Use of transoral Co2 laser microsurgery for treatment of cancerous neoplasms of the larynx in Vietnam

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Abstract. Laryngeal cancer remains one of the most common head and neck tumors. In the treatment of this disease, it is important to assess the overall survival when using transoral CO2 laser microsurgery. Aim of the research was to make an evaluation of treatment of patients with laryngeal cancer using CO2 laser transoralmicrosurgery.A number of 50 patients aged 40-82 years (average age 58.7 years) with early-stage laryngeal cancer were treated with CO2 laser transoral microsurgery at the National ENT hospital from January 2012 to August 2014.Tumors at the T1aN0M0 stage were detected in 34 people (68%), T1bN0M0 in 7 cases (14%), T2N0M0 in 9 cases (18%). Overall survival was 87.1 ± 2.3 months, and 5-year survival was 92%. The survival rate depending on the type of surgical intervention Type III, Type IV, Type Va, Type Vb, Type Vc was 92.3%, 93.8%, 100%,100%, and 100%, respectively. The survival rate depending on the stage T1aN0M0 was 91.2%, on the stage T1bN0M0 was 100%, on the stage T2N0M0 was87.5%.Transoral CO2 laser microsurgery shows excellent results in laryngeal tumors, especially in the T1aN0M0 stage, makes it possible to perform surgery in more comfortable conditions, provides high survival rates, excellent cosmetic and functional results compared to classical open access, without compromising immediate and long-term treatment results.

Key words: CO2 transoral laser microsurgery; larynx; carcinoma; T1- T2; survival

INTRODUCTION

Laryngeal cancer remains one of the most common head and neck tumors, and although significant progress has been made over the past few decades, the diagnosis and treatment of laryngeal cancer, given its complexity, is a unique problem (Le et al., 2019). In particular, squamous cell carcinoma of the larynx accounts for 30-50% of all neoplasms in the head and neck: 157,000 new cases were diagnosed worldwide in 2012 (Ferlay et al., 2015). As a result of the evolution of diagnostic measures, treatment strategies, and follow-up protocols, early- stage treatment of laryngeal cancer (T1-T2) has transformed from classical methods of open surgical resection into a less aggressive and more functional endoscopic approach over the past 40 years. Today, the efficiency and favorable outcome of transoral resection using a CO2 laser for pharyngeal cancer (T1-T2) are 80-90% (Mendelsohn and Remacle, 2018). The main advantages of transoral laser microsurgery (TLM) are the ability to minimize damage to the larynx, maximize the preservation of healthy tissues, as well as respiratory, chewing, and speech functions (Chiesa-Estomba et al., 2019). In addition, the benefits of this type of treatment include a reduced risk of fistula, abscesses, and osteoradionecrosis, as well as a shorter hospital stay, which significantly reduces treatment costs (Golusiński et al., 2019). A number of large studies published between 2000 and 2010 showed that TLM shows excellent results with very high disease-specific survival for all stages of early carcinoma, especially with Tis and T1 (Sjögren,2017).

However, transoral laser microsurgery has several disadvantages. These include certain difficulties in providing hemostasis, access and tissue manipulation (Howard et al., 2016). Inadequate effects on the larynx, damage to the anterior commissure in the craniocaudal plane, invasion of the preepiglottic space, massive infiltration of the preepiglottic space, and even slight erosion of the thyroid cartilage impose certain restrictions on the use of TLM (Peretti et al., 2016). In connection with the foregoing, the aim of the study was to evaluate the treatment of patients with laryngeal cancer using CO2 laser transoralmicrosurgery.

MATERIAL AND METHODS

A number of 50 male patients with diagnosed early-stage laryngeal cancer aged 40-82 years (mean age 58.7 years) were operated at the National ENT Hospital during the period from January 2012 to August 2014 (Figure 1). All patients provided written informed consent to participate in the study, as well as to use the data in thisarticle. The study protocol was approved by an independent ethics committee. All procedures were carried out in accordance with the ethical principles of the Helsinki Declaration.

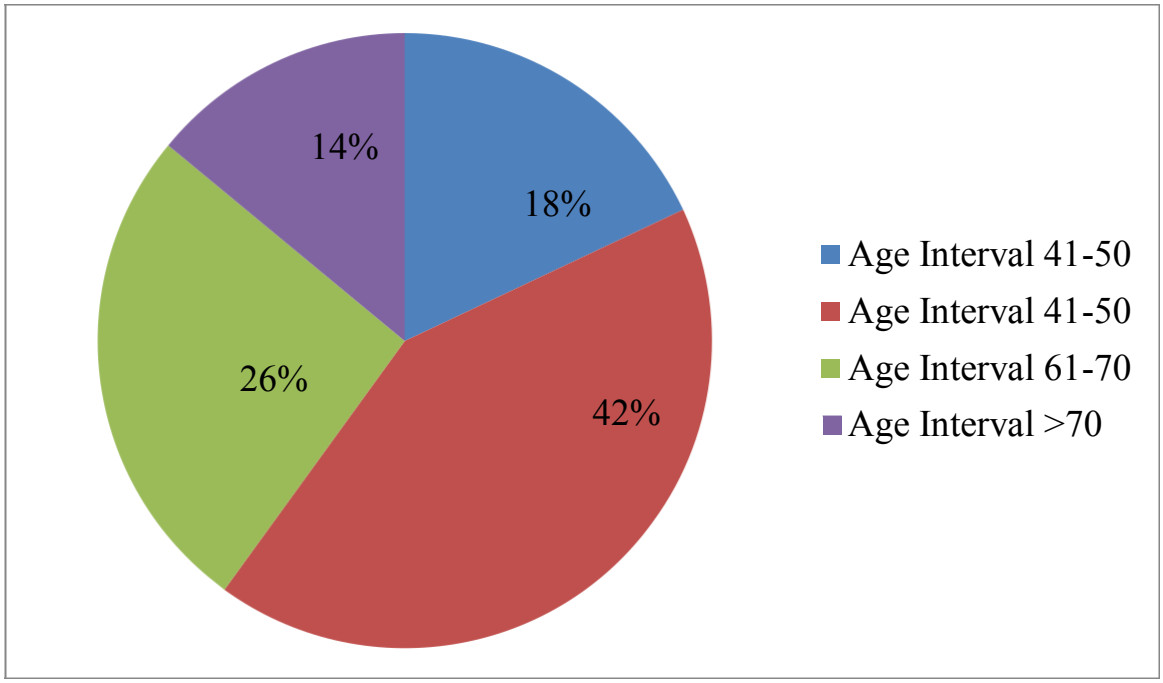

Figure 1. Distribution of study participants by age

72% abused smoking, 36% abused alcohol, and 40% abused smoking and alcohol in this cohort. The types of laryngeal lesions that occurred in our study are presented in Table 1. Tumors at the T1aN0M0 stage were detected in 34 cases (68%), at the T1bN0M0 stage were detected 7 cases (14%), at the T2N0M0 stage were detected 9 cases (18%).

Table 1. Lesions

Lesions	N	%
1CV, Anterior commissure intact	25	50
1Cv, Anterior commissure involve	15	30
2Cv, Anterior commissure involve	10	20

The availability and stage of neoplasm were determined during the preoperative examination using micro laryngoscopy. All patients underwent a biopsy to diagnose tissues, as well as an pan-endoscopy to exclude tumors in the upper digestive tract. Distant metastases were excluded by chest x-ray and abdominal ultrasound.

Statistical processing. The results were recorded prospectively with subsequent recording and storage in the database. Observation data was available to all patients. The total observation interval was 87.1 ± 2.3 months. Survival was calculated by the Kaplan – Meier method. All data were expressed descriptively and compared between subgroups.

RESULTS

Depending on the stage of the tumor, its location and the volume of tissue

removed, a different type of surgical intervention was used in accordance with the classification of cordectomies of the European Laryngological Society (ELS) (Table 2).

Table 2. Types of surgical intervention used in this study

Type	Type III	Type IV	Type Va	Type Vb	Type Vc	Type Vd
N	13	17	17	2	1	0

In some cases, postoperative radiation therapy was used (Figure 2).

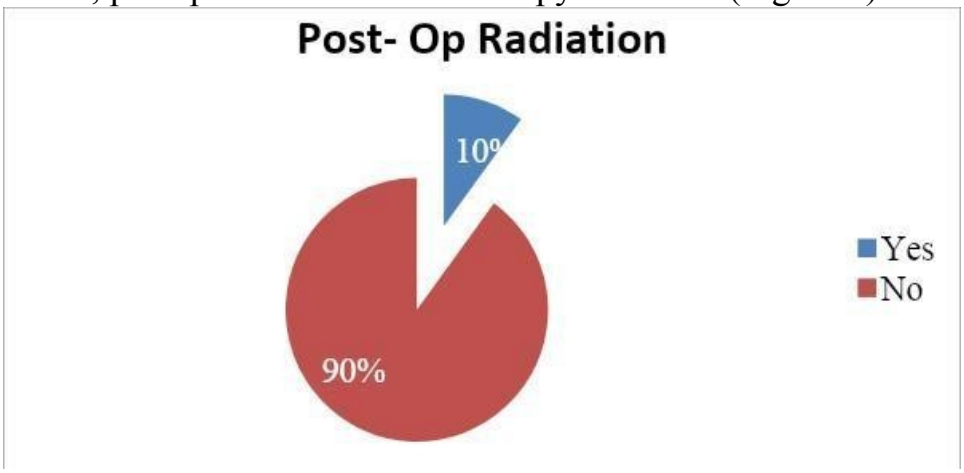

Figure 2. The proportion of postoperative radiation therapy

Survival based on the stage of the tumor process is presented in Table 3. Table 3. Survival based on tumor stage

Stage	Time of survival		mean (months)
	> 5 years		
	n	%	
T1aN0M0	31	91,2	68,87±9,5
T1bN0M0	7	100	65,13±5,2
T2N0M0	8	87,5	64±3,2

Survival depending on the type of surgical intervention is shown in Table 4.

Table 4. Survival according to operative types

OP types	Time of survival		mean (months)
	> 5 years		
	n	%	
Type III	12	92,3	66,7±8,4

Type IV	15	93,8	72,8±10,3
Type Va	17	94,4	63,8±3,3
Type Vb	2	50	61,0±1,3
Type Vc	1	100	64,0±0,8

In our study, relapse was detected in 8 (16%) patients (Table 5).

Table 5. The number of identified relapses during the observation period

Relapse – Metastasis	N=50	
	n	%
Local relapse	2	4
Cervical Lymph node metastasis	0	0

DISCUSSION

In laryngeal cancer, it is important to choose a surgical approach that provides adequate access and visualization (Baskin et al., 2018). The TLM method, especially at stages T1 or T2, shows some of the best results (Mehanna et al., 2016), and application of the CO_2 lasers for laser transoral resection of laryngeal cancer is the gold standard (Strieth et al., 2020). In particular, the transoral laser microsurgical technique offers a beneficial alternative to primary chemotherapy (Lane et al., 2020).

Studies comparing the treatment of laryngeal cancer with TLM and radiation therapy give somewhat conflicting results. For example, one study showed that survival was higher in patients with Tis/T1a laryngeal cancer who underwent TLM compared with radiation therapy (Guimarães et al, 2018). In turn, another study showed that the oncological relapse rate is higher in patients with T1a and T1b treated with TML compared to radiation therapy (Gioacchini et al, 2017). The third study did not reveal differences over a 5-year period in patients with laryngeal cancer in stage T2 (Warner et al., 2017). According to the latest data in this area (2003-2018), the overall five-year survival rate is 90%, the survival rate for concomitant diseases is 100%, and the larynx retention rate is 85% (Forner et al., 2020). In another study, the five-year level of local control was: Tis – 81.5%, T1a – 88%, T1b – 100%, and T2 – 58%; the overall 5-year survival rate is 87%, and the degree of organ preservation is 93% (Shiner et al., 2020). In the work of Lei et al. (2019) the local relapse rate for stages Tis, T1a, T1b, and T2 was 25%, 22.7%, 23.4%, and 22.1%. In our study, a relatively small number of relapses and a high 5-year survival rate are observed, which indicates a significant positive effect of this type of treatment for laryngeal cancer.

Compared with open larynx surgery methods, TLM as a method of treating laryngeal cancer combines high results with a simultaneous reduction in the number of

complications, improved voice and swallowing capabilities, and reduced hospitalization (Meulemans et al., 2017). According to the literature, the 5-year survival rate after laser surgery of T1 carcinomas of the vocal folds is 74-100%, according to other sources, the 5-year survival rate after TLM tumors in the T1 / T2 stage is 82% (Wiegand, 2016). The results of 27-year-old observations (1979-2006) were published, including 404 cases of T1a carcinoma, which reported a local control rate of 86%, laryngeal preservation of 97% and a survival rate of up to 98% (Canis et al ., 2015). Chiesa-Estomba et al. (2016) reported local control in 79.3%, with one operation including T1a, T1b and T2 tumors reaching 98.3% of the local control.

One of the main issues in the treatment of laryngeal cancer is the subsequent quality of life. The work (Vilaseca et al, 2016) showed that

94% of 401 patients who underwent CO_2 TLM had a high quality of life 1 year after treatment. Another publication demonstrates that voice and swallowing function after this type of treatment remains unchanged over time and does not worsen (Valls et al., 2016).

The involvement of anterior commissure in the cancer process has long been considered a risk factor for relapse. For example, it was found that in patients with Tis-T2 carcinoma of the vocal fold and lesion of the anterior commissure, local control, the degree of larynx preservation, and survival are reduced (Hoffmann et al., 2016). However, it is emphasized that when assessing a tumor in the anterior commissure, it is important to assess the degree of damage in the horizontal and vertical planes affecting different areas of the pharynx, since tumors with apurely horizontal spread are a good indicator for CO_2 TLM (Peretti etal., 2016). Studies in Vietnam indicate that the use of CO_2 TLM for the treatment of patients with cancer of the oropharyngeal zone shows high positive results (Tran and Nguyen, 2018). In another work involving Vietnamese patients, laser surgery gives a very good positive prognosis for pharyngeal cancer in stages T1 and T2 with a low number of complications (Nguyen and Tran, 2017). In our study, in some cases, there was a lesion of the anterior commissure, however, as the results showed, 5-year survival, despite this factor, remained at a fairly highlevel.

CONCLUSION

The results of the study suggest that the use of CO2 laser provides thorough hemostasis, makes it possible to carry out the operation in more comfortable conditions, clearly see the border between healthy and tumor tissue and more accurately determine the prevalence of tumor processes. A significantly smaller area of coagulation necrosis allows you to save a significant amount of healthy tissue without the use ofplastics.

Transoral laser microsurgery in the treatment of laryngeal cancer (T1-T2) provides high survival rates, excellent cosmetic and functional results compared toclassic open access, without compromising the immediate and long-term results of treatment.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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