MORPHOLOGICAL SPECTRUM OF LESIONS IN THE SINONASAL REGION

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ABSTRACT: INTRODUCTION: Nasal cavity and paranasal sinuses present a range of non-neoplastic and neoplastic lesions by virtue of their anatomic and histologic diversity. Although a presumptive diagnosis is arrived at based on presenting symptoms and imaging techniques, histopathology is the mainstay for definitive diagnosis and management of sinonasal lesions. **AIMS AND OBJECTIVES:** To study the incidence, mode of presentation and histologic types of sinonasal lesions in surgical pathology material. **SETTING AND DESIGN:** Retrospective retrieval of all sinonasal lesions and histopathologic analysis. **MATERIALS AND METHODS:** All sinonasal lesions, biopsied or excised over a period of three years between May 2010 and May 2013, were studied. The lesions were classified as non-neoplastic or neoplastic. Neoplasms were further categorised as benign and malignant. The histology was correlated with clinical features. Special stains and immunohistochemistry were done wherever indicated. **RESULTS:** In three years, sixty- one sinonasal lesions were reported, representing 0.47% of all surgical pathology specimens. Out of sixty- one cases, forty- one (67.21%) were non-neoplastic and twenty (32.79%) were neoplastic. Sinonasal lesions were common in the second and third decades of life, with male predominance. Among the non-neoplastic lesions, inflammatory polyps were the most common (80.49%). Among neoplasms, benign tumors (60%) were more frequent than malignant tumors (40%). Angiofibroma (6 cases-50%) was the commonest benign neoplasm and squamous cell carcinoma (4 cases- 50%) was the commonest malignant neoplasm. **CONCLUSION:** Non-neoplastic and neoplastic lesions in the sinonasal region have similar clinical manifestations. Categorization based on histopathology is necessary for differential diagnosis, management and prognosis of these uncommon lesions.

KEY WORDS: nasal cavity, paranasal sinuses, non-neoplastic, neoplastic, histopathology

INTRODUCTION: The nasal cavity and paranasal sinuses form a functional unit of specialized tissues, each with its own aberrations.¹ They share many pathologic processes, most of which are inflammatory.² Exposure to various influences like chemical irritants, antigenic stimulants, and mechanical trauma results in deleterious consequences, including formation of tumors and tumor-like conditions.³ Inflammatory polyps are a common cause of nasal obstruction, with a prevalence of 4% in the general population.⁴ Benign tumors are relatively common, but malignant neoplasms are rare, accounting for 0.2-0.8% of all carcinomas and only 3% of those in the upper aero digestive tract.⁵ Most of these lesions present as polypoid masses, making it difficult to distinguish non-neoplastic polyps from polypoid neoplasms clinically.⁶ Histopathologic diagnosis is therefore mandatory for appropriate management and prognosis of sinonasal lesions. This study was undertaken to classify sinonasal lesions based on histopathology and to analyze their age and sex distribution.

MATERIALS AND METHODS: This is a retrospective study conducted in the Department of Pathology, at a medical college hospital. The blocks and slides of all sinonasal lesions biopsied or excised over a period of three years, from May 2010 to May 2013, were retrieved and reviewed. All slides were stained with hematoxylin and Eosin stains. Biopsies with material inadequate for opinion were excluded from the study. Special stains and immunohistochemistry were used where required. The lesions were classified as non-neoplastic and neoplastic. The neoplastic lesions were further categorised as benign or malignant. Clinical history was obtained from medical records department of the hospital in all the cases. Histopathologic findings were correlated with clinical and radiologic features.

OBSERVATIONS: A total of sixty- one specimens from sinonasal region were received in the histopathology laboratory over a period of three years, accounting for 0.47% of all surgical specimens. Forty- one non-neoplastic lesions (67.21%) and twenty neoplasms (32.79%) of various histologic patterns were reported. Among the neoplasms, twelve (60%) were benign and eight (40%) were malignant. Both non-neoplastic and neoplastic lesions showed a slight male predominance, with a male to female ratio of 1.2:1 and 1.5:1 respectively. The age of these patients ranged from eleven to seventy- five years. Most patients were in the third decade of life (Table 1).

Simple nasal polyps were the commonest of all non-neoplastic lesions in the sinonasal region, accounting for thirty- three cases (80.49%) (Table 2). Most patients were in the second and third decades of life. The youngest patient was thirteen years old and the oldest was fifty- six years old. The common presenting symptoms were mass protruding from the nostril and nasal obstruction. Other symptoms included watery or mucoid discharge, headache, and sneezing. Nasal cavity, maxillary and ethmoid sinuses were the commonly involved sites. Eleven cases were bilateral. On gross examination, polyps were soft, grape-like structures, with a glistening surface. They were further categorised as inflammatory (17 cases- 51.52%) and allergic (16 cases- 48.48%), based on the predominant inflammatory cell infiltrate. Microscopic examination of inflammatory polyps revealed lining respiratory epithelium. The stroma was edematous, with an infiltrate of lymphocytes, plasma cells, neutrophils, and eosinophils. Mucous glands and fibroblasts were also noted. Allergic nasal polyps showed an abundance of eosinophils along with other inflammatory cells.

Chronic sinusitis with nonspecific inflammation was noted in six cases (14.63%). These patients presented with nasal block and discharge. The maxillary sinus was involved in all the cases. Notable microscopic features were squamous metaplasia of the respiratory epithelium, chronic inflammatory infiltrate, edema, and glandular hyperplasia.

One case (2.44%) of mucocoele was reported in a fifty- nine year old female patient, who presented with mucoid discharge and nasal obstruction. Microscopically, it was composed of loose mucoid stroma, proliferating mucinous glands and chronic inflammatory exudate.

Rhinoscleroma (1case- 2.44%) was reported in a twenty- two year old male, who presented with a mass in the right nasal cavity. Characteristic Mikulicz cells (foamy histiocytes) and plasma cells were seen in the sub epithelium (Fig. 1).

Among the benign neoplasms, angiofibroma was the commonest (6 cases- 50%) (Table 3). Most of them presented as reddish mass in the nasal cavity with bleeding (Fig.2). It was common in the second decade of life, occurring almost exclusively in males. Histologically, the tumor was

composed of thin- walled blood vessels of varying size and architecture, in a fibroblastic stroma (Fig. 3).

Two cases (16.67%) of capillary hemangioma were reported, both in young girls; one of them occurred in the nasal septum and the other in the nasal cavity. Lobules of dilated capillaries were seen amidst areas of hemorrhage on microscopy.

Two cases (16.67%) of inverted papilloma were reported. Both patients were males in their sixth decade of life. They presented with mass in the nasal cavity and were diagnosed as nasal polyp clinically. Grossly, the tumors were polypoidal, white bits of tissue with undulant surface. They were composed of ribbons and islands of stratified squamous and respiratory epithelia, invaginating in to the edematous stroma. The epithelium had a “moth-eaten” appearance due to the presence of microcysts in one of them.

One case (8.33%) of columnar cell papilloma was reported in a seventy- five year old, who presented with bilateral nasal block and epistaxis. Microscopy showed a tumor composed of papillae lined by pseudostratified tall columnar cells with oncocytic cytoplasm, mucous microcysts and neutrophilic infiltrate.

One case of maxillary ameloblastoma (8.33%) was reported in a thirty- seven year old lady, who presented with pain and swelling in the region of right cheek. CT scan showed erosion of the floor of the maxillary sinus and dental sockets. Histopathological examination revealed sheets and follicles of proliferating odontogenic epithelium with peripheral palisading, hyperchromatic nuclei, reversal of polarity, and central stellate cells (Fig. 4).

Squamous cell carcinoma was the most common malignant neoplasm reported (4 cases- 50%) (Table 4). Two cases each were seen in the fourth and sixth decades. Tumors involved the right nasal cavity in three patients, with maxillary sinus also involved in one of them. The left nasal cavity and maxillary sinus was involved in one patient. Microscopy showed polygonal cells, arranged in nests and sheets, with pleomorphic nuclei, prominent nucleoli and numerous mitoses. Necrosis was seen in some foci. One of them was associated with a papilloma. All were categorised as poorly differentiated.

One case of adenoid cystic carcinoma (12.50%) was reported in a thirty- two year old female, who presented with a mass in the right nostril. The growth was firm to hard in consistency and eroding the medial wall of the maxillary sinus. On microscopy, the tumor was composed of round to oval basaloid cells with scant cytoplasm and hyperchromatic nuclei, arranged in cribriform pattern. These spaces were filled with eosinophilic hyaline material (Fig. 5).

One case of embryonal rhabdomyosarcoma (12.50%) was reported in the left maxillary sinus of a thirty- four year old woman. CT showed erosion of the maxilla, hard palate and left orbit (Fig. 6). Histology showed sheets of poorly differentiated, small, dark, round cells with areas of hypocellularity, necrosis and numerous mitoses (Fig. 7). The tumor cells were positive for Desmin and MyoD1, and negative for synaptophysin.

A case of sebaceous carcinoma (1 case-12.50%) was reported in a fifty- five year old lady, who presented with a gradually increasing mass in the nasal cavity. The growth was ulcerated and locally destructive. Histologic examination revealed an infiltrating malignant neoplasm composed of lobules of small, darkly staining, undifferentiated cells with oval nuclei, interspersed with cells with foamy cytoplasm. Numerous mitotic figures were noted (Fig. 8).

One case of metastatic renal cell carcinoma (12.50%) was reported in a sixty year old male without prior knowledge of the primary neoplasm. The tumor involved the right maxillary sinus and nasal cavity. CT scan reported a heterogeneously enhancing mass, occupying the right nasal cavity and maxillary sinus, and extending into the nasopharynx (Fig. 9). There was no obvious bone erosion. Microscopy showed normal respiratory epithelium with a tumor in the sub epithelium, composed of lobules of clear cells, separated by delicate vascular septae; cytokeratin, vimentin and CD10 were positive (Fig. 10).

DISCUSSION: Sinonasal lesions display a complex and interesting spectrum of histopathologic features. While the non-neoplastic lesions are numerous, the morphologic variants of neoplasms are many. Most of them present as polypoid masses and are almost impossible to distinguish clinically; they are simply labeled as "nasal polyps". Histopathologic categorization is essential in the management of these lesions. The majority of sinonasal pathology is inflammatory, with neoplasms comprising approximately 3% of head and neck tumors.⁷

The incidence of sinonasal lesions was 20.33 cases per year, averaging 0.47% of surgical pathology material received in the Department of Pathology. The incidence of non-neoplastic lesions in the sinonasal region was 13.67 cases per year. This was consistent with the findings of Kulkarni MA et al⁸ (14.42 cases per year). Dasgupta A et al⁹ reported an incidence of 17.4 cases per year. In this series, out of a total of 61 cases, there were 41 (67.21%) non-neoplastic lesions and 20 (32.79%) neoplasms. Among neoplastic lesions, 12 (60%) were benign and 8 (40%) were malignant. Similar statistics were reported by Modh SK et al⁶, Mysorekar VV et al¹⁰ and Khan N et al¹¹.

Common symptoms recorded in our study were nasal obstruction (48 cases- 78.69%), polypoid mass (42- 68.85%), and nasal discharge (27 cases- 44.26%). Nasal obstruction and discharge were the commonest presenting symptoms in a study conducted by Bakari A et al¹² at a Nigerian centre.

True nasal polyps are tumor-like polypoid masses arising from nasal cavity and sinuses. Their formation is associated with inflammation, allergy, or mucoviscidosis. Choanal polyps arise from one of the paranasal sinuses: antrochoanal polyp is the most common.¹³ Allergic polyps are associated with nasal allergy and predominant eosinophilic infiltrate in the stroma whereas inflammatory polyps are found in chronic sinonasal infection. Eosinophils are not restricted to polyps having a presumed allergic pathogenesis, although they are more numerous in them.²

In our study, thirty- three cases (80.49%) of nasal polyps were reported. This was similar to the incidence reported by Khan N et al¹¹ (83.33%), Modh SK et al⁶ (82.06%) and Zafar U et al¹⁴ (82.06%). Lower incidence was reported by Kulkarni MA et al⁸ (69.3%) and Dasgupta et al⁹ (62.85%). The relative incidence of inflammatory and allergic polyps in this study (1.06:1) matched that reported by Dafale SR et al¹⁵ (1.38:1). The peak age of presentation was in the 2nd and 3rd decades of life, which was similar to that observed by these authors. Slight male predominance (1.36:1) was reported in this study. Dasgupta et al⁹ (1.39:1) and Modh SK et al⁶ (1.53:1) reported similar sex ratio in their study.

The maxillary sinus is the most commonly involved site for chronic sinusitis.¹⁶ Six cases (14.67%) of chronic sinusitis with nonspecific inflammation were reported in our study, all of them involving the maxillary sinus and the nasal cavity. Kalpana Kumari MK¹⁷ et al reported 8 cases of nonspecific inflammation, in their series of 66 non-neoplastic lesions.

Mucocele is a complication of chronic sinusitis in which accumulation of inflammatory exudate and mucin secreted by the hyperplastic glands lifts the epithelial lining of the sinus and the periosteum away from the underlying bone.¹⁸ Incidence of mucocele (1 case- 2.44%) in our study matched that of Wahid FI et al¹⁹ (2.22%). Sharma R et al⁷ reported a higher incidence (7%) in their study of 223 cases.

Rhinoscleroma is a chronic progressive infectious disease of the upper respiratory tract, the nose being the most common site affected. It is caused by an organism of the Klebsiella group.²⁰ The disease is due to an altered immune response with impaired cellular immunity, leading to accumulation of distended phagosomes, called Mikulicz cells. The disease is common in North India.²¹ One case (2.44%) of rhinoscleroma was reported in our study, in a twenty- two year old male. The patient presented with nasal discharge and obstruction. Similar incidence was reported by Dasgupta et al⁹ (1.2%), Modh SK et al⁶ (1.82%), and Zafar U et al¹⁴ (4.83%). Higher incidence (15.84%) was reported by Kulkarni MA et al⁸ from Kolhapur, Maharashtra.

Among benign tumors, non epithelial tumors were more common than epithelial tumors. Juvenile angiofibroma constitutes 0.5% of all head and neck tumors. It occurs almost exclusively in males during adolescence. Abnormal blood vessels of different sizes and irregular architecture are embedded in a myofibroblastic stroma. It is histologically benign but locally destructive, with a tendency to recur.²² It was the commonest non-epithelial benign neoplasm (50%) in the present study. 41.67% was the reported incidence in a similar study conducted by Modh SK et al⁶. Khan N et al¹⁷ reported an incidence of 42.85% among benign lesions in this region.

Capillary hemangioma is a benign vascular tumor that is unusual in the nasal cavity. Suggested etiologic factors include trauma and hormones.²³ Histologically, it is characterised by submucosal vascular proliferation arranged in lobules or clusters of central capillaries and smaller ramifying tributaries.⁵ It was the second most common non-epithelial benign neoplasm (16.67%) in the present series. Modh SK et al⁶ and Sharma R et al⁷ reported an incidence of 19.4% and 11% respectively in their studies.

Inverted papillomas are gray-white prune-like polypoid tumors, common in the 6th decade, with a strong male predominance (3:1). Dysplasia is seen in approximately 10% of cases.²⁴ These tumors are aggressive, tend to recur following surgery and are known to undergo malignant transformation.²⁵ It was the commonest benign epithelial neoplasm in various studies [current study (16.67%), Kulkarni MA et al⁸ (15.38%), Narayanaswamy KV et al²⁶ (13.33%), Sharma R et al⁷ (20%)].

Columnar cell papilloma is an uncommon (3-5%) variant of Schneiderian papilloma. Also known as oncocytic schneiderian papilloma and cylindrical cell papilloma, it is the rarest of the three morphologic variants of schneiderian papillomas. Its behaviour is unpredictable: may show both recurrence and malignant transformation if not completely excised. Its differential diagnosis includes low grade sinonasal papillary adenocarcinoma, non-keratinizing squamous cell carcinoma, and rhinosporidiosis.²⁷ One case (8.33%) was reported in our study. Panchal L et al²⁸ reported one case among twenty benign neoplasms.

Ameloblastoma is a benign but locally aggressive odontogenic tumor, rarely seen in the maxilla. It presents as a slow and painless growth, possibly arising from pluripotent cells in the basal layer of the sinonasal epithelium.²⁹ One case (8.33%) of maxillary ameloblastoma was reported in

our study. Narayanaswamy KV et al²⁶ also reported 1 case (3.33%) in their study of 30 benign tumors.

Malignancies in the sinonasal region constitute an important and varied group, accounting for 0.2-0.8% of all carcinomas and only 3% of those in the upper aero digestive tract.⁵ They are often mistaken for simple nasal polyps or chronic inflammatory disease, resulting in delayed diagnosis. Malignant tumours in this location are not common in our country. However carcinomas are, by far, the commonest.⁹ Squamous cell carcinoma is the most common type and maxillary antrum, the most common site.²⁴

Squamous cell carcinomas were the most common malignancies (50%) in this series. Similar incidence was reported by Panchal L et al²⁸ (53%), Modh SK et al⁶ (43.75%) and Sharma R et al⁷ (42%). These patients presented with mass, nasal obstruction, epistaxis and pain. Common sites were nasal cavity and maxillary sinus. One case was associated with squamous papilloma, underlining the importance of thorough sampling.

Adenoid cystic carcinoma is the most common malignant salivary gland tumor of the sinonasal tract. Maxillary sinus and nasal cavity are the common sites of involvement. The tumor is composed of small, hyperchromatic nuclei arranged in the classic cribriform pattern. The spaces contain hyalinized eosinophilic material.⁵ Similar pattern was reported in the solitary case was reported in the present series (12.5%). Sharma R et al⁷ also reported 1 case (5%) in their study. Panchal L et al²⁸ (17.8%) and Dasgupta et al⁹ (19.5%) reported 8 cases each in their large series.

Rhabdomyosarcoma comprises upto 50% of all soft tissue sarcomas of the head and neck, among all age groups. 15% of these occur in adults, of which 10-15% is seen in paranasal sinus. Embryonal rhabdomyosarcoma is a common subtype, often associated with mucosal or epithelial surface. Histologically, it bears a close resemblance to various stages in the skeletal muscle embryogenesis: small, round, undifferentiated cells, rhabdomyoblasts, and myxoid matrix. The tumor cells were positive for Desmin and MyoD1.³⁰ One case (12.50%) was reported in the left maxillary sinus of a 34-year old woman. The tumor was seen extending into the left orbit. Diagnosis was confirmed with immunohistochemistry. Modh SK et al⁶ also reported one case in their study (6.25%).

Sebaceous carcinoma is rare in the nasal cavity. It is often misdiagnosed as squamous cell carcinoma. The morphologic hallmark of sebaceous differentiation is the detection of sebaceous cells, with multiple clear cytoplasmic vacuoles containing fat.³¹ One case (12.50%) of sebaceous carcinoma was reported in this study, in a 55 year old female who presented with a mass in the nasal cavity.

Sinonasal area is an unusual site for metastatic tumors. Kaminski et al³² reported one case of renal cell carcinoma in the maxillary sinus among 46 cases of metastatic tumors in the head and neck region. One case of metastatic renal cell carcinoma (12.50%) was reported in the present study. Diagnosis was clinched based on the uninvolved epithelium, typical architecture, and IHC.

CONCLUSION: Non-neoplastic and neoplastic lesions in the sinonasal region have similar clinical and radiological manifestations, with only a provisional diagnosis possible in most cases. Definitive diagnosis requires histopathological examination, as most lesions are either inaccessible for fine needle aspiration cytology or is not recommended for fear of hemorrhage. Categorization based on histopathology is therefore mandatory for management and prognosis of these uncommon lesions.

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Age range in years	Non-neoplastic	Neoplastic benign	Neoplastic malignant	Total no. of cases	Total in percentage
0-10	-	-	-	-	-
11-20	05	07	-	12	19.67%
21-30	19	01	-	20	32.79%
31-40	09	01	03	13	21.31%
41-50	04	-	-	04	6.56%
51-60	04	02	05	11	18.03%
61 and above	-	01	-	01	1.64%

Table 1- Age- wise distribution of lesions in the sinonasal region

Diagnosis	No. of cases	Percentage (%)	No. of males	No. of Females
Nasal polyps -Inflammatory - 17(51.52%) -Allergic - 16(48.48%)	33	80.49%	19	14
Chronic sinusitis	06	14.63%	02	04
Mucocele	01	2.44%	-	01
Rhinoscleroma	01	2.44%	01	-

Table 2- Non-neoplastic lesions in the sinonasal region

Diagnosis	No. of cases	Percentage (%)	No. of males	No. of Females
Angiofibroma	06	50%	06	-
Capillary hemangioma	02	16.67%	-	02
Inverted papilloma	02	16.67%	02	-
Columnar cell papilloma	01	8.33%	01	-
Ameloblastoma	01	8.33%	-	01

Table 3- Benign Neoplasms in the sinonasal region

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Diagnosis	No. of cases	Percentage (%)	No. of males	No. of Females
Squamous cell carcinoma	04	50%	02	02
Adenoid cystic carcinoma	01	12.5%	-	01
Embryonal rhabdomyosarcoma	01	12.5%	-	01
Sebaceous carcinoma	01	12.5%	-	01
Metastatic renal cell carcinoma	01	12.5%	01	-

Table 4- Malignant neoplasms in the sinonasal region

Fig.1. Rhinoscleroma: photomicrograph showing characteristic Mikulicz cells (foamy histiocytes) and plasma cells in the subepithelium. (H&E, 10x)

Fig.2. Angiofibroma: CECT PNS, coronal section showing an irregularly enhancing lesion in the left nasal cavity and nasopharynx.

Fig.3. Angiofibroma: photomicrograph showing thin-walled blood vessels of varying size and architecture, in a fibroblastic stroma. (H&E, 40x)

Fig.4. Ameloblastoma: photomicrograph showing follicles of proliferating odontogenic epithelium with peripheral palisading, hyperchromatic nuclei, reversal of polarity,

Fig.5. Adenoid cystic carcinoma: photomicrograph showing basaloid cells arranged in cribriform pattern. The spaces are filled with eosinophilic hyaline material. (H&E, 10x)

Fig.6. Embryonal rhabdomyosarcoma: CECT PNS, axial section showing a malignant growth in the left maxillary antrum, involving the orbit.

Fig.7. Embryonal Rhabdomyosarcoma: photomicrograph showing sheets of poorly differentiated, small, dark, round cells with areas of hypocellularity, and numerous mitoses.

Fig.8. Sebaceous carcinoma: photomicrograph showing lobules of undifferentiated cells interspersed with cells with foamy cytoplasm. (H&E, 40x)

Fig.9. Metastatic RCC in the right sinonasal region: CECT PNS, coronal view, showing heterogeneously enhancing mass occupying the right nasal cavity and maxillary sinus.

Fig.10. Metastatic RCC in the sinonasal region: photomicrograph showing respiratory epithelium with an underlying tumor composed of lobules of clear cells, separated by delicate vascular septae (Left: 10x, H&E); the tumor cells were positive for cytokeratin, CD10 and vimentin (right: 10x).

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