

## Clinicopathologic Profile of Patients with Maxillofacial Tumors in a Tertiary Level Government Institution

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**Rationale:** Bone tumors of the head and neck region are rare. Their occurrence, biologic behavior, and management can cause significant personal, social, behavioral and economic ramifications. The aim of this study was to describe the clinicopathologic profile of patients with maxillofacial tumors in a tertiary level government hospital.

**Methods:** This was a retrospective, descriptive study over a five-year period (January 2013 to December 2018).

**Results:** A total of 256 patients was included in the study, with females accounting for 53.5% and males for 46.5%. The mean age of presentation was 37.4 years with a range of 18-80 years. The mean age of patients with benign tumors was 36.1 years, while those with malignant tumors was higher at 61.8 years. Majority of the tumors involved the mandible. Ameloblastoma and dentigerous cysts were the most prevalent benign odontogenic tumors while squamous cell cancer was the most common malignancy. Radical surgery with composite reconstruction was done in malignant cases to ensure adequate pathologic margins, while a more conservative tissue-sparing approach was done for benign cases.

**Conclusion:** Management of maxillofacial tumors remains a challenge because of its relative anatomic location and locally-advanced state upon detection. Identifying these tumors at an early stage ensures adequate resection with minimal functional and aesthetic loss. The low morbidity and mortality rates reported in this study emphasizes the role of the multidisciplinary team approach, surgical experience and comprehensive perioperative care in the management of bone tumors in the head and neck.

**Key words:** odontogenic tumors, oral cavity, maxillectomy, mandibulectomy, ameloblastoma, maxillofacial surgery, squamous cell carcinoma

The anatomic and physiologic complexities encountered in the head and neck region account for the diverse behavior of neoplastic processes and its associated clinical outcomes.<sup>1</sup> Despite advancements in

understanding cancer biology and improvements in surgical technique and technology, the diagnosis and management of maxillofacial bone tumors remain a challenge.<sup>2</sup>

Bone-involving tumors of the head and neck region are rare. Primary bone tumors arise from the cellular matrix, lymphoreticular and myeloid cells in the marrow spaces and odontogenic elements from the maxilla or the mandible.<sup>3</sup> There is limited epidemiologic data regarding the true incidence of maxillofacial bone tumors. Some reports have demonstrated a prevalence of odontogenic tumors of the oral cavity to as high as 30%.<sup>4,5</sup> Apart from tumors of the bone matrix and marrow, non-odontogenic tumors arising from adjacent soft tissue or metastasis from an established primary site comprise an important group as these portend a more aggressive primary.<sup>6,7</sup> Due to multiple anatomic subsites in the head and neck region, a variety of cancers, mostly squamous cell carcinoma (SCC), may arise from the oral cavity, pharynx, paranasal sinuses, and salivary glands. These subsites are usually in close proximity to bony structures, where curative resections entail formidable maxillofacial surgical resection.<sup>8,9</sup>

A description of the institution's experience in the management of maxillofacial bone tumors would contribute to existing literature. This study aims to describe the clinicopathologic profile of patients presenting with maxillofacial bone tumors in a tertiary level government institution. The information generated would result in improved disease detection and discovery of more effective treatment strategies.

## Methods

This was a retrospective, descriptive cross-sectional study of patients with maxillofacial bone tumors managed in a tertiary government hospital. An electronic search was done using the online databases of the Department of Surgery and Department of Otorhinolaryngology - Head and Neck Surgery (ORL-HNS) of the Philippine General Hospital.

All patients identified as having “maxillectomy,” “mandibulectomy,” “enucleation,” “odontogenic tumor,” and “ameloblastoma” in both registries from 1 January 2013 to 31 December 2018 were included in the study. Exclusion criteria were: pediatric patients ( $\leq 18$  years old) and patients who underwent a biopsy for a head and neck tumor but were lost to follow up. All cases were discussed and managed by a multidisciplinary team (MDT) composed of a head and neck surgeon, reconstructive surgeon, orthodontic surgeon, anesthesiologist, radiologist, radiation oncologist, medical oncologist, medical and paramedical staff of Rehabilitation Medicine. Patients’

charts were retrieved from the Medical Records Section and electronic patient registry files.

The following information were obtained: age, sex, clinical presentation, type of tumor, operation performed, perioperative course, length of hospital stay and surgical complications. A grading system based on the treatment given to manage surgical complications was used, to rank the severity of the postoperative condition (Appendix 1).<sup>10</sup> This study was limited by the completeness and accuracy of records obtained from both registries and in-patient charts.

## Results

There were a total of 256 patients, with females accounting for 53.5% of the study population, while males comprised 46.5% (Table 1). The mean age at diagnosis was 37.4 years with an age range of 18 to 80 years. Patients presenting with a benign tumor had an average age of 36.1 years, while those presenting with a known malignancy had a mean age of 61.8 years.

**Table 1.** Frequency, gender, and age distribution of maxillo-facial bone tumors.

Type of Lesion	Number of Cases	Male N (%)	Female N (%)	Mean Age, Years (Range)
<b>Benign</b>				
Ameloblastoma	131 (51.2)	58 (44.3)	73 (55.7)	36.1 (18-80)
Odontogenic Cyst	35 (13.7)	18 (51.4)	17 (48.6)	37.2 (18-68)
Fibrous Dysplasia	22 (8.5)	10 (45.5)	12 (54.5)	27.3 (18-63)
Odontogenic Myxoma	7 (2.6)	2 (28.6)	5 (71.4)	45.1 (26-67)
Odontoma	4 (1.6)	1 (25.0)	3 (75.0)	42.0 (27-60)
Osteoma	4 (1.6)	2 (50.0)	2 (50.0)	39.3 (22-81)
Pleomorphic Adenoma	1 (0.4)	0 (0.0)	1 (100.0)	31.0 (31)
Squamous Papilloma	1 (0.4)	1 (100.0)	0 (0.0)	33.0 (33)
<b>Malignant</b>				
Squamous Cell Carcinoma V	21 (8.2)	13 (61.9)	8 (38.1)	61.8 (38-78)
Sarcoma Well-Differentiated	11 (4.3)	6 (54.5)	5 (45.5)	34.6 (21-65)
Adenoid Cystic Carcinoma	4 (1.6)	1 (25.0)	3 (75.0)	35.3 (19-49)
Mucoepidermoid Carcinoma	4 (1.6)	2 (50.0)	2 (50.0)	46.3 (37-59)
Basal Cell Carcinoma	3 (1.2)	2 (66.7)	1 (33.3)	51.67 (45-57)
Verrucous Carcinoma	3 (1.2)	2 (66.7)	1 (33.3)	57.3 (48-75)
Giant Cell Tumor	2 (0.7)	0 (0.0)	2 (100.0)	46.0 (34-58)
Metastatic From Known Primary	1 (0.4)	0 (0.0)	1 (100.0)	57.0 (57)
Neuroblastoma	1 (0.4)	0 (0.0)	1 (100.0)	34.0 (34)
Spindle Cell Neoplasm	1 (0.4)	1 (100.0)	0 (0.0)	19.0 (19)
<b>Total</b>	<b>256 (100.0)</b>	<b>119 (46.5)</b>	<b>137 (53.5)</b>	<b>37.4 (18-80)</b>

Ameloblastoma was seen in 131 patients (51.2%) and was the most common diagnosis for both males (44.3%) and females (55.7%). Dentigerous cysts were the second most common benign disease. SCCA was the most common malignancy encountered in either sex, 13 cases (61.9%) in males and 8 cases (38.1%) in females. Soft tissue sarcoma, also a non-odontogenic tumor, was the second most common malignancy reported, with 6 cases (54.5%) in males, and 5 cases (45.5%) in females.

In terms of type of tumor and location, Table 2 showed that majority of tumors, regardless of histopathology, were found in the mandible in 217 patients (84.7%). Ameloblastoma was mostly seen in the mandible in 125 out of 131 cases (95.0%), while all cases of odontogenic cysts were reported in the mandible. Two cases of

fibrous dysplasia and a single case of osteoma were encountered in the frontal bone (1.5%). For malignant tumors and those having an aggressive histopathology, the incidence was similar in both the maxilla and the mandible [21 (41.2%) and 29 (56.9%)]. Squamous cell carcinoma, the most common malignancy reported, was encountered in the mandible in 16 cases as compared to 5 cases encountered in the maxilla (6.3% and 2.0%, respectively). Non-odontogenic malignant carcinoma such as well-differentiated soft tissue sarcoma was seen in the maxilla in 5 cases and in the mandible in 6 cases. Adenoid cystic carcinoma was encountered in the maxilla in 3 cases and a single case in the mandible, while 2 cases of mucoepidermoid carcinoma was reported in both the maxilla and the mandible.

**Table 2.** Type of tumor by histopathology and anatomical location.

Type of Lesion	Number of Cases	Maxilla	Mandible	Others
<b>Benign</b>				
Ameloblastoma	131	6	125	-
Odontogenic Cyst	35	-	35	-
Fibrous Dysplasia	22	6	14	2 (Frontal bone)
Odontogenic Myxoma	7	-	7	-
Odontoma	4	-	4	-
Osteoma	4	-	3	1 (Frontal bone)
Pleomorphic Adenoma	1	1	-	-
Squamous Papilloma	1	1	-	-
Total N (%)	205 (100.0)	14 (6.8)	188 (91.7)	3 (1.5)
<b>Malignant/ *Highly Aggressive</b>				
Squamous Cell Carcinoma	21	5	16	-
Sarcoma Well-Differentiated	11	5	6	-
Adenoid Cystic Carcinoma	4	3	1	-
Mucoepidermoid Carcinoma	4	2	2	-
Basal Cell Carcinoma	3	3	-	-
Verrucous Carcinoma	3	-	3	-
Giant Cell Tumor*	2	1	-	1 (Frontal bone with zygomatic extension)
Metastatic From Known Primary	1	-	1	-
Neuroblastoma	1	1	-	-
Spindle Cell Neoplasm	1	1	-	-
Total N (%)	51 (100.0)	21 (41.2)	29 (56.9)	1 (1.9)
Overall N (%)	256 (100.0)	35 (13.7)	217 (84.7)	4 (1.6)

The duration of symptoms prior to initial consult ranged from less than six months to more than five years (Table 3). Majority of patients, 110 (53.7%), who presented with a benign pathology sought consultation within 1 to 5 years, while 47 (22.9%) consulted after more than 5 years. Twenty-seven patients (52.9%) with a malignancy or a tumor with aggressive growth consulted within 6 months after experiencing symptoms, while 15 patients (29.4%) consulted a head and neck surgeon less than a year from experiencing symptoms. Only a single patient (2.0%) with a malignant primary sought consult more than 5 years from experiencing symptoms.

All of the 256 patients underwent elective surgery. Conservative surgeries were performed in 205 patients

(80.1%) for benign cases. Enucleation, which maintains tissue integrity and bone structure was performed in 108 patients, (52.7%), while bone contouring was seen in 12 cases (4.7%). Radical surgery entailing a wide excision with margins pathologically negative for tumor via frozen section was performed in all malignant cases, 51 cases (19.9%). Ameloblastoma cases with adjacent tissue destruction also underwent a similar radical resection. The mean operative time was 2.3 hours with a range from 4 to 13 hours (Table 4). Radical surgeries requiring composite flap reconstruction to restore structural or functional integrity had a mean operative time of 10.4 hours. The average length of hospital stay was 5.0 days, ranging from 3 to 13 days, while the post-operative length of stay was reported from 1 to 6 days with a mean of 2.2

**Table 3.** Type of tumor by histopathology and duration of symptoms prior to consult.

Type of Lesion	Number of Cases N (%)	Symptom Duration Prior To Consult			
		<6 months	6 months – 1 year	1 year – 5 years	>5 years
<b>Benign</b>					
Ameloblastoma	131	7	21	79	24
Odontogenic Cyst	35	-	8	21	6
Fibrous Dysplasia	22	3	1	6	12
Odontogenic Myxoma	7	-	3	4	-
Odontoma	4	1	2	-	1
Osteoma	4	-	-	-	4
Pleomorphic Adenoma	1	1	-	-	-
Squamous Papilloma	1	1	-	-	-
Total N (%)	205 (100.0)	13 (6.3)	35 (17.1)	110 (53.7)	47 (22.9)
<b>Malignant/ *Highly Aggressive</b>					
Squamous Cell Carcinoma	21	15	5	1	-
Sarcoma Well-Differentiated	11	4	6	1	-
Adenoid Cystic Carcinoma	4	4	-	-	-
Mucoepidermoid Carcinoma	4	-	-	3	1
Basal Cell Carcinoma	3	3	-	-	-
Verrucous Carcinoma	3	-	1	2	-
Giant Cell Tumor*	2	-	1	1	-
Metastatic From Known Primary	1	-	1	-	-
Neuroblastoma	1	-	1	-	-
Spindle Cell Neoplasm	1	1	-	-	-
Total N (%)	51 (100.0)	27 (52.9)	15 (29.4)	8 (15.7)	1 (2.0)
Overall N (%)	256 (100.0)	40 (15.6)	50 (19.5)	118 (46.1)	48 (18.8)

days. One death from healthcare-associated pneumonia was observed in this retrospective study. Grade II and IV morbidity rates were seen in 7 (3.1%) and 3 (1.2%) of cases. There was no Grade III morbidity observed.

**Table 4.** Patient demographics and clinical features

Clinical Feature N= 256	Result
Mean patient age, years (range)	37.4 (18-80)
Sex	
Male	119 (46.5)
Female	137 (53.5)
Mean operative time, hours	2.3 (4-13)
Mean overall length of stay, days	5.0 (3-13)
Mean postoperative length of stay, days	2.2 (1-6)
Mean ICU length of stay, days	2.3 (1-4)
Number of patients with composite musculoskeletal reconstruction	41 (16.0)
Number of morbidity cases	7 (12.0)
Grade II	8 (3.1)
Grade III	0 (0)
Grade IV	3 (1.2)
Number of deaths	1 (0.4)

## Discussion

The prevalence of bone tumors in the head and neck region is considerably less when compared to tumors in other organ systems.<sup>9</sup> The predilection for these diseases was found to be equal in both males and females for both benign and malignant tumors.<sup>11</sup> Out of 1642 patients included in a retrospective study, 97% were benign and 3% were malignant.<sup>12</sup> These results were comparable with those of this study showing that majority of cases have a benign histology, 80.1%, and most of these, 91.7%, were located in the mandible. Most benign tumors were odontogenic in origin, with ameloblastoma being the most common (51.2%), followed by fibrous dysplasia (8.6%). The incidence of SCC in this study was 8.2% and were observed to be more common in the older age-group with a mean age of 61.8 years. The findings of this study were

consistent with literature showing a higher prevalence of oral cavity SCC presenting in the 4th to 5th decades of life, attributed to the cumulative effects of alcohol, tobacco use, chronic infection and poor wound healing.<sup>13</sup> This study reported the incidence of ameloblastoma and odontogenic cysts (51.2% and 13.7%) to be more common in the younger age-groups with a mean age of 36.1 years. This is in direct contrast to odontogenic tumors being more common in the pediatric population up to young adults, as these tumors arise from the proliferation and degeneration of the processes of the maxillofacial area.<sup>14</sup>

The study has observed that symptom duration prior to consult reached a period of greater than five years. Most patients with a benign pathology took 1 to 5 years before deciding to consult. For patients with malignant tumors or aggressive histology, consultation with a head and neck surgeon was done less than 6 months or less than a year. The resulting limitations in the performance of activities of daily living and hindrances to feeding and speech, were the primary reasons for consultation.<sup>15,16</sup> Worldwide, close to 50% of patients present with a locally-advanced oral cavity SCC or an odontogenic malignancy. The diversity of clinical presentation of maxillo-facial cancers, from a painless lump to a non-healing oral cavity wound, is thought to add to the delay in appropriate consultation and management.<sup>17</sup>

The authors of this study observed that the more aggressive disease pathologies entailed more radical resections in order to achieve clear margins.<sup>18</sup> Radical surgery with composite free flap had a mean operative time of 10.4 hours, while odontogenic tumors entailing enucleation and fibroma needing contouring were more representative of the observed mean operative time of 2.3 hours. Reported mortality and morbidity rates were low. Grade IV morbidities were attributed to flap necrosis secondary to vascular pedicle compromise in two cases and airway compromise requiring reintubation in one case. A single mortality from healthcare associated pneumonia due to prolonged hospital stay was also reported.

Long term morbidity from maxillofacial surgeries is not uncommon. Speech therapy, dental rehabilitation, and nutritional support are often needed postoperatively.<sup>20</sup> In a study of 651 patients, morbidity rates were reported to be significantly lower in patients who presented with

early stage primary tumors and those not requiring radical surgery with composite reconstruction. Early detection of these tumors or pre-malignant lesions may be increased by reminding the public of the importance of oral health, regular dental exams, and prompt medical consultation upon detection of oral cavity or facial lesions.<sup>21,22</sup> Furthermore, most guidelines stress the importance of risk factor modification in the form of smoking cessation and decreasing alcohol consumption.<sup>23</sup>

The incidence of residual tumor and tumor recurrence was not observed in this five-year retrospective descriptive study. It is recommended that a longer follow up period may be needed in order to detect recurrence rates and residual disease. Low morbidity and mortality rates demonstrated in this study highlight the importance of a multidisciplinary team (MDT) approach. The authors of this study believe that having a robust local database on maxillofacial bone tumors allows for further research to focus on newer and more effective treatment strategies.

## Conclusion

Benign ameloblastoma and dentigerous cysts are still the most prevalent Odontogenic tumors. Squamous cell carcinoma is the most common malignant disease in the maxillofacial area. Diagnosing these diseases at an early stage will result in an adequate resection with minimal functional and aesthetic loss. Improvements in health-seeking behavior and access to healthcare facilities are measures to minimize morbidity from the disease and allow for organ and function preserving surgeries.

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