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A descriptive study of benign lesions of the larynx; therapeutic management and outcomes

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ABSTRACT

Introduction. Papilloma is more common among neoplastic lesions, and vocal cord polyps are more common among nonneoplastic lesions. The objective of this study is to investigate the epidemiological factors, clinical features, etiopathogenesis and management methods of benign lesions of the larynx. *Materials and Methods*. It is a prospective study on 40 benign lesions of the larynx, in a tertiary referral medical period of 18 months (from March 2018 to October 2019). Detailed history and ENT examination as well as relevant investigations were performed. *Results*. Vocal cords were involved in 92.5% of cases, and both supraglottis in 7.5% of cases. Vocal cord polyp lesions were more common than papilloma lesions. Preoperative conservative voice therapy was recommended, and 70% of cases showed improvement. Coblation assisted laryngeal surgery and excision was performed in 1 case, while 11 cases were treated by microlaryngeal surgery. Voice rest and voice therapy was given to all post operative cases. Follow-up ranged from 2 to 18 months, and improvements were seen in 8 cases that were treated by surgery. All cases that underwent conservative treatment improved symptomatically. *Conclusions*. The most likely causes of treatment failure are due to ongoing predisposing factors such as voice abuse, smoking and alcohol consumption, lack of commitment to voice therapy and non-compliance with recommendations by patients.

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Introduction

The larynx is a musculocartilaginous structure of the respiratory system (located between the pharynx and trachea) that functions as a sphincter at the junction of the digestive and respiratory tracts. The word larynx in Greek means *voice-box* because it contains the vocal cords capable of producing voice. The ability to produce voice is characteristic of humans among mammals, where larynx is significantly evolved [1-3].

The voice contributes to the person's identity, and dysphonia is the main symptom of laryngeal pathology. Laryngeal lesions must be carefully evaluated by ENT surgeons, as they have a significant influence on the social and emotional adjustment of patients [4,5].

Lesions of larynx can be congenital (epidermoid cysts, sulcus glottidis, atrophic furrows) and acquired. Acquired laryngeal lesions can be of inflammatory, traumatic or tumor origin. Tumor formations can be benign and malignant. It is important to differentiate benign lesions from malignant tumors, as both have a similar clinical presentation but different management. Benign lesions should not be neglected as they can become large enough to obstruct the airway and affect an individual's life [6-8].

The most common acquired benign lesions encountered are vocal polyps, vocal nodules, papillomas, etc. The cause of these lesions includes behavioral factors (vocal abuse, smoking, alcohol consumption), environmental factors (exposure to upper and lower respiratory infections), trauma, etc. [9,10]. Professional voice users represent a group susceptible to the development of benign laryngeal lesions. Due to significant recent advances, the diagnosis and management of benign lesions are much more efficient. The appropriate diagnostic process of benign laryngeal lesions starts with mirror examination. Although technical advances make it more convenient to start with an endoscopic examination (for both doctor and patient), stroboscopy (confirmatory for benign lesions) should also be considered, as this type of examination does not replace the general presentation of indirect laryngoscopy [11,12].

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The therapy is aimed at restoring the normal function of the larynx either through a conservative or surgical approach. The refinement of surgical techniques is continuous (coablation assisted surgery and laser surgery), and the results obtained document improvements in vocal health following treatment with such types of surgical interventions [13,14].

In our institution we have used microlaryngeal surgery and coablation assisted laryngeal surgery for the treatment of benign lesions, apart from conservative therapy. Microlaryngoscopic instruments with the binocular magnification enable the surgeon to see fine changes and preserve as much as possible the microstructure of the vocal folds.

Coablation technology provides ablation, resection and coagulation of soft tissue and hemostasis of blood vessels. Coablation can be used in larynx and trachea for the removal of sessile polyps, lesions or tumors with minimal blood loss. The aim of this study is to investigate the benign lesions of larynx, epidemiology, clinical features, etiopathogenesis and their management.

Materials and Methods

A prospective study was conducted on 40 patients with history of hoarseness of voice or vocal fatigue, as well as patients with vocal abuse, smoking or alcoholism. The study was conducted for a period of 18 months, from March 2017 to October 2019. An informed consent and complete clinical history of each patient were obtained. was done. Patients were evaluated by a thorough head and neck examination, indirect laryngoscopy, and video laryngoscopy.

Diagnosed patients are subjected to medical management (antireflux medication, voice therapy, reduction of voice abuse, steam inhalation). If no improvement was obtained within a period of 3 months, the patient underwent surgical treatment (MLS or coablation assisted surgery). Patients diagnosed with benign tumoral lesions are directly subjected to surgical management (as they may cause stridor or airway obstruction with increase in size).

After excision, the specimen was sent for histopathological examination. The follow-up of the patient was carried out in order to be able to evaluate the result of the therapeutic management used.

Inclusion Criteria

All clinically suspected cases of benign lesions of the vocal cords (cases were between the age group 1-70 years), smokers, alcoholics with voice abuse and people with professional voice abuse were included in the group.

Exclusion Criteria

Carcinoma lesions in situ, carcinomatous lesions and inflammatory and granulomatous lesions of the larynx.

Results

From March 2017 to October 2019, 40 patients with benign lesions of larynx were examined. All patients were completely examined according to the aims of this study.

Prevalence = no. of cases with benign lesions×100 ÷ total number of cases with hoarseness of voice = 40÷400×100 = 10%.

Table 1. Demographic distribution of benign lesions of larynx

Age	**No. of cases (n-40)**	**Percentage**
0-10 years	4	10
11-20 years	4	10
21-30 years	12	30
31-40 years	10	25
41-50 years	6	15
51-60 years	2	5
61-70 years	2	5
Gender		
Male	22	55
Female	18	45
Occupational		
Teachers	12	30
Students	4	10
Agricultural workers	10	25
Singers	4	10
House wives	10	25
Predisposing Factor		
Vocal abuse	20	50
Smoking	12	30
Vocal abuse and smoking	4	10
Others	4	10
Site		
Vocal cords (glottis)	37	92.5
Supraglottis	3	7.5
Presenting complaints		
Change in voice alone	14	35
Change in voice with vocal fatigue	12	30
Change in voice with noisy respiration	2	5
Change in voice with other complaints	12	30

All the patients between 7 to 67 years were examined, being observed that the majority of the cases were between

the age group of 20-40 years. The number of cases decreased as the age increased. In this study, 22 were males and 18 were females. Males predominate over females with a ratio of 1.2:1. In our study majority of the patients were teachers. Agricultural workers and housewives form the significant group. Voice abuse was found in 20 cases (50%) and smoking in 12 cases (30%). Both voice abuse and smoking were found in 4 cases. Other factors like alcohol consumption and tobacco chewing were present in 4 cases. Most of the benign lesions were present in glottis and hence most of the patients presented with hoarseness of voice (Table 1).

The most common symptom was change in voice, which was present in 14 patients (35%), followed by change in voice with vocal fatigue and other complaints, in 12 patients (30%). Change in voice with noisy respiration was found in 2 patients (5%).

Table 2. Types of benign lesions of larynx based on clinical diagnosis

Type of lesion		No. of cases	Percentage
1.	Neoplastic		
	Papilloma (Multiple+Solitary)	2 (1+1)	5
	Haemangioma	2	5
	Total (neoplastic)	4	10
2.	Non neoplastic		
	Vocal polyp	18	45
	Vocal nodule	12	30
	Vocal cyst	1	2.5
	Sulcus vocalis	1	2.5
	Reinke's edema	2	5
	Laryngocele	2	5
	Total (nonneoplastic)	36	90

Benign non neoplastic lesions accounting for 90% of all cases are more common than neoplastic lesions (10% of all cases). Among nonneoplastic lesions vocal polyps are more common accounting for 45% of all cases. Only 1 case (2.5%) of sulcus has been encountered and is the least common type of benign lesion in this study (Table 2).

Table 3. Age and sex distribution of vocal polyps

Age (years)	Male	Female	Total cases	Percentage
0-10	0	0	0	0
11-20	0	0	0	0
21-30	6	4	10	55.5
31-40	0	4	4	22.2
41-50	2	0	2	11.1
51-60	1	0	1	5.55
>60	1	0	1	5.55
Total	10	8	18	100

Table 3 shows age and sex distribution of vocal polyps. Most of the vocal polyps were seen in the age group of 21-30 years (55.5%) and they are mostly seen in males (10 out of 18 cases), showing their predominance while only 8 cases are seen in female.

Table 4. Variables for vocal polyps

Predisposing factors	No. of cases	Percentage
Voice abuse	8	44.4
Smoking	3	16.6
Voice abuse and Smoking	6	33.3
Others	1	5.5
Occupation		
Singers	2	11.1
Teachers	5	27.7
Students	2	11.1
Agriculture workers	6	33.3
House wives	3	16.6
Site		
Right	6	33.3
Left	10	55.5
Bilateral	2	11.1

Vocal abuse is the main predisposing factor for vocal polyps accounting for 44.4% of the cases, followed by vocal abuse and smoking which were seen in 33.3% of cases. Occupation distribution of vocal polyps and the vocal polyps were mostly seen in agriculturists in this study (in 33.3% cases), followed by teachers (accounting for 27% cases. Site of distribution of vocal polyps which shows that mostly polyps were unilateral. Left vocal cord is involved in most of the cases (55.5%) in this study. Bilateral vocal polyps were seen in only 2 cases out of 18 (Table 4).

Table 5. Age and sex distribution of vocal nodules

Age (years)	Male	Female	Total cases	Percentage
0-10	0	0	0	0
11-20	0	0	0	0
21-30	1	2	3	25
31-40	0	1	1	8.3
41-50	3	3	6	50
>50	0	2	2	16.6
Total	4	8	12	100

Table 5 shows age and sex distribution of vocal nodules. The maximum number of cases were seen between the age group of 41-50 years (50%), mostly among females. Out of 12 cases with vocal nodules, 8 were females (66.6%) and 4 were males (33.3%).

Out of 12 cases, 6 cases had history of vocal abuse being the most common predisposing factor. Vocal nodules in this study are more commonly seen among teachers where

vocal abuse is noted. 5 out of 12 cases are seen in teachers followed by singers (25%), agriculture workers (16.6%), students (8.33%) and house wives (8.33%). In this study, vocal nodules were mostly bilateral. Out of 12 cases, 9 were bilateral and 2 were unilateral (Table 6).

Table 6. Predisposing factors for vocal nodules

Predisposing factors	No. of cases	Percentage
Vocal abuse	6	50%
Smoking	4	33.3%
Others	2	16.6%
Occupation		
Agriculture workers	2	16.6
Students	1	8.33
Teachers	5	41.6
Singers	3	25
Housewives	1	8.33
Site		
Bilateral	9	75
Right	2	16.6
Left	1	8.3

Neoplastic benign lesions

Out of 40 cases, 4 were neoplastic of which 2 were papillomas and 2 were haemangiomas. Among papillomas one was solitary, one was multiple. Multiple papillomatosis was seen in an adolescent male which needed emergency tracheostomy. Solitary papilloma was seen in female. Hemangiomas were seen in adult males. Both were between the age group 20-30. One case presented with stridor for which emergency tracheostomy was performed.

Reinke's Edema

Two cases of Reinke's edema were seen, both noted in females, one belonging to the age group of 30-40 and the other in an adolescent.

Laryngocele

Two cases of laryngocele were recorded. Both were females, one was a child, 11-year-old and other was recorded in a 47-year-old female. Both presented with a swelling in neck on talking and coughing.

Sulcus vocalis

One case of sulcus vocalis was recorded in an adolescent female, who has presented with hoarseness of voice.

Systemic examination

Systemic examination was done in all cases, but one case of multiple papillomatosis and one case of haemangioma presented with inspiratory stridor for which tracheostomy was done.

Table 7. Results post-voice therapy and voice rest in non-neoplastic lesions of larynx

Type of non-neoplastic lesions	Total cases	Cases improved
Vocal polyps	18	13
Vocal nodules	12	9
Vocal cyst	1	1
Sulcus vocalis	1	0
Reinke's edema	2	2

The neoplastic lesions were directly subjected to surgical management, because of the risk of stridor and respiratory obstruction as a result of their increase in size. Of 18 cases of vocal polyps, 13 showed improvement with behavioral modification such as voice rest. Out of 12 cases of vocal nodules 9 shown improvement, and all the cases of Reinke's and vocal cyst improved with speech therapy. Sulcus vocalis did not improve with conservative management (Table 7). The nonneoplastic cases which were not improved with conservative management were subjected to surgical management, while the neoplastic cases were directly subjected to surgical management. Of the total of 40 cases, only 12 cases underwent surgical management (either by microlaryngeal surgery or coablation-assisted laryngeal surgery), suggesting thus that most benign laryngeal lesions can be managed conservatively (Table 8).

Table 8. Surgical management of benign lesions of larynx

Surgical procedure	No. of cases	Percentage
Microlaryngeal surgery	11	91.6%
Coablation assisted surgery	1	8.33%
Tracheostomy	2	16.6%

Out of 12 cases 11 cases were treated with micro laryngeal surgery, 1 with coablation assisted surgery, 2 needed tracheostomy due to the onset of stridor (Table 9).

Table 9. Cases treated with surgical treatment

Type of lesion	No. of cases	Surgical procedure
Papillomas	2	Microlaryngeal surgery (1 needed tracheostomy)
Haemangiomas	2	Microlaryngeal surgery (1 needed tracheostomy)
Vocal polyps	5	Microlaryngeal surgery (4) Coablation assisted surgery (1)
Vocal nodules	3	Microlaryngeal surgery

One multiple papillomatosis and one haemangioma needed tracheostomy and 1 vocal polyp was treated with coablation assisted surgery, while the rest of lesions were treated with microlaryngeal surgery. In this study, out of 12 cases that were surgically managed and the specimen sent for biopsy, 10 cases had a histopathological diagnosis similar to that of the clinical diagnosis (Table 10).

Table 10. Correlation of clinical diagnosis of larynx benign lesions with that of histopathological diagnosis

Type of lesion	Clinically diagnosed cases	Histopathological diagnosis
Neoplastic		
Papilloma multiple solitary	1 1	1 1
Haemangioma	2	1
Non neoplastic		
Vocal polyps	5 (with surgical intervention)	4
Vocal nodules	3	3

Below are images related to laryngeal microsurgery (Figures 1-4).

Figure 1. Normal vocal cords

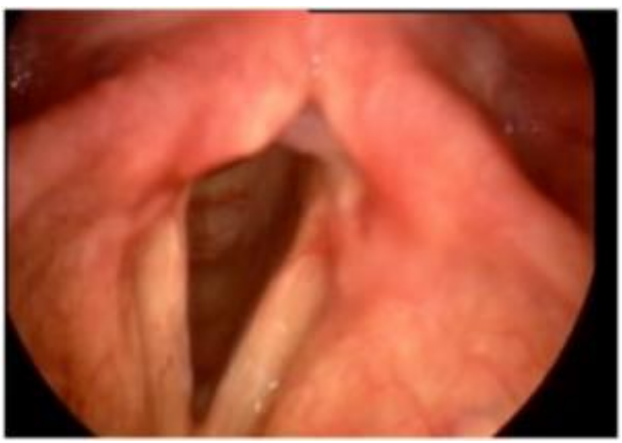

Figure 2. Right vocal cord polyp

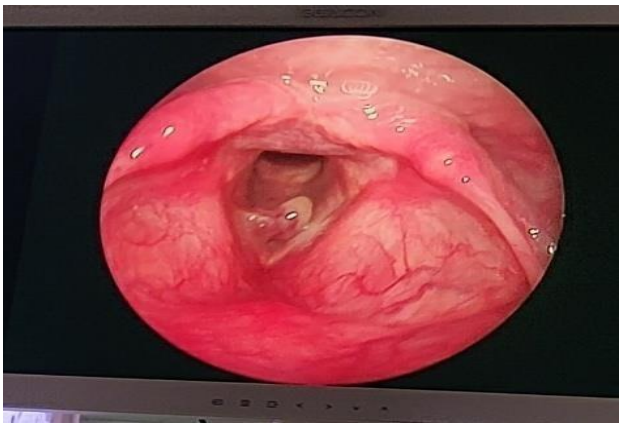

Figure 3. Micro laryngeal surgery and excision of the polyp

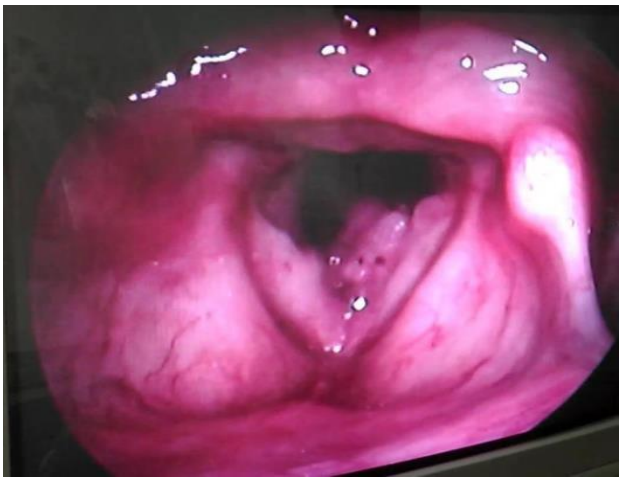

Figure 4. Micro laryngeal surgery and excision of the polyp

Discussion

Benign lesions of the larynx are gaining new importance as it becomes increasingly apparent that the cause of these lesions includes not only behavioural but also environmental factors. The etiology of benign laryngeal lesions is becoming more and more documented, and advances in diagnostic techniques and therapeutic interventions lead to improved outcomes for patients with dysphonia caused by such lesions. The mainstay in the diagnosis of benign vocal cord lesions remains a thorough medical and vocal history and head and neck examination, followed by perceptual voice assessment and detailed vocal folds imaging [15,16].

First-line management for vocal polyps, nodules and cysts is behavioural intervention with voice therapy, with the goal of maximizing the efficiency of the speaking and singing voice mechanisms to reduce the vibratory trauma underlying and exacerbating these masses. Additionally, patients should be treated for concomitant problems that contribute to dysphonia, such as laryngopharyngeal reflux and poor vocal hygiene. When medical and behavioural intervention does not achieve satisfactory improvements in voice, surgical treatment may be considered [17,18].

In the study by Hegde et al. in 2005, the maximum number of cases were seen in the age group between 31 and 40 (the mean age in years was 38.87). In males the mean age was 39.35, while in females the mean age was 36.13. The youngest patient was 7 years old, and the oldest was 80 years old. The observation of this study was that the benign lesions are more common in the younger age group because of the vocal abuse in their profession and their addictions like smoking and alcoholism. In this study, there were 31 (73.8%) male patients and 11 female patients (26.2%). Males were seen to predominate females with a ratio of 2.82:1 [19].

In the study conducted by Sulkowski and Kovvalska in 2005, 66% were primary school teachers [20]. Kamblic et al. reported in 1981 that 218 of a series of 591 patients developed vocal polyps due to the exposure to working conditions in the textile and wood industries. He considers that excessive misuse of voice, unfavourable working conditions, noisy surroundings, smoking and combination of these factors would be responsible for the pathogenesis of vocal polyps [21]. In this study, majority were teachers (12 out of 40 cases were seen in teachers), followed by agriculture workers and house wives (10 cases among each), followed by singers and students (4 cases among each). The observations were similar to that of Sulkowski's study [20].

Kamblic et al. reported that 55% of the patients with vocal polyps were smokers, while 30% of the patients had history of voice abuse [21]. In our study vocal abuse was found in 20 cases (50%) and smoking in 12 cases (12%). Both smoking and voice abuse was found in 4 cases. Other factors like alcohol consumption and recurrent respiratory tract infections were present in our study in 4 cases. Based on multifactorial nature of voice disorders, environmental factors and underlying medical conditions may be suspected to act synergistically in the pathogenesis of benign vocal fold lesions. Environmental factors include allergens, dust and other particulates like occupational irritants, etc. [22-24].

In the study conducted by Hegde et al., all patients presented with hoarseness of voice [19]. Other presenting complaints were cough (23.81%), foreign body sensation in throat (19.05%), throat pain (9.52%), difficulty in swallowing (4.76%) and difficulty in breathing (2.38%). The duration of symptoms ranged from 1 month to 2 years. In the present study, most common symptom presented by patients was change in voice alone, which was noted in 35% of cases. However, the change in voice was associated with other complaints like vocal fatigue (30%), noisy respiration (5%), as well as other complaints like difficulty in swallowing, swelling in neck, foreign body sensation in throat (30%). Change in voice is thus seen in 38 out of 40 cases. The duration of symptoms ranged from several weeks to about 4 years.

In the study conducted by el-Serafy, out of 122 patients 118 (96.72%) were non neoplastic lesions and only 4 (3.27%) were neoplastic lesions [25]. Non neoplastic lesions were laryngocele (2), intubation granuloma (1), cysts (2), polyps (19) and vocal nodules (94). Neoplastic lesions described included neurilemmoma (1), cavernous lymphangioma (1), lipofibroma (1), as well as multiple papillomatosis. In our study, benign non neoplastic lesions were also more common than true benign neoplastic lesions. Vocal cord polyps were most common accounting for 45% of the cases followed by vocal nodules (30%), Reinke's edema and laryngocele (5% each condition).

Jones et al. reported in 1984 in their study 227 cases of papilloma (84%) in a series of 270 cases. Other neoplastic lesions comprised 53 cases only (16%). These neoplastic lesions were oncocytic tumour (15), granular cell tumour (7), haemangioma (5), lymphangioma (3), paraganglioma (2), neurilemmoma (2), neurofibroma (2), lipoma (1), chondroma (1), pleomorphic adenoma (1), nodular fasciitis (1), fibrous histiocytoma (1), fibromatous tissues (1) and rhabdomyoma tumors (1). In this study papillomas and haemangiomas were common benign neoplastic lesions accounting for 5% each of all benign lesions of larynx [26].

In the study conducted by Hegde et al., most of the non-neoplastic cases were vocal polyps (40.47%), followed by vocal nodules (28.57%), tuberculosis of larynx (14.30%), laryngocele (4.47%), laryngeal web (4.76%), epiglottic cysts (4.76%) [19]. In our study also most common non neoplastic lesion was vocal polyp which accounted for 45% of all cases followed by vocal nodules (30%), Reinke's edema and laryngocele (5%), and followed by vocal cyst and sulcus (2.5%) each. The incidence of vocal polyps has been increased as a result of dynamic changes in our lifestyle and unfavourable ecological conditions such as smoking, increased industrialization and air pollution.

The study conducted by Kleinsasser showed that 76% patients with vocal polyps were males and 24% were females [27]. Most of them were between the age group of 30 and 50. In our series out of 18 cases of vocal polyps 10 were found in males (55.5%) and 8 in females (44.4%). Most of the patients were between 20 and 40 years old.

Study conducted by Kamblic et al. showed that 55% of the patients with vocal polyps were smokers, while 30% of the patients had history of vocal abuse [21]. In the present study 8 (44.4%) patients with vocal polyps had history of vocal abuse and 3 (16.6%) patients were smokers. A number of six patients (33.3%) had history of both vocal abuse and smoking.

The study conducted by Kamblic et al. also showed that most of the polyps were workers in textile and wood industries (36.88%) and commercial establishments (13.7%) [21]. Other occupations included especially students, farmers and clerks. In our study most of the patients with vocal polyps were agriculturists (33.3%), as

agriculture is the major occupation in this country. The rest of the occupations included teachers (27.7%), house wives (16.6%), singers and students (11.1%).

In the study conducted by Sinha et al. majority of patients (73%) belonged to the occupations well known for excessive vocal use, such as shopkeeper, teacher, housewife and telephone operator, while the other 27% belonged to occupations with apparently less vocal use [28]. But it was realized that vocal abuse is also determined by individual temperament, social circumstances and other factors. In comparison with the above study, most of the patients in the present study belonged to occupations involved with excessive voice use and voice abuse.

In the present study, out of 12 cases of nodules 9 were bilateral (75%), 2 were present in the right vocal cord (16.6%) and only 1 (8.3%) case had nodule on the left vocal cord. In addition, systemic examination was normal in most of the cases. One patient with multiple papillomas and one patient with haemangioma had inspiratory stridor. In the study of Hegde, all the clinically diagnosed cases were later confirmed by histopathology reports [19]. However, in the present study out of 40 cases, 12 cases were operated and the specimens were sent for histopathological examination. Out of 12 cases only 10 cases (83.3%) were confirmed by histopathological examination. Most of the vocal cord polyps and nodules presenting early in the initial stages were not subjected to biopsy and histopathological confirmation. Most of these lesions were managed conservatively.

Cohen and Garrett were able to improve, in a study of 57 patients with vocal polyps and cyst symptoms, with voice therapy alone 49.1% of cases [29]. Patients with translucent polyps more commonly responded to voice therapy than fibrotic, hyaline, or haemorrhagic polyps, (81.8% versus 15.4%). In the present study all patients with vocal cord polyps and nodules were subjected to voice therapy and voice rest before considering for surgical management. Improvement was seen in 9 cases of vocal nodule and 13 cases of vocal cord polyp, 1 vocal cyst and 2 Reinke's edema, with just voice therapy and voice rest without any surgery. All these patients presented early, in the initial stages of the lesions.

In the study conducted by Hegde et al., all the patients underwent micro laryngeal surgery except those patients with laryngocele and epiglottic cysts [19]. Patients with laryngocele underwent an external approach and excision of the sac. Patients with epiglottic cysts underwent direct laryngoscopy and excision of the cyst. In the present study, excision of the lesion by microlaryngeal surgery was done in 11 cases, coablation assisted laryngeal surgery with excision of the lesion was done in 1 case. Emergency tracheostomy was done in one patient with multiple papillomas, and one with haemangioma who presented with acute onset of stridor.

In the study by Hegde et al., all cases of benign laryngeal lesions were apparently free of symptoms and without recurrence. In fact, 2 cases were partially free of symptoms because of non-compliance of patients [19]. In the present study out of 12 cases which were operated, improvement was observed in 9 cases (75%) while in 3 cases (25%) no improvement was observed.

Conclusions

In the present study it is found that benign non-neoplastic lesions of larynx are more common than true neoplastic lesions. Papilloma is more frequent among neoplastic lesions and vocal cord polyps are more common among nonneoplastic lesions. The symptoms caused by these benign lesions reflect the size and location of the lesion. Generally, change in voice, weaknesses of voice and airway obstruction in varying degrees were the most common complaints.

The diagnosis of a benign laryngeal lesion, although often is suggested by a careful history and physical examination, must be confirmed by biopsy. In general, the treatment of choice is surgical excision, although vocal nodules and polyps in the initial stages are managed conservatively. Avoiding voice abuse and proper speech training, especially in professional voice users like teachers and singers, will play a major role in the prevention of these lesions.

Certain benign neoplastic lesions, such as papillomas, have a tendency to recur following incomplete excision. With the almost universal use of the operating microscope and other improved surgical and diagnostic techniques, combined with an increased awareness and understanding of benign laryngeal lesions, it is expected that the diagnosis and treatment of this group of diseases will continue to improve.

Conflict of interest disclosure

There are no known conflicts of interest in the publication of this article. The manuscript was read and approved by all authors.

Compliance with ethical standards

Any aspect of the work covered in this manuscript has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

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