

Intraoperative Margin Assessment in Early Oral Squamous Cell Carcinoma



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KEYWORDS

• Margin • Squamous cell carcinoma • Oral cavity • Frozen • Gross examination

Key points

- The approach to margin sampling affects local control. Sampling of tumor bed correlates with worse local control.
- The status (positive vs negative) of the margin obtained from the resection specimen correlates with local recurrence, and thus, resection specimen–based margin assessment is always recommended (even if tumor bed margins are submitted separately).
- Adequate margin revision should ideally be represented by one tissue fragment, characterized by size and shape that fits the revised aspect of the resection specimen.
- Resolution of frozen versus final sampling issues is possible only if the examined fragment of tissue is oriented as to the true new margin surface.
- Adequate design of studies on margins should include local recurrence as a primary endpoint, actual measurement of margin clearance, distinguish second primary carcinomas from recurrences, and comment on the source of margins (resection specimen and/or tumor bed).
- Anatomic landmarks, orientation, and approach to margin assessment in partial glossectomy, hemiglossectomy, and mandibulectomy are illustrated.

 Video content accompanies this article at <http://www.surgpath.theclinics.com>.

ABSTRACT

The surgical method of margin sampling affects local control, pathologists' approach to margin sampling, and clarity of pathology reports. Studies have shown that exclusive reliance on tumor bed margins is associated with worse local control and should be avoided. En bloc resections and margins obtained from the resection specimen remain the "gold standard." Successful surgical treatment of early carcinomas of the oral cavity relies on close cooperation between surgeons and pathologists on issues of specimen orientation and margin sampling.

OVERVIEW

The aim of intraoperative margin assessment is to evaluate the adequacy of tumor removal, also referred to as "margin assessment."¹ Although the need for routine intraoperative margin assessment is engrained in the minds of surgeons and pathologists, the method of margin assessment is not universally agreed on. In fact, the approach to intraoperative margin assessment (gross only vs routine microscopic examination) and its overall clinical value are questioned,^{2–4} especially for advanced (pT3–4) carcinomas.⁵

Although complete tumor removal with adequate margins is a fundamental oncologic

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principle, there are actually no *direct* evidence-based data showing whether *intraoperative* margin assessment improves local control. Such research is difficult due to the variability in margin sampling, assessment, and reporting. Specifically, there are currently 2 ways of sampling margins.⁶⁻⁸ In the specimen-driven approach, the entire resection specimen is sent for margin assessment to the pathologist. In a defect-driven scenario, the surgeon performs a resection and then samples tumor bed (ie, margins from wound, cavity, or patient). In the latter scenario, the size, location, and number of tumor bed margins is not guided by the formal margin assessment from the actual resection specimen. Most of the literature on margin assessment essentially ignores the source of margins and the relationship between the 2 margin types. Several recent studies have shown that the only prognostically relevant margins are those derived from the actual resection specimen and the mere fact of tumor bed sampling correlates with worse local control (**Fig. 1**).⁹⁻¹⁶

Indirectly, the need for and value of routine intraoperative margin assessment as practiced currently is highly questionable. In most cases, the margins are adequate and the only value of intraoperative margin assessment is reassurance (see **Fig. 1**, group 1). When the margins are suboptimal, they are revised (see **Fig. 1**, group 2); however, margin revision appears to be of little to no therapeutic value (**Fig. 2**).^{9,12,17-20} Finally, the tumor bed margins obtained in the defect-driven approach are of no prognostic significance and the mere sampling of tumor bed margins seems to correlate with worse local control (see **Fig. 1**, group 3).¹²⁻¹⁴ In groups 2 and 3 the intraoperative information on margins does not appear to lead to clinical benefit.

Margin status is clinically most relevant in a group of patients who are ideally cured by surgery alone, namely patients with pT1-2.⁵ The intent of this review was to illustrate how to best perform intraoperative margin evaluation in early carcinomas of the oral cavity. The principles of gross examination are emphasized. The limitations of and interdisciplinary friction caused by tumor bed margins were highlighted by questionnaire-type studies by the American Head and Neck Society and North American Society of Head and Neck Pathologists^{6,7} and are summarized in **Box 1**. Therefore, this review focuses on intraoperative examination of resection specimens and margin revision.

MARGIN ASSESSMENT

What is an adequate margin clearance (distance from the invasive tumor front to the margin)?

Very few studies adequately addressed the issue of the safe distance to the margins (**Box 2**).²²

When the principles proposed in **Box 2** are followed, there appears to be a linear relationship between local recurrence and margin clearance. There is a 33% decrease in risk of local recurrence for an increase of 1 mm of margin clearance (up to 5 mm of margin clearance for oral tongue).^{12,13} The confounding effect of tumor bed margins on prognostic significance of margin clearance (as measured from the resection specimen) is unclear.

ORAL CAVITY RESECTION SPECIMENS: ORIENTATION AND MARGIN ASSESSMENT

Most oral cavity resection specimens, such as segmental mandibulectomies, hemiglossectomies, partial glossectomies, and partial maxillectomies can be oriented based on anatomic landmarks. Anatomic landmarks may include uvula, maxillary tuberosity in partial maxillectomy (**Fig. 3**), tip of the tongue and curvature of the mandible (**Figs. 4** and **5**, **Videos 1** and **2**), and distinguishing qualities of the mucosa in dorsal and ventral aspects of oral tongue (**Figs. 6-9**, **Videos 3** and **4**).

Smaller specimens may require the knowledge of laterality (right, left, midline) and orientation by sutures or ink (**Fig. 10**).

MARGIN SHRINKAGE

Immediately after resection, the tissue shrinks by 20% to 40% due to unopposed muscle contraction, especially for lower stage (pT1-2) tumors.^{25,26} The extent of tissue shrinkage and of artifactual changes (eg, up to 0.15 cm of cautery) depend on resection technique: cold steel, electrocautery, laser.²⁷ Formalin fixation adds additional 10% of shrinkage. Most importantly, tissue shrinkage takes place in all resections and cannot be used as the only explanation of margin status.¹ Shrinkage of a mucosal floor of mouth margin is illustrated in **Video 2**. **Video 4** shows shrinkage and curling of the deep/midline oral tongue margin.

NONMARGIN CUT AND TEARS AND EXTENSION OF RESECTION

While performing resection, a surgeon may decide that the plane of section should be adjusted and additional cuff of tissue is needed. Such additional tissue should be re-approximated to the initial defect on resection specimen (**Video 3**).

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