Speech Restorative Surgery In Pyriform Fossa Carcinoma
A Shenoy, N Grover, Nanjundappa, A Srihariprasad, M Agarwal, Premalatha, B Reddy

Citation

Abstract
Objective: To assess functional outcome with respect to speech and swallowing in patients undergoing speech restorative surgery for pyriform fossa carcinoma.

Setting: Tertiary Care Cancer Referral Centre.

Materials and Method: A total of 300 patients with pyriform sinus carcinoma underwent surgical intervention with/without adjuvant radiotherapy between 1990-2000. The present study details 123 patients(40%) with T1 - T4 pyriform fossa carcinoma who underwent speech restorative surgeries, having no significant contraindication for the same. 23 patients with supracricoid tumor and good pulmonary reserve were subjected to Extended Supraglottic Laryngopharyngectomy (Ext.SGLP); 89 patients with a tumor free interarytenoid mucosa underwent Near Total Laryngectomy (NTLP) and 11 Total Laryngectomy with partial pharyngectomy with Tracheoesophageal (TLP+TE) voice prosthesis.

Outcome measure: Successful social rehabilitation pertaining to swallow without aspiration and good speech intelligibility.

Results: All except 17% patients in Ext. SGLP were able to swallow without aspiration. speech quality was best in this group(90%), followed in order by ntlp(85%) and tlp with te prosthesis(80%). locoregional control rate at 3 years was 80% in the ext. sglp group(median follow up 23 months, range 2-70 months), 85% in ntlp (median 24 months, range 2-118 months) and 73% for the tlp+te group (median 20 months range 3-132 months).

Conclusion: These biologically aggressive malignancies are amenable to speech restoration with conservation surgery (ext. SGLP), NTLP and voice prosthesis with a locoregional control rate comparable with literature.


INTRODUCTION
Despite advances in speech restoration amongst endolaryngeal tumors, surgical speech restoration in lesions of the pyriform fossa is conspicuous by the paucity of published literature. Ogura J.H. was the first to lay down principles for supraglottic laryngectomy (SGL) in pyriform fossa lesions. According to him a modification of supraglottic laryngectomy could be performed in pyriform fossa cancer, which adhered to the following pre-requisite criteria –

1. The vocal cords and the arytenoids must be free of
gloss disease and mobile.

2. There should not be involvement of the thyroid cartilage by the tumor.

3. There must be no involvement of the pyriform fossa apex 2,3.

Adhering to these guidelines Ogura was able to successfully carry out Extended Supraglottic Laryngopharyngectomy (Ext.SGLP) in 48% of pyriform fossa cancers and achieved a 3-year disease free survival rate 59% 1,2,3.

Pyriform fossa cancer constitute 78% of hypopharyngeal cancers which in turn constitute 13% of the upper aerodigestive tract malignancies seen annually in the department of head and neck oncology, Kidwai Memorial Institute of Oncology, Bangalore, India. Amongst these 88% belong to T3 and T4 stage. Owing to the large number of patients that present with advanced disease, historically, most pyriform fossa cancers were subjected to total laryngectomy and partial pharyngectomy at most centers. Owing to less than satisfactory speech rehabilitation after such ablative surgery there were a significant number of individuals (20%) who refused the procedure (The Laryngectomee Club, Kidwai Memorial Institute of Oncology - unpublished data). The importance of successful speech restoration becomes evident especially in a country like India where speech deprivation in an impoverished illiterate individual, belonging to a low socio-economic condition threatens the very livelihood of the afflicted individual.

METHODS AND MATERIALS

The present study addresses speech restoration in 123 consecutive cases of pyriform fossa cancers in the period 1991 – 2000[figure-1]. Tumor stage was assessed by direct laryngoscopy. CT/MRI scans were not routinely used for tumor delineation. Financial constraints in this part of the world also precluded routine use of these investigative modalities.

RESULTS AND OBSERVATIONS:

Nearly 80% of patients had no evidence of microscopic
Speech Restorative Surgery in Pyriform Fossa Carcinoma

Tumor at specimen periphery; while in the remainder tumor histology indicated a R1 resection viz. positive microscopic tumor at specimen margins. Swallowing restoration was achieved within three weeks in 30% ext.SGLP, 95% NTLP, 100% primary TEP. The rest viz. 53% ext.SGLP and 5% NTLP swallowed within 6 weeks. Seventeen percent ext.SGLP did not achieve swallowing normalcy and needed nutritional support in the form of percutaneous gastrostomy (2) and nasogastric intubation (2) [Table 1]. Delayed swallowing rehabilitation could be ascribed to mainly aspiration in ext.SGLP group and local wound problems due to pharyngeal salivary fistula in the NTLP group.

**Figure 2**

Table 1: Swallowing restoration

<table>
<thead>
<tr>
<th>Surgery</th>
<th>Normal diet</th>
<th>Feeding aids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ext SGLP*</td>
<td>30%</td>
<td>55%</td>
</tr>
<tr>
<td>NTLP**</td>
<td>95%</td>
<td>5%</td>
</tr>
<tr>
<td>TLP+ TEP***</td>
<td>100%</td>
<td>Nil</td>
</tr>
</tbody>
</table>

*Extended Supraglottic Laryngopharyngectomy
**Near Total Laryngo Pharyngectomy
*** Total Laryngopharyngectomy + Tracheo Esophageal Puncture

Table – 2 depicts the speech parameters in the 3 groups. It is evident that successful speech restoration was achieved with best quality of speech in the ext.SGLP followed by the NTLP group and the primary TEP in that order.

**Figure 3**

Table 2: Speech Evaluation

<table>
<thead>
<tr>
<th>Surgery</th>
<th>Maximum Phonation Duration (MFD)</th>
<th>Quality of Voice</th>
<th>Speech Intelligibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ext SGLP (23)*</td>
<td>3-17 sec</td>
<td>Normal - Hot Potatoes - Voice</td>
<td>2</td>
</tr>
<tr>
<td>NTLP (19)**</td>
<td>3-20 sec</td>
<td>Normal - 51</td>
<td>2</td>
</tr>
<tr>
<td>TLP+ TEP (11)**</td>
<td>2 sec</td>
<td>Normal - 27</td>
<td>2</td>
</tr>
<tr>
<td>BS (5)</td>
<td>3 sec</td>
<td>Normal - 23-36</td>
<td>30% (90%)</td>
</tr>
<tr>
<td>Prowex (6)</td>
<td>3-30 sec</td>
<td>Normal - 6</td>
<td>6 (100%)</td>
</tr>
</tbody>
</table>

Extended Supraglottic Laryngopharyngectomy*
**Near Total Laryngo Pharyngectomy
*** Total Laryngopharyngectomy + Tracheo Esophageal Puncture

Adequate speech for interpersonal social interaction was achieved in 95%, 80% and 72% in the extended SSGL, NTLP and primary TEP groups respectively [Table – 3] at final evaluation (3 months after surgery)

**Figure 4**

Table 3: Speech Outcome

<table>
<thead>
<tr>
<th>Surgery</th>
<th>Socially adequate</th>
<th>Socially inadequate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ext SGLP*</td>
<td>95%</td>
<td>5%</td>
</tr>
<tr>
<td>NTLP**</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>TLP+ TEP***</td>
<td>72%</td>
<td>28%</td>
</tr>
</tbody>
</table>

*Extended Supraglottic Laryngopharyngectomy
**Near Total Laryngo Pharyngectomy
*** Total Laryngopharyngectomy + Tracheo Esophageal Puncture

The complications in the ext.SGLP consisted of serious tracheo- bronchial aspiration in 4 out of 23 (17%) patients and wound infection in 7 out of 23 (30%)[Table 4].

**Figure 5**

Table 4: Complications

<table>
<thead>
<tr>
<th>Type of surgery</th>
<th>Serious aspiration</th>
<th>Wound Infection</th>
<th>Fistula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ext SGLP* (23)</td>
<td>(17%)</td>
<td>Nil</td>
<td>Nil</td>
</tr>
<tr>
<td>NTLP** (69)</td>
<td>20%</td>
<td>4%</td>
<td>Nil</td>
</tr>
<tr>
<td>TLP+ TEP*** (11)</td>
<td>Nil</td>
<td>15%</td>
<td>50%</td>
</tr>
</tbody>
</table>

*Extended Subtotal Supraglottic Laryngopharyngectomy
**Near Total Laryngo Pharyngectomy
*** Total Laryngopharyngectomy + Tracheo Esophageal Puncture

In comparison amongst the NTLP group, major wound infection was noted in 22 out of 89(25%), with pharyngo-cutaneous fistula in 27 out of 89(30%) cases. The primary TEP group had fastest convalescence with only 2 instances of minor wound infection without salivary leak. Locoregional control rate at 3 years was 80% in the ext. SGLP group(median follow up 23 months, range 2-70 months), 85% in NTLP (median follow up 24 months , range 2-118 months) and 73% for the TLP+TE group (median follow up 20 months, range 3-132 months).

**DISCUSSION**

Pyriform sinus cancers remain one of the common head and neck cancers seen at our center and often present in advanced stages at initial presentation. In the past,
traditionally most of these lesions were subjected to ablative
total laryngectomy with partial pharyngectomy. These
lesions have a propensity to spread circumferentially
towards the retroarytenoid region as well as in a vertical
direction towards the oropharynx upwards. Further the
biologic aggressiveness is reflected by the predilection to
spread to regional lymphatics of both sides of the neck.

The 22% R1 resection is explainable by extensive
submucosal spread depicted by these tumors, to the extent of
10mm quoted previously. A recent study documented that
submucosal tumor extention is greatest in inferior aspect
followed by lateral and then superiorly, thus advocating
resection margins of 30mm, 20mm and 15mm in the
respective directions. Considering aggressive local behavior
of the tumor as mentioned the microscopic positivity at
resection margins in our study is lower as compared to 33% reported previously.

Our experience does not support the use of these imaging
modalities for pyriform fossa lesions, scarce use of which
not jeopardizing tumor staging in majority. Mucosal disease
is difficult to pick up even on MRI while differentiation
between inflammation and tumor is neither characterized by
CT scans nor MRI. It has been our experience that
conventional CT tends to overstage the disease and unless
specific manoeuvres viz. valsalva during radiologic assay are
undertaken it may not help differentiate medial wall lesions
from those of lateral wall

The treatment strategy for selecting an appropriate speech
restorative procedure at our institution is determined
primarily by the tumor topography [Figure 2].

Figure 6
Figure 2: Treatment Algorithm

#Pulmonary Function Test
## Interarytenoid region
** Extended Supraglottic Laryngopharyngectomy
***Near Total Laryngo Pharyngectomy
* Total Laryngopharyngectomy + Tracheo Esophageal
Puncture

If the tumor is limited in extent (well circumscribed) and
located predominantly above the cricoid (supracricoid) then
the type of surgical procedure is decided by the pulmonary
reserve of the individual. Only motivated and mentally
resilient patients with good pulmonary function would
qualify for ext.SGLP while candidates with poor lung
function would be stratified for NTLP – thus individualizing
the treatment to a great extent. Lesions of pyriform fossa
with inferior extent to the apex (transcricoid) would undergo
NTLP provided the inter and retro arytenoid regions were
free of disease; should this be deemed unsafe by
intraoperative frozen section examination, a total
laryngectomy with partial pharyngectomy would be
performed along with a TEP and / or prosthesis fitment at
the same sitting. Frozen section controlled primary resection
remains the gold standard for intra-operative decision-
making during NTLP. This frozen section examination needs
to address the disease extent at the mucosal as well as the
submucosal levels; ideally this is determined from tissues
from the patient's side after specimen resection. Sometimes
where the pre-surgical evaluation of the tumor topography
has been unsatisfactory, this approach helps to preserve all
the speech restorative surgical options until the last.

Ext.SGLP, if successful is an eminently gratifying
experience for both the patient and surgeon in well-selected
individuals. However extreme caution should be exercised in
case selection. Post-operative convalescence, especially
swallowing rehabilitation is likely to be long drawn and
tedious. Therefore pre-operative preparation with regard to
improving pulmonary function is important. Almost all our
patients who had restoration of swallowing normalcy to
more than 3 weeks had undergone ext. SGLP with resection
of variable extent of base of tongue and / or ipsilateral
arytenoid.
Decannulation is directly related to patients ability to cope with the variable degrees of initial aspiration associated with partial resection with attempts at restoration of swallowing normalcy. Aspiration severe enough to require feeding aids has been reported in the realms of 66% for this group of patients. In addition it has been observed that arytenoid resection negatively impacts restoration of swallowing normalcy. The 80% success of swallowing rehabilitation in this study on the contrary is very encouraging. This could be attributed to laryngoplasty, which is routinely used to reconstruct arytenoid at our center whenever it is resected. This is done by utilizing the posterior strut of ipsilateral thyroid cartilage hinged on the inferior constrictor. It is also important to fix the vocal process in a median position with 3.0 prolene to the posterior edge of the cricoid. Delayed swallowing and failures are attributable to blunting of lateral food channel due to pyriform fossa mucosa resection, a decreased sensory input leading to an uncoordinated swallow and injury to ipsilateral superior laryngeal nerve.

It has been stressed previously that in any partial resection of the larynx intra-operative details need to address the following:-

1. Preservation of at least one mobile arytenoid
2. Restoration of posterior glottic bulk to prevent aspiration
3. Maintenance of anteroposterior diameter of the glottic remnant to preserve an adequate airway and phonation

For oncological safety and to avert the trouble some aspiration and prolonged hospital stay Pearson's NTLP is recommended for lesions in which inferior extent mandates resection of the cricoid. While it does away with the dreaded complication of aspiration in ext.SGLP, the procedure is associated with high incidence of wound breakdown and pharyngo-cutaneous fistula owing to inadequate pharyngeal mucosa to bury the tracheopharyngeal speech shunt. With meticulous attention to surgical technique, prophylactic antibiotics and good nutritional support this rate still stands at 30% with respect to fistulas.

The TEP group, bereft of all the aforesaid problems poses a greater burden in terms of care and cost of prosthesis to the patient. This is especially relevant in a developing country, with varying levels of literacy, where “prosthesis linked physician dependence” precludes its use in many patients.

In terms of useful surgical speech restoration in pyriform sinus cancer we found scarce reference in literature. Ogura's landmark study points this as being 52% for pyriform sinus lesions following ext.SGLP. Experience from this study indicates ability to preserve speech in 90% patients including
Speech Restorative Surgery In Pyriform Fossa Carcinoma

those who required nutritional support and could not be
decannulated owing to aspiration. This provides an impetus
for its continued use in a carefully selected group.

In the NTLP group success rates varying from 70%-100%
have been quoted previously. Amongst all these
studies pyriform fossa lesions formed only a third of cases in
one earlier reports from this center have recounted similar
experience in 60% & 75% respectively. The success rates
were 82%, 75% & 81% respectively. Our success rate of
82% in this select group, with an equal number achieving a
socially adequate speech provides a satisfactory
rehabilitation.

CONCLUSION

All three surgical procedures provide satisfactory speech
outcomes with best results being for ext.SGLP. Good
rehabilitation of swallowing would make ESGLP the surgery
of choice for T1-T3 supracricoid tumors. NTLP and primary
TEP are speech restorative options for tumors that extend to
apex of pyriform sinus and mandate resection of ipsilateral
hemicricoid to ensure a satisfactory oncologic clearance.
Wound problems if overcome would make NTLP the
preferred surgical outcome in T3-T4 group. Practice of
primary TEP as today in India is decided by economic status
of the patient and/or insurance support. There is a tendency
to opt for permanent indwelling prosthesis as they have
minimal prosthesis related problems and a long life in the
body. TLP in our experience is to be reserved only for
lesions/ patients who fail to fit into either of the above
groups.

CORRESPONDENCE TO

Dr. Nancy Grover, Dept. Of Head & Neck Surgical
Oncology, Kidwai Memorial Institute of Oncology Dr. M.H.
Marigowda Road, Bangalore 560 029, India. Ph.
91-80-6560708 Ext 337 Fax 91-80-6560723 Email
nancybatta@yahoo.com

References
224-231.
2. Marks J.E., Kurnik B, Powers WE, Ogura JH. Carcinoma
of the pyriform sinus: An analysis of treatment results and
patterns of failure, Cancer 1978; 41:1008-15
3. Ogura JH, Marks JE, Freeman RB. Results of
conservative surgery for cancers of the supraglottic and
4. Hospital Cancer Registry Data. The Kidwai Memorial
Institute of Oncology, Bangalore, India.
5. Harvey M. Tucker. Deglutrition Following Partial
Laryngectomy. In Carl E. Silver, editor. Laryngeal
6. Toribo C. Flores, Benjamin G. Wood, Howard L. Levine,
Lawrence Koegel Jr., Harvey M. Tucker. Factors In
Successful Deglutrition Following Supraglottic Laryngeal
Surgery. Annals of Otology, Rhinology &
Laryngology1982; 91: 579-583.
7. Som YH, Habermalz HJ. Prognostic factors in pyriform
8. William I.Wei. The Dilemma of Treating Hypopharyngeal
Carcinoma - More or Less. Arch. Otolaryngol Head Neck
Squamous Cell Carcinoma of the Pyriform Sinus: A
retrospective study of 351 Cases treated at the Institute
10. Thomas J. Vogl. Hypopharynx, Larynx, Thyroid &
Parathyroid. In David D. Stark & William G. Bradly Jr.,
Year Book 1992 . Pages 1200, 1202
11. Shenoy AM, Harindra MN, Premalatha BS et al.
Functional Laryngeal Surgery - Critical Determinants Of
Successful Rehabilitation. Indian Journal of Otolaryngology
and Head & Neck Surgery. 2000;52 No. 4 :300-346
12. Biller HF, Lawson W. Partial laryngectomy for
93:297-300
laryngectomy with contralateral laryngoplasty. In Carl E.
15. Pearson BW, Keith RL. Near-Total Laryngectomy. In:
Johnson JJ, Blitzer A, Ossoff RH, Thomas JR, eds,
American Accademy of Otolaryngology - Head and Neck
Surgery, Instructional Courses, vol. 2, St. Louis: CV Mosby,
16. De Santo LW, Pearson BW, Olsen KD. Utility of Near-
Total laryngectomy for supraglottic, pharyngeal, base tongue
17. Shenoy AM , Plinkert PK, Nanjundappa N et al.
Functional utility and oncologica safety of near-total
laryngectomy with tracheopharyngeal speech shunt in a
Third World oncologic center. Eur Arch Otolaryngol 1997
18. Shenoy AM , Sridharan S, Srihariprasad AV et al.Near-
Total Laryngectomy In Advanced Cancers Of The Laryn
And Pyriform Sinus: A Comparative Study Of Morbidity
And Functional And Oncological Outcomes. Ann Otol
Rhinol Laryngol 2002 ;111 : 50-56.
19. Singh W. Electrolaryngography in near-total
laryngectomy with myomucosal valved neoglottis. J
Speech Restorative Surgery In Pyriform Fossa Carcinoma

Author Information

Ashok M. Shenoy, FRCS (Ed.)
Professor & Head, Dept. Of Head & Neck Surgical Oncology, Kidwai Memorial Institute of Oncology

Nancy Grover, MS
Fellow, Dept. Of Head & Neck Surgical Oncology, Kidwai Memorial Institute of Oncology

Nanjundappa, MS
Faculty, Dept. Of Head & Neck Surgical Oncology, Kidwai Memorial Institute of Oncology

A. V. Srihariprasad, MS
Faculty, Dept. Of Head & Neck Surgical Oncology, Kidwai Memorial Institute of Oncology

Mudit Agarwal, MS
Fellow, Dept. Of Head & Neck Surgical Oncology, Kidwai Memorial Institute of Oncology

Premalatha, B.S., PhD.
Speech Pathologist, dept. Of Head & Neck Surgical Oncology, Kidwai Memorial Institute of Oncology

B.K.M. Reddy, MD
Professor & Head, Dept. Of Radiation Oncology, Kidwai Memorial Institute of Oncology