Original Article

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Patients with Laryngeal Disorders Who Undergone Microlaryngeal Surgery at The Dr. Soetomo General Hospital Surabaya

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Abstract:

Objective: To describe laryngeal abnormalities undergoing microlaryngeal surgery (MLS).

Material and Methods: A retrospective analytical study by examining the central medical record and electronic medical record of patients with laryngeal disorders in the otorhinolaryngology head and neck surgery (ORL-HNS) Outpatient Unit and the Teratai ORL-HNS Surgery Inpatient Care Unit at Dr. Soetomo General Hospital, Surabaya, from January 1 until December 31, 2019, utilizing the chi-square test followed by the Wald test.

Results: The number of patient visits from January 1 until December 31, 2019, amounted to 80 patients, most of whom were male and belonged to the 19-60 age group. The histopathology results of patients with neoplasms indicated moderately differentiated squamous cell carcinoma, while the same procedure applied to patients without neoplasms mainly indicated vocal nodules. In this case, the most used technique was a biopsy. Patients with smoking risk factors amounted to 38, while those without smoking risk factors amounted to 42.

Conclusion: MLS is used as a means of diagnosis and therapy, including cases of benign and malignant neoplasms.

Keywords: chronic respiratory disease, laryngeal disorders, laryngeal malignancy, laryngeal neoplasm, micro laryngeal surgery

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Introduction

Micro laryngeal surgery (MLS) is a microscopic surgical procedure to treat various laryngeal disorders[1]. This procedure was introduced and disseminated in the late 1960s. The surgeon removes abnormal tissue in the larynx utilizing a surgical instrument inserted through the laryngoscope into the lesion site. This procedure allows the surgeon to perform a more accurate surgery, excising only the damaged tissue and leaving the surrounding area unharmed[2]. Some specific risks associated with laryngoscope pressure include pain or numbness in the tongue or lips and relatively rarely tooth injuries. In addition, subcutaneous emphysema and pneumomediastinum are also highly uncommon. These two complications are caused by impaired airway integrity of the pharyngeal or laryngeal mucosa due to laryngoscope insertion, resulting in gas leakage into the surrounding tissue and emphysema. Other potential complications associated with anaesthesia, include trauma and excessive manual ventilation[3].

The incidence of benign laryngeal lesions was found in 0.15% of new patients, or 15 cases per 10,000 new patients, with a high prevalence in the third, fourth, and fifth decades of life. Benign non-neoplastic lesions were more familiar with 96.0% of occurrence than benign neoplastic lesions with 4.0% of occurrence, and male patients with 72.0% of occurrence, which was more prevalent than female patients with 28.0% of occurrence[4]. The incidence, prevalence, and mortality rate of laryngeal carcinoma are estimated respectively at 2.76 cases/year per 100,000 population, 14.33 patients/year per 100,000 population, and 1.66 deaths/year per 100,000 population, with an average of 3.28 million annually. The epidemiological burden of carcinoma is approximately five times higher in men, increases in parallel with age, and culminates after reaching 65 years old[5].

In 2017, the US National Health Interview Survey conducted in regard to otorhinolaryngology, which included 26,742 respondents aged 18 years or older; current smoking prevalence was higher among smoking-related cancer survivors compared with non–smoking-related cancer survivors (19.7% vs 10.6%). After cancer diagnosis, the odds of continued cigarette smoking were twice as high among those with smoking-related cancers compared with those with non–smoking-related cancers[6].

Material and Methods

This research is a retrospective analytical study conducted in the ENT-HN Outpatient Unit and the Teratai ENT-HN Surgery Inpatient Care Unit at Dr. Soetomo Public Hospital, Surabaya. This research applied the central medical record and the electronic medical record (EMR) of Dr. Soetomo Public Hospital, Surabaya, from January 1 – to December 31, 2019. The recorded data included the fundamental ones, such as age and sex, whereas the clinical data contained smoking history, anatomical histopathology, and the procedures performed. The collected data were presented in tables based on age, gender, smoking history, anatomical histopathology, and types of procedures. In addition, the researchers performed a statistical test on smoking history and anatomical histopathology to discover the correlation between smoking risk factors and the incidence of neoplasms in patients by adopting the chi-square test. In addition, the Ethical Committee for Research and Development of Dr. Soetomo Public Hospital approved the Ethical Clearance in January 2021. Ethical clearance was obtained from the Health Research Ethical Committee of Medical Faculty Universitas Airlangga, Surabaya, Indonesia (approval number 0426/LOE/301.4.2/IV/2021). Written informed consent was obtained from all subjects included in this study, after a thorough explanation of the ongoing examinations in the study.

Results

Medical record data were collected from 80 patients with laryngeal disorders from January 1 to December 31, 2019, who had undergone MLS.

Table 1 presents the distribution of the 80 patients consisting of 57 male patients (71.3%) and 23 female patients (28.7%). Table 2 displays the age range of patients involved in this research from 0 to 75 years old, with an average of 33.55 years old. The age group with the highest number of patients ranged from older than 19 to 60 years old, amounting to 28 patients (35.0%), whereas the age ranging from 0 to 20 years old had the least number of patients, amounting to one patient (11.3%). The youngest patient in this research was five months old, while the oldest one was 75 years old.

Table 1 Sex distributions

Sex	Total (patients)	Percentage (%)
Male	57	71.25
Female	23	28.75
Total	80	100

Table 2 Age distribution

Age (year)	Total (patients)	Percentage (%)
1–20	9	11.25
21–40	20	25
41–60	23	28.75
>60	28	35
Total	80	100

Table 3 Types of anatomical histopathology

Results of anatomical histopathology	Total	(%)
Neoplasm	49	61.25
Squamous papilloma	14	17.5
Lymphoblastic lymphoma	1	1.25
Squamous cell carcinoma well differentiated	11	13.75
Squamous cell carcinoma moderately differentiated	19	23.75
Squamous cell carcinoma poorly differentiated	2	2.5
Non-keratinizing squamous cell carcinoma	2	2.5
Non-Neoplasm	31	38.75
Fibroepithelial polyp	2	2.5
Vocal nodule	10	12.5
Inflammatory polyp	2	2.5
Chronic inflammation	3	3.75
Granulation	3	2.5
Lymphoepithelial cyst	6	7.5
Adenomatous goitre hyperplastic nodule	1	1.25
Invisible specific or carcinoma process	2	2.5
Non-Anatomical Histopathology	2	8.75
Total	80	100%

Most MLS conducted at Dr. Soetomo Public Hospital was completed with further anatomical histopathology examination. Table 3 indicates the anatomical histopathology results obtained from the surgical tissues, including squamous papillomas, squamous cell carcinomas, non-keratinizing squamous cell carcinomas, fibroepithelial polyps, inflammatory polyps, vocal nodules, chronic inflammation, granulation, lymphoblastic lymphomas, lymphoepithelial cysts, and adenomatous goiter hyperplastic nodules, with the dominant distribution of moderately differentiated squamous cell carcinomas reaching 19 patients (23.7%), followed by squamous papillomas amounting to 14 patients (17.5%), and vocal nodules as much as ten patients (12.5%).

Table 4 presents the types of procedures performed in MLS based on the patient's lesions. The procedures performed in this study were biopsies of 57 patients (71.3%), excision of 15 patients (18.7%), extirpation of six patients (7.5%), and reconstruction of two patients (2.5%).

Table 4 Types of procedures

Types of procedures	Total	Percentage (%)
Biopsy	57	71.25
Excision	15	18.75
Extirpation	6	7.5
reconstruction	2	2.5
Total	80	100

Table 5 presents data on patients with non-neoplastic laryngeal disorders, benign neoplasms, and carcinomas with smoking and non-smoking risk factors. The number of patients with non-smoking history amounted to 52.5% (42 patients), whereas the non-neoplasm patients reached 57.1%. On the other hand, the number of patients with a smoking history amounted to 47.5% (38 patients), while the number of patients with a smoking history and carcinoma was 73.7%. In addition, the number of patients with a smoking history and non-neoplastic laryngeal disorders was seven (18.4%). In addition, the patients with non-smoking history and non-neoplastic laryngeal disorders reached 24 patients (57.1%).

Table 6 presents the data analysis of the correlation between smoking history and carcinoma incidence. Based on the Chi-square test results, the p-value was equal to 0.000, indicating a correlation between smoking and the incidence of neoplasms. Based on the correlation analysis, the p-value was equal to 0.000, indicating a significant correlation between smoking and the incidence of neoplasms. The magnitude of the correlation coefficient was

Table 6 Analysis of the correlation between smoking history and the incidence of carcinoma

Risk factors	OR	CI 95%	p-value
Smoking	10.548	-3.321, -1.391	0.000

Table 5 The correlation of smoking risk factors with laryngeal disorders

Risk factors	Non-Neoplasm	Neoplasm		Total	p-value
		Benign	Malignant		
Non-smoking patient	24 (57.14%)	12 (28.57%)	6 (14.28%)	42 (52.5%)	0.00
Smoking	7 (18.42%)	3 (7.89%)	28 (73.68%)	38 (47.5%)	
Total				80 (100%)	

0.547 (positive correlation), meaning that smoking patients had a high probability of developing carcinomas. The strength of the correlation was categorized in a moderately strong range. The results of the Wald test on the effect of smoking on neoplasms indicated that the p-value was equal to 0.000 (p-value was less than 0.05) with 95% of CI equal to -3.321; -1.391 (did not pass the value of 1), meaning that there was an influence of patients' smoking habit with the incidence of neoplasms. The magnitude of the OR was exp (2.356), equal to 10.548, meaning that the probability of patients with a smoking history developing carcinoma was 10.548 times compared to patients with a non-smoking history.

Discussion

The sex distribution in this study indicated that males suffered from more laryngeal lesions than females. It is in line with a survey by Satpathy et al., which revealed that there were more patients with benign vocal cord lesions in males than females. In contrast to their study, Bastian et al. explained that benign vocal cord lesions were common in women since women often used their voices excessively[7]. Laryngeal cysts may occur at any age and have the same incidence between males and females[8]. This study revealed the incidence of laryngeal carcinoma in 34 patients (33 males and one female). It follows the research of Yujiao et al. (2020), which described the characteristics of laryngeal carcinoma from 1990 to 2017 in a worldwide context. South Asia and East Asia have the largest cases of laryngeal carcinoma worldwide. Males have a six times greater risk of developing laryngeal carcinoma than females[9]. The observed results on sex and laryngeal lesions varied widely in several studies.

The data distribution based on age, in this research, indicated that the most common age group was patients aged 19-60 years, amounting to 43 patients, dominated by benign laryngeal lesions by 28 and malignant lesions by 15. According to Satpathy et al., most benign vocal cord lesions were identified in patients aged 21 to 30 years old[2]. It was mostly discovered in working-age group patients. The working-age group consisted of individuals who still actively worked. The results justified that the working-age patients who frequently used their voices had a greater risk of suffering from benign vocal cord lesions[10,11]. The second most common age group was people aged 60 years and over, amounting to 28 patients, dominated by malignant lesions of the larynx by 19 patients and benign lesions by nine patients. It explained that the malignant lesions of the larynx were commonly identified in the elderly. It occurred since epithelial changes from normal to malignant took time and required genetic mutations. According to research by Yujiao et al., the incidence of laryngeal carcinoma was concentrated in people aged 50-69 years, followed by those aged 70 years and over. The research also described that the incidence, disability, and mortality rates caused by laryngeal carcinoma differed between men and women. The highest incidence, disability, and mortality caused by laryngeal carcinoma occurred in men aged 60-75 years old and in women aged 65-80 years old[9].

MLS is indicated for the clinical diagnosis and treatment of laryngeal disorders, including various carcinomas and premalignant and benign lesions, such as vocal cord nodules, and laryngeal microtissues, laryngeal cysts, tracheal granulation tissue, Reinke's oedema, papillomatosis, granulomas, and hemangiomas. The most common type of cervical cancer is squamous cell carcinoma since the larynx is an organ lined with squamous epithelium, which may turn malignant due to the stimulation of carcinogenic materials[12]. In this research, the results of the anatomical histopathology examination with the highest distribution were moderately differentiated squamous cell carcinomas. The study by Nocini et al. explained different

effects that the most common type of laryngeal carcinoma was well-differentiated squamous cell carcinomas, by 43.5%, followed by moderately differentiated squamous cell carcinomas by 41.5%, and poorly differentiated squamous cell carcinomas by 15%[13]. The most common benign tumour discovered in Nocini's research was squamous papilloma. In addition, research by Gabriel and Fernando (2020) also indicated that laryngeal papilloma was the most common cause, especially in children, with an incidence rate of 4.3% out of 100,000 patients. Perdana reported 34 RRP patients undergoing MLS at Dr. Hospital. Soetomo, as the most common benign neoplasm[14]. It was also reported that there was 1 RRP patient who underwent surgery more than 88 times[15].

Benign laryngeal lesions are classified into neoplastic and non-neoplastic. Non-neoplastic is a tumour-like mass formed from infection, trauma, or degenerative process, divided into solid (vocal nodules, polyps, granulomas, Reinke's oedema, leukoplakia, and amyloid tumours) and cystic[16]. The research data explained that the most discovered cases were vocal nodules followed by lymphoepithelial polyps. Research conducted by Pawan et al. contained similar data to the results of laryngeal disorders in 41 out of 50 patients with benign lesions who had undergone a biopsy. The results indicated that vocal cord polyps were the most common, followed by vocal nodules.

Good visibility is essential for successful laryngeal surgery. The endotracheal tube can interfere with the visualization of the surgical field and hinder surgery. However, the visibility of the laryngeal structure is influenced by many factors, including the limitations of neck extension, mouth opening and individual skills[17,18]. This study found patients with laryngeal disorders. Following the results of anatomical pathology, there was a clinical suspicion of malignancy, i.e., 33 patients with carcinoma (41.3%), and benign clinical suspicion, i.e., 14 patients with benign neoplasms (17.5%). On the other hand, the clinical suspicion and anatomical pathology results that did not match included 17 patients (21.3%).

The most common type of procedure in this study was the MLS biopsy. MLS biopsy is required in diagnosing laryngeal tumours, particularly the suspicion of laryngeal carcinoma, to determine further treatment. Operative treatment should be undergone by patients with benign vocal cord lesions such as polyps and cysts since the lesions are exophytic and non-operative treatment will not provide a good outcome. Operative treatment can be the first choice if it is risky for patients to have airway obstruction. There is a suspicion of malignancy[19-21].

Doloi and Khanna conducted a study on the treatment undergone by patients with benign vocal cord lesions. This study showed that 40% of patients had undergone non-operative treatment, and 60% had undergone operative treatment. The study's non-operative treatment involved antibiotics, anti-inflammatory drugs, steam inhalation, and voice rest. Meanwhile, operative treatment involved excision with direct rigid laryngoscopy, endoscopic excision, and external excision. The percentage of patients who underwent non-operative treatment was quite high and achieved positive results. This result was different from the study conducted by Singhal, as cited by Doloi and Khanna, which found that only 6% of patients undergoing non-operative treatment achieved good results. It was likely because the patients in Doloi and Khanna's study were detected early[22]. Treatment options for patients with early glottic carcinoma (T1 or T2 tumours without nodal or distant metastases) are laser resection MLS, open partial laryngectomy, or radiotherapy. Compared to laser microsurgery, disadvantages of radiotherapy compared to laser microsurgery include that when local tumour recurrence occurs, it is often impossible to undergo

a partial laryngectomy, and the only option is total mainly laryngectomy. Furthermore, radiotherapy cannot be repeated in previously irradiated patients who are found to have a recurrent tumour or a second primary tumour in the head and neck[20,22,23].

The analytical test in this study demonstrated that the group with smoking habits suffered more, from laryngeal lesions, than the non-smokers. Menach et al. conducted a study that compared 50 patients with smoking habits with 50 patients without smoking habits. The result indicated that patients with smoking indicated laryngeal mucosal disorders, two times more severe than patients without smoking. In addition, vocal cords lesions in patients with smoking habits were twice as high as in patients without smoking[24].

This study investigated that patients with smoking habits had a 10.548 times higher risk to be diagnosed with carcinoma compared to patients without smoking habits. These results were following the research conducted by Menach et al. in 2012. Data in Italy suggested that 25% of laryngeal carcinoma cases in men were linked with risk factors for alcohol consumption. In comparison, approximately 75% of cases were associated with a greater risk of developing laryngeal carcinoma in smokers. Carcinoma in patients with risk factors for smoking more commonly occurred in those with a smoking history of more than 40 years or more than 20 cigarettes a day[24]. Smoking became one of the risk factors for the occurrence of laryngeal lesions, both malignant and benign. Smoking also causes laryngeal lesions in patients with benign vocal cord since smokers' histopathological structure of the vocal cords might change. Superficial epithelial keratinization and thinning of the basement membrane generally occurs in smokers. It resulted in an accumulation of vocal cord epithelium, often found in benign vocal cord lesions[25-27].

MLS conducted at Dr Soetomo General Hospital used the cold steel surgery method. In principle, this method was similar to the technique applied by Professor Kleinsasser in the 1960s with slight modifications, especially in imaging. Currently, surgical instruments have developed extensively. The use of a laser and microdebrider provided several advantages over the cold steel surgery method. The use of a laser has improved hemostatic properties, but its installation and maintenance tend to be more complicated.

On the other hand, the use of a microdebrider allowed the operator to perform surgery more quickly due to the simultaneous process of debridement and suctioning. The combination of a microdebrider and laser was commonly applied. First, a microdebrider was used to remove most lesions and followed by a laser to improve hemostasis[5]. Coblation is one of the latest alternatives in MLS with more advantages than laser with a microdebrider. The application of coblation could reduce scarring and stenosis[28].

The limitations in this research are the presence of incomplete medical record data, incomplete data on the duration of, quantity and quality of smoking, and incomplete.

Conclusion

Malignant neoplasms were the most common cases undergoing surgery based on histopathological results. For diagnostic purposes, biopsy is the most common procedure. In addition, the risk of laryngeal carcinoma in patients with smoking habits was more significant than in patients who were not smokers.

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Conflict of Interest

The authors report that there is no conflict of interest in this research.

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