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Impact of the method and success of pharyngeal reconstruction on the outcome of treating laryngeal and hypopharyngeal cancers with pharyngolaryngectomy: A national analysis

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Summary *Background:* Surgical treatment of cancers that arise from or invade the hypopharynx presents major reconstructive challenges. Reconstructive failure exposes the airway and neck vessels to digestive contents.

Methods: We performed a national *N = near-all* analysis of the administrative dataset to identify pharyngolaryngectomies in England between 2002 and 2012. Information about morbidity, pharyngeal closure method and post-operative complications was derived.

Results: There were 1589 predominantly male (78%) patients whose mean age at surgery was 62 years. The commonest morbidities were hypertension (24%) and ischemic heart disease

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(11%). For 232 (15%) patients, pharyngolaryngectomy was performed during an emergency admission. The pharynx was closed primarily in 551 patients, with skin or muscle free or pedicled flaps in 755 patients and with jejunum and gastric pull-up in 123 and 160 patients, respectively. In-hospital mortality rate was 6% and was significantly higher in the gastric pull-up group (11%). Reconstructive failure had an odds ratio of 6.2 [95% confidence interval (CI) 2.4–16.1] for in-hospital death. The five-year survival was 57% and age, morbidities, emergency surgery, gastric pull-up, major acute cardiovascular events, renal failure and reconstructive failure independently worsened prognosis. Patients who underwent pharyngeal reconstruction with radial forearm or anterolateral thigh flaps had lower mortality rates than patients who had jejunum flap reconstruction (hazard ratio = 1.50 [95% CI 1.03–2.19]) or gastric pull-up (hazard ratio = 1.92 [95% CI 1.32–2.80]).

Conclusions: Pharyngolaryngectomy carries a high degree of risk of morbidity and mortality. Reconstructive failure worsens short- and long-term prognosis, and the use of cutaneous free flaps appears to improve survival.

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Introduction

Cancers that primarily arise from or extend into the hypopharynx are a particularly challenging sub-type of head and neck cancers to treat. Most patients present with stage 3 or 4 disease^{1,2} and, not infrequently, with acute airway or digestive tract obstruction. Prognosis for these cancers remains poor with a 5-year survival of approximately 40%.³

Primary treatment of hypopharyngeal cancers in England is increasingly nonsurgical,^{4–7} but for selected advanced cancers and for patients in whom nonsurgical treatment fails, surgery remains the only curative option. Pharyngolaryngectomy involves excision of the larynx and partial or circumferential excision of the pharynx (Figure 1). In some cases, the tongue-base, oropharynx, and the oesophagus are also resected to achieve oncological clearance.

In some patients, the pharyngeal wound can be primarily closed,⁸ but patients with extensive partial or circumferential pharyngeal resections require reconstruction to close the pharyngeal defect in order to restore digestive tract continuity (Figure 1). The reconstructive approach depends on the amount of pharyngeal resection required. Current reconstructive options include regional pedicled flaps, and particularly the pectoralis major flap; microvascular fasciocutaneous flaps including radial forearm and anterolateral thigh flaps; and digestive tract conduits including the jejunum flap; colon transposition; and gastric pull-up.⁹ The most recent multidisciplinary guidelines on managing head and neck cancer recommend that pharyngeal defects with more than 3.5 cm of residual pharyngeal mucosa may be closed primarily, defects with less than 3.5 cm of residual pharyngeal mucosal width require a pedicled patch flap and circumferential pharyngeal defects require circumferential reconstruction. The guidelines recommend the use of tubed flaps or jejunum flap if the inferior anastomosis is above the clavicle and a gastric pull-up or a colon transposition if the inferior anastomosis is below the clavicle.¹⁰ There is little evidence beyond single-institution series to support the optimal reconstructive approach.^{8,11–13} We undertook a

national analysis of patients undergoing pharyngolaryngectomy to assess the impact of reconstructive technique and success on patient outcome and identify further risk factors for short- and long-term morbidity and mortality in this patient group.

Patients and methods

Case identification

This is a sub-group analysis of patients who underwent pharyngolaryngectomy from the dataset of patients who underwent major head and neck surgery in England between 2002 and 2012 identified within the national administrative dataset (www.hscic.gov.uk/hes).¹⁴ The national administrative dataset accrues data on over 99% of all spells of care provided to patients undergoing inpatient, ambulatory, emergency, and outpatient treatment within the National Health Service in England (www.hscic.gov.uk/hes). It contains information about cancer site, morbidities, treatment, complications and mortality. We have previously developed and validated methodologies for analysing the administrative dataset in patients undergoing major head and neck cancer surgery.^{14–17}

Definition of variables

Pharyngolaryngectomy was defined by the presence of procedure codes E19 (Excision of Pharynx) or F22 (Excision of Tongue) and E29 (Excision of Larynx) in the same patient superspell ([E19 OR F22] AND [E29]).¹⁸ From a reconstructive perspective, patients were assigned to pharyngeal repair if there were no codes to identify reconstruction or if E21 codes (Repair of Pharynx) were used without a concomitant donor site code. Different flap types were identified using a previously validated informatics algorithm, and reconstructions were divided into skin/muscle flaps, jejunum, or gastric pull-up.¹⁵ Information about adjuvant treatments such as neck dis-

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