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Role of Coblation in Benign Vocal Cord Lesions

Mazen Alaa Awad Elkaref *[1], Salah Eldeen Saeed Mohamed [2], Mahmoud Elsaid Elsobky [1]

[1] Department of Otorhinolaryngology, Damietta Faculty of Medicine, Al-Azhar University, Damietta, Egypt

[2] Department of Otorhinolaryngology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

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*Corresponding author

Email: mazen_karef94@outlook.com

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ABSTRACT

Background: Benign vocal cord lesions are commonly encountered. Conventional excision techniques are associated with collateral thermal damage. Coblation claims minimized adjacent tissue injury due to its non-thermal mechanism.

Aim of the work: To evaluate safety and efficacy of coblation in excision of benign vocal cord lesions.

Patients and Methods: This prospective study included 30 patients with benign vocal cord lesions undergoing coblation. Lesion type, intraoperative parameters and postoperative outcomes were assessed. Primary outcomes were completeness of excision, perioperative complications and recurrence rate at 6 months. The improvement in voice quality was evaluated using the GRBAS [Grade, Roughness, Breathiness, Aesthenia, Strain] score preoperatively and at 3 months postoperatively.

Results: Common lesions were polyps [n=16] and vocal nodules [n=9]. Mean procedural time was 15 min [range 10-20 min]. Complete excision was achieved in all cases. Only 1 patient had immediate postoperative bleeding managed conservatively. None reported aspiration, infection or visualization difficulties. Mean postoperative hospital stay was 1 day. The GRBAS score significantly decreased from 6.57 ± 1.61 preoperatively to 1.83 ± 0.747 after 3 months [$p < 0.001$], indicating substantial improvement in voice quality.

Conclusion: Coblation is a safe and effective minimally invasive technique for excision of benign vocal cord lesions. It enables complete excision with minimal collateral thermal damage, early postoperative recovery and low recurrence rates.

Keywords: Ablation Techniques; Hoarseness; Vocal Cords.

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INTRODUCTION

The human voice is a remarkable instrument, serving as a primary mode of communication and expression. The vocal cords play a critical role in producing sound by vibrating together in a precise manner [1].

Various benign lesions can develop on the vocal cords, leading to alterations in vocal quality and function. They produce symptoms which can vary from mild hoarseness to life threatening stridor. These lesions can include vocal nodules, polyps, cysts, and other growths that affect the delicate tissues of the vocal cords [2].

Management of benign vocal cord lesions is crucial to restore vocal function and quality of life for individuals experiencing voice disorders. Traditional treatment modalities for benign vocal cord lesions have primarily consisted of voice therapy, medical management, and surgical intervention [3, 4]. The objectives of treating benign vocal fold lesions include removing the lesion, restoring vocal cord function, and enhancing voice quality [5].

Recently, various methods have been suggested to minimize surgical risks and complications. Surgeons need to carefully consider safety, precision, and results when selecting from the available surgical techniques [3].

Among the surgical techniques available, coblation has emerged as a promising intervention for the management of benign vocal cord lesions. Coblation, short for controlled ablation, utilizes radiofrequency energy to precisely ablate targeted tissues while minimizing damage to surrounding structures. This technology has gained popularity in various medical specialties for its ability to provide effective tissue removal with reduced thermal injury and improved healing outcomes [6].

The role of coblation in the management of benign vocal cord lesions is a topic of growing interest within the field of otolaryngology. By offering a minimally invasive and precise treatment option, coblation holds the potential to optimize outcomes for patients with vocal cord lesions while minimizing postoperative complications [7].

Understanding the advantages and limitations of coblation in treating benign vocal cord lesions is essential for guiding clinical decision-making and improving patient care. So, this study aims to provide valuable insights into the efficacy and safety profile of this minimally invasive technique in restoring vocal function for individuals with benign vocal cord lesions.

PATIENTS AND METHODS

In this prospective study, a total of 30 patients with benign vocal cord lesions who underwent coblation surgery between February 2022 and December 2023 were included. Patients were recruited from the Otolaryngology Department at Al-Azhar University Hospital [Damietta] following a thorough diagnostic evaluation of their vocal cord lesions.

Inclusion and Exclusion Criteria: Patients aged 18 years and older with histologically confirmed benign vocal cord lesions, such as vocal nodules, polyps, cysts, or other benign growths, were eligible for inclusion. Patients with a history of malignancy, significant comorbidities affecting surgical risk, or contraindications to coblation surgery were excluded from the study.

All patients had a trial of medical treatment for at least one month, during which they did not respond before enrolling in the study.

Preoperative assessment: All patients underwent a comprehensive preoperative assessment, including a detailed medical history and physical examination. Patients were screened by flexible laryngoscopy under local anesthesia to find out the organic pathology.

Surgical Technique

The patient was placed under general anesthesia. The patient was positioned in the Boyce position. A suspension Kleinsasser laryngoscope was used to hold the patient's mouth open and provide a clear view of the larynx [voice box]. The vocal cords were visualized through the laryngoscope. A small pack was inserted into the subglottic region, which was located just below the vocal cords. The coblator system was prepared, including the coblator handpiece, irrigation system, and foot pedal for controlling the device [Fig. 1]. The lesion within the larynx was visualized using the laryngeal hand of the coblator. The coblator emits radiofrequency energy to ablate [remove] the lesion [Fig. 2]. During the procedure, any bleeding from the surgical site was managed to achieve hemostasis [control bleeding]. Steroid cover may be provided to reduce the risk of post-operative swelling or inflammation. Intraoperative findings, such as lesion characteristics, surgical

time, and any intraoperative complications, were recorded.

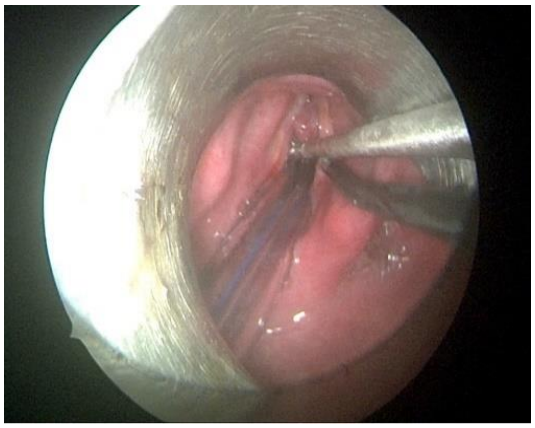

Figure [1]: The coblator system

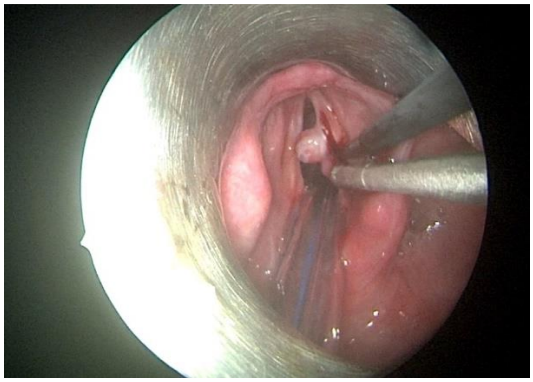

Figure [2]: Lesion excision

Postoperative care and follow-up: Following coblation surgery, patients received standard postoperative care, including voice rest, analgesia as needed, and instructions for vocal hygiene. Postoperative follow-up evaluations were conducted at regular intervals to assess voice outcomes, vocal fold healing and complications. Patients was followed up postoperatively at an interval of 1 week, 1 month, 3 months and 6 months.

The primary outcomes included completeness of excision, perioperative complications and recurrence rate at 6 months.

The assessment of lesion recurrence and vocal healing was conducted using a Video laryngoscope, providing detailed visual insights into the laryngeal region.

The assessment of voice quality was performed using the GRBAS score, capturing various aspects of vocal characteristics. GRBAS stands for the five assessments required, which were Grade, Roughness, Breathiness, Asthenia, and Strain. For each attribute a four-point scale was used to specify the severity of any perceived abnormality, rated from 0 [normal] to 3 [severe]. Grade [G], represents the overall severity/extent of the perceptible abnormality. Roughness [R] quantifies the degree of breathiness and irregular vibration. Breathiness [B] arises from noise in the voice due to excessive breath or void of vibration. Asthenia [A] represent degree of weakness, soft phonation. Strain[S] was indicative of the degree of tension or effort perceived in the voice [8].

Ethical consideration: Informed consent was obtained from all participants prior to enrollment in the study. This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and was approved by the Institutional Review Board at Faculty of Medicine, Al-Azhar University.

Statistical Analysis: Data were collected and entered into a secure database. Descriptive statistics were used to summarize patient characteristics and outcomes [Mean and standard deviation for numerical variables, and Frequency and percentage for categorical variables]. Repeated measures ANOVA, was performed to compare the means of the consecutive samples. P value < 0.05 was considered significant.

RESULTS

Demographic and clinical data: Of the studied patients, 17 were males [56.7%] and 13 were females [43.3%], with mean age was 38.2 ± 7.87 years and range 22 – 57 years and mean BMI was 27.89 ± 2.57 kg/m^2. Six [20%] patients were smokers, five [16.7%] of patients were DM and four [13.3%] of patients were HTN. The most prevalent occupation was housewife [33.3%] followed by worker [23.3%] as shown in Table [1].

Diagnosis of the studied cases: 53.3% of patients diagnosed as polyp, 30% diagnosed as vocal nodules, and 16.7% of patients diagnosed as cyst. The mean procedural time was 15 min [range 10-20 min].

Outcomes: Complete excision was achieved in all cases. Only one patient had immediate postoperative bleeding managed conservatively. None reported aspiration, infection or visualization difficulties. Mean postoperative hospital stay was 1 day. At follow up, all patients had normal vocal function without recurrence. The GRBAS score significantly decreased from 6.57 ± 1.61 preoperatively to 1.83 ± 0.747 after 3 months [p < 0.001], indicating substantial improvement in voice quality.

Table [1]: Demographic and clinical data of the studied patients

Variables		Patients [n=30]
Age [years],	Mean ± SD [Min – Max]	38.2 ± 7.87 [22 – 57]
BMI [kg/m^2]	Mean ± SD [Min – Max]	27.89 ± 2.57 [23.2 - 31.9]
Sex, n [%]	Males Females	17 [56.7%] 13 [43.3%]
Residence, n [%]	Rural Urban	15 [50%] 15 [50%]
Comorbidities, n [%]	Smoking Diabetes mellitus Hypertension	6 [20%] 5 [16.7%] 4 [13.3%]
Occupation	Housewife Worker Teacher Doctor Driver Student	10 [33.3%] 7 [23.3%] 5 [16.7%] 3 [10%] 3 [10%] 2 [6.7%]

Table [2]: Diagnosis distribution among the studied patients

Lesion	Studied Patients [n=30]	
	No.	%
Polyp	16	53.3%
Vocal nodules	9	30%
Cyst	5	16.7%

Table [3]: GRBAS score distribution among the studied patients

	Studied patients [n=30]
GRBA	
Preoperative, Mean ± SD	6.57 ± 1.61
1 month postoperative, Mean ± SD	3.2 ± 0.664
3 months postoperative, Mean ± SD	1.83 ± 0.747
P-value*	**<0.001**

* Repeated measures ANOVA.

DISCUSSION

Benign vocal cord lesions are common abnormalities that can affect the vocal cords. These lesions include nodules, polyps, cysts, and other growths that develop on the vocal cords, leading to changes in voice quality and functionality. These lesions can be attributed to behavioral factors such as vocal strain, smoking, and alcohol consumption, as well as environmental influences like exposure to upper and lower respiratory infections, and physical trauma [9, 10].

Coblation technology serves not only for ablation, coagulation, and irrigation, but also for suction in a single-use device. The benefits of Coblation-assisted micro-laryngeal surgery include shorter procedure times, reduced bleeding, shorter hospital stays, and fewer complications. Additionally, compared to laser or electrosurgical devices, Coblation technology lowers the risk of airway fire [11].

The current study indicated that out of the participants, 17 [56.7%] were male and 13 [43.3%] were female. The average age was 38.2 ± 7.87 years, ranging from 22 to 57 years, with an average BMI of 27.89 ± 2.57 kg/m2. Similar findings were observed in a study by **Reddy *et al.*** [12], where they investigated the effectiveness of Coblation in treating benign laryngeal lesions and reported a male to female ratio of 3:1, with an average age of 32±9.2, and a majority of patients falling within the 30-40 years age group. Likewise, in a study by **Virmani *et al.*** [5] focusing on the outcomes of patients treated for benign vocal fold lesions, 19 of the 30 participants were male, and 11 were female. The age range in their study was 20 to 62 years, with a mean age of 42.23 years.

Our study highlighted the occupation distribution among the studied patients, showing that the most prevalent occupation was housewife [33.3%], with workers following closely at 23.3%. These findings align with **Rudra *et al.*** [13], where housewives were also predominant [19%] among the study subjects, but differ from other studies. **Mobarsa *et al.*** [14] indicated a higher percentage of professional voice users, such as teachers, as compared to our study. The diversity in occupational distribution across these studies sheds light on the varying demographic characteristics and occupational profiles of patients with benign mucosal vocal fold lesions.

The distribution of diagnoses among the patients in our study revealed interesting patterns. Polyps were the most common diagnosis at 53.3%, followed by vocal nodules at 30%, and cysts at 16.7%. These findings align with previous research by **Swain *et al.*** [15], where vocal fold polyps were the most prevalent at 42.59%, followed by vocal nodules at 24.07% and vocal cysts at 14.81%. Additionally, our results were consistent with the findings of **Virmani *et al.*** [5], who also identified vocal polyps, vocal nodules, and vocal fold cysts as the leading benign lesions in their study. These consistent findings across multiple studies underscore the significance of these diagnoses in the clinical context.

The Coblation method can be used in the larynx and trachea to remove or lessen sessile polyps, lesions, or tumors. Coblation bipolar plasma devices are designed to operate at a relatively low temperature, efficiently breaking down and/or diminishing the size of the specific tissue while causing minimal damage to the surrounding healthy tissue [16].

Our results clearly demonstrate the efficacy and safety of the Coblation procedure. With a 100% rate of complete excision and minimal postoperative complications, it's evident that the approach used is highly successful. The short postoperative hospital stay and the absence of long-term issues, such as vocal function impairment or recurrence, further emphasize the positive outcomes of this intervention. There is strong evidence to support the use of this technique for similar cases in the future.

The Coblation technique provides a unified surgical device for removing, cutting, sealing soft tissue, and controlling bleeding in an efficient manner. This minimally invasive approach offers a quicker healing process and shorter hospital stays. The typical procedure involves using a laryngoscope to access the larynx and employing low-temperature plasma technology to visualize and remove the tumor. The application of plasma technology can effectively reduce post-surgery swelling in the larynx [17].

The findings of our study reveal a substantial positive impact of laryngeal surgery on the perceptual analysis of voice, as indicated by the significant reduction in GRBAS scores observed from preoperative assessment to the 3-month postoperative follow-up. These results align with previous research, such as the study by **Swain *et al.*** [15], supporting the utility of GRBAS scores in evaluating voice quality pre- and post-operatively.

Our study's longitudinal analysis demonstrates a consistent trend of improvement in GRBAS scores across all stages of postoperative follow-up, reflecting the sustained positive effects of the surgical intervention on voice quality. The statistical analysis, employing repeated measures ANOVA, further underscores the significance of these improvements, with a notable decrease in mean GRBAS scores at each visit following surgery, emphasizing the robustness of our findings.

Overall, these results provide compelling evidence for the effectiveness of laryngeal surgery in achieving positive perceptual changes in voice quality, thereby underscoring its clinical significance and potential benefit for patients undergoing similar procedures.

Conclusion: In the current study, we revealed that regarding GRBA score distribution among the studied patients, there was a significant reduction regarding GRBA from preoperative to 3-months postoperatively. Also, we found that Coblation is a wonderful tool that can be used safely in management of benign vocal cord lesions as it helps in complete removal of these lesions with preservation of normal anatomy results in a good voice post-operatively. Further studies are needed with larger scales are needed for conforming our results.

Disclosure: None to be disclosed.

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