ORIGINAL RESEARCH PAPER
Volume-6 | Issue-12 | December-2017 | ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 93.98
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ROLE OF EXTRINSIC MUSCLE INVOLVEMENT IN TONGUE CANCER: WORSE OR NOT- A REVIEW

Oncology

Dr Akhlak Hussain

Dr Nida Siddiquee

ABSTRACT

AJCC 8th edition recently exclude the extrinsic muscle invasion (EMI) from the T staging including depth as the only criteria up to T3 stage. We review the prognostic and predictive role of EMI and found it to be an important tool for prediction of lymph node metastasis and hence, it is an important prognostic feature.

KEYWORDS

Introduction

It seems to be controversial excluding the EMI from the AJCC 8th edition. Proponents suggest them to be the superficial muscles and their effect on prognosis can be nullified by including depth of invasion instead. Opponents argue that there is a major difference regarding the prognosis in the tumor with or without EMI. We review systemically including most of the publications on this issue.

Discussion

Regional metastasis to cervical lymph nodes results in 50% decrease in 5-year survival in patients with nodal disease.[1,2] Thus these represents the most significant prognostic factor in HNSCC. Lymph node status is an issue of paramount importance in the treatment of HNSCC, especially in resectable cases. The management of clinically or radiologically positive node is elective nodal dissection. Despite clinical or radiographic "evidence" of lymph node metastasis, 10–20% of these patients were actually metastasis-free upon histologic examination (N0). Conversely, approximately 20%–40% of patients staged clinically as N0 actually had metastatic disease.[3] Hence, clinical staging of lymph node status in oral tongue squamous cell carcinoma (SCC) require further investigations for more accuracy.

Evidences are showing a good correlation between depth of tumor invasion (DOI) and the presence of occult lymph node metastasis. Different studies have used different cut-off points for DOI, ranging from 1.5 to 10 mm, using different methods of measurement.[3-15] AJCC 8th edition has clearly defined and reached a consensus classifying the T staging only on the basis of depth of invasion completely excluding EMI which form the main bulk of previous T4a stage with poor prognosis. Additionally, starting point of DOI mesurement from the surface is not very clear due to some histopathologic findings, such as degree of surface erosion or ulceration and hyperkeratosis, which make it more problematic. Inflammation surrounding the invasive front of the lesion makes the clear assessment of the depth difficult. Frozen section artifact, such as blade chatter and freezing artefact; and specimen shrinkage due to formalin fixation also results in inaccuracy.

Skeletal muscle invasion and more specifically EMI can be determined by preoperative imaging and this information is readily available during surgery. More over, Skeletal muscle invasion would be more straight-forward to ascertain in specimens, as compared to DOI, and would likely have greater inter-observer reproducibility. Additionally, muscle invasion would be simpler to determine in the frozen section setting, which is where DOI is frequently needed to determine if the surgery should proceed to lymph node dissection.

MRI seems to be an excellanet tool in the assessment of EMI (Fig.1). On axial T1- weighted images, fat with high signal intensity can be seen interspersed between the muscles of intermediate signal intensity. The largest of all, Genioglossus can be easily seen on computed tomography (CT) and MRI from genial tubercle to the hyoid bone; posteriorly into the tongue base; and superiorly into the entire ventral surface of the tongue. The hyoglossus muscles define the lateral margins of the tongue and are readily identified on CT and MRI. Both the styloglossus (which arises from the styloid process and stylohyoid ligament) and the palatoglossus (which originates from the palatine aponeurosis) cannot be seen with certainty on imaging studies.[16]

It may be hypothesized that the spread of tumor depends on EMI also, independent of depth of invasion, rather dependent on the types of muscle involved. Clinical evidence shows what, so far, has only been suggested in the literature[17] and adequately described only in the musculoskeletal system: tumour cells can migrate longitudinally following the path of least resistance. From the primary site, along and between the intrinsic and extrinsic muscle fibres, the pattern of spread varies according to the orientation of the infiltrated muscle(s).[18-21] The arrangement of the extrinsic muscles, with a sharp bend from the base of the tongue to the floor of the mouth, allows fast progression of the tumour to the deeper tissue planes. This view is further corroborated by the clinical observations that tumour invasion of nerves and vessels also progresses along a path parallel to the muscle fibres.[22] These evidences supports the importance of EMI, not only their prognostic role but also their role guiding the longitudinal tumour resection.

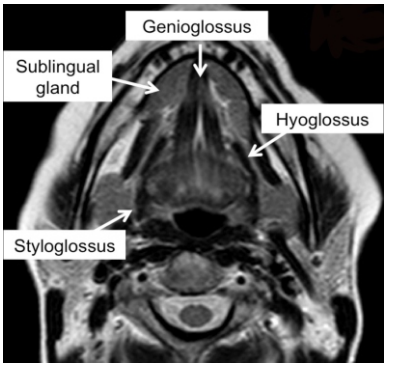

Figure 1: MRI imaging showing clear depiction of extrinsic muscles of tongue

Table1: Studies on the role of extrinsic muscles in oral cancers.

S. No.	Author(s)	Methodology	Results and Inference
1	Murthy SP et al. 2017[23]	Prospective cohort (n=87) study on MRI parameters [the distance of the extrinsic muscles from the normal surface; maximum transverse, craniocaudal, and anteroposterior tumor dimensions and tumor involvement of the muscles] and HPE [depth of invasion]	The mean distances of genioglossus (anteroventral), hyoglossus, and styloglossus were 3.98, 2.13 and 0.66 mm, respectively. Hyoglossus, styloglossus, and genioglossus are involved in 79 (90.8%), 58 (66.76%), and 31 (35.6%), respectively. For DOI < 10 mm, the involvement of hyoglossus, styloglossus, and genioglossus was seen in 80, 35, and 15%, respectively. The extrinsic muscles of the tongue are not deep. Even superficial thin tumors can involve these muscles. The present study justifies the removal of extrinsic muscle involvement in defining stage T4 of the oral cavity.

2	Boland PW et al.[24] 2013	Retrospective study, (n=87). The anatomy of the extrinsic tongue muscles was mapped using images from the Visible Human Project (VHP) to create a computer model of the extrinsic tongue muscles. This was co-registered with 87 archived pre-staging MRI scans of tongue carcinomas to assess tumour ingress of the extrinsic tongue muscles.	16 images were of superficial tumours not visible on MRI. 71 cases showed extrinsic muscle tumour ingress resulting in upstaging of 52% from T1/2/3 tumours to cT4a. Genioglossus muscle invasion did not predict occult cervical lymph node invasion or disease-related survival. Tumour invasion of styloglossus or hyoglossus would result in the majority of lateral tongue tumours being staged T4a. Such stratification is of little clinical relevance.
3	Chandler K et al. [25] Dec 2011	Prospective study (n=61) of stage T1 cases with histological assessment muscle invasion and DOI.	Muscle invasion and DOI (>3mm) had 23.3% and 29.7% PPV of occult lymph node metastasis, respectively. Muscle invasion and DOI (>3mm) had 43.7% and 40.4% PPV of local tumor recurrence, respectively. Muscle invasion is a more easily reproducible parameter to determining the need of elective neck dissection in clinically negative neck, and may represent an important indicator for extent of resection.
4	Barret AW et al.[26] 2017	Retrospective study (n=165) The histological sections from primary resection specimen of tongue SCC were reviewed,	One or more extrinsic muscles of the tongue was involved in 61%. The genioglossus seen the most often (in 96). Hyoglossus was identified in only eight patients, the styloglossus in two, and the palatoglossus in none. Clear identification was possible only in extensive resections. They concluded that the removal of invasion of extrinsic muscles of the tongue in AJCC 8th edition, as a criterion for a pT4a SCC is justified.

Conclusion

Case studies are limited to smaller sample size; a larger study could help elucidate the applicability of muscle invasion as an indicator of lymph node positivity. While more exploration into this topic is needed, these results hold promise for the utility of the use of muscle invasion in clinical decision-making as compared to the more problematic depth of invasion. AJCC 8th edition is justified in including depth of invasion. But complete exclusion of extrinsic muscle invasion should be reviewed in regards of their independent role in prognosis in tongue cancer.

References

1. Snow GB, Annyas AA, Slooten EA, et al. Prognostic factors of neck node metastasis. Clinical Otolaryngol Allied Sci. 1982;7:185–192.
2. Grandi C, Alloisio M, Moglia D, et al. Prognostic significance of lymphatic spread in head and neck carcinoma: therapeutic implications. Head Neck Surg. 1985;8:67–73.
3. Pentenero M, Gandolfo S, Carrozzo M. Importance of tumor thickness and depth of invasion in nodal involvement and prognosis of oral squamous cell carcinoma: a review of the literature. Head Neck. 2005;12:1080–91.
4. Kurokawa H, Yamashita Y, Takeda S, et al. Risk factors for late cervical lymph node metastases in patients with stage I or II carcinoma of the tongue. Head Neck. 2002;8:731–6.
5. Lim SC, Zhang S, Ishii G, et al. Predictive markers for late cervical metastasis in stage I and II invasive squamous cell carcinoma of the oral tongue. Clin Cancer Res. 2004;10:166–172.
6. Byers R, El-Naggar AK, Lee YY, et al. Can we detect or predict the presence of occult nodal metastases in patients with squamous cell carcinoma of the oral tongue? Head Neck. 1998;2:138–44.
7. Sparano A, Weinstein G, Chalian A, et al. Multivariate predictors of occult neck metastasis in early oral tongue cancer. Otolaryngol Head Neck Surg. 2004;131:472–476.
8. Alkureishi LWT, Ross G, Shoaib T, et al. Does tumor depth affect nodal upstaging in squamous cell carcinoma of the head and neck? Laryngoscope. 2008;118:629–634.
9. Fukano H, Matsuura H, Hasegawa Y, et al. Depth of invasion as a predictive factor for cervical lymph node metastasis in tongue carcinoma. Head Neck. 1997;19:205–210.
10. Hosal AS, Unal OF, Ayhan A. Possible prognostic value of histopathologic parameters in patients with carcinoma of the oral tongue. Eur Arch Otorhinolaryngol. 1998;255(4):216–9.
11. Kane SV, Gupta M, Kakade AC, et al. Depth of invasion is the most significant histological predictor of subclinical cervical lymph node metastasis in early squamous carcinomas of the oral cavity. EJSO. 2006;32:795–803.
12. O-charoenrat P, Pillai G, Patel S, et al. Tumour thickness predicts cervical nodal metastases and survival in early oral tongue cancer. Oral Oncol. 2003;39:386–390.
13. Yuen APW, Lam KY, Wei WI, et al. A Comparison of the prognostic significance of tumor diameter, length, width, thickness, area, volume, and clinicopathological features of oral tongue carcinoma. Am J Surg. 2000;180:139–143.
14. Yuen APW, Lam KY, Lam LK, et al. Prognostic factors of clinically stage I and II oral tongue carcinoma–A comparative study of stage, thickness, shape, growth pattern, invasive front malignancy grading, Martinez-Gimeno score, and pathologic features. Head Neck. 2002;24:513–520.
15. Shintani S, Matsuura H, Hasegawa Y, et al. The relationship of shape of tumor invasion to depth of invasion and cervical lymph node metastasis in squamous cell carcinoma of the tongue. Oncology. 1997;54(6):463–7.
16. Ong CK and Chong VFH. Imaging of tongue carcinoma. Cancer Imaging (2006) 6, 186–193
17. Kuriakose MA, Loree TR, Hicks WL, Welch JJ, Wang H, DeLacure MD. Tumour volume estimated by computed tomography as a predictive factor in carcinoma of the tongue. Br J Oral Maxillofac Surg 2000;38:460-5.
18. Chong V. Oral cavity cancer. Cancer Imaging 2005;5 Spec No A:S49-52.
19. Azzarelli A. Surgery in soft tissue sarcomas. Eur J Cancer 1993;29A:618-23.
20. Enneking WF, Spanier SS, Malawer MM. The effect of the anatomic setting on the results of surgical procedures for soft parts sarcoma of the thigh. Cancer 1981;47:1005-22.
21. Karakousis CP, Kontzoglou K, Driscoll DL. Anterior compartment resection of the thigh in soft-tissue sarcomas. Eur J Surg Oncol 1998;24:308-12.
22. Woolgar JA. Histopathological prognosticators in oral and oropharyngeal squamous cell carcinoma. Oral Oncol 2006;42:229-39.
23. Murthy SP et al."Deep Extrinsic Muscle Involvement" Is a Fallacy in the American Joint Committee on Cancer's Seventh Edition of Tumor Staging of Oral Cavity Cancers. J Oral Maxillofac Surg. 2017 Jun. pii: S0278-2391(17)30619-5.
24. Boland PW, Pataridis K, Eley KA, Golding SJ, Watt-Smith SR. Automatic upstaging of tongue squamous cell carcinoma with lateral extrinsic muscle involvement is not justified. Int J Oral Maxillofac Surg. 2013 Nov;42(11):1397-402.
25. Chandler K, Vance C, Budnick S, and Muller S. Muscle Invasion in Oral Tongue Squamous Cell Carcinoma as a Predictor of Nodal Status and Local Recurrence: Just as Effective as Depth of Invasion? Head Neck Pathol. 2011 Dec; 5(4): 359–363.
26. Barrett AW et al.Staging of squamous cell carcinoma of the tongue: extrinsic lingual muscles and the 8th editions of the American Joint Committee on Cancer/Union for International Cancer Control staging manuals. Br J Oral Maxillofac Surg. 2017 Sep 27. pii: S0266-4356(17)30287-5.