PREDICTIVE VALUES FOR ASPIRATION AFTER ENDOSCOPIC LASER RESECTIONS OF MALIGNANT TUMORS OF THE HYPOPHARYNX AND LARYNX

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Accepted 2 June 2003
Published online 23 September 2003 in Wiley InterScience (www.interscience.wiley.com). DOI: 10.1002/hed.10363

Abstract: Background. CO₂-laser surgery is a relatively new treatment for selected carcinomas of the upper aerodigestive tract. The purpose of our study was to evaluate prospectively the functional results for swallowing after CO₂-laser resections.

Methods. The sample was composed of 210 consecutive patients with malignancies of the larynx and hypopharynx treated with CO₂ laser between February 1998 and January 2002. Endoscopic resections included all T1 and T2 tumors and selected T3 and T4 tumors. T1 glottic tumors were not included in the analysis. We assessed the need for a feeding tube and the period the tube remained in place, aspiration pneumonia, tracheotomy secondary to aspiration, the need for a permanent or temporary gastrostomy, and total laryngectomy secondary to aspiration.

Results. The nasogastric feeding tube was used in 23.2% of small tumors (2.5 ± 8.04 days) and in 63% of locally advanced tumors (13.95 ± 22.55 days). Frequency and period of storage of the feeding tube were higher in locally advanced tumors (p = .0001). Twelve patients (5.7%) had postoperative pneumonia and 59 (28.1%) had temporary postoperative cough during oral intake. Aspiration symptoms correlated with location (p = .0001), pT3 and pT4 tumors (p = .002), age (p = .02), and postoperative radiotherapy (p = .04). No correlation was found with the period of feeding tube (p = .38), or aspiration pneumonia (p = .24).

Conclusions. Endoscopic resection of laryngeal and hypopharyngeal tumors is associated with good recovery of deglutition. Many tracheotomies are avoided, the need for a feeding tube is usually reduced, and organ preservation is often feasible even in locally advanced tumors.

Keywords: CO₂ laser surgery; laryngeal and hypopharyngeal carcinoma; deglutition

Endoscopic laser resection of malignancies of the upper aerodigestive tract is becoming increasingly common in oncologic surgery of the head and neck. Its main goal is organ preservation by preserving tissue not infiltrated by tumor. External approaches such as partial laryngectomies or tracheostomies have become less popular among surgeons in recent years. Total laryngectomies are reserved for tumors in which tissue resection would lead to permanent aspiration or dysphagia or in cases of repeated aspiration pneumonias.

Few studies of deglutition, aspiration, or dysphagia after endoscopic laser resections have been published to date. Intuitively, swallowing
difficulties seem to be more likely when the
tumors involve the supraglottis or when they
are extended and voluminous, and the transoral
resection needs to be large. However, this
type has not been confirmed in practice; indeed,
it is also possible that smaller resections might
lead to swallowing problems. Other questions as
yet unanswered are how often a nasogastric
feeding tube is needed, and for how long, or when
tracheostomy or a percutaneous endoscopic gas-
troscopy (PEG) is necessary.

This study is a prospective evaluation of the
functional results of swallowing after CO2-laser
resections of malignant tumors of the upper
aerodigestive tract. Our goal was to identify cases
in which the probability of aspiration and dys-
phagia is higher and in which supplementary
therapy is necessary.

MATERIAL AND METHODS
with malignant tumors of the hypopharynx and
larynx were treated endoscopically by means of
CO2-laser surgery with curative intention at our
institution. They represented approximately 70% of
all patients treated for malignancies of the
larynx and hypopharynx in that period. For the
purpose of the study 109 pTis and pT1 glottic
tumors were excluded, because they were not
expected to have deglutition problems, and so
finally 210 patients were included in the analysis.

Tumors were classified according to the 1997
UICC staging system. Indications for transoral
endoscopic resections included all T1 and T2
tumors of the upper aerodigestive tract and
selected T3 and T4 tumors that allowed good
intraoperative exposure and in which the amount
of resected tissue or location was not expected to
compromise deglutition. No age limit was consid-
ered for endoscopic surgery.

In all patients with supraglottic and hypo-
pharyngeal tumors and in patients with locally
advanced glottic tumors, concomitant or delayed
neck dissection was performed. Postoperative
radiotherapy was carried out in positive necks
starting from N1 with nodes larger than 2 cm. The
primary tumor site was only irradiated post-
operatively when infiltration of vascular vessels,
nerves, or lymphatic spread was demonstrated or
when total resection could not be ensured.

Swallowing was assessed prospectively in all
patients. Most patients with supraglottic and
hypopharyngeal tumors received a nasogastric
feeding tube at the end of surgery. In patients
with locally advanced glottic tumors requiring
partial or subtotal arytenoidectomy, the feeding
tube was also considered. Oral intake was
initiated postoperatively on the same day as the
resections of small tumors. For advanced tumors,
oral intake started with solid food (jelly) 5 to
7 days postoperatively. The feeding tube was
removed as soon as fluids could be swallowed.

Follow-up was performed in the ward of our
department and by the Oncological Committee.
Deglutition was assessed through history and
transnasal flexible endoscopies. A minimum
follow-up period of 5 months was selected to
establish the status of deglutition. We prospec-
tively analyzed the following variables: presence
or absence of a feeding tube, the period of
intubation, cough during oral intake, aspiration
pneumonia, the need for a tracheotomy secondary
to aspirations, the need for permanent or tempo-
rary PEG, total laryngectomy secondary to aspi-
ration, and impossibility of deglutition.

We also studied the influence of age, location,
and postoperative radiotherapy on deglutition
parameters.

Statistical Analysis. Data are presented as
means ± standard deviation. One sample Kolmo-
gorov–Smirnov test was used to assess the
distribution of the variables. Mann–Whitney U
and t tests were used to compare means between
groups. Correlations between deglutition param-
eters, T classification, and tumor location were
analyzed by means of Pearson’s chi-square test.
For statistical purposes seven transglottic and
two subglottic tumors were incorporated in the
“glottic” group. There were thus three major
groups of tumors for evaluation: glottic, supra-
glottic, and hypopharyngeal.

All analyses were performed using SPSS
Windows 10.0 version. A p value of .05 was taken
as statistically significant.

RESULTS
were operated and included in the SPSS data
chart. Mean age was 61.35 years (range, 35–86).
Twenty-nine patients (13.8%) had arterial hyper-
tension, and 29 (13.8%) had diabetes mellitus.
Data relating to tumor location and T stage are
shown in Table 1.

In 59 patients (28.1%), laser surgery of the
larynx was the only treatment. Two patients
(0.95%) received laryngeal surgery and radiotherapy in the neck, and 151 (71.9%) had laryngeal surgery and neck dissection. A total of 236 neck dissections was performed on the 151 patients; 26 were classic and 210 functional. In 66 patients (31.4%), the neck dissection was unilateral, and in 85 patients, (40.5%) it was bilateral. Fifty-three patients (25.2%) received postoperative radiotherapy, 34 (16.2%) in the neck, and 151 (71.9%) had laryngeal surgery and neck dissection. A total of 236 neck dissections was performed on the 151 patients; 26 were classic and 210 functional. In 66 patients (31.4%), the neck dissection was unilateral, and in 85 patients, (40.5%) it was bilateral. Fifty-three patients (25.2%) received postoperative radiotherapy, 34 (16.2%) in the neck and 19 (9.04%) in the neck and the primary site.

Postoperative deglutition was studied in all patients. A nasogastric feeding tube was used in 26 of 112 (23.2%) T1–T2 tumors for a mean of 2.5 ± 8.04 (range, 0–60) days. In T3 and T4 tumors, 46 of 73 patients (63%) needed the tube for a mean of 13.95 ± 22.55 (range, 0–140) days. The insertion of a feeding tube was more frequent and lasted longer in locally advanced tumors (T3 and T4) than in T1 and T2 (p = .0001). The relationship between number of days with feeding tube, location, and T classification is shown in Table 2.

Aspiration symptoms were common in our sample, being observed in 33.8% of patients. Twelve patients (5.7%) had postoperative pneumonia, and 59 patients (28.1%) had temporary postoperative cough during oral intake. Pearson’s chi-square correlated significantly with supraglottis and hypopharynx location (p = .001) and locally advanced tumors (p = .016). The percentages of patients with aspiration symptoms related to tumor location are shown in Table 3.

In 210 patients, 33 (15.7%) tracheotomies were performed. Twenty-five of them (11.9%) had been performed preoperatively for respiratory problems or difficulties during intubation. Eight (3.8%) were secondary to severe swallowing difficulties; six (2.9%) of these were definitive, and two (1%) were temporary. The group of six definitive tracheotomies included two total laryngectomies for absolute dysphagia. Table 3 shows the percentage of tracheotomies according to tumor site.

Thirteen PEGs (6.2%) were needed to avoid severe aspiration; eight (3.8%) were temporary, and five (2.3%) were definitive. In 1 of 58 (1.7%) glottic tumors, 7 of 121 (5.78%) supraglottic tumors, and 5 of 31 (16.1%) hypopharyngeal tumors, a gastrostomy was performed. The need for postoperative gastrostomy correlated significantly with tumor location (p = .002) and pT3 and pT4 tumors (p = .016). Considering each location separately, in the supraglottis the need for a PEG did not correlate significantly with the T classification (p = .16) nor did it in hypopharyngeal tumors, although here a tendency toward statistical significance was observed (p = .08). The percentages of patients with PEG related to tumor location are shown in Table 3.

Table 4 shows an overview of the 13 patients (6.2%) in whom a gastrostomy, a tracheotomy, or both was needed.

Fiberscopic findings differed depending on the tumor location. Explorations of patients with dysphagia or aspirations treated for hypopharyngeal tumors revealed an obliteratorive scaring of the operated side. In these cases, deglutition took place through the contralateral piriform sinus. In some cases, especially when part of the epiglottis and the arytenoid cartilage had to be resected, permanent aspiration was noticed. The fiberscopic findings after extended supraglottic resections...
with swallowing problems showed direct aspiration in the cases with large resection of the base of the tongue. In patients with three-quarter laryngectomies and impaired glottic closure, lateral aspiration was found, especially if one arytenoid had been partially or totally removed.

To establish age as a predictive parameter for deglutition, patients were divided into two groups (30–65 and 65 years). No statistically significant differences were found between groups with regard to period of nasogastric feeding ($p = .38$) or aspiration pneumonia ($p = .24$). Patients older than 65 had a significantly higher number of postoperative gastrostomies ($p = .024$). On the other hand, there was a statistically significant difference between patients who received postoperative radiotherapy and nonirradiated patients with regard to length of nasogastric feeding ($p = .001$), aspiration symptoms ($p = .001$), and a tendency for gastrostomy ($p = .075$).

### DISCUSSION

Our prospective study of 210 consecutive patients with malignant tumors of the upper aerodigestive tract operated endoscopically by means of CO$_2$-laser showed that swallowing difficulties and aspiration pneumonia were significantly more frequent in locally advanced supraglottic and hypopharyngeal tumors. This finding is consistent with the findings of transcervical partial resections.$^{11-18}$

During the pharyngeal phase of swallowing, the entrance of food into the upper airway is prevented by closure of the glottis, depression of the epiglottis over the laryngeal inlet, and anterior rotation and elevation of the larynx to oppose the base of the tongue.$^{19}$ The degree of postoperative swallowing difficulties depends on the extent of resection; therefore, patients with advanced tumors and tumors of the hypopharynx or supraglottis should be prepared to carry a nasogastric tube for approximately 2 weeks after the operation. Patients should also be informed that the process of rehabilitation of swallowing might take 6 to 8 weeks and that in some cases a PEG or a tracheotomy is needed, temporarily or even permanently.

The overall results for deglutition seem to confirm that endoscopic resection of small tumors achieves a fast recovery. In our sample, only 23.2% of small tumors needed postoperative nasogastric feeding and usually for less than 1 week. On occasion, however, the normal laryngeal structures have to be sacrificed to gain access to the tumor, and patients should always be informed that a nasogastric feeding tube might be necessary. Our results are in agreement with previous reports in the literature$^{2-4,20,21}$ and confirm that the technique reduces hospital stay and costs in these patients.

There are many possible explanations for these encouraging results. One is the amount of tissue saved in the resection. Another is the fact that, unlike the transcervical approach, endoscopic resection preserves the sensory pharyngeal nerve endings. In addition, the endoscopic approach avoids the risk of aspiration associated with the lower postoperative laryngeal position after external supraglottic laryngectomy as described by Schweinfurth and Silver.$^{22}$ The preservation of hyoid bone, strap muscles, and

### Table 4. Characteristics of the patients with gastrostomy and/or tracheotomy.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Location</th>
<th>T stage</th>
<th>Gastrostomy</th>
<th>Tracheotomy</th>
<th>Total laryngectomy or reconstructive surgery</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>84</td>
<td>Glottis</td>
<td>T2</td>
<td>Temporary</td>
<td>Definitive</td>
<td>TL</td>
</tr>
<tr>
<td>2</td>
<td>68</td>
<td>Supraglottis</td>
<td>T2</td>
<td>Temporary</td>
<td>Temporary</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>71</td>
<td>Supraglottis</td>
<td>T3</td>
<td>Temporary</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>71</td>
<td>Supraglottis</td>
<td>T3</td>
<td>Temporary</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>5</td>
<td>74</td>
<td>Supraglottis</td>
<td>T3</td>
<td>Temporary</td>
<td>Definitive</td>
<td>TL</td>
</tr>
<tr>
<td>6</td>
<td>69</td>
<td>Supraglottis</td>
<td>T3</td>
<td>Temporary</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>69</td>
<td>Hypopharynx</td>
<td>T3</td>
<td>Temporary</td>
<td>Definitive</td>
<td>RS</td>
</tr>
<tr>
<td>8</td>
<td>54</td>
<td>Hypopharynx</td>
<td>T3</td>
<td>Temporary</td>
<td>No</td>
<td>No</td>
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<tr>
<td>9</td>
<td>77</td>
<td>Supraglottis</td>
<td>T2</td>
<td>Definitive</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>71</td>
<td>Supraglottis</td>
<td>T4</td>
<td>Definitive</td>
<td>Definitive</td>
<td>No</td>
</tr>
<tr>
<td>11</td>
<td>61</td>
<td>Hypopharynx</td>
<td>T2</td>
<td>Definitive</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td>43</td>
<td>Hypopharynx</td>
<td>T3</td>
<td>Definitive</td>
<td>Definitive</td>
<td>No</td>
</tr>
<tr>
<td>13</td>
<td>61</td>
<td>Hypopharynx</td>
<td>T4</td>
<td>Definitive</td>
<td>Definitive</td>
<td>No</td>
</tr>
</tbody>
</table>
laryngeal skeleton, and the integrity of the base of the tongue and pharyngeal musculature have all been reported as factors contributing to the restitution of the sensory function.20

In agreement with other authors,1,3 we found that the swallowing recovery period can also be reduced in T3 and T4 tumors treated endoscopically, with a high percentage of organ preservation. In this group of locally advanced tumors, however, a higher number of complications can be expected.1,23,24 During preoperative counseling, patients with voluminous tumors of the piriform sinus or the supraglottis should be informed that they are more likely to need a feeding tube and that temporary or permanent PEG, tracheostomy, or even a total laryngectomy2 might also be required.

Aspiration is a common complication after partial pharyngolaryngeal resections,1,24,25 and a high incidence of pneumonia might have been expected in our patients because of the absence of postoperative prophylactic tracheotomies. In fact, there was no increase in postoperative pneumonia in our series compared with patients treated by the external approach.11,13,16,26 This might

<table>
<thead>
<tr>
<th>Author</th>
<th>Type of surgery</th>
<th>N</th>
<th>Feeding tube</th>
<th>Aspiration pneumonia</th>
<th>Total laryngectomy</th>
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<tr>
<td>Bocca37</td>
<td>Supraglottic laryngectomy</td>
<td>240</td>
<td>Normal swallowing recovery: 21 d</td>
<td>1.3%</td>
<td>0.4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Delayed swallowing recovery (5.4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flores et al35</td>
<td>Supraglottic laryngectomy + extended supraglottic laryngectomy</td>
<td>46</td>
<td>14–21 d (60.9%)</td>
<td>13%</td>
<td>4.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>28 d (19.6%)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>60 d (19.6%)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Definitive PEG (6.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hirano et al34</td>
<td>Supraglottic laryngectomy</td>
<td>38</td>
<td>30 d (84%)</td>
<td>nm</td>
<td>7.8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>34–61 d (7.8%)</td>
<td></td>
<td></td>
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<tr>
<td>Staffieri36</td>
<td>Supraglottic laryngectomy</td>
<td>143</td>
<td>17 d (range 6–57) (98%)</td>
<td>nm</td>
<td>nm</td>
</tr>
<tr>
<td>Beckardt et al26</td>
<td>Supraglottic + extended supraglottic laryngectomy</td>
<td>46</td>
<td>20 d (39%)</td>
<td>nm</td>
<td>nm</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>20–65 d (33%)</td>
<td></td>
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<td></td>
<td>65 d (28%)</td>
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<tr>
<td>Rademaker et al26</td>
<td>External partial laryngectomy</td>
<td>55</td>
<td>Hemilaryngectomy (10 d)</td>
<td>nm</td>
<td>nm</td>
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<td></td>
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<td>Supraglottic (40 d)</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Extended supraglottic (45–173 d)</td>
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<tr>
<td>Succo et al11</td>
<td>Supraglottic + extended supraglottic laryngectomy</td>
<td>142</td>
<td>16 d (range, 10–39)</td>
<td>nm</td>
<td>nm</td>
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<td></td>
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<td></td>
<td>23 d (range, 11–102)</td>
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<tr>
<td>Herranz-González et al12</td>
<td>Supraglottic laryngectomy</td>
<td>110</td>
<td>11–15 days (6%)</td>
<td>5%</td>
<td>0.9%</td>
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<td></td>
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<td>16–20 days (45%)</td>
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<td>21–25 days (32%)</td>
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<td></td>
<td></td>
<td>26–35 days (9%)</td>
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<td></td>
<td></td>
<td>35 days (7%)</td>
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<tr>
<td>Suárez et al18</td>
<td>Supraglottic laryngectomy</td>
<td>193</td>
<td>—</td>
<td>21.2%</td>
<td>9.8%</td>
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<td></td>
<td>Extended supraglottic laryngectomy</td>
<td>56</td>
<td>—</td>
<td></td>
<td>21.4%</td>
</tr>
<tr>
<td>Zacharek et al27</td>
<td>Supracricoid laryngectomy</td>
<td>10</td>
<td>30 d</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Lawson et al7</td>
<td>Tucker’s reconstructive surgery</td>
<td>34</td>
<td>14 d</td>
<td>2.9%</td>
<td>2.9%</td>
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<td></td>
<td></td>
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<td>PEG (0%)</td>
<td></td>
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<tr>
<td>Schwaab et al17</td>
<td>Subtotal laryngectomy with cricohyoidopexy</td>
<td>146</td>
<td>21 d</td>
<td>19%</td>
<td>9%</td>
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<tr>
<td>Naudo et al13</td>
<td>Supracricoid partial laryngectomy</td>
<td>124</td>
<td>22 d</td>
<td>11.5%</td>
<td>2.5%</td>
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<td></td>
<td></td>
<td></td>
<td>Permanent PEG (2.5%)</td>
<td></td>
<td></td>
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<tr>
<td>de Vicentiis et al14</td>
<td>CHEP</td>
<td>15</td>
<td>15 d (range, 9–90)</td>
<td>Permanent tracheotomy (2%)</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>CHP</td>
<td>28</td>
<td>28 d (range, 15–90)</td>
<td>Permanent tracheotomy (13.9%)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: CHEP, cricohyoidopexy; CHP, cricohyoidopexy; nm, not mentioned.
have been due to the low level of damage created on the superior laryngeal nerves or to the presence of a cough reflex in almost all patients. As in small tumors, the preservation of the laryngeal framework and the avoidance of tracheotomy with maintenance of normal laryngeal elevation have also been considered favorable points.4,20,22

A historical comparison with reports in the literature shows that external supraglottic laryngectomies display a range from 0% to 19% of aspiration pneumonia and a rate of 0.4% to 9.8% of total laryngectomies for permanent dysphagia. The need for a feeding tube is definitely greater and the mean time of maintenance longer Table 5. As for the rates of aspiration pneumonia and total laryngectomy, our results are consistent with other series of partial transoral laryngectomies with the CO2-laser. In addition, the nasogastric feeding period is shorter than when external approaches are used Table 6.

Our results also highlight the need for early functional rehabilitation, especially for patients with T3 and T4 tumors and tumors of the piriform sinus and the supraglottis. Some authors have reported positive long-term results in functional therapy programs after partial laryngectomies9,27,28 and place special emphasis on postoperative evaluation and the establishment of an individual training program. These programs are usually based on posture variations, mouth movements, swallowing techniques, and food consistency.

A range of methods can be used to identify deglutition abnormalities. The degree of aspiration is usually assessed by means of videendoscopy (with or without methylene blue drinking) and videofluoroscopy.9,29 – 32 Aviv33 published a prospective study of the usefulness of endoscopy versus modified barium swallow to avoid aspiration pneumonia in patients with dysphagia; he found no statistical differences between the groups and reported lower cost in the endoscopy group. We prefer fiberoptic examination, because it can be performed easily at the same time as the oncologic control. In addition, the equipment is portable, and the examination can even be performed in an intensive care unit if necessary.

In our experience, fiberoptic endoscopy helps to identify the problem and to plan the rehabilitation program, and it has also led us to introduce and evaluate conservative modifications during surgery. In supraglottic resections, we try to preserve the part of the epiglottis that is not infiltrated and as much of the tissue of the arytenoepiglottic fold as possible to reduce deglutition problems. During surgery for hypopharyngeal tumors, we have started to use mucosal flaps sutured to the lateral wall of the pharynx or to the mucosa of the larynx to allow the hypopharynx to open during swallowing and to avoid its obliterative scarring. Further studies are ongoing to test the clinical usefulness of this technique.

One important issue in our study is that age does not play a decisive role in the functional outcome of endoscopic resection of upper aerodi-

<table>
<thead>
<tr>
<th>Author</th>
<th>Type of surgery</th>
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<th>Feeding tube</th>
<th>Aspiration pneumonia</th>
<th>Total laryngectomy</th>
</tr>
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<tr>
<td>Ambrosch et al20</td>
<td>Supraglottic (T1–T2)</td>
<td>48</td>
<td>6 d (range, 3–30)</td>
<td>2%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Supraglottic (T1–T4)</td>
<td>141</td>
<td>nm</td>
<td>Definitive tracheotomy (9%)</td>
<td>0%</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>in extended resections</td>
<td></td>
</tr>
<tr>
<td>Moreau5</td>
<td>Supraglottic (Tis–T3)</td>
<td>19</td>
<td>16.5 d</td>
<td>10.5%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Supraglottic (T1–T2)</td>
<td>46</td>
<td>14 d (80.4%)</td>
<td>nm</td>
<td>10.9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>28 d (8.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zeitels et al4</td>
<td>Supraglottic (T1–T3) and hypopharynx (T1)</td>
<td>46</td>
<td>1–6 wk in extended supraglottic resections</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Giottis (T2–T4)</td>
<td>58</td>
<td>0.4 d (± 1.8)</td>
<td>Giottis (1.7%)</td>
<td>Giottis (1.7%)</td>
</tr>
<tr>
<td></td>
<td>Supraglottic (T1–T4)</td>
<td>121</td>
<td>9.6 d (± 18.1)</td>
<td>Supraglottis (5.8%)</td>
<td>Supraglottis (0.8%)</td>
</tr>
<tr>
<td></td>
<td>Supraglottic and hypopharynx</td>
<td>31</td>
<td>8.6 d (± 20.6)</td>
<td>Hypopharynx (12.9%)</td>
<td>Hypopharynx (0%)</td>
</tr>
</tbody>
</table>

Abbreviation: nm, not mentioned.
gestive tumors. Only the rate of gastrostomies seems to be higher in elderly patients; however, the total number of gastrostomies (five temporary; two permanent) is low. The finding that age does not affect functional outcome has been reported by Rudert et al\(^\text{23}\) and has influenced our practice. For years, advanced age was considered a formal contraindication for external partial larynx resections. The endoscopic approach has reduced postoperative morbidity and has increased the indications for this type of surgery in the elderly, but older patients should be warned of the higher probability of gastrostomy.

In our study, postoperative radiotherapy had an adverse effect on swallowing recovery, but we considered that it was mainly related to the high number of locally advanced tumors in this group.

In conclusion, endoscopic resection of pharyngolaryngeal tumors leads to an easy recovery of deglutition in the postoperative period. Compared with external approaches, a high number of tracheotomies are avoided, the need for a feeding tube is usually reduced, and organ preservation is feasible, even in many locally advanced tumors.

REFERENCES