ORIGINAL ARTICLE

Clinical practice guidelines for radiographic assessment in management of oral cancer

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ABSTRACT

In recent years, oral cancer has become a huge solicitude in oncology with its accelerating incidence and has accounted for nearly 50% of cancers seen in India. Screening of patients and lack of awareness among people about the early signs and symptoms are the major factors for a late diagnosis. Although examination of the lesion clinically and diagnosis has a paramount role in early detection, different imaging techniques are required to accurately gauge the extent to local regions. Imaging plays a pivotal role in deciding the apt treatment strategy, assessing the resectability of the tumor, and gauging exact margins for resection. Thus, this study aims to describe a new clinical guideline using various available imaging systems and their importance in oral cancer management.

Key words: Computed tomography, imaging, magnetic resonance imaging, oral cancer, panoramic radiographs

INTRODUCTION

More than 378,500 new cases of oral cancer are being diagnosed worldwide and oral cancer is placed at an 8th position. Oral cancer also constitutes more than 50% of all cancers; with a higher male predominance.[1] The common risk factors for developing oral cancer are deleterious habits such as smoking and smokeless tobacco chewing, alcohol consumption along with low-socioeconomic status, deficient diet and hygiene, viral infections such as Herpes simplex virus (HSV), continuous irritation from dentures, or sharp cuspal tips.[2] Ninety-five percent of cancer in the oral cavity is oral squamous cell carcinoma. Commonly affected intraoral sites include gingiva, buccal mucosa, retromolar pad, and hard and soft palate. In comparison with the west, India has about 70% of advanced stages of oral cancer being reported (American Joint Committee on Cancer, Stage III-IV).[3] Early diagnosed patients are found to have comparatively better long-term survival ranging from 60% to 90% and diagnosis of oral cancer has a better survival rate when compared to an advanced stage diagnosis (20%–50%) and is <5% for palliative care patients. The clinical examination followed by proper imaging and histopathological examination is used routinely to detect oral cancer. Our research and knowledge have resulted in high-quality publications from our team.[4-18]

Hence, the early detection of cancer combined with appropriate imaging techniques for proper staging is highly required and crucial.[19]

IMAGING METHODS IN ORAL CANCER

The early stages of oral cancer are quite a challenge to be identified and detected through imaging.

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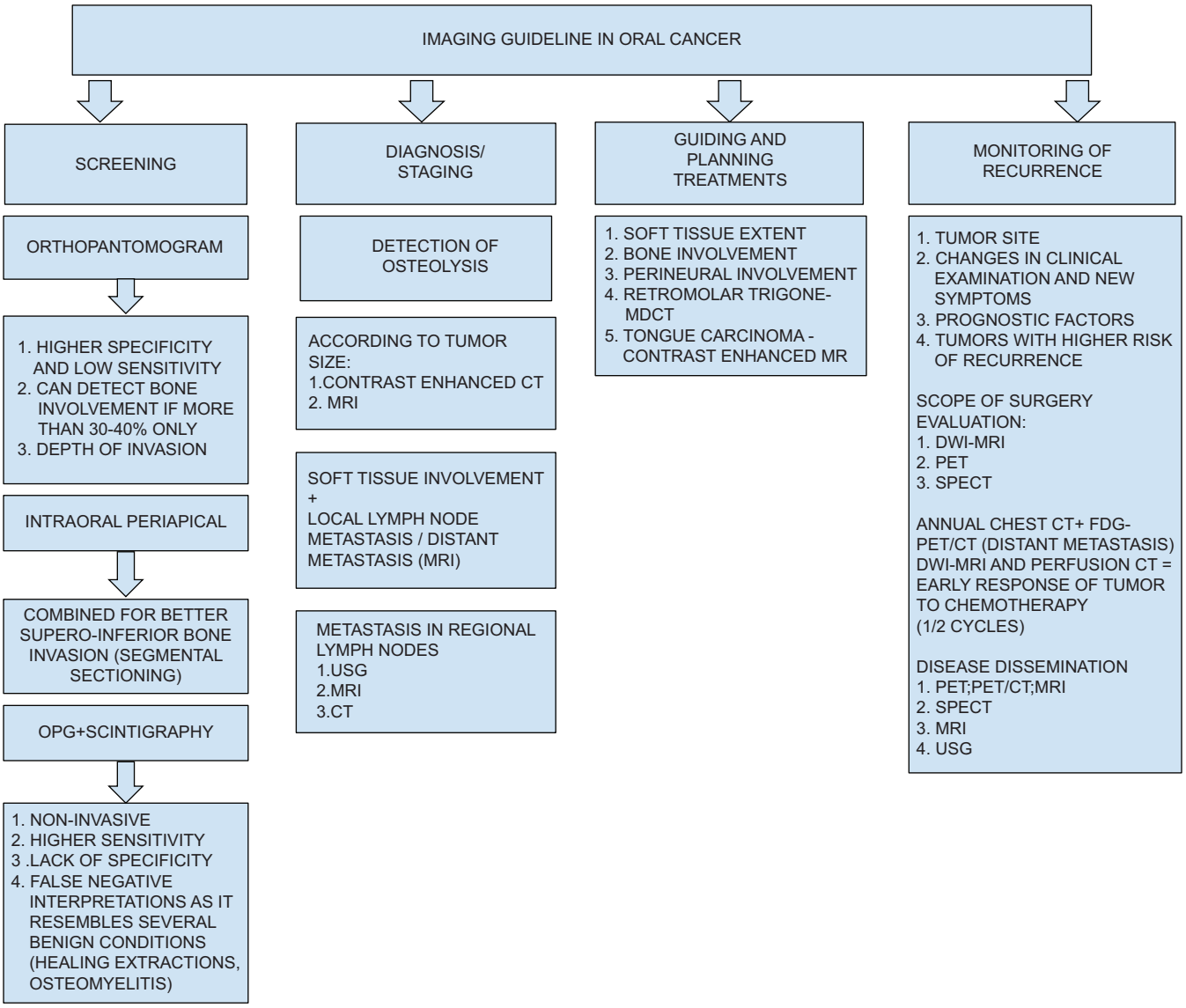

Flowchart depicting different imaging modalities in oral cancer

The subsequent imaging methods that are used include – orthopantomogram, cone-beam computed tomography (CBCT), diffusion-weighted magnetic resonance imaging (DW-MRI), perfusion computed tomography (CT), single-photon emission computed tomography (SPECT), hybrid methods (positron emission tomography [PET]/CT, PET/MRI, and SPECT/CT), and ultrasound.

PANORAMIC RADIOGRAPHS

Panoramic radiographs are the initial imaging modalities used in diagnosis. Plain radiographs depict malignant lesions with loss of cortical lamina, and radiolucency depicting the lesion is significant only when there is 30% or more involvement in the loss of osseous tissue. These radiographs fail to assess the soft tissues, involvement of facial bones, and primary lesions.

CONE-BEAM COMPUTED TOMOGRAPHY

Isovolumetric imaging is intensely and increasingly used by dentists as a diagnostic tool. CBCT is more accurate and has an upper hand to panoramic radiography but less sensitivity and specificity when compared to CT and MRI. CBCT is advantageous as a tool used for the detection of oral cancers but again has poor assessment for soft tissues.

ULTRASONOGRAPHY

Diagnosis of superficial lesions, lymph nodes- and core needle-guided biopsy, and fine-needle aspiration biopsies are evaluated using ultrasonography (USG). Chaukar *et al*.'s study revealed that USG is inadequate as the sole imaging modality in diagnosing cervical lymph nodes. Color-Doppler coupled with USG is commonly used for the assessment of lymph node involvement post

a surgical resection with or without radiation. Studies done by Filauro *et al*. and Noorlag *et al*. infer that intraoral USG being noninvasive can be used as a diagnostic tool for preoperative workup in intermediate anterior oral squamous cell carcinoma cases.[20,21]

COMPUTED TOMOGRAPHY

CT is a three-dimensional imaging modality useful in assessing primary tumors and associated local bone infiltration along with contrast-enhanced determination for lymph node metastasis. CT scan is the gold standard for the identification of tumors in the head-and-neck region due to its increasing accessibility but fails in diagnosing the early stages of cancer. Minor early-stage lesions are preceded with contrast-enhanced CT. The specificity of CT is 82%–100% and sensitivity is 41%–82%. The bone invasion has a sensitivity of 63%–80% and specificity of 81%–100%.[22] Differentiation between recurrent tumors, surgical scars, and postradiation therapy reaction is a huge disadvantage in CT imaging. Boundaries of a tumor are well-detected and -determined by multidetector CT (MDCT).[23] Studies done by Arya *et al*.[24] and Vidiri *et al*.[25] showed that specificity and sensitivity can be increased with the use of puffed cheek MDCT along with the involvement of the inferior alveolar nerve.

MAGNETIC RESONANCE IMAGING

The sequence of undergoing an MRI study includes the following – T1, T2, Short T1 Inversion Recovery (STIR), Turbo inversion recovery magnitude (TIRM), diffusion-weighted imaging (DWI), and perfusion with and without a contrast agent. MRI gives best soft tissue differentiation and helps in assessing the extent of locoregional and distant lymph node metastases as it has a gadolinium contrast and multiplanar reconstruction views can assist in planning surgical resection followed by reconstruction, graft placement, and variation between recurrence and scars posttreatment.[26] The origin, surface area, and margins of the lesions along with assisting as an adjuvant technique to biopsy for screening are a huge advantage of MRI[27,28] DWI-MRI can help in assessing the response of the tumor cells postchemotherapy.[1] The disadvantages of using this imaging are the presence of ferromagnetic materials, claustrophobic patients, and patients with the use of pacemakers.

POSITRON EMISSION TOMOGRAPHY

PET with ^{18}F-fluorodeoxyglucose (radioactive compound) administered orally or intravenously evaluates tissue metabolic activity and has been used to determine the metastasis of tumor cells. Other uses of a PET scan include planning for an adjuvant treatment, estimating for risk of recurrence, and identifying the initial tumor site in cases of early metastases (carcinoma of unknown primary).[29] A recent study by Breik *et al*. reported that PET-CT is preferred for follow-up imaging post 6 months than imaging at 3 months in comparison with MRI.[30]

SINGLE-PHOTON EMISSION COMPUTED TOMOGRAPHY

SPECT uses gamma radiation for mapping the metabolic activity of the tumor. In starting stages, sentinel lymph node biopsy plays a major role as it decides and excludes the presence of lymphatic metastases with high probability. SPECT is the main choice of imaging in the case of sentinel nodes.[31]

CONCLUSION

Knowledge and correct use of the various imaging modalities help in analyzing the extent of the lesion, deciding the course of treatment, plan surgical resection of bone and soft tissue followed by reconstruction procedure for preserving the form and function of the patient. Interpretation of cancer through imaging must go hand in hand with knowledge of the patient's clinical examination of the tumor and its provisional diagnosis. Imaging plays a pivotal role in assessing posttreatment responses and detecting recurrence further distinguishing it from postsurgical changes.

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Conflicts of interest

There are no conflicts of interest.

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