The Dilemma of Treating Hypopharyngeal Carcinoma: More or Less

Hayes Martin Lecture

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The optimal therapy for hypopharyngeal carcinoma depends on its staging. For early-stage disease, radiotherapy and surgery achieve similar results. Radical surgery followed by radiotherapy is applicable in the management of patients with advanced-stage disease. Chemoradiation aiming to preserve the larynx can only be performed for selected patients and in well-equipped institutions. Thorough understanding of pathological behavior of hypopharyngeal carcinoma, its submucosal tumor extension, and its high propensity to metastasize to cervical lymph nodes allows head and neck surgeons to choose optimal surgical treatment. Lymph node status determines the type of neck dissection required while location and size of the primary tumor determine the extent of resection and choice of reconstruction procedure. Adequate tumor extirpation with less extensive and invasive procedures preserving unaffected normal tissue contribute to more tumor control and less morbidity.


Over the past few decades, there have been many developments in therapeutic measures for the management of head and neck malignancies. With better imaging studies in delineating the extent of tumors with improved modalities for delivering radiation energy, the results of radiotherapy have shown better local disease control while leading to less damage of vital head and neck organs. More potent chemotherapeutic agents are now available and their delivery with radiation may alter the progress of malignancy. Surgical treatment of malignant diseases in the head and neck region has also progressed. Understanding the mode of tumor spread both locally and to cervical nodes allows better surgical treatment options to be delivered. Precise tumor resection can be performed with a laser while preserving unaffected nearby organs. Radical resection can also be performed as we have more effective reconstruction methods, aiming at function and form restoration. However, contemporary head and neck surgeons face a dilemma when treating hypopharyngeal carcinomas. A choice has to be made whether (1) to administer more potent chemotherapeutic agents, or less potent; (2) to target a wider field around the tumor during radiation therapy, or a narrower field; or (3) to perform more extensive resection followed by reconstruction, or less extensive resection.

THERAPEUTIC OPTIONS

Primary Tumor

Therapy for hypopharyngeal carcinoma aims to control the tumor locally and regionally while improving the chances of a disease-free survival. The functional outcome following treatment is important and the appropriate therapeutic measure chosen should be “cost-effective” in that the treatment duration should be short and the associated morbidity minimal.

Choice of therapy for hypopharyngeal carcinoma depends on the extent of the disease. In general, stage T1 and T2 tumors with no metastases to cervical lymph nodes are regarded as early tumors, while T3 and T4 tumors and those with metastases to the neck glands are recognized as advanced tumors. For early hypopharyngeal carcinoma, surgical resection of the...
tumor with an adequate margin or delivery of external radiotherapy produces good results. The choice between the 2 treatment modalities depends on the expertise of the treating physician.

For advanced hypopharyngeal carcinoma, radical resection and reconstruction followed by postoperative radiotherapy was the standard form of therapy in the 1970s and 1980s. The reported survival rates from different centers worldwide ranged from 20% to 48%. In recent years, various studies have shown that with chemoradiation, laryngeal preservation is feasible. In patients who responded to chemotherapy and were given postoperative radiotherapy, 60% had their larynx preserved. A laryngeal preservation scheme, however, is only applicable when the patient responds to chemotherapy and completes the entire treatment regimen. Patients should be compliant in attending regular follow-up so that appropriate surgical salvage can be administered in a timely fashion to avoid mortality. Transoral resection of hypopharyngeal carcinoma with a carbon dioxide laser has been reported to be effective. Although its application is primarily for early diseases, it has been used for large tumors and initial responses were encouraging. This therapeutic measure is more effective when the hypopharyngeal carcinoma is exophytic and not invading the laryngeal skeleton.

### Cervical Lymph Nodes

The management of lymph nodes in early hypopharyngeal carcinoma has remained a challenging problem. For patients with clinically negative necks, Buckley and MacLennan found that 36% of neck nodes on the side of the primary tumor and 27% of contralateral neck glands contained a metastatic tumor. Most of tumor-bearing nodes were located in levels II, III, and IV. For patients with clinical palpable necks nodes on the side of the primary tumor, disease-positive pathological nodes were present in 37% in the contralateral neck.

Neck nodes in hypopharyngeal carcinoma require some form of treatment even though they may not be clinically detectable. If surgery is used for the treatment of the primary tumor, selective neck dissection for levels II, III, and IV lymph nodes should be performed; if radiotherapy is used, the radiation field should cover the neck. For clinically positive neck nodes, radical neck dissection on the side of the lesion is the recommended treatment and should be performed with resection of the primary tumor. A selective neck dissection of levels II, III, and IV lymph nodes of the contralateral neck should be considered when the primary tumor extends toward the midline.

### CONCEPTS OF SURGICAL RESECTION FOR THE PRIMARY TUMOR

For the majority of advanced hypopharyngeal carcinomas, radical resection of the primary tumor with neck dissection, followed by postoperative radiotherapy, offers a good chance of eradicating the disease. A frequently asked question regarding radical resection of the primary tumor is whether jejunum or stomach is preferred for reconstruction. This could be answered by going back to basic principles.

The hypopharynx is a cylindrical muscular tube extending from the oropharynx to the esophagus with the larynx as the anterior wall. The lumen of this vascular tube is wider in the upper region. Curative resection aims to remove the primary tumor with an adequate margin, in a 3-dimensional sense, with clearing of the regional draining lymph nodes. The subsequent reconstruction aims to restore the continuity of the alimentary tract and the procedure with lowest morbidity should be chosen. The reconstruction decision method should only be taken when adequate resection of the primary tumor has been performed. When a partial pharyngectomy is performed, the defect can be reconstructed with a myocutaneous flap. When a circumferential pharyngectomy is performed, the defect can be reconstructed with a free jejunal graft. Following pharyngectomy and esophagectomy, the stomach might be used for reconstruction.

With this plan of management, our clinical data reported of the 1980s showed a hospital mortality of approximately 9.2% and a local recurrence rate of 14% (Table 1).

The ultimate goal of surgery is to resect enough tumor to effect an adequate curative resection while removing as little normal tissue as possible, aiming to reduce mortality and morbidity. This optimal balance can only be achieved when the surgeon appreciates the pathological behavior of the malignancy. This behavior in hypopharyngeal carcinoma includes the early and high propensity of metastasis to the cervical lymph nodes and the extensive submucosal tumor spread. Submucosal tumor extension must be taken into account during surgery so that adequate tumor extirpation can be achieved. The distance of submucosal tumor extension along the longitudinal axis of the hypopharynx, as reported from different centers, ranges from 10 mm to 20 mm.

To investigate the incidence of submucosal tumor extension in 3 dimensions, a whole specimen step serial sectioning study was conducted in the early 1990s. Findings showed that submucosal tumor extension was present in 60% of specimens and the distance of submucosal spread was greatest in the inferior aspect, followed by the lateral direction, and then superiorly. On inspecting the specimens macroscopically, the submucosal tumor extension could be divided into 3 types. Type 1 were submucosal extensions that had a grossly evident tumor front. Type 2 submucosal extensions were not ob-

| Table 1. Surgical Treatment Results for Hypopharyngeal Carcinoma, 1983-1990 |
|---------------------------------|---|---|---|---|
| Total laryngectomy and partial pharyngectomy | 44 | 2 | 8 | 8 |
| Total laryngectomy and circumferential pharyngectomy | 23 | 4 | 11 | 3 |
| Pharyngolaryngoesophagectomy | 42 | 4 | 4 | 4 |
| Total | 109 | 10 | 23 | 15 |

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vicious macroscopically, while type 3 included the skipped lesions, ie, the submucosal tumor was separated from the primary tumor with a bridge of normal mucosa. Most type 2 lesions were seen in patients who had previous radiation therapy and surgery was performed for salvage purposes. The distance of submucosal extensions were also more extensive in this group of patients.

Other findings included the invasion of thyroid cartilage in 55% of the specimen and 30% of the thyroid gland. A radial margin of clearance of over 1 mm has been shown to affect survival, as this implies that the tumor can be removed clearly from the prevertebral muscle. Therefore, based on our results, we recommend that the resection margin in patients without previous radiation be 15 mm superiorly, 30 mm inferiorly, and 20 mm laterally. For patients with previous radiation, it should be 20 mm, 40 mm, and 30 mm, respectively. The deep margin under both circumstances should be greater than 1 mm.

We have used these measurements as our guideline for appropriate resection margins when performing resections for hypopharyngeal carcinoma. With the evaluation of the tumor extent before the operation and at the time of resection, adequate resection of the hypopharynx is performed. Patients who had no preoperative radiotherapy will be given radiation after operation. Tumor-free margins were further confirmed by frozen section during operation and appropriate reconstruction followed. When a partial pharyngectomy was performed for tumor extirpation, the pharyngeal defect was reconstructed with a patched pectoralis major myocutaneous flap. When adequate tumor resection resulted in a circumferential pharyngeal defect, a segment of jejunum was transferred to the neck for reconstruction. The jejunal vessels were joined to the neck vessels using microvascular techniques. The free jejunal graft used for reconstruction has been shown to tolerate postoperative radiotherapy if required.

When the hypopharyngeal tumor extends inferio-

rly to affect the cervical esophagus, tumor extirpation to achieve an adequate lower resection margin will include the removal of the esophagus. The resection will become a pharyngolaryngo-esophagectomy and reconstruction can be achieved with mobilization of the stomach to the neck for a pharyngogastric anastomosis. This is a 1-stage operation, removing the organs that might harbor malignant disease; there is only 1 anastomosis. The procedures of resection and reconstruction, however, traverse 3-body compartments, delivering significant trauma to patients who are frequently elderly, chronic smokers, drinkers, and nutritionally deprived. Whenever there is a complication, the associated morbidity may become significant and lead to hospital mortality. The operation, however, when successfully performed, will invariably relieve distressing dysphagia and long-term functional results will be acceptable.

This operation has been performed on 317 patients in the Department of Surgery at Queen Mary Hospital, University of Hong Kong Medical Centre, China, from 1966 to 1995. The operation was performed for extensive laryngeal carcinoma in the early years, and recently has been primarily for patients with carcinoma arising from the lower hypopharynx and cervical esophagus. The operation is performed with the patient in a supine position. While resection of the primary tumor in the neck, with or without radical neck dissection, is performed, a second surgical team simultaneously prepares the stomach in the abdomen. The esophagus is mobilized transhiatally by blunt dissection and removed with the primary tumor and neck dissection specimen. The stomach is then brought up to the neck through the orthotopic route and anastomosed to the oropharynx. When the cervical esophagus extends to affect the trachea, a manubrium resection can be performed to allow resection of the trachea at a lower level and a terminal tracheostome can be constructed over the anterior chest wall.

Since we began performing this operation, hospital mortality has decreased from 31% to 9% and anastomotic leakage rate has been reduced to 9% from 22%. Reports from more than 10 patients published over the last 30 years indicate that overall hospital mortality is approximately 16%. Reported complication rates are approximately 60% and most complications are minor. Major complications associated with this operation are vascular injuries and damage to the posterior tracheal wall. When blunt dissection of the esophagus tears a small artery, it usually contracts and does not give rise to serious problems. The bleeding, however, can be severe when the azygos vein is damaged during blunt dissection. Under these circumstances, immediate thoracotomy is necessary for hemostasis. Injury to the upper part of the posterior tracheal wall can be repaired through the neck while a torn posterior tracheal wall in lower trachea has to be repaired immediately with a thoracotomy. Accidental leakage at the pyrolotomy site can be closed with a loop of jejunum.

Improved outcomes associated with the operation may be the result of patient selection, prompt management of the complications, and some modifications in surgical technique. Instead of blunt dissection of the esophagus, endoscopic mobilization under thoracoscope has been used in recent years. Precise ligation of vessels and sharp dissection of tissue have also been performed under direct vision. Furthermore, to reduce tension at the pharyngogastric anastomosis, apart from removing shoulder support and mobilizing the posterior pharyngeal wall up to the nasopharynx, the incision over the anterior wall of the stomach should be done in a “T” shape fashion. This moves the anterior gastric wall toward the lateral aspect where tissue tension is the greatest. The lowered wound over the anterior wall of the stomach can still meet the mobile tongue base. Despite all these technical modifications, the surgical insult of this operation is significant and should only be performed for adequate tumor extirpation, not for the convenience of using the stomach for reconstruction.

For patients with small leakages at the pharyngogastric anastomosis, conservative management can be used successfully. For any substantial leakage, early construction of a pharyngostome is essential to prevent further contamination of the neck wound and mediastinum. The stomach wall should be everted to suture to the neck skin. When the inflammation subsides, the pharyngostome can be closed with a pectoralis major myocutaneous flap at a second stage.
For the past decade, we have managed hypopharyngeal carcinoma surgically with the concepts presented. We resect adequately and then reconstruct using the procedure associated with the lowest morbidity. Our results have shown improvement over time. Mortality and morbidity have been reduced and, more important, local tumor control has improved (Table 2). These results suggest that surgery and postoperative radiotherapy have been effective. The survival rate, however, has remained unchanged as patients developed distant metastasis and second primary tumors for which prompt salvage may not be applicable (Table 3).

In summary, for early hypopharyngeal carcinoma and for some patients with advanced disease, we are doing less while curing more. For those requiring resection, less but adequate tumor extirpation followed by appropriate reconstruction leads to more favorable outcomes.

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Table 2. Surgical Treatment Results for Hypopharyngeal Carcinoma, 1993-2000

<table>
<thead>
<tr>
<th>Procedure</th>
<th>No.</th>
<th>Mortality</th>
<th>Leakage</th>
<th>Local Recurrence</th>
<th>Recurrence</th>
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</thead>
<tbody>
<tr>
<td>Total laryngectomy and partial pharyngectomy</td>
<td>42</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total laryngectomy and circumferential pharyngectomy</td>
<td>22</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Pharyngolaryngoesophagectomy</td>
<td>19</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>83</td>
<td>2</td>
<td>7</td>
<td>5</td>
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Table 3. Compared Results of Radical Surgery for Hypopharyngeal Carcinoma*

<table>
<thead>
<tr>
<th>Procedure</th>
<th>1980s (n = 109)</th>
<th>1990s (n = 83)</th>
</tr>
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<tbody>
<tr>
<td>Mortality</td>
<td>9.2</td>
<td>2.4</td>
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<tr>
<td>Leakage</td>
<td>21.1</td>
<td>8.4</td>
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<tr>
<td>Local recurrence</td>
<td>13.8</td>
<td>6.0</td>
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<tr>
<td>Neck recurrence</td>
<td>34</td>
<td>13.1</td>
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<tr>
<td>5-y actuarial survival</td>
<td>24.5</td>
<td>27</td>
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*Data are given as percentages.

REFERENCES


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