

Clinicopathological Study of Non-Malignant Lesions of the Larynx**Hemant J Shah¹, Kaushal Prajapati², Shilpa N Parmar³, Dharmendra M Solanki⁴**¹Associate Professor, Department of Otorhinolaryngology, Banas Medical College and Research Institute, Palanpur, Gujarat, India^{2,3}Assistant Professor, Department of Otorhinolaryngology, Banas Medical College and Research Institute, Palanpur, Gujarat, India⁴Senior Resident, Department of Otorhinolaryngology, Banas Medical College and Research Institute, Palanpur, Gujarat, India

Received: 25-02-2024 / Revised: 23-03-2024 / Accepted: 26-04-2024

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Conflict of interest: Nil

Abstract:

Background and Aim: Benign vocal cord lesions often develop due to vocal trauma caused by the abuse and misuse of the voice, leading to ulceration and changes in the healing process. Various factors, including social and occupational vocal use characteristics, medical conditions, psychological structures, smoking, and reflux, can all disrupt the epithelial defense system on the vocal cord. Our study focused on analyzing the epidemiological details, incidence, clinical presentation patterns, and risk factors associated with non-malignant lesions of the larynx.

Material and Methods: The study site is a department of ENT Tertiary Care Teaching Institute in India, where the research will be conducted for a period of one year. The principal investigator completed all the necessary information in a structured study proforma. This form includes important demographic information, clinical features, ENT examination results, findings from flexible video laryngoscopy and stroboscopy, voice handicap index, diagnosis, and management details. Utilizing statistical methods and analyzing data Our study aimed to provide a comprehensive analysis of the data collected from the patients who participated in our research. We employed appropriate statistical methods and principles to ensure accurate and reliable results.

Results: Among the 100 patients studied, vocal cord polyp was found to be the most common non-malignant lesion, followed by vocal cord cyst as the second most common. The presence of hoarseness in patients with nonmalignant lesions was found to be statistically significant, with a p value of $0 \leq 0.05$. A significant finding was observed in patients experiencing difficulty in breathing and non-malignant lesions, with a p value of < 0.05 . When analyzing the stroboscopic results of different lesions, it was observed that all cases of vocal nodule displayed a glottic closure in the shape of an hourglass.

Conclusion: Vocal cord polyps were found to be the most common non-malignant lesion associated with hoarseness, followed by vocal cord cysts. Individuals who engage in voice abuse, smoking, alcohol consumption, dyspepsia, and exposure to fumes have a higher likelihood of developing nonmalignant lesions in the larynx, according to clinical observations.

Keywords: Hoarseness, Non-Malignant Lesion, Larynx, Vocal Cord Cyst.

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Introduction

Benign lesions of the larynx, a condition that is not frequently encountered, can be divided into rare neoplastic growths and more common nonneoplastic tumor-like conditions. These growths in the larynx are considered abnormal masses of tissue that grow in an uncoordinated manner and persist even after the stimuli that caused them to develop have stopped. [1] There has been a rise in the occurrence of benign lesions of the larynx, which can be attributed to the escalating environmental pollution resulting from rapid industrialization and development. There has been a rise in the incidence due to regular exposure to

loud noise in noisy environments. Non-malignant lesions of the larynx are a frequently encountered issue in the field of ENT. The vocal cords play a crucial role in producing our voices and enabling effective communication. [2]

These patients exhibit a wide range of symptoms, from dysphonia to severe respiratory distress that can be life-threatening. [3] The resulting vocal disorder can have a profound impact on individuals, affecting their professional, social, and emotional well-being. [4] When these diseases go undetected and untreated, the lesions can grow

larger and cause respiratory distress, making treatment more challenging. Many benign laryngeal lesions can be effectively treated using medical treatment or voice therapy. However, there are certain diseases that may necessitate endolaryngeal microsurgery. [5]

The most common non-cancerous growths in the vocal cords are polyps and nodules. Vocal abuse, whether it's due to work or everyday habits, plays a significant role in causing common non-malignant vocal cord injuries. According to multiple studies, it has been suggested that benign neoplastic lesions are not very common and occur at a ratio of 1:6 compared to non-neoplastic lesions. This study holds significant value for laryngologists, as it not only helps identify and understand the symptoms associated with these lesions, but also aids in differentiating them from potentially cancerous growths. Certain tumors, such as papilloma (4%) and granular cell tumor (2%), have the potential to become malignant. [6,7] It appears that non-malignant lesions are primarily caused by vibratory trauma. Several factors, such as cigarette smoking, infection, allergy, and gastric reflux, can contribute to the issue. Thanks to the advancements in video laryngoscopy and stroboscopy, early detection and treatment have become achievable. Small lesions can be removed using either a CO2 laser or micro laryngeal instruments. In some cases, when the lesions are larger and extend beyond the laryngeal framework, pharyngotomy or laryngofissure may be necessary.

Our study focused on analyzing the epidemiological details, incidence, clinical presentation patterns, and risk factors associated with non-malignant lesions of the larynx.

Material and Methods

The study site is a prestigious ENT Tertiary Care Teaching Institute in India, where the research will be conducted for a period of one year. Patients included in the study reported symptoms such as hoarseness or changes in voice, difficulty breathing or noisy breathing, feeling of a foreign body in the throat, pain while speaking, and voice fatigue. Patients who have been diagnosed with laryngeal malignancy, those with speech defects caused by central nervous system lesions, individuals with oral and pharyngeal pathology, or those with nasal and nasopharyngeal pathology are excluded from the study.

Approval was obtained from the institutional ethical committee and written consent was obtained from all participants.

Flexible video laryngoscopy was used to examine all patients. All larynx lesions displaying signs of malignancy were excluded. Exclusion criteria for the study included critically ill patients. Another

valuable investigation to consider is stroboscopy. The principal investigator meticulously documented the relevant clinical history, physical findings, and video laryngoscopic and stroboscopic findings using the study proforma. After gathering all the necessary information, the analysis was conducted to achieve the objective of the study. Non-cancerous growths were addressed through either endoscopic removal or managed with voice therapy. The patient did not undergo routine computed tomography. Biopsies are typically performed when there is a need to confirm a diagnosis. In some instances, when the presentation and appearance had a more traditional feel, cost-saving measures were implemented. The principal investigator meticulously completed all the necessary information in a well-organized study proforma. This form includes important demographic information, clinical features, ENT examination results, findings from flexible video laryngoscopy and stroboscopy, voice handicap index, diagnosis, and management details. In this study, we aimed to accurately describe the analysis process by utilizing appropriate statistical methods and principles. We utilized the data collected from the patients who participated in this study.

Statistical Analysis: The data was compiled and entered into a spreadsheet computer program (Microsoft Excel 2019) and then exported to the data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were reported using measures such as means and standard deviations or median and interquartile range, depending on their distribution. The qualitative variables were displayed as counts and percentages. Confidence level and level of significance were set at 95% and 5% respectively for all tests.

Results

Among the 100 patients studied, vocal cord polyp was found to be the most common non-malignant lesion, followed by vocal cord cyst. In our study, we examined a unique case of a subglottic cyst in a one-year-old male baby. Additionally, we included a case of Wegener's granulomatosis with laryngeal presentation. Out of the 100 patients examined, a staggering 92% experienced hoarseness.

In addition, a significant majority of the patients (94%) experienced vocal fatigue, while a smaller percentage (38%) reported reflux symptoms. The researchers also examined the connection between these symptoms and different non-malignant lesions of the larynx.

Hoarseness in patients with nonmalignant lesions was found to be statistically significant, with a p value of $0 \leq 0.05$. A significant finding was observed in patients experiencing difficulty in

breathing and non-malignant lesions, with a p value of < 0.05.

Patients with a history of vocal fatigue and various non-malignant lesions of the larynx had a statistically significant relationship, with a p value of <0.05. Patients diagnosed with a non-malignant lesion of the larynx displayed a notable correlation with experiencing a foreign body sensation in the throat, as indicated by a statistically significant p value of 0.002. Reflux symptoms and dry cough did not demonstrate any significant association with different lesions. The p-value was found to be greater than 0.05.

In our study population, a notable 10% of patients with vocal cord nodules, a significant 36% of patients with a polyp, and a considerable 20% of patients with vocal cord cyst were found to have a strong correlation with vocal abuse. Nevertheless, the statistical analysis did not find a significant correlation between vocal abuse and the presence of all lesions. The p-value was greater than 0.05.

In the study population, it was found that smoking was a risk factor for 10% of patients with

leukoplakia and 6% of patients with vocal process granuloma. Based on the data, it is evident that smoking is strongly associated with an increased risk of developing lesions, with a statistically significant p value of less than 0.05.

Just like smoking, there is a significant correlation between alcohol consumption and the development of lesions, with a p value of less than 0.05. No strong association was found between other risk factors such as dyspepsia and exposure to external irritants ($p>0.05$). According to the study, stroboscopy was found to be helpful in providing additional diagnostic information for 70% of the lesions. It also led to a change in the initial diagnosis for 14% of the lesions.

However, in 16% of the lesions, stroboscopy did not offer any additional diagnostic contribution. Specifically, stroboscopy provided additional information in 100% of vocal cord nodules, 77.8% of polyps, and 70% of cysts. The association between diagnostic values of stroboscopy and various lesions of the larynx was found to be statistically significant, with a p value of < 0.05.

Table 1: Distribution of non-malignant lesions of larynx

Lesions	Number	Percentage (%)
Vocal nodules	10	10
Vocal cord polyp	36	36
Vocal cord cysts	20	20
Reinke's edema	2	2
Leukoplakia	10	10
Vocal process granuloma	6	6
Laryngeal webbing	2	2
Papillomatosis	6	6
Laryngeal cyst	6	6
Others	2	2
Total	100	100

Table 2: Distribution and association of difficulty in breathing/noisy breathing with the lesions

Lesions	Hoarseness						P value
	Absent		Present		Total		
	N	(%)	N	(%)	N	(%)	
Vocal nodules	10	100	0	0	10	100	0.001*
Vocal cord polyp	36	100	0	0	36	100	
Vocal cord cysts	20	100	0	0	20	100	
Reinke's edema	0	0	2	100	2	100	
Leukoplakia	10	100	0	0	10	100	
Vocal process granuloma	6	100	0	0	6	100	
Laryngeal webbing	2	100	0	0	2	100	
Papillomatosis	4	66.6	2	33.3	6	100	
Laryngeal cyst	4	66.6	2	33.3	6	100	
Others	0	0	2	100	2	100	
Total	92	92	8	8	100	100	

* indicate statistically significance at $p\leq 0.05$

Discussion

Vocal trauma resulting from voice misuse is the primary cause of benign laryngeal lesions. In addition, smoking, allergies, and acid reflux can significantly contribute to the development of diseases by causing damage to the mucosal lining.

Benign laryngeal lesions can have a significant impact on a person's social and work life, leading to various functional, physical, psychological, and economic challenges that affect their overall quality of life. These voice disorders can cause a range of impairments that can be quite burdensome. [8-10]

Our study encompassed individuals of all age ranges. Interestingly, we found that the most prevalent age group for nonmalignant lesions was between 41-50 years, with a striking 80% of patients falling into this category. The study conducted by Hedge et al included a wide age range of patients, from as young as 7 years old to as old as 80 years. [11]

According to a study conducted by Sharma et al, the age groups in their third, fourth, and fifth decades of life were found to be the most commonly affected. [12] Interestingly, our own findings align with these results. According to our study, there were 58 male patients and 42 female patients, with a male to female ratio of 3 to 2. In a study conducted by Prakash et al in 2016, they discovered that the ratio of presentation of benign lesions of the larynx was 2.57:1. [13]. Additionally, Shaha et al found that there was a higher prevalence of nodules in females. [14]

In our study, vocal cord polyps were found to be the most common nonmalignant lesion of the larynx, with a total of 36 cases. Following closely behind were vocal cord cysts, with 20 cases. A study conducted by Mohan et al found that vocal cord polyps were present in 38% of the patients. [15] These polyps, along with nodules, are common benign laryngeal lesions. Marcatullio et al also noted that changes in the lamina propria occur earlier in vocal cord nodules compared to polyps, likely due to mechanical trauma. [16] Polyps typically develop during the later stages of wound healing. In professional voice users, it is quite common for women to have bilateral and small nodules. Excessive talking, shouting, and nervousness may not be ideal traits for individuals seeking to be considered as candidates for certain opportunities. [17-19]

The second most common symptom reported was vocal fatigue. We examined how different symptoms were linked to various lesions. Hoarseness, vocal fatigue, dyspnea, and foreign body sensation exhibited a statistically significant p value, indicating their importance. Out of the 100

patients examined, vocal abuse emerged as the predominant risk factor.

According to studies conducted by Buchne et al and Ghosh et al, a significant percentage of patients (62.5% and 72% respectively) reported a history of vocal abuse. [20,21] Similarly, Wani et al's [8] study also yielded comparable results, with 45% of participants reporting the same. Endolaryngeal microsurgery is commonly used for nodules and polyps that have been left untreated for an extended period and have not shown improvement with voice therapy. After the operation, it is important to prioritize vocal hygiene and incorporate voice therapy to address any misuse of the voice and prevent future occurrences. [22-24]

Other factors that can contribute to the issue include dyspepsia, alcohol consumption, smoking, and exposure to external irritants such as smoke, dust, and incense. The study examined the correlation between different risk factors and various lesions. It found that smoking and alcohol consumption were strongly associated with the development of these lesions, with a statistically significant p value. In their study, Prakash et al found that a significant number of cases (38%) were attributed to nonoccupational abuse of voice, supporting the notion that these lesions can be caused by factors unrelated to work. [13] Tobacco smoke and alcohol were found to worsen the development of many benign lesions, especially diffuse polypoid laryngitis. Reinke edema is characterized by the build up of mucinous and gelatinous material in a specific area called the Reinke space, which is located beneath the mucosa in the superficial lamina propria. A vocal cord cyst is characterized by the presence of an accumulation of serous or mucous fluid in the Reinke space, which is enclosed by a delicate wall. It is believed that vocal cord cysts can develop when the mucous gland ducts become blocked due to factors such as excessive strain on the voice, acid reflux, respiratory infections, or the healing process after vocal trauma. The flexibility of the vocal cords decreases, causing forced vibration. [25,26]

According to our study, the vocal cords were found to be the most frequently affected site, followed by the epiglottis, sub-glottis, and the vocal process of arytenoids. In a study conducted by Hedge et al, it was found that almost 93% of lesions originated from the true vocal cords. [10] The arytenoids and epiglottis were identified as the next most common sites for these lesions. In our study, we used the reflux finding score to assess the presence of laryngopharyngeal reflux in all the patients. A majority of the lesions exhibited a reflux finding score of less than 7. After examining the different lesions, a p value of >0.05 was found, indicating that the results were not statistically significant. A study conducted by Chung et al revealed interesting

findings regarding the prevalence of laryngopharyngeal reflux in different vocal conditions. They found that 66 percent of the vocal nodule group, 75 percent of the vocal polyp group, and 90 percent of the Reinke's edema group had laryngopharyngeal reflux. [26] Similarly, in our study, we observed that 60% of patients with vocal nodules and one patient with Reinke's edema also had laryngopharyngeal reflux.

Researchers Nagata et al and Sataloff et al found that cases of vocal nodule showed a slight decrease in the amplitude of the mucosal wave, but the wave remained generally symmetric. [27,28] They also observed decreased or absent mucosal waves on the side of the cyst. When it comes to vocal folds, small polyps usually maintain an intact mucosal wave, whereas larger polyps may exhibit a noticeable decrease in mucosal wave amplitude. In a recent study by Arffar et al, the researchers examined the normative values of VHI 10 and came to the conclusion that a VHI 10 score greater than 11 is considered abnormal. Surgery was found to be the primary mode of treatment in our study. Out of the total number of cases, a mere 14 had opted for conservative management, which involved voice therapy and anti-reflux therapy. Out of these, there were 8 cases of vocal cord nodules and 6 cases of vocal process granuloma. A significant majority of patients, around 86%, underwent micro laryngeal excision using various methods such as cold steel, laser, coblator, and microdebrider. The study findings may not be applicable to a larger population due to the small sample size.

Conclusion

Among the causes of hoarseness, vocal cord polyps were found to be the most common non-malignant lesion, followed by vocal cord cysts. Among the various socio-demographic risk factors, it is worth noting that males between the ages of 41 and 50 are particularly prone to developing chronic voice disorders. Additionally, the study findings revealed that individuals who engage in voice abuse, smoking, alcohol consumption, experience dyspepsia, and are exposed to fumes are more likely to develop nonmalignant lesions in the larynx. Proper vocal hygiene, cessation of smoking, and avoiding alcohol are crucial in reducing the incidence of non-malignant laryngeal lesions. It's not just about the surgery, but also making certain lifestyle modifications. This study highlights the importance of these changes in managing vocal fold lesions.

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