective study conducted by Furuta et al, complication rate in 86 patients undergoing salvage laryngectomy were reviewed and showed increased risk of major wound complications in patients who underwent salvage surgery following radiation or chemoradiation than patients who underwent upfront laryngectomy but were not statistically significant.<sup>7</sup> However the role of pre operative radiation in increasing PCF rate has been disputed by others. Hier et al showed that the fistula rate was increased only in patients who underwent laryngectomy within three months of completing radiation therapy.<sup>8</sup>

Type of pharyngeal closure was suggested to be important risk factor in the development of PCF. In our cases horizontal closure of pharyngeal defect was done in the latter period with decreased incidence of PCF though not statistically significant ( $p=0.06$ ). Various techniques for pharyngeal closure after total laryngectomy were described in the literature. 'T' closure is reported as a risk factor for PCF formation.

Jatin shah described horizontal closure with interrupted inverting sutures for pharyngeal defects with decreased post operative fistula rates than with 'T' closure.<sup>6</sup> According to Shah et al, the weakest point was the three point junction if 'T' or 'Y' shaped closure was performed<sup>9</sup>. This stresses the importance of the vertical line repair which was also stressed by Stell et al.<sup>10</sup> Tosun et al revealed an association of T-shaped suture of the pharynx with the development of postoperative PCF. Qureshi et al performed a prospective study looking at the rates of fistula formation after laryngectomy and included closure technique (T-type, Y-type, and vertical) in their evaluation.<sup>11</sup> Their overall PCF rate was 23% but failed to find a difference in fistula formation based on closure technique.

Reinforcement of the pharyngeal suture line have been described in the literature for reduce the risk and severity of PCF. Shah described the use of pectoralis muscle for suture line reinforcement. Naghibzadeh et al investigated the effect of using the Sternocleidomastoid muscle flap on the incidence of PCF.<sup>12</sup> They conducted a retrospective study dividing patients into two groups. One group did not have any augmentation while the other was augmented with the SCM. PCF occurred in nine patients with only one patient within the flap group. The difference in incidence was statistically significant in favour of the flap group.

## CONCLUSION

Pharyngocutaneous fistula is one of the most common postoperative complications among the patients who underwent total laryngectomy. The incidence of fistula in our study was 34%. PCF significantly increases the length of the hospital stay. In our study, the most important factor associated with the occurrence of PCF was found to be the type of closure used for pharyngeal defect. Horizontal closure with interrupted inverting suture was associated with decreased incidence of PCF when compared to 'T' closure of the defect. Prior radiotherapy had increased incidence of PCF.

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