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CONSERVATIVE VERSUS SURGICAL APPROACHES IN TREATING VOCAL NODULES

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Abstract

Background: Vocal nodules are bilateral benign lesions of the vocal folds. The exact etiology of this condition is still unknown. However, vocal nodules have higher prevalence in people with high vocal demands. Currently, there are two main approaches in treating vocal nodules and the dysphonia associated with this condition, surgical and non-surgical approaches. The conservative non-surgical approach involves combination of speech therapy and medication for symptoms relief, whereas the surgical excision route with or without laser techniques includes direct removal of the acquired lesions.

Aim: To investigate the effectiveness of surgical and non-surgical approaches in treatment and in prevention of recurrence.

Methodology: The study included forty-three (43) adult patients that were selected at the ENT units of Al-Diwaniyah and Al-Kut teaching hospitals in Iraq according to the signs and symptom and the findings from laryngeal endoscopy of vocal nodules. All the included individuals were put on three months of conservative therapy prior to any intervention. Patients were then divided into two groups. First, to continue with the conservative treatment for the next six months, second, to go with the surgical excision route of the vocal nodules followed by six months of conservative treatment.

Results: The study included 12(27.9%) men, and 31(72.1%) women, men to women ratio was found at 1: 2.58. Mean age of the included individuals was (35.02±11.9) years. Minimum age in the study was (15) years, and maximum age recorded was (60) years. No significant variance in the mean ages between men and women, (P=0.092). Results showed that Almost 75% (32/43) of the study's sample were allocated to the age groups ranged from (15 to 40) years. The study investigated recurrence of vocal nodules six months after subjecting patients to the treatment methods, conservative and surgical. Univariate analysis showed a significant reduction in the overall recurrence of the vocal nodules in patients followed the conservative approach, (P=0.029). Analysis also showed no significant contribution from age (P=0.061), sex (P=0.859), duration of complain (P=0.524), smoking (P=0.154), occupational risk (P=0.631) on recurrence of vocal nodules.

Conclusion: Our study showed that conservative approach of treating vocal nodules is essential and effective in preventing recurrence of vocal nodules. A care must be taken following the surgical approach with all potential side-effects should be considered, including

the higher recurrence rate. People at risk of developing vocal nodules must be educated on the importance of reducing voice misuse or overuse and to follow better healthy lifestyle.

Introduction:

Vocal nodules are bilateral benign lesions of the larynx that can cause unwanted changes in the voice while speaking or singing. This condition can cause voice hoarseness or dysphonia[1], and it is mainly caused by voice overuse and voice abuse. It was found that prolonged and loud speaking or shouting triggers vibrational trauma at the midpoint of the membranous part of the vocal cords resulting in the abnormal growth of the nodules[2, 3]. Other factors, however, such as, infections, gastroesophageal reflux disease, and autoimmune diseases can also contribute to development of vocal nodules[4].

Although national studies surveying the acquired dysphonia in Iraq are still scares and needed, several international studies reported higher prevalence of vocal nodules in adults with occupational voice demand, such as, teachers, singers, and clergy[5-7]. Others who do not require significant demand on their voices in daily jobs and activities, are at low risk of vocal nodules. Overall, it was found that almost one-third of the speaking population were found at some point in life have suffered from inability to produce clear voice[8]. In a ten years study conducted by Nagata and others [9] found that almost 2% of visitors to ENT clinics and 6% to voice therapy centers were observed with signs and symptoms of vocal nodules. Children, however, were frequently reported at the highest risk of voice hoarseness[10]. It was found that almost one-quarter of children at school age were with signs of chronic hoarseness[11]. Studies on dysphonia revealed higher prevalence among middle-age female teachers compared to their counterpart, where over 40% of them were affected[12, 13]. Similarly, professional singers and those who sings above their normal range are at high risk of developing vocal nodules[14].

Clinical examination with laryngeal endoscope provides the simplest and most accurate method of diagnosis[15]. However, stroboscope could provide essential information regarding the status of vocal cords specifically the pattern of vibration and the time of folds closing for cases admitted for surgical intervention[16]. In most of the reported cases with voice disorder, however, patients do not usually seek medical treatment. This is owing to the transient nature of the illness, and when dysphonia is not presented with other systemic disease like acute or chronic laryngitis, upper respiratory tract infection, or GIT-related acid reflexes[17].

Several surgical procedures have been developed so far for treating this condition, however, less sever approach should be considered with less potential side effects[14, 15]. It is generally assumed that following the surgical approach should intent on removing the least amount of tissue that includes the nodule without effecting the rest of the membrane and restoring the voice to the normal status.

In fact, due to several controversial reports regarding the effectiveness of the surgical excision of the nodules[18, 19], several non-surgical methods have been established. Including, voice therapy, improving speech behavioral attitude, and medication for either treating a systemic condition or for relieving patient's symptoms[20, 21]. Voice therapy, when available, considers as a very effective way of treating vocal nodule and the dysphonia associated with it. It has proven effective in both children and adults, in acute and in chronic cases with dysphonia as well[22]. Such programs encourage patients to follow healthy vocal behavior and healthy way of living by reducing voice misuse or overuse for reliving stress and damage on vocal cords.

That is to ensure better conditions for the laryngeal wound healing after the onset of the laryngeal insult or surgery and to prevent recurrence of the nodules[23, 24].
Therefore, this study aims on investigating the effectiveness of the conservative and surgical approaches in treating vocal nodules and to prevent future reoccurrence in a sample of patients selected from ENT units at Diwaniya and Kut hospitals in Iraq.

Patients and methods:

The study included forty-three (43) adult patients that were selected at the ENT units of Al-Diwaniyah and Al-Kut teaching hospitals according to the signs and symptom and the findings from laryngeal endoscopy of vocal nodules. Patients' collection for this study was performed in January 2019 to February 2022. Of those, there were twelve (12) men and thirty-one (31) women. Patients with signs and symptoms of vocal cords diseases other than vocal nodules were excluded.
Prior to any intervention, all selected individuals were put on three months of conservative approach of avoid overuse and abuse of voice, medication for symptoms relief, and 48-72 hours of break of work or study depends on the occupational status of the patient. After the three months of conservative treatment, routine ENT examination was performed, and based on the findings, patients were divided into two groups. First, to continue with the conservative treatment for the next six months, second, to go with the surgical excision of the vocal nodules route followed by six months of conservative treatment.
For statistical analysis, patients' information was collected on Microsoft Excel 365 software. Data were then processed for statistical evaluation and level of significance and other correlative examination on Statistical package SPSS (version 26, USA) software. Univariate analysis were performed to examine the relationship between patients' characteristic and risk factor of vocal nodules recurrence. $P \leq 0.05$ was considered significant.

Results:

The study included forty-three (43) patients with vocal cords nodules based on patients' history, symptoms, and the findings from clinical examination. Of those, there were 12(27.9%) men, and 31(72.1%) women, men to women ratio was found at 1: 2.58. Mean age of the included individuals was (35.02±11.9) years. Minimum age in the study was (15) years, and maximum age recorded was (60) years, table 1. Results showed no significant variance in the mean ages between men and women, (P=0.092), table 2. Classifying patients' ages into specific four categories showed equal distribution of patients in both age groups of (15-30) years, and (31-40) years, being 16(37.2%). Small difference was observed in patients' distribution between the reminder age groups of (41-50) years and (51-60) years, being 5(11.6%) and 6(14.0%), respectively.
Symptoms duration and complain form the vocal nodules was also classified into specific time periods, as shown in table 1. Findings showed the highest distribution of patients was found in the duration that extend from (8 to 12) months, followed by (<4) months, being 14(32.6%) and 12(27.9%), respectively. The least number of individuals were complaining from the illness was those who had the symptoms for over a year. Study found no significant association between sex and the duration of the complaint, (P=0.745), figure 1.

The study reported 6(14.0%) patients with smoking behavior, four of those were men, and 37(86.0%) were found non-smokers. Patients with occupational risk of being frequently on voice demand and students were reported as being at higher risk of vocal nodules. Those constituted 16(37.2%) cases compared to 27(62.8%) with limited or no occupational risk factors associated with vocal nodules.

The study divided the patient's group into two groups that were randomly selected to follow different treatment approach designed by this study, being 23(53.5%) patients for conservative non-surgical route, and 20(46.5%) patients who underwent surgical removal of the nodules. No significant difference was found following the treatment approaches according to sex of patients, (P=0.327), table 2 and figure 2. The study investigated recurrence of vocal nodules six months after subjecting patients to the treatment method, conservative and surgical. Univariate analysis showed a significant reduction in the overall recurrence of the vocal nodules in patients followed the conservative approach, (P=0.029) table 3 and figure 3. Analysis also showed no significant contribution from age (P=0.061), sex (P=0.859), duration of complain (P=0.524), smoking (P=0.154), occupational risk (P=0.631) on recurrence of vocal nodules, table 3.

Table 1: Shows overall patients' demographic characteristics.

Patients' characteristics		**Values**
Number of patients		43(100%)
Male		12(27.9%)
Female		31(72.1%)
Age (Years)	(Mean ±SD)	35.02±11.9
Range (Years)		15-60
Age groups (Years)		
15-30		16(37.2%)
31-40		16(37.2%)
41-50		5(11.6%)
51-60		6(14.0%)
Symptoms duration		
<4 months		12(27.9%)
4-8 months		11(25.6%)
8-12 months		14(32.6%)
>12 months		6(14.0%)
Smoking		
Non-smokers		37(86.0%)
Smokers		6(14.0%)
Occupational risk		
No		27(62.8%)
Yes		16(37.2%)
Treatment approaches		
Conservative		23(53.5%)
Surgical		20(46.5%)

Recurrence of vocal nodules	
No (Cured)	27(62.8%)
Yes	16(37.2%)

Table 2: Shows the followed treatment approaches and recurrence of vocal nodules according to the sex of patients.

Patients' characteristics	**Male n(%)**	**Female n(%)**
Age (Mean ±SD) [t]	40.4±12.8	32.9±11.0
Treatment approaches ***F1***		
Conservative	8(66.7)	15(48.4)
Surgical	4(33.3)	16(51.6)
Recurrence of vocal nodules ***F2***		
No (Cured)	9(75.0)	18(58.1)
Yes	3(25.0)	13(41.9)

t: Independent-sample t test (*P*=0.092), *F1*: Fischer's exact test (*P*=0.327), *F2*: Fischer's exact test (*P*=0.484).

Table 3: Univariate analysis and estimated association between patients' chrematistics and recurrence of vocal cords nodules.

Risk factor	***P* value**
Age	0.061
Sex	0.859
Duration of complain	0.524
Smoking	0.154
Occupational risk	0.631
Treatment approach	0.029*

*Significant association

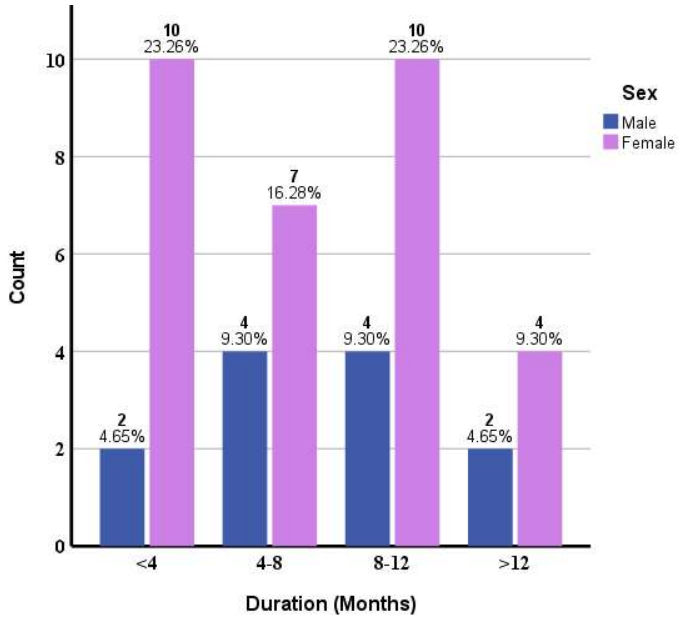


Figure 1: Shows duration of vocal nodules according to sex of patients, no significant association was observed, (*P*=0.745).

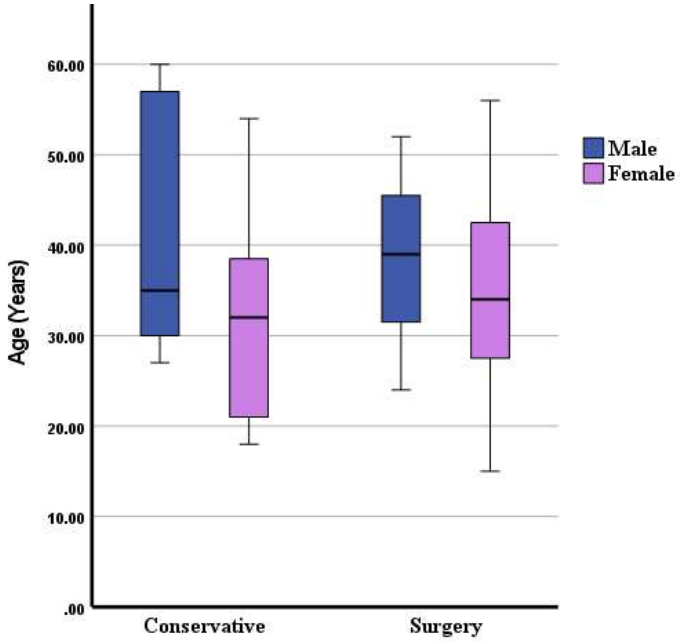


Figure 2: Shows mean age of men and women according to the method of treatment (conservative vs surgery). No significant difference was observed between the two groups, (*P*=0.292).

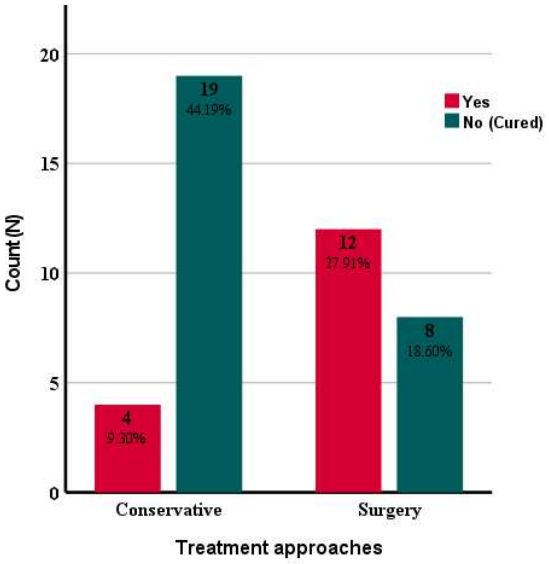


Figure 3: Shows number of vocal nodules recurrence according to the method of treatment (conservative vs surgical). Significant variance was observed between the two treatment methods, (*P*=0.029).

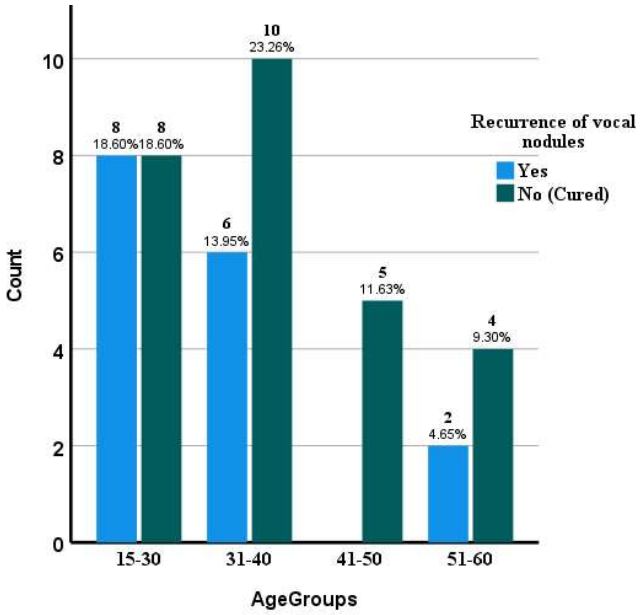


Figure 4: Shows number of vocal nodules recurrence according to the age groups. No significant variance was observed between groups, (*P*=0.138).

Discussion:

Several reports highlighted the unidentified etiology of vocal cords nodules. However, the condition has been commonly documented among those with higher vocal demand compared to the rest of the population[5, 6]. Genetic predisposition and familial history has also been

accounted as one the main risk factors in triggering vocal nodules formation and recurrence after treatment[25]. Genetic studies in this area of research are scarce and frequently limited by the sample size. Currently, there are two approaches in treating vocal nodules and the dysphonia associated with this condition, surgical and non-surgical approaches. The conservative non-surgical approach involves combination of speech therapy and medication for symptoms relief, whereas the surgical excision route with or without laser techniques includes direct removal of the acquired lesion. This study aims to investigate the effectiveness of each approach in treatment and in prevention of vocal nodules recurrence. Here, the study examined the demographic characteristics of forty-three (43) patients diagnosed with vocal nodules and the studied the association of patients' characteristics factors in determining the likelihood of nodules recurrence according to the method of treatment.

In our investigation, there was higher prevalence of vocal nodules among women than men, being (72.1%) and (27.9%), respectively. Findings were in consistent with previous studies of Coyle et al.[26], Zhukhovitskaya et al. [27], and Banjara et al.[16]. This observation can be explained by the fundamental differences in generating voice frequencies between men and women. Women are seen usually with higher likelihood of generating a higher sound wave that is capable on damaging the mucous membrane and the submucosa layers of vocal cords[28]. In addition to the fact that vocal cords in women have less amount of hyaluronan in the connective tissue layer underneath the mucosa, where this layer naturally works on reducing the trauma caused by the vibrational waves. Therefore, higher capacity to vocal cords injuries are seen in women compared to men[29]. Women were also disproportionally higher in developing benign vocal lesions other than vocal nodules[26, 30]. In contrast, studies found that men are at the highest risk of vocal nodules due to the prolonged vocal folds approximation along with high voice intensity in men that could generate higher prevalence of vocal folds injuries[27, 31]. However, studies on general populations found no contribution from sex on developing vocal nodule[2], and differences here may reflect diverse study groups by different research methods. Findings showed that the mean age was (35.02±11.9) years, ranged from (15 to 60) years. Men were found slightly older than women, (40.4±12.8) years vs (32.9±11.0) years. No significant difference was found between the two groups. Categorizing age into age groups showed that the highest perveance of vocal nodules were found in young and adult patients compared to older patients. Almost 75% of the study's sample were allocated to the age groups ranged from (15 to 40) years. Similar findings were reported extensively by several studies[2, 27, 32]. Here, would strongly indicate that those patients were with the highest likelihood of voice overuse and voice abuse, relative to the older age groups that extend between (41 to 60) years. The reason for this age distribution is still unclear, yet genetic predisposition factors might play a significant role in the identifying the pathogenesis of vocal nodules. Further investigation is still required.

People with occupations that require high voice demand are at higher risk of vocal nodules and dysphonia. In our study, there were (37.2%) of patients that have been identified at higher risk due to occupation. Studies of Cho et al. and Won et. al. strongly indicated a no correlation between occupation and vocal nodules[2, 33]. Still however, certain occupations are considered as a risk factor despite the fact of unclear association with triggering factor on vocal nodules development. In fact, Krecicki et al.[34] and Preciado et al.[35] reported a positive association between teaching and appearance of vocal nodules. Sapir et al.[36] and Smith et al.[37] witnessed

40% of the investigated teachers have abandoned their jobs due to voice attrition. Similarly, singers, actors, TV and radio speakers and showmen have higher prevalence of vocal nodules as indicated by studies[38].

Currently, there is no available evidence recommending a specific method of treatment in vocal nodules. Both conservative and surgical approaches were reported effective in treating the condition and restoring voice[15]. In this regard, patients were treated either conservative non-surgical method or through the surgical nodule's excision route. There were 23(53.5%) patients for conservative non-surgical route, and 20(46.5%) patients who underwent surgical removal of the nodules. Analysis from this part showed no significant difference between the groups according to sex of patients, (*P*=0.327), table 2 and figure 2.

Recurrence of vocal cords nodules in both approaches have been investigated by this study following six months of voice therapy and medications. Univariate analysis revealed a significant (*P*=0.029) reduction in recurrence of vocal lesions in the conservative method of treatment compared to the surgical route. Indeed, ((19/23) 82.6%) of patients treated with the conservative approach did not show signs of recurrence, while only ((8/20) 40.0%) were cured following the surgical intervention, figure 3.

Non-surgical intervention has been widely accepted as the most effective method of treatment by several studies[15, 23, 39-42], and this study came in accordance with previous findings. In contrast, other studies found that utilizing the surgical approach was associated with faster healing and less rate of recurrence[18, 43]. This has been reported in cases that require high and continuous voice demand as in singers and others, while the non-surgical approach fails to resolve the vocal lesion completely in this group of individuals[44].

The only patients' factor that was reported by this study to have a significant impact on the rate of recurrence is the method of treatment. The rate of nodules recurrence in the surgical method was (60.0%). Similar recurrence rates with this approach have been reported in studies of Béquignon et al. [42] and Lancer et al.[45], being (56%) and (62%) respectively.

The demographic chrematistics of patients that did not present any association with the recurrence of the vocal lesions are, age (*P*=0.061), sex (*P*=0.859), duration (*P*=0.529), smoking habit (*P*=0.154), and occupational risk (*P*=0.631), table 3. However, age, sex, and occupation were found as significant predisposing factors in higher rates of recurrence[46, 47]. Although, patients' demographic characteristics in this study offered valuable information regarding the prevalence of vocal nodules and the associated factors with it, a larger sample size might provide better insight into the mechanism of the initial occurrence and how to follow the best prevention possible.

Conclusion:

Our study showed that conservative approach of treating vocal nodules is essential and effective in preventing recurrence of vocal nodules. A care must be taken following the surgical approach with all potential side-effects considered, including the higher recurrence rate. People at risk of developing vocal nodules should be educated on the importance of reducing voice misuse or overuse.

Conflict of interest:

The authors declare no conflict of interest.

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