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A Computed Tomographic Diagnosis Of Paranasal Sinus Diseases

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ABSTRACT

As a typical presenting symptom in ordinary otolaryngology practice, nasal obstruction has several potential differential diagnoses. They need to go through certain tests to get a final diagnosis. For illnesses of the central nervous system, a computed tomography scan is excellent. The use of coronal CT to image the paranasal sinuses has been on the increase due to the fact that FESS necessitates a detailed plan of the sinus architecture and the degree of the illness.
Fifty individuals with headache, nasal blockage, nasal discharge, and epistaxis were enrolled in a descriptive cross-sectional observational study at the Department of Radiology at Khaja Bandanawaz University, Faculty of Medical Sciences, Kalaburagi. The patients were referred from the Department of Otolaryngology. They had their CT scans analyzed. The research lasted for a whole 18 months. The age range of the patients included in this research was 18–77 years, with 24 instances falling into the 31–50 age bracket as the most prevalent. Nasal blockage was reported in 50 instances, with headache and nasal discharge following at 42 occurrences each. The DNS on the right side was more popular. The maxillary sinus was the most often affected at 92.5%, followed by the ethmoid at 59.2%, the frontal at 48.1%, and the sphenoid at 33.3%. Thirteen instances were found to have fungal sinusitis. Four of the nine instances of polyps were antrochoanal. There were three instances of neoplasms; two of them were tumors of the epithelial kind, and one was not.
The study found that when it comes to paranasal sinus illnesses, CT assessment is the way to go for diagnosis and treatment planning.

Keywords: Computed tomography, deviated nasal septum, functional endoscopicsinus surgery, paranasal sinus.

I. INTRODUCTION

For the detection and assessment of sinonasal cavity inflammatory disorders, computed tomography (CT) imaging is still the gold standard. Problems with the maxillary and frontal sinuses may be easily seen on a standard plain radiograph. In addition to the frontal recess and the top thirds of the nasal cavity, they provide limited views of the anterior ethmoid cells. Computing tomography (CT) and magnetic resonance imaging (MRI) have largely replaced traditional radiography as the imaging modalities of choice for the peripheral nervous system (PNS). Thanks to developments in these two imaging techniques, PNS illnesses may now be more precisely differentially diagnosed, and their anatomical extents can be better understood. These provide the otolaryngologist all the data they need to make a diagnosis and arrange the surgery. While computed tomography (CT) scans might shed light on finer points, the foundation for a diagnosis is still the patient's history of symptoms and the results of a nasal endoscopy. Sinonasal lesions are frequent in clinical practice and may be caused by a range of illnesses, including inflammatory disorders, non-neoplastic ailments, and cancers. Incidence estimates range from 1% to 4% of the population. Of all carcinomas, 0.2% to 0.8% are sinus and nasal neoplasms. Sinonasal tumors are difficult to treat because they often manifest late and are located near vital anatomical features like the brain and eye. There may be comparable resection scales with less morbidity thanks to the growing use of endonasal endoscopic methods for their removal.

1.1 AIMS AND OBJECTIVES

PRIMARY OBJECTIVES:

1. Using computed tomography, research the paranasal sinuses' anatomy and its variations.
2. Use computed tomography to investigate the pattern of pathological changes in disorders affecting the paranasal sinuses.

SECONDARY OBJECTIVES:

3. Its purpose is to investigate PNS neoplasms in relation to their location and potential metastasis to neighboring tissues.

II. REVIEW OF LITERATURE

CLINICAL ANATOMY:

Process of nasal development is ongoing, starting in third week of gestation with emergence of primordial structures and ending in early adulthood with the cessation of bone growth and sinus pneumatization.
Cranial ectoderm, located above stomatodeum, gives rise to the nose in the fourth intrauterine week, at 5.6 mm crown rump length, when paired thickenings known as the olfactory or nasal placodes become visible.
By 16th week of gestation, the maxillary sinus has expanded laterally from the infundibulum and is visible as a shallow groove. Sinus invasion of the maxilla begins at birth, with the bottom boundary around 4 mm above the nasal floor. Pneumatization and expansion persist till the ages of 8 to 9. In adulthood, the antral floor drops three or four millimeters below the level of the nasal cavity.
The ethmoid sinus forms in the sixteenth week of gestation from furrows that form between folds on the side wall of the nose. At birth, the cells are mostly invaginations of the nasal mucosa that develop into lateral ethmoidal masses. As the sacs continue to expand and absorb bone, they form a well-pneumatized cellular labyrinth. They develop at a leisurely pace up to the age of 6, after which they accelerate to attain their final form during puberty.
At birth, the frontal sinus is not there; it is not visible until a child is between the ages of six and twelve.

The invagination of the spheno-ethmoidal recess, which is the sphenoid sinus, becomes visible as early as the third intrauterine month. Fully aerated by the time it's eight years old, its dimensions at birth are 5 x 2 x 2 mm.

Sphenoid sinus:

Figure 6 shows the larger and lesser wings invaded by the sphenoid sinus, whereas Figure 7 shows the medial and lateral pterygoid plates of the sphenoid. The septum, which normally separates the sinuses, is sometimes not even there or very irregularly shaped. A dense layer of sphenoidal turbinates covers these sinuses on the front. Resting on the posterior ethmoid bone, it covers the sinus in its anterior aspect. Each side's sinus is able to connect with the nasal cavity via the spheno-ethmoidal recess, which is made possible by a foramen located in the center of each turbinate. It has a capacity of around 7.5 milliliters.

Dimensions-

- Height - 2 cm.
- Breadth - 1.8 cm.
- Depth - 2 cm.

Frontal sinus:

Above and deep to the superior ciliary ridges are the two frontal sinuses located in the frontal bone. Each sinus often has an uneven pyramid form with an upwards driven apex, and their sizes are typically unequal (Fig 8).The small septum of bone that separates them is usually sufficient (Fig. 8). Typically, males tend to have bigger sinuses compared to women. Diploic bone, with a thickness ranging from 1 to 5 mm, forms the anterior wall. The bone that makes up the posterior wall is more compact, yet it's thinner. On its way to the frontonasal duct opening, the floor has a steep medial dip before turning around. In the frontal recess region, the duct exits into the middle meatus. It contains around 6-7 milliliters.

Dimensions-

- Height – 28 mm.

- Breadth – 24 mm.
- Depth – 20 mm.

MALIGNANT TUMORS OF PARANASAL SINUSES:

Approximately 3% of all cancers in the head and neck are malignant tumors of the paranasal sinuses, which is rather unusual. Roughly half (50–65%) of sino-nasal malignancies start in the maxillary sinuses, ten to twenty-five percent in the ethmoid sinuses, and fifteen to thirty percent in the nasal cavity. Of all paranasal sinus cancers, eighty percent start in the maxillary antrum, and the yearly incidence in the United States and Europe is around one per one hundred thousand.

SQUAMOUS CELL CARCINOMA IMAGING

These lesions tend to degrade bone even when there is just a tiny visible mass, which is a major imaging and pathological characteristic. A little area of bony abnormalities and visible damage is significant because the density of squamous cell carcinoma and other types of carcinomas is comparable to that of neighboring secretions inside blocked sinuses. On rare occasions, carcinomas of the maxillary sinus may spread to other areas of the skull, such as the cranial cavity, ethmoid sinus, pterygopalatine, or infratemporal fossa. The degree of invasion, particularly orbital and cranial, should be noted radiologically since it determines the extent of surgery and if orbit eventeration is necessary.

By using computed tomography (CT) in both the axial and coronal planes, the tumor's spread into neighboring sinuses and other compartments may be seen, in addition to the borders of the density mass in soft tissues and the bone degradation. To distinguish tumors from inflammatory disorders or other sinus masses, contrast imaging is helpful. These tumors usually don't improve much after contrast. But IV contrast augmentation may be helpful, especially when cerebral or ocular invasion is suspected. The efficacy of radiation and chemotherapy may be evaluated via re-scans. Nevertheless, MRI is superior in this regard.

Malignant melanoma:

Malignant melanomas originate in the nasal cavity and paranasal sinuses in 0.5 to 1.5% of cases. The fifth decade has the greatest occurrence in these locations. It is rare for patients less than 30 years old to present themselves. No major bias towards one sex over the other exists. Melanocytes, normally found in the submucosa and mucosa, are the origin of these malignancies. The common extra nasal location is the maxillary antrum. Sinonasal melanomas do not cause any diagnostic symptoms. In contrast to the common complaints of pain and swelling, epistaxis affects more than 80% of patients. A newly polypoidal tumor, either single or multicentric, is the classic presentation of paranasal sinus malignant melanoma. Heavy pigmentation (looking black) or achromatic (looking pink tan) may characterize these malignancies. More over two-thirds of the melanomas will show easily discernible melanin. Everything else is a pale shade. Misdiagnosis may occur when melanin is scarce. Metastases, anaplastic carcinoma, lymphoma, rhabdomyosarcoma, and angiosarcoma are all part of this category.

Imaging:

The appearance of malignant melanoma on CT scans might vary and is not patient-specific. Neither the density nor the pattern of enhancement are distinctive features of the tumor. Soft tissue masses or mucosal infiltration inside these tumors (20-40 HU) are the hallmarks of these malignancies. Their association with aggressive bone breakdown is less common than with bone growth.

Ameloblastoma:

Approximately 0.1% of sinus tumors are present. Two-thirds of these are located in the mandible and twenty percent in the maxilla. They may be discovered in several places, including the molar region and the area next to the antrum. Orbit, ethmoidal sinuses, and pterygomaxillary fossa are typical locations for tumor metastasis.

III. METHODOLOGY

Imaging:

Ameloblastoma might be radiolucent in one or more locations. There is no new periosteal bone growth in the unilocular variation, but the shape is round to oval with clear borders and, every so often, a little marginal sclerosis. Expansion of the bone to varying degrees, sometimes with a scalloped edge, is also seen. Additionally, you may have issues including tooth displacement, erosion of the tooth apex, and loss of lamina dura. The CT results of an ameloblastoma lesion show a mixture of low-attenuation cystic and isodense regions, which represent the solid parts of the lesion. There is a wide range in the size of low attenuation cysts.

Extramedullary plasmacytoma:

In older persons, this tumor often manifests as a single polypoidal swelling. As a single radiolucent lesion, plasmacytoma may sometimes invade bone. The histology study shows a capillary network with sheets of plasma cells of varying ages. It is necessary to separate amelanotic melanoma from lymphoma, lymphosarcoma, and anaplastic cancer. Primary extramedullary plasmacytoma has an unpredictable and very variable clinical course. The best case scenario is a hostile subset that develops into multiple myeloma or plasma cell leukopenia and has recurrent local recurrences. Bone invasion is another bad indicator of prognosis beside local recurrence. Plasmacytomas are very vulnerable to radiation.

Imaging:

A reasonably well-defined tumor with expansile features, bone remodelling, erosion, and mild to notable enhancement following intravenous contrast administration characterizes a CT scan of a sinonasal tract plasmacytoma.

On computed tomography (CT), these growths manifest as moderate to strongly enhancing masses; they may be calcified, enlarging, and linked to bone degradation. Differentiating between benign and malignant hemangiomas is a daunting task.

Sarcomas:

It is more frequent to find chondrosarcomas and osteogenic sarcomas of the facial bone in the mandible than in the maxilla. Of all primary malignant neoplasms, 2% are osteogenic sarcomas.

Sarcomas, when seen on CT, tend to exhibit muscle-like measurements, a densely calcified mass (often in a whorled pattern with core hypodensity), and a non-calcified mass of soft tissue covering the tumor.

Lymphoma:

Very seldom do the nasal passages and paranasal sinuses get involved. Nasal and paranasal sinus lymphomas are non-hodgkins and are often seen in individuals with disseminated lymphoma, which is prevalent in African populations. According to conventional wisdom, the Epstein-Barr virus is to blame. Children between the ages of 4 and 8 often exhibit this condition. The most typical location is the maxilla.

Imaging:

Nose and paranasal sinus lymphomas might seem similar to more frequent things on CT, such as sinusitis, polyposis, benign and malignant neoplasms, and even sinusitis. Large, noticeable masses, with possible alterations that point to growth, erosion, or infiltration.

Metastatic lesions:

Sinonasal cavities are seldom metastasized from original tumors. Renal cell carcinoma ranks highest among primary cancers, with malignancies of the lungs, breast, prostate, testicles, and gastrointestinal system following closely behind. Rather of causing a thickening of the mucosa, tumors that have spread to the paranasal sinuses often invade their growth along the sinus borders. Hematogenic metastases to the bone are the most common kind of paranasal sinus cancer, and their clinical manifestations are strikingly similar to those of a primary malignant tumor in the nose or sinuses impacted by the tumor.

The walls of the sinonasal canals may be remodeled or destroyed by metastases from renal cell carcinoma and melanomas, which show up on CT scans as soft tissue masses that are significantly enhanced. In the prostate, as in other areas, sclerotic bone with aberrant, uneven borders and little or large pieces of soft tissue are common outcomes of lesions. In most cases, aggressive and bone-destroying metastases originate in the gastrointestinal system, distal GU tract, bladder, lungs, or breasts.

Fig.1 : Seimens Somaton. Multidetector computed tomography-16 slice

IV. RESULTS

Observations:

In Kalaburagi, researchers from Khaja Bandanawaz University's Department of Radio-diagnosis performed a descriptive cross-sectional observational study. The Department of Radio-diagnosis assessed fifty patients that received CT PNS over the course of eighteen months, from March 2021 to August 2022.

Table No.1: Demographics of PNS lesions

Age inyears (Yrs)	Males		Females		Total	
	No.	Percentage(%)	No.	Percentage(%)	No.	Percentage(%)
18-37	9	32.14	12	54.54	21	42.0
38-47	6	21.43	8	36.36	14	28.0
48-57	5	17.86	0	0	5	10.0
58-67	6	21.43	2	9.1	8	16.0
68-77	2	07.14	0	0	2	04.0
Total	28	100.0	22	100.0	50	100.0

The age range of 18–37 years accounted for the biggest number of cases in our research, with 21 cases (42.0%). Then, there were 14 instances (28.0% of the total) in the 38-47 age bracket, and 8 cases (16.0% of the total) in the 58-67 age bracket. The ages of the patients included in our research ranged from 18 to 72 years.

Table No. 2: Symptomatology of patients

Symptoms	Number of patients	Percentage (%)
Nasal obstruction	**50**	**100.0**
Nasal discharge	**42**	**84.0**
Headache	**42**	**84.0**
Fever	**13**	**26.0**
Epistaxis	**8**	**16.0**
Facial pain and swelling	**1**	**2.0**

Our study found that out of 50 cases, the most common symptom was nasal obstruction (100.0%). Other symptoms such as headache and nasal discharge were observed in 42 cases (84.0%) each. Eight cases (16.0%) had epistaxis, thirteen cases (26.0%) had fever, and the least common presenting symptom was facial pain with swelling (2.0%).

Table No. 3: Anatomical variants

Anatomical variants	No. of patients	Percentage (%)
Concha Bullosa	**18**	**60**
Paradoxical middleturbinate	**05**	**16.6**
Agger nasi cells	**03**	**10**
Haller cells	**02**	**6.7**
Onodi cells	**02**	**6.7**
Total	**30**	**100**

While 18 instances were discovered to have Concha bullosa, 5 cases had paradoxical middle turbinate, 3 cases had Agger nasi cells, and 2 cases had Haller cells or Onodi cells, respectively, were the most often seen anatomical variants in the study.

Table No. 4: Representing as per Keros classification of Olfactory fossa

Keros type	No. of patients	Percentage (%)
Type-I	**7**	**25.9**
Type-II	**19**	**70.4**
Type-III	**1**	**3.7**
Total	**27**	**100**

Nineteen of the patients in our research had keros type-I olfactory fossas, whereas one patient had keros type-III fossas.

Table No. 5: Representing deviated nasal septum in study population

DNS	Number of patients	Percentage (%)
Deviated to right	10	58.8
Deviated to left	7	41.2
Total	17	28.0

INFLAMMATORY AND INFECTIVE AETIOLOGY:

Table No. 6: Distribution of cases with inflammatory and infective aetiology

CT feature	No. of patients
Sinusitis	**8**
Mucocele	**4**
Polyps	**11**
Fungal infections	**13**
Total	**36**

We found 36 instances of inflammatory and infectious disorders; the most common of these was fungal sinusitis, which affected 13 patients; there were also 11 instances of polyps, 8 cases of sinusitis, and 4 cases of mucocele.

Table No.7: Age and gender wise distribution of cases with inflammatory and infective aetiology

Age in years(Yrs)	Males		Females		Total	
	No.	Percentage(%)	No.	Percentage(%)	No.	Percentage(%)
18-37	6	30	10	62.5	16	44.44
38-47	3	15	6	37.5	9	25.00
48-57	5	25	0	0.0	5	13.88
58-67	4	20	0	0.0	4	11,11
68-77	2	10	0	0.0	2	5.55
Total	20	100	16	100	36	100.0

The age bracket spanning 18–37 years accounted for 40.74 percent of the participants in this research with inflammatory and infectious reasons. There were 1.2 males for every female.

Table No. 8: Type of paranasal sinuses affected in inflammatory and infectiveaetiology

Paranasal sinuses	Number of patients	Percentage (%)
Frontal	13	48.1
Maxillary	25	92. 5
Ethmoidal	16	59.2
Sphenoid	9	33.3

In our research, the most frequent sinuses damaged were the maxillary sinus in 25 instances (92.5%), the ethmoidal sinus in 16 cases (59%), the frontal sinus in 13 cases (48.1%), and the sphenoid sinus in the least number of cases (93.3%).

Table No. 9: Distribution of patients with sinusitis (N=8)

Sinuses involved	Male	Female	Total	Percentage (%)
Frontal	2	0	2	25
Fronto-Ethmoidal	4	1	5	62.5
Maxillary	5	3	8	100

Sphenoidal	**2**	**1**	**3**	**37.5**

Eight instances occurred in the maxillary sinus, five in the fronto-ethmoidal sinus, three in the sphenoidal sinus, and two in the frontal sinus, making it the most often affected sinus in this research.

Table No. 10: Distribution of patients with PNS mucocele (N =4)

Sinuses involved	Male	Female	Total	Percentage (%)
Frontal	**0**	**2**	**2**	**50**
Fronto-Ethmoidal	**0**	**0**	**0**	**-**
Maxillary	**1**	**1**	**2**	**50**
Sphenoidal	**0**	**0**	**0**	**-**

Four of our patients had mucocele in both the frontal and maxillary sinuses, which is considered an equal percentage.

Table No. 11: Distribution of patients with Invasive Fungal sinusitis (N =13)

ge in years(Yrs)	Males		Females		Total	
	No.	Percentage (%)	No.	Percentage (%)	No.	Percentage (%)
18-37	**1**	**11.1**	**3**	**75.0**	**4**	**30.77**
38-47	**2**	**22.2**	**1**	**25.0**	**3**	**23.08**
48-57	**3**	**33.3**	**0**	**0.0**	**3**	**23.08**
58-67	**2**	**22.2**	**0**	**0.0**	**2**	**15.38**
68-77	**1**	**11.1**	**0**	**0.0**	**1**	**7.69**
Total	**9**	**100.0**	**4**	**100.0**	**13**	**100.0**

The current research found that the age range of 18–37 had the greatest prevalence of invasive fungal sinusitis. There were nine male patients and four female patients diagnosed with fungal sinusitis. There were 2.2 times as many males as females.

Table No. 12: Invasive Fungal Sinusitis involving various sinuses (N =13)

Sinuses involved	Number of patients	Percentage (%)
Maxillary	13	100.0
Frontal	7	53.8
Ethmoidal	9	69.2
Sphenoidal	9	69.2

Table No. 13: Age and gender wise distribution of neoplastic diseases

Age in years(Yrs)	Males		Females		Total	
	No.	Percentage (%)	No.	Percentage (%)	No.	Percentage (%)
18-37	3	37.5	2	33.3	5	35.7
38-47	3	37.5	2	33.3	5	35.7
48-57	0	0.0	0	0.0	0	0.0
58-67	2	25.0	2	33.4	4	28.6
68-77	0	0	0	0	0	0.0
Total	8	100	6	100	14	100.0

The highest prevalence of neoplastic illnesses in our research was seen in the 18–37 and 38–47 age groups. There were 1.3 males for every female.

Table No. 14: Distribution of cases of benign neoplasms

Total number of patients	11 (22.0%)
Age range	18-60 years
Males	7 (25.0%)

Females	**4 (18.2%)**
Common symptom	**Nasal Obstruction**

Table No. 15: Distribution of cases of malignant neoplasms

Total number of patients	**3 (6.0%)**
Age range	**60-65 years**
Males	**1 (3.6%)**
Females	**2 (9.1%)**
Common symptom	**Nasal Obstruction**

All of the patients with malignant neoplasms in this research were between the ages of 60 and 65, and the most prevalent symptom they reported was nasal obstruction.

Table No. 16: Distribution of cases of malignant neoplasms

Types of Malignant	Number of patients	Percentage (%)
Maxillary carcinoma	**2**	**66.7**
Chondrosarcoma	**1**	**33.3**
Total	**3**	**100.0**

Two instances of maxillary carcinoma and one case of chondrosarcoma were among the three cases of malignant neoplasm in our investigation.

Table No. 17: Neoplastic diseases of paranasal sinuses

Type of tumor	Maxillary sinus	Frontal sinus	Spheno-Ethmoid	Total
Maxillary carcinoma	**2**	**0**	**2**	**2**
Osteoma	**0**	**2**	**2**	**4**
Total	**2**	**2**	**4**	**--**

Two instances of maxillary carcinoma and two instances of frontal and spheno-ethmoidal osteoma were among the six instances of neoplastic illnesses of the paranasal sinuses that were identified in our investigation.

Table No. 18: Tumor extension to paranasal sinuses

Type of tumor	Number of patients	Percentage (%)
Juvenile nasopharyngeal angiofibroma	2	50.0
Inverted papilloma	1	25.0
Chondrosarcoma	1	25.0
Total	4	100.0

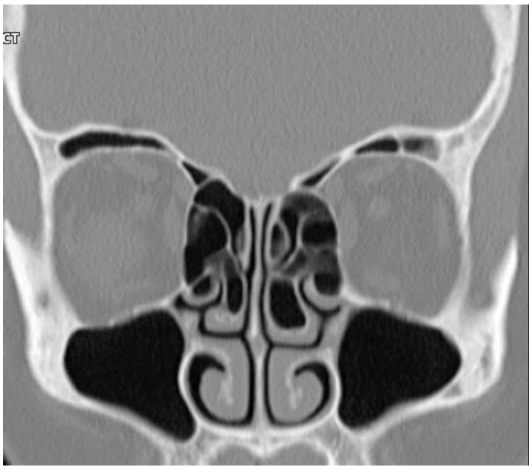

Fig 2: Anatomical variant: Bilateral Concha bullosa, larger on the left side.

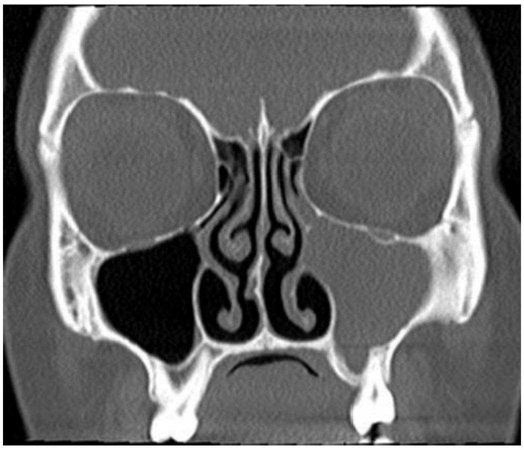

Fig 3: Anatomical variant: Bilateral paradoxical turn of middle turbinates.

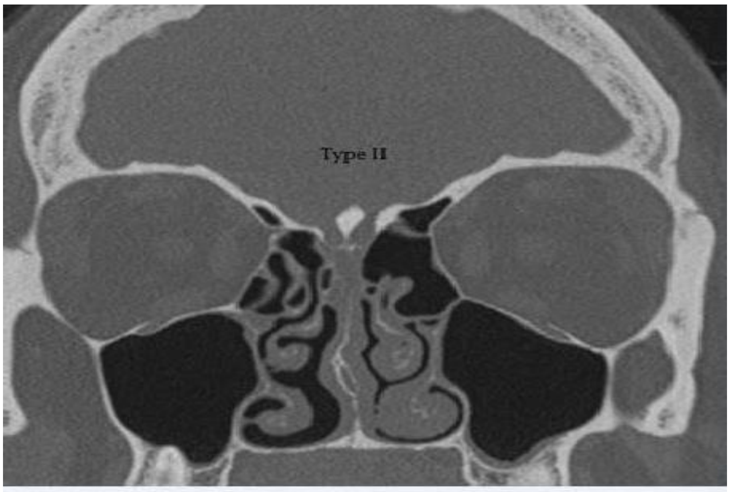

Fig 4: Keros type II olfactory fossa.

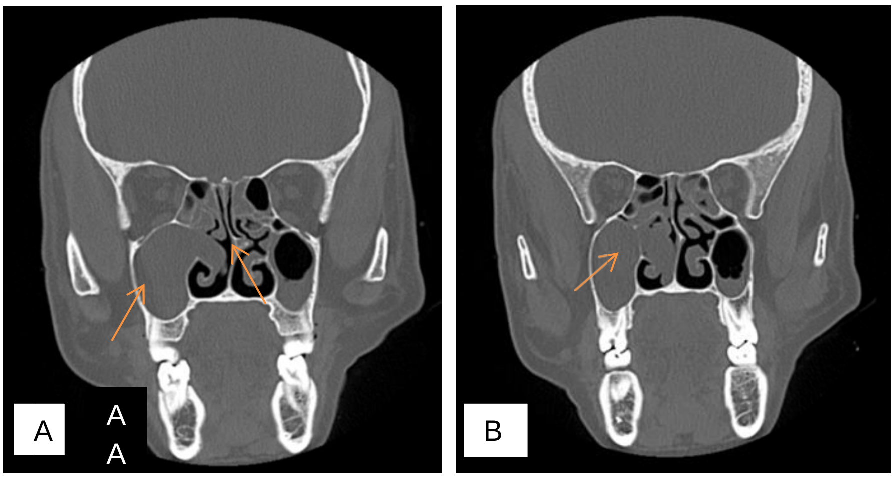

Fig 5: The right antrochoanal polyp is a dense mass of soft tissue in the right maxillary sinus that has spread to the right nasal cavity via the maxillary ostium. This lesion is seen in images A and B, respectively.

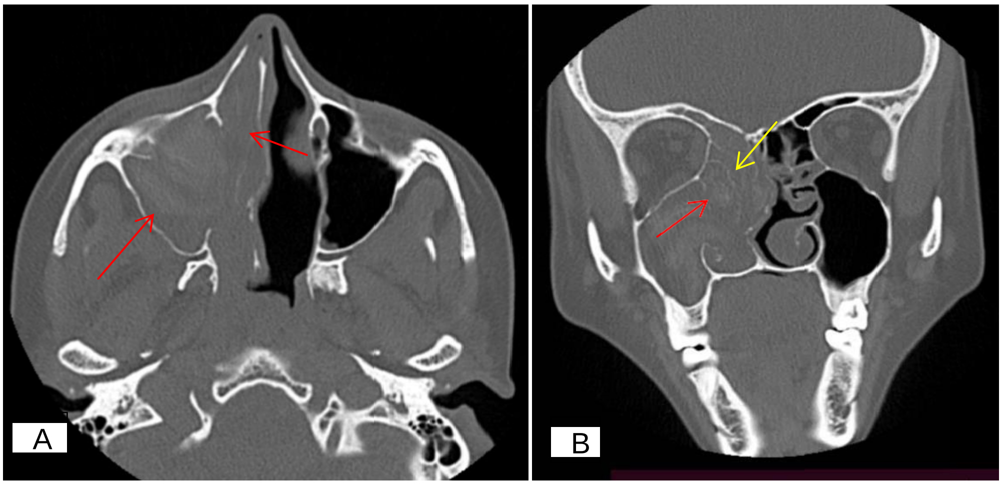

Fig 6: The right maxillary and anterior ethmoidal sinuses are opacified by dense soft tissue (sinonasal polyposis; see arrows in picture A and red arrow in image B), and the maxillary ostium is widened. The yellow arrow in picture B indicates the rarefaction of the right ethmoid trabeculae.

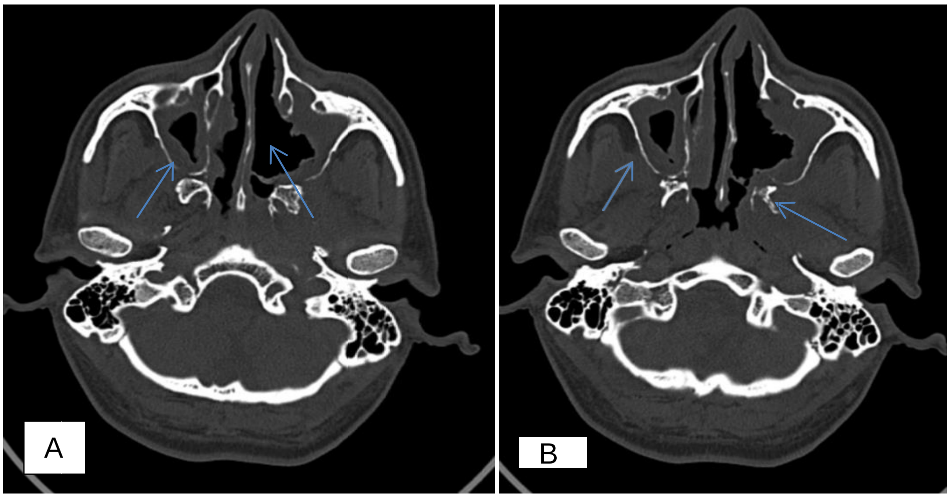

Fig 7: Images A and B show pterygoid plates and haziness of the retroantral fat pad, respectively, as well as erosions of the medial wall of the sinuses and thickening of the mucosa in both maxillary sinuses due to fungal sinusitis.

Fig 8: Chronic Sinusitis: Mucosal thickening of bilateral maxillary sinuses with thickening and sclerosis of its walls (arrows).

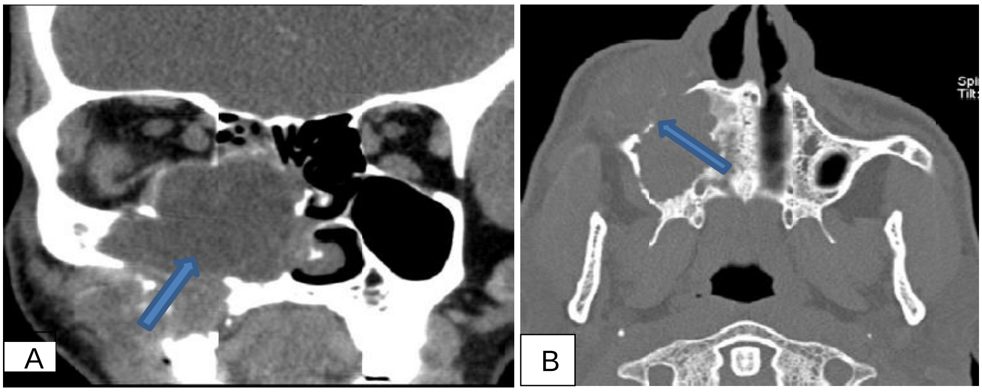

Fig 9: A tumor in the right maxillary sinus is seen as a mass of dense soft tissue in image A, which is eroding the sinus walls and spreading to the right orbit in image B. This tumor is a carcinoma of the right maxillary sinus.

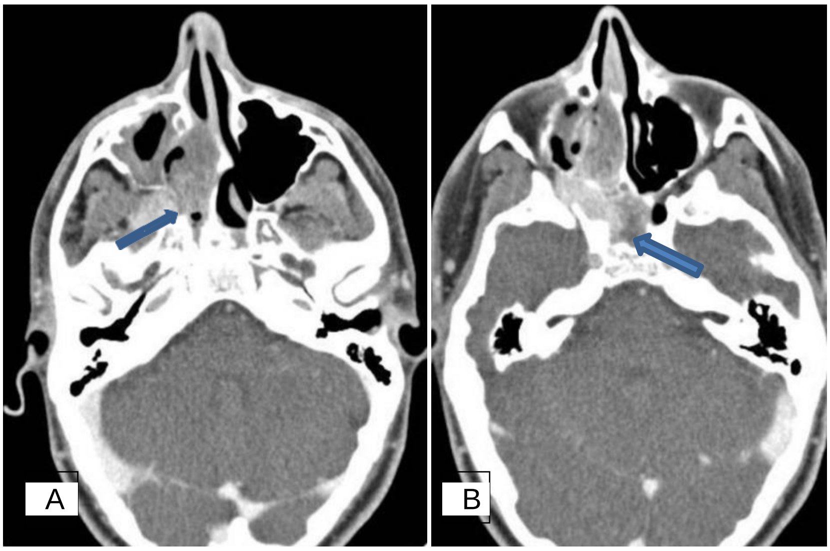

Fig 10: A juvenile nasopharyngeal angiofibroma is characterized by a large mass that begins in the right pterygopalatine fossa and spreads into the sphenoid sinus.

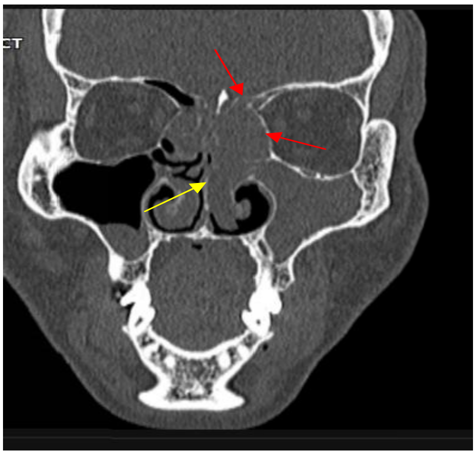

Fig 11: The inverted papilloma is characterized by a medial orbital wall thinning, septae of the ethmoidal air cells, a left sinonasal mass centered on the middle turbinate, and thinning of the floor of the anterior cranial fossa.

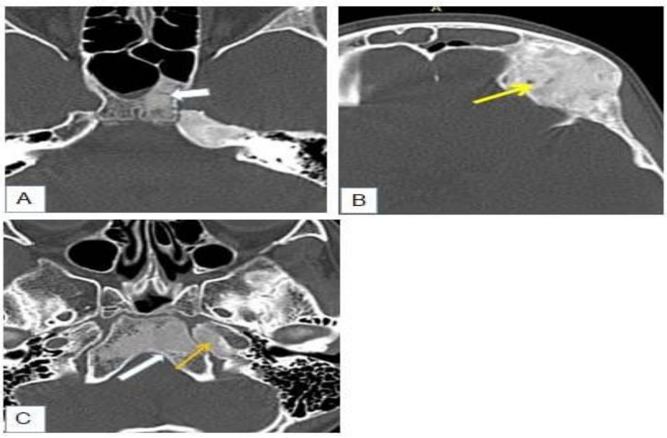

Fig 12: Fibrous dysplasia: Image A: Lesion in the basisphenoid with uniform ground-glass attenuation and an expanding margin. Image B: A ground-glass attenuated expansile lesion in the left frontal bone. Image C: The clivus

and left petrous bone show homogeneous ground glass attenuation.

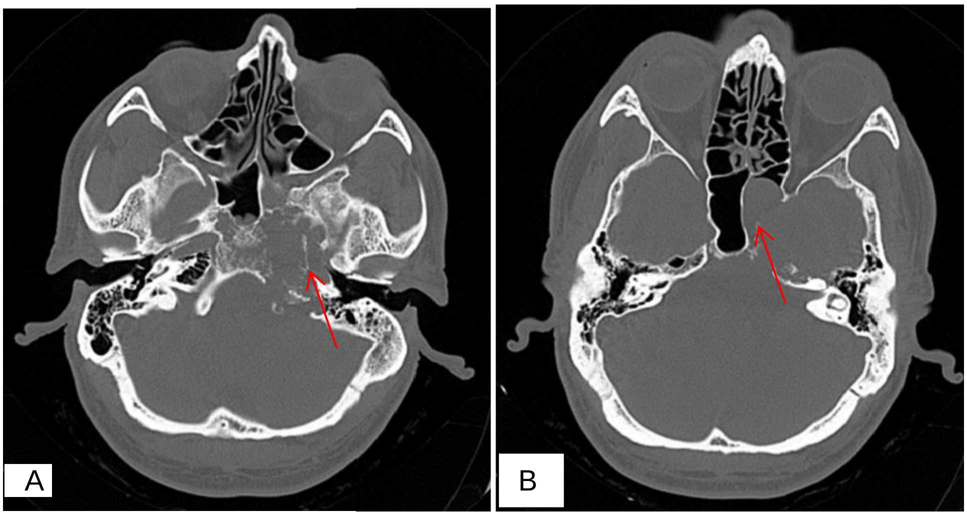

Fig 13: Chondrosarcoma: Large expansile soft tissue mass lesion in clivus (arrow in image A) with extension to left sphenoid sinus (arrow in image B).

DISCUSSION

Among the many sinonasal illnesses that may be diagnosed, CT scans of the nasal cavity and paranasal sinuses have recently emerged as the gold standard. Despite CT's gradual replacement of plain radiograph as the go-to imaging modality for diagnosing paranasal sinus disorders, the former remained still the most often requested examination. This is due to the fact that improved visualization of air, soft tissue, and bone allows for more precise anatomical delineation. The evaluation of acute sinus infections is done by clinical assessment, whereas the examination of persistent and chronic sinus diseases is done using CT scans. Unlike with simple radiographs, CT can assess the intricate architecture of the bones and teeth. The primary objective of FESS is the treatment of diseases affecting the osteomeatal complex area, which may be best seen on a CT scan.

Examining the use of CT in the diagnosis of paranasal sinus disorders was the driving force for this research. Part of this procedure is looking at how well CT can detect the illness and how well it can pinpoint where it has spread to the paranasal sinuses. CT scans were used to assess fifty individuals.

Age of incidence (years):

Age range of the patients in this research was 18–72 years, with the largest age group being 18–37 years. Our findings are in line with those of an Indian research that used CT scans to examine 210 consecutive instances of sinusitis (Vekatachalan et al., 2000:40). Like our research, the patients' ages varied from seven to sixty-six, with the majority falling between the ages of twenty-one and thirty. The same holds true for the 104 consecutive instances of paranasal diseases investigated by Gliklich et al. (2004). The participants' ages ranged from 15 to 73 years, with a mean age of 41.2.

Sex distribution (%):

Approximately 44% of our patients were female and 56% were male. The gender ratio was also somewhat higher in a research of 100 patients conducted by Sanjeev M et al. (2016)42, with 51% male and 49% female. A little male preponderance of 58% and females of 42% was found in a research on sinusitis conducted by Venkatachalan et al (2000).

Symptoms:

Fifty instances (100.0%) of the patients in our research had nasal blockage as their most prevalent symptom. Out of the total number of patients, 42 (84.0%) reported headaches and nasal discharge, 13 (26.0%) reported fever, eight (16.0%) reported epistaxis, and one (2.0%) reported face discomfort and edema.

According to research by Venkatachalan (2000) et al., 147 patients reported nasal discharge, whereas 183 reported nasal blockage.

Deviated nasal septum:

Our research found that 58.8% (17 out of 50 individuals) had a deviated nasal septum. DNS on the right was more prevalent than DNS on the left.

Sinuses involved in diseases of PNS:

When 25 instances (92.5%) of sinuses were implicated, the most prevalent one was the maxillary sinus, followed by the ethmoid (59.2%), frontal (48.1%), and sphenoid (33.3%).

Also, in a research on chronic rhinosinusitis43 conducted by Zojaji et al. (2008), the most

The maxillary sinus was the most often impacted sinus, with 42 patients (82%) seeing changes there. The ethmoidal sinuses were the second most common, with 28 patients (54%) experiencing changes there. The frontal and sphenoid sinuses were the least affected, with 10 patients (20%) and 13 patients (25%), respectively.

Because the maxillary ostia is located higher and makes draining more difficult, it was shown to be the most usually affected sinus in all of the aforementioned research.

Invasive fungal sinusitis:

Thirteen out of fifty cases (26%) of invasive fungal sinusitis were identified in our investigation. More instances of COVID-19 occurred during our investigation, which is the reason for the highest number of these cases.

Another research that is comparable to my own was conducted by S J Zinerich et al. (2004). Out of 293 patients, 44, 28, or 9.5% developed fungal sinusitis.

Consistent with our findings, another study found that fungal sinusitis frequently produces bone erosions, thickening of the bone, increased opacity in the sinuses (bone hazy opacity), and thickening of the mucosal lining. The prevalence of this condition was 14 out of 120 cases (11.66%), which is also consistent with our findings. Our investigation found that the maxillary sinus was involved in 13 instances, followed by the ethmoid and sphenoid sinuses in nine cases each, and the frontal sinuses in seven cases.

Inspissated secretion, calcification in bacterial infections, and a rise in density are all examples of false positives. Since there won't always be a rise in density, false negatives are noticeable. However, computed tomography (CT) is useful for determining if fungal sinusitis has spread to neighboring structures or if there has been bone erosion or disintegration.

Bone destruction in fungal sinusitis:

Based on our findings, the maxillary sinus was the most often affected sinus (13 instances), followed by the ethmoid and sphenoid sinuses (9 cases).

CT is one of the most accurate imaging modalities when it comes to delineating bone degradation or disintegration. All thirteen patients in this research who underwent HPR had bone erosion or disintegration indicated by CT. Comparatively, clinical detection had a sensitivity of 14.3% and a specificity of 100% when it came to detecting bone erosion or destruction, whereas CT had a sensitivity and specificity of 100%.

Polyp:

Three instances involved the right maxillary gland, one involved the bilateral maxillary gland, and one involved the right ethmoidal gland; the majority of the polyps in our research were antrochoanal (4 cases).

Four patients, ranging in age from 25 to 50, had antrochoanal polyps, making it the most prevalent kind of polyp. Older individuals were more likely to have maxillary and ethmoidal polyps.

P Frosini et al. (2009)45 also found polyps in 200 antrochoanal polyp cases, with a mean age of 40 years, which is in line with the age range we were studying.

Neoplasms:

There were a total of three neoplasms in our research; two of these tumors were epithelial in nature, and one was not.

Based on our findings, the maxillary sinus was implicated in tumors in two instances, whereas the sphenoid sinus was involved in one case.

The condition most often manifests in the nasal cavity and maxillary sinus.46 With a diagnostic accuracy of 100%, our investigation identified two cases of fibrous dysplasia of the maxillary sinus and one instance involving the frontal sinus. The most prevalent fibro-osseous lesion, according to J. Philips et al. (2015)47, is fibrous dysplasia.

Two occurrences of epistaxis and nasal blockage were associated with the diagnosis of juvenile nasopharyngeal angiofibroma in our investigation.

In a similar vein, K Narayana S et al. (2004) revealedSimilar to our research, 48 found that among 30 patients with benign tumors of the paranasal sinuses and nose, the most prevalent was juvenile nasal angiofibroma, accounting for 26.66 percent of the cases.

V. CONCLUSION

Fifty individuals experiencing symptoms were scanned with CT scans of the paranasal sinuses in both axial and coronal regions as part of this descriptive cross-sectional observational research.

The age range of 18–37 comprised the majority of the patients. A typical first sign was a blockage in the nasal passages.

The sphenoid sinus was shown to be the least affected sinus when examining individuals with CT PNS, whereas the maxillary sinus was the most prevalent. The most prevalent type of inflammation and infectious cause found during the COVID-19 pandemic was invasive fungal sinusitis.

Statistically, CT performed the best in this research when it came to determining whether lesions were benign or aggressive. However, CT is essential for evaluating paranasal sinus illnesses and for detecting bone erosion or destruction when nearby structures are involved, since the clinical evaluation of these lesions was inadequate. Where the CT really shines is in pinpointing the exact spot, measuring the size of the lesion, and seeing if any nearby structures are involved.

Most cases of invasive fungal sinusitis affected the maxillary sinus, whereas the ethmoidal sinus was the second most frequent. In instances of invasive fungal sinusitis, CT was more sensitive in detecting bone damage.

Results showed that CT scans are superior to clinical exams for diagnosing and treating paranasal sinus illnesses in people experiencing symptoms.

SUMMARY

1. When evaluating paranasal sinus problems caused by chronic illnesses, CT is the imaging modality of choice.
2. Accurate disease delineation and microanatomy localization by CT scan give a relative pre-operative road map.
3. Imaging of bone erosion and degradation using computed tomography (CT) is the method of choice.
4. New multidetector CT technology allows us to get 1 mm collimation images and subsequent high-quality multiplanar reformations.
5. The diagnostic assessment and planning of effective care of PNS disorders today need CT, earning it the reputation as the gold standard imaging of PNS diseases.

Complex projections, artefacts caused by very dense structures in and near the PNS (such as dental amalgam artefact) or by the patient's movement, and low resolution of soft tissues are some of the possible downsides and limitations of CT. Because of the low doses of radiation involved, computed tomography (CT) scans are not recommended for routine use, particularly in young children and pregnant women.

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