Original article

A STUDY OF COMPUTED TOMOGRAPHY PATTERNS OF ORAL AND MAXILLOFACIAL DISEASES IN A TERTIARY HOSPITAL

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ABSTRACT

OBJECTIVE: Computed Tomography (CT) patterns of oral and maxillofacial diseases in our environment are either poorly documented or may not be complemented with histopathological evaluation for definitive diagnosis; to ensure proper staging and prognostication of the malignant lesions. This study aims at determining the CT patterns and to compare the findings with histopathological diagnosis of oral and maxillofacial lesions in a Nigerian population.

METHODS: A retrospective review of the clinical records, CT reports and available conventional images, complemented with a review of the histopathological slides and reports of patients with diagnosed oral and maxillofacial diseases over a 10-year period.

RESULTS: Only 40 (83.3%) patients with CT and complementary histopathological reports of the lesions were selected for this study. The lesions occurred in patients with a mean age of 43± 2.7 (S.E.) years and the peak age group was the 6th decade of life (n=11, 27.5%). There was a male to female ratio of 1:1.1 and the maxilla (n= 27, 67.5%) was the commonest solitary clinical site. The commonest clinical diagnoses was antral carcinoma (n=6, 15.0%). The CT findings were mostly ill-defined lesional margin (n=31, 77.5%), solid pattern (n=32, 80.0%), heterogeneous contrast enhancement (n=11, 27.5%), soft tissue compression (n=20, 50.0%), bone and soft tissue infiltration (n=30, 75.0%). The histopathological diagnosis of the lesions were mostly malignant lesions (n=24, 60.0%) associated significantly with ill-defined lesional margin and heterogeneous contrast enhancement pattern on CT.

CONCLUSION: This study recommends a multidisciplinary approach to the diagnosis and treatment of oral and maxillofacial diseases in our environment.

Key words: Computed tomography, histopathology, oral and maxillofacial diseases

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INTRODUCTION

The management protocol for patients with head and neck malignant tumours include taking proper history and clinical examination of the patients, supplemented by computerized tomographic scan, magnetic resonance imaging (MRI), fine needle aspiration cytology (FNAC) and histological diagnosis; before proper treatment is commenced. [1-3] However, several factors such as late patient presentation, inaccessible and limited facilities and delayed histopathological evaluation in our environment have been identified as contributory to the poor outcome in the management of head and neck malignant tumours. [4]

Imaging complemented with clinical examination and histopathologic data are recommended in staging of oral cancer. Accordingly, computed tomography (CT) and magnetic resonance imaging (MRI) are routinely used during the initial pretreatment evaluation for staging, and to provide additional prognostic information, such as perineural invasion and lymph node extracapsular spread that is not included in the tumour, node, and metastasis (TNM) classification scheme. [5] MRI gives better soft tissue characterization than CT, with a further advantage of being non-ionizing. However, CT is more readily available and bone destruction is better demonstrated with CT. Cross sectional imaging with computed tomography (CT) is of value in imaging of oral and maxillofacial diseases including the orbits and its contents. Bony lesions causing proptosis are also better evaluated by CT.[6,7] Furthermore, CT is considered to be a sensitive method for assessing primary mandibular malignant tumours (size, location, spread to soft tissues and regional lymph node metastasis).[8] Although imaging will not always provide a specific diagnosis, it is useful in narrowing differential diagnosis. [9]

However, CT scan and MRI are rarely used for clinical evaluation of oral and maxillofacial diseases in our environment for non-availability. A previous Nigerian study by Adeyi et al [1] reported that only 4.5% of the patients were able to afford CT scan for evaluation of head and neck malignant tumours. There is a dearth of literature that correlates CT findings with clinical and histopathological diagnosis of oral and maxillofacial diseases in our environment. Most CT of oral and maxillofacial diseases in our environment are either poorly documented and reported, or may not be complemented with histopathological evaluation for definitive diagnosis; to ensure proper staging and prognostication of the malignant lesions. This study therefore aims to determine the CT patterns, and to compare the findings with histopathological diagnosis of oral and maxillofacial lesions from a 10-year audit of the patients seen in a Tertiary Hospital in a Nigerian population.

MATERIALS AND METHODS

This study was designed as a retrospective review of the clinical records, computed tomography (CT) reports and available images, complemented with a review of the histopathological slides and reports of patients with diagnosed oral and maxillofacial diseases over a period of 10 years (October 2006 and January 2017), in the Departments of Radiology, and Oral Pathology / Medicine, University of Benin Teaching Hospital, Benin City, Nigeria. The CT machine used for the scans was either a Siemens 1994 Somatom ART or General Electric Bright Speed 2007.

Only the patients with CT and histopathology reports were selected. The age, gender, orofacial site, clinical diagnosis, CT findings (lesional margin, size of lesion, lesional characteristics, contrast enhancement pattern, effect of the lesion on surrounding structures, and associated findings), histopathological diagnosis and classification of the lesions were analyzed. The data was analyzed using the Statistical Package for the Social Sciences (SPSS version 23). Statistical correlation was performed using Pearson's chi square test. The confidence level was set at 95% and probability (P) values of <0.05 were regarded as significant. Ethical approval was obtained from the Hospital Ethical Committee for this study.

RESULTS

Of the forty-eight (48) patients who performed CT of oral and maxillofacial diseases during the

study period, only 40 (83.3%) of the patients with complementary histopathological evaluation of the lesion were selected for this study. The lesions occurred in patients within the age range of 6 to 73 years, with a mean age of 43± 2.7 (S.E.) years and the peak age group was the 6th decade of life (n=11, 27.5%). There were 19 (47.5%) males and 21 (52.5%) females, giving a male to female ratio of 1:1.1 (Table 1). The maxilla (n= 27, 67.5%) was the most common solitary clinical site of the lesions, with the maxillary antrum accounting for 11(27.5%) of the cases (Table 2). The commonest clinical diagnoses were antral carcinoma (n=6, 15.0%), ameloblastoma (n=4, 10.0%) and pleomorphic adenoma (n=4, 10.0%) [Table 3].

The CT findings showed that most of the lesional margins were ill-defined (n=31, 77.5%), followed distantly by well-defined margins (n=8, 20.0%) and expansile lesion (n=1, 2.5%). All the lesions were large (> 3cm) on CT. The lesional characteristics was predominantly solid pattern (n=32, 80.0%), others patterns were mixed cystic and solid (n=5, 12.5%) and cystic (n=3, 7.5%). For the majority of the lesions, contrast enhancement was either nonspecific or unremarkable (n=17, 42.5%), followed by lesions with heterogeneous contrast enhancement (n=11, 27.5%). The adjacent soft tissues (n=20, 50.0%) and airway (n=9, 22.5%) were the most common surrounding structures affected by the lesions. This was followed by infiltration into the orbit (n=6, 15.0%) and dental anarchy (n=3, 7.5%). Bone and soft tissue infiltration (n=30, 75.0%) were the most common associated CT finding and lymph node infiltration was seen in 4 (10.0%) patients.

Majority of the lesions in this study were classified histopathologically as malignant (n=24, 60.0%) [Figures 1 & 2], followed by benign lesions (n=10, 25.0%) [Figure 3], infective lesions (n=4, 10.0%) and reactive / hamartomatous lesions (n=2, 5.0%) [Figure 4]. The commonest histopathological diagnosis of the lesions were ameloblastoma (n=6, 15.0%), adenocystic carcinoma (n=5, 12.5%), squamous cell carcinoma (n=4, 10.0%) and orofacial granulomatosis/deep mycosis (n=4, 10.0%) [Figure 5].

There was statistically significant association of patients within the 4th (n=10, 25.0%) and 6th (n=11, 27.5%) decades of life, with histopathological diagnosis of malignancy (p=0.042), which accounted for 80.0% and 81.8% of the patients in the 4th and 6th decades of life respectively. The clinical diagnosis of antral carcinoma (n=6, 15.0%) was significantly associated with histopathological diagnosis of antral malignant lesion (n=5, 12.5%) [p=0.014], with antral carcinomas accounting for 80.0% of the malignant lesions. Ill-defined lesional margin on the CT was significantly associated with histopathological diagnosis of malignant lesion (n=23, 57.5%) [p=0.006], with ill-defined lesional margin seen in 95.8% of the malignant lesions. Solid CT pattern was significantly associated with histopathological diagnosis of malignant fibrous histiocytoma, adenocystic carcinoma, orofacial granulomatosis (deep mycosis), plexiform ameloblastoma and pleomorphic adenoma (p=0.048). Heterogeneous CT contrast enhancement pattern was significantly associated with histopathological diagnosis of malignancy (p=0.001), with 100% heterogeneous CT contrast pattern seen in histopathologically diagnosed cases of ameloblastic carcinoma (n=3, 7.5%).

Table 1: Age and gender distribution of the patients

Age group	Male	Female	Total	%
0-10	2	1	3	7.5
11-20	0	1	1	2.5
21-30	0	6	6	15.0
31-40	5	5	10	25.0
41-50	2	1	3	7.5
51-60	7	4	11	27.5
61-70	2	3	5	12.5
≥71	1	0	1	2.5
Total	**19 (47.5)**	**21(52.5)**	**40**	**100**

Table 2: Clinical sites and histopathological types of the lesions

Clinical site	Malignant	Benign	Infection	Reactive / Harmatoma	Total (%)
Maxillary antrum	6	3	1	1	11 (27.5)
Maxilla	3	3	2	1	9 (22.5)
Parotid	1	0	0	0	1 (2.5)
Submandibular	2	0	0	0	2 (5.0)
Mandible	3	1	0	0	4 (10)
Maxilla & parotid	1	0	0	0	1 (2.5)
Antral & infraorbital	0	0	1	0	1 (2.5)
Palate	4	2	0	0	6 (15.0)
Floor of mouth	1	0	0	0	1 (2.5)
Lower lip	1	0	0	0	1 (2.5)
Parotid & temporal	0	1	0	0	1 (2.5)
Maxilla & orbit	1	0	0	0	1 (2.5)

Table 3: Clinical diagnosis of the oral and maxillofacial diseases

Clinical diagnosis	Frequency	%
Unspecified	8	20.0
Antral carcinoma	6	15.0
Ameloblastoma	4	10.0
Submandibular gland tumour	2	5.0
Osteosarcoma or lymphoma	1	2.5
Pleomorphic adenoma	4	10.0
Antral mucocele or sinoantral carcinoma	1	2.5
Osteosarcoma or ameloblastoma	1	2.5
Juvenile angiofbroma	1	2.5
Antral and infraorbital abscesses	1	2.5
Antra-choanal tumour / carcinoma	2	5.0
Fibrous dysplasia	1	2.5
Salivary gland carcinoma, or deep mycosis or lymphoma	1	2.5
Carcinoma of the floor of the mouth	1	2.5
Antral squamous cell carcinoma	1	2.5
Benign mucosal cyst of maxillary antrum	1	2.5
Adenocystic carcinoma	1	2.5
Neurofibroma	1	2.5
Chronic osteomyelitis	1	2.5
Nasal polyp	1	2.5
Total	**40**	**100.0**

Table 4: Classification of the histopathological type of the lesions into malignant, benign, infective, and reactive / harmatomatous lesions

Histopathological diagnosis	Malignant	Benign	Infective	Reactive/ harmatoma	Total (%)
Malignant fibrous histiocytoma	4	0	0	0	4 (10.0)
Olfactory neuroblastoma	1	0	0	0	1 (2.5)
Ameloblastic carcinoma	3	0	0	0	3 (7.5)
Florid osseous dysplasia	0	0	0	1	1 (2.5)
Malignant haemangioendothelioma	1	0	0	0	1 (2.5)
Angiofibroma	0	1	0	0	1 (2.5)
Orofacial granulomatosis (deep mycosis)	0	0	4	0	4 (10.0)
Adenocystic carcinoma	5	0	0	0	5 (12.5)
Polymorphous low grade adenocarcinoma	1	0	0	0	1 (2.5)
Acinic cell carcinoma	1	0	0	0	1 (2.5)
Well differentiated SCC	3	0	0	0	3 (7.5)
Plexiform ameloblastoma	0	3	0	0	3 (7.5)
Central giant cell granuloma	0	1	0	0	1 (2.5)
Clear cell odontogenic carcinoma	1	0	0	0	1 (2.5)
Poorly differentiated SCC	1	0	0	0	1 (2.5)
Luminal unicystic ameloblastoma	0	1	0	0	1 (2.5)
Acanthomatous ameloblastoma	0	1	0	0	1 (2.5)
T cell NHL or Liposarcoma	1	0	0	0	1 (2.5)
Fibrous dysplasia	0	0	0	1	1 (2.5)
Pleomorphic adenoma	0	2	0	0	2 (5.0)
solid-multicystic ameloblastoma	0	1	0	0	1 (2.5)
Diffuse NHL	1	0	0	0	1 (2.5)
Carcinoma ex-pleomorphic adenoma	1	0	0	0	1 (2.5)
Total	**24** (60.0)	**10** (25.0)	**4** (10.0)	**2** (5.0)	**40** (100)

SCC= squamous cell carcinoma; **NHL**= nonHodgkin's lymphoma

DISCUSSION

Although, Adeyi et al [1] reported that 4.5% of the patients with head and neck malignant tumours were assessed with CT, the study only focused on the challenges in managing these patients in our environment. The CT findings of the patients and the relationship between the CT patterns and the histological type of malignant lesions were not analyzed. Also, a previous study of the CT patterns of patients with proptosis among Nigerians reported that CT of tumours accounted for 81.8% of the CT analyzed but the histopathological diagnosis of the tumours were not analyzed. [6] Whereas, the clinical findings, CT patterns and the histopathological diagnoses of oral and maxillofacial diseases of a relatively larger sample of patients (83.3%) was analyzed and their statistical association was determined in this study.

In a report of CT of lesions with associated proptosis by Ogbeide et al, [6] the patients' mean age was 29 years, with a slight female predilection (male: female =1:1.2) and the lesions were predominantly tumours (81.8%) consisting

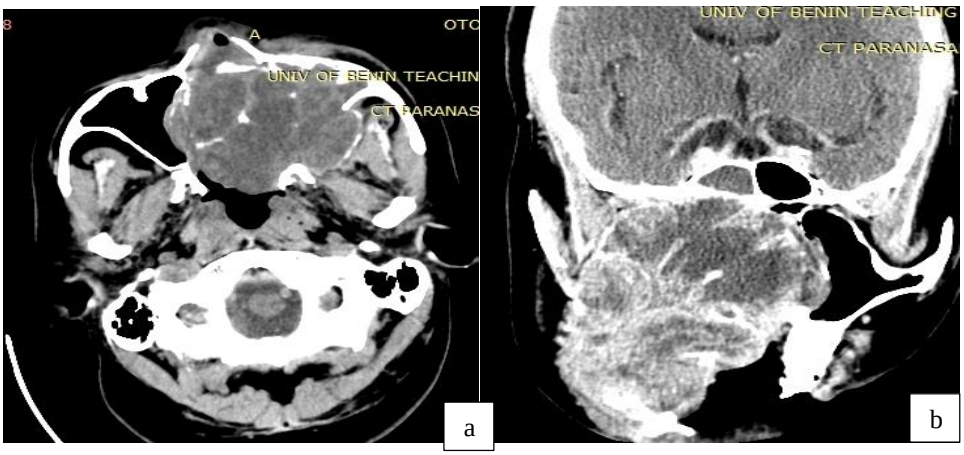

Fig 1. Axial unenhanced (a) and coronal enhanced (b) computed tomographic images shows an extensive heterogeneously enhancing soft tissue mass with lytic destruction of the left maxillary antrum, nasal cavity and medial wall of the right maxillary antrum. Histologic diagnosis in this case was olfactory neuroblastoma.

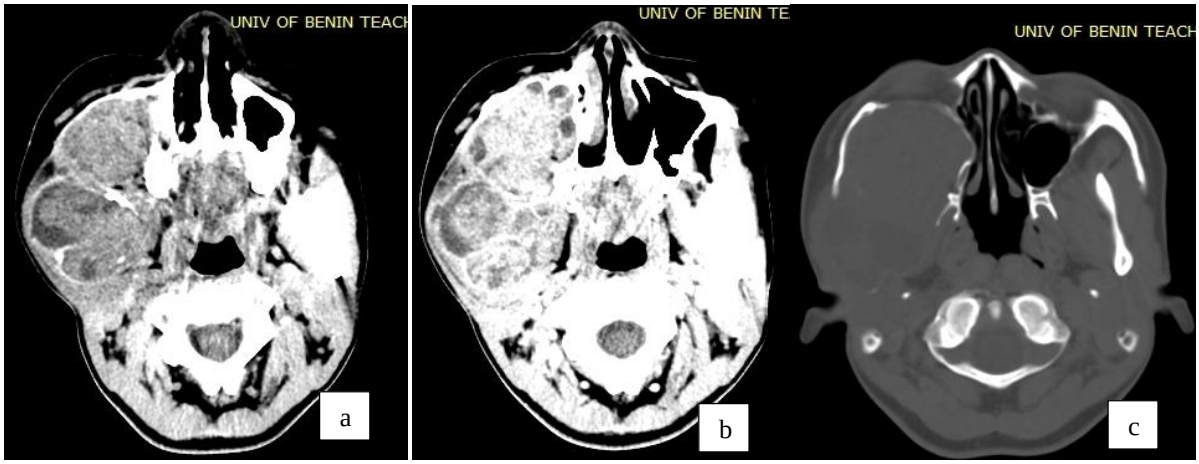

Fig. 2. Ameloblastic carcinoma. Axial unenhanced (a) and contrast enhanced (b) Computed tomographic images show a large ill- defined predominantly solid heterogeneously enhancing mass with lytic destruction of the right maxilla. There are multiple hypoattenuating areas suggestive of necrosis. The lytic destruction of the right maxilla and mandible is well depicted on bone window level (c).

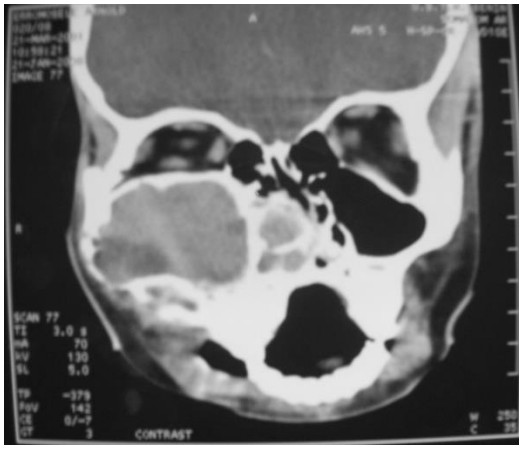

Fig 3: Coronal contrast enhanced CT image showing a heterogeneously enhancing soft tissue mass expanding the left maxillary antrum, extending medially into the left nasal fossa with areas of cortical breech.

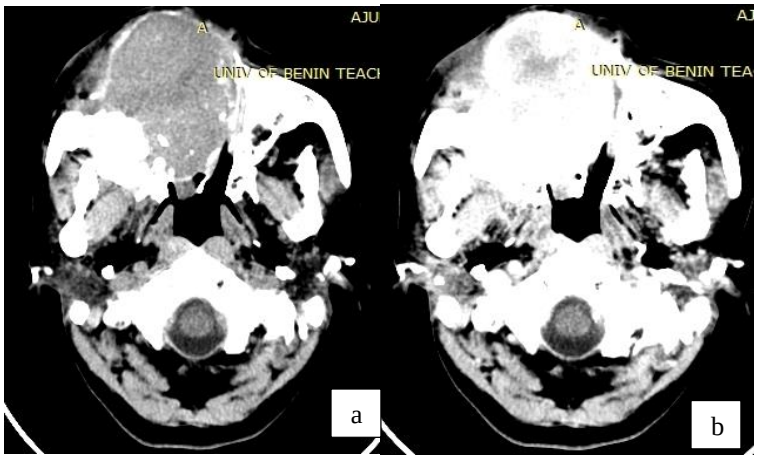

Fig. 4a Axial CT scan of a histologically proven case of florid osseous dysplasia showing a large predominantly isodense mass in the right maxillary sinus with marked bone destruction and calcific densities within it.
Fig 4 b. Shows heterogeneous contrast enhancement.

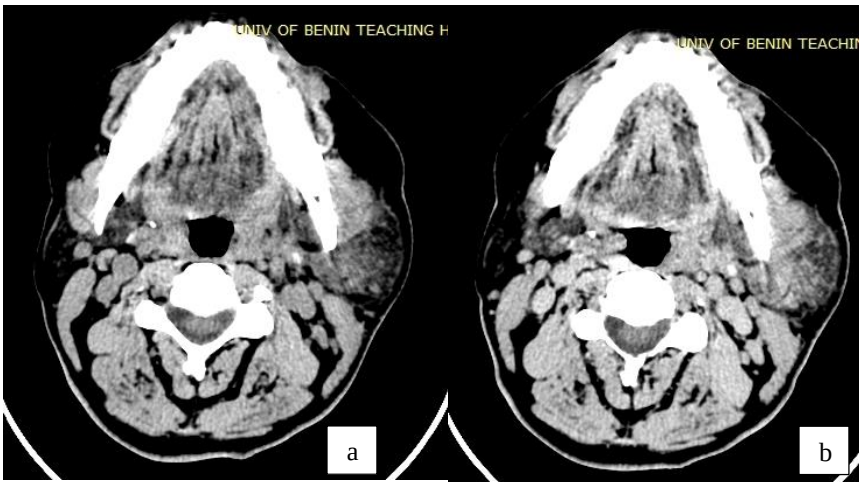

Fig 5.a Axial CT scan unenhanced (a) and following intravenous contrast injection (b) showing a heterogeneously enhancing predominantly retromandibular left soft tissue swelling involving the left masseter and left parotid gland in a histologically proven case of orofacial granulomatosis.

of mostly of primary extraorbital tumours (70.4%), with sinonasal and orbital involvement.

Whereas, the patients in this study were slightly older (mean age of 43 years), with a slight female predilection, and a predilection of the lesions for the maxilla as a solitary clinical site (67.5%). In addition, there was involvement of airway, orbit and teeth, and the lesions were predominantly neoplastic tumours (85.0%). This support reports from several studies on CT with proptosis associated with tumours involving sinonasal and orbital regions. [10-14] These findings show fairly similar patterns of presentation of craniofacial lesions on CT. However, the older mean age may be due to delayed presentation of the patients for treatment in this study. Furthermore, the 4th and 6th decades of life were predictive of histopathological diagnosis of malignancy, while clinical diagnosis of antral carcinoma was predictive of histopathological diagnosis of antral carcinomas in the patients in this study.

When the CT findings were correlated with histopathological diagnosis of the patients in this study, there was a high index of suspicion of malignant lesions in patients with ill-defined, erosive destruction of lesional margin and heterogeneous CT contrast enhancement pattern. This supports a previous study which suggests that CT evidence of bony destruction and contrast enhancement pattern may be of value in

distinguishing malignant from benign sinonasal tumours.[6] Furthermore, solid CT pattern was predictive of histopathological diagnosis of malignant fibrous histiocytoma, adenocystic carcinoma, orofacial granulomatosis (deep mycosis), plexiform ameloblastoma and pleomorphic adenoma in this study. These findings serve as baseline CT patterns for differential diagnosis of some oral and maxillofacial diseases in our environment. This study also underscores the need for a multidisciplinary approach involving oral and maxillofacial surgeons, radiologists and pathologists in the diagnosis and treatment of oral and maxillofacial diseases in our environment.

The limitations of this retrospective study includes poor documentation of CT contrast enhancement pattern for some lesions, which was regarded as nonspecific or unremarkable in the absence of CT images to substantiate contrast enhancement pattern. Also, there were patients with CT reports (16.7%) without complementary histopathological diagnosis, probably because the patients were not properly educated on the benefit of this investigation in their management.

In conclusion, the CT patterns with complementary histopathological diagnosis of oral and maxillofacial diseases of a relatively larger sample of patients (83.3%) was analyzed in this study compared with previous studies. The lesions were seen mostly in older adults, with a slight female predilection and a preponderance of the lesions in the maxilla. The patients in the 4th and 6th decades of life, a clinical diagnosis of antral carcinoma, ill-defined lesional margin on CT, heterogeneous contrast enhancement pattern and solid CT patterns correlate with histopathological diagnosis of some oral and maxillofacial diseases in this study. A multidisciplinary approach is recommended in the diagnosis and treatment of oral and maxillofacial diseases in our environment.

No conflict of interest is declared in this study.

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