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Macroscopic technique for the evaluation of oral tongue tumour thickness: a reliable intraoperative method

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Abstract. There is no reliable method to assess tumour thickness preoperatively or intraoperatively in cases of oral tongue squamous cell carcinoma (SCC). The purpose of this study was to evaluate the efficacy of a macroscopic technique to measure tumour thickness. This was a prospective study of 51 consecutive patients with T1/T2 primary SCC of the oral tongue. All patients underwent primary resection with ipsilateral neck dissection. Thickness measurements were obtained using Vernier calipers on the fresh specimen. The technique was correlated with the microscopic evaluation statistically using (1) Pearson's correlation coefficient, (2) intra-class correlation, and (3) Bland–Altman plot with 95% confidence intervals. On comparing the macroscopic technique to the microscopic evaluation, Pearson's correlation (r) was 0.915 ($P < 0.001$). The inter-rater reliability using the intra-class correlation coefficient was 0.955. The Bland–Altman plot to test the agreement between the techniques showed the average difference between macroscopic thickness and microscopic thickness (bias) to be −0.421, with 95% limits of agreement of −3.166 and 2.82. There was a significant correlation and agreement between the macroscopic and microscopic measures of tumour thickness. The macroscopic technique could be used as a reliable tool to measure tumour thickness intraoperatively, prior to neck dissection.

Key words: tumour thickness; oral tongue cancer; head and neck cancer; neck dissection; N0 neck.

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The tongue remains the most common intraoral site of oral cancer worldwide, and this represents a serious public health problem with significant morbidity and mortality in a number of countries.[1] The status of cervical lymph nodes is the most important prognosticator of survival in oral tongue squamous cell carcinoma (SCC).[2] Unfortunately these metastatic lesions are quite often subclinical or occult at the time of diagnosis, and may not become evident even at the time of treatment of the primary tumour. The regional rate of recurrence in the untreated clinical N0 neck varies from 30% to 47% for the

early tumours of the oral tongue (T1 and T2).[3,4] Controversy exists regarding the best method to address the clinically N0 neck in the management of these cases.[5]

Tumour thickness is reported to be a significant predictive factor of nodal involvement.[6,7] However, the optimal thickness predicting lymph node metastases is controversial. The suggested thickness cut-off for deciding to treat the neck varies greatly in the literature, ranging from 1.5 mm to 10 mm, with 4 mm reported most often.[8–10] Huang et al., in a meta-analysis of studies, concluded that tumour thickness was a strong predictor of cervical nodal involvement, with a cut-off value of 4 mm.[11] It has been suggested that those with tumours of a thickness of less than 4 mm may not need to undergo a neck dissection. However, there is no reliable method to assess tumour thickness preoperatively or intraoperatively prior to neck dissection. Various techniques have been proposed for the preoperative evaluation of tumour thickness. Clinical palpation to gauge the thickness of a tumour has been found to be inaccurate. Preoperative imaging of the lesion by ultrasound and magnetic resonance imaging (MRI) has been attempted, with variable results.[12–14]

The purpose of this study was to determine the efficacy of a macroscopic technique for the measurement of tumour thickness done intraoperatively. This was done by correlating values with those obtained with the gold standard microscopic evaluation.

Methods

Institutional review board approval was obtained for this study. This was a prospective study of 51 consecutive patients with primary SCC of the oral tongue with American Joint Committee on Cancer (AJCC) stage T1 or T2 tumours (Fig. 1). Tumours of the tongue crossing the midline, those involving the tip of the tongue, those infiltrating into surrounding structures, and irradiated and recurrent tongue tumours were excluded from the study. The study period was December 2010 to December 2014.

Nodal status was confirmed by physical examination and ultrasonography of the neck. All patients underwent resection of the primary lesion and ipsilateral elective selective neck dissection (levels I to IV). The measurement of tumour thickness was obtained intraoperatively from the fresh glossectomy specimen using a macroscopic method. Tumour thickness was then measured postoperatively by microscopic histopathological paraffin section examination.

Technique

After resection, the fresh specimen was taken immediately to the pathology gross room for sectioning. To avoid shrinkage and distortion errors, the specimen was not treated with formalin. Specimen measurements, tumour measurements (except for thickness), and margins (except deep margins) were noted before sectioning. Specimens were cut into approximately 2–3-mm-thick transverse slices (Fig. 2). Tumour tissue could be visualized clearly as a whitish hard tumour mass in the surrounding reddish uninvolved tongue muscle. Cut sections were examined for tumour thickness. The tissue section in which mucosa adjacent to the tumour was observed and which was considered to have the greatest infiltration into the underlying tissue was noted in both ulcerated and exophytic lesions, disregarding any superficial keratin or inflammatory infiltrate that existed. The technique was an adaptation of that used by Huang et al.[11] Tumour thickness measurements were obtained using Vernier calipers (Fig. 3). This thickness was verified and confirmed by one other pathologist.

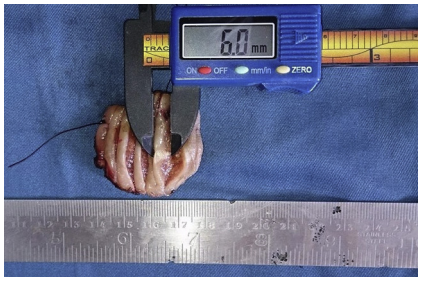

Fig. 3. Macroscopic method using Vernier calipers showing a thickness of 6 mm. The specimen was cut into 2–3-mm thick transverse slices. Tumour tissue could be visualized as a whitish tumour mass in the surrounding reddish uninvolved tongue muscle.

Microscopic examination

Conventionally prepared paraffin sections from the tumour specimen were examined microscopically and the lesion was staged according to the seventh edition of the AJCC system (AJCC 2010).[15] Microscopic measurements were obtained using the Vernier calipers attached. The maximum thickness was recorded from the imaginary line reconstructing the intact mucosa to the deepest point of invasion into the underlying tissue, in both ulcerated and exophytic lesions, disregarding any superficial keratin or inflammatory infiltrate that existed. The technique was an adaptation of that used by Huang et al.[11]

Statistical methods

Tumour thickness measured by macroscopic technique was compared to the gold standard microscopic thickness statistically using (1) Pearson's correlation coefficient, (2) intra-class correlation (ICC), and (3) Bland–Altman plot with 95% confidence intervals.

Fig. 1. Squamous cell carcinoma: T1 stage, oral tongue.

Fig. 2. Fresh unpreserved surgical specimen cut into 2–3-mm thick transverse slices. Stitch on the tongue denotes the anterior margin.