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Which is a better management for vocal fold cyst: cold knife or laser resection?

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Abstract

Background: The objective of the study is to compare the conventional microlaryngeal surgery and the CO₂ laser in the treatment of cysts of vocal folds, regarding the postoperative quality of voice.

This study was conducted on 53 cases with vocal fold cysts. The cases were randomly allocated into two groups: group 1 (27 cases) was operated by the conventional technique, and group 2 (26 cases) was operated with CO₂ laser microlaryngeal operation. At 3-month postoperative, evaluation was done by stroboscopic evaluation of vocal folds, grade of hoarseness, roughness, breathiness, asthenia, and strain (GRBAS) scale and Arabic version of Voice Handicap Index (VHI).

Results: The stroboscope assessment revealed that glottic closure was complete, symmetrical motion, the reappearance of the mucosal wave, normal amplitude, and periodicity in all patients. There is insignificantly different between either group as regards the postoperative scores on VHI and GRBAS scale.

Conclusion: There is insignificantly different when comparing laser to conventional microlaryngeal surgery for excision of vocal fold cysts regarding the quality of voice.

Keywords: Vocal fold cysts, Conventional microlaryngeal surgery, CO₂ laser, GRBAS scale, Voice Handicap Index

Background

The vocal fold cyst is one of minimal-associated pathological lesions (MAPLs) arising within the Reinke's space. Vocal fold cysts are considered around 6–13% of benign laryngeal lesions. Cysts usually developed in the midportion of the true vocal fold as sac-like pocket with distinct borders [1]. Mucoïd retention cysts and epidermoid cysts are the most common types of vocal cysts, and they are presented with dysphonia and difficult vocalization [2].

Treatment of vocal fold cysts is mainly surgical as these lesions do not resolve with phonotherapy and examination can lead to rupture of the cyst. Rupture of the cysts may lead to scarring or sulcus formation [3].

Micro-flap technique, first described by Boucharger, is considered the standard microsurgical technique to exercise vocal fold cysts. Unfortunately, the risk of scarring postoperatively is higher than other MAPLs such as polyps [4].

With the great development of LASER in microlaryngeal surgeries, Hirano et al. and Matar et al. have used CO₂ LASER in excision of vocal fold cysts. The CO₂ LASER may help the surgeon to minimize damage of the surrounding tissue and resect the superficial lesions without influencing the wave form of vocal fold mucosa [5, 6].

Our hypothesis is suggesting that laser surgery is considered as newer and more time-saving than conventional surgery and may offer better voice outcome, and we will prove this hypothesis through this study methodology in vocal fold cysts.

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Objective of the work

To compare the conventional surgery and CO₂ laser techniques in treatment of cysts of vocal folds, as regards the postoperative quality of voice.

Materials and methods

This is a prospective randomized interventional comparative research which is conducted on 53 cases with vocal folds cysts. These cases were randomly divided into two groups: group 1 (27 cases) was operated by the conventional technique, and group 2 (26 cases) was operated with CO₂ laser microlaryngeal surgery. The study was conducted after approval from the ethics committee. Written informed consent was taken from all cases.

The inclusion criteria are cases with vocal fold cysts not responding to conservative management with normal freely mobile bilateral vocal folds, while cases with the previous microlaryngeal surgery for any cause, immobile vocal folds, malignant vocal fold lesions, and not fit for general anesthesia were excluded.

Preoperative assessment

It was conducted by expert otolaryngologists and senior phoniatician which included the following:

- Complete history taking
- Vocal fold cyst was diagnosed in every patient using flexible or rigid laryngoscope with evaluation of the mobility of vocal folds.
- GRBAS scale (grade of hoarseness, roughness, breathiness, asthenia, and strain)
- Stroboscopic assessment
- Arabic version of Voice Handicap Index (VHI) [7]

Operative procedures

All cases were controlled by general anesthesia using the smallest endotracheal tube considered safe to every patient. Laser-safe endotracheal tubes were chosen for cases who were operated on by laser. All cases were given an intraoperative dosage of 8 mg dexamethasone.

All surgeries were performed by the senior author using an operating microscope at 400-mm focal length by a suspension laryngoscope to expose the vocal folds.

In the first group of patients, conventional surgeries were performed using cold microsurgical instruments. The surgeon grasped the medial edge of the cyst with microforceps, and then, he sharply excised the lateral edge with a laryngoscopic knife or scissor. Dissection and excision of the cysts were performed in the highly superficial plane to prevent trauma to the deeper layers.

In the second group of patients, a microspot CO₂ surgical laser was used with 1035 nm wavelength, 2 W

power, and beneath continuous super-pulse mode. All laser precautions and protection for the patients and the operation room staff were done. The vocal fold cyst was exposed as in first group of the study, and gauzes soaked in saline were positioned at the subglottic area to keep the endotracheal tubes and avoid laser harm to surrounding tissues. The laser beam was focused to the smallest spot size (0.2–0.25 mm). The lesion was clasped with microforceps and removed by the laser in a superficial plane to prevent damage to the deep layer of the lamina propria.

All samples were referred to the pathology department for histological sectioning and diagnosis.

Postoperative care

Cases were put on a regimen of 2 weeks of voice rest and hydration. Antireflux measures were prescribed to all cases for at least 4 weeks postoperatively. Smokers were invited to carry out smoking cessation.

Postoperative assessment was done 3 months postoperatively by GRBAS scale, stroboscopic analysis, and VHI and detect recurrence.

Statistical analysis

Data were examined by SPSS version 15. Normally distributed scale variables were explained as mean and standard deviation. Qualitative variables were presented as frequency and percentage. Comparison among groups regarding a qualitative variable was performed by chi-square test; however, the comparison between two groups regarding a normally distributed scale variables was performed by independent *t*-test. Additionally, the comparison of a normally distributed paired variable was performed by paired *t*-test to compare between pre- and post-surgery parameters, while McNemar test was utilized to compare paired qualitative data.

Results

This study included 53 patients having vocal fold cysts, 25 males (47.2%) and 28 females (52.8%). Their average age is 41.8 ± 9.5 years. Group 1 was 27 (50.9%) patients who underwent surgery by conventional cold dissection technique, while group 2 was 26 (49.1%) patients who underwent their microlaryngeal surgeries using CO₂ laser dissection method.

There was insignificantly different between two groups as regard demographic data. Group 1 involved 12 males and 15 females, while group 2 included equal number of males and females. There was insignificantly different between two groups as regard age and gender.

Preoperative evaluation by stroboscopic assessment showed that all cases in two groups had incomplete glottic closure, asymmetrical motion, absent mucosal wave, and decreased amplitude with aperiodicity. There was

Table 1 Comparison of pre-surgery parameters between studied groups as regards MLS

		MLS	N	Mean	SD	t	p-value	
GRBAS	G	Laser	26	2.2	0.7	0.421	0.676	NS
		Traditional	27	2.2	0.7			
	R	Laser	26	1.5	0.8	-0.391	0.698	NS
		Traditional	27	1.6	0.9			
	B	Laser	26	1.0	0.6	-0.874	0.386	NS
		Traditional	27	1.2	0.7			
	A	Laser	26	0.8	0.6	0.882	0.382	NS
		Traditional	27	0.6	0.6			
	S	Laser	26	2.2	0.7	1.463	0.15	NS
		Traditional	27	1.9	0.8			
VHI	Laser	26	36	36.0	9.7	0.056	NS	
	Traditional	27	40.44	40.4				6.6

NS non-significant, N number of patients

Table 2 Strobe pre- and 3-month post-surgery for all patients in both groups

	Preoperative	Postoperative
Glottic closure		
Incomplete	53	0
Complete	0	53
Motion		
Asymmetrical	53	0
Symmetrical	0	53
Mucosal wave		
Absent	53	0
Present	0	53
Amplitude		
Decreased	53	0
Normal	0	53
Periodicity		
Aperiodic	53	0
Periodic	0	53

insignificantly different between two groups as regard voice parameters like VHI and GRBAS scale ($P > 0.05$) (Tables 1, 2, 3, and 4).

Three-month postoperative assessment using stroboscope revealed that glottic closure was complete, symmetrical motion, reappearance of the mucosal wave, normal amplitude, and periodicity in all patients (Table 3). Moreover, the patients obtained marked higher results than the preoperative ones; therefore, by studying the difference between the preoperative and the postoperative results, we found there were highly significant difference for all studied voice parameters in both groups (Tables 2, 3 and 4).

However, there is insignificantly different between two groups as regard the postoperative scores of VHI and GRBAS scale (Table 5).

Table 3 GRBAS pre- and 3-month postoperative for all patients

			Mean	SD	t	p-value	
GRBAS	G	Pre-surgery	2.19	0.71	13.35	0.000	HS
		Post-surgery	1.09	0.71			
	R	Pre-surgery	1.51	0.869	7.532	0.000	HS
		Post-surgery	0.77	0.847			
	B	Pre-surgery	1.08	0.615	6.722	0.000	HS
		Post-surgery	0.49	0.576			
	A	Pre-surgery	0.70	0.575	5.140	0.000	HS
		Post-surgery	0.23	0.423			
	S	Pre-surgery	2.00	0.760	11.614	0.000	HS
		Post-surgery	0.89	0.670			

HS highly significant

Table 4 VHI pre- and 3-month postoperative for all patients in both groups

		Mean	SD	t	p-value	
VHI	Pre-surgery	38.26	8.501	12.476	0.000	HS
	Post-surgery	26.55	9.518			

HS highly significant

Table 5 Comparison of post-surgery parameters between studied groups as regards GRBAS and VHI

		MLS	N	Mean	SD	t	p-value	
GRBAS	G	Laser	26	1.1	0.8	0.209	0.836	NS
		Traditional	27	1.1	0.7			
	R	Laser	26	0.6	0.9	-1.345	0.185	NS
		Traditional	27	0.9	0.8			
	B	Laser	26	0.4	0.6	-0.835	0.408	NS
		Traditional	27	0.6	0.6			
	A	Laser	26	0.2	0.4	-0.573	0.569	NS
		Traditional	27	0.3	0.4			
	S	Laser	26	0.9	0.7	-0.023	0.982	NS
		Traditional	27	0.9	0.7			
		Traditional	27	15.1	3.2			
	VHI		Laser	26	24.5	24.5	10.6 8.1	0.126

NS non-significant, N number of patients

Discussion

In this study, we compared conventional cold knife MLS versus CO2 laser MLS on the voice parameters in cases with vocal fold cysts. The risk of scarring after surgery of vocal fold cysts is higher than other MAPLs [4]. To our information, this study is the 1st study differentiating the impacts of both methods on vocal cysts with no other MAPLs involved. Benninger [8] and Fahim et al. [9] did not specify a lesion, and their patients suffered from different types of MAPLs, while Zhang et al. include patients with vocal fold polyps only in their study conducted in 2015 [10].

In this study, the voice parameters are affected similarly in both groups preoperatively without any significant difference as regard GRBAS and VHI. Three months postoperatively, we found that there is significant difference for all parameters with a tendency to normalization in both groups (Tables 1, 2, and 3). Stroboscopic parameters also showed the same pattern of the tendency to the normalization in the 3-month postoperative period as shown in Table 4. Video stroboscopic assessment of vocal folds edges and mucosal waves presented substantial enhancements in postoperative examination in two groups.

We did not find any important difference between CO2 laser and conventional methods regarding GRBAS scale and the Arabic version of VHI.

Benninger (2000) did not find any clinical result variances in 37 cases with vocal fold polyps, cysts, and nodules who were treated by microspot CO2 laser excision or by conventional microdissection [8]. Moreover, in concomitant to our results, Zhang et al. in 2015 did not show any significant difference in their results between both approaches in managing of vocal fold polyps [10].

Furthermore, in Fahim et al. (2021) study on 80 patients with different MAPLs of vocal folds and divided into two equal groups, each group is treated surgically by either CO2 laser excision or conventional microdissection, and they concluded that the enhancement of quality of voice following operation in two methods had insignificant difference [9].

In a study with short-term postoperative follow-up period (2 weeks), Abitbol J. and Abitbol P. showed that there is no significant variance in all voice parameters except the shimmer percent that was improved in the conventional group and not in laser group [11].

Conclusion

There is insignificantly different when comparing laser to conventional microlaryngeal surgery for excision of vocal fold cysts regarding quality of voice.

Abbreviations

VHI: Voice Handicap Index; GRBAS: Grade of hoarseness, roughness, breathiness, asthenia, and strain; MLS: Microlaryngeal surgery.

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Authors' contributions

The authors read and approved the final manuscript. AGK, contributes to idea, patient examination, all surgeries operated, analysis of data, and writing of manuscript. AA, contributes to examination preoperative, follow up patient's postoperative, analysis of data, and writing of manuscript. HK, contributes to examination preoperative, follow up patients postoperative, analysis of data, and writing of manuscript. AAA, contributes to idea, phoniatic assessment preoperative and postoperative, analysis of data, and writing of manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations**Ethics approval and consent to participate**

Ethics committee of Magrabi Hospital, Doha, Qatar. Reference number is ENT-8-2017VF. Informed written consent from all patients to participate in the study.

Consent for publication

Written informed consent for the publication of the images is obtained from the participants.

Competing interests

The authors declare that they have no competing interests.

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