

Larynx cancer treatment results: survive and quality of life assessment

Larenks kanseri tedavi sonuçları: Sağkalım ve yaşam kalitesi değerlendirilmesi

Davut Akduman, M.D.,¹ Murat Karaman, M.D.,¹ Celil Uslu, M.D.,² Ömer Bilaç, M.D.,² Özlem Türk, M.D.,²
Mahmut Deniz, M.D.,² Ruhi Durmuş, M.D.²

¹Department of Otolaryngology, Ümraniye Training and Research Hospital, İstanbul, Turkey

²Department of Otolaryngology, Haydarpaşa Numune Training and Research Hospital, İstanbul, Turkey

Objectives: To make a contribution to the treatment modality of larynx cancer, we evaluated our surgical outcomes of the patients with larynx cancer and their quality of life in the postoperative period.

Patients and Methods: Forty-three patients (38 males, 5 females; mean age 57.6 years; range 34 to 84 years) with larynx cancer were included in this retrospective clinical study. Total laryngectomy/near total laryngectomy (TL/NTL) was performed in 29 patients, supracricoid laryngectomy in 13 patients and supraglottic laryngectomy in one patient. Neck dissection performed in 39 patients. Two patients had preoperative and eleven patients had postoperative radiotherapy (RT). The patients were evaluated with respect to age, sex, smoking, alcohol consumption, localization-differentiation-stage of the tumor, surgery and RT, postoperative complications and survival. QLQ-C30 and QLQ-H and N35 questionnaires were used and the results of 26 patients who were alive and filled in the questionnaires themselves were evaluated.

Results: The most frequent postoperative complication was pharyngocutaneous fistula (41.3%), which occurred only in TL/NTL patients. Mean postoperative hospitalization time was 21.2 days. Laryngeal preservation, peristomal recurrence and locoregional recurrence rates were 64.3%, 6.9% and 9.3% respectively. Overall survival rate was 88.8%. Mean survival time was 62.4 months. In quality of life assessment, speech problem ($p<0.01$) and cough index ($p<0.05$) were significantly higher in TL/NTL group than SCL group ($p<0.05$). There were no significant difference in both groups with respect to RT ($p>0.05$).

Conclusion: Our surgical outcomes are compatible with the previous studies. Although the larynx preservation had a positive effect on the speech, it did not affect other quality of life parameters. In addition, having a permanent tracheostomy increased cough index markedly. We emphasize that multi-institutional prospective quality of life studies comparing different treatment methods for similar stage tumors are essential in defining the optimal management strategy in patients with larynx cancer.

Key Words: Laryngectomy; larynx cancer; quality of life.

Amaç: Larenks kanserlerinin tedavi yaklaşımına katkıda bulunmak için larenks kanseri cerrahi sonuçlarımız ve hastaların ameliyat sonrası yaşam kaliteleri değerlendirildi.

Hastalar ve Yöntemler: Geriye dönük yapılan bu klinik çalışmaya 43 larenks kanserli hasta (38 erkek, 5 kadın; ort. yaş 57.6 yıl; dağılım 34-84 yıl) dahil edildi. Hastaların 29'una total larenjektomi/near total larenjektomi (TL/NTL), 13'üne suprakrikoid larenjektomi (SKL) ve bir hastaya da supraglottik larenjektomi uygulandı. Otuz dokuz hastaya boyun diseksiyonu uygulandı. İki hastaya ameliyat öncesi, 11 hastaya ameliyat sonrası, radyoterapi (RT) uygulandı. Hastalar yaş, cinsiyet, sigara-alkol kullanımı, tümörün yerleşimi-histopatolojisi-evresi, cerrahi ve RT, ameliyat sonrası komplikasyonlar ve sağkalım açısından değerlendirildi. Değerlendirmede yaşam kalitesi QLQ-C30 ve QLQ-H ve N35 anketleri kullanıldı, hayatta olan ve anketleri kendi dolduran 26 hastanın formu değerlendirildi.

Bulgular: Ameliyat sonrası komplikasyon olarak en sık görülen farengokütanöz fistül (%41.3), sadece TL/NTL hastalarında gelişti. Ameliyat sonrası hastanede kalış süresi ortalama 21.2 gün idi. Larenks koruma, peristomal nüks ve lokal nüks oranları sırasıyla %64.3, %6.9 ve %9.3 olarak saptandı. Genel sağkalım oranı %88.8 ve ortalama sağkalım süresi ise 62.4 ay olarak bulundu. Yaşam kalitesinin değerlendirmesinde, konuşma sorunları ($p<0.01$) ve öksürme indeksi ($p<0.05$) TL/NTL grubunda SKL grubuna göre anlamlı düzeyde yüksek bulundu. İki grup arasında RT'ye bağlı değişiklik anlamlı bulunmadı ($p>0.05$).

Sonuç: Cerrahi sonuçlarımız önceki çalışmalarla uyumlu bulundu. Larenksin korunması, konuşmayı olumlu etkilemekle birlikte, diğer yaşam kalitesi parametrelerinde değişikliğe neden olmadı. Ayrıca kalıcı trakeostomi öksürüğü belirgin olarak artırdı. Larenks kanserlerinde en iyi tedavi stratejisini belirlemek için; aynı evreli olgulara uygulanan farklı tedavi yöntemlerinin, yaşam kaliteleriyle karşılaştırıldığı çok merkezli çalışmalar gerekmektedir.

Anahtar Sözcükler: Larenjektomi; larenks kanseri; yaşam kalitesi.

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Correspondence / İletişim adresi: Davut Akduman, M.D. Bursa Yüksek İhtisas Eğitim ve Araştırma Hastanesi, Kulak Burun Boğaz Hastalıkları Kliniği, 16330 Yıldırım, Bursa, Turkey.

Tel: +90 224 - 360 50 50 Fax (Faks): +90 224 - 360 50 55 e-mail (e-posta): dr.akduman@gmail.com

In total of the cancer cases of the head and neck accrued by the National Cancer Data Base between 1985 and 1995 years, larynx was the most common site accounting for more than 20% of all head and neck cancers.^[1] The larynx cancer is 2-3% and 0.4% of all cancers for men and women respectively.^[1,2]

Quality of life (QoL) is defined as satisfaction and well-being that a patient experiences on a daily basis.^[3] Since 1948, when the World Health Organization defined health as "an individual's perception of their position in life, in the context of the culture and values systems in their life, and in relation to their goals, expectations, standards, and concerns"^[4] QoL studies became steadily more important in health care practice and researches. The first researches on QoL were conducted in 1973, and the number of studies is increasing foremost the cost-efficiency analysis of new treatments and programmes.^[5,6]

We intended to manifest the patient and tumor characteristics, the surgical outcomes, and the survival analysis of the patients who were treated for larynx cancer with surgery and, if necessary, with additional radiotherapy (RT) in our institute. Another objective of this study is to reveal the effect of permanent tracheostomy (PT) and postoperative RT on QoL, and to contribute the treatment method selection for larynx cancer. We used QLQ-C30 Version 3.0 (Quality of Life Questionnaire, Core 30) and QLQ-H and N35 (Quality of Life Questionnaire for Head and Neck Cancer) questionnaires, developed by the European Organization for Research and Treatment of Cancer (EORTC) to assess the health related QoL of cancer patients in our study.^[7,8]

PATIENTS AND METHODS

This study was conducted with 43 patients (38 males, 5 females; mean age 57.6 years; range 34 to 84 years), who had laryngectomy and when required neck dissections, and received postoperative RT for larynx cancer between February 2002 - October 2006 at our institute.

Total laryngectomy and near-total laryngectomy (TL/NTL) were performed to selected stage III and stage IV patients, while cricothyroidopexy (CHP), and cricothyroidoepiglottopexy (CHEP) were performed to selected stage III, and stage II tumors as supracricoid partial laryngectomy (SCL) conservation surgery. A supraglottic partial laryngectomy (SGL) performed to a patient with stage II supraglottic tumor.

None of our patients had received chemotherapy, while two patients had preoperative, eleven patients had postoperative received RT. Patient selection for RT was based on the surgical pathology reports documenting stage IV carcinoma of the larynx. The neoplasm of larynx, which is advised to have RT, meant involving the cartilaginous framework, vallecula/base of tongue, extralaryngeal extension into the soft tissues of the neck (T4), multiple lymph node involvement (N2c, N3), having extracapsular nodal invasion, or perineural, vascular invasion.^[9]

The patients' data were collected from hospital records. Patients were evaluated for age, sex, smoking habits, alcohol consumption, tumor localization, differentiation and the stage of tumor, the surgical management and RT, postoperative complications, the hospitalization time, the time to initiate to oral feeding, the decannulation time (only SCL patients), the laryngeal preservation rate (only SCL+SGL patients). When assessing the surgical and oncologic results, TL and NTL patients considered in the same group because the surgical techniques and the patient groups were similar, except oro-nasal breathing and voice was relatively protected in NTL patients.

All patients were staged using AJCC (American Joint Committee on Cancer) 2002 manual.^[10] The patients were staged preoperative with direct laryngoscopy under general anesthesia; intraoperatively by direct inspection and postoperative by pathologic reports of the surgical specimens. But only intraoperative staging kept in view choosing the type of surgery.

The survival analysis was made by the overall survival rate (the percentage of the patients who were alive for a certain period of time after the treatment) and the cumulative survival rate (the proportion of persons in a specified group alive at the beginning of a time interval who survive to the end of the interval and it is often studied using life table methods).

The patients who were alive called for an extra-examination and informed about the study. With the patients' written consent, EORTC QLQ-C30 Version 3.0 Turkish, and EORTC QLQ-H and N35 Turkish questionnaires were polled to the patients.^[7,8] Thirty-four patients were alive when this study was designed, and only 26 of them filled the questionnaires. To assess the QoL for permanent tracheostomy (PT) and RT, each group of patients were separated into two subgroups. The

QoL of patients who had a PT (n=17, TL/NTL group) or did not have PT (n=9, SCL group), and who had RT (n=11) or did not have RT (n=15) were evaluated with questionnaires, and the differences between groups were investigated. A NTL patient who is alive was not excluded from PT group because it did not affect the results of speech problems.

The QLQ-C30 incorporates five functional scales (physical, role, cognitive, emotional, and social), three symptom scales (fatigue, pain, and nausea and vomiting), a global health status/QoL scale, and a number of single items assessing additional symptoms commonly reported by cancer patients (dyspnea, loss of appetite, insomnia, constipation and diarrhea) and perceived financial impact of the disease.^[7] The QLQ-H and N35 module comprises 35 questions assessing symptoms/side effects of treatment, social function and body image/sexuality.^[7,8]

Mann Whitney U-test was used to compare the descriptive statistical data (mean, standard deviation, frequency) and quantitative data between groups. Wilcoxon signed rank test was used to compare groups' internal data. Chi square test was used to compare qualitative data. Kaplan Meier survival analysis test was used for survival analysis. The results were interpreted in 95% security range and significant ($p < 0.05$). The scores of the QoL were calculated according to the EORTC QLQ-C30 and H and N35 scoring manuals.^[8]

Our study was approved by Haydarpasa Numune Training and Research Hospital Local Ethical Committee.

RESULTS

Thirty-eight patients (88.4%) were smokers, 22.4 cigarettes/day for 28.6 years. Five patients (11.6%) were non-smokers. Thirty-five patients (81.4%) had never consumed alcohol whereas eight patients (18.6%) were drinkers for a mean 18.6 years.

Seven patients (16.3%) had glottic, 12 patients (27.9%) had supraglottic and 24 patients (55.8%) had transglottic tumor. Transglottic tumors were invading all three divisions of the larynx in 11 patients (25.6%), both glottic and supraglottic divisions in eight patients (18.6%), both glottic and subglottic divisions in five patients (11.6%). The characteristics of the patients are summarized in Table 1.

The patients were staged preoperatively by direct laryngoscopy under general anesthesia; intraoperatively by direct inspection and postoperatively by

pathologic reports (Table 2). But only intraoperative staging kept in view choosing the type of surgery.

Total laryngectomy (n=25), NTL (n=4), CHP (n=10), CHEP (n=3), and SGL (n=1) operations were performed to the patients (Table 2). Preoperative tracheotomy performed to seven TL patients. Ten patients had radical neck dissection (RND), four had modified RND type 1, 23 had modified RND type 3 and, two had lateral neck dissection (LND). Forty-eight neck dissections performed in 39 of all patients (90.7%) and nine of them had bilateral neck dissection. The stages of disease and the surgical treatments are summarized in Table 3. Furthermore 11 patients (25.6%) confirming the selection criterias had postoperative, and two patients (4.7%) preoperative RT. Also none of our patients had chemotherapy.

All of the patients had epidermoid cancer. The histopathology of tumor was mildly in 29

Table 1. Patient characteristics and treatment

	n	%
Criteria		
Sex		
Males	38	88.4
Females	5	11.6
Smoking	38	88.4
Alcohol	8	18.6
Radiotherapy		
Preoperative	2	4.7
Postoperative	11	25.6
Primary tumor subsite		
Supraglottic	12	27.9
Glottic	7	16.3
Transglottic	24	55.8
Histopathology of tumor		
Well differentiated	11	25.6
Mild differentiated	29	67.5
Low differentiated	3	7.0
Operation		
Total laryngectomy	25	58.2
Near-total laryngectomy	4	9.30
Supraglottic laryngectomy	1	2.3
Cricohyoidopexy	10	23.3
Cricohyoidoepiglottopexy	3	7.0
Neck dissection		
Unilateral	31	72.1
Bilateral	8	18.6
None	4	9.3

Table 2. Tumor-node-metastasis staging

	Preoperative		Intraoperative		Postoperative		<i>p</i>
	n	%	n	%	n	%	
Stage I	2	4.65	0	0.00	4	9.30	
Stage II	10	23.25	13	30.23	10	23.25	
Stage III	25	58.14	16	37.20	17	39.53	
Stage IV	6	13.95	14	32.55	12	27.91	
All stages							
Preoperative-intraoperative							0.020*
Peroperative-postoperative							0.617
Intraoperative-postoperative							0.180
T1	2	4.65	1	2.32	5	11.63	
T2	13	30.23	14	32.55	9	20.93	
T3	27	62.79	24	55.81	21	48.84	
T4	1	2.32	4	9.30	8	18.60	
All T stages							
Preoperative-intraoperative							0.058
Peroperative-postoperative							0.074
Intraoperative-postoperative							0.539
N0	32	74.41	33	76.74	29	67.44	
N1	7	16.27	1	2.32	7	16.27	
N2	4	9.30	9	20.93	6	13.95	
N3	-	-	-	-	1	2.32	
All N stages							
Preoperative-intraoperative							0.160
Peroperative-postoperative							0.357
Intraoperative-postoperative							0.854
M0	43	100	43	100	43	100	
M1	-	-	-	-	-	-	

n: Number of the patients; SD: Standard deviation; *: Wilcoxon signed rank test; $p > 0.05$ There is not statistically significant difference between two groups.

patients (67.5%), well differentiated in 11 patients (25.6%) and low differentiated in three patients (7.0%).

The pharyngocutaneous fistula (PCF) was the most frequently postoperative complication (12/29, 41.4%), and did occur only after TL/NTL operations. Wound infection, subcutaneous emphysema, laryngeal stenosis, acute renal failure and postoperative excessive hemorrhage were the other postoperative complications that are summarized in Table 3.

The mean hospitalization time was 21.2 days (28.6 days for PCF group, 13.9 days for non-PCF group). The mean time to start the oral feeding was 18.3 days for 41 patients (96.3%), while two patients died with PCF at 1st and 18th months. Also

28 patients (68.3%) initiated to the oral feeding at postoperative 7th day. Twelve of SCL patients succeeded to decannulation, and the mean decannulation time was 17.2 days.

The laryngeal preservation rate was 64.3% (9/14) for SCL+SGL patients, the peristomal recurrence rate was 6.9% (2/29) for only TL/NTL patients, and the locoregional recurrence rate was 9.3% (4/43) for all patients.

Nine patients (20.9%) were dead when this study was completed in September 2007. Four patients died from the locoregional recurrence (TL, n=4), one patient from aspiration pneumonia (CHP), one patient from cardiopulmonary arrest (TL), and three patients died from unknown causes (CHP, n=2; TL, n= 1).

Table 3. Intraoperative stage of disease and surgical treatment

Stage	Node	n	Surgery
Stage IV			
	N2	1	TL + Bilateral RND
	N2	1	TL + Bilateral LND
	N2	7	TL + Bilateral type 3 ND
	N1	1	TL + Ipsilateral RND
	N0	4	TL + Ipsilateral RND
Stage III			
	N0	4	TL + Ipsilateral RND
	N0	1	TL + Ipsilateral type 3 ND
	N0	2	NTL + Ipsilateral type 1 ND
	N0	6	TL + Ipsilateral type 3 ND
	N0	2	NTL + Ipsilateral type 3 ND
	N0	1	CHEP + Ipsilateral type 1 ND
Stage II			
	N0	1	SGL + Ipsilateral type 1 ND
	N0	7	CHP + Ipsilateral type 3 ND
	N0	1	CHEP + Ipsilateral LND
	N0	1	CHEP
	N0	3	CHP

n: Number of patients; TL: Total laryngectomy; NTL: Near-total laryngectomy; CHP: Cricohyoidopexy; CHEP: Cricohyoidoepiglottopexy; RND: Radical neck dissection; ND: Neck dissection.

The overall survival rate was 88.8% at the 36th month, and the cumulative survival rate was 67.5%. The mean survival time was 62.4 months. The survival analysis is summarized in Table 5 and Figure 1.

Quality of life assessment

Thirty-four patients were alive when this study designed, and only 26 of them filled the questionnaires. The number of the patients who had a PT was 17 (TL, n=16; NTL, n=1), while the non-PT group was 9 (SCL, n=9) patients. Radiotherapy

Table 4. Postoperative complications

Complication	n/N	%
Pharyngocutaneous fistula		
TL + NTL	12/29	41.37
All patients	12/43	27.90
Wound infection	3/43	6.97
Subcutaneous emphysema	2/43	4.65
Laryngeal stenosis (SCL+SGL)	1/14	7.14
Accute renal failure	2/43	4.65
Hemorrhage	1/43	2.32

n: Number of the patients that complication occurred; N: Number of the risk group; SCL: Supracricoid laryngectomy; SGL: Supraglottic laryngectomy.

group was 11 patients and non-RT groups was 15 patients. The effects of PT and side/adverse effects of RT on QoL were evaluated.

Global health status, functional scales (physical, role, emotional, cognitive and social functioning), symptom scales (fatigue, nausea and vomiting, pain, dyspnea, insomnia, appetite loss, constipation, diarrhea, financial difficulties) did not show any statistically significant difference between TL/NTL and SCL groups in QLQ-C30 questionnaire ($p>0.05$).

Symptom scales (pain, swallowing, taste and smell) did not show any statistically significant difference between TL/NTL and SCL groups ($p>0.05$), while speech problems were significantly increased in TL/NTL group than SCL group as expected ($p<0.01$). Social eating, social contact, sexuality, teeth, opening mouth, dry mouth and sticky saliva did not show any statistically significant difference between TL/NTL and SCL groups ($p>0.05$), while coughing problems were significantly increased in TL/NTL group compared to SCL group ($p<0.05$). Feeling of sickness, using of pain killers, nutritional

Table 5. Follow-up period depended survive

Period (months)	Alive (n)	Dead risk (n)	Dead (n)	Death rate±SD	Survive rate	Cumulative survive rate±SD
Initial	43	43	4	0.09±0.003	0.907	0.907±0.044
12	39	31.5	2	0.06±0.003	0.936	0.849±0.057
24	22	19	2	0.10±0.005	0.894	0.760±0.078
36	14	9	1	0.11±0.006	0.888	0.675±0.106
48	3	2	0	0.0±0.00	1.00	0.675±0.106
60	1	0.5	0	0.0±0.00	1.00	0.675±0.106

SD: Standard deviation.

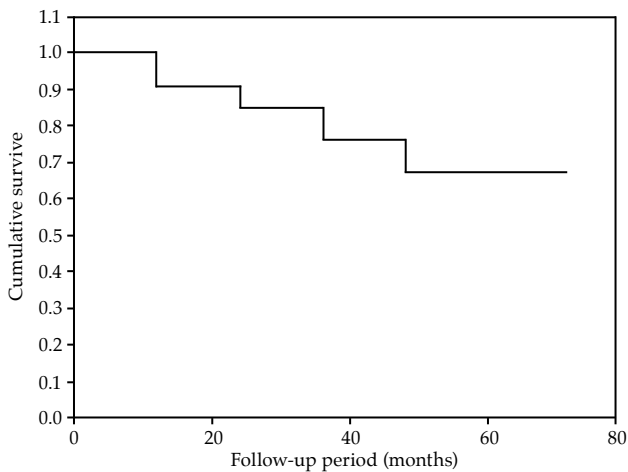


Figure 1. Kaplan-Meier cumulative survive after treatment of larynx cancer by laryngectomy, and required additional radiotherapy (43 patients).

supplements, feeding tube, weight loss/gain did not show any statistically significant difference between TL/NTL and SCL groups in QLQ-H and N35 questionnaire ($p>0.05$).

Global health status, functional scales, and symptom scales did not show any statistically significant difference between RT and non-RT groups in QLQ-C30 questionnaire ($p>0.05$).

Symptom scales did not show any statistically significant difference between RT and non-RT groups ($p>0.05$). Social eating, social contact, sexuality, teeth, opening mouth, dry mouth, sticky saliva and coughing did not show any statistically significant difference between RT and non-RT groups ($p>0.05$). Feeling of sickness, using of painkillers, nutritional supplements, feeding tube, weight loss/gain did not show any statistically significant difference between RT and non-RT groups in QLQ-H and N35 questionnaire ($p>0.05$).

DISCUSSION

Larynx is the most common site of all head and neck cancers.^[1,2] The most ideal form(s) of treatment for larynx cancer is still under dispute. To evaluate the efficiency of treatment methods, many studies on the QoL have been performed.^[3,5-16] We aimed to make a contribution to the larynx cancer treatment modality with our surgical results, and postoperative QoL assessment.

Mean age (57.6) in our study was similar to that of some studies,^[11,12] and lower than various studies.^[6,13] The rate of female to male was (5/38) concordant with the literature.^[11-15]

Smoking and alcohol consumption were investigated by various authors. Portal et al.^[14] reported smoking and alcohol rates were 83.9% and 61.2%. Weinstein et al.^[15] published that all of their SCL patients were mean 45 year smokers. The smoking rate and mean duration were 88.4% and 28.6 years in their study. We found 88.4% of our patients were smokers for 28.6 years, and 18.6% of the patients were drinkers for 20 years in our study.

Tumor localizations seem to be different in various studies. Nordgren et al.^[12] reported glottic and supraglottic rates 72.1% and 27.9%. Finizia et al.^[16] published glottic, supraglottic, subglottic and transglottic rates as 64.2%, 21.4%, 7.1% and 7.1% respectively. Weinstein et al.^[15] established 84% for glottic and 16% for supraglottic tumors. In our study glottic, supraglottic and transglottic rates were 16.3%, 27.9% and 55.8% respectively. Increased rate of transglottic tumor was probably related to the late recourse of the patients.

Finizia et al.^[16] reported T1, T2, T3, T4 rates as 17.8%, 35.7%, 32.1% and 14.2% respectively. In our study these rates were 11.62%, 20.93%, 48.85% and 18.6% respectively. Erdamar et al.^[11] published stage I, II, III, and IV rates as 17%, 25%, 35%, and 23%. Our results are similar to their results, and concordant with the literature.

Local control, recurrence and laryngeal preservation rates are essential to appraise a treatment approach for larynx cancer. Weinstein et al.^[15] published 96% local control rate, during the follow-up minimum 18 months later, this rate was 93%, neck recurrence rate was 8% and distant metastasis rate was 4% in their study with 25 SCL cases. Also laryngeal preservation rate was 88% for the patients who had neo-adjuvant RT and 100% for the patients who had SCL for primary treatment. Dufour et al.^[17] performed SCL for T3N0-3 cases, and reported 7.6% recurrence rate. Their local control rates were 97.3%, 93.5%, and 91.4% for one, three and five years. Laryngeal preservation rate was 89.9% and mean local control rate was 98.3%. Hall et al.^[18] reported 86% local control rate, 84% neck control rate for TL patients. Local recurrence rate was reported as 3.1% by Dufour et al.^[17] Our peritomal recurrence rate was 6.9% (2/29), locoregional recurrence rate was 9.3% (4/43) in accordance with the literature and laryngeal preservation rate was 64.3% (9/14) lower than the literature.

Hoffman et al.^[19] reported a five year relative survival rate as 68.1% in 1985, and 62.8% in 1993

according to the analysis of National Cancer Data Base. Sessions et al.,^[20] published mean survival rate as 65.5% for their supraglottic larynx cancer treatment results. Hall et al.,^[18] reported five year survival rate 67% for their TL patients. We found cumulative survival rate of 67.5%, overall survival rate of 88.8%, and mean survival time of 62.4 months for follow-up period (36 months).

Pharyngocutaneous fistula is especially important because it is a potential risk for main blood vessels. Feeding tube, salivary flow and prolonged hospitalization time aggravates the QoL. Lavallo and Maw,^[21] reported 31.6% PCF rate in their retrospective analysis of 170 laryngectomized patients. Soylu et al.,^[22] reported PCF rate as 12.5%, and while the hospitalization time was 12 days for non-PCF patients, it was 41 days for PCF patients. Akduman et al.^[23] reported a PCF rate as 35.9% in their retrospective analysis of 53 patients with TL. Our PCF rate was 41.4% for the TL/NTL patients, and 27.9% for all laryngectomized patients. Mean hospitalization time for fistulized patients was 28.6 days, and 13.9 days for non-fistulized patients. Our fistula rates and mean hospitalization times were compatible with those reported in the literature.

Yuceturk et al.,^[24] reported the initiation to oral feeding times as 5.5 days, and hospitalization time as 17.8 days respectively, and mean decannulation time as 12.8 days. Our mean decannulation time was 15.8 days, which conforms with the literature.

The main advantage of laryngeal preservation with SCL is the better speech outcomes. Permanent tracheostomy is undesirable for the patients and it is the most frequent cause for rejection of the surgery. Therefore speech and coughing problems were increased in the PT group, while global health status, functional scales and symptom scales did not show any difference between PT and SCL groups in our study. Speech is reported as the most important factor influencing QoL in various studies.^[3,6,11,13,16]

Erdamar et al.,^[11] used University of Washington QoL (UW-QOL) questionnaire, and supported that NTL affects only appearance when compared with partial laryngectomies. Quality of life between total and vertical partial laryngectomized patients compared by Braz et al.,^[25] there was no difference for global health status, while social functions were better in the vertical partial laryngectomy group, and fatigue, social eating, financial difficulties, taste and smell problems were higher in TL group. Finizia et al.,^[16] reported no difference for global health status

and functional symptom scale with QLQ-C30 questionnaire, between patients who had TL as salvage surgery and who take RT. On the other hand the hoarseness was increased in RT group as indicated by QLQ-H and N35 questionnaire. Muller et al.,^[13] reported QoL of TL patients is worse than the patients who had conservative surgery. Also they reported dry mouth, sticky saliva and cough in the patients who take RT, and there was no difference between RT and partial laryngectomy groups for nausea, vomiting, dyspnea, constipation and diarrhea, and they related this to that questionnaires designed one year after RT. Global health status, functional scales and symptom scales did not show any difference between RT and non-RT groups in our study either. It is probably because the questionnaires were designed at least one year after RT and patients disregarded their earlier complaints.

In this study, one of the most prominent etiologic factors was smoking, while alcohol consumption was considerably lower. The rate of transglottic tumors was two times more frequent than the others, according to the localization of the tumor. We staged the disease preoperative, intraoperative, and postoperative, but kept in view only intraoperative staging to choose the type of the surgery. The histopathologic differentiation of the tumor was predominantly mild. We performed TL and unilateral neck dissection on many patients. The PCF was the most frequent postoperative complication and it occurred in only TL/NTL patients. This complication significantly increased the hospitalization time. The laryngeal preservation rate was 64.2% for only SCL+SGL patients, and this was lower than the literature. We could make a maximum 36 months survival analysis, and the overall survival rate was 88.8%.

Although the larynx preservation had a positive effect on the speech, it does not affect other QoL parameters. Additionally having a PT had a marked increment on cough index.

We emphasize that multidisciplinary prospective QoL assessment studies comparing different treatment methods for similar staged tumors will manifest more accurate information. Multi-institutional prospective studies are essential to define the optimal management strategy in the patients with larynx cancer in the future.

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