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Comparison of transoral laser surgery and open partial surgery in early-stage laryngeal cancers

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ABSTRACT

Aim: To compare demographic data between open partial laryngectomy (OPL) and transoral laser microsurgery (TLM) in early-stage laryngeal cancer.

Methods: A retrospective analysis was conducted on 55 patients treated for early-stage (T1–T2, N0, M0) glottic squamous cell carcinoma between 2015 and 2025. Thirty-one patients underwent TLM and 24 underwent OPL. Hospital stay duration, tracheostomy rates, and nasogastric tube placement rates were evaluated.

Results: Demographic and tumor stage distributions were comparable between groups. None of the patients in the TLM group required tracheostomy or nasogastric tube placement, whereas all patients in the OPL group did. The mean hospital stay was significantly shorter in the TLM group (3.16 ± 1.93 days) compared with the OPL group (21.21 ± 11.41 days; $p < 0.001$).

Conclusion: TLM provides superior demographic data compared to OPL in early-stage laryngeal cancer, with significantly reduced hospital stay, elimination of tracheostomy and nasogastric tube requirements, and faster functional recovery. These findings support TLM as the preferred surgical approach for early-stage glottic cancers.

Keywords: Laser surgery, open partial laryngectomy, demographic data, tracheostomy.

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1. Introduction

Laryngeal squamous cell carcinoma (SCC) accounts for approximately 1.9% of all cancers worldwide. Among laryngeal cancers, nearly 51% originate in the glottic region. Due to voice changes caused by lesions on the vocal cords, glottic cancers are frequently diagnosed at early stages (T1-T2, N0, M0) [1, 2]. In recent years, with the advancement of fiberoptic, endoscopic, and robotic technologies, surgical options such as transoral CO_2 laser microsurgery (TLM) and transoral robotic surgery have become increasingly common alternatives to open partial laryngectomies in the treatment of early-stage laryngeal tumors [3, 4]. Both open partial surgeries and TLM provide favorable oncologic and functional outcomes without compromising locoregional control [5]. However, TLM has been reported to be more advantageous in preserving laryngeal function and facilitating faster functional recovery of the larynx [6, 7]. In this

study, we compared hospital stay durations, tracheostomy rates, and nasogastric tube placement rates in patients with early-stage laryngeal cancer who underwent either TLM or open partial laryngeal surgery. The objective of this study was to compare demographic data such as length of hospital stay, tracheostomy rates, and nasogastric tube placement in the early postoperative period, between transoral laser microsurgery (TLM) and open partial laryngeal surgery (OPL). These parameters were selected because they directly reflect the functional burden of surgery on patients, providing measurable indicators of recovery, airway management, swallowing function, and treatment costs. Furthermore, they allow for an objective comparison between TLM and OPL in terms of postoperative morbidity and overall functional outcomes.

2. Materials and methods

A total of 55 patients who underwent either open partial laryngeal surgery (OPL) or transoral laser microsurgery (TLM) for early-stage glottic cancer between 2015 and 2025 at our clinic were included in this study. This study was supported by Dicle University Scientific Research Projects (BAP) under project number TIP.23.007. Data from all patients were analyzed retrospectively. The TLM group included 31 patients, while the OPL group consisted of 24 patients. Length of hospital stay, tracheostomy rates, and nasogastric tube placement rates were compared between the two groups.

2.1. Statistical Analysis

Descriptive statistics for quantitative variables were expressed using measures of central tendency and variance (mean ± standard deviation). Fisher's Exact Test (for small sample sizes) and Chi-square test were used to assess differences in proportions or relationships between categorical variables. The Mann–Whitney U test was used to compare group means when the assumptions of normality and homogeneity of variance were not met. Statistical significance was defined as $p = 0.05$ for all analyses. Statistical analysis was performed using IBM SPSS Statistics software (Version 21.0 for Windows; Armonk, NY, IBM Corp.).

3. Results

The TLM group included 22 male (71.0%) and 9 female (29.0%) patients, whereas the OPL group included 22 male (91.7%) and 2 female (8.3%) patients. The mean age was 56 years (range: 50.5–69.5) in the TLM group and 59.5 years (range: 54.75–64) in the OPL group. There was no statistically significant difference between the groups in terms of age or sex. In the TLM group, 17 patients (54.8%) were classified as T1 and 14 (45.2%) as T2 stage. Similarly, in the OPL group, 13 patients (54.2%) were T1 and 11 (45.8%) were T2 stage. No significant difference was found between the groups in terms of tumor stage (Table 1).

Table 1. Demographic characteristics of TLM and OPL groups.

Groups	**TLM**	**OPL**	***P* value**
Age	58.5 ± 11.9	59.2 ± 7.8	0.696
Sex (M/F)	22 / 9 (71%/29.0%)	22 / 2 (91.7%/8.3%)	0.089
T Stage	T1: 17 (54.8%)	T1: 13 (54.2%)	1.000
	T2: 14 (45.2%)	T2: 11 (45.8%)	

TLM: transoral laser microsurgery; OPL: Partial laryngeal surgery.

In the TLM group, 13 patients (41.9%) underwent type 3 cordectomy, 6 (19.4%) underwent type 4 cordectomy, 7 (22.6%) underwent type 5a, 4 (12.9%) type 5c, and 1 patient (3.2%) underwent type 5d cordectomy

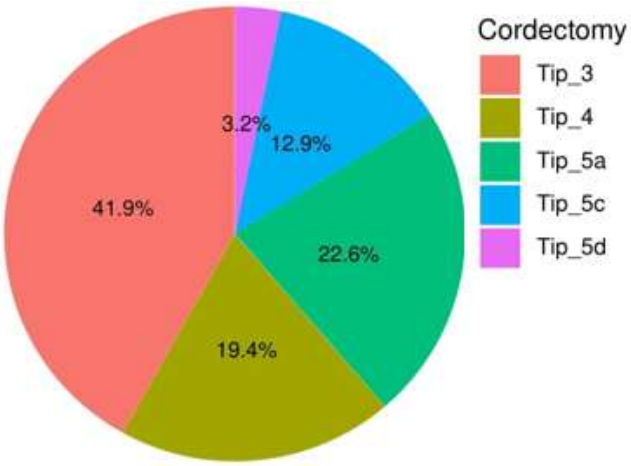

Figure 1. Subtypes of surgeries performed in the TLM group.

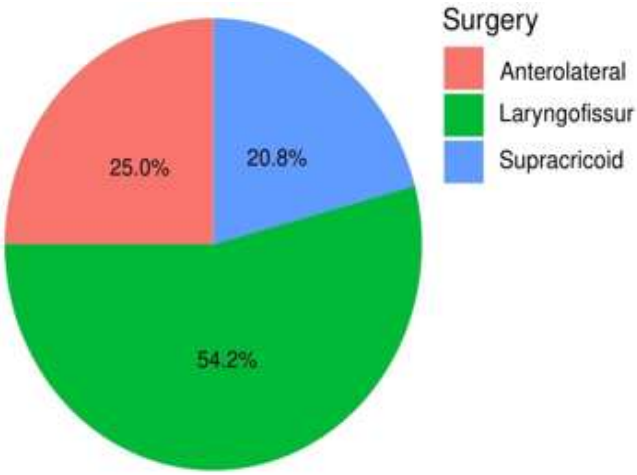

Figure 2. Subtypes of surgeries performed in the OPL group.

(Figure 1) (Table 2). In the OPL group, 13 patients (54.2%) underwent laryngofissure, 6 (25.0%) had anterolateral laryngectomy, and 5 (20.8%) had supracricoid laryngectomy (Figure 2) (Table 2).

Table 2. Surgical procedures performed in the TLM and OPL groups.

Group	TLM	OPL
Surgery	Type 3 cordectomy: 13 (41,9%)	Laryngofissure: 13(54,2%)
	Type 5a cordectomy: 7 (22,6%)	Anterolateral laryngectomy: 6 (25,0%)
	Type 4 cordectomy: 6 (19,4%)	Supracricoid laryngectomy: 5 (20,8%)
	Type 5c cordectomy: 4 (12,9%)	
	Type 5d cordectomy: 1 (3,2%)	

TLM: transoral laser microsurgery; OPL: Partial laryngeal surgery.

In the TLM group, none of the 31 patients required a tracheostomy or nasogastric tube. In contrast, all patients in the OPL group required both tracheostomy and nasogastric tube placement. The rates of tracheostomy and nasogastric tube placement were significantly lower in the TLM group (Table 3).

Table 3. Comparison of hospital stay duration, nasogastric tube, and tracheostomy rates between groups.

Group	TLM	OPL	*P* value
Hospital stay duration(days)	3.16 ± 1.93	21.2 ± 11,4	<0.001
Nasogastric tube	0 (0,0%)	24 (100,0%)	<0.001
Tracheostomy	0 (0,0%)	24 (100,0%)	<0.001

TLM: transoral laser microsurgery; OPL: Partial laryngeal surgery.

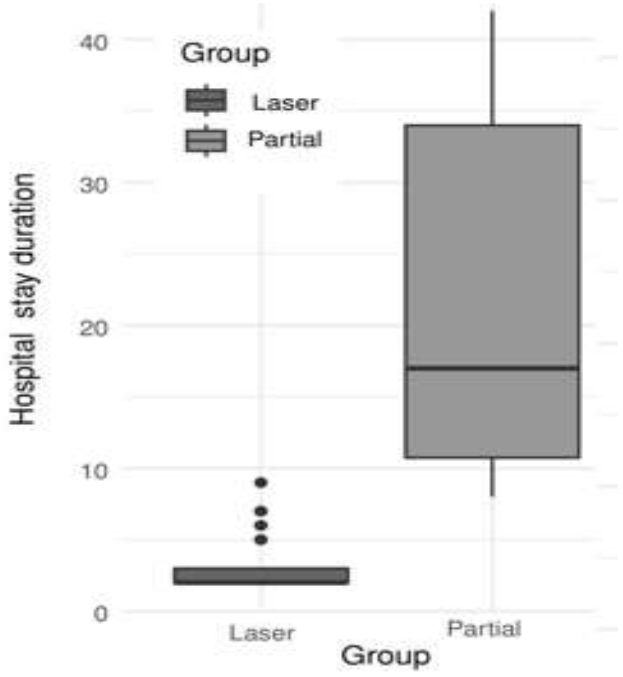

Figure 3. Comparison of hospital stay duration between groups.

The mean length of hospital stay was 3.16 ± 1.93 days in the TLM group, compared to 21.21 ± 11.41 days in the OPL group. The TLM group had a significantly shorter hospital stay (Figure 3) (Table 3).

4. Discussion

In the treatment of early-stage laryngeal cancers, the primary goal is not only to achieve oncologic control but also to preserve functional parameters that significantly affect patients' quality of life. Considering that early-stage tumors generally have a good prognosis, treatment objectives should include not only cure but also preservation of the larynx with optimal voice quality, minimization of complications, and reduction of healthcare costs.

In this study, we compared transoral laser microsurgery (TLM) and open partial laryngectomy (OPL) in terms of short-term functional outcomes. Specifically, we evaluated tracheostomy and nasogastric tube placement rates as well as length of hospital stay, which serve as valuable indicators of early postoperative recovery. Our findings are consistent with several previously published studies in the literature.

Both TLM and OPL provide high local control rates in early-stage (T1–T2, N0, M0) glottic cancers [8, 9]. However, due to its minimally invasive nature, TLM allows for better preservation of functional structures in the early postoperative period. In our study, the absence of tracheostomy and nasogastric tube placement in the TLM group reflects this short-term functional advantage. In contrast, OPL often requires more extensive surgical exposure and partial removal of functional structures, which increases the likelihood of temporary impairments and necessitates additional support measures such as tracheostomy and nasogastric feeding.

The significant difference in the need for tracheostomy and nasogastric tubes—absent in all TLM patients and required in all OPL patients—highlights TLM's superiority in preserving upper airway integrity and enabling earlier oral feeding. The mean hospital stay was 3.16 days in the TLM group compared to 21.21 days in the OPL group, a dramatic difference that underscores TLM's minimally invasive nature and its association with fewer postoperative complications.

Similar outcomes have been reported in the studies by Peretti and Motta, who found that the majority of patients treated with TLM resumed oral intake within a few days and did not require tracheostomy [10, 11]. Vilaseca et al. reported a hospital stay of 2–5 days for TLM patients and up to 2–3 weeks for those undergoing OPL [12]. Mallo et al. reported that only 3 out of 71 patients treated with TLM required nasogastric tubes or tracheostomy, emphasizing the lower complication rates and associated healthcare costs in laser surgery [13]. Similarly, Succo et al. found that patients who underwent OPL had higher complication rates and longer hospital stays than those treated with TLM [14]. Granados et al. reported higher rates of tracheostomy and gastrostomy dependence in OPL patients compared to those who underwent TLM [15]. Gregoire et al. noted that the overall treatment cost of OPL was nearly twice as high as TLM due to longer hospital stays [16]. Back et al. also found that OPL was associated with higher postoperative morbidity and longer hospitalization, ultimately impacting quality of life more negatively than TLM [17]. Ambrosch et al. reported that, in comparison with open surgical techniques, TLM avoids tracheostomy, shortens hospital stay, reduces costs, and lowers the incidence of postoperative dysphagia.

Consistent with the existing literature, our findings confirm that TLM is associated with lower tracheostomy and nasogastric tube placement rates and shorter hospital stays compared to OPL in early-stage laryngeal cancer. These findings support the superiority of TLM over OPL in terms of short-term functional outcomes. OPL is associated with greater early postoperative morbidity and longer rehabilitation.

The main limitations of this study are its retrospective design and relatively small sample size. Additionally, we report that our study, along with tracheostomy and nasogastric tube placement rates, provides valuable indicators of short-term postoperative function, including length of hospital stay. However, it does not address long-term outcomes such as voice quality, swallowing, and aspiration, which limits the generalizability of our findings. Based on the outcome measures included, the superiority of TLM over OPL is supported only with respect to short-term functional outcomes. We emphasize the need for further prospective studies incorporating objective assessments of voice, swallowing, and aspiration to comprehensively evaluate long-term functional outcomes.

4.1. Conclusion

In conclusion, our study demonstrates that TLM significantly reduces hospital stay duration, eliminates the need for tracheostomy and nasogastric tube placement compared to OPL in the treatment of early-stage laryngeal cancer.

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