

# Predictive Factors for the Occurrence of Pharyngostoma after Laryngectomy and Total Pharyngo-Laryngectomy in Yaounde and Douala

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## Abstract

**Introduction and Aims:** Pharyngostoma or pharyngo-cutaneous fistula is a frequent complication of totals laryngectomies and pharyngo-laryngectomies. Its incidence varies from one series to another from 13% to 58%. Multiple risk factors are known. The data from our environment concerning this condition are few. Thus, in order to contribute to the study of this complication in our environment, we proposed to carry out this study, whose objective was to determine the predictive factors for the occurrence of pharyngo-cutaneous fistula or pharyngostoma after total laryngectomy and total pharyngo-laryngectomy in Yaounde and Douala. **Patients and Methods:** This was a retrospective, cross-sectional, descriptive study conducted in the 5 Ear-Nose-Throat (ENT) department of hospital in the city of Yaounde and Douala. The study took place between January 2009 and December 2020. All patients who underwent total laryngectomy or total pharyngo-laryngectomy with a follow-up of at least one month were included in the study. Incomplete records were excluded, as well as those of patients who died before one month of postoperative follow-up. **Results:** We selected 48 cases of total laryngectomies (TL) and total pharyngo-laryngectomies (TPL), and identified 37 cases of pharyngostoma. 45 men (93.8%) and 3 women (6.3%). The mean age was 56.4 years with extremes

ranging from 37 to 86 years. Smoking and alcoholism were noted in 75% and 79.2% of our patients respectively. A tracheotomy before TL and TPL was found in 41.7%. 100% of the tumours found were T3 or T4. The surgery was in 34 cases (70.8%) TL and in 14 cases (29.2%) TPL. Pharyngostomas were observed in 37 cases among 48 patients operated on, *i.e.* a frequency of 77.1%. The average delay of appearance was 7 to 14 days. We had spontaneous healing with pressure dressing and nasogastric tube feeding in 35 patients (77.8%) and two patients benefited from pectoralis major flap treatment; the healing time was 21 to 30 days. We did not find any correlation between gender, age, tumour site of origin and locoregional extension and the occurrence of pharyngostoma. Preoperative tracheotomy and radiotherapy were not significant risk factors for the occurrence of pharyngostoma. However, preoperative anaemia ( $p = 0.02$ ), LTP ( $p = 0.02$ ), early complications ( $p < 0.001$ ) and lack of continuous saliva aspiration postoperatively ( $p = 0.03$ ) were statistically significant predictors of pharyngostoma in univariate analysis. **Conclusion:** Pharyngostoma is the most common postoperative complication after TL and TPL. In our setting, the main associated risk factors identified were: preoperative anaemia, LTP, early complications and failure to continuously aspirate saliva postoperatively.

## Keywords

Pharyngostoma, Predictive Factors, Yaounde and Douala

## 1. Introduction

Pharyngostoma or pharyngo-cutaneous fistula is a frequent complication of total laryngectomies (TL) and total pharyngo-laryngectomies (TPL). Its incidence varies from one series to another from 13% to 58% [1] [2]. Multiple risk factors are known. Patient-related factors such as age, smoking, gastro-oesophageal reflux, diabetes, undernutrition, pre-operative anaemia, tumour stage. As well as treatment-related factors such as: pre-operative radiotherapy, type of surgery performed, post-operative infections, post-operative aspiration. These factors must be taken into account when performing TL and TPL. There is little data in our field on this complication, in our environment. This is due to the fact that this surgery is not very practical. In our tropical environment probably have some specific factors can cause the pharyngostoma. In order to contribute to the study of pharyngostomas in our setting, and to improve our practice, we proposed to conduct this study, so the general objective was to study pharyngostoma post TL and TPL in Yaounde and Douala. Specifically: to determine the frequency of occurrence of pharyngostoma, to draw up the epidemiological profile of the patients, to give the clinical and paraclinical profile of the patients, to give the therapeutic profile of the patients, and to determine the predictive factors of occurrence of pharyngostoma after laryngectomy and total pharyngo-laryngectomy in Yaoundé and Douala.

## 2. Patients and Method

This was a retrospective cross-sectional and descriptive study, carried out in the 5 ear-nose throat (ENT) departments of the university hospitals of the cities of Yaounde and Douala, The Yaounde General Hospital, the Yaounde University Hospital Centre, the Yaounde Central Hospital, the Douala General Hospital and the Douala Laquintinie Hospital. The study took place between January 2009 and December 2020, *i.e.* for 12 years. The selection criteria were the patients who underwent TL or TPL with a follow-up period of at least one month. All the patients files who present with pharyngostoma during the study period were included in the study. The sampling was consecutive. The recruited patients files were gathered, analysed, and all the data was order in our quiz. Incomplete records were excluded, as well as those of patients who died before one month of post-operative follow-up. Selection process: the recruited patients files were gathered, analysed, and all the datas was order in our quiz, specially the predictive factor find in the literature (age, sex, nutritional status, tobacco, alcohol, diabetes, hiv, cancer stage...). After data collected, we did two group of patients: first group with those who has pharyngostoma, and those who did not have pharyngostoma. The data collected were computerised using the SPSS 23.0 statistical programme. We conducted a descriptive and then an analytical study. Quantitative variables were expressed as mean and qualitative variables as frequency. The analytical study consisted in comparing two groups of patients according to whether or not they developed a pharyngostoma, on several parameters (epidemiological, clinical, type of surgery following surgery). We used the Chi Carre test where the Theoretical numbers was  $\geq 5$  and Fisher test when  $< 5$ , and Odd ratio was used. The significance threshold was set at 5%. The degree of significance depended on the p-value found:

- For p between 0.01 and 0.05: the test is considered significant.
- For p between 0.001 and 0.01: the test is said to be highly significant.
- For  $p \leq 0.001$ : the test is said to be highly significant.

## 3. Results

1) Frequency of occurrence of pharyngostoma:

48 cases of total laryngectomies (TL) and total pharyngo-laryngectomies (TPL) were compiled during the study period. 37 cases of pharyngostoma were identified, *i.e.* a frequency of 77.1%.

2) Epidemiological data:

The distribution of patients operated on for TL and TPL, according to sex, was as follows: 45 men (93.8%) and 3 women (6.3%). The average age was 56.4 years with extremes ranging from 37 to 86 years. **Table 1** show socio-demographic data.

3) Clinical and paraclinical data:

A history of smoking and alcoholism were noted in 75% and 79.2% of our patients respectively. Cigarette smoking averaged 23.1 pack-years (PY). Smoking was often massive, reaching 50 BP. 41.7% of patients had gastroesophageal reflux

disease (GERD). Anemia was noted in 62.5% of cases. **Table 2** shows the clinical data.

An extension work-up systematically included, for each patient, a chest X-ray and abdominal ultrasound which were normal, and a cervical CT scan. The tumour was classified as T3 T4 in 48 cases (100%). **Table 3** shows the distribution of patients according to tumour stage.

#### 4) Therapeutic data:

A pre-operative tracheotomy before TL and TPL had been performed in 41.7% of cases. 100% of the tumours found were T3 or T4. The distribution according to the type of surgery showed 34 cases (70.8%) of LT and 14 cases (29.2%) of PLT.

**Table 1.** Socio-demographic data.

	Number	(%)	TI* à 95%
<b>Sex (n = 48)</b>			
Men	45	93.8	02.8 - 98.7
Women	03	06.2	01.3 - 17.2
<b>Profession (n = 48)</b>			
Professional of voice**	18	31.2	18.7 - 46.3
Others professions	30	68.8	53.7 - 81.3

\*TI: Trust Interval. \*\*Teacher, musician, journalist, Majority of men.

**Table 2.** The clinical data.

	Number	(%)	TI* 95%
<b>Alcohol</b>			
Yes	38	79.2	65.0 - 89.5
No	10	20.8	10.5 - 35.0
<b>Tobacco</b>			
Yes	36	75.0	60.4 - 86.4
No	12	25.0	13.6 - 39.6
<b>gastroesophageal reflux</b>			
Yes	20	41.7	27.6 - 56.8
No	28	58.3	43.2 - 72.4
<b>Diabetes</b>			
Yes	01	02.1	0.1 - 1.1
No	47	97.9	88.9 - 99.9
<b>HIV</b>			
Yes	03	06.3	1.3 - 17.2
No	45	93.8	82.8 - 98.7

\*TI: Trust Interval.

The number of pharyngostomas observed was 37 cases. The average time to onset was 7 - 14 days, discovered by methylene blue test. The location of the fistulas was defined in relation to the tracheostomy orifice as supra-orificial and peri-orificial (clockwise location) (**Figure 1**). We had spontaneous healing with pressure dressing and nasogastric tube (NGT) feeding in 35 patients (77.8%) and two patients benefited from treatment with a pectoralis major flap (image lambeau); the healing time was 21 to 30 days.

#### 5) Predictive factors of pharyngostoma occurrence

We did not find any correlation between gender, age, tumour site of origin or locoregional extension and the occurrence of pharyngostoma. Preoperative tracheostomy and radiotherapy were not significant risk factors for the occurrence

**Table 3.** Distribution of patients by tumour stage.

Stage	Number	%
T3N0M0	26	54.2
T3N1M0	05	10.4
T3N2M0	01	02.1
T3N3M0	01	02.1
T4N0M0	07	14.6
T4N1M0	02	04.2
T4N2M0	06	12.5
<b>Total</b>	<b>48</b>	<b>100</b>



**Figure 1.** Pharyngostoma.

of pharyngostoma. In contrast, preoperative anaemia ( $p = 0.02$ ), LTP ( $p = 0.02$ ), early complications ( $p < 0.001$ ) and lack of continuous saliva aspiration post-operatively ( $p = 0.03$ ) were the statistically significant predictors of pharyngostoma in univariate analysis. **Table 4** shows the distribution of the results of the univariate analysis.

#### 4. Discussion

Pharyngostoma or pharyngo-cutaneous fistula (PCF) is a frequent complication of total laryngectomy (TL) and total pharyngo-laryngectomy (TLP) [3]. The frequency of pharyngostoma in our series is 77.1%. This rate is higher than most series where the rates vary between 8.0% and 58.0% [1] [2]. Several factors can be incriminated, in our study we were interested in studying certain factors. This higher rate can also be explain y the fact that our study was the multicentric recruitment, many studies in literature was unicentric. We will discuss them one after the other, in order to see their real impact in the occurrence of pharyngostoma

**Table 4.** Distribution of the results of the univariate analysis.

Predictives factors	OR* (TI**)	p value***
age	1.74 (0.14 - 4.5)	0.19
Sex	0.57 (0.04 - 6.97)	0.55
Professional of voice	1.27 (0.28 - 5.70)	0.52
Alcohol	0.80 (0.14 - 4.50)	0.58
Tobacco	1.16 (0.25 - 5.35)	0.563
Gastroesophageal reflux	0.51 (0.13 - 1.93)	0.26
Diabetes	-	0.77
HIV	0.13 (0.01 - 1.53)	0.12
3-stage disease	1.06 (0.22 - 6.93)	0.61
Emergency tracheotomy	2.22 (0.51 - 9.91)	0.22
TPL	0.24 (0.02 - 2.07)	0.16
Pre-operative anaemia	2.44 (0.63 - 9.85)	0.16
BMI	0.22 (0.0)	0.89
Cancer stage	0.44 (0.10 - 1.93)	0.22
Radical lymph node dissection	=	0.77
Piriform sinus detachment	0.35 (0.06 - 1.86)	0.18
Flap closure	-	0.76
Thyroidectomy	0.70 (0.11 - 4.24)	0.51
Post-operative complications	-	0.01
standard protocole	0.98 (0.25 - 3.78)	0.62

\*Odds ratio, \*\*TI: Trust Interval 95% \*\*\*p value < 0.05.

in our study population. Limitation of the study can be that we excluded 16 incomplet files of patients with pharyngostoma, they can affect the frequency.

#### 1) Age and sex

The influence of age and sex remains controversial. Indeed, while Dedivitis *et al.* suggest that the development of a fistula is not correlated with sex, but that its incidence increases with age after 60 years [4], most series, including ours, do not find a statistically significant correlation. We did not find a significant association with pharyngostoma ( $p = 0.56$ ).

As the combination of the two is a major risk factor in laryngeal cancer, several authors studying its impact on the development of pharyngostoma have not found a real correlation [5] [6]. However, their role in the alteration of the microvascularisation could explain the delay in the healing of PFC.

#### 2) Gastroesophageal reflux disease

The study of comorbidities attributes an important role to gastro-oesophageal reflux. Indeed, an interdependent relationship has been proven. Cooper *et al.* [7] and Biacabe *et al.* [8] found a high incidence of gastro-oesophageal reflux in patients with laryngeal cancer. Welch *et al.*, using pre- and post-total laryngectomy manometry, have demonstrated altered upper oesophageal sphincter tone and the presence of pharyngolaryngeal reflux in these patients [9]. Choi *et al.* [10] agreed with Welch and demonstrated that total laryngectomy, by altering the structures of the pharynx, altered the innervation plexus, thus affecting oesophageal motility and decreasing upper oesophageal sphincter pressure. Moreover, GERD is recognised as the main problem in post-laryngectomy phonatory prostheses. In our work, 20 patients with gastroesophageal reflux disease were found before surgery (41.7% of cases). GERD is not recognised in our series as an exposure factor, with a non-significant correlation with pharyngostoma ( $p = 0.933$ ). Skander *et al.* [11] in Tunisia found 35% of patients with GERD but also without significant correlation.

#### 3) Diabetes

In the literature, several authors have shown that diabetes is also responsible for the increased risk of CPF [12] [13]. Indeed, studies by Cavalot *et al.*, Boscolo-Rizzo *et al.*, and Mattioli *et al.* found a significant role for diabetes in the occurrence of CPE. All these factors combine to alter the phenomenon of tissue healing necessary after laryngectomy. This work had only one diabetic patient and a non-significant correlation  $p = 0.58$ .

#### 4) Undernutrition

It is currently accepted that undernutrition, which is often present in patients who have undergone head and neck cancer surgery, increases the risk of surgical complications. Mattioli and Morton demonstrated a significant correlation between hypoalbuminemia and the risk of CPE [12] [14]. In this study, as we were unable to collect albumin levels (which are not commonly used in our institutions), we relied on BMI, which found 54.2% of patients to be lean before surgery and 76.9% of these patients presented with a pharyngostoma. Nevertheless we did not find a significant correlation  $p = 0.9$ .

#### 5) Anemia

Data from the literature show a positive correlation between anaemia and CPE [15] [16] [17]. Erdag *et al.* found a significant correlation between a haemoglobin level < 12.2 g/dl and the risk of CPE [5]. Furthermore, postoperative haemoglobin levels appear to be correlated with intraoperative blood loss. However, Palomar-Asenjo *et al.* [15] did not find a significant correlation between haemoglobin level and CPF. Preoperative anaemia was found in 60.4% of patients with a significant correlation  $p = 0.02$ . This result could be explained by the fact that the biological value of the haemoglobin level at >12.5 g pre- and post-op is not practised by either anaesthetists or surgeons.

A good control of the haemoglobin level, keeping it above 12.5 g/dl, is necessary to contribute with the other factors to guarantee the best healing conditions.

#### 6) The tumor state

Several series have investigated the relationship between tumour stage and the risk of developing a pharyngostoma postoperatively. The majority of authors agree that there is a linear relationship between these two factors [16] [17]. Concerning regional lymph node metastases, only Pinar *et al.* and Fernandez-Prada *et al.* found a statistically proven correlation on the formation of PCF after laryngeal surgery [18] [19]. Our series, in line with the results of the multivariate analyses of Erdag, Boscolo and Furuta, did not find a relationship between PCF and metastatic lymph node involvement [6] [20] [21].

#### 7) Per-operative tracheostomy

In their meta-analysis, Paydafar *et al.* found a correlation between preoperative tracheostomy and the occurrence of PCF with  $p = 0.03$  [22] [23] [24]. In our study, 17 of the 37 patients who developed a pharyngostoma had an emergency tracheostomy before surgery, we did not find a significant association ( $p = 0.22$ ). These results are consistent with those of several other series [6] [14] [18] [19] [18] [22] [23] [24] which did not find a significant association.

#### 8) Associated lymph node dissection

Cervical lymph node dissection associated with laryngectomy is routinely performed. The influence of lymph node dissection on the occurrence of pharyngostoma has often been studied in different series including ours, and most authors have not found any correlation [5] [6] [20]. In our study, in addition to whether or not curage was performed, we were interested in whether or not curage was performed bilaterally and in the type of curage. Our results show a positive influence with radical curage. Similarly, a bilateral functional curage was responsible for more CPF with  $p = 0.349$ . This result remains debatable, given that most of our patients underwent systematic bilateral functional curage.

#### 9) The type of surgery performed

The type of surgery is an understudied parameter in the authors' opinion as to its involvement in the occurrence of PCF. In our series, we found a pharyngostoma rate of 91.7% in patients who had a total pharyngolaryngectomy (TPL), and 72.2% in those who had a total laryngectomy. We found a significant association ( $p = 0.02$ ) for TPL. This result is similar to that of Morton *et al.* who dem-



onstrated in their series that the rate of CPE in case of LTP was 40% whereas this rate was 7.2% in case of TL with a  $p = 0.003$  [24].

#### 10) Occurrence of a post-operative infection

Few authors have looked at the role of postoperative infection on the occurrence of CPE. Mario *et al.* showed in their study that postoperative infection increases the risk of developing CPE. In our study, we evaluated the impact of postoperative infection which was positive ( $p = 0.02$ ), CRP was not performed postoperatively in our series.

#### 11) Post-operative suction

In this study we found that 77.3% of the patients had postoperative suctioning. This factor is not studied in the literature but its practice reduces the risk of early swallowing of saliva and therefore of pharyngostoma. This study found a significant association  $p = 0.03$ . This can be explained by the fact that total laryngectomy is not a common surgery, and nurses do not master the issues of strict nursing care to avoid complications.

## 5. Conclusions

Pharyngostoma is the most common postoperative complication after total laryngectomy or total pharyngo-laryngectomy. This study found a prevalence of pharyngostoma of 77.1%. The age group most represented was between 40 and 60 years, with males representing 93.8% of the sample. The main associated risk factors identified in our study were preoperative anaemia, TPL, early complications and lack of continuous saliva aspiration postoperatively. These factors are identical to those found in the literature.

This work in our setting has attempted to group together the various potential factors and identify new factors, particularly those independent of the tumour, which can be acted upon to prevent the risk of pharyngostoma. Preventing the risk factors for pharyngostoma will reduce the time our patients spend in hospital, the time they return to oral feeding, and thus reduce the cost of surgery.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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