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Morbidity After Flap Reconstruction of Hypopharyngeal Defects

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Objectives: **Laryngopharyngeal reconstruction continues to challenge in terms of operative morbidity and optimal functional results. The primary aim of this study is to determine whether complications can be predicted on the basis of reconstruction in patients undergoing pharyngectomy for tumors involving the hypopharynx. In addition, we detail a reconstructive algorithm for management of partial and total laryngopharyngectomy defects.** ***Method:*** **A retrospective review was performed of 153 patients undergoing flap reconstruction for 85 partial and 68 circumferential pharyngectomies at a single institution over a 10-year period. There were 118 males and 35 females, the median age was 62 years, and mean follow up was 3.1 years. Pharyngectomy was performed for recurrence after radiotherapy in 80 patients and as primary surgery in 73. Free flap reconstruction was used in 42%, with 30 jejunal, 15 radial forearm, 11 anterolateral thigh, five rectus abdominis, and three gastroomental flaps. Gastric transposition and pectoralis major pedicle flap was used in 14% and 44% of patients, respectively. Morbidity was analyzed according to extent of defect, regional versus free flap, enteric versus fasciocutaneous free flap reconstruction, and the effect of laparotomy.** ***Results:*** **The total operative morbidity and mortality rate was 71% and 3%, respectively. The most common complications were hypocalcemia in 45%, pharyngocutaneous fistula in 33%, and wound complications in 25%. The late complication and stricture rate was 26% and 15%, respectively. On univariate analysis, circumferential defects were associated with increased total ($P = .046$) and flap-related morbidity ($P = .037$), hypocalcemia ($P < .001$), late complications ($P = .003$), and stricture ($P = .009$). Gastric transposition had increased total ($P = .007$), flap-related ($P = .035$), late complications ($P = .034$), and hypocalcemia ($P = .001$). Pharyngocutaneous fistula was increased in patients undergoing salvage pharyngectomy for radiation failure ($P = .048$) compared with primary surgery. On multivariate analysis, gastric transposition independently predicted for wound complications ($P = .014$) and fistula ($P = .012$). Circumferential defects predicted for flap-related morbidity ($P = .030$), hypocalcemia ($P = .017$), and late complications ($P = .042$). Tracheoesophageal speech was the method of voice restoration in 44% of patients. Oral diet was achieved in 93% of patients; however, 16% required gastrostomy tube feeds for either total or supplemental nutrition.** ***Conclusion:*** **The operative morbidity associated with pharyngeal reconstruction is substantial in terms of early and late complications. We were able to predict morbidity by defect extent and reconstruction type and initial treatment modality. Swallowing function is acceptable; however, less than half of the patients undergoing pharyngectomy had tracheoesophageal puncture voice restoration.**
Key Words: **Reconstruction, free flap, myocutaneous flap, squamous cell carcinoma, hypopharynx, pharyngectomy, laryngopharyngectomy.**
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INTRODUCTION

Cancer involving the hypopharynx, either primary hypopharyngeal malignancy or advanced tumors from other sites, is associated with a poor prognosis. Chemoradiation and altered fractionation radiotherapy protocols have enabled larynx preservation in many patients with marginal improvements in survival over conventional radiotherapy. Unfortunately, surgical salvage after definitive radiation therapy is not a rare event. Other patients are not suitable candidates for these toxic therapies and are best managed with primary surgery. When hypopharyngectomy is undertaken, either alone or in combination with laryngectomy, reconstructive surgeons are faced with the challenge of minimizing morbidity in a high-risk population while achieving adequate functional results with regard to swallowing and voice restoration. The primary aim of this study was to determine whether postoperative morbidity could be predicted by the defect extent or

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method of reconstruction. In addition to this, we outline a reconstructive algorithm for patients undergoing partial and circumferential laryngopharyngectomy.

MATERIALS AND METHODS

Patients

A retrospective chart review was performed for all patients referred to Princess Margaret Hospital, Toronto, who underwent partial or circumferential hypopharyngectomy between January 1992 and December 2001. In total, there were 171 pharyngectomies in 168 patients. Only patients requiring flap reconstruction were included in the analysis; hence, 15 patients were excluded in whom the defect was closed primarily, giving a final cohort of 153 patients. The median age was 62 years (range, 27–81 y), there were 35 females and 118 males, and the mean follow up of survivors was 3.2 years (median, 2.2 y; range, 5 mo to 13 y). The distribution of patients according to pathologic diagnosis and primary tumor site is shown in Table I and the distribution of patients with squamous cell carcinoma according to T and N stage is shown in Table II.

Indications for Laryngopharyngectomy

Pharyngectomy was performed for recurrent disease (n = 75) or stricture (n = 5) after definitive radiotherapy in 52%. Radiotherapy was delivered using a hyperfractionated accelerated technique in 74 patients to a median 66 Gy (range, 50–70 Gy). Concurrent chemoradiation was used in only six patients. In the remaining 73 patients (48%), pharyngectomy was performed as primary treatment. Primary surgery was used in patients who had prior radiation therapy to other head and neck sites (n = 38), nonsquamous cell carcinoma (SCC) pathology (n = 5), or advanced local disease (n = 30) in whom radiotherapy was unlikely to provide a good outcome in terms of disease control and function. For analysis of complications by initial therapy (radiotherapy or surgery), only patients receiving macroscopic tumoricidal doses (>50 Gy) to the laryngopharynx were included in the radiotherapy group.

TABLE II.
Pathologic T and N Stage of 147 Pharyngectomies Performed for Squamous Cell Carcinoma.

	N0	N1	N2a	N2b	N2c	N3	Total
T1	2						2
T2	11		1	2		1	15
T3	34	2	4	4	3		47
T4	41	2	5	20	13	2	83
Total	88	4	10	26	16	3	147

Surgical Ablation

Pharyngectomy was combined with laryngectomy (laryngopharyngectomy) in 129 patients (84%). A further 16 patients (11%) had a prior laryngectomy, leaving eight patients (5%) with intact larynges after surgery. The surgical approach was through a standard anterior cervical exposure in 141 patients, lateral pharyngotomy in seven patients, and through a combined mandibulotomy and cervical approach in five patients with extensive disease. Concurrent neck dissection was performed in 144 patients (94%) with 137 bilateral and seven unilateral dissections. A selective dissection (51%) was performed when nodal disease was absent or limited, and comprehensive neck dissection (43%) was reserved for patients with more advanced nodal disease.

Reconstruction

Laryngopharyngeal reconstruction was partial in 85 patients (56%) and total (circumferential) in 68 patients (44%). More patients undergoing primary surgery (55%) had a circumferential reconstruction than patients undergoing salvage (35%). Pectoralis major myocutaneous flap (n = 68) was the most common flap overall (44%) and was used almost exclusively for partial defects. Gastric transposition was used in 21 patients (14%) with tumors arising in or extending to the cervical esophagus. Free tissue transfer was used in 64 patients (42%) predominantly for circumferential defects. The

TABLE I.
Distribution of Patients According to Tumor Pathology and Site.

	Squamous Cell Carcinoma	Nonsquamous Cell Carcinoma	Total
Larynx			
Glottis	25	Leiomyosarcoma (1) Chondrosarcoma (1)	27
Supraglottis	21	—	21
Subglottis	1	—	1
Transglottis	5	—	5
Hypopharynx			
Piriform sinus	56	Malignant schwannoma (1)	57
Posterior wall	11	Malignant schwannoma (1)	12
Postcricoid	15	—	15
Not specified	4	Adenoid cystic carcinoma (1)	5
Other			
Cervical esophagus	6	—	6
Oropharynx	3	—	3
Thyroid	—	Insular papillary carcinoma (1)	1
Total	147	6	153