High-Volume Surgeons Deliver Larger Surgical Margins in Oral Cavity Cancer

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Purpose: In oral cavity cancer surgery there are many factors that contribute to the surgical margin; thus, the factors determining patient outcomes are still not completely understood. The aim of this study was to determine which variable or variables had the greatest influence on increasing the size of the surgical margin.

Materials and Methods: A retrospective cohort study was conducted at the Royal Brisbane and Women's Hospital of patients who underwent resective surgery for a primary oral cavity cancer from January 1, 2008 through December 31, 2012. The primary outcome variable was the surgical margin, defined as the closest distance between the surgical edge and invasive cancer. A heterogeneous set of predictor variables was identified as potentially affecting the primary outcome variable: demographic, 5 surgical, and 7 histologic variables. The data then underwent statistical analysis using univariable linear regression, and variables that were found to have a statistical association were retained in a non-interaction multivariable model.

Results: This study included 250 patients. The results showed that high-volume surgeons delivered larger surgical margins than low-volume surgeons. The single most important variable associated with larger surgical margins was who performed the resective operation. The following variables also were associated with smaller surgical margins: retromolar trigone location, non–squamous cell carcinomas, perineural invasion, and a lip-split mandibulectomy surgical approach.

Conclusion: There was a strong association between high-volume surgeons and larger surgical margins, supporting the rationalization of oral cavity cancer management in high-volume centers and by high-volume surgeons.

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Oral cavity cancer is the sixth most common type of cancer in the world,[1] placing a large burden on the health care system. Most patients are managed surgically, guided by the fundamental principle that complete tumor resection is required for successful treatment.[2]

Involved margins (invasive cancer at the resection site) and close margins (invasive cancer within 5 mm but not involving the resection site) are associated with local disease recurrence and poorer survival rates.[3,4] Therefore, achieving clear margins (no invasive cancer within 5 mm of the resection site) is highly desirable to improve patient outcomes.

When patients present for treatment, many prognostic factors are already predetermined, such as tumor size, nodal involvement, distant metastases, and patient age.[5] However, the surgical margin is an important independent prognostic factor that clinicians can influence. Therefore, understanding what alters the surgical margin is highly relevant, as patient survival rates could theoretically be improved.[4]

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There is very little in the current literature on this subject. Sutton et al[4] defined histologic factors that were associated with poorer surgical margins in oral cavity cancer. Perineural invasion, vascular invasion, larger tumor, and tumors that were more aggressive were found to be independently associated with close or involved surgical margins. There is very little known about how specific surgical techniques and clinical practices play a role.

The purpose of this study was to identify which surgical and histologic factors influence the surgical margin in oral cavity cancer surgery. The authors hypothesized that variables existed that could be manipulated to improve the surgical margin. The aims of this study were to *1)* measure and compare the data to determine which variables correlated with a statistically larger surgical margin and *2)* propose evidence-based methods to increase the surgical margin.

Materials and Methods

STUDY DESIGN

To address the research purpose, the authors designed and implemented a retrospective cohort study. The study sample was derived from the population of patients who presented to the Royal Brisbane and Women's Hospital (RBWH; Herston, Australia) for the evaluation and management of oral cavity cancer from January 1, 2008 through December 31, 2012. Patients eligible for study inclusion had histologically established malignant primary oral cavity cancer, which had been surgically resected at the RBWH. Patients with primary malignant melanoma of the oral cavity were excluded from the study. The RBWH human research ethics committee granted formal approval for this research project.

STUDY VARIABLES

In this study, the primary outcome variable was the surgical margin, defined as the closest distance between the surgical edge of the excision specimen and histologic evidence of invasive cancer. This was coded as a continuous variable in millimeters. During surgical resection of oral cavity cancer, the current practice at RBWH is to aim for a macroscopic surgical margin of at least 10 mm. Intraoperative frozen section was used variably between different surgeons when there was concern for potential involvement of surgical margins. Postoperatively, the excision specimens were fixed in formalin and analyzed by the RBWH anatomical pathology unit. Although formalin can shrink specimens, and therefore alter the surgical margins, the fixative procedure for all specimens in this study was standardized, having been performed in the same laboratory.

A heterogeneous set of predictor variables was identified as potentially influencing the primary outcome variable. The predictor variables were grouped into demographic, surgical, and histologic sets. The only demographic information recorded was patient age, which was coded as a continuous variable in years.

The surgical predictor variables were resective surgeon, reconstructive surgeon, reconstructive type, surgical approach, and access procedure. The surgeons were de-identified and categorically coded into 3 major groups based on the volume of cases treated: resective surgeon group 1 consisted of surgeons who treated more than 40 patients, resective surgeon group 2 consisted of surgeons who treated 20 to 40 patients, and resective surgeon group 3 had surgeons who treated fewer than 20 patients. The reconstructive surgeon was categorically coded as same (the same surgeon performed the resection and the reconstruction), different (a reconstructive surgeon different than the resective surgeon repaired the defect), or nil (no reconstructive surgeon was required). The reconstructive type was categorically coded as nil (primary closure or no closure), graft, locoregional flap, or free flap. The surgical approach was categorically coded as oral, mandibulectomy, mandibulotomy, lip-split mandibulotomy, lip-split mandibulectomy, dropdown, or Weber-Ferguson. The surgical approaches were coded into an additional binary category as to whether they are considered "access procedures" or "nonaccess procedures." Access procedures, designated "yes," included mandibulotomy, lip-split mandibulotomy, lip-split mandibulectomy, dropdown, and Weber-Ferguson. Nonaccess procedures, designated "no," included oral and mandibulectomy only.

The histologic predictor variables were cancer type, location, maximum tumor dimension, tumor stage (T stage), frozen section, lymphovascular invasion, and perineural invasion. The cancer type was coded in a binary fashion as squamous cell carcinoma (SCC) or non-SCC (salivary carcinoma and sarcoma). The tumor location was categorically coded as tongue, buccal mucosa, mandible, floor of the mouth, retromolar trigone, or maxilla. The maximum tumor dimension was coded as a continuous variable in millimeters. The T stage was categorically coded as T1 (0 to 20 mm), T2 (20 to 40 mm), T3 (<40 mm), or T4 (tumor invades adjacent structures). Frozen section, lymphovascular invasion, and perineural invasion were coded in a binary fashion as yes or no.

DATA COLLECTION AND MANAGEMENT

Two medical practitioners familiar with intraoperative processes and histopathology techniques were involved in the data collection. Eligible patients were identified from the RBWH multidisciplinary team