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CBCT: Third Eye In Dental Oncology

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Abstract
Background: The highest incidence of oral cancer is observed in South Asia, making it the Oral cancer with the sixth highest incidence worldwide. Less than 60% of patients survive for five years, indicating a high fatality rate. Preoperative diagnostic imaging modalities offer data on metastasis to distant locations, extension, and infiltration into nearby structures. Cone beam computed tomography (CBCT) is the modality of choice these days for analysing medullary changes and determining the extent of bony infiltration in the maxillofacial region. The literature proposes three patterns of bony invasion: the erosive, infiltrative, and mixed patterns. Aim: The purpose of this study is to analyse the patterns of bone invasion and its relationship with that of the mandibular canal. Methodology: This study included 50 CBCT images of patients with radiologically evident mandibular bone invasion and clinically and histopathologically diagnosed OSCC. By analysing the axial section of CBCT images, the bone invasion patterns are classified into three groups based on the erosive pattern, infiltrative and the mixed pattern. Statistical analysis was done using SPSS Version 22. P value of <0.05 was considered to be statistically significant. Results: Among 50 samples erosive, infiltrative, and mixed patterns were observed with a frequency of 30%, 20%, 50% respectively. As well as the comparison of IANC involvement to different patterns showing 10% in the erosive pattern, 16% in the infiltrative pattern, and 34% in the mixed pattern respectively. Conclusion: The evaluation of mandibular bone invasion patterns in patients with OSCC was done using CBCT. Fifty samples in all were chosen for the investigation and their different patterns of bony invasion were assessed. The mandibular canal exhibits the highest involvement in a mixed pattern.

Keywords: Oral cancer, Preoperative, maxillofacial, erosive pattern, mandibular canal.

Introduction

The highest incidence of oral cancer is observed in South Asia, making it the cancer with the sixth highest incidence worldwide.[1] Less than 60% of patients survive for five years, indicating a high fatality rate.[2] Preoperative diagnostic imaging modalities offer data on metastasis to distant locations, extension, and infiltration into nearby structures. Cone beam computed tomography (CBCT) is the modality of choice these days for analysing medullary changes and determining the extent of bony infiltration in the maxillofacial region.[3] The literature proposes three patterns of bony invasion: the erosive, infiltrative, and mixed patterns.[3,4] Whether these patterns indicate the aggressiveness of lesions is up for debate. This study aims to examine the patterns of bone invasion and how they relate to the mandibular canal.

Methods

From the OPD of Shree Narayana Medical Institute & Hospital, 50 subjects were chosen. To determine the percentage distribution of the different mandibular bony invasion patterns in the sample size, "descriptive statistical analysis" was performed. This study included CBCT images of patients with radiologically evident mandibular bone invasion and clinically and histopathologically diagnosed OSCC. The exposure parameters used for these images were 90 Kvp, 8 mA, and 13.6 s. The CBCTPLANMECA ProMax 3D Mid machine with romexis software version 3.2 was used for the exposure. The images had an 8 5 cm field of view. On the other hand, patients with CBCT scans who have been histopathologically and clinically diagnosed with OSCC and who do not exhibit radiological evidence of mandibular invasion are excluded from the study. 75 micrometre CBCT slice thickness that were examined in the axial, sagittal, and coronal views. By analysing the axial section of CBCT images, the bone invasion patterns can be classified into three groups based on the erosive pattern, which displays bone destruction with smooth, well-defined margins and scalloping.

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A mixed pattern exhibiting isolated bony fragments and an uneven margin indicates bone destruction. The infiltrative pattern exhibits spicules or fragments of bone along with uneven and ill-defined margins of bone destruction. Statistical analysis was done using SPSS Version 22. And chi-square test done to compare the involvement of inferior alveolar nerve canal (IANC) to the various bony invasion patterns. *P* value of <0.05 was considered to be statistically significant.

Results

A total of 50 samples were included in this study. Table 1 shows the distribution of various patterns of bony invasion among 50 samples. An erosive, infiltrative, and mixed patterns were observed in 15, 10, 25 cases with a frequency of 30%, 20%, 50% respectively. Table 2 shows the comparison of IANC involvement to different patterns showing 10% in the erosive pattern, 16% in the infiltrative pattern, and 34% in the mixed pattern respectively.

Table 1. bony invasion patterns distribution in OSCC

Erosive		**infiltrative**		**mixed**		**Total**
No.	%	No.	%	No.	%	No.
15	30%	10	20%	25	50%	50

Table 2. Comparison of the involvement of IANC in the various patterns of OSCC involving the mandible

Involvement of IANC	**Erosive**		**infiltrative**		**mixed**		**Total**
	no.	%	no.	%	no.	%	no.
Yes	5	10%	8	16%	17	34%	30
No	11	22%	9	18%	0	0	20
Total	16	32%	17	34%	17	34%	50

Discussion

Oral cancer among the South Asian population, especially in the Indian subcontinent, has the highest prevalence that accounts for 90–95%.[5,6] The most common histological type of oral cancer is squamous cell carcinoma and includes the anatomical sub sites such as lip, buccal mucosa, lower and upper alveolus, retro molar trigone area, tongue, floor of mouth, palate, and paranasal sinus.[7] In advanced stages, tumors from the soft tissues can invade directly into the adjacent structures, such as bone, muscle, and neurovascular tissue. In Indian subcontinent, the incidence and prevalence of OSCC involving the mandible range from 12 to 56% and 26.67% in the maxilla.[8] In the mandible, direct infiltration occurs by seven possible routes of entry by the tumor, which include the alveolar crest, mental and mandibular foramen, secondary tumors involving the mandible, cortical bone defects in the edentulous arch, and periodontal membrane and attached gingiva in the dentulous jaw.[5] However, the pathway of tumor entry to the mandible is mainly through the attached mucosa irrespective of the dentulous or edentulous jaw. Determining the extent of bony invasion is important because it alters the Tumor (T), Nodes (N), and Metastases (M) staging that influences surgical planning.[7] Therefore, the extent of bony invasion should be assessed preoperatively through radiographic examination. Several radiographic imaging modalities are used to assess the extent of bony invasion but each has its own advantages. Panoramic radiograph gives a gross image of the lesion but the detailed picture of the extent with anatomical structures cannot be assessed thoroughly. Computed tomography appears to be a superior modality compared to PR because of its role in soft tissue evaluation but has a high false negative rate and also it tends to underestimate the bone involvement. Magnetic resonance imaging having less radiation exposure compared to the above imaging techniques is less reliable in evaluating the bony structures. CBCT is also a reliable imaging modality for evaluating the depth of the tumor invasion. The patterns of invasion are classified into three types: erosive, infiltrative, and mixed.[8] The present study aims to evaluate various mandibular invasion patterns in OSCC. A total of 50 samples were selected for the study based on inclusion and exclusion criteria and interpreted and evaluated for various bone invasion patterns. Out of 50 samples, the most common pattern was found to be mixed in 50%, erosive 30% and infiltrative in 20% [Table 1]. Each pattern has its own degree of conduct in the bone. [Table 2] shows that in mixed pattern, all the samples (34%) are found to be involving the mandibular canal, whereas in infiltrative, (16%) of the samples are involving the canal and the least involvement to the canal is noticed in the erosive pattern (10%). Therefore, this suggests that determining the pattern as well as the depth of the tumour is the major considerations in treatment planning that can alter from segmental mandibulectomy to marginal resection or vice versa, which significantly modifies the prognosis and quality of life. The current research emphasised the fundamental significance of evaluating bony invasion patterns on imaging tests as a precondition for treatment planning that directly reduces morbidity and enhances patient quality of life.

Conclusion

In this study, the evaluation of mandibular bone invasion patterns in patients with OSCC was done using CBCT. Fifty samples in all were chosen for the investigation and their different patterns of bony invasion were assessed. The mandibular canal exhibits the highest involvement in a mixed pattern. Consequently, additional research can be done to

determine the correlation between the length of the lesion and the involvement of the canal by each pattern, which could reveal the degree of aggression associated with each pattern.

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