Malignant Lesions in the Dentomaxillofacial Complex

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KEYWORDS

• CBCT imaging • Dental imaging • Mandible • Maxilla • Paranasal sinuses • Malignancy

KEY POINTS

- Malignancies in the maxillofacial complex may mimic the symptomatology of benign dental disease, sinusitis, and temporomandibular joint disorders.
- Plain film radiography, cone beam CT, or sinus CT imaging may be the initial imaging study conducted of undiagnosed maxillofacial malignancies.
- The dentition, periodontium, and alveolar ridge are common sites of infection and postsurgical changes that should be distinguished in their clinical context from malignant changes.

INTRODUCTION

The contents of this text emphasize the effect of malignant changes on hard tissue structures of the maxillofacial complex, including the periodontium, maxilla, mandible, and sinuses. Malignant pathologies are characterized according to the manner of osseous involvement: (1) primary malignancies arising within the maxilla or mandible, (2) local osseous invasion of adjacent epithelial or soft tissue tumors, (3) malignancies spread to the maxillofacial complex via the hematopoietic or lymphatic system, and (4) metastases from distant primary tumors. The malignancies affecting the maxillofacial structures represent a broad spectrum of disease, with widely varying management and prognosis. Most malignancies, however, presenting in the head and neck region are squamous cell carcinomas (SCCs) arising within the muscular surfaces of the pharynx, larynx, paranasal sinuses, oral cavity, and nasal cavity. Many benign pathologies may mimic the radiographic features of malignancies, particularly in an area of the body prone to infection and inflammation, such as the oral cavity and paranasal sinuses.

IMAGING PROTOCOLS

The imaging techniques emphasized in this article include conventional radiographs and cone beam CT (CBCT) imaging, commonly used in dentomaxillofacial imaging, and bone-window multidetector CT (MDCT) imaging, standard for sinus evaluation. These techniques allow examination of detailed, initial osseous changes of occult malignancies, including lytic or osteoblastic changes, cortical disruption, or periodontal ligament (PDL) space changes. CBCT imaging allows manipulation of orientation that can more precisely characterize the pattern of bone loss in relationship to the dentition. MDCT imaging may better characterize lesions with soft tissue windowing and contrast enhancement but is limited by the fixed orientation of reconstructed images.

In known malignancies, MDCT and MR imaging allow for evaluation of tumor extension in the soft tissue, lymph node evaluation, and staging of the disease for appropriate treatment planning. MR imaging also allows for an assessment of bone marrow involvement before lytic or sclerotic changes are radiographically apparent.

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Fluorodeoxyglucose (^{18}FDG) PET/CT imaging may be used in cases of suspected disseminated disease (not limited to the head and neck region), including multiple myeloma (MM), metastatic disease, and extranodal lymphoma.

NORMAL ANATOMY

The normal anatomic features of the dental and maxillofacial structures are outlined in Mohammed Abbas Husain's article, "Dental Anatomy and Nomenclature for the Radiologist"; and Mitra Sadrameli and Mel Mupparapu's article, "Oral and Maxillofacial Anatomy," in this issue. A review of dental anatomy is provided in Mohammed Abbas Husain's article, "Dental Anatomy and Nomenclature for the Radiologist," in this issue, whereas overall maxillofacial anatomy is outlined in Mitra Sadrameli and Mel Mupparapu's article, "Oral and Maxillofacial Anatomy," in this issue.

COMMON CLINICAL AND RADIOGRAPHIC FEATURES OF MALIGNANCIES ON DENTAL AND OSSEOUS STRUCTURES

Clinical Changes

Clinical signs and symptomatology may be entirely absent or may present as a clinically identifiable mass or lump, ulceration, oral cavity leukoplakia/erythroplakia, nasal congestion or airway obstruction, epistaxis, anosmia, paresthesia/anesthesia/dysesthesia (especially a numb chin), dental/temporomandibular joint [TMJ]/sinus pain, or, in advanced high-grade malignancies, hemorrhage, rapid onset of tooth mobility, fever, malaise, and weight loss.

Radiographic Changes

A majority of malignancies involving bone in the maxillofacial region present as an ill-defined lytic change radiographically, whereas a minority demonstrate an osteoblastic component with or without periosteal reaction. The maxillofacial region is a unique anatomic area of the body that often demonstrates inflammatory and postsurgical changes. Bone loss around teeth has many causes other than malignancy, including periapical granulomas or cysts, root fractures, furcational bone loss, and vertical alveolar defects (**Fig. 1**). The irregular PDL space widening of malignancies is ragged, often not centered on the apex and not associated with obvious dental pathology. Malignant periosteal bone is characteristically aggressive (**Fig. 2**). A summary of radiographic changes suspicious for malignancies is included in **Box 1**.

REVIEW OF DIAGNOSTIC CRITERIA

The diagnostic criteria that suggest a malignancy in the maxillofacial complex are outlined in previous section and in **Box 1**. Lesions detected in the maxillofacial complex suspicious for malignancy on plain film or CBCT imaging usually require fine-needle aspiration, biopsy, and/or advanced imaging for better characterization to establish a diagnosis.

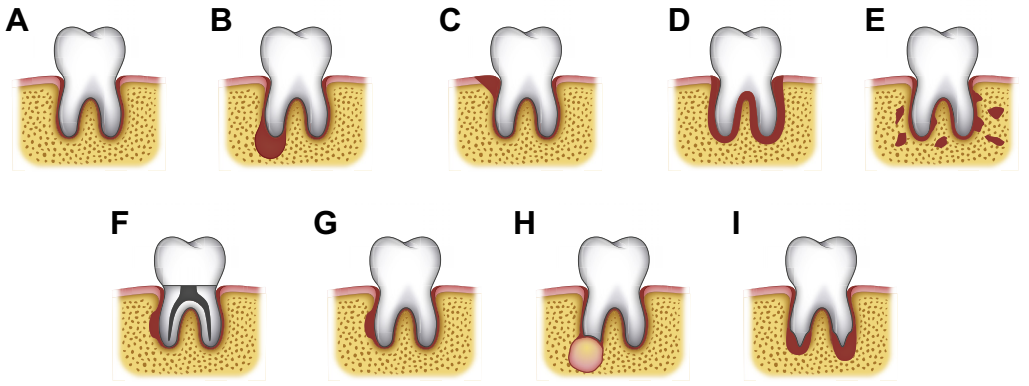

Fig. 1. The images show the different tooth-related changes seen with malignancy on dental imaging. (*A*) Normal PDL space. (*B*) Periapical pathology (granuloma or cyst) centered at a root apex. (*C*) Periodontal bone loss, originating from the alveolar crest, forming a vertical defect. (*D*) Generalized PDL space widening (occlusal trauma or scleroderma). (*E*) Irregular PDL space widening and ragged, lytic changes in trabecular bone. (*F*) Midroot PDL space widening in endodontically treated tooth with a post, suggestive of a root fracture. (*G*) Midroot PDL space widening in vital tooth with no inflammatory etiology, suspicious for malignancy. (*H*) Sharp root resorption, associated with benign, space-occupying lesions. (*I*) Spiking resorption of roots associated with aggressive or malignant lesions.