Original Article

Endoscopic laser surgery of early glottic cancer: Involvement of the anterior commissure

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KEYWORDS
carbon dioxide laser microsurgery, glottic squamous cell carcinoma, early glottic cancer, anterior commissure involvement, local control

ABSTRACT

Background
Early glottic cancer can be cured with transoral laser resection, but in cases with anterior commissure involvement, there is still controversy concerning the best treatment modality.

Methods
The impact of anterior commissure involvement on local control was analyzed in a retrospective review of 444 patients with early glottic cancer (pT1a-pT2a) treated between 1986 and 2004 with transoral laser microsurgical resection.

Results
The anterior commissure was involved in 153 cases; the 5-year local control rate with and without anterior commissure involvement was 73% versus 89% for T1a and 68% versus 86% for T1b tumors. For T2a lesions, the 5-year local control rate was 76%, irrespective of anterior commissure involvement.

Conclusion
In early glottic cancer treated by transoral laser microsurgery, a decrease in local control is evident in case of anterior commissure involvement for T1a and T1b but not for T2a tumors. © 2009 Wiley Periodicals, Inc. Head Neck, 2009

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ARTICLE TEXT

Management of early glottic cancer (T1a, T1b, and T2a) involving the anterior commissure still remains controversial because of the fact that it may be associated with a higher recurrence rate.

The anatomy of the anterior commissure was investigated in several studies and is still the subject of controversy. According to Paulsen and Tillmann[1] and Kutta et al.[2] the vocal ligament inserts at the anterior commissure by 2 characteristic structures: the noduli elastici and the vocal ligament tendon (Broyles’ ligament[3]). These structures fulfill biomechanical function by equalizing the different elastic moduli of tendon, cartilage, or bone.

Some authors[4-7] consider the fibrous tissue of the anterior commissure tendon to act as a tumor barrier preventing tumor spread cranially to the glottic plane or invasion of the adjacent thyroid cartilage. In contrast, other investigators[1-3][8][9] assume the anterior commissure to represent a weak point with regard to tumor spread because it is here that Broyles’ ligament inserts into the thyroid cartilage, and penetration might induce susceptibility to tumor invasion. Ventral spread and infiltration of the thyroid cartilage...
may be further advanced by lymphatic spread, the lack of a thyroidal perichondrium or periosteum in this area, and vascularization due to ossification of the thyroid cartilage.

Tumors involving the anterior commissure may extend caudally to the glottic ligament into the anterior subglottic space with penetration of the cricothyroid membrane, which is one of the weak points in the laryngeal framework.[7][10] Because only a few millimeters separate the anterior commissure mucosa from the thyroid cartilage especially below the anterior commissure tendon, a small tumor on the surface actually may penetrate the cartilage changing from early (T1) to advanced (T3 or T4) glottic cancer only within a few millimeters of growth.

As the tumor infiltration and the involvement of the thyroid cartilage is sometimes misjudged, anterior commissure lesions may be underestimated preoperatively, with the result that true T4 lesions are treated as “early glottic cancer” with unfavorable oncological results. Furthermore, tumors of the anterior glottic region are reported to recur predominantly in the region of the AC and recurrence may be understaged on endoscopy because of submucous spread or infiltration of the thyroid cartilage.[8][11][12]

Despite the advantages of transoral laser microsurgery,[13-15] treatment of early glottic cancer with anterior commissure involvement is still controversial because of the fact that the endoscopic exposure of the anterior commissure is more difficult and requires significant surgical experience. Primary radiotherapy and open surgical procedures are other possible therapeutic options. Irradiation may lead to good functional results, but it bears the risk of a higher recurrence rate. Open partial laryngectomies are considered as oncologically safe but functionally as not always favorable. Total laryngectomy may offer improved local control rates but with a reduced quality of life.

The aim of our study was to assess the impact of anterior commissure involvement on local control, organ preservation, and overall survival based upon a great cohort of patients with early glottic cancer treated by transoral laser microsurgery.

Patients and Methods

Patients
Four hundred sixty-three patients with previously untreated early glottic carcinomas (pT1a, pT1b, and pT2a) were treated between August 1986 and December 2004 at the Department of Otorhinolaryngology, University of Göttingen, Göttingen, Germany, by various surgeons. Nineteen patients were excluded from this study because of previous (10 patients) or simultaneous (3 patients) second primary tumors, the need for open surgery because of an inadequate microlaryngoscopic exposure (3 patients), and primary radiotherapy because of patients’ preference (3 patients). Thus, this review was based on 444 patients treated for early glottic carcinoma primarily with transoral laser microsurgery. The patients ranged in age from 28 to 90 years (median age, 62 years); 399 were men and 45 were women. Median posttherapeutic follow-up time was 65 months (range, 6-218 months).

Preoperative Examination
The routine preoperative examination comprised magnifying laryngoscopy and phoniatric examination with video stroboscopy. CT was rarely employed. Ultrasonography for staging of the neck was performed in most of the patients. Panendoscopy for the exclusion of a second primary tumor was done together with the tumor resection.

Treatment of Primary Tumors
All patients received transoral CO2-laser microsurgical resection of the glottic carcinoma. Massive involvement of the anterior commissure was not considered as an exclusion criterion for the endoscopic approach. In cases with marginal involvement of the anterior commissure without subglottic extension, the anterior commissure was resected together with the vocal cord lesion. Vertical transection of the lesion through the anterior commissure was performed for tumors with subglottic or supraglottic extension. In the region of the anterior commissure, the dissection was carried along the thyroid cartilage under high magnification of the operating microscope in order to estimate a possible infiltration of the perichondrium or the cartilage. If necessary, parts of the thyroid cartilage, the false vocal cords, and/or the cricothyroid ligament were removed, and in case of doubt, histologic examination from a frozen section was obtained.

No patient had adjuvant radiotherapy after initial surgery. Pathologic staging according to the 2002 Union Internationale Contre le Cancer (UICC)/American Joint Committee on Cancer (AJCC) classification was used. Two hundred ninety-two patients were seen with a pT1a lesion, 50 patients had a tumor categorized pT1b, and 102 patients were seen with a pT2a tumor. Involvement of the anterior commissure was histopathologically proven in 55 pT1a tumors (19%), 34 pT1b tumors (68%), and in 64 pT2a tumors (63%). Regular swabbing of fibrin layers was performed in 62 of 444 patients (14%) in order to prevent glottic synechia.

Treatment of the Neck
Two patients with a pT1b and 13 patients with a pT2a tumor with subglottic spread were seen with cervical lymph nodes suspicious for metastases, so they subsequently received selective neck dissection of the levels II and III.

Statistical Methods
Postoperative follow-up data could be evaluated on all patients. Each patient was followed until death or at the longest until March 2006. A local recurrence was defined as a carcinoma in situ or a carcinoma occurring after completion of primary treatment independent of the localization in the larynx. Locoregional recurrence was defined as simultaneous development of disease failure at both the primary site and cervical lymphatics. Regional recurrence was defined as the development of late neck metastasis without
evidence of local recurrence or a second primary tumor at time of diagnosis. Local control and overall survival rates were calculated by the Kaplan-Meier method.[16] Comparisons between subgroups divided according to anterior comissure involvement were performed by the log-rank test. For the determination of the local control rate, neck recurrences, TNM-related deaths, intercurrent deaths, and deaths as a result of second primary tumors as well as patients alive without recurrence were regarded as censored observations. Local and locoregional failure were considered as uncensored events. The larynx preservation rates were given absolutely. The overall survival time was defined as the interval between the date of surgery and the date of the last consultation or the date of death.

Results

Re-resection

Forty-one of the entire group of 444 patients (9%) received re-resection because of positive or uncertain resection margins. In 19 of 41 cases (46%), re-resection specimens were free of tumor. Residual carcinoma was found in 22 of 41 patients (54%).

Another 141 patients (32%) had a second microlaryngoscopy because of granuloma, webs, or scar formation in order to exclude recurrence. All specimens from these patients were free of tumor.

Local Control

Seventy-four of the 444 patients (17%) developed local or locoregional recurrences with an average interval to recurrence of 32.9 months. Thirty-seven of these patients (50%) had primary anterior comissure involvement, whereas the anterior comissure was free of tumor in the other 37 cases at the time of primary surgery. The 5-year local control rate estimated according to Kaplan-Meier with and without anterior comissure involvement was 73% versus 89% for pT1a tumors, 68% versus 86% for pT1b tumors, and 76% each for pT2a tumors (Table 1, Figure 1). Thus, the 5-year local control rates were higher for T1a and T1b tumors without anterior comissure involvement but not for T2a patients.

Figure 1. Local control after laser microsurgical resection of early glottic carcinoma separated for T1a (A), T1b (B), and T2a (C) tumors. AC+, anterior comissure involvement; AC-, no anterior comissure involvement. A decrease in local control is evident if the anterior comissure was involved by the primary tumor for T1a and T1b tumors but not for T2a lesions.

[Normal View 44K | Magnified View 115K]

Table 1. Treatment results and oncological follow-up of carbon dioxide laser microsurgery for early glottic carcinoma (T1a-T2a)

<table>
<thead>
<tr>
<th></th>
<th>Primary TNM</th>
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<tbody>
<tr>
<td></td>
<td>pT1a (n = 292)</td>
</tr>
<tr>
<td></td>
<td>AC+</td>
</tr>
<tr>
<td>Number of patients</td>
<td>55</td>
</tr>
<tr>
<td>Overall survival, %</td>
<td></td>
</tr>
<tr>
<td>3-year</td>
<td>88</td>
</tr>
<tr>
<td>5-year</td>
<td>85</td>
</tr>
<tr>
<td>Local control, %</td>
<td></td>
</tr>
<tr>
<td>3-year</td>
<td>79</td>
</tr>
<tr>
<td>5-year</td>
<td>73</td>
</tr>
<tr>
<td>Ultimate local control, %</td>
<td></td>
</tr>
<tr>
<td>3-year</td>
<td>100</td>
</tr>
<tr>
<td>5-year</td>
<td>16</td>
</tr>
<tr>
<td>Local recurrence, %</td>
<td>(9/55)</td>
</tr>
<tr>
<td>Locoregional recurrence, %</td>
<td>6 (3/55)</td>
</tr>
<tr>
<td>Regional recurrence, %</td>
<td>2 (1/55)</td>
</tr>
<tr>
<td>Number of local or locoregional recurrences</td>
<td></td>
</tr>
</tbody>
</table>
In the 37 recurrence-patients seen initially with anterior commissure involvement, local recurrence did not extend into the anterior commissure in 17 patients. Thirty-seven of the 291 patients without primary anterior commissure involvement developed a local recurrence, of which 11 extended into the anterior commissure region.

Larynx Preservation
Fifty-three of 74 patients (72%) with local or locoregional recurrences had organ preserving salvage therapy by further laser resection or laser resection and radiotherapy. Open partial laryngectomy was not needed. Twenty-one patients had salvage laryngectomy. Thus, the larynx preservation rate of the entire group was 95%. The larynx preservation rate for patients with and without anterior commissure involvement was 95% versus 98% for pT1a tumors, 88% versus 100% for pT1b tumors, and 89% versus 95% for pT2a tumors, respectively (Table 1).

Regional Control
Three of 15 patients who had neck dissections concomitantly with the primary resection were seen with neck metastases on histopathologic examination (all were pN1). All patients had a pT2a tumor. The remaining 12 patients were free of neck metastases (pN0).

Twelve patients underwent selective neck dissection (level II and III) during follow-up because of suspicious lymph nodes, and regional recurrence was proven by histopathologic examination in 7 patients (3 pT1a, 1 pT1b, 3 pT2a). However, in 2 of these patients, a secondary lung cancer was detected within a period of 12 and 23 months after neck surgery. For these cases, it can be speculated that neck metastases may be due to the lung tumor, and not related to the glottic cancer. Another patient with a pT2a tumor developed late neck metastasis. He refused surgical treatment and underwent radiotherapy.

Second Primary Tumors
Second primary tumors occurred in 54 patients (12%), mainly in the lung (Table 2).

Table 2. Second primary tumors in our cohort of 444 patients with early glottic cancer (pT1a-pT2a)

<table>
<thead>
<tr>
<th>Location of second primaries</th>
<th>No. of patients</th>
<th>Percentage (n = 444)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung</td>
<td>28</td>
<td>6.3</td>
</tr>
<tr>
<td>Head and neck</td>
<td>7</td>
<td>1.5</td>
</tr>
<tr>
<td>Prostate/urinary tract</td>
<td>6</td>
<td>1.4</td>
</tr>
<tr>
<td>Skin</td>
<td>4</td>
<td>0.9</td>
</tr>
<tr>
<td>GIT</td>
<td>2</td>
<td>0.5</td>
</tr>
<tr>
<td>Lymphoma</td>
<td>3</td>
<td>0.7</td>
</tr>
<tr>
<td>Esophagus</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>Brain</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Soft tissue</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Total</td>
<td>54</td>
<td>12.2</td>
</tr>
</tbody>
</table>

Survival

One hundred nine patients (25%) died during follow-up until March 2006. The causes of death are listed in Table 3.
One hundred nine patients (25%) died during follow-up until March 2006. The causes of death are listed in Table 3. Anterior commissure involvement was not associated with a decrease in overall survival (Table 1).

Table 3. Causes of death in our series of 444 patients with early glottic cancer (pT1a-PT2a) treated exclusively by transoral laser microsurgery

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>No. of patients</th>
<th>Percentage (n = 444)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tumor-related deaths *</td>
<td>8</td>
<td>1.8</td>
</tr>
<tr>
<td>Second primary tumor</td>
<td>25</td>
<td>5.6</td>
</tr>
<tr>
<td>Intercurrent disease</td>
<td>76</td>
<td>17.1</td>
</tr>
<tr>
<td>Total</td>
<td>109</td>
<td>24.5</td>
</tr>
</tbody>
</table>

* Deaths due to local recurrent disease, late metastasis, and/or distant metastasis.

Postoperative Complications

Postoperative complications were scored as major if surgical management was necessary and as minor if they could be managed by conservative therapy. One patient with a pT1a vocal cord carcinoma and 2 patients with a pT2a tumor (0.7%) suffered postoperative endolaryngeal hemorrhage and had endoscopic electrocaugulation. Ten patients (2.3%) developed temporary endolaryngeal edema and were treated with corticosteroids. Two patients with a pT1a tumor and 2 patients with a pT2a tumor (0.9%) developed neck emphysema which required no further therapy. None of the 444 patients required tracheotomy or feeding tube. Late complications did not occur. Twelve (3%) patients required postoperative intensive care because of preexistent chronic pulmonary or cardiac diseases and diabetes.

Discussion

The ideal treatment of early vocal cord cancer is still a topic of controversy, especially in cases involving the anterior commissure.[17] The behavior of the latter seems to be somewhat different from that of other glottic tumors, and they deserve special consideration when treatment modalities are considered.

Early glottic cancer encompasses a variety of tumors ranging from small and superficial lesions involving only a small portion of the vocal cord to tumors extending into the anterior commissure and/or reaching to the arytenoid. Thus, the efficiency of the TNM classification in predicting prognosis in laryngeal cancer is limited and different types of cordectomy have been classified in treatment of early glottic cancer reflecting the heterogeneity in tumor extension. As patients with early glottic cancer represent an inhomogeneous group, the extent of the glottic lesion has to be further described in detail. In conclusion, a classification taking into account the actual size and the extent of the tumor could be a better predictor of outcome compared to the conventional T-staging. Rucci et al[18] suggested the “anterior commissure classification” considering the degree of tumor infiltration at this site. In their series of 309 patients with laryngeal cancer (T1 to T4) extending into the anterior commissure treated with different modalities (radiotherapy, endoscopic cordectomy, open partial laryngectomy procedures, and total laryngectomy), the rate of recurrence increased with the degree of anterior commissure involvement but no such association was found between local control rate and TNM class.

With regard to superior quality of voice, primary radiotherapy is a widely accepted treatment option for early glottic carcinoma. However, the impact of anterior commissure involvement on the success of primary radiotherapy is less clear. Some authors[19-28] could not show anterior commissure involvement to bear a significant risk for local recurrence. Persky et al[29] and Stevenson et al[30] documented excellent control rates of 93% and 100%, respectively, for T1 glottic carcinomas involving the anterior commissure, thus recommending primary radiotherapy as an effective method of treatment. In contrast, other investigators regarded anterior commissure involvement to be associated with a decrease in local control rate varying from 13% to 88%.[31-42] According to Kelly et al[43] and Le et al,[44] anterior commissure involvement is associated with a decreased local control rate for T1 but not for T2 lesions. For T1 tumors, Mantravadi et al[45] reported anterior commissure involvement to adversely influence prognosis when it is associated with bilateral vocal cord involvement. Technical factors (fraction size, treatment time, technique for application) and inadequate staging with a risk of under-dosage and/or missing more advanced disease which is more likely to recur locally are considered to explain why anterior commissure involvement is of prognostic relevance in some studies but not in others.[10][17] In this context, pretherapeutic CT or MRI of the larynx have been recommended to assess the extension and a possible cartilage infiltration.[37][40][46] However, as the thyroid cartilage starts to ossify already in the second decade of life,[2] it is difficult to assess cartilage invasion by CT or MRI.[47] According to Krespi and Meltzer,[48] primary radiotherapy for tumors involving the anterior commissure provides results similar to those obtained for conservation surgery. Mlynarek et al[49] compared patients with early glottic carcinoma after primary radiotherapy and microsurgery. They found that 50% of patients with anterior commissure involvement had recurrences, irrespective of the treatment modality.

Radiotherapy is a time-consuming and expensive procedure necessitating several weeks and cannot be repeated in case of...
Radiotherapy is a time-consuming and expensive procedure necessitating several weeks and cannot be repeated in case of recurrence or a second primary tumor in the region of irradiation. Furthermore, it may be associated with debilitating complications, such as chondronecrosis and edema requiring tracheostomy, and it introduces the risk of radiogenic carcinoma especially in younger patients. Delayed diagnosis of persistent or recurrent tumor may be due to residual edema. As a salvage operation, total laryngectomy is mostly needed, sometimes followed by delayed healing due to irradiation. Tumor-related deaths occur more often after radiotherapy than after surgery. Radiotherapy includes the need for a diagnostic microlaryngoscopy and biopsy, a procedure that can be used for curative laser surgery. Because of the fact that there is no operative exploration, radiotherapy contains a pretherapeutic uncertainty of overstaging or understaging of the glottic lesion, especially in the anterior commissure region.

Given the disadvantages of primary radiotherapy, open partial or subtotal laryngectomy procedures with or without reconstruction of the endolaryngeal surgical defect have been advocated for the treatment of early glottic cancer with anterior commissure involvement, such as vertical hemilaryngectomy, horizontal supracricoid laryngectomy, partial frontolateral laryngectomy, and near total laryngectomy. Data on local control vary between 81% and 100%. However, conventional partial procedures contain certain disadvantages. They are expensive treatment options, including longer hospitalization, tracheostomy, and a nasogastric tube in many cases. Some patients may develop laryngeal stenosis and require permanent tracheostomy or, if possible, extensive reconstructive surgery. Furthermore, these procedures can lead to the resection of more tissue than is needed for proper oncological control, thus compromising good functional results and, therefore, many patients were seen with a certain degree of permanent speech alteration or hoarseness because of a lack of glottic closure. The optimal entry point into the laryngeal lumen has to be selected by using landmarks determined before surgery and the tumor is not in view until the larynx has been opened. However, open partial laryngectomy procedures offer no guarantee against local recurrence and total laryngectomy remains the only surgical treatment option in the vast majority of these cases. With regard to anterior commissure involvement, Rebeiz et al introduced a combined endoscopic and open technique called the “window partial laryngectomy” in order to minimize excessive resection seen with external partial laryngectomy.

In recent years, organ-preserving endoscopic laser resection of laryngeal tumors has achieved considerable popularity, thanks to the pioneer work of the senior author (W.S.). In contrast to other treatment options, laser resection offers a shorter duration of treatment and hospitalization. It can be performed as an outpatient procedure and can be repeated preserving the option of radiotherapy, and, if necessary, salvage open surgery. A tracheostomy is usually not necessary. Each excision can be adapted individually to the size of the tumor with preservation of the laryngeal framework. For early glottic cancer, data on local control are varying between 80% and 94%, with larynx preservation in more than 94% of cases.

Treatment of lesions with anterior commissure involvement by laser surgery, however, is still debated. Some investigators believe that laser surgery should be avoided in case of anterior commissure involvement because of a high rate of recurrence. Other authors recommend endoscopic laser surgery in case of anterior commissure involvement only for tumors spreading “superficially” at the level of the glottis without extension to the supraglottis or subglottis and/or if exposition of the anterior glottic region poses no difficulties. Other investigators demonstrated that early glottic cancer extending into the anterior commissure can be treated successfully by endolaryngeal microlaryngoscopic resection, even in cases with radiotherapy failures.

Up to now, however, there have been only few studies on long-time follow-up data based upon a greater number of patients with early glottic cancer and anterior commissure involvement treated by laser surgery. Some authors observed a decrease but not a statistically significant influence on local control in cases with involvement of the anterior commissure. However, analysis by staging was not performed because of the small number of cases. For patients with single-cord lesions, Pradhan et al reported recurrence rates of 13% and 36% for cases with and without anterior commissure involvement, respectively. In a retrospective study on 110 patients with early glottic cancer, Mortuari et al reported rates of recurrence of 22% for T1a, 14% for T1b, and 66% for T2 cases without association between local control and anterior commissure involvement. In case of recurrence, the anterior commissure was concerned in 54% of the patients. Hart et al reviewed 79 cases with early glottic cancer treated by transoral laser resection staged as T1s, T1a, and T1b but could not show a relationship between recurrence and anterior commissure involvement. However, this was probably due to the superficial nature of most of the tumors involving the anterior commissure in their series and/or the small number of cases (n = 8) with anterior commissure involvement. Furthermore, the recurrence rate was remarkably higher for T1b tumors. In contrast to our series, a massive involvement of the anterior commissure was an exclusion criterion for endoscopic surgery in some studies resulting in a possible inadvertent bias toward primary radiotherapy or open partial laryngectomy. Thus, with regard to anterior commissure involvement, the range on local control may not only be due to differences in surgeons’ experience or in the structure of subgroups (T1s, T1, T2) but also due to a heterogeneity in patient selection.

In our study, subgroup analysis showed anterior commissure involvement to be associated with a tendentially decreased local control for T1a and T1b (Table 1, Figure 1). For T2a tumors, however, we could not show any impact of anterior commissure involvement on local control. Thus, in our opinion, grouping T1a, T1b, and T2 lesions together in any statistical analysis seems to be unwise because of the heterogeneous behavior of these lesions. Nevertheless, in accordance to our previous article on 263 patients, this analysis suggests that laser surgery is an effective treatment option in patients with early glottic cancer and anterior commissure involvement, as most of the recurrent tumors could be treated by further laser resection with a high rate of larynx preservation.

In tumors with anterior commissure involvement, endoscopic exposure is more essential and requires much experience. Surgery in this region can be optimized by small diameter laryngoscopes and high magnification. For adequate exposure, pressure must be exerted on the bottom end of the thyroid cartilage or on the cricothyroid area, near the median line and partial supraglottic resection
may be necessary in some cases. During resection, subdivision of the tumor may be useful to visualize its margins and its true extension. On surgery, aggressiveness in dealing with anterior commissure involvement is required even in early and superficial lesions with, if necessary, resection of thyroid periosteum, anterior commissure cartilage, and soft tissue between thyroid and cricoid cartilage followed by frozen and/or permanent section.[80][81]

Open partial laryngectomy is a safe treatment option for surgeons with limited experience in transoral laser surgery, in cases with difficult endoscopic exposure of the anterior commissure and for local recurrence to ensure the complete resection of the tumor. This may particularly be necessary in difficult local situations when the resection of the tumor cannot be controlled by the transoral approach because of scar formations or submucous spread. In our series, open partial laryngectomy was not needed for local recurrence, as most recurrent tumors could be managed by the transoral approach again, followed by radiotherapy in some cases. In the remaining 21 patients, however, total laryngectomy had to be performed as a salvage procedure because of extralaryngeal tumor spread and/or infiltration of both artenoids.

As our analysis of the site of recurrence indicates, recurrent tumor does not necessarily appear in the anterior commissure in cases with primary anterior commissure involvement.

In our patients, we observed an incidence of 0.7% for major and of 3.2% for minor complications. In contrast, the incidence of major or long-term complications because of primary radiotherapy, such as glottic fibrosis and/or stenosis, cervical myelitis, laryngeal cartilage necrosis, and hypothyroidism is reported by up to 9%, whereas minor complications, such as laryngitis, moderate edema, are reported to occur in up to 18%.[22][37][45][82-84] As expected for early glottic carcinoma, most patients in our series died of intercurrent disease (17%), with only 8 patients (1.8%) dying of TNM-related disease.

**Conclusions**

Transoral CO2-laser microsurgery is an effective therapeutic option in early glottic carcinoma. Involvement of the anterior commissure by carcinoma, however, affects local control in T1a and T1b tumors. In case of recurrence, organ preserving surgery seems possible in most patients by repeated transoral laser microsurgery preserving other treatment options such as irradiation and open salvage surgery.

**REFERENCES**

Ottohlinolaryngol 2006; 263: 879-888. Links


A

Local Control [%]

- pT1a (AC+)
- pT1a (AC-)  

p = .06

Time [Months]

B

Local Control [%]

- pT1b (AC+)
- pT1b (AC-)  

p = .32

Time [Months]

C

Local Control [%]

- pT2a (AC+)
- pT2a (AC-)  

Time [Months]