The Clinical Impact of MRI for Assessment of Squamous Cell Carcinoma of the Tongue

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Target audience: Researchers interested in MRI assessment of oral cavity cancer, and head and neck physicians.

Purpose: Magnetic resonance imaging (MRI) is an indispensable tool for staging of tongue cancer, as it is capable of detecting deep structural invasion that cannot be evaluated clinically, differentiating different types of soft tissue, and is associated with fewer dental artifacts in comparison with CT. Invasion of squamous cell carcinoma (SCC) of the tongue into extrinsic muscles of the tongue (hyoglossus, genioglossus, styloglossus, and palatoglossus) is the key factor for T staging up to T4a (AJCC/UICC). Invasion of neurovascular bundles by SCC arising in the tongue has a direct impact on treatment and prognosis. Recent technological advances with MRI have had a critical and positive effect on clinical diagnosis and therapy. However, to our knowledge, the correlation between these recent developments in MR modalities and the outcomes of tongue SCC has not been reported. The purpose of the present study was to investigate the relationship between the features of extrinsic muscle/ neurovascular bundle invasion demonstrated by recently developed MRI and treatment outcome in patients with tongue cancer.

Methods: One hundred sixty-eight consecutive MRI studies of SCC of the tongue for which histological confirmation had been obtained, between August 2008 and July 2013, were retrospectively reviewed. All studies were performed using 3T-MRI scanners (Ingenia or Achieva, Philips Medical Systems, Best, Netherlands). Examinations that were severely limited by motion or dental artifacts were excluded. The following sequences were reviewed by two radiologists, paying particular attention to invasion of extrinsic muscles and neurovascular bundles: Axial and coronal T1WI, T2WI, STIR, contrast-enhanced T1 fast-field echo (slice thickness 3 mm), and 3D-T1 turbo field echo (slice thickness 1 mm). Electronic medical records for all patients were reviewed for the presence or absence of pathologically confirmed cervical lymph node metastasis. To evaluate the crude association between each factor and the likelihood of having lymph node metastasis, multivariate logistic regression analysis was conducted. Odds ratios and their 95% confidence intervals (CI) were calculated.

Results: Of the 168 patients with tongue SCC, 44% (74/168) had pathologically confirmed cervical lymph node metastasis. Multivariate logistic regression analysis showed that extrinsic muscle invasion (odds ratio 4.21; 95% CI 1.86–9.55; P<.005) and neurovascular bundle invasion (odds ratio 3.63; 95% CI 1.53–8.60; P<.005) were significant predictors of cervical lymph node metastasis. The probability of metastasis was estimated with these models.

Discussion: Vascular invasion by SCC of the tongue is associated with an increased likelihood of cervical metastasis, loco-regional and nodal recurrence, and an overall reduction in patient survival rates. Preoperative identification of such invasion may make it necessary to obtain wider margins and to perform ipsilateral neck dissection in selected patients at the time of surgery. Recent advances in MR imaging techniques may have improved potential for delineating the true extent of a tumor, determining the presence of lymph node metastases, and predicting the response to treatment.

Conclusion: It is suggested that MRI of tongue cancer associated with preoperative estimation of any invasion into extrinsic muscles and neurovascular bundles can contribute to prediction of cervical lymph node metastases.

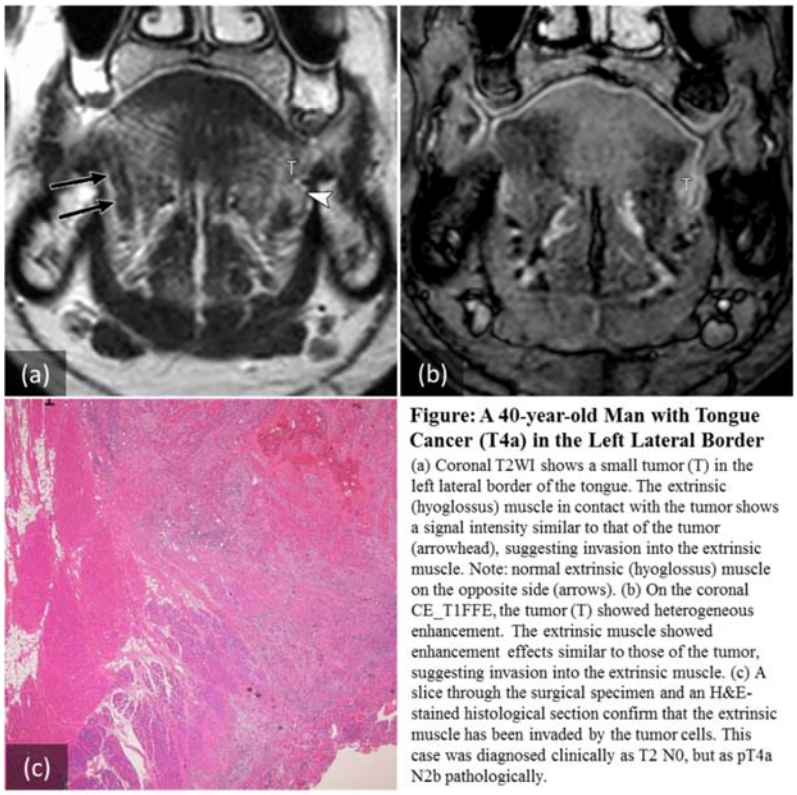

Figure: A 40-year-old Man with Tongue Cancer (T4a) in the Left Lateral Border
(a) Coronal T2WI shows a small tumor (T) in the left lateral border of the tongue. The extrinsic (hyoglossus) muscle in contact with the tumor shows a signal intensity similar to that of the tumor (arrowhead), suggesting invasion into the extrinsic muscle. Note: normal extrinsic (hyoglossus) muscle on the opposite side (arrows). (b) On the coronal CE_T1FFE, the tumor (T) showed heterogeneous enhancement. The extrinsic muscle showed enhancement effects similar to those of the tumor, suggesting invasion into the extrinsic muscle. (c) A slice through the surgical specimen and an H&E-stained histological section confirm that the extrinsic muscle has been invaded by the tumor cells. This case was diagnosed clinically as T2 N0, but as pT4a N2b pathologically.

References:

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