Current status of near-total laryngectomy: review

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Abstract
Concurrent chemoradiation is currently the accepted ‘standard of care’ for locally advanced laryngeal and hypopharyngeal cancers. However, there is a subset of patients not suitable for chemoradiation, in whom primary surgery is the best option. Speech preservation is of prime importance in these patients. Near-total laryngectomy is a voice-preserving procedure which can be considered as an alternative to total laryngectomy for selected patients with lateralised, locally advanced cancers of the larynx and hypopharynx. Although these patients are left with a permanent tracheostomy, lung-powered speech is maintained by way of a dynamic shunt created from the uninvolved tissues of the larynx. Since its first description in the early 1980s, the procedure has been shown by various authors to be oncologically sound, with high success rates. Unfortunately, the procedure has not gained wide acceptance due to perceived fears of surgical complexity. In this review, we discuss the various issues related to the procedure and we review the relevant literature.

Key words: Larynx Cancer; Laryngectomy; Speech

Introduction
There has been a paradigm shift in the management of patients with laryngeal and hypopharyngeal cancers. Concurrent chemoradiation is now the accepted ‘standard of care’ for these patients.

However, this treatment has its limitations, and benefits a select subset of patients with tumour stage (T) two, three and (in a small number) four cancers. Issues such as toxicity and poor tolerance may further preclude its routine use.

Therefore, there is still a definite group of patients with locally advanced cancer who require total laryngectomy as primary surgery, with ensuing loss of voice.

Following total laryngectomy, the tracheoesophageal puncture prosthesis is the ‘gold standard’ for speech restoration, with high success rates of up to 90 per cent.1–3 However, this technique has its limitations, namely complications, recurrent costs, device maintenance and physician dependence.

The near-total laryngectomy procedure is a useful alternative in patients who cannot avoid total laryngectomy as primary surgery. This procedure is as radical as total laryngectomy in terms of disease management, but makes use of the uninvolved contralateral laryngeal mucosa to fashion a dynamic shunt between the trachea and the neopharynx. Speech is lung-powered, and aspiration is avoided as the shunt is dynamic. Most importantly, the procedure has a high success rate (90 per cent), similar to that for tracheoesophageal puncture prosthesis, and once successful stays so for life, avoiding the recurrent costs associated with device change and maintenance.

Unfortunately, near-total laryngectomy has not gained worldwide acceptance despite numerous publications confirming its oncological safety and functional success. In this review, we discuss the procedure and review the relevant literature.

Historical background
Near-total laryngectomy was first described by Pearson et al. in the early 1980s and is often referred to as the Pearson procedure.4 Other synonyms for the procedure are extended vertical hemilaryngectomy, subtotal laryngectomy and parsimonious laryngectomy.4–6 However the most commonly accepted terminology is the near-total laryngectomy.

Prerequisites
The near-total laryngectomy is ideal for patients who have unilateral laryngeal or pyriform disease limited to one side of the larynx, with sufficient uninvolved contralateral mucosa to be fashioned into a voice shunt.

The essential prerequisites for the procedure are: (1) a contralateral, uninjured, mobile arytenoid and posterior half of the true vocal fold; and (2) a free interarytenoid and post-cricoid region, to ensure oncological safety of the resection margins.

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**Indications**

Near-total laryngectomy is suitable for all cases amenable to total laryngectomy, provided the above pre-requisites are met. These include: T3 and T4 cancers of the larynx and pyriform fossa; patients whose radiotherapy has failed; and cases compatible with resection of the pharynx and limited areas of the tongue base, with or without flap reconstruction.

**Contraindications**

There are two main contraindications to near-total laryngectomy.

Involvement of the interarytenoid and postcricoid regions is an absolute contraindication, as this compromises the oncological safety of the resection.

Subglottic disease is not an absolute contraindication to the procedure, as the patient will have a permanent tracheostoma. However, extensive posterior subglottic extension will leave insufficient mucosa to fashion the shunt, and is thus a relative contraindication.

**Types**

Near-total laryngectomy is suitable for both laryngeal and hypopharyngeal cancers, and requires the resection of variable amounts of pharyngeal mucosa.

Three types of near-total laryngectomy have been described, based on the amount of pharyngeal resection, as follows: (1) near-total laryngectomy proper, used primarily for pure glottal lesions; (2) near-total laryngopharyngectomy, which involves partial resection of pyriform fossa mucosa with primary closure; and (3) extended near-total laryngopharyngectomy, which involves more extensive hypopharyngeal mucosa resection necessitating a flap repair.

**Technique**

A detailed description of the near-total laryngectomy procedure is beyond the scope of this article but has been well presented elsewhere.4,7

In terms of disease management, the procedure is as radical as total laryngectomy, with removal of the ipsilateral thyroid cartilage, ipsilateral cricoid cartilage segments and upper tracheal rings, in order to ensure wide excision of the tumour. The pre- and para-glottic spaces are removed along with the ipsilateral strap muscles and thyroid gland. The procedure is compatible with appropriate nodal dissection in the lateral and central compartments.

The success of the procedure is based on the creation of a dynamic myomucosal shunt using a laryngotracheal remnant, the diameter of which should fit a 14 French Foley’s catheter. Therefore, the utmost care must be taken to preserve the contralateral recurrent laryngeal nerve and criocarotidoid joint. The patient will be left with a permanent tracheostoma, as for total laryngectomy, and voicing will require the use of a thumb, as for the tracheosaphageal puncture prosthesis. The neopharynx is created either by primary closure using uninvolved pyriform fossa mucosa, or by augmented closure using an appropriate flap.

**Outcome measures**

The success of near-total laryngectomy is assessed based on its oncological safety, the presence and quality of post-operative speech, and complications.

**Oncological safety**

Throughout the literature, published cure rates confirm the safety of near-total laryngectomy, with control rates similar to those achieved with total laryngectomy.

In the largest series, 225 cases reported by Pearson et al., five-year local control rates were comparable to those for total laryngectomy.8

Aslan et al. studied 135 patients undergoing near-total laryngectomy between 1989 and 2000, and analysed survival in 124 patients.9 Survival rates for T2, T3 and T4 cancers were 50, 64.2 and 73.3 per cent, respectively; these differences were not statistically significant.

The oncological safety of near-total laryngectomy was further demonstrated in a series of 137 patients with laryngeal and pyriform fossa cancer managed at our institution between 1989 and 1999.7 After a median follow up of 35 months, 70.1 per cent of patients were alive and disease-free. The local and locoregional recurrence rate was 7.3 per cent.

However, in cases with subglottic extension, the oncological safety of near-total laryngectomy is debatable. Aslan et al. compared results for supraglottic and transglottic cancers without subglottic extension to those for laryngeal cancer with subglottic extension. The five-year survival rates for transglottic, supraglottic and subglottic cancers were 65.8, 53.8 and 20 per cent, respectively.10 The presence of subglottic extension increased the risk of local and peristomal recurrence. Thakar et al. also found inferior functional outcomes for near-total laryngectomy in cases with subglottic extension.11 In their 1998 series, Pearson et al. did not find any local recurrence in cases with subglottic extension.8 However, extensive subglottic spread, particularly posteriorly, precludes the use of this procedure and is one of its relative contraindications.

Near-total laryngectomy is possible even in the presence of cervical lymphadenopathy. Aslan et al. found survival rates for node stage (N) one and two disease of 84.2 and 66.7 per cent, respectively.9 All patients with N3 disease died, which is understandable given the advanced nature of the disease. In our previous series of 137 cases, nodal disease was present in 83 (60.6 per cent) patients, comprising 23 N1 cases, 46 N2 cases and 14 N3 cases. Regional recurrence alone occurred in 11.7 per cent of cases, and locoregional recurrence in 2.2 per cent.7 Table I summarises the results of literature published to date.4,7,10–23
Their treatment without any adverse outcome.7 receiving radiotherapy, 88 (93.7 per cent) completed
treatment in patients receiving post-operative radiother-
apy. Similarly extended near-total laryngectomy with or
without patch pharyngoplasty also developed success-
ful speech.34 This speech was maintenance-free. None
of the published series reported loss of voice sub-
sequent to its initial establishment.

Presence of speech
The advantages of near-total laryngectomy are its high
success rate, lung-powered speech, maintenance-free
shunt and excellent speech outcomes. The incidence of successful speech outcomes ranges from 74 to 100
per cent.18,20,21,23–34 The results of various studies are summarised in Table II.

In the previously published series, we analysed the
speech outcomes of 150 patients with carcinoma of
the larynx and pyriform fossa who underwent near-
total laryngectomy at our institution. Intelligible
speech was acquired by 90 per cent of these patients.
Similarly extended near-total laryngectomy with or
without patch pharyngoplasty also developed successful speech.34 This speech was maintenance-free. None
of the published series reported loss of voice sub-
sequent to its initial establishment.

Satisfactory voice outcomes are generally main-
tained in patients receiving post-operative radiother-
apy.8,9,17,22 In our previous experience of 94 patients
receiving radiotherapy, 88 (93.7 per cent) completed
their treatment without any adverse outcome.7

Quality of speech
During our speech analysis of 150 patients treated at
our institution, speech quality was subjectively

Table: PUBLISHED NEAR-TOTAL LARYNGECTOMY SURVIVAL RATES

<table>
<thead>
<tr>
<th>Study</th>
<th>Pts (n)</th>
<th>Site (pts; n)</th>
<th>Time period</th>
<th>Survival rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson et al.4</td>
<td>7</td>
<td>Larynx</td>
<td>3 mth to 5 yr FU</td>
<td>100%</td>
</tr>
<tr>
<td>Singh &amp; Hardcastle12</td>
<td>4</td>
<td>Larynx (3)</td>
<td>1.3 yr</td>
<td>100%</td>
</tr>
<tr>
<td>Lima et al.13</td>
<td>28</td>
<td>Larynx</td>
<td>1990–1994</td>
<td>85% (3-yr disease-free survival)</td>
</tr>
<tr>
<td>Andrade et al.14</td>
<td>42</td>
<td>Larynx (37)</td>
<td>1988–1995</td>
<td>81.7% larynx (5-yr overall survival)</td>
</tr>
<tr>
<td>Thakar et al.11</td>
<td>28</td>
<td>Larynx (16)</td>
<td>1996–2005</td>
<td>66.6% hypopharynx (5-yr overall survival)</td>
</tr>
<tr>
<td>Shenoy et al.15</td>
<td>54</td>
<td>Larynx (14)</td>
<td>1991–1996</td>
<td>74% (4-yr disease-free survival)</td>
</tr>
<tr>
<td>Maamoun et al.16</td>
<td>39</td>
<td>Larynx</td>
<td>1998–2001</td>
<td>74% larynx (3-yr disease-free survival)</td>
</tr>
<tr>
<td>Kavabata et al.17</td>
<td>15</td>
<td>Hypopharynx (1)</td>
<td>1993–2002</td>
<td>60% pyriform fossa, medial wall (5-yr survival)</td>
</tr>
<tr>
<td>Aslan et al.10</td>
<td>74</td>
<td>Larynx</td>
<td>1989–2000</td>
<td>54% pyriform fossa, lateral wall (5-yr survival)</td>
</tr>
<tr>
<td>Qi J et al.18</td>
<td>12</td>
<td>Larynx</td>
<td>1990–1996</td>
<td>81.6% (3-yr actuarial survival)</td>
</tr>
<tr>
<td>Ozüdoğru et al.19</td>
<td>20</td>
<td>Larynx (18)</td>
<td>1980–1994</td>
<td>53.8% supraglottis (5-yr survival)</td>
</tr>
<tr>
<td>Tang et al.20</td>
<td>14</td>
<td>Larynx (10)</td>
<td>1991–1998</td>
<td>20% subglottis (5-yr survival)</td>
</tr>
<tr>
<td>Han et al.21</td>
<td>28</td>
<td>Larynx</td>
<td>1989–2000</td>
<td>81.2% (2-yr disease-free survival)</td>
</tr>
<tr>
<td>Terris et al.22</td>
<td>22</td>
<td>Larynx</td>
<td>1980–1994</td>
<td>78.6% (2-yr survival)</td>
</tr>
<tr>
<td>Bernáldez et al.23</td>
<td>87</td>
<td>Larynx (63)</td>
<td>1991–1998</td>
<td>90.9% (local control rate)</td>
</tr>
<tr>
<td>Pradhan et al.7</td>
<td>137</td>
<td>Tongue base (2)</td>
<td>1989–1999</td>
<td>75.8% (cause-specific survival)</td>
</tr>
</tbody>
</table>

Table: PUBLISHED NEAR-TOTAL LARYNGECTOMY SPEECH OUTCOMES

<table>
<thead>
<tr>
<th>Study</th>
<th>Pts with sat SO (of total pts)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
</tr>
<tr>
<td>Singh &amp; Hardcastle12</td>
<td>4/4</td>
</tr>
<tr>
<td>Hoasjoe et al.24</td>
<td>11/11</td>
</tr>
<tr>
<td>Desanto et al.25</td>
<td>29/39</td>
</tr>
<tr>
<td>Pearson et al.4</td>
<td>7/7</td>
</tr>
<tr>
<td>Levine et al.26</td>
<td>9/11</td>
</tr>
<tr>
<td>Han et al.27</td>
<td>27/28</td>
</tr>
<tr>
<td>Chandrachud et al.28</td>
<td>11/11</td>
</tr>
<tr>
<td>Su &amp; Hwang29</td>
<td>18/21</td>
</tr>
<tr>
<td>Shank et al.30</td>
<td>10/10</td>
</tr>
<tr>
<td>Tang et al.31</td>
<td>12/14</td>
</tr>
<tr>
<td>Suits et al.32</td>
<td>30/39</td>
</tr>
<tr>
<td>Shenoy et al.33</td>
<td>23/29</td>
</tr>
<tr>
<td>Thakar et al.34</td>
<td>23/28</td>
</tr>
<tr>
<td>Shenoy et al.35</td>
<td>44/54</td>
</tr>
<tr>
<td>Cakli et al.36</td>
<td>19/23</td>
</tr>
<tr>
<td>Andrade et al.37</td>
<td>35/42</td>
</tr>
<tr>
<td>Maamoun et al.38</td>
<td>31/38</td>
</tr>
<tr>
<td>Qi et al.39</td>
<td>10/12</td>
</tr>
<tr>
<td>Aslan et al.40</td>
<td>90/127</td>
</tr>
<tr>
<td>Pearson et al.41</td>
<td>191/225</td>
</tr>
<tr>
<td>Kavabata et al.42</td>
<td>12/15</td>
</tr>
<tr>
<td>Bernáldez et al.43</td>
<td>51/79</td>
</tr>
<tr>
<td>Su44</td>
<td>50/66</td>
</tr>
<tr>
<td>Pradhan et al.45</td>
<td>135/150</td>
</tr>
</tbody>
</table>

Pts = patients; sat SO = satisfactory speech outcome
divided into three categories depending upon ease and fluency. Speech was graded as excellent when patients were able to speak full sentences effortlessly. A grade of ‘fair’ was allotted when patients spoke short sentences with some effort. A grade of ‘poor’ was given when speech was intelligible but consisted of a breathy whisper requiring considerable effort.

Out of a total of 135 patients (90 per cent) developing functional speech, 113 (75.3 per cent) were graded as excellent, 16 (10.6 per cent) as fair and six (4 per cent) as poor (Table III).

We also analysed speech quality objectively using clinical speech voice software. Voice analysis was done three months post-treatment and was compared with matched patients who had undergone total laryngectomy with tracheoesophageal puncture prosthesis. Of the various parameters studied, patients with near-total laryngectomy performed better in terms of fundamental frequency, frequency range and maximum frequency, with results approaching those for the normal voice. This provides strong evidence for the superiority of biological shunting over the tracheoesophageal puncture prosthesis (Table IV).

Similarly, Singh examined eight patients with near-total laryngectomy, using electrolaryngography, and found functional similarities between the neoglottis and the normal glottis. In a subsequent study, this same author used electrolaryngography to compare the fundamental frequencies of 15 near-total laryngectomy patients with those of 17 oesophageal speakers and 11 normal speakers. The mean fundamental frequencies of the neoglottis and male oesophageal speakers were higher than those of the normal group. The fundamental frequency of the single female neoglottis speaker was higher than the normal mean, but all female oesophageal speakers had a lower frequency compared with normal female speakers.

Hoasjoe et al. compared near-total laryngectomy voice characteristics to those of normal laryngeal voice. They found that the near-total laryngectomy speakers had a generally restricted fundamental frequency, reduced intensity and limited phonation duration, compared with the normal laryngeal speakers.

**Complications**

The major complications of near-total laryngectomy are shunt stenosis and aspiration. Another complication related to the procedure is pharyngocutaneous fistula. Table V summarises reported complication rates.

**Shunt stenosis.** Shunt stenosis adversely affects voice outcomes. A shunt of adequate diameter is necessary to achieve a satisfactory voice. Stenosis of the shunt can be avoided by taking particular care when creating the shunt. The minimum shunt diameter required to prevent stenosis is said to be 6 mm. We recommend using a 14 French Foley’s catheter or a number six red rubber catheter as a guide when fashioning the shunt. If the mucosa is insufficient to create a shunt of adequate diameter, it can be augmented using the mucosa from the adjoining pyriform sinus. In cases of stenosis, several dilatations may be attempted. The reported incidence of shunt stenosis varies.

**Aspiration.** The shunt formed during near-total laryngectomy is a dynamic shunt. This acts as a valve allowing air inflow into the shunt, powered by the lungs, and producing vibration of the neoglottis. Aspiration is prevented by contraction of laryngeal musculature which is vagally innervated. The preservation of the recurrent laryngeal nerve is the most important step to preventing aspiration. Although rates vary in different series, the risk of major aspiration is generally quite low. Aslan et al. reported aspiration in 26.7 per cent of cases; however, the incidence of major aspiration was 5.5 per cent, and this could be completely rectified surgically in 57.1 per cent of cases. In our own previous series, minor aspiration developed in 12.4 per cent of cases, while major aspiration requiring completion laryngectomy occurred in only 0.7 per cent. Maamoun et al. reported an aspiration rate of 33.3 per cent, but all cases were of a transient nature and resolved spontaneously. Other studies have reported aspiration rates ranging from 10 to 42 per cent.

**Pharyngocutaneous fistula.** Theoretically, one would expect the incidence of pharyngocutaneous fistula to be slightly higher following near-total laryngectomy compared with total laryngectomy, due to the former procedure’s uneven suture line caused by the invagination of the voice shunt in the neopharynx. Fortunately, most cases of pharyngocutaneous fistula settle with conservative treatment. Kavabata et al. reported a pharyngocutaneous fistula incidence of 53 per cent in their series.
but none of these cases required surgical correction.\textsuperscript{17} In our previous study, 8.7 per cent of our patients developed a major fistula, and the incidence of leakage requiring surgical intervention was 3.6 per cent.\textsuperscript{7}

Post-radiation failures

Pearson \textit{et al.} reported a cancer recurrence rate of 20 per cent in their near-total laryngectomy patients who had previously undergone radiotherapy.\textsuperscript{8} Thus, they concluded that previous radiotherapy was a relative contraindication to near-total laryngectomy.

In our previous series of 137 patients, 15 had received prior radiotherapy.\textsuperscript{7} The local control rate for post-radiotherapy salvage was 93.3 per cent, thus confirming the oncological safety of the procedure in this setting. The complication rate was slightly higher in this group. Two out of 13 patients (15.4 per cent) developed a major pharyngocutaneous fistula: one of these patients died and the other lost the shunt.

Therefore, in patients who have received previous radiotherapy, judicious selection must be exercised.

\textbf{Current status}

Near-total laryngectomy was first described by Pearson \textit{et al.} in 1980, in a small series of seven patients with early glottic cancers. However, the procedure did not gain popularity because of its perceived complexity and unproven oncological safety.

There are now various publications, from many authors around the world, establishing that near-total laryngectomy has acceptable oncological safety, a high rate of successful post-operative speech, and an acceptable complication rate. Therefore, the practising head and neck surgeon should be conversant with the

\begin{table}[h]
\centering
\begin{tabular}{|l|l|l|l|}
\hline
Parameter & Procedure & Mean & SD & \textit{p*} \\
\hline
Fundamental frequency (Hz) & TEP & 120.95 & 41.75 & 0.000 \\
& NTL & 162.32 & 54.46 & \\
Maximum frequency (Hz) & TEP & 159.89 & 57.63 & 0.000 \\
& NTL & 214.04 & 73.18 & \\
Minimum frequency (Hz) & TEP & 91.60 & 37.25 & 0.70 \\
& NTL & 108.47 & 44.38 & \\
Frequency range (Hz) & TEP & 68.92 & 54.13 & 0.019 \\
& NTL & 105.57 & 80.45 & \\
Maximum intensity (dB) & TEP & 70.32 & 8.79 & 0.633 \\
& NTL & 71.17 & 6.94 & 0.49 \\
Minimum intensity (dB) & TEP & 38.55 & 19.66 & \\
& NTL & 41.69 & 20.75 & \\
Maximum phonation time (Seconds) & TEP & 4.43 & 3.75 & 0.314 \\
& NTL & 5.39 & 4.57 & \\
Jitter & TEP & 1.46 & 0.868 & 0.738 \\
& NTL & 1.36 & 0.90 & \\
Shimmer & TEP & 5.84 & 2.34 & 0.843 \\
& NTL & 5.67 & 2.66 & \\
S/Z ratio & TEP & 1.11 & 1.90 & 0.594 \\
& NTL & 1.40 & 1.92 & \\
Harmonic-to-noise ratio & TEP & 14.50 & 5.32 & 0.669 \\
& NTL & 15.30 & 5.45 & \\
Sound-to-noise ratio & TEP & 31.41 & 5.00 & 0.702 \\
& NTL & 14.10 & 5.28 & \\
\hline
\end{tabular}
\caption{Voice Analysis: Tracheoesophageal Puncture Prosthesis vs Near-Total Laryngectomy}
\label{table IV}
\end{table}

\begin{table}[h]
\centering
\begin{tabular}{|l|l|l|l|l|}
\hline
Study & Shunt stenosis (%) & Aspiration (%) & Pharyngocutaneous fistula (%) & \\
\hline
Su\textsuperscript{33} & 13/66 (20) & 4/66 (6) & -- & \\
Kavabata \textit{et al.}\textsuperscript{17} & 4/15 (26.6) & 8/15 (53) & \\
Aslan \textit{et al.}\textsuperscript{9} & 34/127 (26.8) & 9/39 (33.3) & 40/82 (48) & \\
Maamoun \textit{et al.}\textsuperscript{16} & 13/39 (33.3) & 9/39 (33.3) & 40/82 (48) & \\
Bernaldez \textit{et al.}\textsuperscript{23} & 16/79 (20.2) & 5/49 (10.2) & 23/49 (46.9) & \\
Gavilán \textit{et al.}\textsuperscript{16} & 5/49 (10.2) & 5/23 (21.7) & 5/23 (21.7) & \\
Cakli \textit{et al.}\textsuperscript{12} & (42) & (13.9) & (58.9) & \\
Prim \textit{et al.}\textsuperscript{17} & 8/39 (21) & 18/137 (13.1) & 12/137 (8.7) & \\
Suits \textit{et al.}\textsuperscript{20} & 9/137 (6.6) & (33.9) & (58.9) & \\
Pradhan \textit{et al.}\textsuperscript{7} & 13/137 (9.5) & 18/137 (13.1) & 12/137 (8.7) & \\
\hline
\end{tabular}
\caption{Published Near-Total Laryngectomy Complication Rates}
\label{table V}
\end{table}

\textsuperscript{*} t-test. SD = standard deviation; TEP = tracheoesophageal puncture prosthesis; NTL = near total laryngectomy; S/Z ratio is the ratio of voiceless sound to voiced sound. Normal value is 1.4
procedure, given its distinct advantage of avoidance of a tracheoesophageal puncture prosthesis. We estimate that approximately 10 per cent of patients suitable for total laryngectomy are also suitable for near-total laryngectomy. The procedure involves the creation of a shunt from the patient’s uninvolved tissues, which has the advantage of being maintenance-free and dynamic.

Near-total laryngectomy should be considered as an alternate to total laryngectomy in selected individuals. Surgeons should train themselves in the procedure, so that it acquires the prominence it deserves.

**Conclusion**

Near-total laryngectomy should be considered as an alternative to total laryngectomy in selected patients with well lateralised, advanced laryngeal and hypopharyngeal cancers. Although patients are left with a permanent tracheostoma, lung-powered speech is made possible by fashioning a voice shunt from the patient’s unremoved tissues. This shunt is dynamic, and maintenance-free once established. The incidence of successful post-operative speech is as high for near-total laryngectomy patients as for those using a tracheoesophageal puncture prosthesis. Furthermore, objective speech assessment suggests that the speech outcomes of the former procedure are superior to those of the latter.

Finally, the oncological safety of near-total laryngectomy has been established by various studies worldwide.

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