Original Article

One hundred supracricoid laryngectomies with cricohyoidoepiglottopexy: do we achieve better local control?

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Abstract

Objective: Supracricoid laryngectomy with cricohyoidoepiglottopexy has been known to be able to cope with tumor excisions with minimal margins. Extended resection may result in a limited margin and may impair the prognosis. We conducted a clinicopathologic analysis of local recurrence in supracricoid laryngectomy with cricohyoidoepiglottopexy patients.

Methods: Between 1997 and 2013, 100 patients with glottic cancers underwent supracricoid laryngectomy with cricohyoidoepiglottopexy. The clinicopathologic findings were evaluated. We also analyzed: (i) cancer-specific and overall survival rates, (ii) the correlation between locoregional recurrence and overall survival, (iii) T staging and larynx preservation rates and (iv) previous radiation history and larynx preservation rates.

Results: Local recurrence was recognized in eight of the 100 patients (8%); all were initially staged as T3 or T4. Recurrence was identified in the submucosal regions of the ipsilateral arytenoid and/or infraglottis. Six patients were salvaged by completion total laryngectomy except two. Cancer-specific survival at 5 years was 93%; overall survival at 5 years was 89%. There was no significant difference between overall survival and locoregional recurrence. There was a significant difference between larynx preservation rates in T1–2 and T3–4 patients. There was no significant difference between larynx preservation and the previous radiation therapy status.

Conclusions: Our experience convinced us of the clinical potential of supracricoid laryngectomy with cricohyoidoepiglottopexy as one of the effective options for functional larynx preservation. Supracricoid laryngectomy with cricohyoidoepiglottopexy is the most suitable for unfavorable T2 and T3a cases and is applicable for appropriately selected radiation-failed patients. Thorough preoperative evaluation, proper surgical techniques and careful follow-up are prerequisites for the success of supracricoid laryngectomy with cricohyoidoepiglottopexy.

Key words: laryngeal cancer, functional larynx preservation, local recurrence

Introduction

Supracricoid laryngectomy with cricohyoidoepiglottopexy (SCL-CHEP) is a functional larynx preservation surgery indicated for early and selected advanced laryngeal cancers. In 1959, Majer and Rieder (1), from Austria, reported the first concept of SCL and, in the 1970s, Piquet (2,3) and Laccourreye (4,5), from France, established and
popularized the clinical use of SCL. Today, SCL has become one of the main surgical options for functional larynx preservation worldwide (6–10).

By removing approximately three-quarters of the larynx including en bloc resection of the bilateral glottis and paraglottic spaces except for one or two arytenoids, SCL-CHEP can achieve optimal control of the primary site. Local recurrence rates have been reported between 5 and 8% (3,4,8–11), recognized to be significantly lower than in conventional partial laryngectomies (12,13).

The surgical potential of SCL-CHEP has been confirmed to be able to cope with tumor excisions with margins of a few millimeters at the anterior, posterior and superior glottis except for the inferior glottis (14). An intraoperative margin study was reported to be useful for ensuring the validity of SCL-CHEP (15). However, extended resection with SCL may result in a limited resection margin (16), and a positive margin is known to impair the prognosis (17,18).

After initial surgical training at the Institut Gustave Roussy and University of Paris V in France, we performed our first case of SCL-CHEP in 1997 (6). In this study, we conducted a clinicopathologic analysis of local recurrence in SCL-CHEP patients operated on in the past 17 years.

Patients and methods

Between January 1997 and December 2013, 100 patients with glottic cancers (squamous cell carcinoma) underwent SCL-CHEP at our institute. In all procedures, a margin study was conducted by histopathologically examining surrounding mucosal strips between the resected specimen and residual larynx using frozen sections. Margin studies influenced the intraoperative decision to convert from SCL-CHEP to total laryngectomy (TL) in two cases, and these patients were not included in the 100.

The incidence, clinicopathological findings, management and outcome of the patients with local recurrence were evaluated. The outcome measures analyzed included: (i) cancer-specific (CS: a net survival measure representing cancer survival in the absence of other causes of death) and overall survival (OS) rates, (ii) the correlation between locoregional recurrence and OS, (iii) T staging and larynx preservation (LP) and (iv) previous radiation history and LP rates. Tumor Node Metastasis staging was classified based on the International Union Against Cancer (UICC) classifications, fifth edition before 2001 and sixth edition after 2002 (19).

Results

Pathological TN (pT, pN) staging and past histories of radiation therapy (RT) in the 100 patients are presented in Table 1. There were 96 male and four female patients, with a median age of 64 years old (ages ranged from 32–76 years old, at the time of SCL-CHEP). Sixty-five and 35 patients received SCL-CHEP as initial treatment and salvage surgery after failed RT, respectively. Local recurrence was recognized in eight of the 100 (8%) patients. Clinical details of the eight patients are presented in Table 2. Images of the larynx, computed tomography (CT) scans and surgical specimens at the initial treatment and on local recurrence are presented in Table 3.

CS and OS rates are presented in Figure 1.

All eight patients with recurrences were male and initially staged as T3 or T4; only one had received RT previously (Case 5). Recurrence was identified in the submucosal region of the remaining ipsilateral arytenoid in four and in the ipsilateral subglottis in four patients. In two patients (Cases 5 and 6), surgical margin was redefined intraoperatively because of the obscure tumor extension. Intervals between SCL-CHEP and local recurrence ranged from 4 to 61 months (average: 21 months). Six patients were salvaged by completion TL except one, who refused to receive further treatment. One patient (Case 7) developed distant metastases after the removal of local and nodal recurrence, followed by adjuvant RT.

Among the 100 patients, three developed solitary neck node recurrence; intervals between SCL-CHEP and nodal recurrence ranged

![Table 1](https://example.com/table1.png)

Pathological TN (pT, pN) staging and the past history of radiation therapy (RT) of the 100 SCL-CHEP patients analyzed

<table>
<thead>
<tr>
<th>pT1</th>
<th>pT2</th>
<th>pT3</th>
<th>pT4</th>
</tr>
</thead>
<tbody>
<tr>
<td>pN0</td>
<td>4 (4)</td>
<td>36 (14)</td>
<td>34 (11)</td>
</tr>
<tr>
<td>pN1</td>
<td>0 (1)</td>
<td>1 (1)</td>
<td>1 (0)</td>
</tr>
<tr>
<td>pN2</td>
<td>1 (1)</td>
<td>0 (0)</td>
<td>3 (1)</td>
</tr>
<tr>
<td>Total</td>
<td>5 (5)</td>
<td>37 (15)</td>
<td>38 (12)</td>
</tr>
</tbody>
</table>

SCL-CHEP, supracricoid laryngectomy with cricohyoidoepiglottopexy.

![Table 2](https://example.com/table2.png)

Clinical details of the eight SCL-CHEP patients with local recurrence

<table>
<thead>
<tr>
<th>Patients at SCL</th>
<th>Pathology</th>
<th>Local recurrence (LR)</th>
<th>Prognoses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial visit</td>
<td>Age/ sex</td>
<td>Intra-SCL margin (sites examined)</td>
<td>Minimum margin</td>
</tr>
<tr>
<td>1 2004</td>
<td>72/M</td>
<td>T4N0</td>
<td>All negative (5)</td>
</tr>
<tr>
<td>2 2004</td>
<td>64/M</td>
<td>T3N0</td>
<td>Inf and post positive (12) + (1)*</td>
</tr>
<tr>
<td>3 2008</td>
<td>66/M</td>
<td>T4N0</td>
<td>All negative (11)</td>
</tr>
<tr>
<td>4 2009</td>
<td>66/M</td>
<td>T3N0</td>
<td>All negative (9)</td>
</tr>
<tr>
<td>5 2012</td>
<td>71/M</td>
<td>T3N0</td>
<td>All negative (8)</td>
</tr>
<tr>
<td>6 2012</td>
<td>38/M</td>
<td>T4N0</td>
<td>All negative (10)</td>
</tr>
<tr>
<td>7 2013</td>
<td>66/M</td>
<td>T3N0</td>
<td>All negative (6)</td>
</tr>
<tr>
<td>8 2011</td>
<td>75/M</td>
<td>T4N0</td>
<td>Post positive (5) + (1)*</td>
</tr>
</tbody>
</table>

CT, computed tomography; TL, total laryngectomy; DOD, died of disease; AWOD, alive without disease; AWD, alive with disease.

*The number of additional sampling obtained.
Table 3. Images of the eight SCL-CHEP patients with local recurrence: larynx, CT scan and surgical specimen at the initial treatment and at local recurrence

<table>
<thead>
<tr>
<th>Initial Stage</th>
<th>①T4</th>
<th>②T3</th>
<th>③T4</th>
<th>④T3</th>
<th>⑤T3</th>
<th>⑥T4</th>
<th>⑦T3</th>
<th>⑧T4</th>
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<tbody>
<tr>
<td>Larynx</td>
<td><img src="image1" alt="Image" /></td>
<td><img src="image2" alt="Image" /></td>
<td><img src="image3" alt="Image" /></td>
<td><img src="image4" alt="Image" /></td>
<td><img src="image5" alt="Image" /></td>
<td><img src="image6" alt="Image" /></td>
<td><img src="image7" alt="Image" /></td>
<td><img src="image8" alt="Image" /></td>
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<tr>
<td>CT</td>
<td><img src="image9" alt="Image" /></td>
<td><img src="image10" alt="Image" /></td>
<td><img src="image11" alt="Image" /></td>
<td><img src="image12" alt="Image" /></td>
<td><img src="image13" alt="Image" /></td>
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<td><img src="image15" alt="Image" /></td>
<td><img src="image16" alt="Image" /></td>
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<tr>
<td>SCL</td>
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<td><img src="image18" alt="Image" /></td>
<td><img src="image19" alt="Image" /></td>
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<td><img src="image23" alt="Image" /></td>
<td><img src="image24" alt="Image" /></td>
</tr>
<tr>
<td>Larynx</td>
<td><img src="image25" alt="Image" /></td>
<td><img src="image26" alt="Image" /></td>
<td><img src="image27" alt="Image" /></td>
<td><img src="image28" alt="Image" /></td>
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<td><img src="image31" alt="Image" /></td>
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<td>CT</td>
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<td><img src="image45" alt="Image" /></td>
<td><img src="image46" alt="Image" /></td>
<td><img src="image47" alt="Image" /></td>
<td>NA</td>
</tr>
</tbody>
</table>
from 11 to 30 months (average: 17 months). These patients subsequently underwent neck dissection; currently, two are alive without disease and one is alive with lung metastases. CS rates at 5, 10, and 15 years were 93%, 91%, and 91%, respectively. OS rates at 5, 10, and 15 years were 89%, 75%, and 75%, respectively.

The correlations between OS and locoregional recurrence (eight local and three nodal) are presented in Figure 2. There was no significant difference between these two patient groups ($P = 0.93$). The correlations between LP rates and T staging are demonstrated in Figure 3. There was a significant difference between T1–2 and T3–4 stage groups ($P = 0.006$). The correlations between LP rates and the previous RT status are demonstrated in Figure 4. There was no significant difference between these two patient groups ($P = 0.34$).

**Discussion**

Landmark trials of VA in 1991 (20) and RTOG 91-11 in 2003 (21) changed the treatment paradigm of advanced laryngeal cancer from surgery to chemoradiation therapy (CRT). Over the past two decades, the vast majority of patients have been managed without a primary surgical approach, and there has been a decline in the rate of open surgeries (22). Many teaching hospitals are now unable to train residents in open larynx preservation surgeries because of a lack of experience (23). Despite the successful results of CRT, it has become evident that a significant proportion of patients do not benefit from it due to difficulties in failure management and severe late toxicities (24,25). A higher total dose of RT is significantly correlated with a higher late toxicity incidence (26). As the treatment paradigm gradually and inevitably shifts back from CRT to surgical options such as transoral laser and open larynx preservation surgeries, it is important to pursue an optimal balance between non-surgical and surgical larynx preservation options. By analyzing the clinical results of 100 SCL patients, we aimed to reveal the clinical usefulness and limitations of SCL and establish its clinical indication, which will help develop the future treatment paradigm.

Differing from conventional partial laryngectomies, SCL-CHEP is a more radical functional larynx preservation surgery designed to treat not only early to intermediate but also selected advanced cancers. By removing approximately three-quarters of the larynx including bilateral paraglottic spaces, SCL-CHEP can achieve three primary goals of larynx preservation: (i) continuous oncological control, (ii) life without a tracheal stoma and (iii) acceptable vocal and swallowing functions. Among the three goals, continuous oncological control is by far the most important for the success of SCL-CHEP. Better oncological control essentially relies on better local and regional control (14–16). Local recurrence of SCL-CHEP has been reported at rates of 5–8% (3,4,8–11), compared with 18–31% in conventional partial laryngectomies (12,13).

Among the 100 SCL-CHEP patients, eight and three developed local and regional (nodal) recurrence, respectively. The incidence of local recurrence in our series was at the highest level among the previous reports; this was presumably on the result of the higher proportion (38%) of advanced (T3–4) stage cases. We did not encounter local...
Reurrence until 2006, but encountered three cases in 2009 and four after 2013; all eight patients were initially staged as T3 or T4 (Fig. 3). Previous RT did not increase the risk of local recurrence (Fig. 4). Increased surgical experience did not reduce the risk of local recurrence since we have recently treated more advanced stage cases and have faced more challenging resections. Regardless of this reverse learning curve phenomenon, we wish to continue pursuing the optimal potential and indication of SCL-CHEP. In SCL-CHEP, neck dissection was performed when positive palpation and/or suspicious imaging results were obtained. Prophylactic neck dissection was generally not performed regardless of T stagings.

Clinical symptoms of local recurrence after SCL-CHEP were non-significant and often asymptomatic. Changing qualities of voice and/or swallowing functions are likely to be the initial symptoms of local recurrence. Recurrence was generally identified in the submucosal regions of the arytenoid and subglottis, being consistent with the pathologic findings of scattered invasive patterns observed in the posterior and infraglottic regions. Though, the sites of minimum margin did not always match with the sites of local recurrence. Redefining surgical margin may also be a risk factor for local recurrence. Meticulous follow-up, utilizing fiberoptic and periodic CT evaluation, is recommended, particularly for advanced stage patients.

Local recurrence of SCL-CHEP is generally resectable, and early detection is important [27]. In our series, six patients were successfully salvaged by completion TL except one, who refused to receive further treatment. Locoregional recurrence did not influence survival in our series (Fig. 2); this was largely related to early detection. Case 7 developed distant metastases after the removal of local and nodal recurrence followed by a full-dose adjuvant RT. Adjuvant treatments may be considered for advanced stage cancers with a close resection margin (<1 mm). However, the clinical effectiveness remains speculative.

Do we achieve better local control with SCL-CHEP? Yes, we do. Our experience with 100 SCL-CHEP patients convinced us of the clinical potential of SCL-CHEP as one of the effective options for functional larynx preservation. SCL-CHEP is the most suitable for unfavorable T2 and T3a cases and is applicable for appropriately selected radiation-failed patients [28]. Thorough pre-operative evaluation, proper surgical techniques and careful follow-up are prerequisites for the success of SCL-CHEP. Head and neck surgeons are encouraged to take reasonable risks in pursuing optimal functional larynx preservation surgeries. In the future treatment paradigm, we should not merely follow the guidelines or evidence, but pursue ideal individualized medicine for our patients.

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**Conflict of interest statement**

None declared.

**References**


