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Comparison between Laryngeal Microsurgery versus Laryngeal Microsurgery with Corticosteroid Injection in the Management of Patients with Minimal Associated Pathological Lesions

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ABSTRACT

Background: Minimal Associated Pathological Lesions (MAPLs) are non-neoplastic, non-inflammatory, traumatic lesions of the vocal fold that occupy a position somewhere between the organic benign and non-organic groups and might have been predisposed by long-standing non-organic vocal dysfunction.

Methods: This Prospective randomized study was carried out on 30 consecutive candidates with MAPLs. They were categorized into two main groups according to their management, Group A, managed by laryngeal microsurgery (LMS), and Group B, managed by LMS and corticosteroid injection. Under each main group, there were three subgroups according to their primary lesions a subgroup of vocal fold polyps, a subgroup of vocal fold nodules, and another subgroup of vocal fold cysts. All patients were exposed to subjective evaluation by a scale of modified GRBAS (grade, roughness, breathiness, asthenia, strain) and objective evaluation by acoustic parameter and aerodynamically by maximum phonation time (MPT). **Results:** The acoustic, and aerodynamic parameters, as well as the modified GRBAS scale, showed a significant difference between pre-and post-operative in both groups in the three types of vocal folds (polyp, cyst, and nodules) indicating the effectiveness of both lines of management. The obtained results of the modified GRBAS scale and acoustic and aerodynamic parameters in vocal fold nodules showed a significant variation in the result of both groups pre-operative and post-operative.

Conclusions: Steroid injection with laryngeal microsurgery used for the treatment of MAPLs may not cause significant improvement regarding the modified GRBAS scale, acoustic analysis, and aerodynamic measures in short-term assessment over laryngeal microsurgery.

Keywords: laryngeal microsurgery, GRBAS scale, acoustic parameter, maximum phonation time, vocal fold.

INTRODUCTION

Minimal Associated Pathological Lesions (MAPLs) are non-neoplastic, non-inflammatory, traumatic lesions of the vocal fold that occupies a position somewhere between the organic benign and non-organic groups as they are usually associated with and might have been predisposed by long-standing non-organic vocal dysfunction [(1)].

This category is gathered together because they share many points as they have the same predisposing factors such as vocal trauma (abuse or misuse), harmful cough or hawking, pollution, general or self–inflicted smoking, and have small or at least benign characteristics. They are presented with dysphonia with or without phonasthenia and their management varies between voice therapy and endo-laryngeal microsurgical removal depending on the type of lesion with favorable prognosis [(1)].

MAPLs, including Reinke's edema, vocal nodules, cysts, polyps, and vocal process granulomas, are typically the result of long-term vocal abuse or misuse. phono trauma and subsequent remodeling of Reinke's space are all typical pathologies [(2)].

Restoring voice quality and facilitating accurate diagnosis of MAPLs are two common applications of LMS. Although an LMS is a fast and definitive surgical procedure, it might cause some unpleasant postoperative side effects such as persistent dysphonia [(3)].

Postoperative adhesion, scarring, or fibrosis of the vocal folds has been linked to chronic dysphonia or a worsened quality of voice after LMS, even though smoking and voice demand are both known to impact wound healing in the vocal folds [(4)].

The anti-inflammatory effects of glucocorticoids and steroids are significant. Many laryngeal illnesses are thought to be caused by an aberrant inflammatory response, which may explain why steroids are so often used in laryngology. Widespread reports describe the success of injecting steroids directly into the vocal fold. [(5)].

Steroid injection, as shown by **Campagnolo *et al.*** affects collagen deposition during acute wound healing and may prevent fibrosis [(6)].

Resting the voice following LMS is indicated for reducing phono trauma to the vocal folds. Vocal fold granulation is a serious problem that must be avoided at all costs. Although voice rest is an important part of the therapy, it may be challenging to implement for certain patients due to their line of work.

A 6.3-fold rise in the anti-inflammatory cytokine interleukin- 10 was documented in the steroid therapy group in patients with acute phono trauma, thus we hypothesized that this strategy might be useful in LMS [(7)]. Protecting against phono trauma after LMS might be

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accomplished with a steroid injection into the vocal fold. As a result, it might be useful for shortening the time needed for voice rest. Our study aims to compare the impact of laryngeal microsurgery with steroids injection contrasted with laryngeal microsurgery in MAPLs patients' management.

PATIENTS AND METHODS

This prospective randomized study was carried out on 30 consecutive candidates with MAPLs in the period from October 2020 to November 2021. Cases were recruited from the outpatient clinic of Tanta University Hospital. This study was done after being approved by the Research Ethical Committee, Faculty of Medicine, Tanta University. Patients or their relatives gave their informed written consent.

Inclusion criteria were the presence of MAPLs including (polyps, Reinke's edema, cysts, nodules, intubation granuloma, and contact granuloma).

Exclusion criteria were the presence of total laryngectomy, organic lesions, allergy to corticosteroids, patients refusing to participate in the study, and patients with recurrence.

Patients were randomly distributed into two main groups according to their management, Group A, managed by LMS, and Group B, managed by LMS and corticosteroid injection.

Under each main group, there were three subgroups according to their primary lesions a subgroup of vocal fold nodules, a subgroup with vocal fold polyps, and another subgroup of vocal fold cysts.

For each group subjective and objective evaluations preoperatively as well as one month postoperatively. Subjective evaluation was done by modified GRBAS scale while objective evaluation was done by acoustic parameter shimmer %, noise to the harmonic ratio (NHR), and "jitter and aerodynamically by maximum phonation time (MPT).

Protocol of assessment: All patients were subjected to the protocol of voice assessment applied at the Phoniatrics Unit-ORL department, Tanta University Hospitals [(1)].

Elementary Diagnostic Procedures:

Patient interview: personal data, complaint, and symptoms analysis, as well as the impact of the complaint on the patient.

Auditory perceptual assessment (APA): this is a subjective evaluation of voice by the phoniatrician to evaluate voice, stressing on the overall grade of dysphonia, quality of voice, pitch, intensity, register, non-phonatory laryngeal sound production (cough, whisper, and laughter). Quality of voice is described according to the modified GRBAS scale [(1)] **as** overall grade; (G), strained; (S), leaky; (L), breathy; (B), irregular; (I). All elements of the assessment are given a value on a scale from 0-4.

Neck examination: For thyroid scars, mass, lymph nodes, or any anatomical abnormalities, cranial nerve and vocal tract examination.

Clinical Diagnostic Aids: including the glottal picture documentation, the auditory perceptual assessment documentation, and augmentation.

Additional Instrumental measures: including acoustic analysis of voice and aerodynamic measures.

Operative technique: Cases were laid in a supine position on the table of the operating room. They underwent a place for the laryngoscope technique's success. The key to successfully placing a laryngoscopy is ensuring the patient is in the correct head and neck position. Then the laryngoscope can be passed under the ability to see directly beneath the epiglottis and into the endolarynx. Then suspend the laryngoscope in the endolarynx at a modest upward and forward (caudal) angle for the best laryngoscopic view and the least amount of damage or injury to surrounding tissue. The external counter traction is applied in a downward and upward direction to allow good laryngeal exposure. Using the 0, 30, 70° (and as needed, 120°) telescope for visualization in a "three-dimensional" fashion of the endolarynx is of great value. Suspending the laryngoscope allows for unique visualization of photo-documentation, surgical planning, and the pathology of the vocal fold. All steps of the technique must be carried out with binocular vision at high magnification power using a microscope.

Ethical Approval:

The study was approved by the Ethics Board of Tanta University and informed written consent was taken from each participant in the study. This work has been carried out following The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis

SPSS v22 was used for the statistical analysis (Chicago, IL, USA, IBM Inc.). Quantitative variables were compared for the same group by paired Student's t-test and described as mean and standard deviation (SD). Qualitative variables were compared by Chi-square test and described as a percentage (%) and frequency. To be statistically significant, a two tails P-value must be less than 0.05.

RESULTS

Patients' characteristics were insignificantly different between both the studied groups. **Table 1**

Table 1: Characteristics of the studied patients (n = 30)

		Group A (n=15)	Group B (n=15)	P-value
Age	Range	8-57	20-55	0.312
	Mean ± S. D	33.47± 14.31	38.13±10.16	
Sex	Male n (%)	7(46.7%)	6(40%)	0.713
	Female n (%)	8 (53.3%)	9(60%)	

Data are presented as mean ± SD or frequency (%).

Regarding the modified GRBAS scale in vocal fold polyps, there was a significant difference between pre-operative and post-operative results in both groups, with no significant difference in postoperative results between both groups. **Table 2.**

Table 2: Preoperative and follow-up results of Modified GRBAS scale in vocal fold polyps in both groups

Polyp		Mean ± S. D	t. test	p. value
G pre	**G A**	2.00±0.00	1.227	0.297
	G B	2.20±0.45		
R pre	**G A**	2.00±0.00	0.000	1.000
	G B	2.00±0.71		
B pre	**G A**	0.00±0.00	-	-
	G B	0.00±0.00		
A pre	**G A**	0.33±0.52	1.488	0.254
	G B	1.00±1.22		
S pre	**G A**	1.00±1.26	0.000	1.000
	G B	1.00±1.22		
G post	**G A**	0.50±0.84	0.717	0.492
	G B	0.20±0.45		
R post	**G A**	0.50±0.84	0.229	0.824
	G B	0.40±0.55		
B post	**G A**	0.00±0.00	-	-
	G B	0.00±0.00		
A post	**G A**	0.17±0.41	0.905	0.389
	G B	0.00±0.00		
S post	**G A**	0.50±0.84	0.717	0.492
	G B	0.20±0.45		

Data are presented as mean ± SD or frequency (%).

According to acoustic and aerodynamic parameters of vocal fold polyps, there was a considerable difference between preoperative and postoperative results in both groups, but there was no significant difference in postoperative results between both groups as regard acoustic and aerodynamic parameters. **Table 3**

Table 3: Comparison between preoperative and follow-up results of vocal fold polyps in both acoustic and aerodynamic parameters in both groups

Polyp		Mean ± S. D	t. test	p. value
Jitter % pre	**G A**	2.24 ± 1.77	0.546	0.479
	G B	1.58 ± 1.02		
Shimmer % pre	**G A**	4.29 ± 1.72	0.001	0.981
	G B	4.27 ± 0.72		
NHR pre	**G A**	0.28 ± 0.18	1.325	0.279
	G B	0.18 ± 0.07		
MPT pre	**G A**	5.15 ± 2.26	0.149	0.709
	G B	5.77 ± 3.13		
Jitter % post	**G A**	1.17 ± 0.50	0.803	0.443
	G B	0.88 ± 0.70		
Shimmer % post	**G A**	2.44 ± 1.00	0.846	0.419
	G B	2.02 ± 0.53		
NHR post	**G A**	0.14 ± 0.04	0.719	0.491
	G B	0.12 ± 0.02		
MPT post	**G A**	12.99 ± 2.80	0.391	0.705
	G B	14.21 ± 7.07		

Data are presented as mean ± SD or frequency (%).

In vocal fold cysts, there was a significant difference between preoperative and postoperative results as regards the modified GRBAS scale in both groups, but there was no significant difference in postoperative results between both groups as regards the modified GRBAS scale. **Table 4**

Table 4: Preoperative and follow-up results of Modified GRBAS scale in vocal fold cysts in both groups

Cyst		Mean ± S. D	t. test	p. value
G pre	**G A**	2.60 ± 0.55	0.400	0.545
	G B	2.80 ± 0.45		
R pre	**G A**	2.40±0.89	0.182	0.681
	G B	2.60±0.55		
B pre	**G A**	0.00±0.00	-	-
	G B	0.00±0.00		
A pre	**G A**	1.60±0.55	1.000	0.347
	G B	2.00±0.71		
S pre	**G A**	2.20±0.45	3.200	0.111
	G B	1.40±0.89		
G post	**G A**	1.00±0.71	0.408	0.694
	G B	0.80±0.84		
R post	**G A**	0.80±1.10	0.730	0.486
	G B	0.40±0.55		
B post	**G A**	0.00±0.00	-	-
	G B	0.00±0.00		
A post	**G A**	0.80±0.45	2.121	0.067
	G B	0.20±0.45		
S post	**G A**	1.00±0.71	0.784	0.455
	G B	0.60±0.89		

Data are presented as mean ± SD or frequency (%).

The acoustic and aerodynamic parameters in vocal fold cysts showed a significant difference between preoperative and postoperative results in both groups, but there was no significant difference in postoperative results between both groups. **Table 5**

Table 5: Comparison between preoperative and follow-up results of vocal fold cysts in both acoustic and aerodynamic parameters in both groups.

Cyst		Mean ±S. D	t. test	p. value
Jitter % pre	**G A**	4.70±2.08	4.062	0.079
	G B	2.64±0.94		
Shimmer % pre	**G A**	7.47±1.83	3.069	0.118
	G B	5.56±1.62		
NHR pre	**G A**	0.27±0.14	1.441	0.264
	G B	0.19±0.08		
MPT pre	**G A**	4.68±2.42	0.438	0.527
	G B	3.92±0.87		
Jitter % post	**G A**	1.80±0.94	1.183	0.271
	G B	1.26±0.37		
Shimmer % post	**G A**	3.76±1.02	2.182	0.061
	G B	2.41±0.93		
NHR post	**G A**	0.16±0.05	0.834	0.429
	G B	0.14±0.04		
MPT post	**G A**	9.30±2.51	0.798	0.448
	G B	10.77±3.27		

Data are presented as mean ± SD or frequency (%).

The obtained results of the modified GRBAS scale and acoustic and aerodynamic parameters in vocal fold nodules showed a significant difference between preoperative and postoperative results in both groups, with no significant difference in postoperative results between both groups. **Table 6**

Table 6: Comparison between preoperative and follow-up results of Modified GRBAS scale and acoustic and aerodynamic parameters in vocal fold nodules in both groups

Nodules		Mean ± S. D	t. test	p. value
G pre	**G A**	3.00±0.00	0.778	0.407
	G B	2.80±0.45		
R pre	**G A**	0.50±1.00	1.296	0.292
	G B	0.00±0.00		
B pre	**G A**	0.00±0.00	-	-
	G B	0.00±0.00		
A pre	**G A**	2.50±0.58	0.071	0.798
	G B	2.60±0.55		
S pre	**G A**	2.50±1.00	0.015	0.905
	G B	2.40±1.34		
G post	**G A**	1.00±0.82	0.479	0.511
	G B	0.60±0.89		
R post	**G A**	0.00±0.00	-	-
	G B	0.00±0.00		
B post	**G A**	0.00±0.00	-	-
	G B	0.00±0.00		
A post	**G A**	0.50±0.58	0.882	0.407
	G B	0.20±0.45		
S post	**G A**	1.00±0.82	3.556	0.101
	G B	0.20±0.45		
Jitter % pre	**G A**	3.72±0.43	0.521	0.494
	G B	3.09±1.69		
Shimmer % pre	**G A**	6.70±1.91	1.545	0.254
	G B	5.17±1.78		
NHR pre	**G A**	0.33±0.09	0.040	0.847
	G B	0.32±0.16		
MPT pre	**G A**	5.94±1.72	1.531	0.256
	G B	4.88±0.79		
Jitter % post	**G A**	1.38±0.50	0.973	0.357
	G B	1.05±0.52		
Shimmer % post	**G A**	3.22±0.94	3.012	0.126
	G B	2.24±0.75		
NHR post	**G A**	0.19±0.05	3.096	0.122
	G B	0.13±0.04		
MPT post	**G A**	10.35±1.74	1.482	0.182
	G B	12.58±2.55		

Data are presented as mean ± SD or frequency (%).

DISCUSSION

MAPLs are non-neoplastic, non-inflammatory, traumatic lesions of the vocal fold and this group occupies a position somewhere between the organic benign and non-organic groups as they might have been predisposed by long-standing non-organic vocal dysfunction. Injecting steroids into the vocal fold following LMS can protect against phono trauma. Accordingly, we postulated that injecting steroids as an adjuvant to LMS might improve its therapeutic efficacy for MAPLs.

Regarding the modified GRBAS scale, there was no significant difference in the results between both groups as MAPLs are not inflammatory in nature mainly as Vocal fold vibration causes vascular congestion and edema at the junction of the anterior and middle thirds, followed by hyperplasia of the overlying epithelium and hyalinization of Reinke's space [7] and the major role of steroids to decrease the inflammation.

Another cause of non-significant results may be due to the time of assessment of the cases, in the current study we assessed the patients after one month, so we may need to assess the patients after a prolonged time.

Another cause of non-significant results may be referred to the lack of video stroboscopy usage in the assessment of the cases as in this study we assessed the improvement regarding modified GRBAS scale, computerized speech lab (CSL), and MPT.

Cho et al. 2017 reported that Group B had a significantly higher incidence of aberrant vocal fold lesions than Group A did, as determined by video stroboscopic assessment 3 months following surgery. and this result confirms our opinion that we must increase the period of follow-up and use video stroboscopy in the evaluation of the cases as it detects the minimal changes that cannot be detected by indirect laryngoscopy [4].

Baraka et al. 2021 also reported that glottis closure is an important stroboscopic finding that was assessed. Post-treatment assessment revealed significant improvement, as 89.6% of the cases had a mild or no glottal gap post-ILSI, and this confirms our opinion that we must use videostroboscopy in the evaluation of cases [8].

The current results are confirmed by many studies such as **Cho *et al.*** [4] who recruited patients with benign vocal fold lesions (BVFLs), every procedure performed beneath the microscope was a success. Vocal polyps, cysts, nodules, and (BVFLs). Patients were classified into two groups, Group A patients also got an injection of steroids in addition to LMS, whereas group B patients just received LMS, **Cho *et al.*** [4] reported that There was no statistically significant difference between the groups in terms of the degree to which voice parameters improved.

Contrary to this result, **Baraka *et al.*** [8] enrolled 29 cases, 17 males (58.6%) and 12 females (41.4%). Eight patients (27.6%) underwent a single injection and 21 patients (72.4%) all patients underwent steroid injections, in case of polyps, nodules, cysts, and Reinke's edema and granuloma. They reported that the summation of the GRBAS scale showed a highly significant improvement in the study.

In this study, although neither group was significantly different from the other regarding the modified GRBAS scale, there was some improvement in some cases in group B than in group A, this may be explained by the presence of concurrent inflammation, phonathenic manifestation or by the recent onset of the problem.

Regarding different items in the GRBAS scale, we found that the best improvement was in the degree of weakness and straining and this is logical because these features are an early manifestation of dysphonia which will get improvement with steroid injection as it is an inflammatory disorder.

But the roughness was the worst result explained by it usually results from hypertrophy of the ventricular bands and it is the late manifestation of dysphonia which is anatomical change not improved by steroid injection.

In the current study, as regards acoustic analysis (NHR, jitter%, shimmer) and MPT, We found no statistically significant differences in the result between the two groups (there was an improvement in Group B than in Group A, but this improvement was not significant).

This result is confirmed by the study done by **Cho *et al.*** [4] reported that there was no statistically significant difference between the groups in terms of the degree to which voice parameters improved.

The opposite of our study, **Baraka *et al.*** [8] stated that shimmer %, Jitter %, NHR as well as MPT demonstrated significant improvement after injecting a steroid.

A study done by **Cho *et al.*** [4] observed that the non-steroid group had a higher incidence of postoperative persistent dysphonia. Further, the group that did not get steroid injections had a higher incidence of granulation at the surgical site of the vocal fold, Accordingly, we hypothesized that injecting steroids into the vocal fold during LMS would have averted scar formation and local anti-inflammatory impact. In the meanwhile, new research suggests that repetitive subepithelial steroid injection in the vocal folds may temporarily cause vocal fold atrophy, but that this atrophy resolves on its own within two to four months.

In the current study, regarding the result of different types of MAPLs, the difference was significant among preoperative and post-operative assessment as regards modified GRBAS scale, acoustic analysis, and MPT but after surgery, neither group showed a statistically significant improvement over the other.

This is confirmed by the result obtained from **Elkawa *et al.*** (all acoustic parameters, GRBAS scale,

and MPT) show no significant difference between the two groups statistically in vocal fold polyps.

Contrary to this result, **Hsu *et al*.** [9] reported that all acoustic parameters (jitter, shimmer, NHR) and GRBAS scale showed significant changes after steroid injection in vocal fold polyps.

Contrary to this result also **Baraka *et al*.** [8] explained that all acoustic parameters (jitter, shimmer, NHR), modified GRBAS scale and MPT showed highly significant changes after steroid injection.

Some individuals developed a white plaque on the injected vocal fold, as was seen. The chalky substance in the triamcinolone solution is thought to be the cause of the triamcinolone plaque. In most cases, these white plaques would disappear on their own after a month or two, and they did not influence the vibrating of the vocal folds. Changing from triamcinolone to dexamethasone may help stop the formation of these plaques. The dexamethasone solution does not leave any residual deposits and is clear.

Our study was a prospective randomized study comparing the LMS versus the LMS and steroid injection in the management of MAPLs.

We had good voice assessment by subjective evaluation via modified GRBAS scale, Objective evaluation by acoustic parameter" shimmer%, NHR, and jitter%, aerodynamically by (MPT). But the research had a variety of limitations involving the relatively small sample size. The study was in a single center. The follow-up of patients was limited to a relatively short period and video-stroboscopy was not used.

CONCLUSIONS

Steroid injection with laryngeal microsurgery for the treatment of minimal associated pathological lesions may not cause a significant improvement in short-term assessment as regards the modified GRBAS scale, acoustic analysis, and aerodynamic measures over laryngeal microsurgery.

DECLARATIONS

- **Consent for Publication:** I confirm that all authors accept the manuscript for submission
- **Availability of data and material:** Available
- **Competing interests:** None
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- **Conflicts of Interest:** The authors declare no conflicts of interest regarding the publication of this paper.

REFERENCES

1. **Kotby M, Barakah M, Abou El Ella M *et al*. (2016):** Introduction to vocology. Clinical Vocology (Volume I), a publication of the Egyptian Society of Phoniatrics and Logopedics: El Hariry Print, Cairo, Egypt, 29-76.
2. **Abdelgelil A, Dawood Y, Ibraheem M (2018):** Transnasal endoscopic steroid injection for the treatment of vocal fold polyps (a noninvasive technique). Al-Azhar Assiut Medical Journal, 16:241.
3. **Shin Y, Chang J, Yang S *et al*. (2013):** Persistent dysphonia after laryngomicrosurgery for benign vocal fold disease. Clin Exp Otorhinolaryngol., 6:166-70.
4. **Cho J, Kim S, Joo Y *et al*. (2017):** Efficacy and Safety of Adjunctive Steroid Injection After Microsurgical Removal of Benign Vocal Fold Lesions. J Voice, 31:615-20.
5. **Wang C, Lai M, Liao L *et al*. (2013):** Transnasal endoscopic steroid injection: a practical and effective alternative treatment for benign vocal fold disorders. Laryngoscope, 123:1464-8.
6. **Campagnolo A, Tsuji D, Sennes L *et al*. (2010):** Histologic study of acute vocal fold wound healing after corticosteroid injection in a rabbit model. Ann Otol Rhinol Laryngol., 119:133-9.
7. **Altman K (2007):** Vocal fold masses. Otolaryngol Clin North Am., 40:1091-108, viii.
8. **Baraka M, Behairy E, El Desouky H *et al*. (2021):** Office-Based Steroid Injection in Benign Vocal Fold Lesions. Egyptian Journal of Ear, Nose, Throat and Allied Sciences, 22:1-9.
9. **Hsu Y, Liao L, Huang T *et al*. (2019):** Assessment of Patient Outcomes after Adjuvant Vocal Fold Steroid Injection for Fibrosis After Microlaryngeal Surgery. JAMA Otolaryngol Head Neck Surg., 145:811-6