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Pre-operative predictors of bone marrow invasion in patients with oral cavity squamous cell carcinoma

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Abstract:
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Authors and Institutions

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Introduction

Accurate pre-operative diagnosis of bone marrow (BM) invasion in patients with oral cavity squamous cell carcinoma (OCSCC) is critical to determine the surgical approach (segmental versus marginal mandibulectomy). In this study we explored the possible pre-surgical clinical and imaging predictors of BM invasion in patients with OCSCC.

Patients and methods:

A retrospective study of 160 patients with OCSCC, arising from or abutting the upper or lower alveolar ridge, who underwent staging PET/CT and contrast enhanced CT (Ce-CT) or MRI studies before surgery. The results of imaging were reported as either positive or negative for BM invasion. The clinical and pathological data were also recorded.

Bone resection was planned according to the treating surgeon final decision to achieve free surgical margin. All patients received mandibulectomy (marginal or segmental) and/or maxillectomy as part of their surgical management. Histopathology was taken as the reference standard for comparison.

Results:

BM invasion was present in 48 patients (30%). Mandible was invaded in 42 patients, maxilla in 5 and both were invaded in one patient. On univariate analyses, cancer subsite "gum, retromolar trigone and hard palate", edentulous status, T4-disease, positive Ce-CT
or positive MRI, positive PET/CT and high SUV were significantly associated with BM invasion.
Using a binary logistic model, only cancer subsite, positive Ce-CT or positive MRI and positive PET/CT remained in the model as independent predictors of BM invasion.

Conclusion

Cancer subsite and positive diagnostic examination are the most important pre-operative clinical predictors of bone marrow invasion.

Table 1: Univariate analysis of clinical factors and their relation to bone invasion in patients with OCSCC

Characteristic	n	Marrow intact (n, %)	Marrow invaded (n, %)	OR (95% CI) RR (95% CI)	P
Cancer sub-site					
Buccal (+FOM, tongue)	87	(75, 86.2)	(12, 13.8)	6.1 (2.8-13)	< 0.0001*
Gum (+RMT, HP)	73	(37, 50.7)	(36, 49.3)	3.6 (2-6.4)	
Clinical AJCC stage					
Stage I-III	63	(61, 96.8%)	(2, 3.2%)	27.5 (6.4-118.9)	< 0.0001*
Stage IV	97	(51, 52.6%)	(46, 47.4%)	14.9 (3.8-59.4)	
Primary tumor size (cm)					
≤ 3 (ROC)	52	(44, 84.6)	(8, 15.4)	3.2 (1.4-7.6)	< 0.0001*
> 3	108	(68, 63)	(40, 37)	2.4 (1.2-4.8)	
Primary tumor size (cm)					
≤ 3.5 (Median)	83	(56, 64)	(19, 22.9)	1.5 (0.8-3)	0.0570
> 3.5	77	(56, 48)	(29, 37.7)	1.3 (0.8-2.2)	
Clinical T-stage					
T1-T3	79	(78, 98.7%)	(1, 1.3%)	107.8 (14.3-813.9)	< 0.0001*
T4	81	(34, 42%)	(47, 58%)	45.8 (6.5-324.2)	
Clinical N-staging					
N0-1	101	(77, 76.2%)	(24, 23.8%)	2.2 (1.1-4.4)	0.0243
N2-N3	59	(35, 59.3%)	(24, 40.7%)	1.7 (1.1-2.7)	
Differentiation					
WD-MD SCC	140	(98, 70)	(42, 30)	1 (0.3-2.7)	1.0000
PD SCC	20	(14, 70)	(6, 30)	1 (0.5-2)	
Metal artifact					
No	79	(58, 73.4)	(21, 26.6)	1.4 (0.7-2.7)	0.3910
Yes	81	(54, 66.7)	(27, 33.3)	1.3 (0.8-2)	
Dentate status					
Dentulous	90	(73, 81.1)	(17, 18.9)	3.4 (1.7-6.9)	0.0009*
Edentulous	70	(39, 55.7)	(31, 44.3)	2.3 (1.4-3.9)	
CT/MRI					
Negative	76	(73, 96.1)	(3, 3.9)	28.9 (8.4-99.5)	< 0.0001*
Positive	81	(37, 45.7)	(44, 54.3)	13.8 (4.5-42.5)	
PET/CT					
Negative	101	(93, 92.1)	(8, 7.9)	24.5 (9.9-60.5)	< 0.0001*
Positive	59	(19, 32.2)	(40, 67.8)	8.6 (4.3-17)	
SUV of the primary tumor					
≤ 13.4 (Median)	85	(66, 77.6)	(19, 22.4)	2.2 (1.1-4.4)	0.0370*
> 13.4 (Median)	75	(46, 61.3)	(29, 38.7)	1.7 (1.1-2.8)	

* Statistically significant
OR = odds ratio; RR = relative risk; CI = confidence interval; FOM = floor of the mouth; RMT = retromolar trigone; HP = hard palate

Table 2: Binary logistic regression analysis of clinical factors and their relation to bone invasion in patients with OCSCC

Characteristic	Predictive hazard (95% CI)	P
Cancer sub-site in gum, HP, RMT	4.67 (1.37-15.92)	0.014*
Clinical T4	21.32 (2.25-201.79)	0.008*
Primary tumor size > 3cm	2.11 (0.42-10.61)	0.366
Edentulous	1.29 (0.4-4.17)	0.671
Positive CT/MRI	6.7 (1.39-32.17)	0.018*
Positive PET/CT	5.55 (1.79-17.19)	0.003*

SUV > Median	0.71 (0.21-2.35)	0.57

* Statistically significant
RMT = retromolar trigone; HP = hard palate
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Topic (Complete): 702 Head & Neck

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