The Prevalence and Risk Factors of Tracheostomal Stenosis Following Total Laryngectomy

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Abstract

Background: Tracheostomal stenosis (TS) following total laryngectomy is relatively common in patients and a distressing complication with major effects on patient rehabilitation it affected 4-44% of patients following total laryngectomy worldwide. Various etiological factors and some risks have been indicated as contributing to the onset of stenosis.

Purpose: We aimed to investigate the prevalence and risk factors of tracheostomy stenosis following total laryngectomy

Method: Tracheostomal stenosis was defined as respiratory insufficiency at rest or during exercise, difficulty in tracheal clearance due to non laminar flow, or both. Eighty data of patients were enrolled in this study consisting of 76 male (95.0%) and 4 females (5.0%). Baseline characteristics (BL) stage of cancer (SC), type of surgery (TS), the onset of stenosis following surgery (OS) and risk factors (RF) from each patient were recorded and analyzed using a pre-installed statistic software.

Result: The overall prevalence of tracheostomal stenosis was 13.8% (11 of 80 patients). The prevalence and risk factors of tracheostomal stenosis following total laryngectomy consisted of 7 hypertrophic scar patients (63.3%), 2 infection patients (18.12), and 1 radiotherapy and peristomal fat patient (9.01), respectively.

Conclusion: Out of eighty patients, eleven patients indicates the characters of tracheostomal stenosis using the bevel technique. The most common etiological factor is hypertrophic scar, followed by infection, radiotherapy and peristomal fat.

Keywords: *Tracheostomal stenosis, laryngectomy, prevalence, the risk factor*

Introduction

Tracheostomal stenosis (TS), following total laryngectomy, is relatively common in patients and is a distressing complication with major effects on patient rehabilitation. It affects 4 - 44% of patients, following total laryngectomy worldwide [1–3]. TS can occur at any point with some factors that can be considered as stenosis formation, including the occurence of infection around the stoma postoperatively, prolonged use of a tracheostomy tube postoperatively, female sex, and postoperative radiotherapy [4]. The separation of airways and pharynx are some of the consequences due to laryngectomy [5].

Laryngectomy is done due to some larynx abnormality which carcinoma takes most of the cases.

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Some of the cases suggest an occurrence of malignant growths in the region of permanent tracheostoma after laryngectomy which is usually considered to be the peristomal recurrence of the primary laryngeal carcinoma [6,7]. Various etiological factors have been indicated as the contributing factors to the onset of stenosis, including the type of skin incision, the diameter of trachea, excess skin and peristomal fat, incorrect mucosal – cutaneous suturing, hypertrophic scarring and keloid formation, radiotherapy, infection, and tracheoesophageal puncture[8–11].

Some potential cofactors can cause aberrant wound healing and play an important role in the genesis of TS such as adjuvant chemotherapy, advanced age, smoking, cardiopathies, diabetes, local infections, impaired immunocompetence, dan malnutrition [2]. Based on those facts, this study aims to investigate the prevalence and risk factors of tracheostomal stenosis following total laryngectomy.

Material and Methods

A retrospective study from a single tertiary-center was conducted within the period of 2013-2016 following an ethical clearance by the Ethical Committee of Dr. Soetomo Hospital, Surabaya, Indonesia. Tracheostomal stenosis was defined as respiratory insufficiency at rest or during exercise, difficulty in tracheal clearance due to non-luminar flow, or both.

Eighty data of patients were enrolled in this study, consisting of 76 males (95.0%) and 4 females (5.0%). None of these patients experienced previous neck surgery. Baseline characteristics (BL) stage of cancer (SC), type of surgery (TS), the onset of stenosis following surgery (OS) and risk factors (RF) from each patient were recorded and analyzed using a pre-installed statistical software SPPS version 22.

Results

The overall prevalence of tracheostomal stenosis in our center was 13.8% (11 of 80 patients). The onset of stenosis with a median period of 3.27 months (2-6 months). All males aged between 33-62 years. One patient underwent postoperative radiotherapy, while none have experienced tracheoesophageal puncture. There were 5 stage-III patients, and 6 stage-IV patients. Seven patients underwent total laryngectomy and 4 patients underwent total laryngectomy plus selective neck dissection (Table 1).

The prevalence and risk factors of tracheostomal stenosis following total laryngectomy consisted of 7 hypertrophic scar patients (63.3%), 2 infection patients (18.2%), 1 radiotherapy and peristomal fat patient (9.1%) as seen in Figure 1. A sample case of tracheostomal stenosis is shown in Figure 2 of pre and post revision (Fig. 2)

Tabel 1. Data patients of Tracheostomal Stenosis Pasca Total Laryngectomy

No	Stadium	type operation	Onset/mnth	Risk Factor
1.	T3N0M0	TL	6	infection
2.	T3N0M0	TL	3	HS
3.	T4N0M0	TL+SND	2	HS
4.	T4N0M0	TL+SND	4	HS
5.	T3N0M0	TL	4	HS
6.	T3N1M0	TL+SND	3	HS
7.	T4N1M0	TL+SND	6	Rtx
8.	T4N0M0	TL	1	HS
9.	T4N1M0	TL	2	infection
10.	T3N0M0	TL	3	HS
11.	T3N0M0	TL	2	Peristomal fat

Note : TL : Total laryngectomy; SND : selective neck dissection; HS : hyperthropic scar
Rtx : radiotherapy

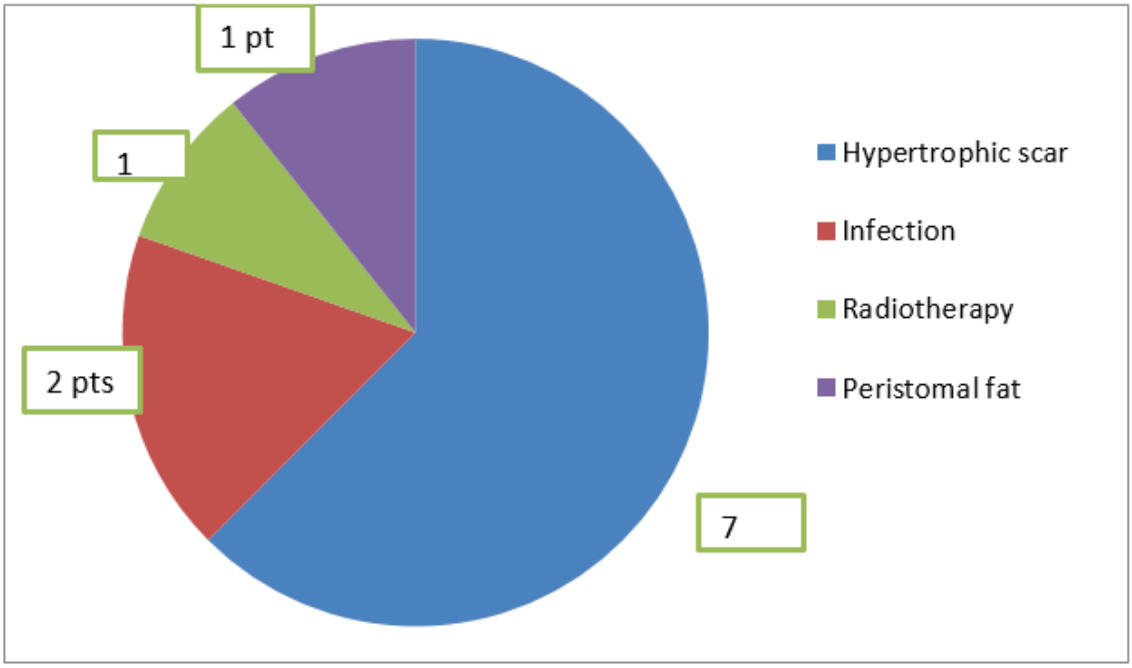

Figure 1. The prevalence and risk factors of tracheostomal stenosis following total laryngectomy

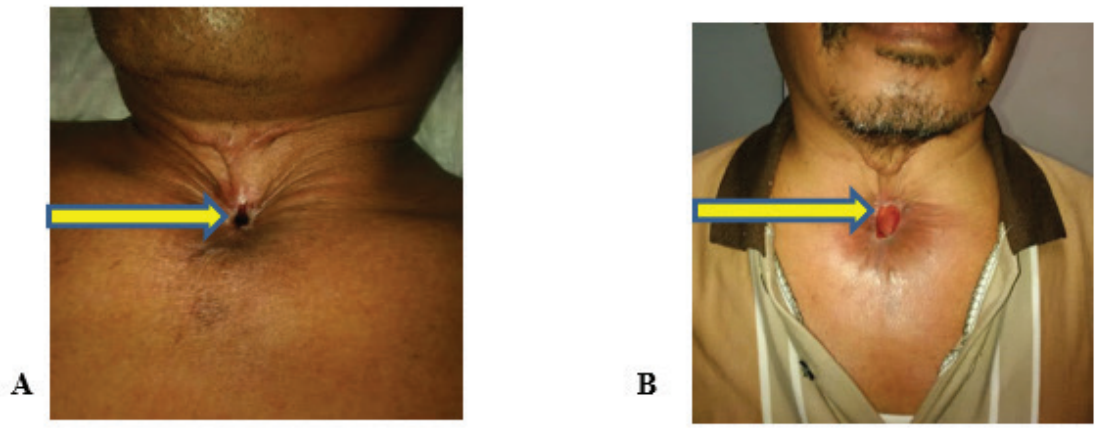

Figure 2. Case of trachoestomal stenosis A. Pre revision B. Post revision
= stenosis with hypertrophic scar

Discussion

The most important factor is prevention. The primary causes are the formations of scar tissue and other tissue around the stoma, resulting in a narrowing or constriction. Several factors may contribute to the stenosis, including the type of skin incision, surgical technique used to create the stoma, the diameter of trachea, excess skin and peristomal fat, incorrect mucosal – cutaneous suturing, hypertrophic scarring and keloid formation, radiotherapy, infection, and tracheoesophageal puncture. To minimize its occurrence, the correct construction of the tracheostoma when total laryngectomy is carried out. A simple circle of straight transection of the trachea had the highest incidence of stenosis (29.0%), which can be reduced with a bevel technique (15.0%). The lowest incidence was seen with a primary plastic or flap construction technique (8.0%). The incidence of tracheostomal stenosis in this study

used the bevel technique and amounted to 138%.

Tracheostomal stenosis is a devastating problem following a total laryngectomy. The prevalence of stenosis ranged from 4% to 42%, depending on the criteria used. In our study, the prevalence was 13.8% (11 of 80 patients) while Kou et al. (1994) reported the occurrence of 13% [12]. Hypertrophic scars have been indicated as the cause of stenosis. In these series, the most common etiological factor is a hypertrophic scar (63.3%), followed by infection (18.2%), as well as radiotherapy and peristomal fat (9.1%), as seen in Figure 1. All of the patients were Javanese. The race might contribute to hypertrophic scar. Tracheostomal infection may contribute to stenosis in several ways.

Crusting and bleeding at the stoma may cause damage to the mucosal lining of the trachea and subsequent fibrosis. Infection of the mucocutaneous junction of the cartilage of the trachea leads to the formation of granulation tissue, followed by healing by secondary intention, which results in increased scar tissue formation and decreased internal tracheal diameter. Radiotherapy has been associated with stenosis, although it has been suggested that this may be secondary to impairment of wound healing consequent upon obliterative vasculitis and ischemia being the irradiation lesion. It is more likely to happen due to concentric scaring.

Conclusion

Out of eighty patients, 11 patients indicate the characters of tracheostomal stenosis using the bevel technique. The most common etiological factor is hypertrophic scar, followed by infection, radiotherapy and peristomal fat.

Ethical Clearance: This research involves participants in the process using a questionnaire that wasaccordant with the ethical research principle based on the regulation of research ethicregulation. The present study was carried out in accordance with the research principles. This study implemented the basic principle ethics of respect, beneficence, non-maleficence, and justice.

Source of Funding: All of the cost and fees related with this research are paid by the authors only with no sponsorship nor external funds.

Conflict of Interest: There is no conflict of interest

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