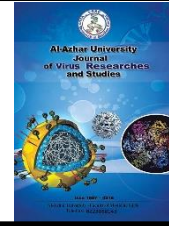




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Sentinel Nodule in Unilateral Vocal Fold Lesion

Eman Ali Mohammed Ghoneem¹, Sayed Mohamed Said Kadah¹ Bothina Ahmed Mohamed Bendary¹ and Nabila Ebrahim Abd-Allah Elneklawy¹

¹**Department of Otorhinolaryngology, Faculty of Medicine for Girls, Al-Azhar University, Cairo, Egypt.**

***E-mail: emanali1993.6.20@gmail.com**

Abstract

Benign vocal lesions are non-malignant growths of abnormal tissue on the vocal cords. Several factors can be responsible for the development of benign vocal lesions such as vocal abuse, overuse or misuse of voice, chronic infections of upper airway, allergy, smoking and gastroesophageal reflux. To estimate the prevalence of sentinel nodule and its correlation to site and size of vocal fold polyp and cyst. This study was conducted to analyze the presence of reactive lesions in unilateral vocal fold lesion especially vocal fold polyp and cyst, its histological type and to detect the effect of size, site and type of vocal fold polyp or cyst on the contralateral (sentile nodule). This study was conducted on 30 randomly selected patients divided into 2 groups: Group (1) including 20 patients with unilateral vocal fold polyp. Group (2) including 10 patients with unilateral vocal fold cyst. The results revealed that contralateral nodule more with vocal fold polyp than vocal fold cyst. According to polyp size, contralateral nodule presents more in large vocal fold polyp than small. According to polyp type, contralateral nodule presents more in fibroid vocal fold polyp than myxoid and angiomatoid polyp. In this study it found that sentinel nodule is presented with unilateral vocal fold polyp and cyst as reactive lesion on contralateral side of lesion. Size and histopathological type of vocal fold polyp affect the presence of sentinel nodule as it is present more with large polyp and fibroid polyp.

Keywords: Vocal fold nodules, Human papillomavirus.

1. Introduction

The larynx is an intrinsic organ of the body which has to perform very composite functions like protection, respiration, and phonation. To carry out the function larynx should be adaptable and flexible. Any structural disorder like a vocal cord polyp and cyst alters the specialized function, squanders the laryngeal pacing, and increases voice discomfort of the patient like hoarseness, dysphonia and

odynophagia day by day (**Delwar et al., 2020**) [1].

Sentinel nodule is a reactive nodule caused by fibrosis of the superficial layer of lamina propria of the vocal fold which is present opposite to benign vocal fold lesion (**Doruk et al., 2020**) [2].

Benign vocal fold lesions are a group of acquired structural abnormalities of the glottis, typically resulting from trauma or

irritation. Most are manifestations of tissue injury from phonatory vibration, termed phonotrauma. Others are consequences of irritants such as cigarette smoke or laryngopharyngeal reflux (**Gurunathan et al., 2021**) [3].

Benign vocal fold lesions (BVFLs) including vocal fold nodules, polyps, and cysts, are a common cause of voice disorders (**Naunheim et al., 2017**) [4].

Vocal polyps and cysts are generally unilateral, whereas reactive lesions are often found on the contralateral vocal fold directly opposite the primary lesion. A reactive vocal fold lesion must be paired with a contralateral vocal fold lesion. It may have a cup-and-saucer appearance, with the contralateral lesion indenting the reactive vocal fold lesion at the point of maximum contact (**Rosen et al., 2012**) [5]. Shape of vocal cord polyp can be classified as sessile or peduncular, and their histological characteristics as gelatinous or translucent, fibrous or organized, and angiomatous or hemorrhagic (**Kadah et al., 2021**) [6].

The origin of the vocal polyp or cyst is phonotraumatic. Other irritating processes, however, may contribute to the emergence of polyps, such as gastroesophageal reflux, smoking, aspiration of aggressive chemical substances, or intense respiratory activities (**Bohlender, 2013**) [7].

Signs and symptoms in individuals with vocal fold polyps are hoarseness or breathiness and vocal fatigue. However, rare cases of airway obstruction caused by large or giant polyps have also been reported (**Yiing and Abdullah, 2011**) [8]. Speech trauma is very common in our country; however, individuals respond differently to such trauma. There are those who develop polyps, others develop nodules and others do not develop injuries on the vocal folds after a speech trauma. Among other possible factors, we believe that there may be some prior anatomical change in the vocal folds, the so called minimum structural lesions, which may predispose certain individuals to have these

speech-trauma related lesions (**Eckley et al., 2008**) [9].

This study aims to estimate the prevalence of sentinel nodule and its correlation to site and size of vocal fold polyp and cyst.

2. Patients and Methods

This observational cross-sectional study was approved by the Research Ethics Committee of the Faculty of Medicine for Girls, Al-Azhar University and written informed consent was obtained from the patients. It was carried out in Al-Zahraa Hospital, Al-Azhar University for Girls during the period from January 2021 to January 2022.

2.1 Patient's Criteria

This study included 30 randomly selected patients with unilateral vocal fold lesions.

2.2 Inclusion Criteria

Unilateral single vocal fold lesion. Fit for surgery under general anesthesia. Patients Aged above 21 years, complete pubertal voice change, both genders.

2.2 Exclusion criteria

Patients aged below 21 years, Patients who refuse evaluation, Patients with a history of dysphonia in childhood, Presence of Reinke's edema, Leukoplakia, malignancy, Prior laryngeal surgeries or intubation and Bilateral vocal fold lesion.

2.3 Methodology and Classification

Patients were classified into: Patients with vocal fold polyps (20 patients). Patients with vocal fold cysts (10 patients).

2.4 Patients with Vocal Fold Polyp

According to the *Site* into anterior and middle; anterior (in the anterior third of the vocal fold), middle (in the middle third of the vocal fold). *Size*: into large and small; by measuring the length and width of the polyp in mm and classify it into small (≤ 3 mm) and large (> 3 mm) in the maximum

length. *Type*: into fibrous, edematous and vascular after histopathology of the polyp.

2.5 Patients with vocal fold cyst

According to the *Site*: into anterior and middle; anterior (in the anterior third of the vocal fold), middle (in the middle third of the vocal fold). *Type*: into Mucous retention cyst and Epidermoid cyst. This classification was done to compare between vocal fold polyp and cyst on structural alteration on the contralateral vocal fold. All the patients were evaluated: 2 weeks preoperative evaluated by video laryngoscopy, Histopathological examination specimen and the contralateral side that is obtained from the side of the lesion and contralateral side and 2 weeks postoperative evaluated by video laryngoscopy.

2.6 Histopathological Evaluation

Then the specimen that was obtained from the lesion and contralateral reactive lesion

was sent to the lab for histopathology to: Detect polyp type (edematous, vascular or fibrous polyp). Detect cyst type (retention, epidermoid). Determine the histopathology of the contralateral lesion.

2.7 Statistical Analysis

Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 23. The quantitative data were presented as mean, standard deviations and ranges when parametric and median, and inter-quartile range (IQR) when data was found non-parametric. Also, qualitative variables were presented as numbers and percentages. The comparison between groups with qualitative data was done by using the *Chi-square test*. The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following: $P > 0.05$: non-significant. $P < 0.05$: Significant. $P < 0.01$: Highly significant.



Figure (1): Right vocal fold polyp with reactionary nodule, AL-Zahraa hospital.” The blue arrow refers to the right vocal fold polyp while the black arrow refers to the left contralateral nodule”

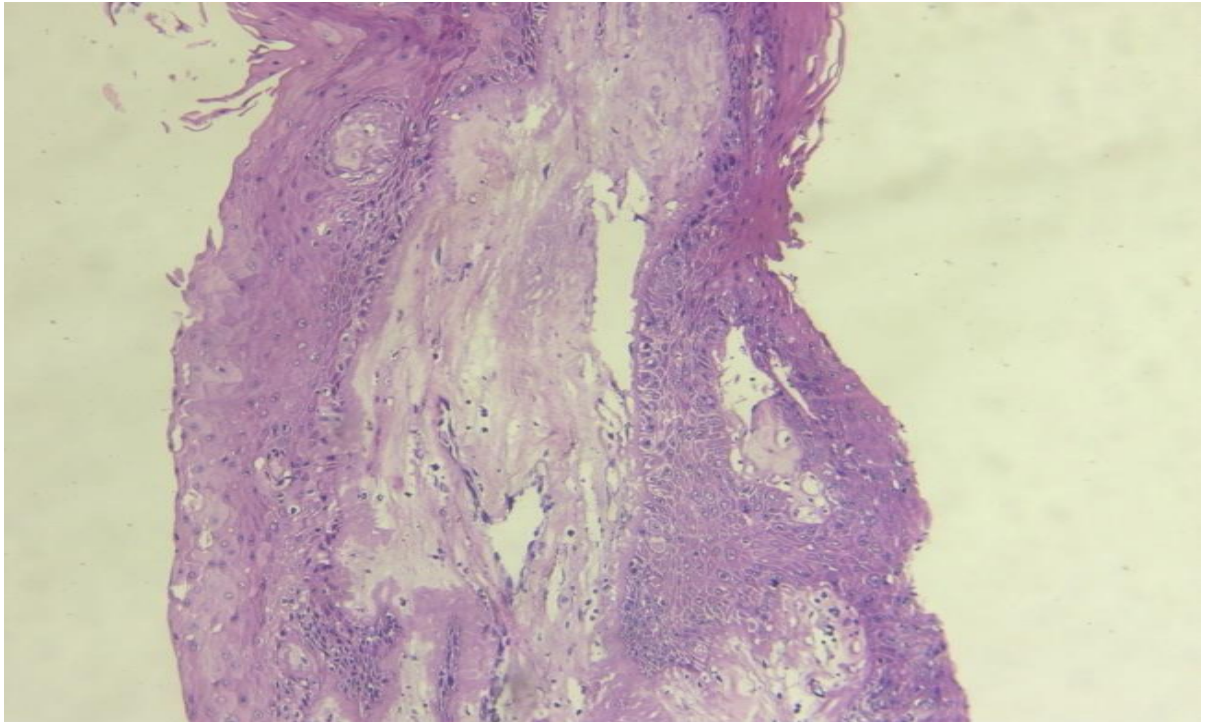


Figure (2): Myxoid polyp with Hx&E×100, Black arrow (non-keratinizing squamous epithelium with), Red arrow (fibro myxoid core).

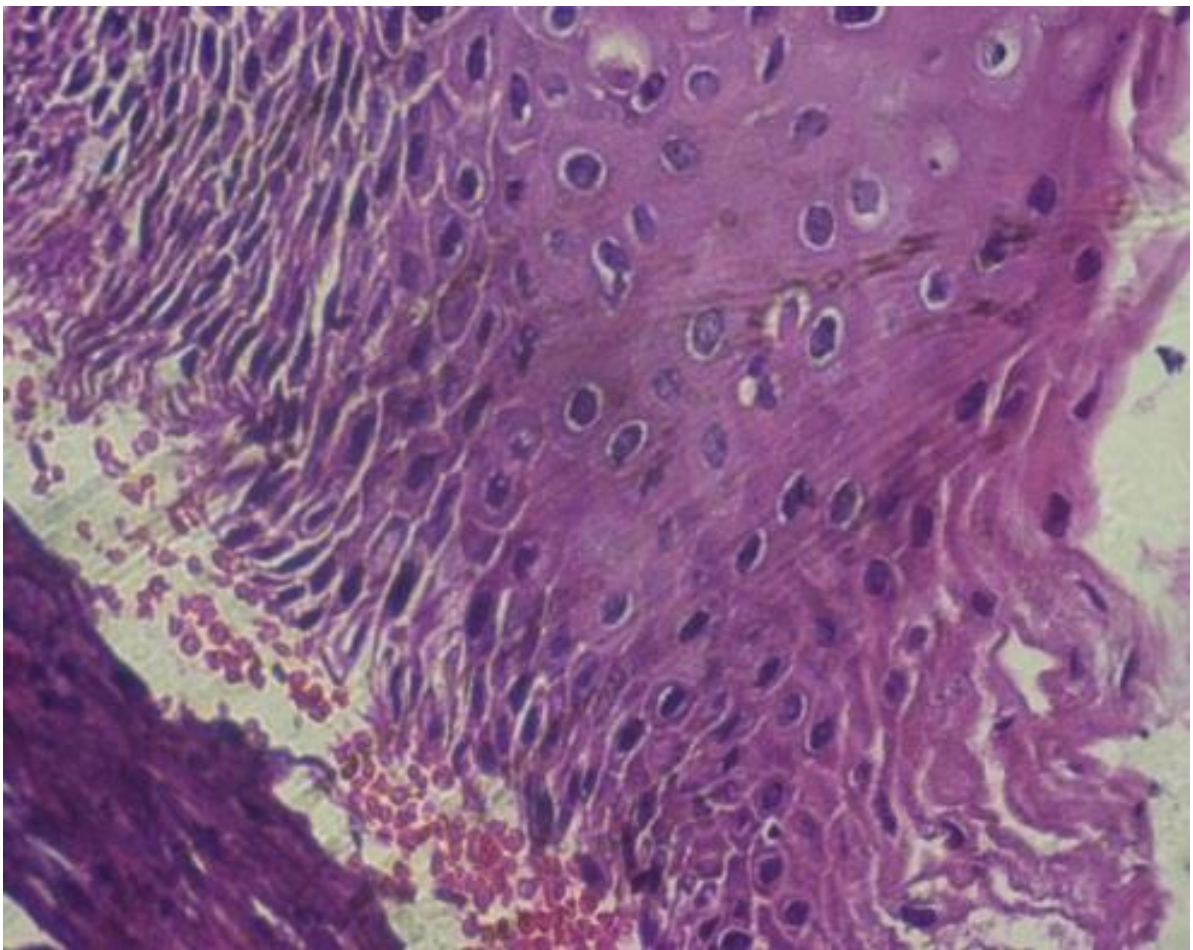


Figure (3): Angiomatoid polyp Hx&E ×100, red arrow (non-keratinized squamous epithelium), black arrow (vascular connective tissue core).

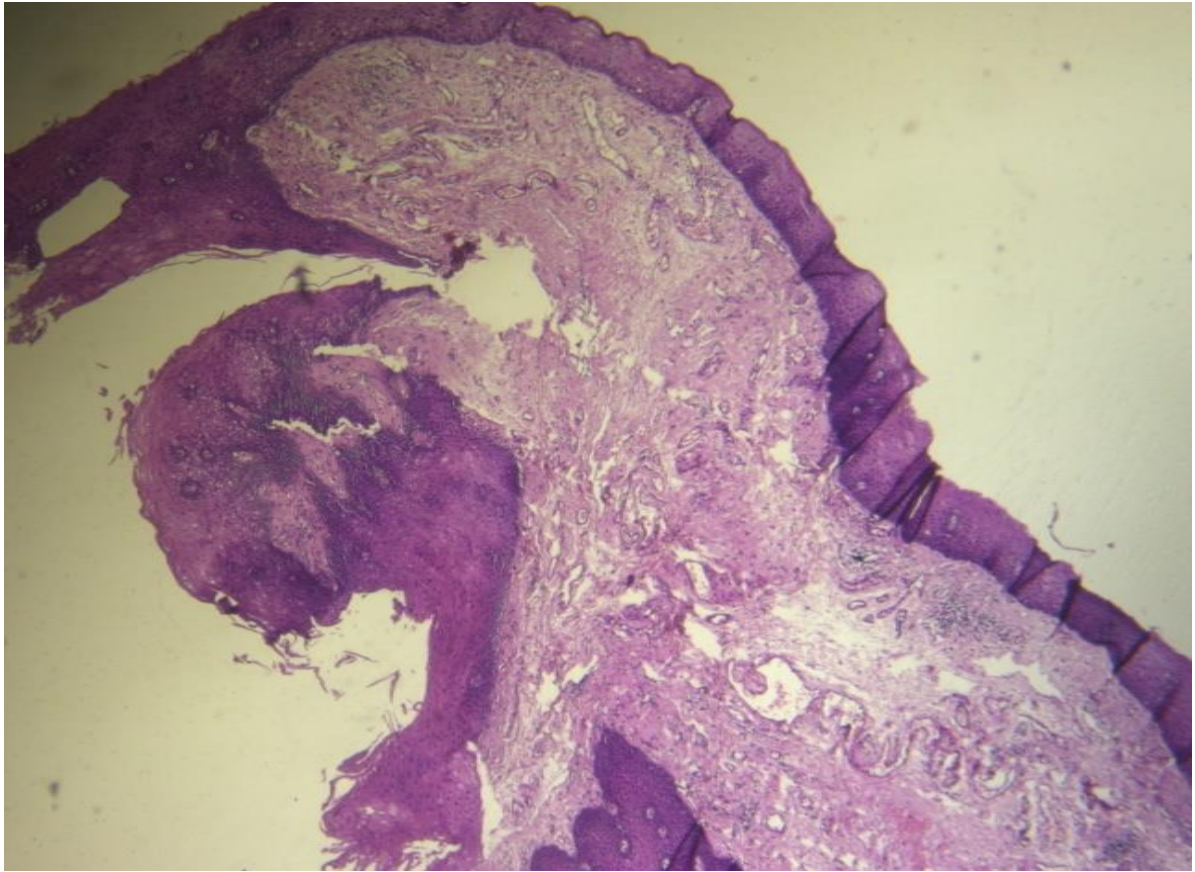


Figure (4): Fibroid polyp Hx&E×100, black arrow (by non-keratinized Squamous epithelium, red arrow (fibrous core).

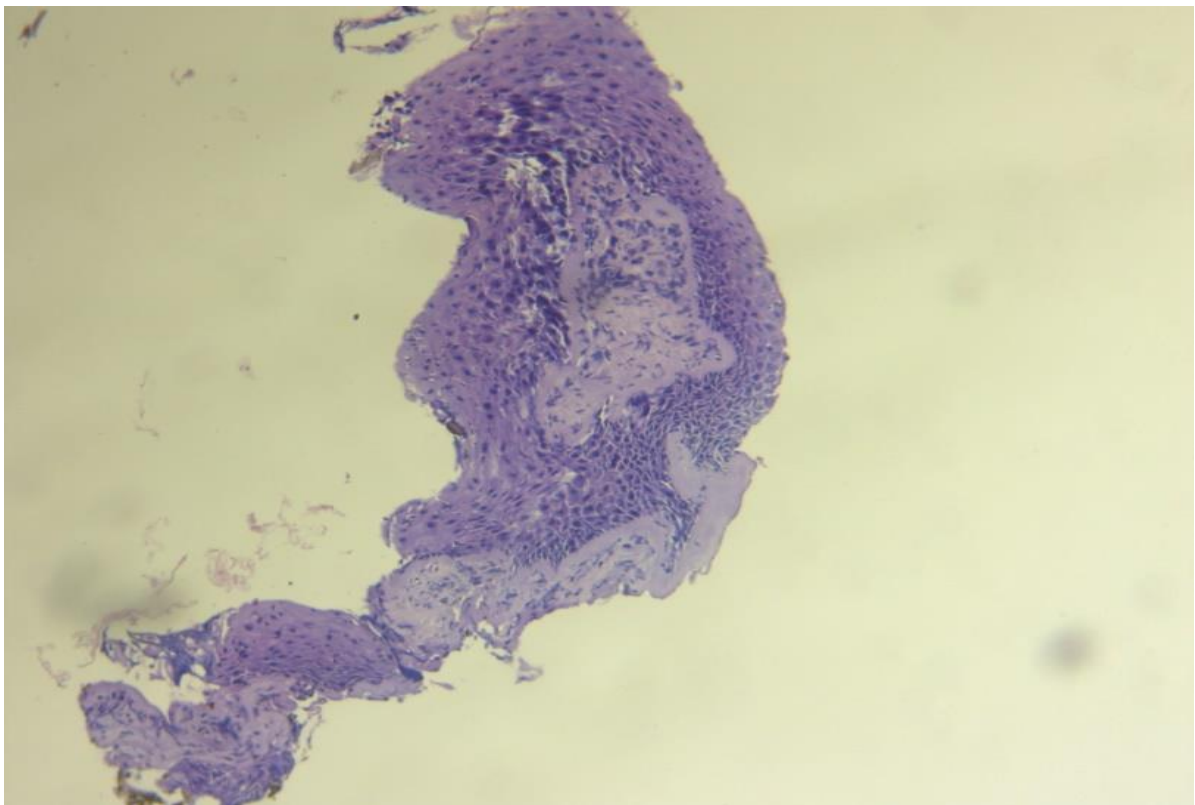


Figure (5): Fibroid polyp Hx&E×100, black arrow (by non-keratinized Squamous epithelium, red arrow (fibrous core).

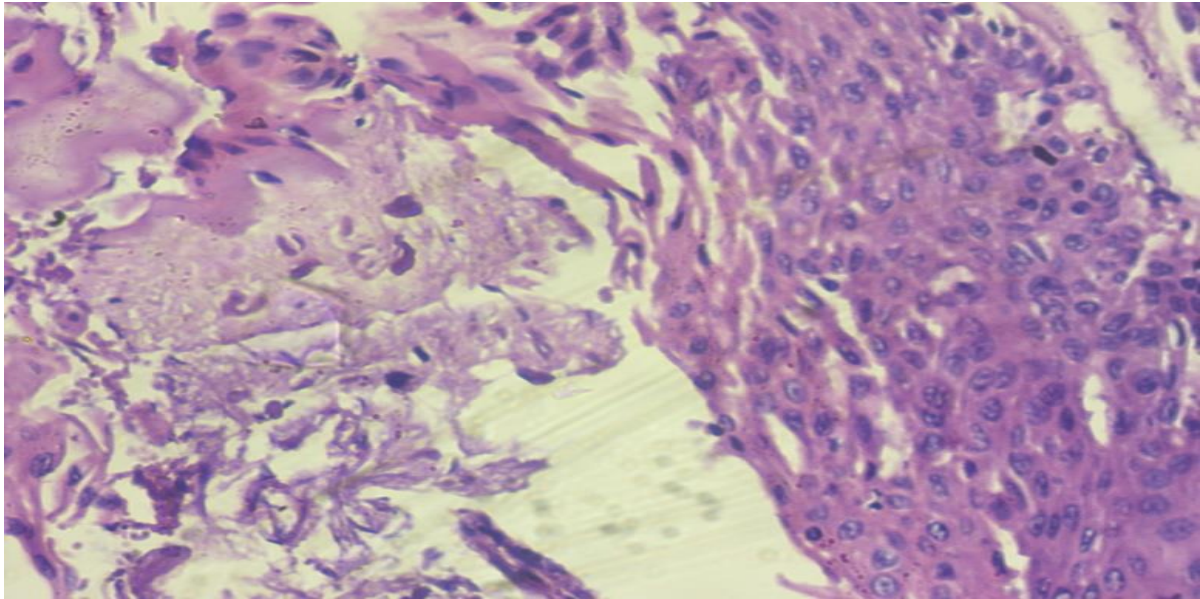


Figure (6): Epidermoid cyst Hx&E×100, a black arrow (squamous epithelium), a red arrow (keratinous material)

3. Results

Table .1 shows no statistically significant difference between groups according to side and type of lesion regarding (, sulcus vocalis, capillary ectasis, Cyst and Microweb) with p-value > 0.05 NS. There was a statistically significant difference between groups according to the type of reactive lesion (nodule) higher in the polyp group, with a p-value< 0.01 HS. This table

shows no statistically significant difference between presence of nodule and site of polyp with p-value >0.05 NS. There was positive correlation between presence of nodule and size of polyp, higher in large polyp with p-value< 0.05 S. There was positive correlation between presence of nodule and type of polyp, higher in fibroid polyp with p-value < **0.05 S**.

Table (1): Comparison between polyp and cyst group according to side and type of reactive lesion (histopathological lesion).

		Polyp group		Cyst group		Test value*	P-value	Sig.
		No.	%	No.	%			
Reactive lesion	No	7	35.0%	5	50.0%	0.625	0.429	NS
	Yes	13	65.0%	5	50.0%			
Side of the reactive lesion	Absent	7	35.0%	5	50.0%	4.760	0.190	NS
	Contra lateral	11	55.0%	2	20.0%			
	Ipsilateral	2	10.0%	2	20.0%			
	Glottic (microweb)	0	0.0%	1	10.0%			
Type of reactive lesion	No	7	35.0%	5	50.0%	0.625	0.429	NS
	Nodule	7	35.0%	0	0.0%	4.565	0.033	S
	Sulcus vocalis	3	15.0%	2	20.0%	0.120	0.729	NS
	Capillary ectasis	2	10.0%	1	10.0%	0.000	1.000	NS
	Cyst	1	5.0%	1	10.0%	0.268	0.605	NS
	Microweb	0	0.0%	1	10.0%	2.069	0.150	NS

P-value >0.05: Non-significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS), *: Chi-square test.

Table (2): Correlation of presence of nodule to site, size & type of polyp.

		Nodule				Test value*	P-value	Sig.
		No		Yes				
		No.	%	No.	%			
Side of lesion	Right	7	53.8%	4	57.1%	0.020	0.888	NS
	Left	6	46.2%	3	42.9%			
Site of lesion	Anterior	4	30.8%	1	14.3%	0.659	0.417	NS
	Middle	9	69.2%	6	85.7%			
Size of polyp	Small	8	61.5%	1	14.3%	4.105	0.043	S
	Large	5	38.5%	6	85.7%			
Type of lesion	Fibroid polyp	1	7.7%	4	57.1%	5.934	0.015	S
	Myxoid polyp	8	61.5%	2	28.6%	1.978	0.160	NS
	Angiomatoid pedunculated polyp	4	30.8%	1	14.3%	0.659	0.417	NS

P-value >0.05: Non-significant (NS); P-value <0.05: Significant (S); P-value < 0.01: highly significant (HS), *: Chi-square test.

4. Discussion

16 males and 14 females with 53%: 47% ratio was detected, which indicates male predominance. This may be due to mechanical strain generated during the characteristic production of low-pitched sounds in men occurs in deeper parts of the lamina propria. In this study, we illustrated that there was a statistically significant difference between groups according to type of reactive lesion (nodule) higher in polyp group, with a p-value < 0.01 HS.

Regarding postoperative results, reactive (sentile) nodule is found to be present in polyp than cyst. This may be due to vocal cysts which are located in the lamina propria with a normal epithelium, produce less shearing force on the contralateral vocal fold than vocal polyps. Thus, vocal polyps, rather than cysts, might be a risk factor for reactive nodule. The vocal fold polyp has a detrimental contralateral effect on vocal fold with subsequent most significant reactive nodule. Sünter et al. (2019) [10] disagree as rate of coexistence of 47% for reactive lesion in vocal fold cysts. This rate was similar to the rate for polyps. Cho et al. (2018) [11] disagree as there was a Clinical Significance of Reactive Lesion in Vocal Fold Polyp and

Cyst, in which vocal polyps were independent risk factors for reactive lesions ($P < 0.05$). Eckley et al. (2010) [12] agree as found that a positive correlation was found between the presence of polyps and associated structural abnormalities ($r = 0.0035$; $P < 0.05$) in which 18 patients (22.2%) presented reactive nodules on the opposite Vocal polyp. In this thesis we demonstrated that there was statistically significant difference between presence of nodule and size of polyp, higher in large polyp with p-value < 0.01 HS. Regarding postoperative results, the larger polyp the more the presence of reactive nodule than small polyp this may be due to incomplete glottal closure and reduced or absent mucosal wave amplitude at the lesion site leading to vibration asymmetry between vocal folds and high vibratory irregularity on the free edge of the vocal folds become more with large polyp. Carmel et al. (2018) [13] agrees as there was highly correlation between vocal polyp size and presence of nodule with p-value (<0.001). Cho et al. (2011) [14] agree as found that there was a strong association between big polyps and reactive lesions. Eckley et al. (2010) [12] agree as found that the most of patients with very large polyps were significantly

associated with presence of associated structural abnormalities (nodules) with p-value (<0.001). In this study we concluded that there was a positive significant correlation between type of reactive lesion (nodule) and vocal polyps. From the results presented, the size of the polyp is the most influential factor in the presence of nodule in patients with vocal polyps. In this thesis we demonstrated that there was statistically significant difference between presence of nodule and types of polyps, higher in fibroid polyp than other vocal fold types with p-value < 0.01 HS. Indicated that fibrous polyp stiffness interferes directly in the vibratory pattern of the vocal polyp, producing more vibration asymmetry between vocal folds so more affecting contralateral side of vocal fold. This study had some limitations. First, the small size sample study which may influence our results, so further study with large sample size is indicated to establish our results.

5. Conclusion

In this study it was found that sentinel nodule is presented with unilateral vocal fold polyp and cyst as reactive lesion on contralateral side of lesion. Size and histopathological type of vocal fold polyp affect the presence of sentinel nodule as it is present more with large polyp and fibroid polyp.

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Conflicts of interest: No competing interest

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