Original Research Article

A study of computed tomography in diagnosis of paranasal sinus diseases

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Abstract

Background: Paranasal sinus diseases are common among population of all ages. CT has replaced conventional radiographs as imaging modality of choice for assessment of Para-nasal sinus diseases. A complete axial and coronal CT scan series provides an excellent and comprehensive evaluation of PNS. **Aim and objective:** To study the role of computed tomography in diagnosis of paranasal sinus diseases. **Methodology:** Present study was conducted on patients presenting with signs and symptoms of paranasal sinus diseases. Data was collected with pretested questionnaire. Data included demographic data, Clinical history and clinical examination. All patients underwent CT for paranasal sinuses. CT features noted were sinuses involved, size of the mass, characterization of lesion (air fluid level, mucosal changes, necrosis, calcification, cystic changes, hyperdense areas, contrast enhancement etc) and bony changes. All the data was entered in excel sheet and analysed with appropriate statistical tests. **Results and discussion:** Total 100 patients with signs and symptoms of paranasal sinus disease were studied. Male to female ratio was 1.85:1. Majority of the patients were complaining of headache (55%) followed by facial pain and swelling (36%). Majority of the patients diagnosed as chronic sinusitis. Polyp was the second most commonly diagnosed lesion (28%). In our study, most commonly involved sinus was maxillary sinus (86%) followed by ethamoidal sinus (52%). Extension of neoplastic lesions into adjacent areas were noted in CT scan.

Key Word: tomography, paranasal sinus diseases.

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INTRODUCTION

The paranasal sinuses are air-filled spaces located within the bones of the skull and facial bones. They are centered on the nasal cavity and have various functions, including lightening the weight of the head, humidifying and heating inhaled air, increasing the resonance of speech, and serving as a crumple zone to protect vital structures in the event of facial trauma. [1] Four sets of paired sinuses are present i.e maxillary, frontal, sphenoid, and ethmoid. The cavities are surrounded by bone and cartilage with a midline septum, floors formed by the hard palate and lateral walls formed by the palatine, maxillary and ethmoid bones which support the three turbinates. The meati beneath the turbinates are the sites into which drain the posterior ethmoidal sinus (superior meatus), other ethmoidal cells, maxillary and frontal sinuses (middle meatus) and the nasolachrymal duct (inferior meatus).

Paranasal sinuses (PNSs) diseases commonly affect the population of all age group. These diseases range from inflammatory conditions to neoplasms, both benign and malignant. [2] Standard plain radiographs still have a limited role in the imaging of the paranasal sinuses and are used as the initial technique before the application of CT. Most sinus pathologies are readily identifiable by plain radiographs and can be useful in tailoring the CT protocol. Plain radiography could not display the three-dimensional structures in a two-dimensional plane. It can provides limited views of the anterior ethmoid cells along with the

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upper two-thirds of the nasal cavity. [3] Also, Coronal and axial CT scanning has dramatically improved the imaging of the anatomy of paranasal sinus. CT excellently displays the bony architecture and its mucosal covering as well as the narrow air channels of the osteomeatal complex. CT accurately depicts the boundaries between the paranasal sinuses, the orbit and the intracranial compartment and also the relationship between the optic nerve, cavernous sinus, carotid artery and fifth cranial and vidian nerves to the sphenoid sinuses. [4,5] CT has become an important imaging modality and aided the development of functional endoscopic sinus surgery (FESS).[6,7] Various inflammatory, benign/ malignant neoplastic conditions affect the paranasal sinuses. The primary role of imaging is to document the extent of the disease, to provide accurate display of the anatomy of the sinonasal system. Characterization of the lesion can be helpful in ambiguous cases. Contrast media helps evaluate the vascularity and contrast enhancing characteristics of lesions, giving clues to the histology and extent of abnormality.[8]

Present study was conducted to study the role of computed tomography in diagnosis of paranasal sinus disease.

MATERIAL AND METHODS

Present study was conducted in department of radiology at a tertiary health care center. Study population was patients presenting with signs and symptoms of paranasal sinus diseases.

Inclusion Criteria: 1. Patients with sings and symptoms of paranasal sinus diseases 2. Patients willing to participate

Exclusion criteria: 1. Patients with history of trauma to face 2. Patients who were allergic to contrast 3. Patients not willing to participate Study was approved by ethical committee of the institute. A valid written consent was taken after explaining study to them.

Data was collected with pretested questionnaire. Demographic data like age , sex was collected. Clinical history (headache, nasal discharge, nasal obstruction, epistaxis, facial swelling, proptosis) duration symptoms and any relevant past history were noted. A through clinical examination was done. Local examination was done with posterior rhinoscopy, oro-pharyngeal examination and dental examination. All patients underwent Hb, ESR, TLC/DLC, FNAC/Biopsy and other required investigations. All patients underwent CT for paranasal sinuses. Equipment used was Multidetector Spiral CT, Siemens Somatom Volume Access Somaris, Siemens Medical Systems, Forchiem, Germany.

CT scan of PNS was done in coronal and axial planes. A lateral 256 mm scout scan was done at 120 kVp and 100 mA. Axial scanning was done in supine position. Reformatting in coronal and sagittal planes was done using software provided. If necessary direct coronal imaging was done. For direct coronal imaging patients were kept in prone position or supine position with head of patient free leading edge of the table of the scanner. The gantry angle used in case of coronal imaging was perpendicular to the plane of hard palate. 3 mm sections from anterior margin of nose to the posterior margin of sphenoid sinus were taken. CT features noted were sinuses involved, size of the mass, characterization of lesion (air fluid level, mucosal changes, necrosis, calcification, cystic changes, hyperdense areas, contrast enhancement etc) and bony changes. All the data was entered in excel sheet and analysed with Statistical package for social sciences (SPSS v 21.0, IBM).

RESULTS

Total 100 patients with signs and symptoms of paranasal sinus disease were studied. In our study 65% patients were male and 35% were females. Male to female ratio was 1.85:1. Fig 1 shows age wise distribution of PNS disease patients. Majority of the patients were in the age group of 11-20 years (31%) followed by 21-30 years (26%). Patients in the age group of 31-40 years and 41-50 years were 19% and 13% respectively. PNS diseases were less observed above the age of 50 Years. (10%). Majority of the patients were complaining of headache (55%) followed by facial pain and swelling (36%). Nasal obstruction was observed in 15% patients. (table 2) In our study, CT findings showed majority of the patients diagnosed as chronic sinusitis. Polyp was the second most commonly diagnosed lesion (28%). Fungal sinusitis was observed in 16% patients and antrochoanal polyp was observed in 7% patients. neoplastic lesions were observed in 17% patients. (table 3)

In our study, most commonly involved sinus was maxillary sinus (86%) followed by ethamoidal sinus (52%). Frontal sinus was involved in 31%. Sphenoid sinus was affected in 19% patients. (fig 2) Osteomeatal unit obstruction was noted in 42 patients. The most common pattern of involvement was sinonasal polyposis (39%), followed by osteomeatal (26%). Infundibular (14%), sphenoethmoidal recess (6%), and sporadic pattern (3%) were other patterns seen in CT scan. Extension of neoplastic lesions into adjacent areas were noted in CT scan. Extension into infratemporal fossa was seen in 58.82% cases and infraorbital extension was seen in 47.05% patients. Intracranial extension was seen in 29.41% patients. External soft tissue extension was seen in 41.17% patients of neoplastic lesions. Intraoral extension was observed in 5.88% patients. (table 5)

Table 1: Distribution of PNS disease patients according to gender

Sr no	Gender	No of patients	Percentage
1	Male	65	65%
2	Female	35	35%
3	**Total**	**100**	**100%**

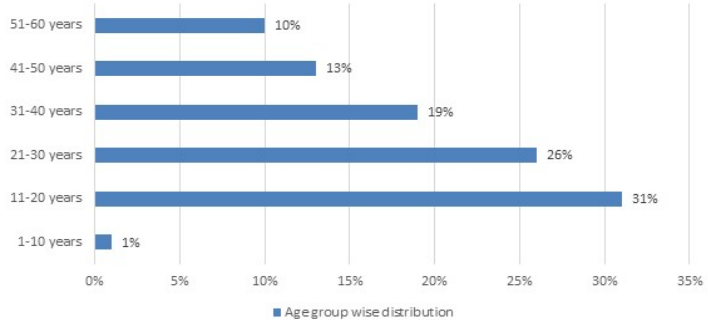

Figure 1: Distribution of PNS disease patients according to age group

Table 2: Distribution of PNS disease patients according to symptoms

Sr no	Symptoms	No of patients	Percentage
1	Headache	55	55%
2	Facial pain and swelling	36	36%
3	Nasal obstruction	15	15%

Table 3: Distribution of PNS disease patients according to diagnosis by CT scan

Sr no	Diagnosis	No of patients	Percentage
1	Chronic sinusitis	32	32%
2	Fungal sinusitis	16	16%
2	Polyp	28	28%
3	Antrochoanal polyp	07	7%
4	Neoplastic	17	17%
5	**Total**	**100**	**100%**

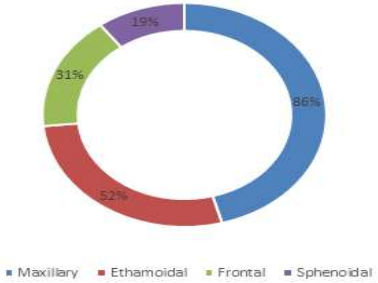

Figure 2: Distribution of PNS disease patients according to sinus involved

Table 4: Distribution of patients according to CT inflammatory pattern in patients with sinus disesaes

Sr no	CT pattern	No of patients	Percentage
1	Sinonasal polyposis	39	39%
2	Osteomeatal	26	26%
3	Infundibular	14	14%
4	Sphenoethmoidal rescess	6	6%
5	Sporadic	3	3%

Table 5: Distribution of patients according to extension of neoplastic lesions in adjacent areas

AREA	NUMBER	PERCENTAGE
INFRATEMPORAL FOSSA	10	58.82 %
INTRACRANIAL	05	29.41 %
INTRAORBITAL	08	47.05 %
INTRAORAL	01	5.88 %
EXTERNAL SOFT TISSUE	07	41.17%

DISCUSSION

In our study 65% patients were male and 35% were females. Male to female ratio was 1.85:1. Majority of the patients were in the age group of 11-20 years (31%) followed by 21-30 years (26%). Similar results were seen in previous studies like Prabhakar *et al..*, [9] Ahmed *et al..* [10] and Dewan *et al..* [11]. In our study, Majority of the patients were complaining of headache (55%) followed by facial pain and swelling (36%). Nasal obstruction was observed in 15% patients. Kushwah *et al...* [12] noted that headache was the prominent presenting complaint in the patients with PNS diseases. Similar findings were observed in Asruddin *et al...* [13] In our study, CT findings showed majority of the patients diagnosed as chronic sinusitis. Polyp was the second most commonly diagnosed lesion (28%). Fungal sinusitis was observed in 16% patients and antrochoanal polyp was observed in 7% patients. similar results were seen in Chaitanya *et al...* [14] where they reported that the sinonasal polyposis pattern was the most common followed by OMU. In constract to our study Babbel *et al..* [15] infundibular pattern was most common. In our study, most commonly involved sinus was maxillary sinus (86%) followed by ethamoidal sinus (52%). Frontal sinus was involved in 31%. Sphenoid sinus was affected in 19% patients. In the study conducted by Smith and Brindley [16,] maxillary sinus was involved in 55.5 % of cases, ethmoidal air cells were involved in 46.5 % of cases, frontal sinus in 30 % and sphenoid in 20 %. In our study, Extension of neoplastic lesions into adjacent areas were noted in CT scan. Extension into infratemporal fossa was seen in 58.82% cases and infraorbital extension was seen in 47.05% patients. According to the study conducted by Parsons C and Hodson N [17], the tumour extension was most commonly into the region of orbit and into the pterygoid region.

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