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A Study on the Clinicopathological Profile and Staging of Malignant Maxillary Tumours

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KEYWORDS

Malignant maxillary tumors, squamous cell carcinoma, adenocarcinoma, TNM staging, maxillectomy, radiotherapy, chemotherapy, clinicopathological profile, treatment outcomes.

ABSTRACT:

Background: Malignant maxillary tumors are rare neoplasms with complex clinical presentations and diverse histopathological profiles, often diagnosed at an advanced stage due to nonspecific symptoms. This study aimed to assess the clinicopathological profile, management strategies, and prognosis of these tumors in a hospital-based cohort.

Methods: A cross-sectional study was conducted at Sree Balaji Medical College and Hospital, Chennai, from October 2022 to April 2024, involving 50 patients aged 18-60 years presenting with signs of maxillary tumors. Diagnostic tools included Diagnostic Nasal Endoscopy, Video Laryngo Endoscopy, and imaging modalities (CT and MRI), followed by histopathological confirmation. Tumors were staged using the TNM and Broder's systems. Management included surgical resection, radiotherapy, and chemotherapy. Data were analyzed using SPSS version 9.0.

Results: The mean age was 54.18 years, with a near-equal gender distribution. Squamous cell carcinoma was the most common histopathological type (48%), followed by adenocarcinoma (30%). Tumors predominantly involved the maxillary antrum and middle meatus. There was no significant association between disease stage and response to therapy ($p = 0.250$) or treatment choice ($p = 0.325$). Common symptoms included nasal obstruction (24%), epistaxis (18%), and dental issues (14%).

Conclusion: The study highlights the varied clinicopathological features and complex treatment outcomes of malignant maxillary tumors. Despite advances in diagnostic and therapeutic modalities, no significant correlations were found between disease stage and therapy response or treatment choice, suggesting the need for individualized treatment strategies and further research to improve outcomes.

Introduction:

Malignant maxillary tumors, although uncommon, pose substantial diagnostic and therapeutic challenges due to their complex anatomical location, varied presentation, and diverse histopathological types. These neoplasms can arise from different structures within the maxillary sinus and surrounding areas, such as the nasal cavity, ethmoid sinus, and hard palate, leading to a range of clinical manifestations that can complicate early detection. Common symptoms include facial pain, nasal obstruction, epistaxis (nosebleeds), and dental problems such as tooth mobility or non-healing ulcers in the oral cavity. These nonspecific and often overlapping symptoms can lead to delayed diagnosis, allowing the disease to progress to an advanced stage by the time it is identified (1).

Epidemiologically, malignant maxillary tumors constitute a small fraction of head and neck cancers, representing less than 1% of all malignancies. They are most frequently diagnosed in adults, with a peak incidence in the fifth to seventh decades of life. While no specific gender predominance has been established for these tumors, certain subtypes, such as maxillary adenocarcinomas, are more common in older adults (2). Geographical variation in the prevalence of these tumors has been observed, which may be attributed to

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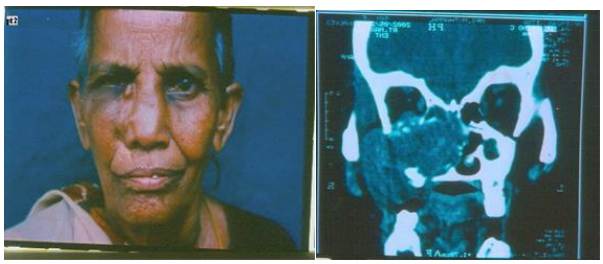
differences in environmental exposures and lifestyle factors. For instance, regions with high exposure to wood dust or industrial chemicals have reported a higher incidence of these neoplasms, suggesting a link between occupational hazards and tumor development (3).

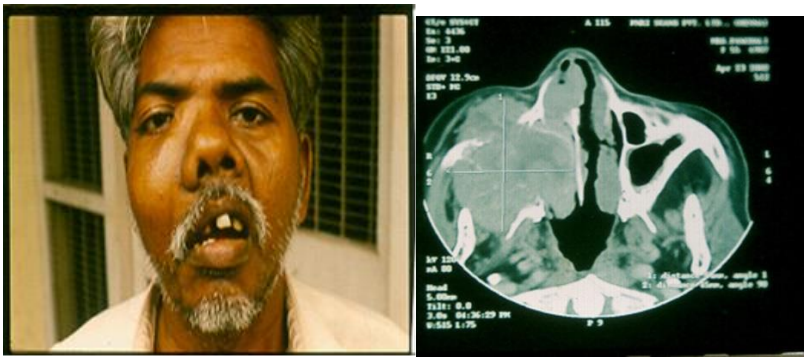
The etiology of malignant maxillary tumors is multifactorial, involving both environmental and genetic factors. Key risk factors include tobacco use, which significantly increases the risk of squamous cell carcinoma, the most common histological type of maxillary sinus cancer. Chronic sinusitis and long-standing inflammation have also been implicated, although the exact pathophysiological mechanisms remain unclear. Occupational exposure to carcinogenic substances such as wood dust, nickel, and formaldehyde has been associated with a higher risk of developing these tumors. Additionally, infection with high-risk strains of human papillomavirus (HPV) has emerged as a potential etiological factor, particularly in squamous cell carcinomas of the head and neck region, including the maxillary sinuses (4).

Figure 1: MRI PNS showing Maxillary Tumour.



Staging of malignant maxillary tumors is typically performed using the TNM classification system, which evaluates the primary tumor's size and extent (T), regional lymph node involvement (N), and the presence of distant metastasis (M). Accurate staging is essential for determining the most appropriate treatment strategy and predicting prognosis. Early-stage tumors (Stage I and II) are often confined to the maxillary sinus, and patients may benefit from surgical resection with curative intent. In contrast, advanced-stage tumors (Stage III and IV) may involve adjacent structures such as the orbit, skull base, or even distant organs, necessitating a combination of surgery, radiation therapy, and chemotherapy (5).

Figure 2: CT PNS showing Maxillary Tumour.



Despite advances in imaging techniques and surgical approaches, the prognosis for patients with malignant maxillary tumors remains guarded, especially for those diagnosed at an advanced stage. Survival rates vary widely depending on factors such as tumor histology, stage at diagnosis, and treatment modalities used. Therefore, early detection and accurate staging are crucial for improving outcomes in this challenging malignancy. Ongoing research is focused on identifying molecular markers that could facilitate early diagnosis and provide new therapeutic targets, ultimately enhancing the management of these rare but aggressive tumours.

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Methodology:

This cross-sectional, hospital-based study was conducted at Sree Balaji Medical College and Hospital, Chennai, from October 2022 to April 2024. The study included patients aged 18-60 years presenting with signs and symptoms of maxillary tumors to the ENT outpatient department, ENT ward, and casualty. Using purposive sampling, 50 patients were selected based on a calculated sample size, considering a 40% incidence rate of maxillary tumors in the fifth decade with a 95% confidence interval and a margin of error of 13%. Diagnostic tools included Diagnostic Nasal Endoscopy (DNE), Video Laryngo Endoscopy (VLE), and imaging modalities like CT and MRI of the sinonasal area, followed by biopsy for histopathological confirmation. Tumors were staged using the TNM and Broder's systems to guide treatment planning. Patients underwent surgical intervention, typically total or radical maxillectomy, followed by adjuvant radiotherapy or chemoradiotherapy as indicated. Postoperative follow-up was conducted monthly for six months to monitor outcomes and recurrence. Data was analyzed using SPSS version 9.0, with results presented through tables and graphs for clarity. The study aimed to assess the clinical profile, management strategies, and prognosis of malignant maxillary tumors, providing insights for improved patient outcomes.

Results:

Category	Subcategory	Details
Demographic Profiles	Mean Age	54.18 years (SD: 15.55 years)
	Gender Distribution	Male: 52%, Female: 48%
Habit Distribution	Alcohol Consumption	32%
	Smoking	20% smokers, 20% both smokers and alcoholics
	No Habits	28%
Histopathological Findings	Squamous Cell Carcinoma	48%
	Adenocarcinoma	30%
	Mucoepidermoid Carcinoma	16%
	Undifferentiated Tumors	6%
Tumor Size Distribution	Tumor Size (1 cm to 5 cm)	26% each for 3 cm and 4 cm; significant presence of smaller sizes indicating early-stage detection
Staging	Well Differentiated	36%
	Moderately Differentiated	30%
	Poorly Differentiated	22%
	Undifferentiated	12%
Anatomical Location	Maxillary Antrum and Middle Meatus	30% each
	Alveolar Ridge	28%
	Nasal Cavity	12%
Tumor Classification (cT and pT)	cT Classification	T2 and T4a: 24% each
	pT Classification	T4b: 32%, T1: 22%
N Classification	N2 Classification	36%
	N3 Classification	24%

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Category	Subcategory	Details
	N0 and N1 Classification	20% each
Nodal Levels Involvement	Level 1, 2, 4 Nodal Involvement	16%
	Level 3, 2,3, and 2,3,4 Involvement	Varying patterns observed among cases
Treatment Modalities	Surgery + CT + RT	36%
	Surgery + CT	28%
	CT + RT	20%
	Surgery + RT	16%
Response to Therapy	Partial Response	40%
	Progressive Disease	26%
	Complete Response	18%
	Stable Disease	16%
Stage of Disease	Stage 1	32%
	Stage 2	20%
	Stage 3	20%
	Stage 4	28%
Symptomatic Distribution	Nasal Obstruction	24%
	Epistaxis	18%
	Loose Teeth	14%
	Other Symptoms	Palatal ulcer, hyposmia, proptosis
Staging vs. Response to Therapy	Association	No significant association (p = 0.250)
Staging vs. Treatment Choice	Association	No significant relationship (p = 0.325)

The study involved a cohort with a mean age of 54.18 years (SD: 15.55), and a nearly equal gender distribution (52% males and 48% females). Lifestyle habits showed that 32% of patients consumed alcohol, 20% were smokers, and an additional 20% used both, while 28% had no habits. Histopathologically, squamous cell carcinoma was the most common finding (48%), followed by adenocarcinoma (30%), mucoepidermoid carcinoma (16%), and undifferentiated tumors (6%). Tumor sizes ranged from 1 to 5 cm, with 26% each measuring 3 cm and 4 cm, suggesting early detection. In terms of differentiation, 36% of tumors were well differentiated, 30% moderately differentiated, 22% poorly differentiated, and 12% undifferentiated. The maxillary antrum and middle meatus were the predominant anatomical sites (30% each), followed by the alveolar ridge (28%) and nasal cavity (12%). Clinical tumor classification revealed 24% each in T2 and T4a, while pathological classification showed 32% in T4b and 22% in T1. For nodal involvement, 36% were classified as N2, 24% as N3, and the remainder as N0 and N1 (20% each). Nodal involvement varied, with 16% affecting levels 1, 2, and 4. Treatment modalities included surgery with CT and RT (36%), surgery with CT (28%), CT with RT (20%), and surgery with RT (16%). Response to therapy showed partial response in 40% of cases,

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progressive disease in 26%, complete response in 18%, and stable disease in 16%. Disease staging indicated 32% in Stage 1, 20% each in Stages 2 and 3, and 28% in Stage 4. The most common symptoms were nasal obstruction (24%), epistaxis (18%), and loose teeth (14%), with other symptoms including palatal ulcer, hyposmia, and proptosis. No significant associations were found between disease stage and response to therapy ($p = 0.250$) or treatment choice ($p = 0.325$).

Discussion:

The study's findings on malignant oral cancers reveal both consistencies and discrepancies when compared to existing literature. Epidemiologically, while Tavares et al. (2016) report a slightly older average age and similar gender distribution, the current study's mean age of 54.18 years reflects potential regional or temporal differences. Histopathologically, the predominance of squamous cell carcinoma (48%) aligns with Ghartimagar et al. (2020), though the higher proportion of adenocarcinomas (30%) compared to Ismail and SAW Chee Lynn (2018) may reflect variations in tumor classification or regional differences. Tumor sizes and staging are consistent with Alcántara-Vázquez et al. (2021) and Cardoso et al. (2022), yet the lack of significant association between disease stage and therapy response ($p = 0.250$) contrasts with Akinyamoju et al. (2020), suggesting potential nuances in treatment outcomes. Anatomical findings corroborate with Tavares et al. (2016) and Cardoso et al. (2022), highlighting common tumor locations. Treatment modalities and responses reflect trends noted in Ghartimagar et al. (2020) and Alcántara-Vázquez et al. (2021), though the absence of a significant link between treatment choice and disease stage ($p = 0.325$) points to the need for further exploration of these factors. Symptom patterns, such as nasal obstruction and epistaxis, align with existing literature, reinforcing common clinical presentations. These findings underscore the importance of continued research to address variations in tumor characteristics, treatment responses, and regional differences in malignant oral cancers.

Conclusion:

This study provides valuable insights into the clinicopathological profile and staging of malignant maxillary tumors, highlighting both consistencies and deviations from existing literature. The mean age of patients, predominant tumor types, and anatomical locations align with established studies, yet variations in tumor size distribution, histopathological findings, and the relationship between disease stage and treatment responses suggest regional or methodological differences. The high prevalence of squamous cell carcinoma and the significant proportion of adenocarcinomas emphasize the need for targeted diagnostic and therapeutic strategies tailored to these malignancies. Despite the use of advanced imaging and treatment modalities, the study reveals that no significant associations were found between disease stage and therapy response or treatment choice, indicating complex interactions that warrant further investigation. The common symptoms observed, such as nasal obstruction and epistaxis, reaffirm known clinical presentations of malignant maxillary tumors. Overall, the findings underscore the necessity for ongoing research to refine diagnostic approaches, enhance treatment protocols, and address regional disparities in the management of malignant maxillary tumors to improve patient outcomes.

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