Does Tonsillectomy Affect Voice in Early or Late Postoperative Periods in Adults?

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Summary: Objective. The aim of our study was to investigate the short- and long-term effects of tonsillectomy on voice performance in adults.
Study design. Prospective cohort study.
Materials and methods. This study was conducted between January 2013 and June 2015. A total of 26 adults who had tonsillectomy due to chronic tonsillitis or recurrent acute tonsillitis were included in the study. The voice performances of the participants were analyzed with objective and subjective methods before surgery, and 1 and 3 months after surgery. An acoustic voice analysis (fundamental frequency [F0], jitter %, shimmer %) was performed for objective analysis, and Voice Handicap Index survey was used for subjective analysis of the voice. Preoperative F0, jitter %, shimmer %, and Voice Handicap Index values were compared with the values obtained 1 and 3 months after surgery.
Results. Impairment of voice performance was determined when preoperative and postoperative first month F0, jitter %, and shimmer % values were compared. Three months after surgery, those values were found similar to the preoperative values.
Conclusion. Tonsillectomy affects voice performance negatively in adults in short term; however, it does not affect voice performance in long term after surgery.
Key Words: tonsillectomy–voice–long term–short term–acoustic.

INTRODUCTION

Tonsillectomy is performed because of infectious factors such as recurrent acute tonsillitis, chronic tonsillitis, and peritonsillar abscess, as well as airway obstruction related to hypertrophy of the tonsils, asymmetrical tonsillar hypertrophy, and tumors of the tonsils. Tonsillectomy is one of the most frequently performed surgical procedures in childhood, and it is also performed in the adults.[1] Pain, bleeding, dehydration, and wound infection are some complications of tonsillectomy. The complication rate of tonsillectomy has been reported as 20% in adults. Healing period may last longer because of complications.[2]

Activator, vibratory, resonator, and articular organs must act in harmony with the central nervous system for production of voice and speech. Voice is mainly produced in the larynx and gains its acoustic characteristics in the vocal tract. Oral cavity, lips, soft palate, and tongue are quite important for resonance and articulation.[3] Palatine tonsils, which are components of the oral cavity, affect voice and speech. This effect is supposed to appear in two ways. In the first one, it was suggested that palatine tonsils affect the quality of the resonance in vocal tract by a mass effect.[4] Secondly, palatine tonsils may affect nasal resonance together with articulation owing to their natural tissue characteristics.[5] It may be supposed that tonsillectomy would affect voice because of localization and characteristics of the palatine tonsils. The trauma and edema due to mouth gag used during tonsillectomy, the trauma and edema of the surgical procedure in the oropharynx, healing tissue and scar in the area of tonsillectomy, and widening of the airway after removal of the palatine tonsils were supposed to affect voice.

Some studies in the current English literature investigated the effects of tonsillectomy on the voice performance in adults. Those studies compared preoperative and postoperative short-term objective and subjective voice parameters.[6,7] In our study, we compared preoperative objective and subjective voice parameters with the parameters obtained 1 and 3 months after surgery. Our study is unique in this aspect.

MATERIALS AND METHODS

This study was conducted between January 2013 and June 2015, and the study protocol was approved by the local Ethics Committee before starting the study. A total of 26 patients who had tonsillectomy because of chronic tonsillitis or recurrent acute tonsillitis were included in the study. The surgical technique included cold knife tonsillectomy under general anesthesia, in all patients.

The participants were questioned for the presence of hoarseness and speech disorders, and the ones with those disorders were not included in the study. All participants were asked to complete the Voice Handicap Index (VHI-30), which is a 30-item questionnaire regarding the effect of the voice on physical, emotional, and physiological aspects of life. This questionnaire contains 10 questions in three subscales and consists of 30 questions in total. Later, all subjects had detailed examinations of oral cavity, oropharynx, nasal cavity, and larynx. The ones with active infection and/or any pathological findings on physical examination were not included in the study. The patients with normal physical examination findings had acoustic voice analysis. The acoustic voice analysis included fundamental frequency (F0), jitter %, and shimmer %. The patients completed VHI-30 questionnaire, and had acoustic voice analysis 1 and 3 months after surgery.

Accepted for publication November 30, 2015.
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Journal of Voice, Vol. 31, No. 1, pp. 131.e5–131.e8
0892-1997

http://dx.doi.org/10.1016/j.jvoice.2015.11.023

VHI-30

VHI-30 is a 30-item questionnaire used for subjective analysis of the voice. Every item is scored on a five-point scale (0–4). Total score may be between 0 and 120. A higher score indicates a more severe subjective voice disorder.

Acoustic voice analysis

All participants had acoustic voice analysis. XION Medical (Berlin, Germany) *DiVAS 2.5* digital video archiving and analysis software was used for acoustic voice analysis. The subjects sat comfortably with their mouths 30 cm away from the USB Audio CODEC microphone (Royal Philips Electronics, Amsterdam, Netherlands), connected to the preamplifier. They were asked to talk normally for 5 seconds and say "a" in normal voice tone. After 10-minute rest, a second acoustic analysis was performed. A third acoustic analysis was done after 20-minute rest. We did not perform acoustic voice analysis one after another; the patient rested between the measurements. We suppose that a longer resting period is needed after second voice analysis record, and the third voice analysis would give more accurate results. Three acoustic voice samples were saved on the computer using Creative Labs SB0240 Audigy 2 Platinum 6.1 sound card (Creative, Milpitas, California, USA) and *Dr. Speech v.4* program (Tiger Electronics, Seattle, WA, USA), which runs on Windows XP operating system. F0, jitter %, and shimmer % were measured on acoustic analysis. The means of three measurements were recorded.

In our study, we compared preoperative F0, jitter %, shimmer %, and VHI scores with the data obtained 1 and 3 months after surgery. In addition, postoperative first and third month data were compared.

Statistical analysis

SPSS Statistics 21.0 (SPSS Inc., Chicago, IL, USA) statistical software package was used for statistical analysis. Continuous variables were presented as mean ± standard deviation. Categorical variables were presented as number (n) and percent (%). Analysis of normally distributed continuous variables was done using Student *t* test. Mann-Whitney *U* test was used if continuous variables were not distributed normally. $P < 0.05$ was considered as statistically significant.

TABLE 1.
The Characteristics of the Patients

Men (n)	16
Women (n)	10
Age (years)	28.07 ± 6.69

RESULTS

Of 26 patients included in the study, 16 patients (61.5%) were men and 10 (39.5%) of them were women. The mean age of the participants was 28.07 ± 6.69 (range 19–44) years (Table 1).

Acoustic voice analysis was performed for objective analysis of voice, and F0, jitter %, and shimmer % were measured. Mean preoperative F0 was 191.73 ± 54.97 Hz, whereas mean F0 measured 1 and 3 months after tonsillectomy were 179.07 ± 50.09 Hz and 191.57 ± 58.17 Hz, respectively. Postoperative first month F0 was significantly lower than the preoperative value ($P < 0.001$); however, the difference between preoperative and postoperative third month F0 values was not significant ($P = 0.907$). F0 measured 3 months after tonsillectomy was significantly higher compared with the F0 measured 1 month after surgery ($P < 0.001$). It was evident that F0 deteriorated after tonsillectomy in short term, whereas it improved in the long term (Table 2). It was also evident that postoperative long-term mean F0 was not significantly different from the preoperative F0 value (Table 2).

Preoperative, postoperative first month, and postoperative third month mean jitter % were 0.59 ± 0.42, 0.72 ± 0.34, and 0.58 ± 0.42, respectively. Voice analysis performed 1 month after tonsillectomy showed a significantly higher jitter % compared with preoperative value ($P < 0.001$). However, mean preoperative and postoperative third month jitter % values were similar ($P = 0.701$). Mean jitter % measured 3 months after tonsillectomy was significantly smaller when compared with the value measured 1 month after surgery ($P < 0.001$). It was seen that jitter % deteriorated in the early postoperative period; however, it improved in the long term (Table 2). It was also evident that preoperative and postoperative third month mean jitter % values were similar (Table 2).

Preoperative mean shimmer % was 0.77 ± 0.51. This value was found as 0.87 ± 0.41 1 month after surgery, and as 0.75 ± 0.49 3 months after surgery. Mean shimmer % obtained on the voice analysis performed 1 month after tonsillectomy was significantly

TABLE 2.
Statistical Comparison of Preoperative Data and the Data Obtained 1 Month and 3 Months After Tonsillectomy

	Preop	Early Postop (1 Month)	Late Postop (3 Months)	*P* Value (Preop-early Postop)	*P* Value (Preop-late Postop)	*P* Value (Early Postop-late Postop)
F0	191.73 ± 54.97	179.07 ± 50.09	191.57 ± 58.17	**<0.001**	0.907	**<0.001**
Jitter %	0.59 ± 0.42	0.72 ± 0.38	0.58 ± 0.42	**<0.001**	0.701	**<0.001**
Shimmer %	0.77 ± 0.51	0.87 ± 0.41	0.75 ± 0.49	**0.005**	0.314	**0.002**
VHI-30	1.96 ± 2.23	2.53 ± 2.19	1.73 ± 2.27	**0.022**	0.161	**0.006**

Notes: bold formatting is $p < 0.05$.
Abbreviations: Postop, Postoperative; Preop, Preoperative.