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ORIGINAL ARTICLE

A Review of Surgical Outcomes of Management of Sinonasal Malignancies: A 8-Year of Clinical Experience (2013–2021) at the Tertiary Centre, Sarawak

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Abstract

Sinonasal carcinoma, a rare and challenging malignancy, originating in the nasal cavity and paranasal sinuses, poses diagnostic and management complexities. This 8-year retrospective analysis at Sarawak General Hospital aims to elucidate demographic trends, histopathological entities, and management outcomes, shedding light on this multifaceted malignancy. Emphasizing the significance of accurate histopathological classification, the study explores the impact on prognostication and treatment strategies. Spanning 2013 to 2021, the study involved 54 patients with sinonasal malignancies. Demographic, clinical, and histopathological details were examined, adhered to the AJCC staging criteria. Analysis involved demographic distributions, tumour characteristics, treatment modalities, and instances of treatment failure. Statistical analysis was done using SPSS version 29.02. The cohort, predominantly male (57.4%) and of Iban ethnicity (44.4%), with a mean age of 52.8 years, exhibited diverse histopathologies, with squamous cell carcinoma as the most common (38.9%). Epistaxis and nasal blockage were common clinical presentations. Advanced stages (III and IV) were prevalent, with the nasal cavity as the primary site. Surgical interventions, mainly endoscopic endonasal excision, were complemented by adjuvant therapies. Complications occurred in 24% of cases. The study highlights a male predilection, occupational risk factors, and a significant association between tobacco smoking and sinonasal cancers. Surgical interventions predominantly utilized the endoscopic approach. Despite a mean survival of 46.6 months, treatment failure occurred in 29.6% of cases, with recurrence and metastasis. Histopathological analysis revealed comparable 5-year disease survival rates between squamous and non-squamous histologies. Treatment failure was significantly associated with the mode of surgery, with open surgery showing a lower incidence. However, nodal status, histopathology types, T staging, and overall staging did display positive associations with treatment failure. This 8-year review provides comprehensive insights into sinonasal carcinoma, addressing demographic, clinical, and histopathological dimensions. The study underlines the complexity of managing this challenging malignancy, emphasizing the need for a holistic approach to patient care. The findings contribute to the understanding of sinonasal carcinoma, guiding clinical decision-making and fostering further research.

Keywords Sinonasal carcinoma · Retrospective analysis · Management outcomes · Histopathological classification · Treatment failure

Introduction

Sinonasal carcinoma, a rare malignancy originating in the nasal cavity and paranasal sinuses, poses diagnostic and management challenges due to its anatomical complexity and diverse histopathology. Malignancy of the sinonasal tract is uncommon and accounts for only 1% of all malignancies and ~5% of head and neck malignancy [1]. The rate in Asia is 3 per 100,000 and higher than in Europe [1].

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Despite the high incidence rate in Asia, there is limited data on sinonasal carcinoma treatment outcomes in the literature. In embarking on a retrospective 8-year analysis at Sarawak General Hospital which is the largest tertiary state referral centre in Sarawak. Our goal is to comprehensively examine cases, shedding light on demographic trends, histopathological intricacies, and the multifaceted landscape of management outcomes in sinonasal carcinoma.

The spectrum of histological entities within sinonasal carcinoma underscores the importance of accurate histopathological classification, emphasized by seminal works like Thompson et al. [2], influencing prognostication and treatment strategies. A comprehensive understanding of histopathology is imperative for navigating the diverse clinical behaviors of sinonasal carcinoma.

The anatomical complexity of the sinonasal region poses significant challenges in surgically managing tumours closely related to vital structures such as orbits or the skull base. Over the past decade, advances in endoscopic surgical techniques, highlighted by the work of Lee et al. [3], offer less invasive alternatives with maintained oncological efficacy, impacting long-term outcomes.

The dynamic landscape of adjuvant therapies further complicates sinonasal carcinoma management. Surgery remains the mainstay for non-metastatic cases, with endoscopic techniques revolutionizing the surgical approach [4]. Advanced radiation therapies, including intensity-modulated radiation therapy (IMRT) and proton therapy, demonstrated potential in optimizing outcomes [5]. Novel systemic therapies explored by Patel et al. [6] introduce new dimensions in personalized treatment, necessitating an exploration of their impact on long-term survival.

While individual studies contribute valuable insights, a comprehensive decade-long review at a single institution offers a unique opportunity to synthesize institutional data, elucidating patterns, challenges, and successes. This research aims to bridge gaps in the literature by providing a holistic understanding of the interplay between demographic factors, histopathological characteristics, and treatment outcomes at Sarawak General Hospital.

Despite the high incidence rate in Asia, there is limited data on sinonasal carcinoma treatment outcomes in the literature. Conducted at Sarawak General Hospital, the largest tertiary state referral center in Sarawak, this study aims to contribute scarce data to the literature. Objectives include identifying characteristic features, assessing treatment outcomes, and exploring prognostic factors. This 8-year review seeks to enhance the broader understanding of this rare malignancy, laying the groundwork for improved patient outcomes and guiding future research endeavors.

Materials and Methods

This study constitutes a 8-year retrospective analysis conducted at Sarawak General Hospital, Sarawak, Malaysia, spanning from 2013 to 2021. The primary objective was to examine all patients diagnosed with sinonasal malignancies, investigating demographic details, clinical presentations, and tumour characteristics. The inclusion criteria comprised individuals with a confirmed histological diagnosis of malignancy originating from the nasal cavity or paranasal sinuses, all of whom underwent treatment with curative intent. Tumour staging adhered to The American Joint Committee on Cancer (AJCC) staging 8th edition.

Data extraction involved a thorough examination of patients' case notes, focusing on demographic variables such as age and gender, as well as presenting symptoms and their duration. Detailed information regarding tumour characteristics, including site, stage, and histologic subtypes, was also collected. Exclusion criteria encompassed patients with malignancies arising from the nasopharynx, those with distant metastasis, and individuals with a history of prior treatment from other healthcare facilities.

Following the application of inclusion and exclusion criteria, a total of 54 eligible patients were incorporated into the study cohort. Primary variables under scrutiny included age, gender, risk factors, tumour histologic subtypes, tumour site, neck nodal status, staging, treatment modalities, and instances of treatment failure, specifically in terms of locoregional recurrence or distant metastasis. All surgeries were done by the same consultant surgeon. The dataset underwent comprehensive analysis using the Statistical Package for the Social Sciences (SPSS) software, version 29.02 (SPSS, Chicago, IL, USA). Chi-square test was applied to identify significant differences that were relevant. ANOVA tests used to determine whether there is a statistically significant difference between the means of the groups. $P \leq 0.05$ was considered as statistically significant.

Results

Our study encompassed a cohort of 54 patients diagnosed with sinonasal malignancies. Among them, 31 (57.4%) were males, and 23 (42.6%) were females. The average age of the patients was 52.8 years (standard deviation [SD] $\pm$ 17), ranging from 4 to 82 years. Majority of our cohort were Iban ethnicity ($n = 24$, 44.4%), Chinese ethnicity ($n = 14$, 25.9%) and Malay ethnicity ($n = 12$, 22.2%) (Table 1).

The predominant histopathological finding was squamous cell carcinoma ($n = 21$, 38.9%), followed by rhabdomyosarcoma ($n = 6$, 11.1%), sinonasal undifferentiated carcinoma ($n = 5$, 9.3%), sinonasal neuroendocrine carcinoma ($n = 5$,

Table 1 Demographic and patient characteristic features

Entities		Frequency, *n* (%)
Gender	Male	31 (57.4)
	Female	23 (42.6)
Race	Malay	12 (22.2)
	Iban	24 (44.4)
	Bidayuh	1 (1.9)
	Chinese	14 (25.9)
	Others	3 (5.6)
Histopathology	Adenoid cystic carcinoma	4 (7.4)
	Adenocarcinoma	3 (5.6)
	Malignant melanoma	2 (3.7)
	Squamous cell carcinoma	21 (38.9)
	Neuroendocrine carcinoma	5 (9.3)
	Sinonasal undifferentiated carcinoma	5 (9.3)
	Rhabdomyosarcoma	6 (11.1)
	Others	8 (11.1)
T stage	1	1 (1.9)
	2	6 (11.1)
	3	15 (27.8)
	4a	24 (44.4)
	4b	8 (14.9)
N stage	N0	49 (90.7)
	N1	4 (7.4)
	N2	1 (1.9)
Overall stage	I	2(3.7)
	II	4 (7.4)
	III	18 (33.3)
	IV	30 (55.6)
Primary tumour site	Maxillary sinus	13 (24)
	Nasal cavity	28 (51.9)
	Ethmoidal sinus	6 (11.1)
	Sphenoid sinus	3 (5.6)
	Frontal sinus	4 (7.4)
Radiotherapy	Yes	44 (81.5)
	No	10 (18.5)
Chemotherapy	Yes	35 (64.8)
	No	19 (35.2)
Recurrence (3 years)	Yes	16 (29.6)
	No	38 (70.4)

9.3%), and adenoid cystic carcinoma ($n=4$, 7.4%). Additional rare histological entities were observed: malignant melanoma ($n=2$), lymphoepithelial carcinoma ($n=1$), poorly differentiated carcinoma ($n=1$), other rare sarcoma ($n=5$; Ewing sarcoma, spindle cell carcinoma, undifferentiated sarcoma, leiomyosarcoma, dermatofibrosarcoma; one each case), oncocytic carcinoma ($n=1$). The nasal cavity emerged as the primary site in the majority of cases ($n=28$, 51.9%), followed by the maxillary sinus ($n=13$, 24%). The prevalent clinical complaints were epistaxis ($n=28$, 51.9%) and nasal blockage ($n=25$, 46.3%).

Seven patients (12.9%) had identifiable occupational related risk factors as they worked in construction sites, wood or food factories. 43.6% of patients out of the whole cohort had a history of tobacco smoking.

A significant portion of our patient cohort presented at advanced stages, with 18 (33.3%) at stage III and 30 (55.6%) at stage IV. Notably, the majority exhibited no metastasis to neck nodes, N0 ($n=49$, 90.7%). Surgical intervention was a universal approach, with all 54 patients undergoing surgery. The predominant surgical method employed was endoscopic endonasal excision, performed on the majority of patients ($n=32$, 59.3%). Forty-four (81.5%) patients received postoperative adjuvant radiotherapy. Thirty-five patients (64.8%) received chemotherapy (Table 1).

In our clinical observations, N + status predominantly manifested in cases of locally advanced tumours. The distribution of T-stages among patients was as follows: T3 = 1, T4a = 3, T4b = 1. Despite an initial clinical status of cN0, two patients underwent neck dissection based on the recommendation of the tumour board, attributed to the local extent of the tumour (T4 stage). Notably, histopathological examination in these two cases confirmed the absence of lymph node involvement (pN0 status).

Among our total cohort of 54 patients, complications were observed in 13 individuals, accounting for 24% of the cases. These complications encompassed post-operative wound or flap breakdown in 5 patients, radiation-related side effects in 4 patients, middle ear effusion in 3 patients, and cerebrospinal fluid leakage in 1 patient.

The mean survival period was 46.6 months with a range of 2 months to 177 months. Treatment failure was seen as recurrence of the tumour occurred in 16 patients (29.6%) following curatively intended treatment. Among these, 8 patients experienced local recurrences, 6 had loco-regional recurrences, and 2 exhibited isolated regional recurrences (Fig. 1). Salvage surgery was performed for one patient, while the remaining 16 patients opted for palliative care. Additionally, 6 patients (11.1%) were diagnosed with distant metastasis during the course of the study.

Histologically, the tumors were categorized into squamous type ($n=21$, 38.9%) and non-squamous cell carcinoma ($n=33$, 61.1%). The mean survival years for squamous and non-squamous cell carcinoma types were compared, but the result was not significant, with a p-value of 0.813 (Table 2). Additionally, the mean survival years for each stage were compared, but again, the difference was not deemed significant, with a p-value of 0.06 (Table 3).

Patients with recurrence or metastasis are considered as treatment failure. Treatment failure was significantly associated with mode of surgery ($P=0.008$) with the open surgery associated with lesser treatment failure. Nodal status,

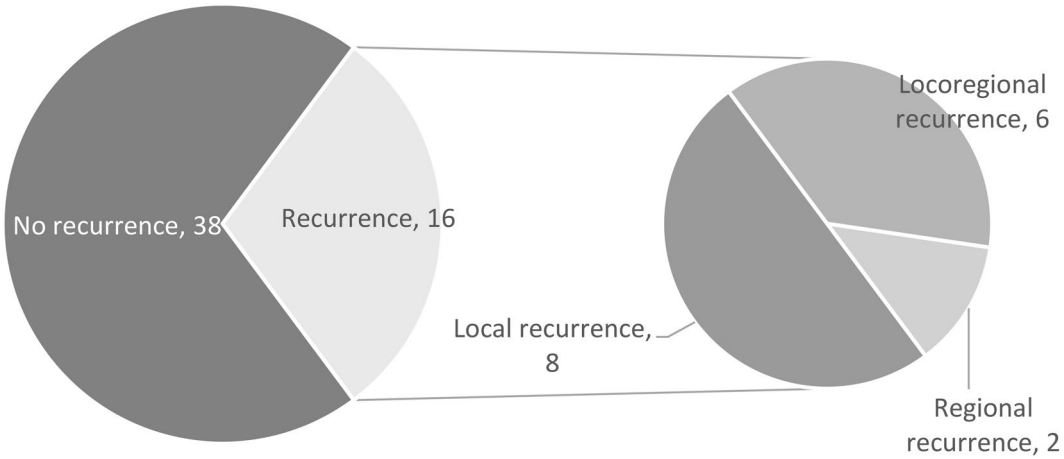

Fig. 1 Recurrence within 3 years and its breakdown

Table 2 Mean survival (in years) for histopathology group

Histopathology	Mean survival (in years)	Significance
SCC	3.1	0.813
Non-SCC	3.3	

Table 3 Mean survival (in years) for each overall staging

Staging	Mean survival (in years)	Significance
I	9.1	0.06
II	3.3	
III	3.1	
IV	2.9	

Table 4 T staging, nodal status, overall staging, histology and surgical approach association with treatment failure

Characteristics	Total number	Treatment failure (mets/recurrence)	*P*
T staging			0.480
1	1	0	
2	6	1	
3	15	4	
4	32	11	
Nodal status			0.904
Positive	5	2	
Negative	49	15	
Overall Stage			0.087
I	2	0	
II	4	2	
III	18	7	
IV	30	17	
Histopathology			0.539
SCC	21	7	
Non-SCC	33	9	
Surgery			*0.008
Endoscopic endonasal excision	32	14	
Open surgery	11	1	
Combined approach	11	4	

histopathology types, T staging and overall staging were not significantly associated with treatment failure (Table 4).

Discussion

Our study, involving a cohort of 54 patients diagnosed with sinonasal malignancies, provides valuable insights into the demographic, clinical, and histopathological characteristics of this rare and challenging malignancy, especially in Kuching, Borneo as there are limitation in terms of financial support and transportation. The demographic distribution in our study demonstrated a slight male predilection, consistent with previous literature on sinonasal cancers [1, 7]. The diverse ethnic distribution, with a majority being of Iban ethnicity, highlights the importance of considering ethnic variations in the epidemiology of sinonasal malignancies [8].

Squamous cell carcinoma emerged as the predominant histological subtype, aligning with other cohorts in sinonasal malignancies [1, 9]. However, our study also captured a spectrum of rare histological entities, emphasizing the diversity and complexity of tumors affecting the sinonasal region. The nasal cavity predominated as the primary site, consistent with previous reports, and epistaxis and nasal blockage emerged as the most common clinical complaints [10]. However due to non-specific symptoms, patients usually presented late.

Occupational risk factors and tobacco smoking have been implicated in sinonasal cancers. In our study, a noteworthy proportion of patients had identifiable occupational-related risk factors, emphasizing the importance of occupational history in the evaluation of sinonasal malignancies [11]. A substantial history of tobacco smoking among our patients further supports the established association between smoking and sinonasal cancers [12].

The advanced stage at presentation in a significant portion of our cohort aligns with the challenging nature of sinonasal malignancies, often diagnosed at later stages due to their anatomical location and non-specific symptoms. The universal utilization of surgical intervention, primarily through endoscopic endonasal excision, emphasizes the integral role of surgery in the management of sinonasal malignancies. Adjuvant therapies, including radiotherapy and chemotherapy, were commonly employed post-operatively, indicating a multidisciplinary approach to treatment [13].

Our clinical observations regarding N + status predominantly occurring in locally advanced tumors highlight the aggressive nature of these malignancies. The decision-making process involving neck dissection, chemoradiation, and palliative measures required an individualized approach. Notably, the histopathological confirmation of pN0 status in cases with an initial clinical status of cN0 emphasizes the importance of comprehensive assessment and individualized treatment decisions.

Complications were observed in a notable proportion of patients, underscoring the challenges associated with the management of sinonasal malignancies. These complications, ranging from post-operative issues to radiation-related side effects, highlight the need for careful consideration of potential morbidities in treatment planning and discussion with patients.

Despite curative intent, treatment failure in the form of tumour recurrence was observed in a substantial portion of our cohort. Salvage surgery and palliative care were chosen pathways, showcasing the complexity in managing recurrent sinonasal malignancies. Additionally, distant metastasis further underscores the aggressive nature of these tumours and the challenges in achieving long-term disease control.

Histologically categorizing tumours into squamous and non-squamous types revealed comparable mean surivival years, with no significant difference observed. The study offers insights into the survival trends for these distinct histological entities. However, the analysis of mean survival years across different stages did not yield significant differences.

The occurrence of treatment failure, characterized by recurrence or metastasis, demonstrated a significant association with the chosen surgical approach, revealing a lower incidence with open surgery. This disparity can be attributed to the typically available surgical resection margin in open procedures, which contrasts with the challenges in obtaining a margin during endoscopic endonasal surgery. Notably, factors such as nodal status, histopathology types, T staging, and overall staging did display positive associations with treatment failure in our study but due to the small number of sample, the result was not significant. In literature stated that T staging and nodal status affect the outcome of treatment [14]. Adenoid cystic carcinoma and squamous cell carcinoma showed better long-term outcomes [14]. This underscores the complexity of factors influencing treatment outcomes in sinonasal malignancies, necessitating a holistic approach to patient care.

Our study is constrained by its retrospective design and a relatively smaller sample size in comparison to existing literature. The heterogeneity entities also contributed to the limitation of this study. The presence of numerous missing data, attributed to file loss or patient defaulting from our follow-up, further adds to the limitations. Notably, a considerable portion of our patients hails from rural districts in Borneo, introducing challenges in ensuring regular follow-up visits due to geographical constraints and limited accessibility.

In conclusion, our study contributes valuable information on sinonasal malignancies, encompassing diverse demographic, clinical, and histopathological aspects. The findings guide clinical decision-making and underscore the need for continued research to enhance the understanding and management of these challenging malignancies. Multidisciplinary approach is crucial with combination care from otolaryngolgist, neurosurgeons, maxillofacial surgeons, oncologists, radiation therapists, and allied healthcare professionals. Surgical modality should be tailored according to facilities and expertise available with consideration of the tumour extension and skull base defect reconstruction.

Author Contributions Leong Wai Yee– main author. H. Jumastapha– statistical analysis. Chian Ling Tang– Data collection. IP Tang– supervision.

Data Availability The data and material are available for cross-checking.

Declarations

Ethics Approval and Consent to Participate The above titled study was conducted in Sarawak General Hospital. The study was approved by the hospital ethics committee.

Consent for Publication On behalf of all the authors, the consent is given for the Indian Journal of Otolaryngology and Head & Neck Surgery for publication for this article.

Competing Interests The are no competing interest or funding from any side regarding the above article.

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