

Role Of Thyroplasty In The Management Of Sulcus Vocalis

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Abstract

In this study, thyroplasty results of 6 patients were discussed from two different perspectives; from the patients' point of view and according to computerized voice analysis outcomes.

Material and Method:

Subjects were aged between 18 and 34 years old (mean age was 26). They were operated between October 2002 and June 2004. The mean follow-up time was 14,8 months. The voice evaluations were performed 1 week before and 2 months after the surgery. None of the patients had voice therapy before the voice evaluation in the postoperative period.

There is a statistically significant difference in VHI scores ($p=0,002$) postoperatively. The difference in DSI scores ($p=0,810$) scores is insignificant.

In our study, there is a subjective instead of objective improvement in voice postoperatively. In the evaluation of voice patients, success should be based not only to the acoustic (computerized) analysis, but also to the subjective measurements of any kind.

INTRODUCTION

The term sulcus vocalis has been applied to a spectrum of disorders ranging from minor vocal fold indentations to destructive lesions causing severe dysphonia (1). There is a groove of mucosa along the surface of the vocal fold(s) which is giving it a retracted appearance. Videostroboscopy reveals an area of decreased mucosal wave corresponding to the sulcus and more clearly demonstrates the associated incomplete closure.

The symptoms of the patients with sulcus vocalis are hoarseness, vocal fatigue, voice weakness, and increased effort, which are mostly the signs of glottal insufficiency. The voice is hoarse and breathy, vocal performance is decreased.

Sulcus vocalis may be congenital or secondary to vocal trauma, infection, degeneration of benign lesions, or surgery.

Treatment of sulcus vocalis needs to achieve anatomical and functional improvements that satisfy the behavior of the larynx and vocal quality (2). There is no consensus in the treatment of sulcus vocalis. Though some authors advise the voice therapy techniques, most of the authors prefer surgical management with/without voice therapy. It is our belief that only voice therapy will not fulfill the requirements needed to therapy the symptoms of sulcus vocalis. But, before

considering surgery, any concomitant condition such as reflux laryngitis affecting the voice is treated and abusive behaviors in voice are reduced to maximize the benefits of surgery. Afterwards, patients with sulcus vocalis are scheduled for surgery in our clinic. The voice therapy is performed in cases only, where the surgical results were unsatisfactory.

In this study, thyroplasty results of 6 patients with sulcus vocalis were discussed.

MATERIAL AND METHOD

6 patients, aged between 18 and 34 years old (mean age was 26), were included to the study. They were operated between October 2002 and June 2004. The mean follow-up time was 14,8 months. The voice evaluations were performed 1 week before and 2 months after the surgery. None of the patients had voice therapy before the voice evaluation in the postoperative period.

VIDEOLARYNGOSCOPY

The diagnosis of sulcus vocalis was established by videolaryngoscopy using a 70° rigid scope (Karl Storz, Tuttlingen, Germany).

RBH (AUDITIVE ANALYSIS)

Roughness(R), breathiness(B), and hoarseness(H) were

estimated by the author with the patients reading a passage from the turkish text “Kasagi” by Omer Seyfettin, as recommended by Nawka et al. (3). These parameters are estimated as 0 = normal or absent deviance, 1 = slight deviance, 2 = moderate deviance, 3 = severe deviance.

ACOUSTIC ANALYSIS

Analysis of jitter (%) allows the relative evaluation of the period-to-period variability of the pitch within the analyzed voice sample. These parameter were analyzed on a sustained /a:/ using the Multi Dimensional Voice Program (MDVP) with the Computerized Speech Lab CSL 4300B (Kay Elemetrics Ltd., Lincoln Park, NJ, USA).

VOICE RANGE PROFILE (VRP)

Voice range profile identifies the minimal I(low) and maximal amplitude and the lowest and highest frequency F0(high) of the voice range. Measured with Computerized Speech Lab CSL 4300B (Kay Elemetrics Ltd., Lincoln Park, NJ, USA)

MAXIMUM PHONATION TIME (MPT)

MPT is the simplest aerodynamic parameter of phonation in seconds. This parameter was measured on a sustained /a:/ after full inspiration in a comfortable loudness (4).

DISPHONIA SEVERITY INDEX (DSI)

In assessing the dysphonia severity, the formula $[DSI = 0.13 \times MPT + 0.0053 \times F0(\text{high}) - 0.26 \times I(\text{low}) - 1.18 \times \text{jitter}(\%) + 12.4]$ is used (5).

VOICE HANDICAP INDEX (VHI)

The patients were instructed that, these statements are that many people have used to describe their voices and the effects of their voices on their lives. The patients marked the response that indicates how frequently they have the same experience.

0=Never 1=Almost Never 2= Sometimes 3=Almost Always 4=Always.

0 to 30= This is a low score and indicates that there most likely is a minimal amount of handicap associated with the voice disorder.

31 to 60= Denotes a moderate amount of handicap due to the voice problem.

60 to 120= This score represents a significant and serious amount of handicap due to a voice problem (6).

These examinations were performed as recommended by the Union of European Phoniaticians (UEP) (7). Statistical analysis was performed using paired sample T-Test.

RESULTS

Table 1 shows the voice evaluation scores of the patients pre- and postoperatively. There is a statistically significant difference in VHI scores ($p=0,002$) postoperatively. The difference in DSI scores ($p=0,810$) scores is insignificant.

Figure 1

Table 1: The surgeries performed and voice analysis data of the study group pre- and post-operatively.

Patient number	age	sex	surgery	R	B	H	Jitter	F ₀ High (Hz)	I Low (dB)	MPT (sec)	DSI	VHI
1 (pre-op)	18	F	thyroplasty type 1+3	3	1	3	2,70	466	50	13	0,5	92
1 (post-op)				3	1	3	2,98	445	46	16	0,9	72
2 (pre-op)	21	m	thyroplasty type 1	2	2	2	0,58	262	48	13	2,4	94
2 (post-op)				2	1	2	0,98	255	55	14	0,2	67
3 (pre-op)	34	m	thyroplasty type 1	2	2	2	1,32	587	56	11	0,9	47
3 (post-op)				2	1	2	1,44	602	50	14	2,8	27
4 (pre-op)	32	m	thyroplasty type 1	2	2	2	0,528	415	58	11	0,4	40
4 (post-op)				2	2	2	0,402	449	55	14	1,9	28
5 (pre-op)	26	m	thyroplasty type 1	2	0	2	8,91	660	52	24	-4,9	39
5 (post-op)				2	0	2	6,44	643	60	22	-4,4	25
6 (pre-op)	29	m	thyroplasty type 1	2	2	2	5,587	440	54	10	-4,5	98
6 (post-op)				2	1	2	4,112	469	55	14	-2,3	60

DISCUSSION

A clinically useful classification for sulcus vocalis are: type 1 is a physiologic variant accentuated by atrophy but with intact lamina propria; types 2 (sulcus vergeture) and 3 (sulcus vocalis) are characterized by severe dysphonia, loss of vibratory activity, and destruction of the functional superficial lamina propria (8).

Incidence of sulcus vocalis is not known. In a study of autopsy specimens by Nakayama et al. sulci were identified in 20% of specimens (9). Most sulci are undiagnosed because of subclinical symptoms (type 1), lack of clinician awareness, and difficulty in identification due to limited availability of laryngoscopy.

As a rule of thumb, anatomic changes in the vocal folds are difficult or impossible to treat with medication alone. In the management of sulcus vocalis, any concomitant condition such as reflux laryngitis affecting the voice should be evaluated and treated. Misuse and/or abusive behaviors in voice should be treated or at least reduced before considering a surgical therapy to maximize the benefits of

surgery.

Voice therapy is focused to improve phonatory technique and vocal hygiene. The primary goal of voice therapy is to improve vocal efficiency.

Medialization of the affected cord through thyroplasty or vocal fold augmentation techniques,

or restoring the sliding motion of the affected mucosal cover are the goals of surgical therapy (^{10,11,12}). In addition; through thyroplasty type 3, the tension in the vocal cord could also be reduced. In one of our patients, thyroplasty type 1 to the effected cord and type 3 to the other vocal cord were both applied to her, but the results were indifferent from those whom only the thyroplasty type 1 was applied.

Medialization laryngoplasty may be effective in patients in whom arytenoid mobility is good but the cord is thin, lateralized, fibrotic, and adynamic. Benninger et al. recommended medialization for glottic gaps of at least 1.5 mm. This procedure may be combined with lipoinjection in an attempt to reestablish the mucosal wave (¹⁰).

Autologous fat probably is the best augmentation material currently in use. More forgiving placement of autologous fat within the larger muscle bed is possible, and longevity has improved through development of viable adipocytes. Archer et al. demonstrated maintenance of viable adipocytes and bulk for up to 1 year in an animal model (¹³).

Strap muscles can also be used to medialize the vocal cord. Su et al. reported that medialization laryngoplasty with strap muscle transposition is a safe, and effective technique for correcting glottic incompetence caused by sulcus vocalis (¹⁴). Fat injection and fascia transplantation alone have also been used to treat patients with sulcus vocalis, the results were satisfactory (¹⁵).

However, after thyroplasty or vocal fold augmentation, voice quality is not improved because the sulcus has not been directly addressed, but since the vocal efficiency was improved and the effort for phonation is reduced, the patients are able to speak louder, more understandable and they did not feel any voice fatigue. The statistically significant difference in VHI scores of our patients is a proof of it.

Studies by Ford et al and Pontes and Behlau used microsurgical techniques on 30 patients with pathologic sulcus (^{16,17}). Both studies, based on objective measures,

reported voice improvement in most patients. Sataloff et al. described voice improvement and limited return of mucosal wave using fat implantation methods (¹⁸). Most patients can expect significant voice improvement from either technique, but improvement is not equal to premorbid conditions in most individuals. In addition, insufficient data are available on the longevity of the improvement.

In our study, the post-operative improvement is subjective rather than objective. DSI scores were the same as the preoperative ones. We believe that surgery of any kind mentioned above is unfortunately unable to return the patients' voice to normal levels. The glottic gap can be closed through surgery but since the mucosal wave will stop where the sulcus resides, there will not be a clear voice either. However, from the patients' point of view, that is VHI, though voice is not a clear voice, but it is satisfactory. Surgery resulted in diminished voice fatigue, elaborated breathiness, voice weakness, and increased effort (There is not a gap postoperatively and subglottic pressure can be now established). The importance of this study comes from evaluating the surgical results also from the patients' perspective. If this study was done without measuring VHI scores (patients' point of view), it could be said, that thyroplasty alone is ineffective in sulcus vocalis management.

CONCLUSION

In the surgical management of sulcus vocalis, thyroplasty can be performed with patient satisfaction. But more important, especially in the evaluation of voice patients, success should be based not only to the acoustic (computerized) analysis, but also to the subjective measurements, such as voice handicap index.

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