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A Retrospective Study on Histomorphological Analysis of Sinonasal Polyps at A Tertiary Care Centre in A Rural Area of South India

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Abstract

In clinical settings, it is common to encounter a variety of non-neoplastic and neoplastic disorders affecting the paranasal sinuses and nasal cavity. This study's main goal was to examine the histological and clinical features of polypoidal masses in the paranasal sinuses and nasal cavity at a tertiary care hospital in kerala between March 2020 and March 2023. This retrospective investigation covered 202 cases of polypoidal masses in the nasal cavity and paranasal sinuses over a three-year period (March 2020 to March 2023) (122 males, 80 females; age range: 10 years to 83 years). All tissues were treated and stained with hematoxylin and eosin after being fixed in 10% buffered formalin for routine histopathological examination. These 202 cases were divided into two general categories: lesions that were malignant and non malignant. These lesions were more prevalent in third and fourth decades of life with male preponderance. Of the masses seen in the nasal and paranasal sinuses, 34 (16.8%) were neoplastic and 168 (83.1%) were non-neoplastic. Out of all the non-neoplastic masses, allergic polyps (47.61%) were the most prevalent and among benign neoplasms, Inverted papillomas (45.46%) were most common. Squamous cell carcinoma and adenoid cystic carcinomas (27.07%) were the most common among malignant masses that occurred in the study population. We came to the conclusion that clinical, radiological, and histopathological correlation enables us to classify these sinonasal lesions into different non-neoplastic and neoplastic lesions. A final histopathological examination confirms the diagnosis, though in a small number of cases, special stains, immunohistochemistry, and molecular studies were required.

OPEN ACCESS

Key Words

Histopathological, nasal and paranasal masses, non-neoplastic, neoplastic

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INTRODUCTION

The nasal cavity and paranasal sinuses together are referred to as the "sinonasal tract[1]. The air we breathe is filtered and made more humid by the sinonasal tract. In addition, the paranasal sinuses serve as resonating chambers during speaking and lessen the relative weight of the skull and the nasal cavity has particular receptors for sensing molecules of odour in the air. These functions subject the sinonasal tract to a variety of allergens, pathogens, irritants both chemical and physical and other environmental factors. As a result, multiple inflammatory conditions, infections, and neoplasms can arise[2], which in turn can cause polypoidal masses to form in the nasal area. Nasal mucous membranes and paranasal sinuses are the source of nasal polyps, also known as polypoidal masses. In clinical practice, these are the lesions that are most commonly found in the sinonasal tract[3]. Numerous indications and symptoms, including nasal blockage, running nose, blood-stained nasal discharge, epistaxis, facial edema and symptoms related to the mouth, orbit and ears, are linked to these polypoidal tumors[4]. There are two types of nasal polypoidal masses: non-neoplastic and neoplastic. Non-neoplastic lesions are the more prevalent type. There are basically two types: those linked to inflammatory or granulomatous pathology[5] and those linked to allergy, where histology shows eosinophilic infiltration of the stroma. Benign and malignant lesions are further classifications for neoplastic masses. The most prevalent benign lesions in the sinonasal region could mimic malignant lesions, resulting in erroneous diagnoses and invasive procedures[6]. Benign lesions often cause severe morbidity due to their frequent local recurrence and lengthy clinical history. Of all malignant tumors, less than 1% is found in the nasal cavity, paranasal sinuses and nasopharynx. These lesions are responsible for <3% of head and neck cancers. Geographically, these lesions are more common in Africans, Japanese and Arabians and less common in Americans and Western Europeans[7].

Given the variability in histology and stages of malignancy, it is imperative to study the pathological characteristics of these lesions. Since the clinical signs of polypoidal masses and other lesions frequently overlap, the diagnosis of these lesions can be made via nasal endoscopy, radiographic investigation and histology. A histopathological study is still the gold standard for a conclusive diagnosis, even if a preliminary diagnosis is typically given based on clinical characteristics and imaging methods[8]. We intend to examine the histopathological patterns of polypoidal and other masses in the sinuses and nasal cavity over a period of three years at Karuna Medical College in Chittur, Palakkad, Kerala, India, in light of this data.

MATERIALS AND METHODS

The 202 sinonasal polypectomy biopsy specimens that were received by the pathology department of Karuna Medical College, Palakkad, a tertiary care facility in Chittur, Kerala, over a three-year period between March 2020 and March 2023, are the subject of this retrospective and observational study. From histopathology request forms and MRD records, demographic information on age, sex, chief complaints, clinical examination and radiological findings was obtained.

The masses or polyps in the nasal cavity, paranasal sinuses and nasopharynx that required surgical intervention served as the inclusion criterion for case selection. Every biopsy that was received was preserved in 10% buffered formalin. Haematoxylin and eosin staining was carried out for the histopathological examination following the standard gross examination and processing. When necessary, special stains, immunohistochemistry and molecular analysis were employed.

Ethical Issue: The study was evaluated and approved by the ethics committee of our hospital, Karuna Medical College and Hospital on 29.11.2023

RESULTS AND DISCUSSIONS

The current study included 202 instances, with a mean age of 43.3 years and a patient age distribution ranging from 10-83 years. Male to female ratios of 1.5:1 were frequently observed in patients in their third and fourth decades. In 80 patients (78.4%), nasal obstruction or block was the most prevalent presenting symptom. Sneezing, an allergic symptom was reported in 62 patients (60.78%). Headache, nasal discharge, nasal bleeding, voice change, diminished sense of smell and facial puffiness were among the less frequent complaints. Of the 202 cases in total, 16 cases involved the nasopharynx, while the majority had masses in the nasal and paranasal sinuses. A histopathological analysis of these indicated the presence of 34 (16.9%) neoplastic lesions and 168 (83.1%) non-neoplastic lesions.

Thirty of the 168 non-neoplastic cases had an infectious etiology, but the remaining did not. The most prevalent type of polyps was allergic, accounting

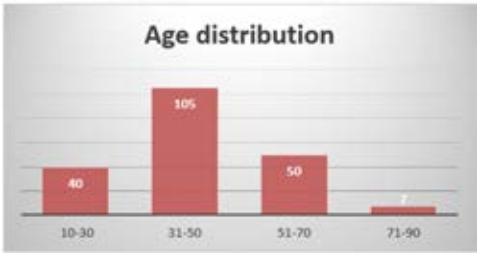

Chart 1: Age wise distribution of study participants

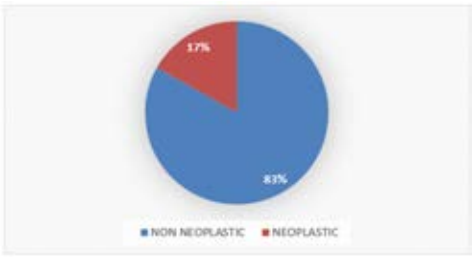

Chart 2: Neoplastic and non-neoplastic distribution of cases

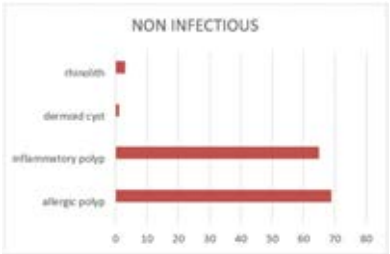

Chart 3: distribution of non-neoplastic (non-infectious)

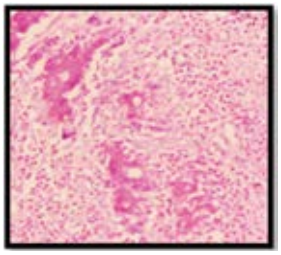

Fig. 1: HE (4X) Entomophthoromycosis showing large fungal hyphae with splendore-Hoeppli phenomenon and dense eosinophilic infiltration

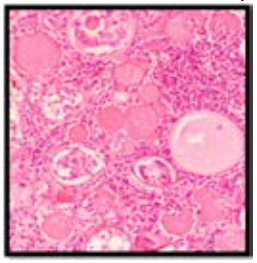

Fig. 2: HE (10X) Rhinosporodiosis - Globular sporangia of varying sizes containing numerous spores

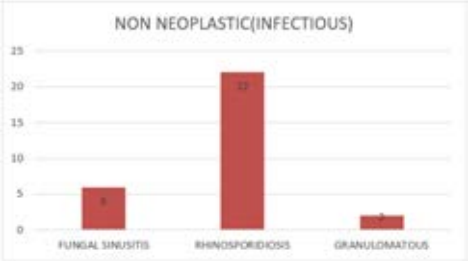

Chart 4: Distribution of Non neoplastic (infectious) cases

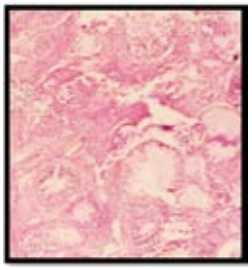

Figure 3: HE (4X) Respiratory epithelial adenomatoid hamartoma (REAH) showing proliferation of medium sized glands lined by respiratory epithelium

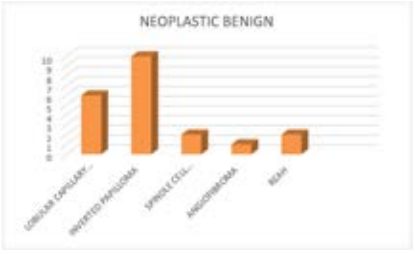

Chart 5: Distribution of neoplastic (benign) cases

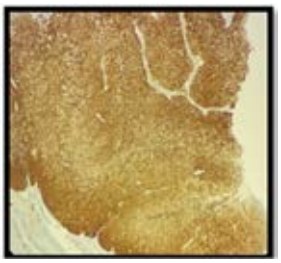

Figure 4: IHC (4X) non keratinising squamous cell carcinoma positive for IHC Marker P16-HPV

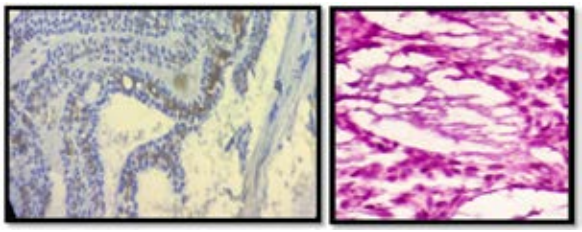

Figure 5: IHC (40X) adenoid cystic carcinoma positive for IHC Marker CD117 and insert HE(40X) adenoid cystic carcinoma

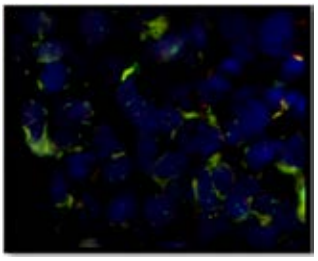

Figure 6: FISH analysis of biopsy section shows presence of cells that are POSITIVE for IRF4/DUSP22 gene rearrangement on chromosome 6, band p25.3

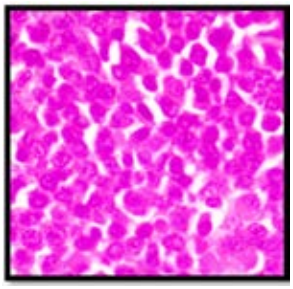

Figure 7: HE (40X) plasmablastic myeloma with sheets of plasmablasts having nuclei with cart wheel chromatin

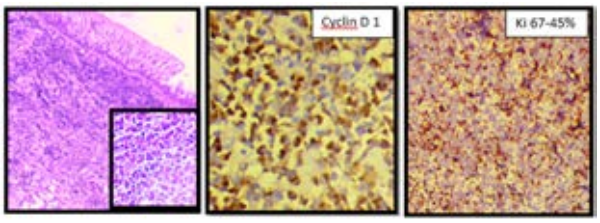

Figure 8: H andE(4X and insert 40X) Mantle Cell Lymphoma, Fig 9 and Fig 10: IHC marker Cyclin D1 nuclear positivity and ki-67 showing 45% positivity

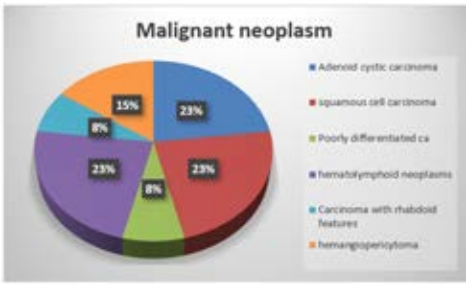

Chart 6: Distribution of neoplastic (malignant) cases

for 69 cases (41.07%). Non-specific inflammatory polyps were found in 65 cases (38.69%)and22 cases (13.09%) of rhinosporidiosis, 6 cases (3.5%) of fungal infections, 3 cases of rhinolith (1.7%), 2 cases of granulomatous lesions (1.1%), and one dermoid cyst (0.5%) were also found.

The most common polyps seen in the sinonasal region were inflammatory and allergic, peaking in the second and third decades of life. Most of the patients had bilateral polyps and their presenting symptoms included nasal discharge, headaches, congestion and obstruction. Under microscopy these polyps were made up of mucous glands bordered by respiratory epithelium and loose mucoid stroma. This loose stroma had an inflammatory infiltration of neutrophils, eosinophils, plasma cells and lymphocytes. Eosinophilic infiltration was higher in allergic polyps than in other inflammatory polps. Infections with fungi were observed in the third and fourth decades. They manifested as malodorous discharge and upon microscopy, showed signs of inflammation, abscess, and granuloma. Fungal elements tested positive for specific stains, such as Gomori's Methenamine Silver and Periodic Acid-schiff and demonstrated by fungus cultures on Sabouraud's dextrose agar medium. The most prevalent fungal infection was aspergillosis, which was followed by mucormycosis. When entomophthoromycosis was examined microscopically, it was found that two of the cases had dense eosinophilic infiltration, angioinvasion with thrombosis, and big, broad, sparsely septate, thin-walled fungal hyphae with Splendore- Hoeppli phenomenon. [Fig 1]

The majority of cases of rhinosporodiosis were observed in the fifth decade, and microscopic analysis revealed a large number of characteristic globular sporangia containing many spores. [Fig 2]

Thirteen cases (38.23%) of malignant tumors and twenty-one (61.76%) of benign tumors were found among the 34 neoplastic lesions. The inverted papilloma was the most frequent(10 cases-47.61%) among benign lesions.The remaining patients were six cases of capillary hemangioma (28.57%), two cases of spindle cell neoplasms (schwannoma) (9.5%), two cases of respiratory epithelial adenomatoid hamartoma (REAH) (9.5%) and one case of angiofibroma (4.7%).Inverted papillomas manifested as nasal obstruction and epistaxis In the second and third decades. Microscopically, they were made up of downward-growing, interconnected, round to elongated epithelial nests with smooth outer contours, bordered by hyperplastic, respiratory, transitional, and squamous cells accompanied by transmigrating neutrophils. Angiofibromas made of blood vessels in a fibrous stroma and REAH composed of proliferation of medium-sized glands surrounded by a thick basement membrane and lined with respiratory epithelium. [Fig 3], were seen in the second decade of life.

Capillary hemangioma and schwannoma, two benign tumors, were seen in the third and fifth decades and had a distinctive microscopic appearance.

Of the 13 malignant cases, the majority consisted of three cases each of squamous cell carcinoma and adenoid cystic carcinoma (23.07%), followed by three cases each of hematolymphoid malignancies (23.07%), which included one each of follicular lymphoma, mantle cell lymphoma, and plasmablastic myeloma; one case of carcinoma with rhabdoid features, one case suggestive of poorly differentiated carcinoma and two cases (15.4%) of hemangiopericytoma (solitary fibrous tumor).

In the sixth and seventh decades, squamous cell carcinoma was the most frequently occurring malignant lesion. Two of the squamous cell carcinomas were non-keratinizing variants and one of those had

the Human Papilloma Virus(HPV) relationship validated by positivity for immunohistochemistry marker P16 (Fig 4).

Three cases of adenoid cystic carcinoma were the next most frequent. First case, immunohistochemistry revealed positive results for the myoepithelial markers S-100, SMA, and calponin [Fig. 5] as well as the epithelial markers CK7, CD117. Amongst the two cases of hemangiopericytoma one had round to oval tumor cells clustered around vessels and seemed highly cellular under the microscope. However, it also had mild atypia and was positive for the immunohistochemical markers CD34, SMA, BCL2 and CD99.

Immunohistochemistry was used to confirm hematolymphoid neoplasms in all three cases, and molecular genetics was used in one. Atypical lymphoid proliferation was observed in the first case of hematolymphoid neoplasm, with large B lymphoid cells primarily organized in a follicular pattern and positive for CD10, MUM-1, and BCL-6.Before treating the case as a reactive lymphoid infiltrate, molecular genetic testing (FISH FOR IRF4/DUSP22 gene rearrangement) was performed to rule out the likelihood of B cell Non-Hodgkin lymphoma. It was diagnosed as large B cell lymphoma with IRF4 rearrangement and demonstrated positivity for IRF4/DUSP22 gene rearrangement on chromosome 6, band p25.3 (Fig. 6). The other two were Mantle cell lymphoma with CD20 and Cyclin D1 positivity and plasmablastic myeloma with CD138, LCA, MUM-1, and Lambda light chain positivity [Fig. 7]. [Fig 8, Fig 9 and Fig 10]

A 60-year-old woman who presented with nasal hemorrhage had a rare rhabdoid-looking carcinoma that showed positivity for CK7, Vimentin, EMA, CD10, and PAX8. As CD10, Vimentin and PAX8 were positive, metastases from kidney was a differential diagnosis and investigations for same was suggested. Unfortunately the patient was lost for follow-up. The other malignant lesion was signed out as poorly differentiated carcinoma as immunohistochemistry was inconclusive.

Clinical distinction is challenging due to the wide spectrum of non-neoplastic and neoplastic lesions seen in the sinonasal tract. Many of these lesions are widely thought to have an allergic or infectious origin and are frequently classified as nasal polyps[9]. Benign sinonasal diseases are a major cause of hospital visits, which emphasizes the importance of this subject. Making the right diagnosis and starting the right therapy are significantly delayed when benign and malignant lesions cannot be differentiated during the initial presentation.

These masses in the current investigation, exhibited a preference for males, showing a male to female ratio of 1.52:1, which is comparable to that of a study by Zafar *et al*.[10] According to a research conducted in Nigeria, the M:F ratio was 1:1.2, with a preponderance of females[11]. Similar to previous research, nasal discharge, headache, nasal obstruction, epistaxis and loss of smell were the most prevalent presentations of sinonasal tumors[10,11].

In terms of age distribution, the present study was in accordance with Bakari *et al.*'s observation, with second and fifth decades of life the most susceptible to non-neoplastic lesions[11]. In line with Patel et al., malignant lesions have typically been reported in the sixth and eighth decades[12]. In our analysis, non-neoplastic lesions accounted for 83.1% of all cases. Similar to this, a sizeable percentage of non-neoplastic lesions are also documented in the study conducted by Zafar *et al.,*[10] which found 89% of non-neoplastic lesions.

The most frequent lesions in the nasal cavity are nasal polyps. Although the precise etiology is unknown, allergies, asthma, aspirin sensitivity and infections are strongly linked to it. Similar to Modh *et al.,* six cases of fungal infection were observed in our investigations in the third and fourth decade[13]. In a three-year study period, we discovered 22 cases of rhinosporodiosis (13.09%) which is high compared to study conducted by Pradhananga *et al*.[14] Rhinosporodiosis Seeberi, the source of this persistent infectious lesion, is endemic to south India, Sri Lanka, South America and Africa[15]. This study, which was carried out in South India, is consistent with a study by Capoor MR *et al*.[15]

Ten cases of Inverted papillomas have been seen by us, these represent 47.6% of all benign neoplastic masses, which is marginally more than the findings of Humayun *et al.,*[16] (33.33%). Similar to the findings of three cases by Parajuli S *et al.,* we have documented one case of angiofibroma in a male in their second decade who presented with recurrent epistaxis with nasal obstruction[17]. These are common lesions seen in young individuals. Capillary hemangiomas made 28.57% of benign neoplasms, which is marginally more than 19.4% found by Modh *et al*.[13] These lesions presented as nasal obstruction and bleeding nasal polyps. Instead of being considered a l tumor, this one has been diagnosed as a hamartoma or malformation. According to Modh *et al.,* Schwannoma are rare in nasal cavity and we came across two cases in females in their second decade[13]. Histology showed uniform spindle cells with palisading nuclei organized in the Antoni A and Antoni B patterns (Verocay body).

In this region, malignant tumors are quite rare[17]. Malignant polypoidal tumors can occasionally be misdiagnosed as simple nasal polyps or persistent inflammatory masses. The most prevalent histological type is squamous cell carcinoma[18]. Similar to Modh *et al.,* squamous cell carcinoma comprised 23.07 percent of the cases in our study. After squamous cell

carcinoma, adenoid cystic carcinoma is the second most common malignant tumor of the nasal cavity and paranasal sinuses. Amongst the head and neck adenoid cystic carcinomas,sinonasal adenoid cystic carcinoma accounts for 10-25% o cases[19]. After the maxillary sinus, the nasal cavity is the second most common location for this tumor[20]. Three cases of (23.07%) adenoid cystic carcinomas were found in the nasal cavity of the current investigation, which was next to squamous cell carcinoma. The subsequent malignant entities observed in this investigation were haematolymphoid neoplasms, accounting for 23.07% of the total. This figure is marginally greater than that reported by Grau C *et al.,*[21] which indicated 17%of which Plasmablastic myeloma, which is very rare was seen in our series. Roughly 80% of isolated extramedullary (extraosseous) plasmacytomas are identified in the upper respiratory tract, with the most frequent site of involvement, varying from 35-54%, in the sinonasal area[22]. Large B cell lymphoma with IRF4 rearrangement (LBCL-IRF4) is a rare and generally indolent lymphoma that primarily affects young adult and pediatric patient's cervical lymph nodes and Waldeyer's ring[23]. Compared to many Diffuse Large B cell Lymphoma (DLBCL), Large B cell lymphoma with IRF4 rearrangement (LBCL-IRF4) may have relatively bland cytologic features morphologically. Immunophenotypically, it frequently expresses all three of the Hans classifier markers (CD10, BCL6 and MUM1)[24]. These results were consistent with the findings of the current study, which found large atypical lymphoid cells and B cell lymphoma with IRF4 rearrangement in young adults. Given its unique prognosis, Large B cell lymphoma, IRF4 is a crucial aspect to take into account during the work-up of sinonasal Large B cell lymphomas. Additionally, its behavior adds credence to the idea that the pathophysiology and behavior of lymphomas are influenced by regional microenvironmental elements along the sinonasal tract. Mantle cell lymphoma (MCL), an aggressive lymphomas are seen only in 3-4% of Waldeyer's ring lymphomas and 5% of NHLs[25]. With a male-to-female preference ratio of 2.5:1, Mantle cell lymphoma has a median diagnostic age of 68 years.[25] There have only been five cases of nasopharyngeal Mantle cell lymphoma recorded in the English literature, as far as we are aware[259]. The current study's age, sex and Mantle cell lymphoma incidence are similar to the results before.

Classifying lesions into non-neoplastic and neoplastic categories was done in the present study, and the results were then compared with those from earlier studies. A noteworthy incidence of malignant lesions was found in our investigation. As far as non-neoplastic lesions go, allergic polyps were the most common type. The most common benign neoplastic lesion was inverted papilloma, but the most common malignant lesions were squamous cell carcinoma and adenoid cystic carcinoma. Our investigations include rare entities such as Mantle cell lymphoma, plasmablastic myeloma and large B cell lymphoma with IRF4 rearrangement. For the majority of benign and non-neoplastic masses, surgical excision is the primary modality of treatment, in contrast, malignant masses frequently necessitate extensive surgical excision, radiation and/or chemotherapy. Regular and consistent follow-up is necessary to identify metastases or recurrences in a timely manner.

CONCLUSION

The nasal cavity and paranasal sinuses are common sites of tumor in the modern healthcare environment, and they can be difficult to diagnose and treat. The aim of this study is to clarify many possible diagnoses for sinonasal masses, with a focus on their association with histological results. Given that rhinosporidiosis is prevalent among cases, more investigation into its relationship to epidemiological and demographic aspects can now be conducted.

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