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Evaluation of the pattern and mechanism of bony invasion in gingivobuccal sulcus and gingival squamous cell carcinoma and its correlation with the regional lymph node metastasis: A histopathological study

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ARTICLE INFO

Keywords:
Gingivobuccal complex
Erosive pattern
Invasive pattern

ABSTRACT

Objective: The purpose of this study was to assess the frequency of bony invasion and to evaluate the pattern and mechanism of tumor invasion into the bone and its correlation with the regional lymph node metastasis in gingivobuccal sulcus (GBS) and gingival squamous cell carcinoma.

Study design: A prospective study in which 25 resected specimens of the jaws along with the associated lymph nodes of patients treated for GBS and gingival squamous cell carcinomas were evaluated for the frequency, pattern and mechanism of tumor invasion into the bone and the regional lymph node metastasis, using a light microscope.

Results: 8 of the 25 cases showed bony invasion, among which 5 (20%) showed invasive pattern of tumor invasion while 3 (12%) showed the erosive pattern into the bone. The main mechanism of bony invasion was via the cortical plate (20%) than the periodontal ligament (12%). Regional lymph node metastasis was seen in 6 of the 8 cases showing bony invasion. No significant correlation was found between any of the above parameters.

Conclusion: In our attempt to study the tumor invasion into the bone, we found no significant correlation between the pattern and mechanism of invasion and the regional lymph node metastasis. A possible treatment guide through our study to the surgeon from our side is to prevent aggressive resections and to preserve the integrity of the jaw and thus, to provide the maximum probability of cure and maintain the quality of life.

1. Introduction

Oral squamous cell carcinoma (OSCC) remains the 6th most common malignant neoplasm worldwide, constituting about 95% of all oral cancers.[1] OSCCs are characterized by an aggressive behavior and associated with a low 5-year survival rate, mainly because of metastatic disease.[2] The most common affected sites are the floor of the mouth, the ventrolateral part of the tongue, the soft palate complex[3]

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http://dx.doi.org/10.1016/j.jpfa.2017.01.003

Please cite this article in press as: Vidyalakshmi I, et al. Evaluation of the pattern and mechanism of bony invasion in gingivobuccal sulcus and gingival squamous cell carcinoma and its correlation with the regional lymph node metastasis: A histopathological study, *J Pierre Fauchard Acad (India Sect)*. (2017), http://dx.doi.org/10.1016/j.jpfa.2017.01.003

and the gingivobuccal complex (GBC).[4] The GBC carcinomas constitute the buccal mucosa, gingivobuccal sulcus (GBS), the gingiva and the retromolar trigone (RMT)[4] with 40% in the GBS,[5] 63.75% involving the buccal mucosa,[6] 15% in the RMT[6] and less than 10% on the gingiva.[7]

Gingival/GBS SCC has its own unique clinical significance. Because the thickness of gingiva overlying the alveolar bone does not exceed 2–3 mm, they have a strong predilection for the tumor invading the bone.[8] Histopathologically, two patterns of bony invasion are identified: the erosive/arrosive pattern and the infiltrative/invasive pattern.[7] In the erosive/arrosive pattern of bony invasion, the tumor cells invade in a broad front, with no bony remnants within the tumor mass and the tumor cells separated from the normal bone by a well demarcated fibrous zone with active osteoclasts separating the tumor from the bone. On the other hand, the infiltrative or the invasive pattern shows tumor cells invading as irregular cords and islands. Partially lysed bony spicules with little osteoclastic activity are present within the tumor mass with no clear cut demarcating tissue between the tumor and bone.[9]

The pattern of bony invasion plays a role in predicting prognosis of the disease with a 5-year cumulative survival rate of 76.6% in erosive pattern and 53.9% for the infiltrative pattern.[10] Therefore, it would be of considerable advantage to the surgeon to know the pattern of invasion prior to surgery.

Gingival and GBS SCCs have more predilection for bony invasion and variable lymph node metastasis.[5] Cervical lymph node metastases were 11.1% in those cases without bony invasion, while those with bony invasion ranges from 22.2% to 45.5%. The 5-year survival rate of 100% was seen in patients with no bony invasion but it is not the case for those with bony invasions. For the cases with bony invasion, depending on the depth of invasion, the 5-year survival rate ranges from 28.2% to 76.2%.[11]

Knowledge of the pathway of entry of tumor into the bone and of the patterns of spread within the bone is essential in adopting a logical approach to bone resection in oral cancer surgery. Hence, we intend to evaluate in our study, the pattern and mechanism of bony invasion by the tumor and if there is any correlation with regional lymph node metastasis.

2. Materials and methods

The study consisted of 25 resected specimens of maxillary and mandibular jaws of subjects who were diagnosed with either OSCC of GBS or gingiva and were treated with radical neck dissections. It is a prospective study in which the resected specimens along with the associated lymph nodes were collected from the Department of Oral and Maxillofacial Pathology, The Oxford Dental College and Hospital, Bangalore, from November 2012 to May 2014. All grades of OSCC of the gingiva and GBS were included in the study. Association with any form of habits and systemic diseases was not assessed which is considered as a drawback.

The specimens were grossed and the bone was kept for decalcification in 10% formic acid. After decalcification, the tissues were continued with routine processing and paraffin wax embedding. The associated lymph nodes were also grossed and taken for routine processing and embedding. The embedded tissue was then cut into 5 μm thick sections, stained with haematoxylin and eosin stain and viewed under the light microscope. The lymph nodes were cut into 2 μm thick sections and were also viewed under the light microscope. The tissues were histopathologically assessed for pathological jaw invasion, the type of invasion and the route of invasion or spread. The type of invasion was classified as (i) erosive and (ii) invasive.[9] The mechanism of tumor invasion/route of spread into the bone was through various ways as suggested by Brown and Browne et al.[9] Any tumor cells in and around the periosteum were not considered bony invasion if there were not clear evidence of invasion into the periosteum, periodontal space, or bone. The lymph node involvement was confirmed, if there was presence of any tumor cells in the lymph nodes. The results obtained were then statistically analyzed for correlation between the pattern and mechanism of tumor invasion into the bone and lymph node metastasis using Pearson's Chi-Square correlation test using SPSS11 software.

3. Results

The study comprised of 25 resected specimens of jaws as a part of the treatment for gingival/GBS SCC. Out of these 25, 16 (64%) were male, showing male predilection. All the cases were that of patients who were over 30 years of age, and it showed almost equal distribution from 4th to 7th decades of life. Slight increase was seen in the 6th and 7th decades.

The frequency of tumor invasion into the bone was found to be 32%, that is, in 8 of the 25 cases. Among these 8 cases, 4 were in the maxilla and 4 in the mandible.

As per our aim, the pattern of tumor invasion was examined histopathologically in those cases showing tumor invasion into the bone and was found that 20% of the cases showed invasive pattern (Fig. 1) of invasion into the bone while 12% had the erosive pattern (Fig. 2) (Table 1). 68% did not show any evidence of tumor invasion into the bone.

Histopathological examination was also done to evaluate the mechanism of tumor invasion into the bone or the route in

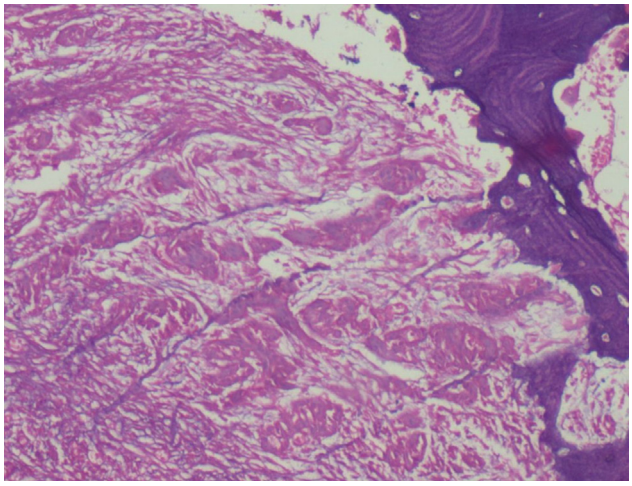

Fig. 1 – Photomicrograph of invasive pattern of tumor invasion into the bone (10×).

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