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Reliability of Frozen Section Pathology in Transoral Laser Laryngectomy

Original Investigation

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Abstract

Objective: To evaluate the reliability of frozen section analysis in transoral laser laryngectomy (TOLL).

Methods: A retrospective analysis was conducted for patients who underwent TOLL in a university hospital between January 2012 and February 2014. The grade of the tumor and the histopathological diagnosis were noted. The results of frozen section pathologies and routine histological examinations were compared.

Results: A total number of 84 sections from 21 patients with a mean age of 57.3 years were included in the study. All the patients were operated with superpulse continuous mode carbon dioxide laser with a power of 5–8 watts. Squamous cell carcinoma was histologically diagnosed in all patients. The tumor was grade 1 in 80.95% of the patients, grade 2 in 9.52%, and grade 3 in 9.52%. A routine histopathological examination confirmed the frozen section in 94.04% of the patients.

Conclusion: Laser surgery is a commonly preferred treatment modality in early-stage laryngeal carcinomas, in particular. However, a safe surgical margin is a debate in transoral laser surgery. In light of our results, we can conclude that frozen section pathology is a reliable method to achieve safe surgical margins in TOLL.

Keywords: Frozen section, reliability, laser laryngectomy, transoral surgery

Introduction

The term "laser" originated as an English acronym for "light amplification by stimulated emission of radiation" (1). The foundation of the studies related to laser was established by the radiation theory of Einstein in 1917 (2). The use of laser in ear-nose-throat (ENT) procedures began with the discovery of carbon dioxide laser (CL) in 1965 and Polanyi's putting this into practice by developing articulated arm system in 1968 (3). The most commonly used types of laser in ENT are argon, neodymium-doped yttrium aluminum garnet (Nd:YAG), potassium titanyl phosphate (KTP), and CL. These laser types can be used for treating various diseases according to their wavelengths and penetration depth. The most common technique used in laser therapy of laryngeal cancers is CL with the wavelength of 10.6 μm and the penetration depth of 0.03 mm.

The first study on the use of CL in endoscopic microsurgery of laryngeal cancers was conducted by Strong and Jako in 1972 and its use has become widespread since then (4). Particularly, laser surgery for transoral excision of early stage tumors is preferred by many surgeons because it allows either bleeding control or removal of more tissues. However, since exposition is more limited in transoral approach for laryngeal cancers than in open interventions, difficulties can sometimes be experienced in excising tumor safely. At this point, frozen section examination (FSE) becomes an important guide for surgeon. FSE allows for the control of the presence of residual tumor tissue after excision as well as providing mapping of tumor

In this study, it was aimed to evaluate the reliability of FSE for reaching intraoperetively safe surgical margins in patients undergoing transoral laser laryngectomy (TOLL).

Methods

In our study, the files of patients having undergone TOLL with CL by the same surgeon (MKG) in the ENT Clinic of Medical Faculty in Ankara University between January 2012 and February 2014 were reviewed retrospectively. The patients who were operated with another laser type except CL or whose file did not include a note on FSE were excluded from the study. Demographic data, histopathological examination results, and tumor stage of patients were recorded. The findings of the FSE performed and assessed by a pathologist during surgery and postoperative routine histo-

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pathological examination of the same sections were compared. Written informed consents were obtained from all patients participating in the study.

Results

Eighty four sections taken from 21 patients (18 male and 3 female) who met the criteria of the study were included. The mean age was 57.3±11.2 years (41-67 years). All patients were operated with superpulsed CL at the power of 5-8 watt in continuous mode (Lumenis; 30C®, Yokneam, Israel). Although this amount of energy seems high for the surgery of glottic and supraglottic plane, it was preferred by the surgeon because of its being effective in bleeding control and not causing tissue injury. Preoperative histopathological diagnosis of all patients was squamous cell carcinoma (SCC) (Figure 1). Of the tumors, 11 were well-differentiated SCC, 8 were moderately-differentiated SCC, and 2 were poorly-differentiated SCC. Localizations and stages of tumors are shown in Table 1 in detail. Clinical and radiological examinations revealed no neck metastasis in any early stage tumor. All of stage 3 tumors were with localization of supraglottic region. All of patients with stage 3 tumors located in the supraglottic region underwent bilateral selective neck dissection (level 1-5) two weeks after the excision of tumor.

In 79 of 84 sections taken from patients, the results of FSE and postoperative routine histopathological examination were found to be consistent with each other. Accordingly, the reliability rate of FSE in this study was detected to be 94.04%. All of 5 sections, the results of which were inconsistent, were taken from patients having stage 1 glottic tumor. Of these sections, FSE in 4 was reported as thermal artifact (laser artifact) and they were evaluated to be safe surgical margin in routine histopathological examination. On the other hand, in the other inconsistent section, FSE was reported as malignant and histopathologically evaluated to be safe surgical margin.

Discussion

The basic philosophy of cancer surgery is to excise the whole lesion in safe surgical margins without leaving residual tumor tissue. For reaching safe surgical margins, an amount of normal tissue in the neighborhood of tumor is usually excised as safety margin. However, if tumor is localized in an organ that can lead to severe morbidity, such as larynx, in case of much excision, these margins should be determined more carefully.

The procedure of freezing tissues for taking sections was first performed by Glaskow in 1882. However, the application was conducted not for intraoperative evaluation but for biopsy and autopsy materials (5). Although various trials and definitions were carried out on FSE in the following years, the article of Louis Wilson turned a new page related to the use of FSE for intraoperative evaluation in 1905 (6). At present, with the development of microscope, optic technology, and sectioning techniques, FSE can be performed in a short time and it can guide surgeon during operation, with results having high accuracy rate.

Table 1. Localizations and stages of tumor

	Glottic	Supraglottic	Total
Stage I	11 (%64.7)	6 (%35.3)	17
Stage II	2 (%100)	-	2
Stage III	-	2 (%100)	2
Total	13 (%61.9)	8 (%38.1)	21

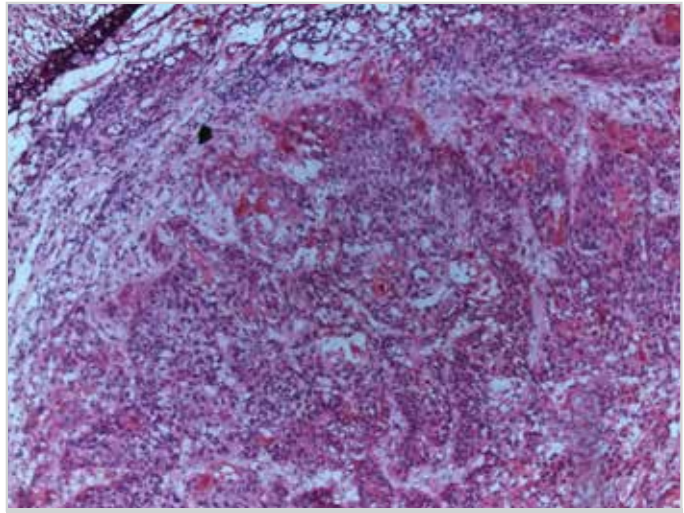

Figure1. Squamous cell carcinoma (H&E, X100)

In large series investigating the reliability of FSE, rates ranging from 95.1% to 98.2% were revealed (6, 7). Samples taken from all body tissues were evaluated in these studies. Similar results can be seen in the examination of the studies on only head and neck cancers (8-12).

A considerable increase is seen in the number of studies related to endolaryngeal laser surgery, especially in recent years (8-10). However, the results of FSE in patients having undergone laser surgery are not included in these studies. Ord et al. (11) reported the rate of consistency as 99% for 307 FSE taken from 39 patients with squamous cell carcinoma of the oral cavity. DiNardo et al. (12) found this rate as 98.3% for 420 FSE from 80 patients having squamous cell carcinoma in the head and neck region, but the reliability rate of 71.3% reported for near or positive surgical margin is a more remarkable finding of this study. Pathak et al. (13) investigated oral cavity carcinomas in 416 patients in their series and they stated that FSE did not affect local recurrence and survival. In our literature review, only one study investigating the reliability of FSE in TOLL was found. In this study, Remacle et al. reported a consistency rate of 94.8% in DPKs of 97 patients who were applied transoral CL cordectomy (14).

In FSE studies, pathologists take on a big task. Sections should definitely be evaluated by an experienced clinician. In addition, it is very important that surgeon should take a sample in adequate size and from accurate area. The most frequently encountered problems in FSE procedures are thermal artifacts and tis-

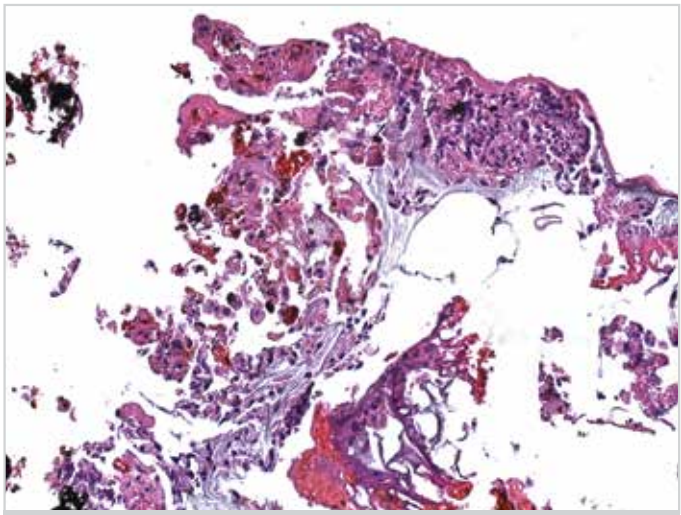

Figure 2. Thermal artifact (H&E, X200)

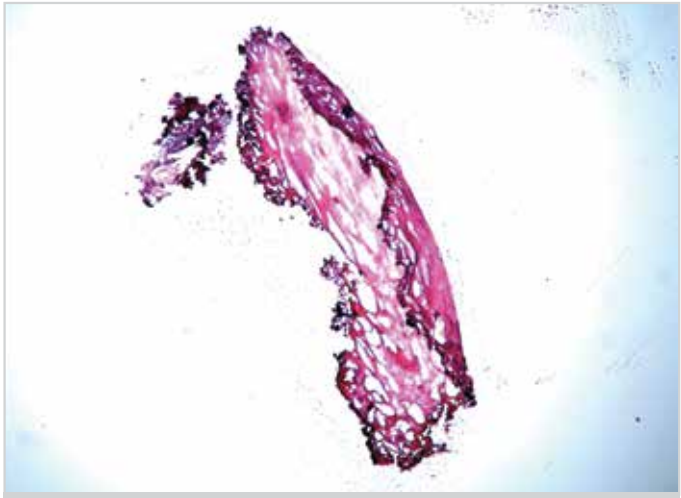

Figure 3. Inadequate tissue (H&E, X40)

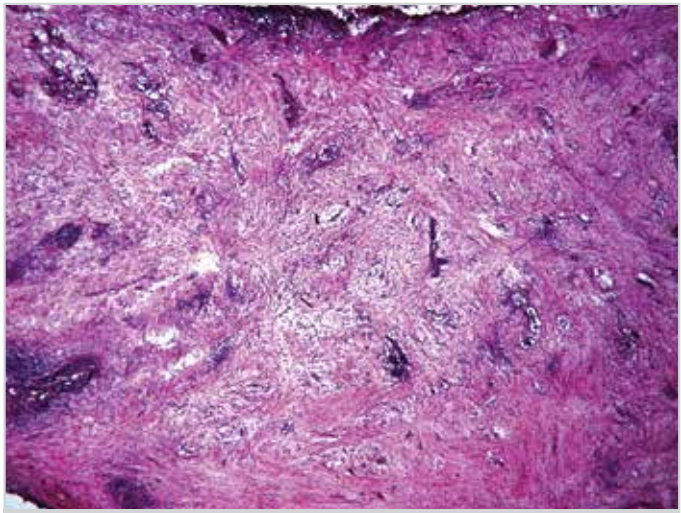

Figure 4. Fibrosis (H&E, X40)

sues taken in inadequate size. In Figure 2, a thermal artifact in our case series is seen. And, an inadequate sample is presented in Figure 3. Furthermore, a sample belonging one of our cases and being reported as fibrosis in FSE is shown in Figure 4.

Of 21 patients included in our study, 19 had early stage tumor. The reliability rate of 94.04% was consistent with other studies in literature. Considering previous studies and our case series, the conclusions can differ. In this evaluation in which personal experience is very important, it is difficult to form a sampling group in which all variables are distributed homogenously. However, it is seen in literature that studies have been conducted with similar methodology. We believe that further multi-centered studies on this issue will be more guiding.

Conclusion

In conclusion, the results obtained in our study suggest that FSE is a reliable technique for reaching safe surgical margins in TOLL. Besides that, surgeon's taking biopsy through appropriate technique, the tissue to be evaluated by an experienced pathologist, and when necessary, assessment of the tissue by both surgeon and pathologist together are important for getting accurate results.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Ankara University Faculty of Medicine Clinical Researches Ethical Committee (numbered 11-445-15 in 22.06.2015).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

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Conflict of Interest: No conflict of interest was declared by the authors

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