COMPARISON AND PREDICTION OF THE EXTENT OF LESION OF ORAL SQUAMOUS CELL CARCINOMA

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Abstract

The purpose of the study is to compare and predict the extent of lesions of oral squamous cell carcinoma by various imaging modalities. The modalities used in clinical assessment are, radiography (OPG), C.T scan & MRI. The extent of the lesion was confirmed by histopathological examination.

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This study consist of total 10 patients diagnosed for oral squamous cell carcinoma and the extent of the tumor mass of these patients was assessed by the above mentioned modalities.

For the tumor involving only soft tissue; clinical assessment, radiography (OPG) & C.T scan under-predicted the extent of soft tissue tumor mass when compared with histopathology. For the tumor involving hard tissue; clinical assessment, radiography (OPG), C.T scan, MRI over-predicted the extent of hard tissue tumor mass when compared with histopathology.

It is concluded that proper judicious combination of these imaging modalities should be used so as to overcome the shortcomings of these available means of visualization.

This study predicts the extent of lesions of oral squamous cell carcinoma by various imaging modalities and compares it with the actual extent of invasion of tumor by detailed histological assessment.

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Introduction

Patients undergoing ablative surgery in the management of oral squamous cell carcinoma affecting the oral region often suffer a considerable reduction in function and aesthetics[1]. In addition to diseased part, ablative surgery involves the removal of adjacent normal mucosa and occasionally overlying skin[1]. An adequate staging of a tumor arising in the oral cavity is essential for the choice of appropriate surgical management[2,3].

There is no clear guideline for resection of the tumor mass, which will predict the exact extent of the lesion. Clinical assessment of bone invasion is possible by evaluating clinical symptoms and signs[4].

However, the clinical examination always requires an imaging correlation. Various imaging techniques i.e. orthopanthomography (OPG), computed tomography (CT), magnetic resonance imaging (MRI) [sigma, GE healthcare] are used to make an assessment of bone invasion by tumors in the oral cavity[5-7].

The purpose of the study was to carry out detailed analysis of the predictability of different imaging modalities and clinical examination.

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The aim with which the study was performed was as follows:

1. TTo compare the extent of tumor by different imaging modalities.

2. TTo develop a protocol for the investigations of tumors of different size and site.

3. To correlate this imaging extent by histopathological assessment in the resected specimen.

Materials and methods

This institutionally approved study consists of 10 patients diagnosed with squamous cell carcinoma requiring resection of tumor mass as a part of their treatment. Ethical committee clearance for performing the study was taken. Informed consent was taken from all the patients. These patients were divided into two groups. First group consisted of patients with oral squamous cell carcinoma involving soft tissue only. Second group consisted of patients with OSCC involving soft & hard tissue also. These patients were admitted to Oral surgery ward in Acharya Vinobha Bhave Hospital, Sawangi (Meghe) Wardha.

All the investigations that is; OPG, C.T scan & MRI required for this study were done in the above mentioned hospital. Patient consent was taken prior to these investigations.

Procedure :

1) Clinical assessment:

This was done with the help of thread and ruler and exact clinical extent of lesion was noted (clinically). This clinical extent was then plotted on resected specimen with the help of surface landmarks.

2) OPG:

OPG of the patient was taken and extent was measured on the graph; the exact radiographic extent of the lesion was noted. OPG is mainly helpful in case of hard tissue lesions where the extent of bone invasion has to be noted.

3) C.T scan:

C.T scan of head, neck & face region of the patient was taken. Exact size of the lesion was noted. The purpose of this investigation was to assess exact infiltration of tumor into the mandible and adjacent soft tissues.

4) MRI:

MRI has been known to have an excellent diagnostic value for both cortical erosion & neoplastic replacement of medullary bone. Magnetic resonance imaging is commonly considered the technique of choice for treatment planning in advanced oral and oral squamous cell carcinoma because of its accuracy in depicting soft-tissue involvement.[12] MRI of the patient was taken and exact extent of the lesion was noted.

5) Resected specimen:

The patient then underwent surgery and hemi-mandibulectomy was carried out as a part of the treatment projected. The resected specimen was then subjected to this following investigation.

Exact size of the resected specimen was noted with help of thread and ruler.

Histological assessment:

Immediately following the surgical resection the fresh specimen was examined. Soft tissue specimen was transported in formalin for histopathological examination & hard tissue specimen was also transported in formalin & then it was decalcified in 10% formic acid.

The exact extent that is measured by each of the imaging modality was plotted on the resected specimen. Tissues between two consecutive plotted lines were measured. Specimen was cut into slices according to this plotted extent by each investigative modality, then processed in paraffin wax, sectioned & stained with H & E. These slides were then seen microscopically and reported for the extent of malignancy.

Case 1:

A 45 years aged male patient was diagnosed as squamous cell carcinoma of lip.

Extent of the lesion was predicted using all above mentioned imaging modalities and the graph was plotted after the histological assessment of the resected specimen. [Fig.1 (a, b, c, d) & (A, B, C, D)].

Figure 1. a. Clinical assessment: 40 mm.

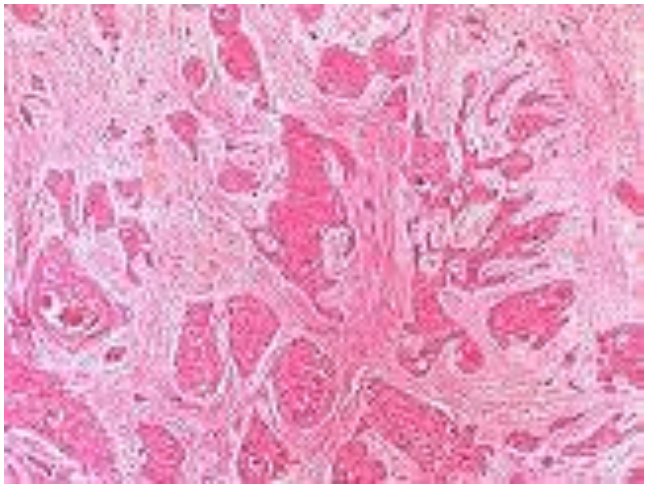

Figure 1. A. Positive for malignancy (40mm).

All the above mentioned extents by various modalities were plotted on resected specimen and the respective slides were cut and were examined for squamous cell carcinoma.
End margins of this resected specimen were also cut and examined for malignancy.
Table 1.1 shows results after histological examination.

IMAGING MODALITIES	EXTENT IN MM	HISTOLOGICAL ASSESSMENT
Clinical assessment	40mm	Positive
OPG	-	-
C.T scan	38mm	Negative
MRI	36mm	Positive
Resected specimen	46 mm	End margins- negative

Table 1.1 Results of histological examination.

Case 2:
A 52 years aged male patient was diagnosed as squamous cell carcinoma of alveolus.
Extent of the lesion was predicted using all above mentioned imaging modalities and the graph was plotted after the histological assessment of the resected specimen. [Fig.2 (a, b, c, d, e) & (A, B, C, D, E)].
All the above mentioned extents by various modalities were plotted on resected specimen and the respective slides were cut and were examined for squamous cell carcinoma.
End margins of this resected specimen were also cut and examined for malignancy.
Table 2.1 shows results after histological examination.

IMAGING MODALITIES	EXTENT IN MM	HISTOLOGICAL ASSESSMENT
Clinical assessment	25mm	Positive
OPG	22 mm	Positive
C.T scan	19mm	Positive
MRI	29mm	Positive
Resected specimen	32 mm	End margins- negative

Table 2.1 Results of histological examination.

Results

For the tumor involving only soft tissue; clinical assessment, OPG, C.T scans under predicted the extent of soft tissue tumor mass. And for the tumor involving hard tissue; clinical assessment, OPG, C.T scan, MRI over predicted the extent of hard tissue tumor mass i.e. the lesion extended beyond the margins visualized by these modalities. Hence, proper judicious combination of these treatment modalities should be used so as to overcome the shortcomings of these available means for visualization.
Fig 1: For the tumor involving only soft tissue;
On clinical assessment length of the lesion is 40 mm, (Fig 1, a). Margins for this clinical length is positive for malignancy on histological assessment, (Fig 1, A).
Length of the lesion on CT scan is 37.8 mm, (Fig 1, b). Margins for this length on CT scan is positive for malignancy on histological assessment, (Fig 1, B).

Figure 1. b. C.T scan: 37.8 mm.

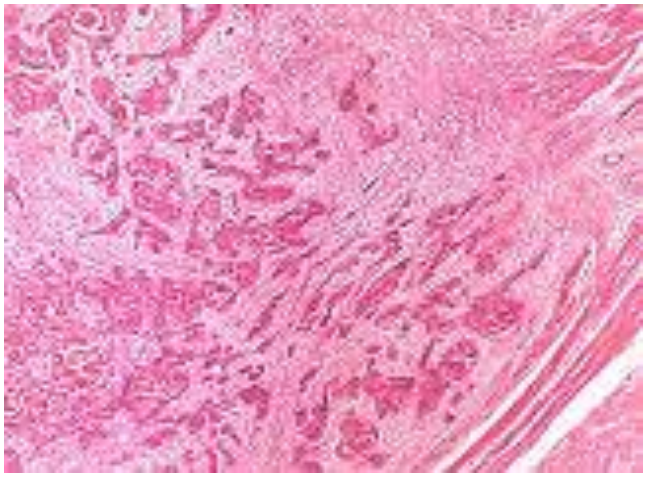

Figure 1. B. Positive for malignancy (37.8mm).

Length of the lesion on MRI is 36 mm, (Fig 1, c). A margin for this length on MRI is positive for malignancy on histological assessment,(Fig 1, C).

Figure 1. c. MRI: 36 mm.

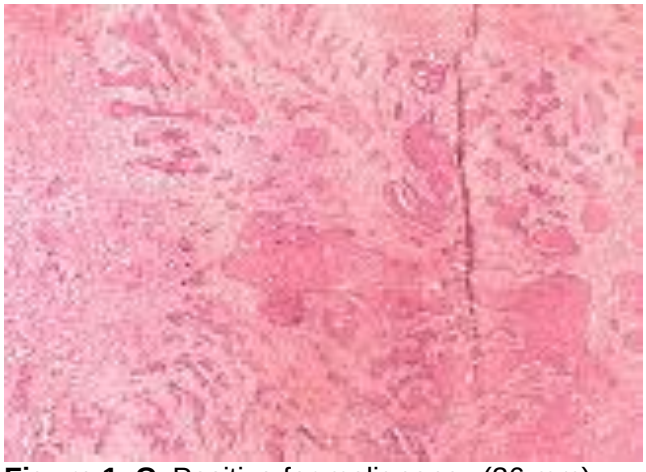

Figure 1. C. Positive for malignancy (36 mm).

Length of the resected specimen is 46 mm, (Fig 1, d). Margins of this resected specimen is negative for malignancy on histological assessment, (Fig 1, D)

Figure 1. d. Resected specimen : 46 mm.

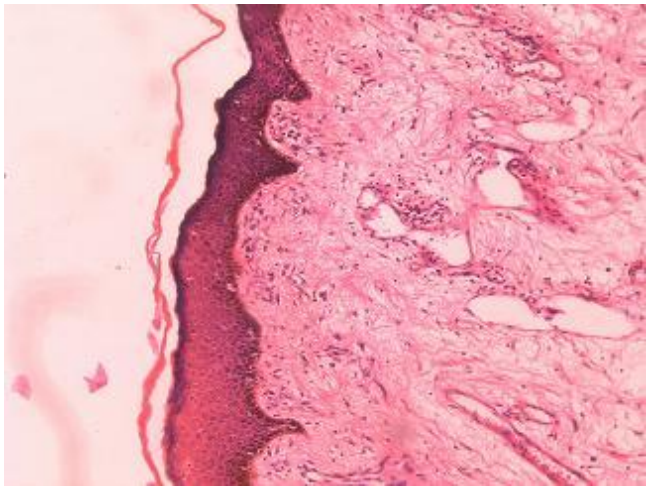

Figure 1. D. Negative for malignancy (end margin)

Figure 1. Measurement of extent of lesion of case 1 by comparing different modalities; **a.** Clinical assessment: 40 mm, **b.** C.T scan: 37.8 mm, **c.** MRI: 36 mm, **d.** Resected specimen: 46 mm.

Therefore, it suggests that above imaging modalities under predicted the extent of soft tissue tumor mass.

Fig 2: For the tumor involving hard tissue; On clinical assessment length of the lesion is 25 mm, (Fig 2, a). Margins for this clinical length is positive for malignancy on histological assessment, (Fig 2, A)

Figure 2. a. Clinical assessment: 25 mm.

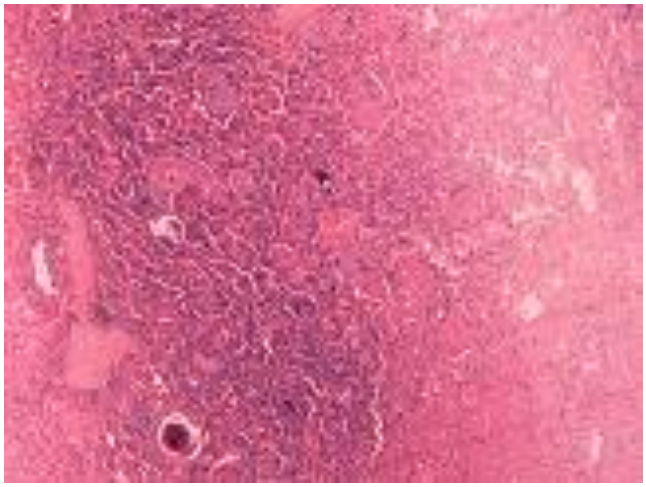

Figure 2. A. Positive for malignancy (25 mm).

Length of the lesion on OPG is 28 mm, (Fig 2, b). Margins for this length on CT scan is positive for malignancy on histological assessment, (Fig 2, B)

Figure 2. b. OPG : 28 mm.

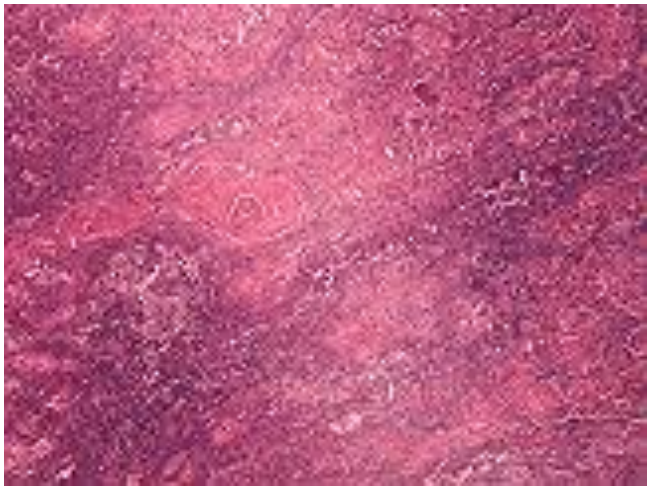

Figure 2. B. Positive for malignancy (28 mm).

Length of the lesion on CT scan is 19 mm, (Fig 2, c). Margins for this length on CT scan is positive for malignancy on histological assessment, (Fig 2, C).

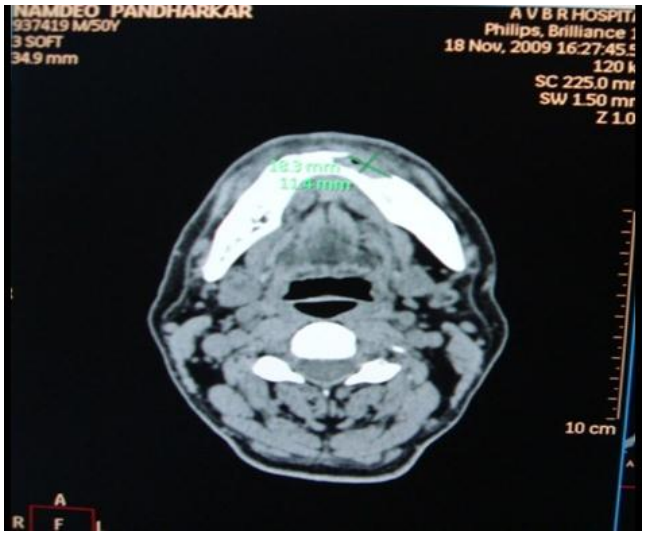

Figure 2. c. C.T scan: 19 mm.

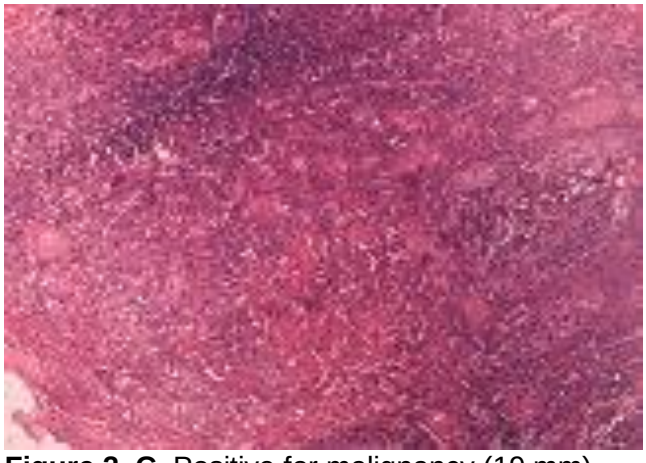

Figure 2. C. Positive for malignancy (19 mm).

Length of the lesion on MRI is 29 mm, (Fig 2, d). Margins for this length on MRI is positive for malignancy on histological assessment, (Fig 2, D).

Figure 2. d. MRI: 29 mm.

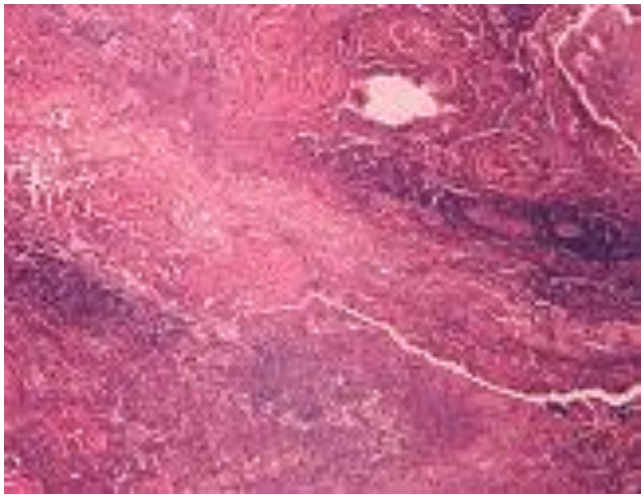

Figure 2. D. Positive for malignancy (29 mm).

Length of the resected specimen is 32 mm, (Fig 2, e). Margins of this resected specimen is negative for malignancy on histological assessment, (Fig 2, E)

Therefore, it suggests that above imaging modalities over predicted the extent of soft tissue tumor mass.

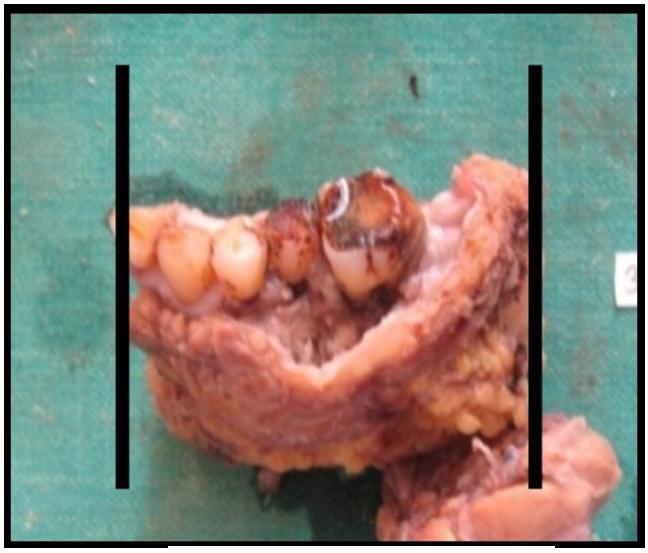

Figure 2. e. Resected specimen: 32 mms.

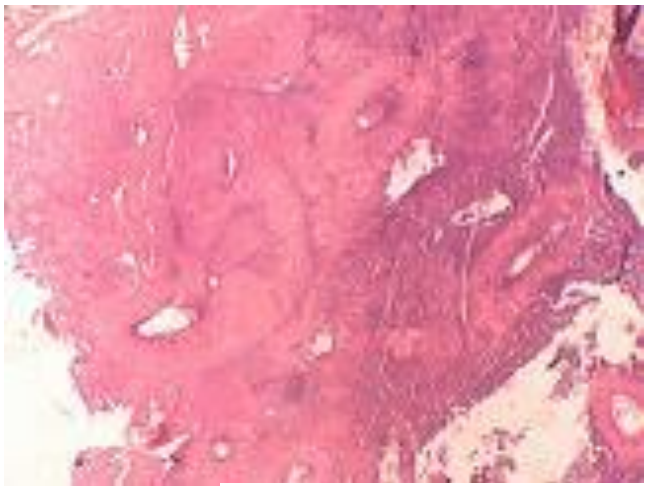

Figure 2. E. Negative for malignancy (end margin).

Figure 2. Measurement of extent of lesion of case 2 by comparing different modalities; a) Clinical assessment: 25 mm, b) OPG: 28 mm c) C.T scan: 19 mm, d) MRI: 29 mm, e) Resected specimen : 32 mm.

Discussion

In patients with oral squamous cell carcinomas (OSSC) it is desirable to avoid unnecessary bone resection without neglecting the overall surgical treatment goal of tumor-free margins.[11] Determining mandibular invasion with a high degree of accuracy before surgery might allow the surgeon to contain the cancerous cells, prevent unnecessary mandible removal and aid in planning for reconstruction.[13] In some cases it has been noted that, when the bone is surgically resected, histology often shows no direct bone

invasion, and such resections may result in unnecessary postoperative complication and morbidity.[14]

This study is an attempt at predicting the extent of lesion using the different forms of imaging techniques and direct inspection and comparing it with actual extent of tumor invasion by assessment of the histological sections. The following conclusion could be drawn from this:

For soft tissue lesions:

1. Clinical assessment: This investigative modality under-predicted the extent of soft tissue tumor mass as end margins of the measured length of the lesion clinically, are positive for malignancy on histological assessment.
2. OPG: This investigative modality under-predicted the extent of soft tissue tumor mass as OPG does not help in diagnosing soft tissue lesion.
3. C.T scan: This investigative modality under-predicted the extent of soft tissue tumor mass as end margins of the measured length of the lesion on CT scan are positive for malignancy on histological assessment.
4. MRI: This investigative modality under-predicted the extent of soft tissue tumor mass as end margins of the measured length of the lesion on MRI are positive for malignancy on histological assessment.

For hard tissue lesions:

1. Clinical assessment: This investigative modality over-predicted the extent of soft tissue tumor mass as end margins of the measured length of the lesion clinically, are positive for malignancy on histological assessment.
2. OPG: This investigative modality over-predicted the extent of soft tissue tumor mass as end margins of the measured length of the lesion on OPG, are positive for malignancy on histological assessment.
3. C.T scan: This investigative modality over-predicted the extent of soft tissue tumor mass as end margins of the measured length of the lesion on CT scan are positive for malignancy on histological assessment.
4. MRI: This investigative modality over-predicted the extent of soft tissue tumor mass as end margins of the measured length of the lesion on MRI are positive for malignancy on histological assessment.

Conclusions

An overzealous extension of margin during cancer surgery leads to an increase in morbidity whereas the under-extension of margin leads to increased chances of recurrence and therefore increased mortality.

This study indicates that a proper combination of all above mentioned imaging modalities should be used so as to overcome the shortcomings of these available means for accurate visualization and to provide an exact assessment of the tumor extent.

The need for accurate and adequate imaging during curative surgery of oral squamous cell carcinoma cannot be over emphasized. In the zeal of getting correct measure often the surgeon ends up with either under or excessive removal of tissue.

Unfortunately current imaging techniques seem to be inadequate in helping us to predict the proper extent of margins. Hence a judicious use of these imaging techniques would be necessary for optimum results.

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Declaration of Interest

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