



Respiratory functions after partial laryngectomy surgery

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ABSTRACT

Aim: Larynx cancers are among the smoking-related cancers frequently encountered at the head and neck area. Partial surgeries have been preferred in the early-stage larynx cancers during the recent years. Even though partial surgeries are advantageous in terms of protection of the breathing, swallowing, and voice functions, studies regarding the change in the postoperative respiratory functions are not sufficient. Our objective in this study is the scrutiny of the change in the respiratory functions subsequent to various partial surgeries.

Materials and methods: Patients who had 34 (10 cordectomy, 7 frontolateral, 9 supraglottic, 8 supracricoid laryngectomy) partial laryngectomy operations and 30 healthy control patients were included in our study. The patients were subject to respiratory function test in the postoperative period and their FEV1, FVC, FEV1/FVC and FEF25–75 values were examined. Data were compared with the healthy control group.

Results: Lower FEF25–75 value ($p < 0,05$) was observed in the supracricoid laryngectomy patients compared to the control group. In three patients of the supracricoid laryngectomy group, various degrees of restrictive and obstructive findings were observed in the respiratory function test. The least respiratory function change was observed in patients with cordectomy.

Conclusions: In our study, various degrees of restrictive and/or obstructive findings were observed in the respiratory functions after partial surgeries. It was determined that such findings increased as long as the amount of the removed larynx tissue increased. We recommend that patients undergo a respiratory function test after partial laryngectomy and treated according to the findings as restrictive and obstructive findings affect patients' survival.

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1. Introduction

Larynx cancers constitute 30% of all head and neck cancers [1]. Hence, larynx cancers are the most significant oncologic diseases of the head and neck area.

Today, larynx cancers can be diagnosed earlier, thanks to the increase of endoscopy in physical examination and to the fact that patients have become more conscious. In the treatment of early-stage larynx cancers, treatment methods that can protect the larynx physiology and function can be utilized. These methods are radiotherapy, partial laryngectomy, or a combination of both.

In cases where partial laryngectomies are possible, the larynx physiology and functions are provided by the larynx that is regenerated during the surgery. In early-stage larynx cancers, local control of the disease with partial laryngectomy is at least as effective as total laryngectomy [2]. Subsequent to partial laryngectomy, patients are able to speak, do not need a permanent tracheotomy, and

do not distance from the social and economic life in contrast to total laryngectomy. However, in making the decision of operating the patients, respiratory reserve must be good, and it is not known how such reserve changes during the postoperative period.

In this study, the objective is the evaluation of the changes in the respiratory function of patients, who had a partial laryngectomy operation in our clinic, during the postoperative period, through objective methods.

2. Materials and methods

This study on the changes in the respiratory function of patients subject to partial laryngectomy was conducted after receiving the approval of the ethical committee of the hospital (with the date 06.05.2014 and number 89513307/1009/273). Thirty-four male patients with the diagnosis of larynx carcinoma, to whom partial laryngectomy was done under general anesthesia between the years of 2008 and 2014, in our clinic, and randomly selected 30 healthy male volunteering patients from the same age group, as a control group, were included in the study. The study was designed as cross sectional, single-centered and controlled. No relapse or other pathology was observed in the routine follow-ups and controls of the

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partial laryngectomy patients included in the study. Patients with the background of recurrence and radiotherapy were not included in the study. All patients were decannulated and continuing their normal life. All patients are ex-smokers and none of them have allergy and occupational exposure of lung disease history.

Among the 34 patients subject to partial laryngectomy due to larynx carcinoma, with an average of 58,38 years of age (40–75 years), included in the study, surgeries of cordectomy were given to 10 patients, frontolateral to 7 patients, supraglottic to 9 patients, and supracricoid partial laryngectomy to 8 patients.

The control group was composed of 30 healthy male individuals between the ages of 22 and 65, without any complaint and without any infection and pathology during the ear, nose, and throat examination. Additionally none of the control group have occupational disease, allergy, chronic lung disease and tobacco usage.

2.1. Aerodynamic evaluation

For every patient, maximum phonation time (MPT) was calculated by measuring on the basis of seconds for an aerodynamic evaluation. MPT was measured 3 times for each patient and the highest value was recorded. Patients were asked to conduct maximum inspiration for such a measurement. Subsequently, they were asked to give the sound of /a:/ comfortably in the speaking frequency and recorded.

2.2. Respiratory function test

Every patient underwent a respiratory function test (RFT) prior to examination. FEV1, FVC, FEV1/FVC% and FEF25–75 ratios were calculated. The patients' RFT values were evaluated in terms of being obstructive and restrictive.

For a statistical analysis, SPSS 15.0 program was utilized. To determine whether there is a statistical difference between the partial laryngectomy subgroups and control group, a Mann-Whitney-U test was done. To determine whether the parameters between the groups are consistent with each other, Pearson and Spearman correlations were done.

3. Results

Thirty-four male patients to whom partial laryngectomy operation was done and 30 randomly selected healthy male volunteers were included in the study. Patients were scrutinized in 4 groups as cordectomy, frontolateral laryngectomy, supraglottic laryngectomy and supracricoid laryngectomy.

The patients who had partial laryngectomy were entirely male patients with an average of 58,38 years of age (40–75 years). The patients were monitored in our clinic for an average of 29,38 months (6–70 months). The control group age average was 35. Changes of the demographic findings and respiratory function test results between the groups are shown in Table 1. The tumor stage of the patients can be seen in Table 2.

Among the partial laryngectomy group, no statistically significant difference in terms of respiratory function test parameters was

Table 2

Tumor stage of the patient groups before partial laryngectomy surgery.

Tumor stage	Cordectomy (n = 10)	Frontolateral (n = 7)	Supraglottic (n = 9)	Supracricoid (n = 8)
T1	10	2	6	0
T2	0	5	3	8

observed ($p > 0,05$). However, in patients who underwent supracricoid laryngectomy, low levels in the FEF25–75 value were observed to a statistically significant extent when compared with the control group ($p < 0,05$). In addition, all in the partial laryngectomy group have lower maximum phonation time than the control group in statistically significant levels ($p < 0,05$).

In 40% of the patients with cordectomy, deterioration was determined in the respiratory function test. A slight obstruction was determined in one of the 4 patients with cordectomy with FEV1/FEVC and FEF 25–75% values, moderate obstruction in one another, and moderate obstruction and slight restriction in the remaining two. It was also determined that MPT reduced in these patients to 10 and 8 secs. It was elaborated that such values were in relation with the obstruction and restriction findings in the respiratory tracts.

Among the patients who had frontolateral laryngectomy, pathology at the RFT was determined in 57,1% of them. Mild level of obstruction was determined in two patients and moderate obstruction in two others. The MPTs of the 2 patients with mild obstruction were measured as 20 and 5 secs, while the MPTs of the patients with moderate obstruction were determined as 13 and 20 secs respectively.

In 44.4% of patients having supraglottic laryngectomy deterioration was determined in the RFT values. Severe obstruction and moderate restriction in 1 patient and severe obstruction and mild restriction in 1 patient, mild obstruction and mild restriction in 1 patient, and mild obstruction in 1 patient were observed. In patients with severe obstruction and mild restriction, MPT was determined to be 11 secs. In patients with severe obstruction and moderate restriction, MPT was found to be 12 secs. In two patients with mild obstruction, MPT values were found to be 18 and 22 secs.

In 75% of 8 patients having supracricoid laryngectomy, pathology was determined in their RFT values. Mild obstruction was determined in four patients and severe obstruction was observed in two patients.

4. Discussion

Larynx cancers are among the frequently encountered and smoking-related head and neck cancers. Presently, conservative surgeries can be done as they are captured during the early stages. According to the larynx cancer location and stage, various partial laryngectomy methods are done in the treatment. Cordectomy, frontolateral, supraglottic, and supracricoid laryngectomy are the most frequently used surgical methods.

In selecting partial surgeries, the patients must have sufficient lung reserve. As majority of the patients are smokers, various

Table 1

Mean, minimum, and maximum values of the respiratory function tests and age belonging to the partial laryngectomy group and control group.

	Cordectomy (n = 10)	Frontolateral (n = 7)	Supraglottic (n = 9)	Supracricoid (n = 8)	Healthy control (n = 30)
Age (years) mean (min, max)	63,4 (54–72)	57,1 (45–75)	52 (40–65)	61,2 (45–69)	35 (22–65)
MPT (sec) mean (min, max)	17,1 (8–31)	15,4 (5–21)	15,8 (11–22)	12,25 (10–15)	28 (20–36)
FEV1 (%) mean (min, max)	93,8 (63–112)	97,7 (72–128)	95,2 (44–140)	90,25 (80–102)	105 (80–145)
FVC (%) mean (min, max)	100 (32–117)	103,7 (81–129)	106,8 (61–147)	100,7 (93–117)	104 (75–140)
FEV1/FVC (Tiffeneau index) mean (min, max)	73,1 (64–81)	72,8 (61–80)	69,3 (44–80)	71 (65–81)	104 (80–130)
FEF25–75 mean (min, max)	70,8 (42–107)	90,2 (42–161)	70,4 (20–119)	56 (35–81)	95 (80–120)

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