SAS Journal of Surgery
Abbreviated Key Title: SAS J Surg
ISSN 2454-5104
Journal homepage: https://www.saspublishers.com

OPEN ACCESS

Surgery

Transoral Co Laser Surgery in the Treatment of Laryngeal Cancers: About 30 Cases

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DOI: https://doi.org/10.36347/sasjs.2025.v11i05.014 | **Received:** 23.03.2025 | **Accepted:** 065.2025 | **Published:** 13.05.2025

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Abstract | **Case Series**

Objective: The aim of our work was to study the different aspects of transoral CO Laser surgery in the treatment of laryngeal cancer, ranging from indications and surgical techniques to functional and oncological results. ***Maerial and Methods*:** This is a retrospective descriptive study of 30 cases of laryngeal cancer that underwent transoral CO Laser microsurgery over a 5-year period from 2018 to 2023. The Kaplan-Meier method was used to estimate survival function and Voice handicap index-30 was used for voice function assessment. ***Results*:** The average age of our patients was 60 years with a clear male predominance (90%). Tumors were classified as Tis in 23.3% of cases, T1a in 63.3% of cases, T1b in 13.4% of cases according to the 2017 UICC TNM classification of head and neck tumors. The type of cordectomy used was classified as type I according to the European Laryngological Society classification in 3.3% of cases, type II in 46.6% of cases, type III in 30% of cases, type IV in 13.4% of cases and type V in 6.6% of cases. Margins were histologically negative in 93% of cases and positive in 7% of patients. Lymph node metastasis was found in only 1 case requiring lymph node dissection. According to the Kaplan-Meier method, overall survival and 5-year specific survival were 93% and 100%, respectively. The rates of local control with laser only and preservation of the larynx were 90% and 100% respectively. Functionally, we noted a modest improvement in the VHI-30 score at 6 months and a marked improvement at 12 months. ***Conclusion*:** Transoral laser microsurgery is an effective therapeutic alternative in the treatment of early-stage squamous cell carcinomas in terms of oncological outcomes. It offers low morbidity, excellent local control and preservation of the larynx. However, careful patient selection is necessary to achieve good results.

Keywords: Larynx, Laser, Outcomes, VHI-30.

INTRODUCTION

The larynx, as an essential organ for phonation and respiration, plays a crucial role in the relational and social life of individuals. Among the cancers of the upper aerodigestive tract, laryngeal cancer is one of the most frequent localizations, representing approximately 20% of head and neck cancers [1]. Dysphonia, a revealing symptom, is often the first clinical sign leading to a diagnosis. Early diagnosis is crucial to avoid mutilating therapies, such as total laryngectomy, and to improve the functional and vital prognosis of patients [2].

Management of laryngeal carcinomas relies on a multidisciplinary approach, integrating oncologists, ENT surgeons, radiotherapists, and speech therapists to optimize treatment outcomes. Transoral CO2 laser surgery has recently emerged as an innovative technique [3]. It allows for the complete resection of the tumor while preserving essential laryngeal structures, thereby ensuring oncological outcomes comparable to more invasive techniques, but with better functional results [4, 5].

Finally, the importance of psychological support and accompanying psychotherapy is emphasized for optimizing post-therapeutic outcomes, particularly concerning vocal rehabilitation. These approaches aim to reduce the psychological and emotional impact of voice loss or alteration, which is essential for the patients' quality of life [6].

MATERIALS AND METHODS

We conducted a descriptive and analytical retrospective study involving 30 cases of laryngeal squamous cell carcinoma that underwent transoral CO2 laser microsurgery in the ENT and Head and Neck

Surgery department of Mohamed VI University Hospital in Marrakech over a 5-year period from 2018 to 2023. We relied on the Kaplan-Meier method to estimate survival function and the Voice Handicap Index-30 for functional vocal assessment.

RESULTS

The average age of our patients was 60 years, with extremes ranging from 32 to 85 years. The most representative age group was between 60 and 69 years. 90% of the patients were male (Figure 2)

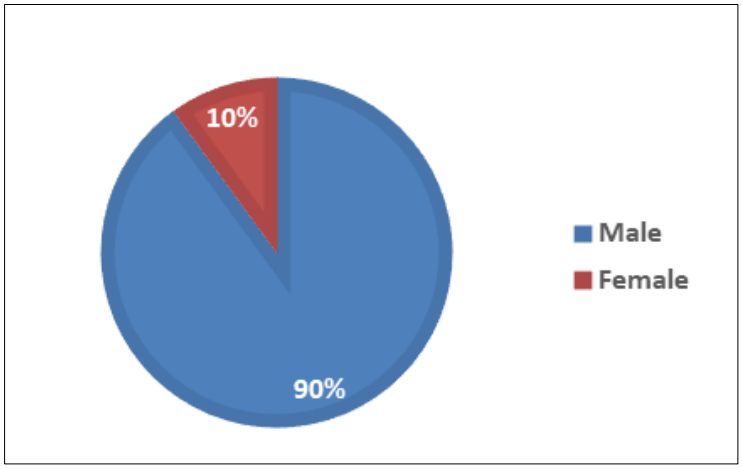

Figure 1: Distribution by gender

Regarding toxic habits, 67% of patients were alcoholics, and 93% were smokers. The average consultation delay was approximately 8 months, with extremes ranging from 2 to 12 months. Dysphonia was the predominant symptom in 100% of patients. General signs such as weight loss, asthenia, and anorexia were found in 14 patients (Figure 2).

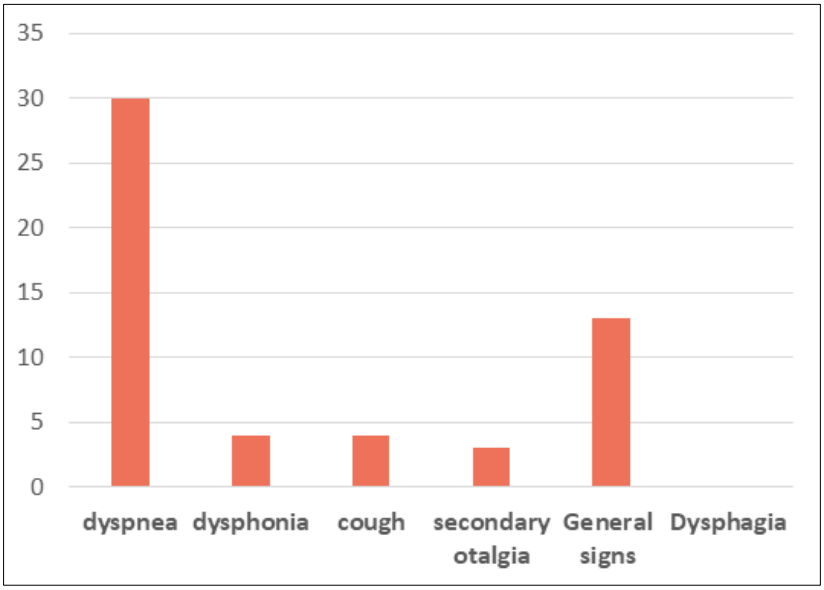

Figure 2: Distribution according to functional signs

Nasofibroscopy, is a crucial part of the clinical examination. It was performed on all our patients, revealed a budding tumor in 69.2% of cases, ulcerative lesions in 7.7%, and thickening in 23% of cases (Figures 3 and 4). The cervical examination did not reveal any cervical lymph nodes. The rest of the general examination, particularly cardiovascular and pulmonary examination, was normal.

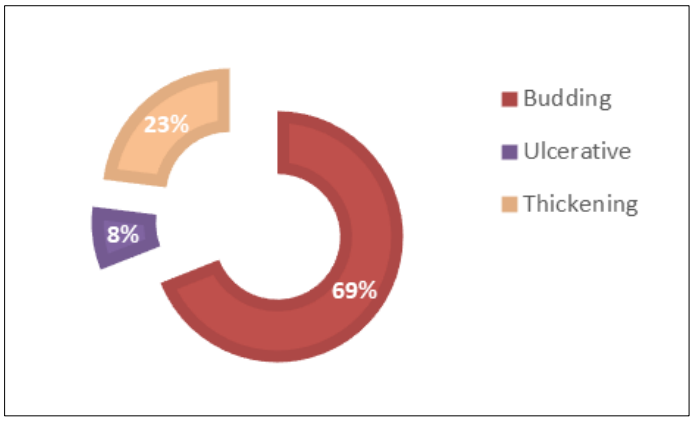

Figure 3: Nasofibroscopic aspects

Figure 4: Aspect of a budding tumor of the right vocal cord

Injected cervical computed tomography (CT) was performed in all our patients, supplemented by direct suspension laryngoscopy (Figure 5). This endoscopic examination enabled multiple biopsies to be taken, pinpointing the exact site and location of the tumour, as well as any extensions to adjacent structures.

Figure 5: Axial CT scan showing thickening of both vocal cords

As for anatomopathological findings, the diagnosis of squamous cell carcinoma of the larynx was confirmed in all cases (Figure 6). An extension work-up based on thoraco-abdomino-pelvic CT and panendoscopy of the upper aerodigestive tract in search of synchronous lesions or metastases was performed in all our patients with no notable lesions. Tumours were classified as Tis in 23.3%, T1a in 63.3% and T1b in 13.4% (Figure 7).

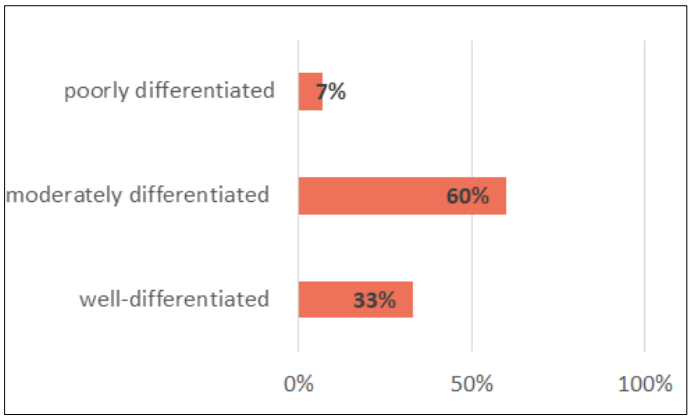

Figure 6: histological results

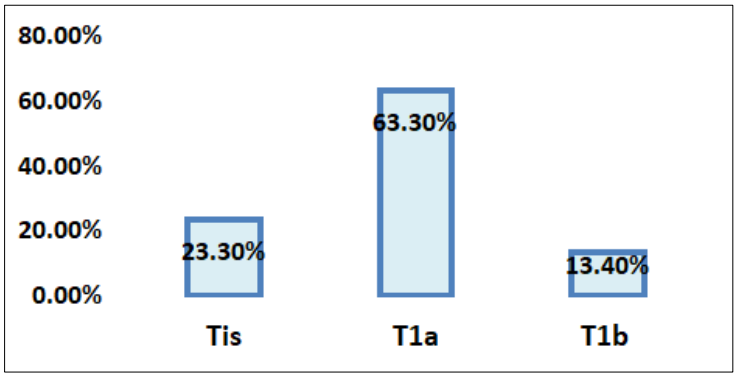

Figure 7: Distribution according to TNM classification

Concerning therapeutic management, a multidisciplinary consultation meeting was held with respect to the contraindications for the transoral approach, particularly poor laryngeal exposure and cordo-arytenoid fixation. For better exposure, we used the Boyce and Jackson position, flexing the neck on the trunk and extending the head on the neck (Figure 8).

Figure 8: Intraoperative images showing patient positioning, suspended laryngoscopy with microscope and laser setup during transoral surgery

The type of cordectomy used was classified as type I according to the European Laryngological Society classification in 3.3% of cases, type II in 46.6%, type III in 30%, type IV in 13.4%, and type V in 6.6% (Figure 9). Tumor resections were performed during each cordectomy based on the tumor's location and extension. No patient underwent tracheostomy or lymph node dissection.

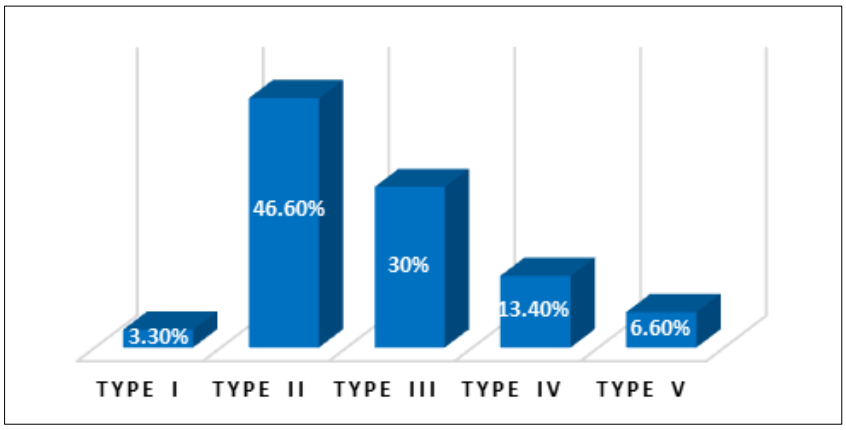

Figure 9: Distribution according to the type of cordectomy

The squamous cell carcinoma was the only histological type present. The resection margins were negative 93% of the cases. They were positive in 2 patients who underwent surgical revision with type IV laser cordectomy. The margins were negative (Figure 10).

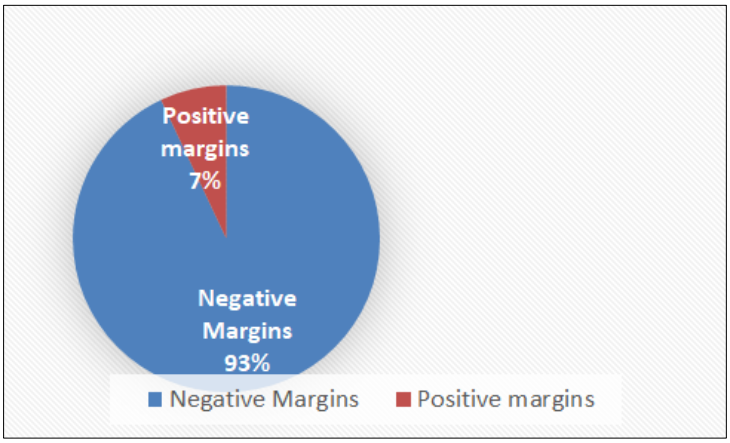

Figure 10: Distribution according to resection margins

In addition to surgical treatment, all our patients received antibiotic prophylaxis, corticosteroids, analgesics, and a nebulization protocol. The average length of hospitalization was 4 days (2-8 days). No patient required the placement of a gastric tube or tracheostomy. Resumption of feeding occurred on day 1. No per or postoperative complications were noted, particularly no hemorrhage, cervical emphysema, respiratory infections, aspiration, or swallowing disorders. All our patients benefited from speech therapy and early respiratory physiotherapy. None of the patients in our series received radiotherapy or chemotherapy. Two of our patients (6.6% of cases) underwent surgical revision via the transoral approach.

The rates of local control with laser only and preservation of the larynx were 90% and 100% respectively. Regarding functional results, we used the Voice Handicap Index 10 score (Table 1).

Table 1: Results of the VHI 10 score

	Preoperative Score	**Postoperative Score**
Average	21,13	11,13
Median	21,84	11,62
Range	10 à 34	2 à 21

The student's t-test showed a significant improvement between preoperative and postoperative scores, with a mean difference of VHI-10 being -10.30. This relationship is statistically significant as the p-value is less than 0.05 (Figure 11).

```
        Paired t-test

data:  postOP and preOP
t = -8.2879, df = 29, p-value = 3.888e-09
alternative hypothesis: true mean difference is not equal to 0
95 percent confidence interval:
 -12.845264  -7.760365
sample estimates:
mean difference
      -10.30281
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Figure 11: Analytical result of the Student's t-test

We relied on the **Kaplan-Meier** method to estimate survival function. Overall survival and disease-specific survival at 5 years were 93% and 100%, respectively (Figure 12).

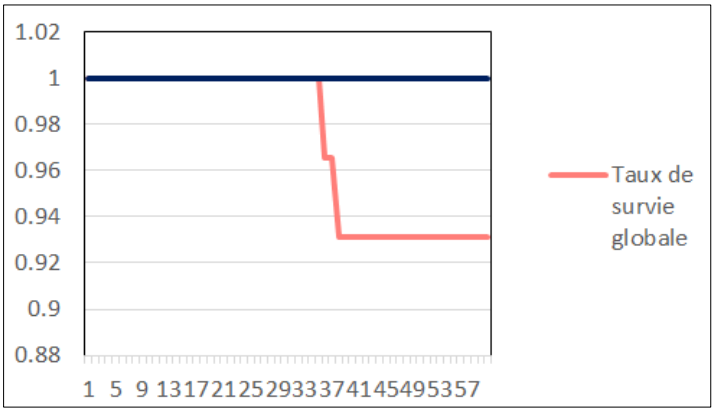

Figure 12: Survival function according to the Kaplan-Meier method

Table 2: Variations in sex and age according to series

SERIE	Average age	SEX RATIO
XAVIER LEÓN and al (15)	**62.4**	5
H. SADEK, A. TAHRI (16)	**57.5**	13.2
A. DELAGRANDA and al (17),	**60**	**7.7**
FERAS M. GHAZAWI (18)	**60**	3.2
OUR SERIE	**60**	**7.6**

DISCUSSION

Treatment of early-stage glottic cancer offers several therapeutic options, including radiotherapy, transoral laser surgery, and conventional open surgery [7]. The choice of treatment is often determined by a balance between cost, length of hospitalization, potential complications, and, above all, functional outcomes, especially preservation of voice and swallowing [8, 9]. Transoral CO2 laser surgery proves to be an increasingly preferred approach in early laryngeal cancers, thanks to its excellent oncological and functional results. This technique allows for precise tumor excisions, thus reducing side effects and facilitating rapid recovery for patients. In case of recurrence, this surgical approach also offers the flexibility to opt for complementary treatment, such as radiotherapy, or to pursue a second surgical intervention, thereby maximizing chances for tumor control and functional preservation [10-12].

Regarding epidemiological data: According to "The International Agency for Research on Cancer" established by the WHO, laryngeal cancer ranks third among head and neck cancers worldwide. It predominantly occurs in the seventh decade between the ages of 50 and 70 [13, 14]. In large retrospective series, the average age is between 55 and 69 years with a clear male predominance (Table 2).

Multiple studies have demonstrated that the relative risk of developing laryngeal squamous cell carcinoma increases in a dose-dependent manner with tobacco consumption, which is the primary risk factor implicated, in line with our series data. Other factors have also been identified, such as alcoholism, occupational exposure (involving inhalation of asbestos, wood, cement, nickel dust, etc.), genetic factors, laryngeal papillomatosis, vocal strain, and gastroesophageal reflux [19, 20]. Clinically, in various series, dysphonia was the main presenting symptom [21].

Diagnostic evaluation consists of a cervical computed tomography (CT) scan to assess the morphology of laryngeal and paralaryngeal structures, followed by a direct laryngoscopy in suspension (LDS) [22]. This is an essential examination to confirm the diagnosis of laryngeal tumors. It helps to accurately locate the primary tumor, determine its extension relative to adjacent structures, evaluate the complete exposure of the tumor, and visualize hard-to-expose regions, particularly the anterior commissure and the subglottic area, which are major criteria for the feasibility of partial laryngectomy via endoscopic approach [23].

Ideally, a descriptive diagram should be drawn (Figure 13). The staging workup is primarily based on thoraco-abdominal-pelvic CT scans and a panendoscopy to search for synchronous tumors.

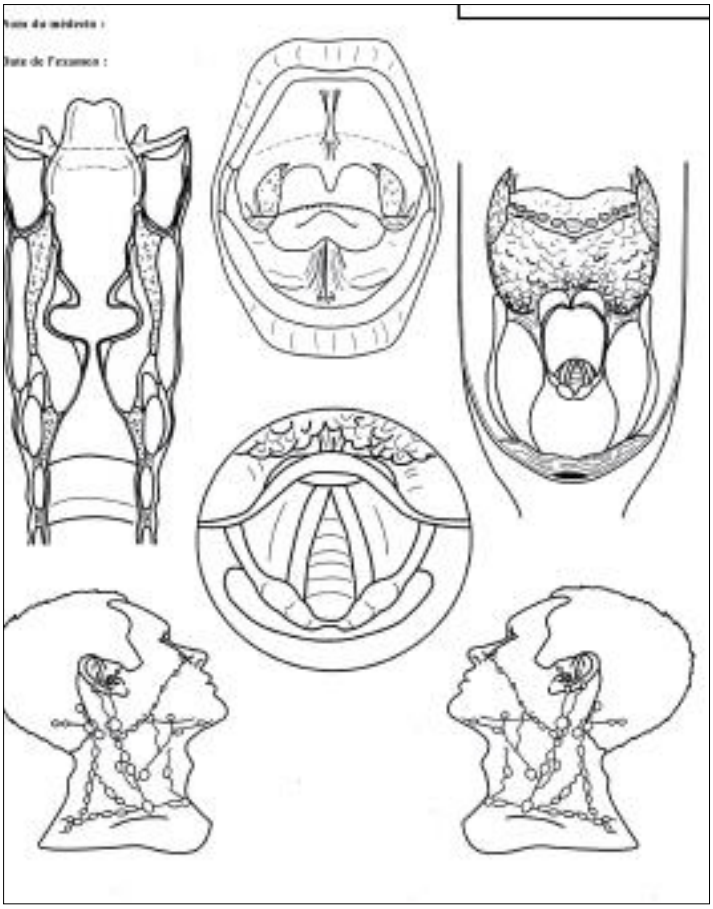

Figure 13: Descriptive Diagram of LDS Results

O_2 laser transoral endoscopic surgery is now recognized as an effective approach for the treatment of laryngeal tumors, offering promising outcomes in terms of oncological control and preservation of laryngeal functions. This technique achieves good tumor control, including its extensions, while preserving laryngeal function as much as possible, contributing to improved quality of life for patiens [24].

The advantages of this method include a significant reduction in postoperative pain and bleeding, a decreased risk of infection, and fewer tracheotomies, allowing for earlier swallowing recovery. Moreover, functional recovery post-procedure is often faster compared to traditional surgical methods [25].

CO_2 laser indications are mainly limited to vocal cord tumors, where complete resection can be achieved via this approach. In contrast, deeply infiltrating tumors, those with cartilage invasion, subglottic extension, or anterior commissure involvement, are generally excluded from this technique. The type of cordectomy is determined intraoperatively by the surgeon, based on tumor extension and adjacent structures (Table 3). This personalized approach

optimizes oncological outcomes while minimizing functional impacts on the patient [26, 27].

Table 3: Types of Cordectomy [28, 29]

Type I		Subepithelial Cordectomy
Type II		Subligamentous Cordectomy
Type III		Transmuscular Cordectomy
Type IV		Total Cordectomy
Type V	Va	Extended cordectomy involving the anterior commissure and the contralateral vocal cord
	Vb	Extended cordectomy to include the arytenoid
	Vc	Extended cordectomy to the ventricle
	Vd	Extended cordectomy to the subglottis
Type VI		Bilateral cordectomy with anterior commissurectomy

Regarding oncological outcomes, endoscopic cordectomies provide oncological results comparable to their external approach counterparts (Table 4), with better postoperative outcomes. Certainly, external surgery still holds an important place in the therapeutic management of T1-T2 glottic cancers. The resection margin is the most important factor for local recurrence [30]. However, there is currently no consensus on the margin in glottic cancer. Ansarin [31], suggested that margins can be considered clear if the distance from the disease is at least 1 mm. Nevertheless, if the margins are positive (>1 mm), further treatment should always be proposed.

Tableau 4: Local Control Rates with Laser Alone Across Series

Series	**Local Control Rate**
Gallo *et al*., [32]	94%
Eduado Breda [33]	88.4%
David Bakhos [34]	83%
Our serie	**90 %**

The vocal outcomes in our study, using the VHI-10 score, align with previous longitudinal studies, demonstrating a marked improvement and stabilization in the late postoperative period [35].

In our study, the 5-year overall and specific survival rates were 93% and 100%, respectively, corroborating with international series (Table 5).

Tableau 6: Survival Rates Across Series

Series	**Overall Survival (%)**	**Specific Survival (%)**
Batra *et al*, [36]	92.4	98.1
Lee *et al*., [37]	87,9	99
Galli *et al*., [38]	84,7	98,6
Lucioni *et al*., [39]	90,8 %	98,8 %
Our serie	93.3%	100%

CONCLUSION

Transoral laser microsurgery is an effective therapeutic alternative for early-stage laryngeal cancers in terms of oncological outcomes. It offers low morbidity, excellent local control, and preservation of the larynx. However, rigorous patient selection is necessary to achieve good results.

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