

**“A STUDY ON PREOPERATIVE CT FINDINGS AND
PEROPERATIVE FINDINGS OF CHRONIC
RHINOSINUSITIS AND IT'S FOLLOW UP WITH
POSTOPERATIVE CT”**

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In partial fulfilment of the Regulations

for the award of the Degree of

**M.S. (OTO-RHINO-LARYNGOLOGY & HEAD AND NECK SURGERY)
BRANCH-IV**

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DEPARTMENT OF E.N.T & HEAD AND NECK SURGERY

TIRUNELVELI MEDICAL COLLEGE

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MAY 2020

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ABBREVIATIONS

OMC-N	:	Osteomeatal complex normal
OMC-TO	:	Osteomeatal complex total occulsion
OMC-PO	:	Osteomeatal complex partial occlusion
MT-S	:	Mucosal thickening in sinuses
PC-S	:	Polypoidal changes in sinuses
M	:	Maxillary sinus
F	:	Frontal sinus
AE	:	Anterior ethmoid
PE	:	Posterior ethmoid
PRE OP-SS	:	Preoperative symptom score
POST OP-SS6	:	Post operative symptom score at 6th month
PER OP-ES	:	Peroperative endoscopic score
PRE LM-RS	:	Preoperative lund mackay radiological score
POST LM-RS6	:	Postoperative lund mackay radiological score

INTRODUCTION

Rhino sinusitis refers to a group of disorders characterised by inflammation of mucosa of paranasal sinuses and nasal airway.

5 clinical categories:

Acute rhino sinusitis - 4 weeks

Subacute rhino sinusitis- 4 to 12 weeks

Chronic rhino sinusitis-more than 12 weeks

recurrent acute rhino sinusitis - acute exacerbations of chronic rhino sinusitis.

Chronic sinusitis is diagnosed by repeated attacks of acute sinusitis or persistent inflammation. Plain radiograph has limited value for imaging paranasal sinuses when compared to CT. CT is the method of choice for paranasal sinusitis in both adults and paediatrics.

The diagnosis of chronic rhino sinusitis is made by a variety of physicians including primary care physicians, general physicians, pediatricians, pulmonologists and otolaryngologists. Chronic rhinosinusitis significantly impacts the quality of life by interfering with the general health, vitality and social functioning and cause decrease in productivity in the work force, which is comparable with that observed in patients with coronary heart disease and chronic lung disease.

Computer assisted tomography [CT] provides an essential pre-operative assessment of patients undergoing FESS. The aim of CT of the sinuses is to delineate the extend of the disease, define any anatomical variants and relationship of the sinuses with the surrounding important structures. High resolution CT (HRCT) of the paranasal sinuses (PNS) has a significant and necessary place in the pre-operative assessment of patients prior to endoscopic sinus surgery. It helps in establishing the anatomy of the sinuses and its common variants as well as sinus and drainage passage pathology.

The development of endoscopic sinus surgery (ESS) has coincided with major advances in computed tomography (CT) scanning technology. Before CT scanning, the extent of sinus disease and the anatomy of the nose and sinuses were assessed on plain X-rays. Plain X-rays are no longer used in this role because they provide neither sufficient anatomical detail nor accurate information on the extent of nasal and sinus pathology. The CT scan has allowed the detailed anatomy of the sinuses to be evaluated and in this thesis CT scans are used extensively to reconstruct the anatomy of the sinuses thus enabling a surgical plan to be made before surgery begins.

CT scans are used as an aid for both the diagnosis of chronic sinusitis and for the planning of the surgery. However, there is a significant incidence of mucosal abnormalities seen in completely asymptomatic patients.¹ Thus it is important that the patient has undergone

adequate medical treatment for the nasal and sinus condition before a CT scan of the sinuses is performed.² The coronal scan is the primary scan used to assess the anatomy of the sinuses.³ These scans should be sufficiently close together so that an identified cell can be followed from one slice to the next. This allows a three-dimensional (3D) image of the anatomy to be reconstructed from the scans.^{4–6} The axial scan is of particular value in determining the drainage pathway of the frontal sinus. This is important when deciding where the curette or probe is going to be slid during the dissection of the frontal recess.

some other studies considered a high clinical value for POHE in patients who underwent endoscopic treatment for paranasal sinusitis, regarding the complex evaluation of inflammation and appropriate anti-inflammatory. Until now, many investigations have been done to show the clinical importance of examination of routine postoperative material in patients who didn't have unilateral or bilateral polyposis. Some studies suggested histopathologic examination of postoperative specimens is only indicated when unilateral polyposis and opacification, or intraoperative suspicious of tumor is present or when additional diagnostic information is needed. some other studies recognized that there was a good correlation between clinical and histopathologic diagnosis of nasal and paranasal polyposis and sinusitis, and introduced a questionable value for routine post-

operative histopathological examination (POHE), in patients whom preoperational occult pathology were not suspicious.

AIM OF STUDY

To study about cases of chronic sinusitis with preoperative CT scan. Its comparison with peroperative endoscopic findings, and to follow up with post operative CT.

OBJECTIVES:

- To evaluate the role of CT in assessing the clinical outcome of Fess in chronic sinusitis.
- To evaluate the role of CT in clinically suspected cases if chronic sinusitis for detection, assessment of anatomical variants , pathological abnormalities of parasnasal sinuses and nasal cavity.
- To compare the various symptoms of Chronic Rhinosinusitis before and after 6 months of post FESS.

MATERIALS AND METHODS

Study population includes patients attending ENT Out Patient Department at Government hospital, TVMC. with clinical symptoms nasal obstruction, nasal discharge, headache and anosmia. Those patients with nasal symptoms are investigated with DNE & CT PNS. Selected patients are advised to undergo FESS. They are followed postoperatively for every 2 weeks for a minimum period of 6 months. They are assessed for crusting, discharge and synechiae formation, improvement of CRS and supported with CT evaluation.

STUDY AREA:

DEPARTMENT of ENT, TVMCH.

STUDY PERIOD:

NOV 2017 to SEP 2019.

METHOD OF STUDY:

Prospective study.

SAMPLE SIZE:

150, randomly selected.

INCLUSION CRITERIA:

- Age > 15 years
- Sex-both
- Patient with recurrent headache, nasal obstruction and nasal discharge.

EXCLUSION CRITERIA:

- Age < 15 years
- Biopsy proven cases of recurrent nasal rhino sporidiosis and sinonasal malignancy
- Acute rhino sinusitis.

REVIEW OF LITERATURE

1. Dr. Swati tendon et al. conducted study at Maulana azad medical College, New Delhi, between October 2010 and February 2012 on correlation of CT findings and intraoperative findings in patients with chronic sinusitis. It showed that maxillary sinus was the most common sinus involved. Preoperative CT findings correlated well with intraoperative findings for all sinuses except left maxillary sinus. Thus operating surgeons should be well versed with the reading of CT scan of nose and PNS.

2. Dr. Shritih satyanarayanah and anakere et al. in 2016 studied clinical study of correlation of preoperative CT scan findings with intraoperative findings in cases of chronic rhino sinusitis at Yashoda super speciality hospital, Hyderabad. It showed excellent correlation >90% between preoperative CT scan and endoscopic sinus surgery in cases of osteomeatal complex widening, anterior ethmoidal polypoidal change. p value was significant in all parameters.

3. Dr. Amita kumari and Amarjitkaur et al. did a study on comparison between preoperative computed tomography scan of paranasal sinuses and operative findings in functional endoscopic sinus surgery over a period 3 years from 2010 to 2013 at Punjab. It showed the common presenting symptoms were nasal obstruction, Headache, nasal discharge and post nasal drip. Maxillary sinus was frequently involved followed by anterior ethmoid, posterior ethmoid, sphenoid & frontal sinuses.

4. Dr. Ebrahimrazmpa et al. conducted a study on the correlation of preoperative sinusitis patient's characteristics with final diagnostic findings at Tehran. It concluded that clinical diagnosis of CRS, considering symptoms, imaging study (paranasal sinus CT scan) and nasal endoscopy, was accurate and postoperative histopathological examination had little clinical value in confirmation of diagnosis in these circumstances.

5. Dr. Deepthi and Unnikrishnan K Menon et al. did a study on correlations and comparison between repeat computed tomography scores, endoscopy scores and symptomatic improvement before and after endoscopic sinus surgery in 2013 at Kerala over a period of 1.5 years for CRS with or without nasal polyposis. It showed a good to strong correlation between the symptoms, endoscopic findings and CT images and also showed that all scores had statistically significant improvement.

6. Dr. Anoop P. S. et al. conducted a comparative study on endoscopic findings and radiological appearance in chronic rhinosinusitis over a period of 2009-2011. It showed that common symptoms were nasal obstruction and headache. The anterior ethmoid was most frequently involved sinus. Both diagnostic nasal endoscopic examination and CT imaging of PNS are important preoperative evaluation tools in detecting pathology and both are complementary to each other. CT assists the surgeon as a "road map" during surgery.

7. Dr. Dhibakhar Perya viraatz. G.B. et al. in 2015 did a study on the effect of functional endoscopic sinus surgery on the symptom profile in patients with chronic sinusitis at Madurai. It showed that preoperative non-contrast computed tomography of PNS revealed the disease predominantly involved the anterior ethmoid and infundibulum, which are of rhinogenic origin, followed by the posterior ethmoid and maxillary sinus. The symptoms resolved well after FESS, with resolution of nasal obstruction, headache, and all other minor symptoms.

8. Dr. Sushanttyagi and Lalit Kumar et al. in 2015 at Hapur, UP studied a comparative evaluation of chronic rhinosinusitis patients by conventional radiography, computed tomography, and diagnostic nasal endoscopy. It concluded that conventional radiography should not be used as a single diagnostic tool in preoperative evaluation. Diagnostic nasal endoscopy should be promoted and thereby reducing unnecessary radiation exposure to patients.

9. Dr. Shruti Baruah and Prathibavyas at Jaipur, Rajasthan in 2018 did a study on computed tomography scan VS nasal endoscopic findings in the diagnosis of chronic sinusitis. It showed that maxillary sinus involvement is the most common finding in CT scan of PNS in chronic rhinosinusitis, while deviated nasal septum is the most common finding on diagnostic nasal endoscopy. CT scan and DNE are both key preoperative

diagnostic tools for the patients of chronic rhinosinusitis and both are complementary to each other in detecting type and extent of pathology.

10. Dr. Rushriskandukiri and Suresh Patal et al. at Wardha, Maharashtra. Conducted a study on computed tomography evaluation of inflammatory sinonasal diseases. It concluded that CT is the diagnostic modality of choice in evaluation of various inflammatory pathologies and associated complications thereby planning the further management of the patients. 'P' value in all instances was <0.05 i.e. <0.001 indicating the significance of the findings.

DEVELOPMENT OF PARANASAL SINUSES

MAXILLARY SINUS:

First sinus to appear between the 7th and 10th weeks of gestation.

Appears as a shallow groove expanding from the primitive ethmoidal Infundibulum into the mass of maxilla.

Rapid growth occurs until age 7, followed by gradual enlargement, reaching its final size by 17 to 18 years.

Abnormality in development of maxillary sinus leads to :

- a) Extensive pneumatisation involving the entire hard palate.
- b) Maxillary sinus aplasia.
- c) Maxillary sinus hypoplasia – 10% of CT scans.

Diagnostic criteria of maxillary sinus hypoplasia :

1. Enlargement of the vertical orbit.
2. Lateral position of the infraorbital neurovascular canal.
3. Elevated canine fossa.
4. Enlargement of superior orbital fissure.
5. Enlargement of pterygopalatine fissure.

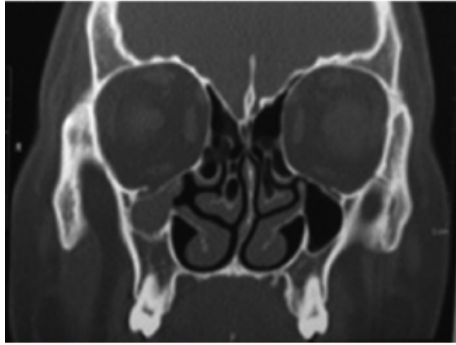


Figure 87.5 Coronal CT demonstrating maxillary sinus hypoplasia on the right side and maxillary sinus atelectasis on the left side.



Figure 87.4 Coronal CT of extensive maxillary sinus pneumatization into the hard palate (arrows) with evidence of maxillary sinus dysfunction (left greater than right).

ETHMOID SINUS:

Ethmoturbinals, a series of folds that are separated from each other by corresponding grooves appears in the lateral wall of nasal capsule during 9th and 10th weeks of gestation. Fusion of these folds leads to crests with an ascending and descending portion.

Lamella from anterior to posterior are

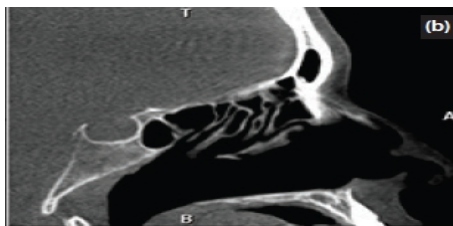
1. Agger nasi (ascending portion) and uncinat process(descending portion).
2. Bulla ethmoidalis.
3. Basal lamella of the middle turbinate.
4. Superior turbinate.
5. Supreme turbinate.

SPHENOID SINUS:

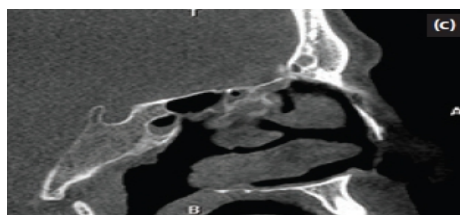
Develops from the sphenoidal recess at the twelfth week of gestation. Three patterns of pneumatization for transphenoid approach to pituitary tumours are sellar, presellar and conchal.



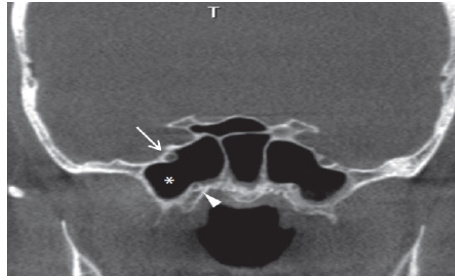
a. sellar type -90% sphenoid pneumatization posterior to sella turcica.



b. presellar-9%. sphenoid pneumatization up to the anterior sella turcica.



c. conchal-1%. a shallow bowl with minimal sphenoid pneumatization and trabecular bone between the sinus and sella.



Sphenoid sinus pneumatise laterally into the pterygoid root resulting in **lateral sphenoid recess**. Expose neurovascular structure surrounding the sphenoid sinus. Occurs between maxillary nerve (branch of trigeminal nerve) and vidian nerve.

FRONTAL SINUS:

Developes by 16th week of gestation from anterior ethmoid complex. frontal sinus is seen radiologically by age 8 years. Reaches adult ratios by 10 to 12 years just prior second growth spurt.

LATERAL NASAL WALL AND TURBINATES:

Inferior turbinate- embryologically independent bone.

Middle turbinate and superior turbinate are extensions of the ethmoid bone. The space between the lateral wall and turbinates is called meatus.

Inferior meatus –the nasolacrimal duct drains 1cm posterior to the head of the inferior turbinate which is guarded by Hasners valve.

Middle meatus-common drainage pathway of the maxillary sinus, anterior ethmoid and frontal sinus into the nasal cavity.

Superior meatus-drainage pathway of posterior ethmoid air cells.

Turbinates – warm and humidify air and modify nasal airflow resistance . Continuously dilate and constrict every 0.5 -3 hours in a normal physiological phenomenon known as the nasal cycle resulting in alternating congestion and decongestion of the nasal cavities.

BLOOD SUPPLY OF THE LATERAL WALL:

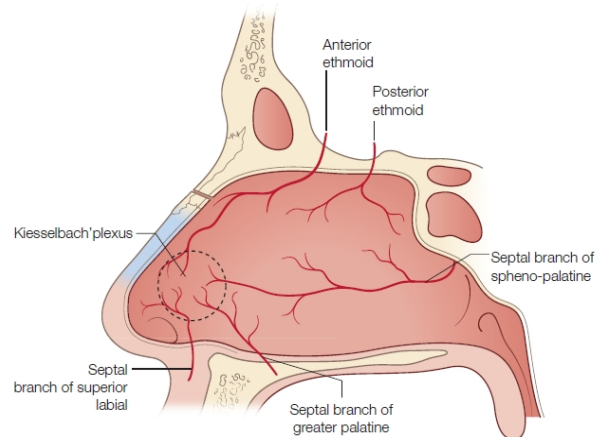
Internal and external carotid arteries supply the lateral wall of nose.

Sphenopalatine artery- major blood supply is by sphenopalatine artery a branch of external carotid artery which enters the nasal cavity through the sphenopalatine foramen. This foramen lies inferior to the horizontal attachment of the middle turbinate and is formed by sphenopalatine notch of the palatine bone in articulation with the sphenoid bone.

The crista ethmoidalis is a small crest of the perpendicular plate of the palatine bone located anterior to the sphenopalatine foramen and serves as a consistent and reliable landmark to identify the sphenopalatine artery during endoscopic dissection. There are often two or more branches of the sphenopalatine artery medial to the crista ethmoidalis.

Greater palatine artery: supplies inferior part of the lateral wall adjacent to the palate.

Internal carotid artery contributes via the anterior and posterior ethmoid arteries (branches of ophthalmic artery)



Course of anterior ethmoid artery:

After arising from the ophthalmic artery in the orbit passes between superior oblique and medial rectus through anterior ethmoid foramen. Then the anterior ethmoid artery travels through the ethmoid cavity obliquely in a posterior to anterior direction either within the bone of skull base or a mucosal mesentry.

The artery then traverses intracranially into the olfactory fossa through the lateral lamella of lamina cribrosa , giving rise to anterior meningeal branches before reentering the nasal cavity through the cribroethmoidal foramen.

In the nasal cavity it gives off anterior and posterior nasal arteries each giving rise to lateral and medial branches that supply the lateral nasal wall and nasal septum respectively

The anterior ethmoid artery is more difficult to access endoscopically, with only 20% found within a mesentery that can be ligated via transnasal approach.

An external approach using a modified Lynch incision is often the preferred method of ligation.

SURGICAL ANATOMY OF PARANASAL SINUSES

The goal of endoscopic sinus surgery is to identify these landmarks early during the procedure in order to provide orientation during the remainder of the operation. These include

1. Maxillary sinus.
2. Orbit from maxillary sinus roof/orbital floor and medial orbital wall (lamina papyracea).
3. Skull base identified posteriorly by the sphenoid sinus.

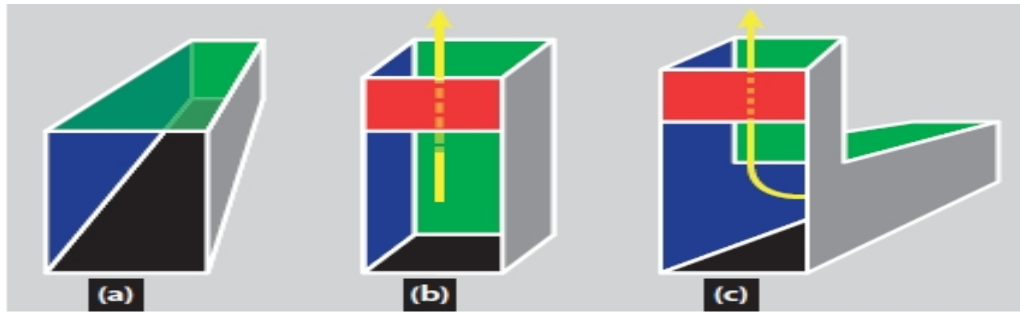


Figure Schematic diagram of the right paranasal surgical box. (a) Horizontal component of the right surgical box with limits of dissection including medial orbital wall (blue), middle turbinate (grey), skull base (green), sphenoid sinus (yellow). (b) Vertical component of the right surgical box with limits of dissection including medial orbital wall (blue), middle turbinate (grey), skull base (green), anterior nasal beak (red). (c) Combined schematic diagram of the horizontal and vertical components of the paranasal surgical box.

The boundaries of horizontal portion of the paranasal surgical box include middle turbinate medially, medial orbital wall (lamina papyracea) laterally, floor of the nose inferiorly and skull base superiorly.

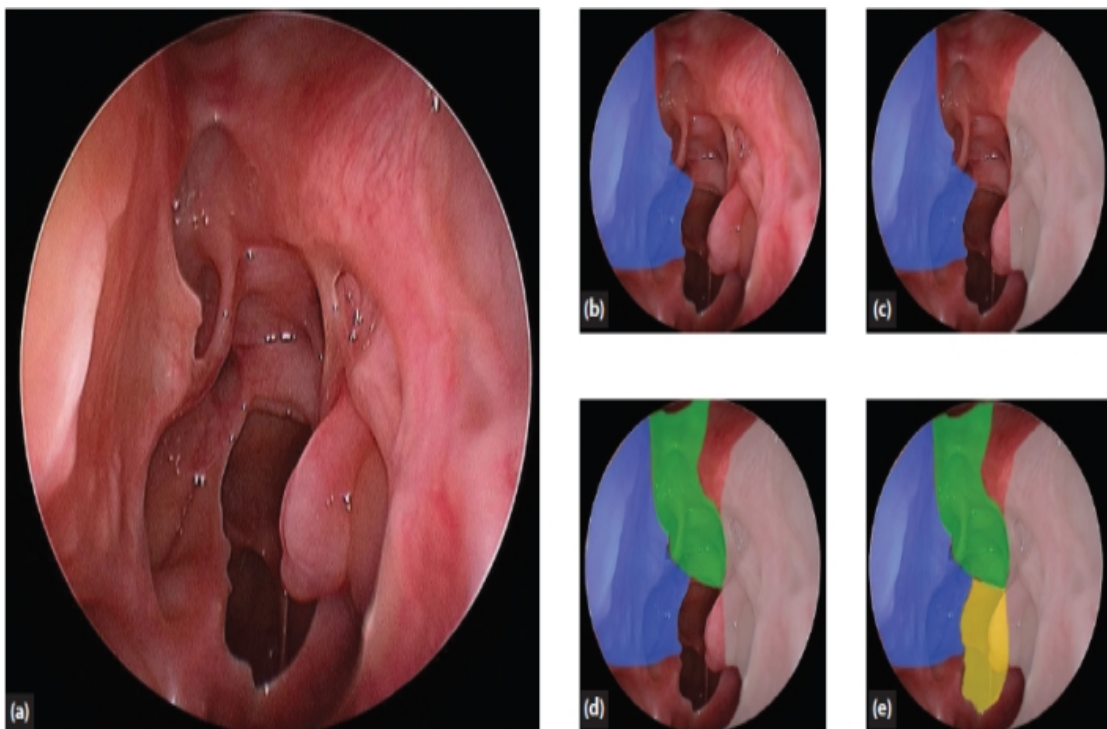


Figure (a) Endoscopic view of the right horizontal component of the paranasal sinus surgical box with the medial, lateral, superior and inferior limits of dissection visible with a single position of the endoscope. The lateral, medial and superior boundaries of the horizontal surgical box are indicated as (b) medial orbital wall (blue) (c) middle turbinate (grey) (d) skull base (green) respectively. (e) Sphenoid sinus (yellow) serves as an important landmark to identify the skull base at its most posterior position.

The boundaries of the vertical portion of the paranasal surgical box include middle turbinate and intersinus septum medially, lamina papyracea laterally, nasofrontal beak anteriorly and skull base posteriorly.

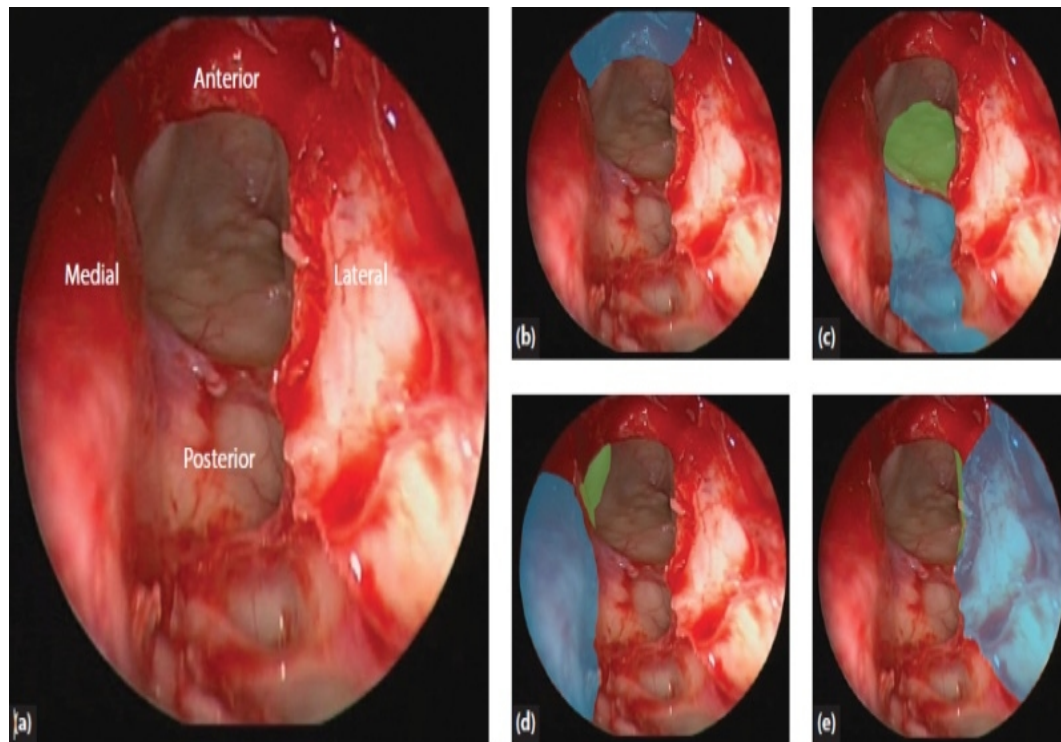


Figure 87.16 (a) Endoscopic view of the left vertical component of the paranasal sinus surgical box with anterior, posterior, medial and lateral limits of dissection visible with a single position of the endoscope. The anterior, posterior, medial and lateral boundaries of the vertical surgical box are indicated as (b) nasal beak (blue) (c) skull base (blue) and posterior table of frontal sinus (green) (d) middle turbinate (blue) and frontal intersinus septum (green) (e) medial orbital wall (blue) and supraorbital roof (green) respectively.

Upon completion of the maxillary antrostomy identifies the maxillary sinus roof/orbital floor- first key anatomical landmark. The orbital floor was below the level of the skullbase in 100% of cases with a mean distance of 10.1+/- 2.7mm. This landmark also below the level of the sphenoid planum with a mean distance of 11.0 +/-3.7mm. as dissection proceeds posterior below the level of the maxillary sinus roof/orbital floor will avoid the skull base.

Removal of ethmoid bulla enables identification of second key anatomical landmark, the medial orbital wall(lamina papyracea).This landmark enable safe exposure of entire orbital axis and delination of the lateral boundary of the paranasal surgical box.

The third key landmark is the sphenoid sinus/posterior skull base.dissection medial to the orbital axis and below the level of orbital floor will allow safe entry into the sphenoid.Opening the sphenoid ostium and removal of the anterior sphenoid wall enable identification of posterior skull base. Thus the skull base slopes downward from anterior to posterior with its lowest height at the level of the sphenoid sinus.

These landmarks help to define the anatomical limits of dissection during surgery and establish the boundaries of the paranasal surgical box.

DEVELOPEMENTAL AND FUNCTIONAL ANATOMY OF THE PARANASAL SINUSES

The paranasal sinuses are divided into anterior, posterior and sphenoid compartments based on drainage pathways. Anterior functional unit comprises of maxillary ,anterior ethmoid and frontal sinuses and drain through the osteomeatal complex in the middle meatus. Posterior functional unit comprises of posterior ethmoid sinus and drain through the superior meatus into the nasal cavity and a variant of it is onodi cell which pneumatise over the optic nerve exposing this structure to injury during surgery.

Sphenoid functional unit comprise of sphenoid sinus and drain through the sphenoid ethmoid recess located medial and posterior to the superior turbinate. All disease mucosal cells within the compartments must be removed in order to prevent mucocele formation, recirculation effects and enable maximal delivery of topical therapy.

ANTERIOR FUNCTIONAL UNIT:

Uncinate process and maxillary sinus –uncinate process is a sickle shaped bone. Attached inferiorly to inferior turbinate and palatine bone. Anterosuperiorly to lacrimal bone. Postero superiorly to medial orbital wall in 85% of cases or skull base/middle turbinate in 15% cases.

The true maxillary ostial opening is covered by the uncinat process together with anterior and posterior fontanelle. Failure to connect the true ostia with the common sinus cavity results in mucous recirculation.

Ethmoid bulla: Largest and consistent anterior ethmoid air cell, attached laterally to lamina papyracea and has variable attachments to skull base and basal lamella. Haller cell- a variant of ethmoid bulla .an infraorbital anterior ethmoid cell that pneumatizes into the maxillary sinus and cause obstruction to it.

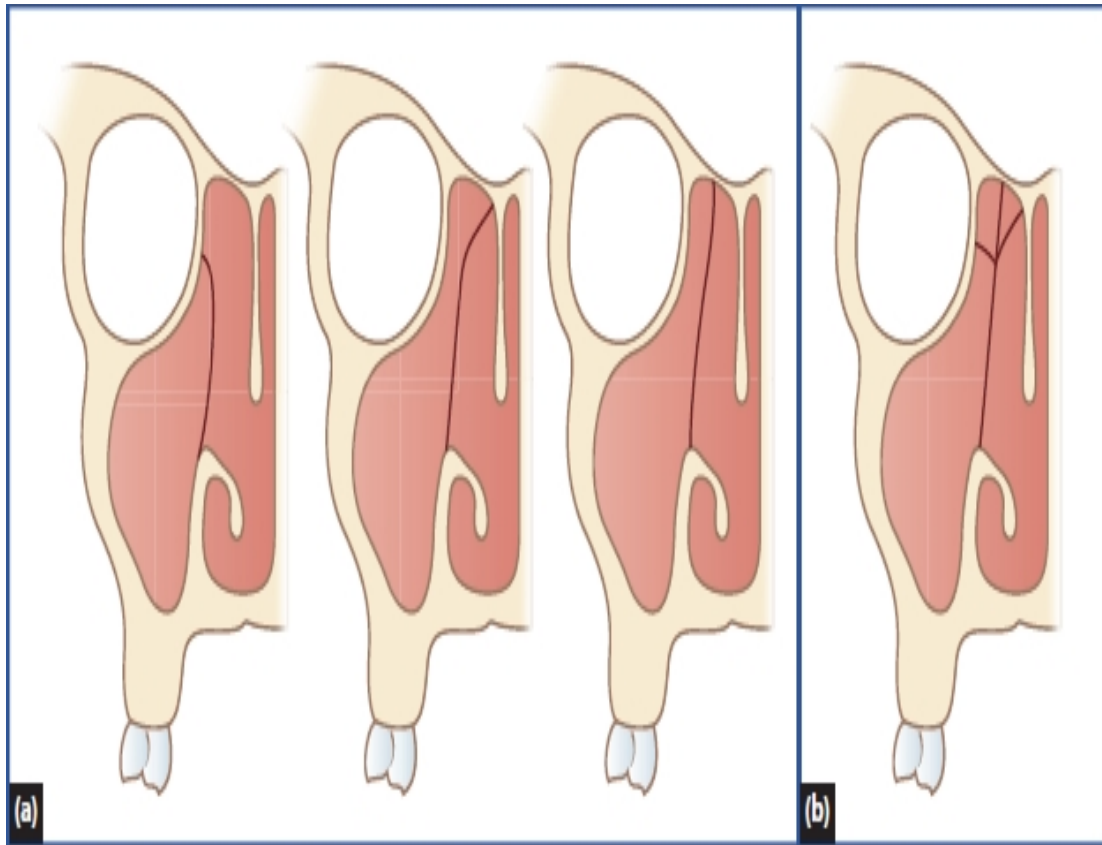
Middle turbinate has three segments. sagittal, coronal and axial segments.

1. Sagittal-attaches to skull base at the lateral lamella.
2. Coronal-forms the basal lamella which separate the anterior ethmoid and posterior ethmoid cavities.
3. Axial-attaches to the lateral nasal wall and is the entry point of the terminal branch of the sphenopalatine artery.

Frontal sinus-Anterior structures encroaching on the frontal recess include the agger nasi, lateral unciniate process and frontal cells.

Agger nasi is anterior most ethmoid air cell. medial border by the unciniate process.

Uncinate process in 85% of cases inserts into the medial orbital wall, thus the frontal recess drainage pathway is medial to the unciniate process. 15% of cases unciniate process attaches to either skull base /middle turbinate. the frontal recess drainage pathway is lateral to the unciniate process.



KUHN CLASSIFICATION OF FRONTAL CELLS:

Represents cells of first ethmoturbinal that pneumatise above agger nasi towards the frontal sinus.

TYPE 1-A single frontal ethmoidal cell above the agger nasi but below the frontal sinus floor.

TYPE 2 –A tier of cells above the agger nasi.

TYPE 3 –A cell pneumatizing in the floor of the frontal sinus.

TYPE 4 –an isolated frontal ethmoidal cell within the frontal sinus.

Wormald stated frontal ethmoid cells that fill less than 50% of the frontal sinus as TYPE 3 and greater than 50% of the frontal sinus as TYPE4.

Posterior structures encroaching on the frontal recess include supraorbital ethmoidal cells, suprabullar cells and the ethmoid cell.

Supraorbital ethmoid cells-

Anterior ethmoid air cells that extend superiorly and laterally over the orbital roof. They cause

1. Obstruction to the frontal recess.
2. Falsely mistaken for the true frontal sinus leading to incomplete surgical dissection and
3. Low position of anterior ethmoid artery within a mesentry.

Suprabulla cells-

Pneumatized extensions above the ethmoid bulla up the skull base and on the posterior table of the frontal sinus.

Medial structures encroaching on the frontal recess include intersinus septal cells and medially inserting uncinat process.

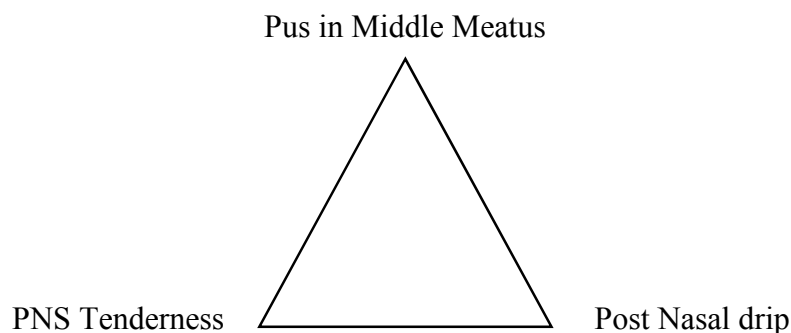
Laterally encroaching structures are frontal cells, agger nasi and a lateral uncinat process attachment.

RHINOSINUSITIS

Clinical definition of rhinosinusitis

Diagnostic criteria for rhinosinusitis	Symptoms correlated by endoscopic and radiological findings
Primary symptoms	Nasal blockage/obstruction/congestion Nasal discharge(anterior/posterior)
Additional symptoms	Facial pain/pressure Olfactory dysfunction Hyposmia/anosmia
Duration	>10 days,<3 months=acute >3 months=chronic
Endoscopy	Nasal polyps Mucopurulent discharge(middle meatus) Oedema/mucosal obstruction in middle meatus
Ct scan findings	Mucosal changes in osteomeatal complex/sinuses

Sign of sinusitis



DIAGNOSTIC AIDS: Rigid nasal endoscopy and CT scanning of the sinuses are the gold standard investigations for CRS. CT scan should be considered mandatory for all cases where surgical intervention is planned.

Others include

1. Allergy testing –RAST
2. Nasal brushings for neoplasia, granuloma/vasculitis, eosiniphilia and fungal hyphae
3. Blood tests-full blood count(serum eosiniphilia), ANCA(wegeners granulomatosis), ACE(sarcoidosis)
4. Olfactory testing-olfactory event related potentials.
5. Physiological testing – peak inspiratory nasal flow, rhinomanometry, mucociliay clearance.
6. Ciliary functioning testing - ciliary beat frequency, ciliary beat pattern analysyis ,electron microscopy.
7. Patients reported outcome measures/symptom scores- SNOT,RSOM,CSS and other questionnaires.

CHRONIC SINUSITIS WITH POLYPS

Localised nasal polyposis (CRSwNPS-LOCALISED) represent a benign entity such as an antro-choanal polyp or be part of a tumour such as an inverted papilloma or sinonasal malignancy.



Diffuse nasal polyposis (CRSwNP - DIFFUSE) -bacterial superantigens ,fungal antigens and allergic allergens have all been suggested as mechanisms driving T-cell activation ,IgE and IL5 production resulting in subsequent tissue eosinophilia.TH1 cell and TH17 pattern within polyp tissue and in cystic fibrosis, patients exhibit a neutrophila.



The super antigen hypothesis proposes that non invasive staph. aureus in the nasal mucosa of CRS patients secretes exotoxins,which produce a localised eosinophilic inflammatory response .exotoxin specific super antigen IgE, eosinophil and markers of eosinophilic inflammation are higher in cases of CRSwNPs compared to CRSsNPs.

Localised CRSsNP (isolated sinus disease and odontogenic disease)

anatomical variation may predispose a patient to isolated inflammation in only one of the sinuses as a postobstructive phenomenon. Anatomical variants such as infraorbital ethmoid cells, concha bullosa, and narrow nasal cavity secondary to deviated nasal septum correlated with mucosal thickening, particularly in the maxillary sinus. 10% of these cases the cause will be odontogenic.



Diffuse non-polypoidal (CRSsNP) it is characterised by fibrosis, goblet cell hyperplasia, basement membrane thickening, subepithelial oedemas and mononuclear cell infiltration. Remodelling is a dynamic process in both health and disease that balances extra-cellular matrix (ECM) production and degradation, which is regulated by diverse mediators among which TGF- beta takes a central role.



Upregulation of the TGF-beta signalling pathway in patients with CRSsNPS and its down-regulation in patients with CRSwNPs on the protein level are reflected by oedema formation and a lack of collagen production in patients with CRSwNPS and excessive collagen deposition associated with fibrosis in patients with CRSsNPs. Increased levels of IFN-gamma in the inflamed sinus mucosa and low ECP/myeloperoxidase.

Systemic conditions causing rhinosinusitis or possible differential diagnosis

Conditions	Disease	Diagnostic aids
Congenital	Cystic fibrosis	Abnormal sweat test
	Primary ciliary dyskinesia	Abnormal mucociliary clearance
	Primary immunodeficiencies (CVID, SCID, hypo/dys-gammaglobulinaemias)	Absent/low antibodies

Infectious/ inflammatory	HIV Sarcoidosis Tuberculosis Granulomatosis with polyangitis Churg – strauss syndrome	ELISA Elevated ACE, hilar lymphadenopathy AFB, Mantoux test cANAC positive pANCA positive
Neoplastic	Hematalogical malignancy Sinonasal malignancy	Abnormal FBC/bone marrow Biopsy/radiological changes
Iatrogenic	Atrophic rhinitis Chemotherapy /immunosuppression	Excessive crusting following radical nasal surgery drug history
Metabolic	malnutrition	Low BMI

NASAL POLYPOSIS

Nasal polyps represent the end stage local manifestation of chronic inflammatory disease of the sinonasal tract. Incidence is between 1 and 20 per 1000 population. Nasal polyps are more common in males(2-4:1).no racial predilection.

Clinical presentation - mild nasal congestion with a watery rhinorrhoea, persistent nasal obstruction associated with hyposmia/anosmia, thick post nasal discharge. Chronic mouth breathing and obstructive sleep symptoms. Proptosis, hypertelorism and diplopia.

PATHOGENESIS:

Polyps form when oedematous connective tissue stroma ruptures and herniates through the basement membrane. Bacteria, fungi, allergens and superantigens play a prominent role. A robust T-helper 2 response, eosinophilic infiltration, decreased T regulatory function and an abundance of IL-5 cytokine.

Allergy - only 0.4-4.5% of patients with allergic rhinitis have nasal polyps elevated levels of immunoglobulin E (IgE) and +ve skin tests to inhalant allergens.

Bacteria – include gram positive organisms like streptococci, coagulase negative staphylococci and staphylococcus aureus and gram negative organisms like moraxella catarrhalis, hemophilus influenza, prevotella species, enterobacter species and pseudomonas species.

42.5% of staph. Aureus secrete exotoxin gene which behave as super antigens. These antigens induce the activation of numerous T-cell clones and a massive secretion of cytokines.

Biofilms are bacteria enclosed within a self-developed matrix of polysaccharides which renders the bacteria inaccessible to microbial agents.

ASSOCIATED DISEASES

ASTHMA -30-71% .directly associated.

ASPIRIN – exacerbated respiratory disease (AERD, Samters triad) - 5-10%.Bronchial asthma, nasal polyposis and aspirin sensitivity.

Allergic fungal rhino sinusitis (AFRS) -80%

Bent and kunt classification of AFRS

Major	Minor
Type I Hypersensitivity	Asthma
Nasal polyposis	Unilateral disease
Characteristic CT findings	Bone erosion
Eosinophilic mucin without invasion	Fungal cultures
Positive fungal stain	Charcot-Leyden crystals
	Serum eosinophilia

CYSTIC FIBROSIS - 86% . Autosomal recessive disorder . CFTR gene mutation. Neutrophil driven with IL-8 being the primary cytokine. culture grow staph. Aureus or pseudomonas aeruginosa.

PRIMARY CILIARY DYSKINESIA -27% nasal polyposis and bronchiectasis . Kartageners syndrome is a triad of chronic sinusitis, bronchiectasis and situs inversus.

YOUNGS syndrome- 10%. obstructive azoospermia, bronchiectasis and sinus disease.

EPGA (churgstrauss) - 50%. A systemic small vessel vasculitis associated with asthma and eosinophilia.

GENETICS.

MEDICAL MANAGEMENT OF CHRONIC RHINOSINUSITIS

Aim will be to

1. Reduce inflammation,
2. Reduce bacterial load and
3. Optimize ciliary function by removing mucus.

TREATMENT TARGETING INTRINSIC MUCOSAL INFLAMMATION Intranasal

corticosteroids –improved overall symptoms scores. A greater benefit in reduction of polyp score when topical steroid was administered in patients groups who had undergone previous sinus surgery compared to patients who had never had surgery.

Mometasone and **fluticasone** –excellent safety profile, low incidence of adverse events,no evidence of nasal mucosal atrophy or growth retardation in pediatric population.

Systemic corticosteroids-short course (2-4 weeks) of oral steroids showed an objective reduction of polyp size and a subjective improvement of nasal symptoms and quality of life. Long term risks are osteoporosis and posterior subcapsular cataract formation.

Immunomodulatory antibiotics-target markers including IL-8,IL-4,gamma -IFN and TNF –alpha and neutrophil mediated inflammation.

Roxithromycin reduced symptoms scores and IL-8 levels. long term macrolides increased resistance and Gi side effects. 20 day course of **doxycycline** reduced myeloperoxidase, eosinophil cationic protein, matrix metalloproteinase-9 in CRSwNPs and reduced polyp size over a 12 week period.

leukotriene receptor antagonists – monteleukast used as an adjunct to steroid treatment in patients with CRSwNPs and asthma. Reduced nasal allergic symptoms like sneezing and facial pain.

Novel immunoregulation – monoclonal antibodies like omalizumap (anti-IgE) and mepolizumap (anti-IL-5) reduced symptom score and polyp size.High cost, risk of anaphylaxis and need for subcutaneous injection are limiting factors.

Aspirin desensitisation –lysine aspirin, a soluble form, is used for diagnosis of aspirin sensitivity by nasal or bronchial challenge and topical nasal desensitisation.

TREATMENT AIMED AT REDUCING MICROBIAL LOAD-

long term macrolides are used predominantly for an anti-inflammatory effect. Doxycycline reduced post nasal drip ,considered as an adjunct in treatment of CRSwNP . Biofilms both fungal and bacterial are associated with more severe disease and recalcitrant to surgical therapy. systemic antibiotics are ineffective against biofilms. Topical antibiotics and surfactants may be beneficial.

TREATMENT AIMED AT IMPROVEMENT IN MUCOCILIARY CLEARANCE

Saline irrigation can improve mucociliary clearance by the removal of mucus ,infected crusts and proinflammatory agents. Large volume irrigation appears to have a greater impact on mucus management than simple sprays.

Mucoactive agents – chemical surfactants are cationic, anionic or zwitterionic based on the charge of the hydrophilic domain present in these molecules. Detergents, soil wetting agents paints, antifogging solutions and ski wax are surfactants.

Delivery of medical therapy –

ESS can improve delivery, but if ostial size and the extent of surgery are sufficient to do so. Most effective delivery devices are the positive pressure

,high volume irrigation bottles or neti pots, which can penetrate all sinuses in a postoperative patient following wide sinus surgery of fronto sphenoidotomy.

SURGICAL MANAGEMENT OF RHINOSINUSITIS

MAXILLARY SINUS

Different surgical modalities are

1. Antral washout
2. Intranasal antrostomy
3. Caldwell –luc operation
4. Denker's operation
5. Canfield's operation
6. Mc neil's obliteration procedure
7. Functional endoscopic sinus surgery

ETHMOID SINUS

Different surgical modalities are

1. External approach by Lynch Howarth incision
2. Transantral approach by Jansen Horgan's operation
3. Patterson's operation by transitional approach
4. Functional endoscopic sinus surgery : Has replaced all the above mentioned surgical modalities.

FRONTAL SINUS

Different surgical modalities are

1. Trephining of the frontal sinus
2. External fronto ethmoidectomy

Types (Lynch Howarth's procedure , Killian's procedure , Reidel's procedure , Lothrop's procedure (Chaput Mayer procedure)

3. Osteoplastic frontal sinus with obliteration
4. Draf's frontal sinus procedure
5. Functional endoscopic sinus surgery

SPHENOID SINUS Different surgical modalities are

1. Trephining
2. External transethmoidal sphenoidectomy
3. Transeptal transphenoidal approach
4. Functional endoscopic sinus surgery

FUNCTIONAL ENDOSCOPIC SINUS SURGERY

It is termed as functional as the function of the sinuses is restored by providing ventilation and drainage of the sinuses.

Anaesthesia can be done under local or general anaesthesia . Local anaesthesia is preferred due to the following reasons :

Less blood loss

Good visualisation

Vision of the patient can be monitored.

Oral diazepam 10mg at night and morning on the day of surgery

Inj.pethidine, Inj.phenergan, Inj.atropine given IM 45mins before surgery.

Cottonoids are dipped in a solution containing 10 ml of 4% xylocaine and

1ml of 1:1000 adrenaline,thus making the dilution of adrenaline

1:10,000.spray the nasal cavity with 4% xylocaine and the cottonoids are

placed as follows:

- Posteriorly in the middle meatus and close to the sphenopalatine foramen.
- Between the lateral wall and middle turbinate anteriorly.
- Between the middle turbinate and the septum.
- Between the inferior turbinate and the septum.

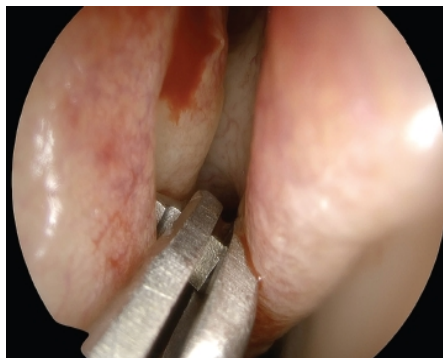
Local infiltration 2% xylocaine with 1:1,00,000 adrenaline under endoscopic guidance given to the following sites:

- Axilla of middle turbinate
- lateral wall opposite to the upper and middle part of middle turbinate
- lateral just above the inferior turbinate.

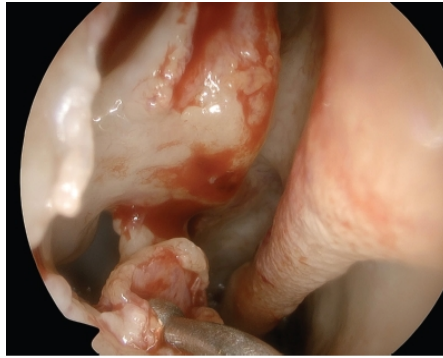
Surgical position: Supine position with 15 degree head elevation.

SURGICAL TECHNIQUES

i) UNCINECTOMY: The free edge of the boomerang shaped uncinate process can be identified. The uncinate process is removed using back biting forceps or dislocated using a double right angled ball probe and then removed with micro debrider.



A back biting forceps is used to perform the inferior uncinectomy incision.



Dissecting out the bone of the horizontal process of the uncinata.

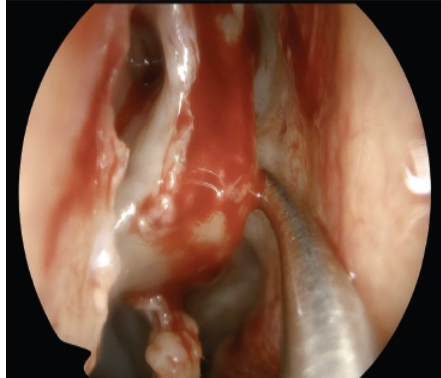
ii) MIDDLE MEATAL ANTROSTOMY:

The maxillary sinus ostium is identified and enlarged toward the anterior fontanelle, by using a back biting forceps. Care is taken in not opening the ostium anterior to the level of the middle turbinate to prevent injury to the nasolacrimal duct. Many of the surgeons enlarge the maxillary sinus ostium posteriorly by using a straight biting forceps.

iii) ANTERIOR ETHMOIDECTOMY:

The bulla ethmoidalis is seen clearly when the uncinata bone is removed. The bulla ethmoidalis is removed with Blakesly forceps. Never work above the upper attachment of the middle turbinate. The bulla is opened by gently pushing in its anterior surface in the medial direction with a Blackesly forceps. After identifying the lumen the entire bulla can be resected. The ethmoid cells are removed off the disease. The anterior ethmoidal vessels

cross the ethmoids immediately below the anterior skull base in a bony ridge.



A double right- angle ball probe is inserted into the natural ostium of the bulla ethmoidalis (medial) then the anterior face is fractured anteriorly.

IV) POSTERIOR ETHMOIDECTOMY:

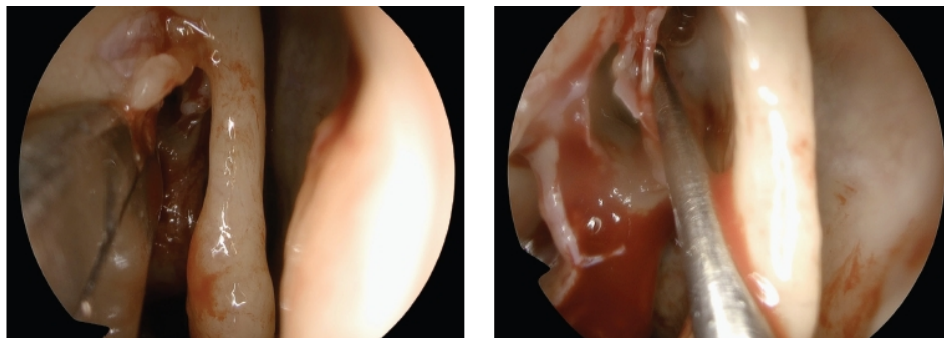
After the ethmoidal bulla is removed the course of the ground lamella can be easily followed with the endoscope. The ground lamella should be opened as far medially and inferiorly as possible to open the posterior ethmoids. Ground lamella is the posterior wall of bulla separating anterior and posterior ethmoidal cells. Never remove the whole of ground lamella, which destabilizes the middle turbinate .The posterior ethmoidal cells are opened and cleared off from the disease.

V) SPHENOIDOTOMY:

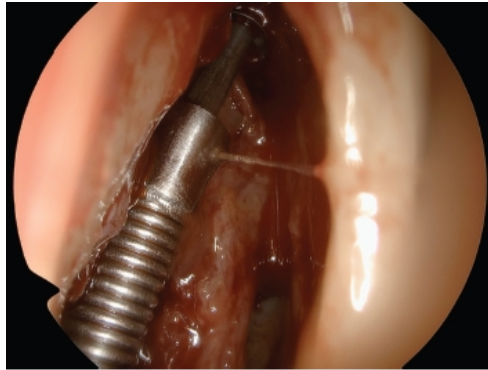
The sphenoid sinus ostium is seen in the inferomedial aspect of the posterior ethmoidal cells or medial to the middle turbinate; 1-1.5 cm above the upper limit of the posterior choana and can be opened under direct vision. Widen the ostium inferiorly and medially.

vi) FRONTAL SINUS SURGERY:

Using a Kerrison's punch in the axilla of the middle turbinate, the anterior portion of the agger nasi can be removed.



Curettes and angled instruments can then be used to remove the posterior wall and roof of the agger nasi to expose the frontal recess. The position of the anterior ethmoid artery needs to be identified and maintained in the surgeon's mind at all times. Any intersinus septum cells or supraorbital ethmoid cells need to be addressed, angled endoscopes and curved microdebrider blades and giraffe forceps or houseman punch may be needed in this area.



Use of a housemann punch to facilitate removal of Kuhncells in the frontal recess.

COMPLICATIONS OF FESS

- Nasal complications
- Orbital complications
- Intracranial complications

NASAL COMPLICATONS

- Haemorrhage
- Adhesions
- Infection
- Osteitis
- Crusting
- Mucous cyst
- Recirculation of mucus

ORBITAL COMPLICATIONS

Minor complications

- damage to periorbita
- perorbital surgical emphysema

Major complications

- Damage to medial rectus muscle
- Damage to the nasolacrimal duct
- Intraorbital haemorrhage
- Injury to optic nerve

INTRACRANIAL COMPLICATONS

- CSF leak
- Meningitis
- Pneumocephalus
- Intracranial bleed



FESS INSTRUMENTS

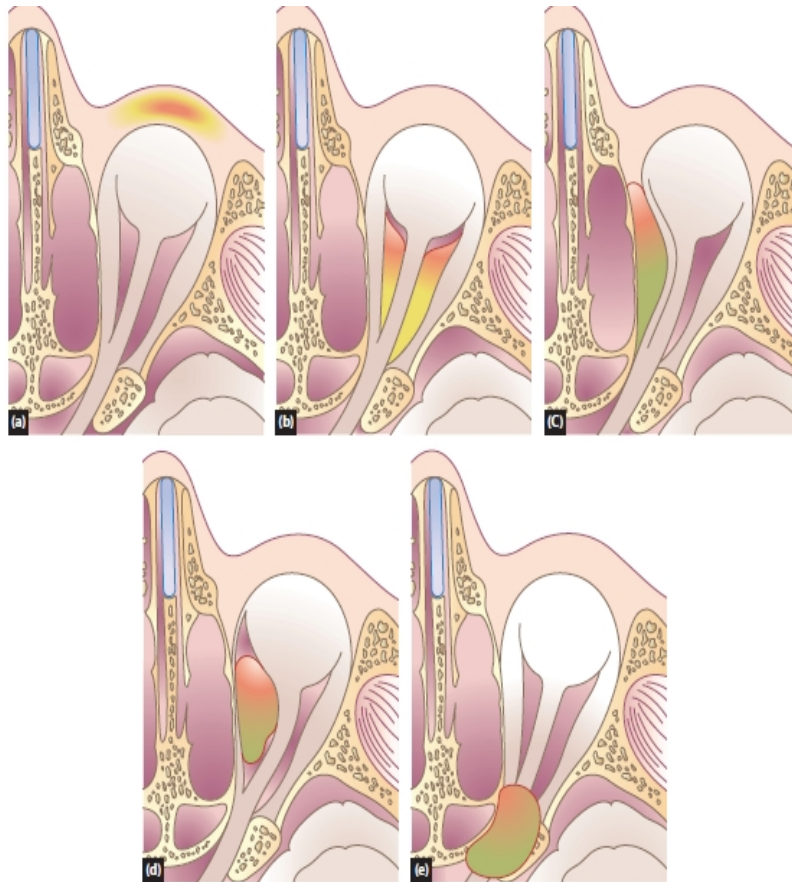
TABLE:FESS INSTRUMENTS

0,30 & 70 Degree endoscopes with guard	Blakesley forceps – straight 45 & 90 degree
Cold light source & fibre-optic cable	Ostrum’s reverse cutting forceps
Suction tips- straight & curved	Kerrison’s punch forceps
Long curved needle/ 26G with 5ml syringe	Middle turbinate scissors-straight,
Anti-fog solution(ultrastop/savlon)	Right & left
Freer’s elevator	Curettes & spoons of diff angles
Sickle knife	Video adapter & monitor
Ball probe	Cautery

TABLE: Complications of rhinosinusitis

Orbital	Intracranial	Bony	Chronic
Preseptal cellulitis (50%)	Sub dural empyema (38%)	Osteomyelitis & pott's puffy tumour	Mucocele & pyocele
post septal cellulitis or orbital cellulitis without abscess(35%)	Intracranial abscess(30%)		
Subperiostial abcess (15%)	Extradural abscess(23%)		
Orbital abscess(1%)	Meningitis(2%)		
Cavernous sinus thrombosis	Cavernous or sagittal sinus thrombosis(2%)		

ORBITAL COMPLICATIONS



Various orbital complications on axial projection: (a) preseptal inflammation; (b) orbital cellulitis; (c) orbital cellulitis with subperiosteal (extra periosteal) abscess; (d) orbital cellulitis with intra-periosteal abscess; (e) cavernous sinus thrombosis. Red and yellow shading indicate inflammation/cellulitis, and green shading indicates pus.

CHANDLER STAGES

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Preseptal cellulitis	Postseptal cellulitis or orbital cellulitis without abscess	Subperiosteal abscess	Orbital abscess	Cavernous sinus thrombosis/ abscess
Inflammation does not extend beyond the orbital septum (where the medial orbital periosteal reflection attaches to the medial eyelid at the tarsal plate).	Inflammation extends into the tissues of the orbit.	There is abscess formation deep to the periosteum of the orbital bones, typically at the lamina papyracea from ethmoid sinusitis.	There is abscess formation within the orbit which has breached the periosteum.	The inflammatory process has extended into the cavernous sinus which thromboses and may progress to abscess formation.

Risk factors for simultaneous orbital and intra-cranial complications

Male

Age 7 years and older

Failure to improve after appropriate therapy

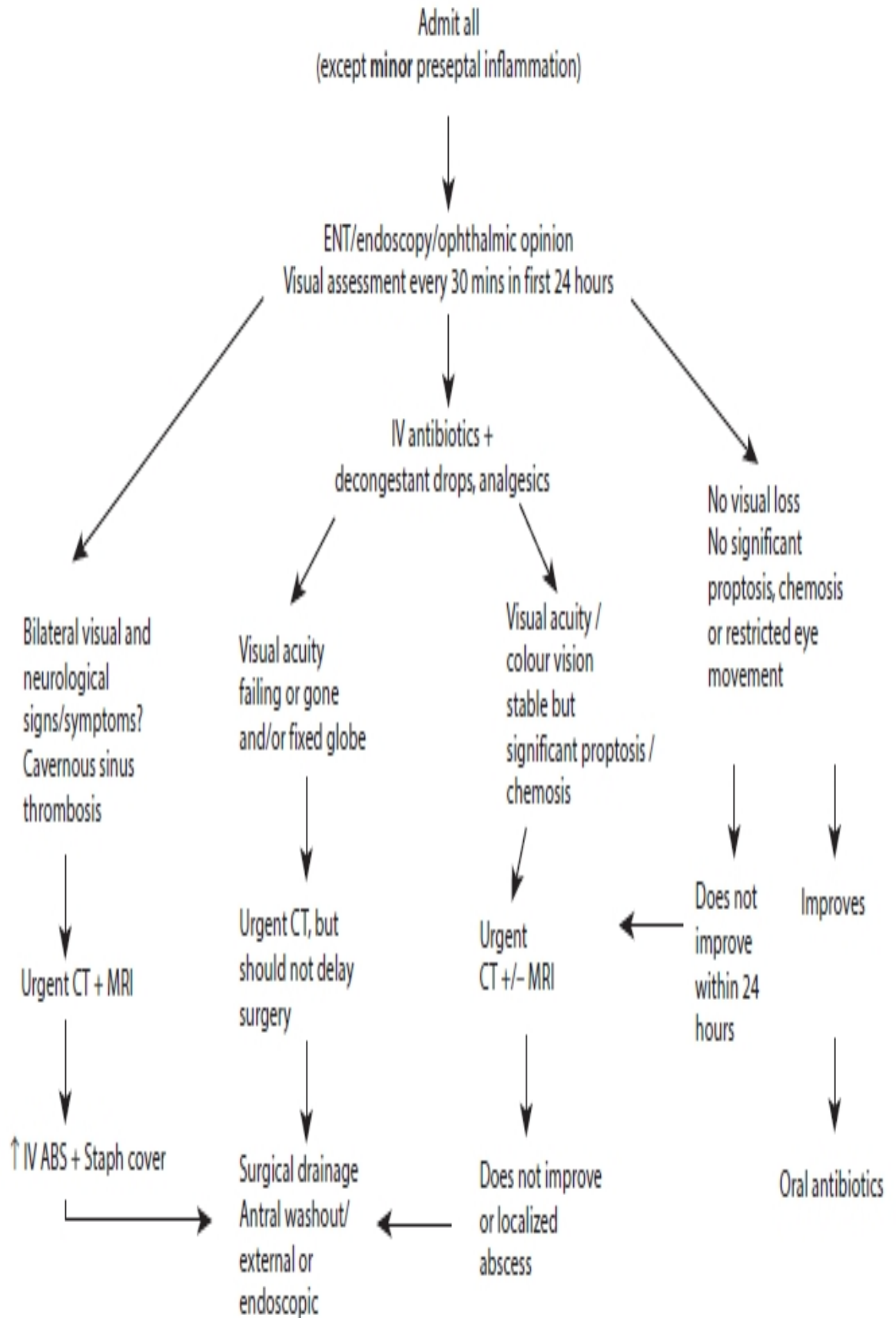
Changes in neurologic status

Frontal sinus opacification on CT

Superior or lateral position of orbital abscess

Need for surgical intervention to drain orbital abscess

MANAGEMENT ALGORITHM FOR ORBITAL COMPLICATIONS



Statistical Analysis: Correlation between CT scan and Endoscopic sinus surgery.

Findings was done on the basis of,

1. Sensitivity
2. Specificity
3. Positive Predictive Value (PPV)
4. Negative Predictive Value (NPV)
5. Kappa's measure of agreement
6. P-value

Parameters for Study

Osteomeatal complex normal, total occlusion, partial occlusion(OMC-N,TO,PO),Mucosal thickening in nasal cavity and sinuses(MT-N,S), Polypoidal changes in nasal cavity and sinuses(PC-N,S), Polypoidal changes in individual sinuses like maxillary(M), frontal(F), anterior ethmoid (AE),Posterior ethmoid (PE).

SCORING SYSTEMS

- Symptom score (ss)-questionnaire based on the RSI
- Nasal endoscopic score (ES) – Lund-Mackay
- CT PNS score (LM) – Lund-Mackay

These are detailed below

Modified RSI scoring

CLINICAL SYMPTOMS PREOP/POSTOP	Absent	Very mild	Mild	Moderate	Severe	Very severe
Facial pain/pressure	0	1	2	3	4	5
Facial congestion	0	1	2	3	4	5
Nasal obstruction	0	1	2	3	4	5
Post nasal drip	0	1	2	3	4	5
Hyposmia	0	1	2	3	4	5
Headache	0	1	2	3	4	5
Fever	0	1	2	3	4	5
Bad breadth	0	1	2	3	4	5
Fatigue	0	1	2	3	4	5
Dental pain	0	1	2	3	4	5
Cough	0	1	2	3	4	5
Ear pain/fullness	0	1	2	3	4	5

Lund-mackay endoscopy staging system

Preoperative/postoperative endoscopic appearance

Characteristics	Right	Left
Polyps	0,1,2,3	0,1,2,3
Edema	0,1,2	0,1,2
Discharge	0,1,2	0,1,2
Scarring	0,1,2	0,1,2
crusting	0,1,2	0,1,2

Polyps:0-absence of polyp;1-polyps in the middle meatus only;2-polyps beyond the middle meatus but not obstructing the nose ;3-polyps completely obstructing the nose; Edema: 0-absent; 1-mild; 2-severe; Discharge:0-no discharge;1-clear thin discharge:2-thick purulent discharge.Scarring:0-absent ;1-mild;2-severe; crusting:0-absent;1-mild;2-severe.

Lund-Mackay Radiological grading of CT PNS

<i>Sinus system</i>	<i>Right</i>	<i>Left</i>
Maxillary	0,1,2	0,1,2
Anterior ethmoid	0,1,2	0,1,2
Posterior ethmoid	0,1,2	0,1, 2
Sphenoid	0,1,2	0,1,2
Frontal	0,1,2	0,1,2
Osteomeatal complex(OMC)	0,2	0,2
Total	0-12	0-12

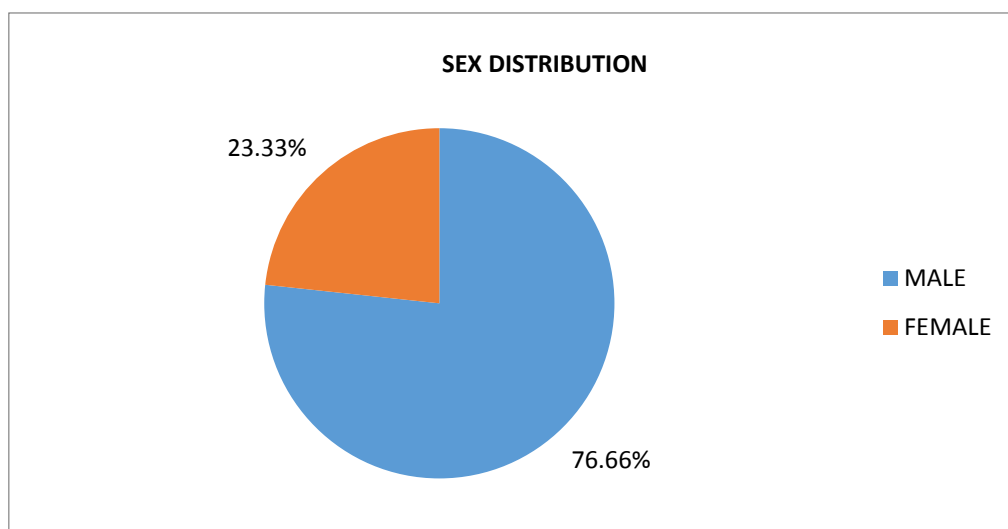
All sinus systems except OMC:0-clear;1-partial opacification;2-total opacification;OMC:0-not occluded;2-occluded.

RESULTS

A total of 150 cases was studied during the study period . Among the study population ,115 (76.66%) were males and 35(23.33%) were females. Common age group of presentation in our study was between 21-30 yrs followed by age group between 31-40 yrs.

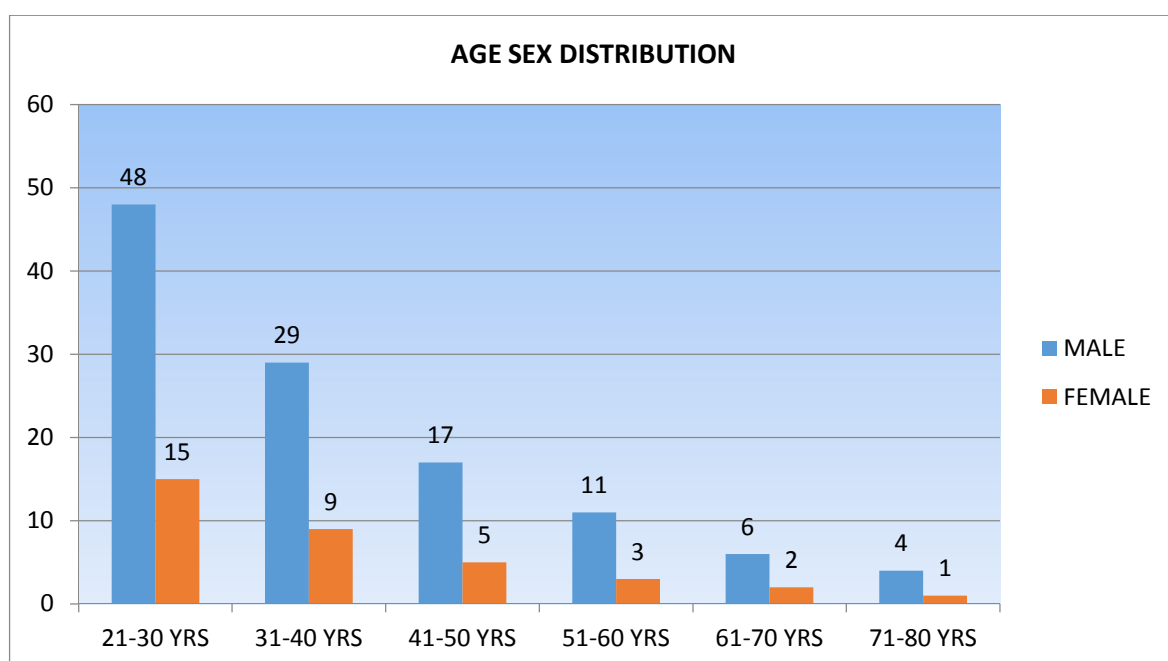
SEX DISTRIBUTION

Sex	No of cases	Percentage (%)
Male	115	76.66%
Female	35	23.33%



AGE SEX DISTRIBUTION

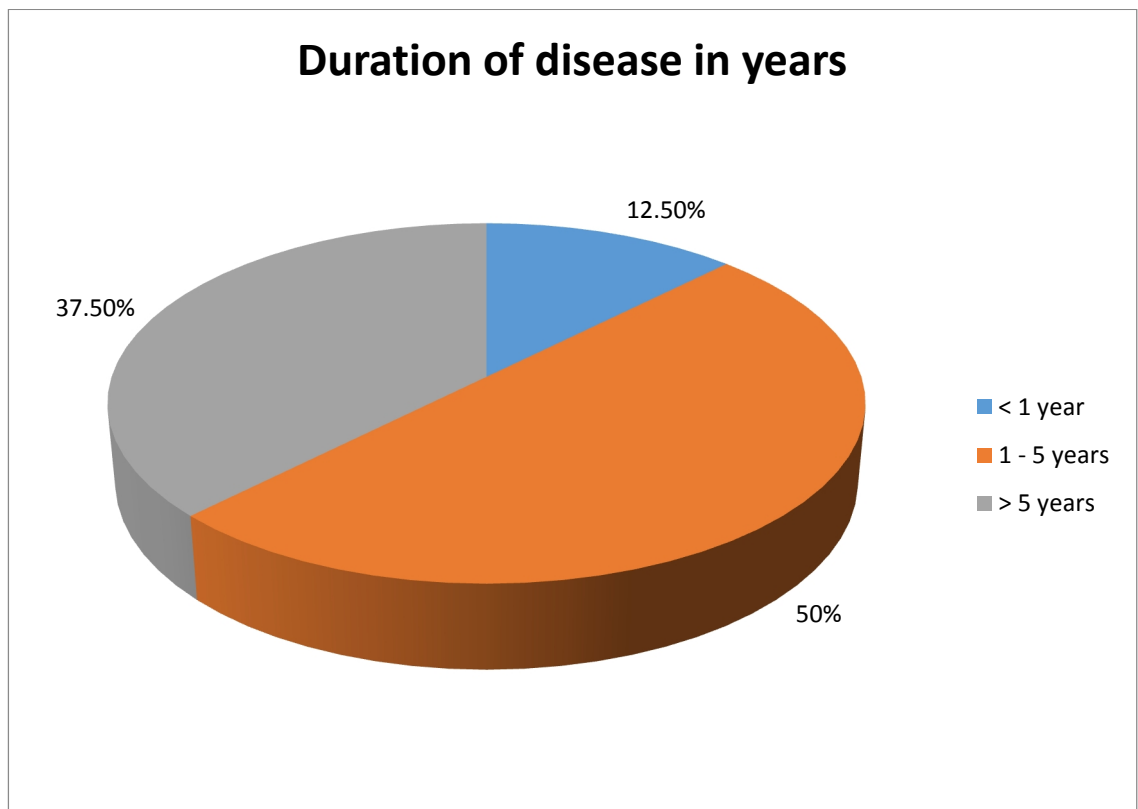
Age in years	Male	Male%	Female	Female%	Total	Total%
21-30	48	32%	15	10%	63	42%
31-40	29	19.33%	9	6%	38	25.33%
41-50	17	11.33%	5	3.33%	22	14.66%
51-60	11	7.33%	3	2%	14	9.33%
61-70	6	4%	2	1.33%	8	5.33%
71-80	4	2.66%	1	0.66%	5	3.32%



DISTRIBUTION OF DURATION OF DISEASE

Duration in years	No of cases	Percentage(%)
Less than 1	25	12.5%
1-5	75	50%
More than 5	50	37.5%

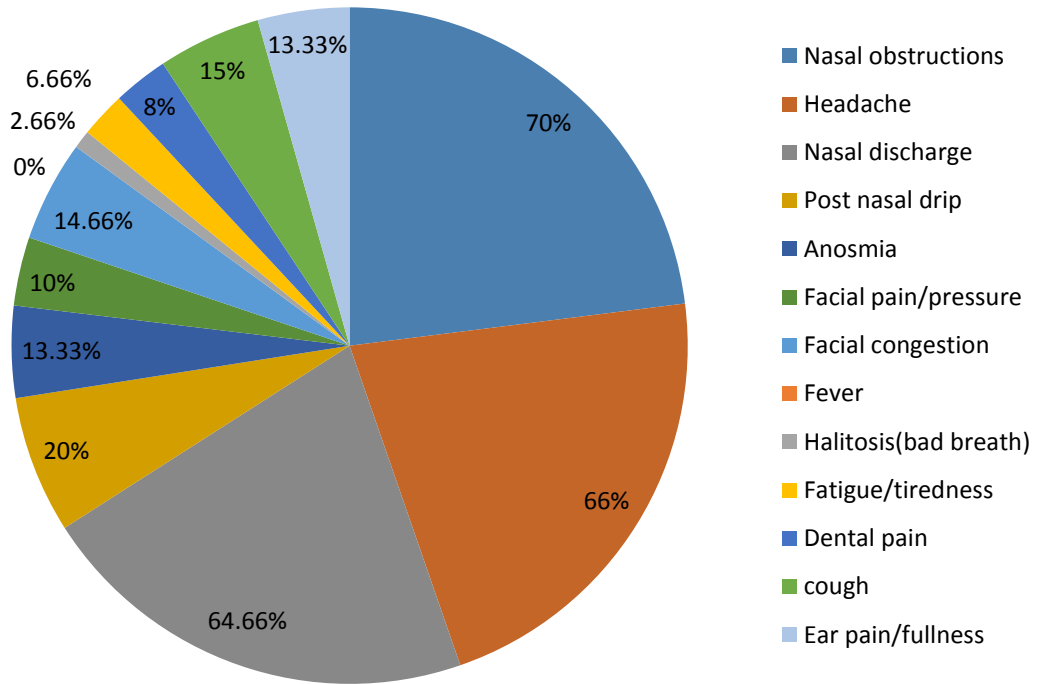
50% of patients with chronic sinusitis had clinical symptoms for 1 to 5 yrs and 37.5% had symptoms for more than 5 yrs .12.5% had symptoms for less than 1 yr.



CLINICAL SYMPTOMS IN PATIENTS WITH CHRONIC SINUSITIS

Clinical symptoms	No of cases	%
Nasal obstructions	105	70%
Headache	99	66%
Nasal discharge	97	64.66%
Post nasal drip	30	20%
Anosmia	20	13.33%
Facial pain/pressure	15	10%
Facial congestion	22	14.66%
Fever	0	0%
Halitosis(bad breath)	4	2.66%
Fatigue/tiredness	10	6.66%
Dental pain	12	8%
cough	15	15%
Ear pain/fullness	20	13.33%

clinical symptoms in chronic sinusitis

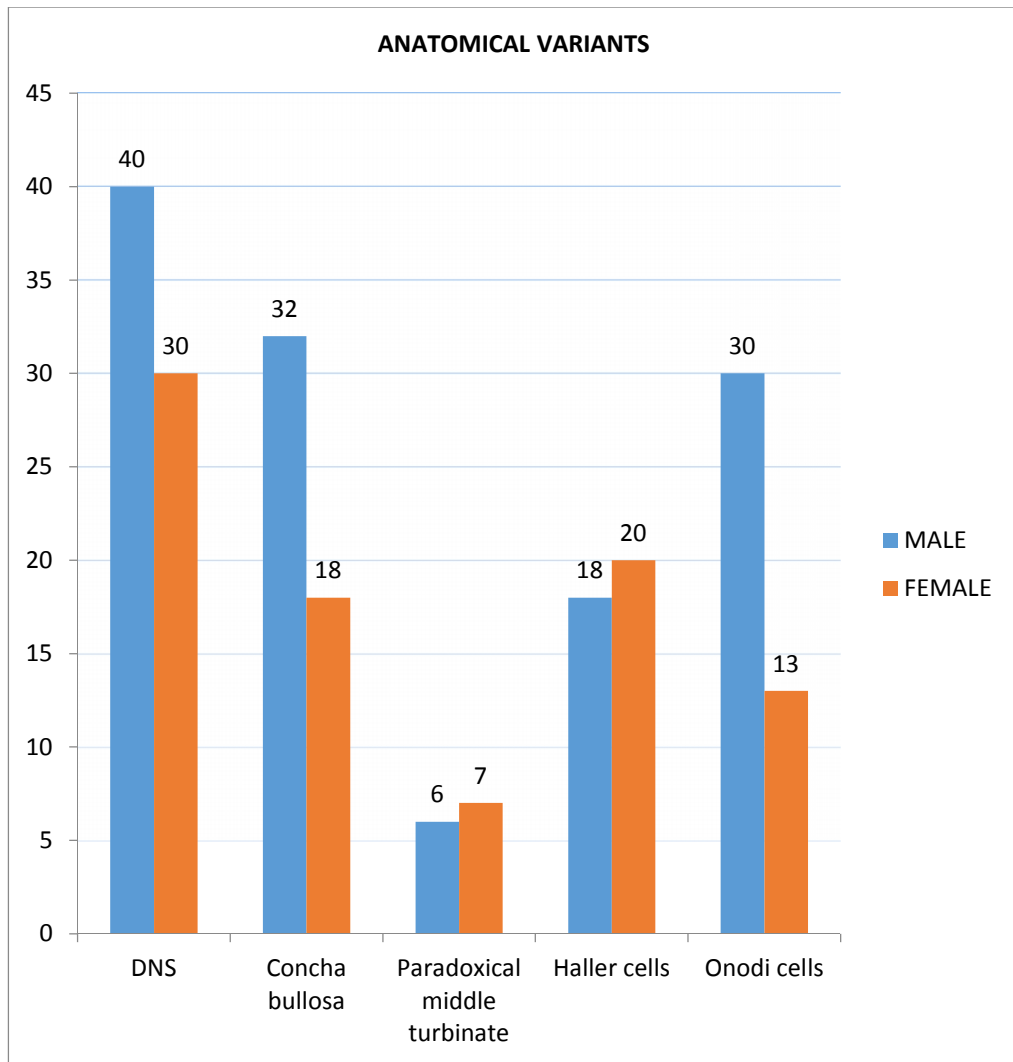


Among the clinical symptoms ,nasal obstruction was the commonest symptom noted in 105(70%) ,followed by headache 99(66%).fever and halitosis were the least clinical symptoms noted.

**ANATOMICAL VARIATIONS ON CT SCAN IN PATIENTS OF
CHRONIC SINUSITIS**

Anatomical variants	Male	Male%	Female	Female%	Total	Total%
Deviated nasal septum	40	26.66%	30	20%	70	46.66%
Concha bullosa	32	21.33%	18	12%	50	33.33%
Paradoxical middle turbinate	6	4%	7	4.66%	13	8.66%
Haller cells	18	12%	20	13.33%	38	25.33%
Onodi cells	30	20%	13	8.66%	43	28.66%

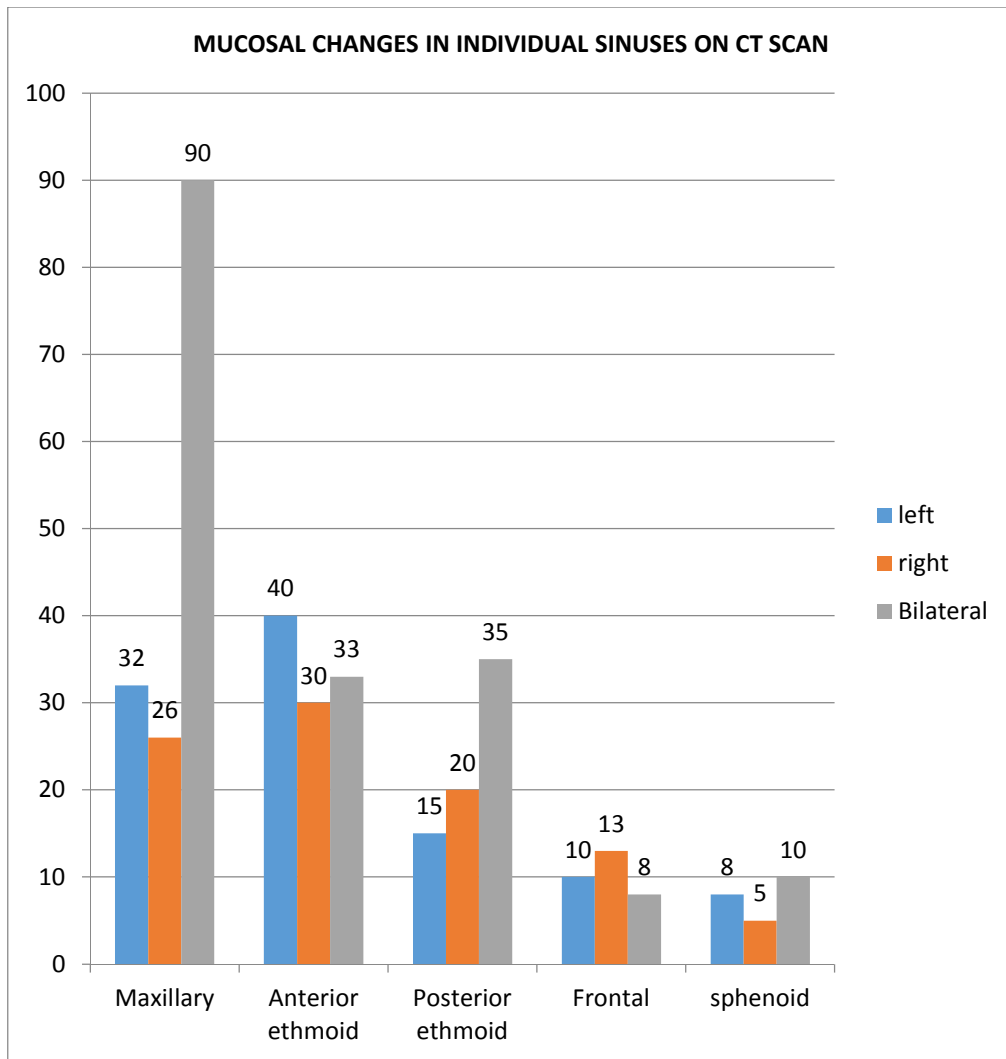
Deviated nasal septum, concha bullosa, onodi cells and haller cells were the common anatomical variants noted in 46.66%, 33.33%, 28.66% and 25.33% respectively. The less common anatomical variant noted was paradoxical middle turbinate.



**ASSESSMENT OF MUCOSAL THICKENING IN INDIVIDUAL
SINUSES ON CT SCAN**

Involved sinuses	No of cases			Total	Total%
	left	right	B/L		
Maxillary	32	26	90	148	98.66%
Anterior ethmoid	40	30	33	103	68.66%
Posterior ethmoid	15	20	35	70	46.66%
Frontal	10	13	8	31	20.66%
Sphenoid	8	5	10	23	15.33%

Overall 98.66% of maxillary,68.66% of anterior ethmoid,46.66% of posterior ethmoid,20.66% of frontal and15.33% of sphenoid sinuses were found to have mucosal abnormality on CTscan.

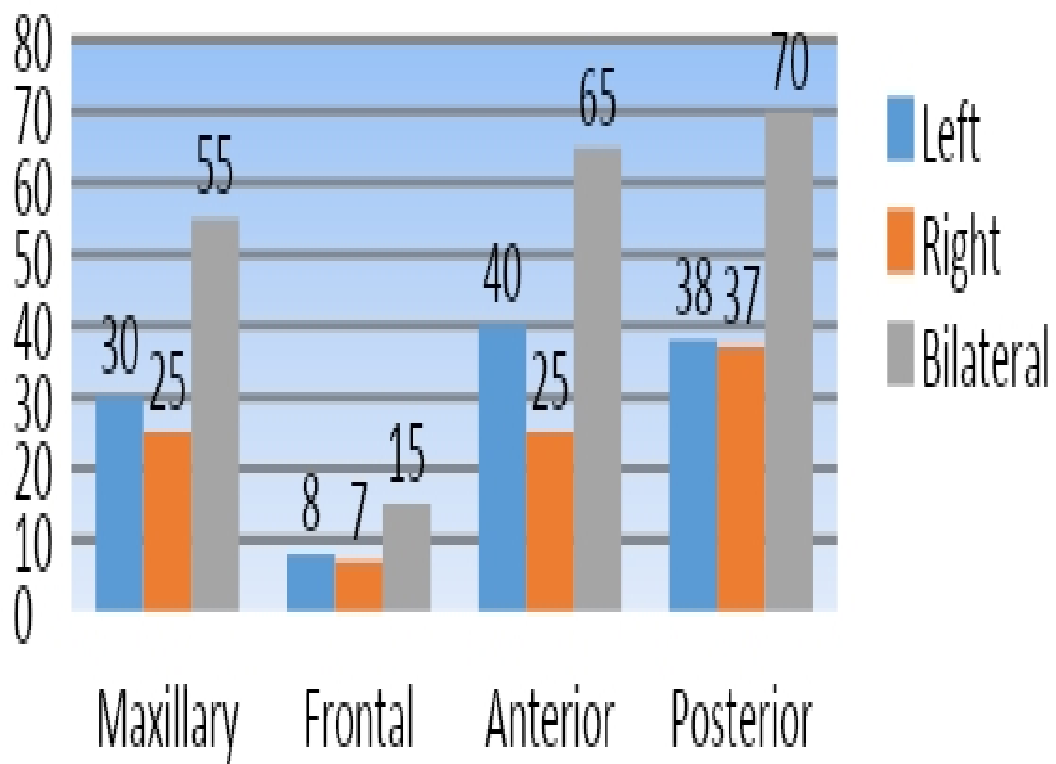


**ASSESSMENT OF POLYPOIDAL CHANGES IN INDIVIDUAL
SINUSES ON CT SCAN**

Involved sinuses	No of cases			Total	Total%
	left	right	B/L		
Maxillary	30	25	55	110	73.33%
frontal	8	7	15	30	20%
Anterior ethmoid	40	25	65	130	86.66%
Posterior ethmoid	38	37	70	145	96.66%

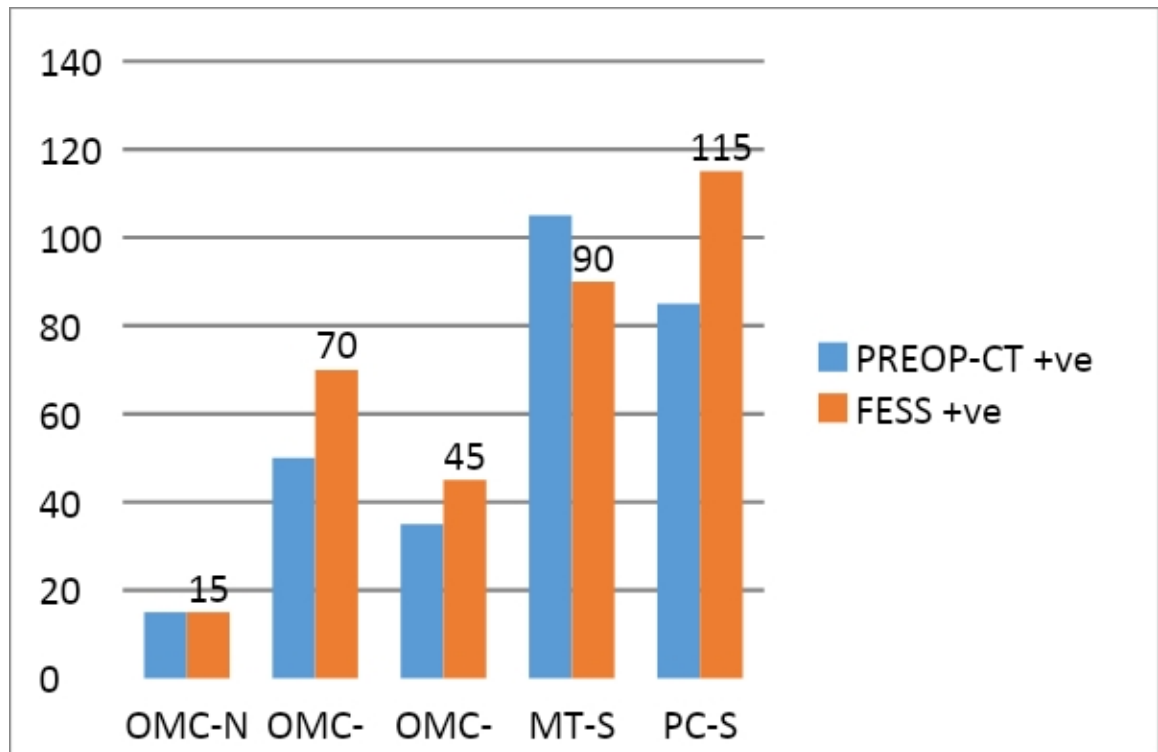
Polypoidal change was commonly found in posterior ethmoid in 145 patients with chronic sinusitis (96.66%), followed by the anterior ethmoid in 130(86.66%),maxillary sinus in 110(73.33%) and frontal sinus in 30(30%).

Polypoidal changes in individual sinuses in CT scan



**CORRELATION OF PREOPERATIVE CT SCAN AND
INTRAOPERATIVE ENDOSCOPIC FINDINGS IN CHRONIC
SINUSITIS**

Parameters	CT scan		FESS	
	No	%	No	%
OMC-N	15	10%	15	10%
OMC-TO	50	33.33%	70	46.66%
OMC-PO	35	23.33%	45	30%
MT-S	105	70%	90	60%
PC-S	85	56.66%	115	76.66%



In our study total occlusion in osteomeatal complex was present in 46.66% of patients intraoperatively as compared to 33.33% in CT scans. similarly partial occlusion was found in about 30% intraoperatively and 23.33% in CT scan.so common pathology was total occlusion followed by partial occlusion in osteomeatal complex. Mucosal thickening in sinuses was found in 60% of patients intraoperatively and in 70% patients in CT scan.polypoidal change in the sinuses showed discrepancy between ct scan 56.66% and intraoperatively (76.66%).

Parameters	sensitivity	specificity	PPV	NPV	correlation
OMC-N	100	100	100	100	Excellent

OMC-TO	64.3	93.7	90	75	Poor
OMC-PO	66.7	95.2	85.7	86.5	Poor
MT-S	100	75	85.7	100	Excellent
PC-S	73.9	85.7	94.4	50	Acceptable
M	60	86.7	81.8	68.5	Poor
F	66.7	96.3	66.7	93.3	Poor
AE	91.6	88.9	84.6	94.1	Excellent
PE	86.7	86.7	86.7	86.7	Good

- Sensitivity of > 90 is excellent correlation
- >80 is good correlation
- >70 is acceptable correlation
- >60 is poor correlation.

The correlation was excellent in patients with normal osteomeatal complex, mucosal thickening in sinuses and polypoidal change in anterior ethmoid. good correlation was found for polypoidal change in anterior ethmoid. acceptable correlation for polypoidal changes in sinuses and poor correlation for osteomeatal complex total occlusion, partial occlusion (omc-po), polypoidal change for maxillary and frontal sinuses.

KAPPA'S MEASURE OF AGREEMENT AND 'p' value

Parameters	Kappa's value	agreement	P value	Statistical significance
OMC-N	1.0	Very good	0.000	significant
OMC-TO	0.591	Moderate	0.001	Significant
OMC-PO	0.661	Good	0.000	Significant
MT-S	0.783	Good	0.000	Significant
PC-S	0.478	Moderate	0.005	Significant
M	0.467	Moderate	0.008	Significant
F	0.630	Good	0.001	Significant
AE	0.795	Good	0.000	Significant
PE	0.733	good	0.000	significant

kappa's value

0.81-1.0 is very good agreement between CT scan and operative findings.

0.61-0.80 is good agreement

0.41-0.60 is moderate agreement

0.21-0.40 is fair agreement

<0.2 is poor agreement

<0.01 no agreement

Very good agreement was found between preoperative ct scan and operative findings in cases with normal osteomeatal complex. Good agreement for osteomeatal complex-partial occlusion, mucosal thickening in sinuses, polypoidal changes in frontal, anterior ethmoid ,posterior ethmoid. Moderate agreement was found in osteomeatal complex-total occlusion, polypoid changes in sinuses and maxillary sinus.p value <0.05 is statistically significant.In our study all parameters were statistically significant.

CLINICAL SYMPTOMS IN PATIENTS WITH CHRONIC SINUSITIS

SYMPTOMS	PRE-OPERATIVE	POSTOPERATIVE
Nasal obstruction	105	10
Post nasal drip	30	12
Rhinorrhea	97	45
Synechia	-	7
Ostial stenosis	-	5
recurrence	-	4
Facial pain/pressure	15	-
Facial congestion	22	-
Anosmia/hyposmia	20	3
Headache	99	8
Fever	-	-
Halitosis(bad breath)	4	-
Fatigue/tiredness	10	-
Dental pain	12	-
Cough	15	-
Ear pain/fullness	20	-

In our study , patients with chronic rhinosinusitis showed improvement in clinical symptoms such as nasal obstruction, postnasaldrip, rhinorrhea after 6 months of functional endoscopic sinus surgery. only few patients had recurrence and developed synechia with ostial stenosis after fess.

COMPARISON OF THE THREE PARAMETERS OF CHRONIC RHINOSINUSITIS BEFORE AND AT 6 MONTHS AFTER FESS

PRE-SS : Preoperative symptom score

Variable	Mean	Standard deviation	P-value
PRE-SS	2.11	0.38	0.001
POST-SS6	0.53	0.49	0.001
PEROP-ES	7.29	1.02	0.001
PREOP-LM	14.95	5.37	0.001
POSTOP-LM6	2.78	2.56	0.001

POST-SS6 : postoperative symptom score

PEROP-ES : peroperative endoscopic score

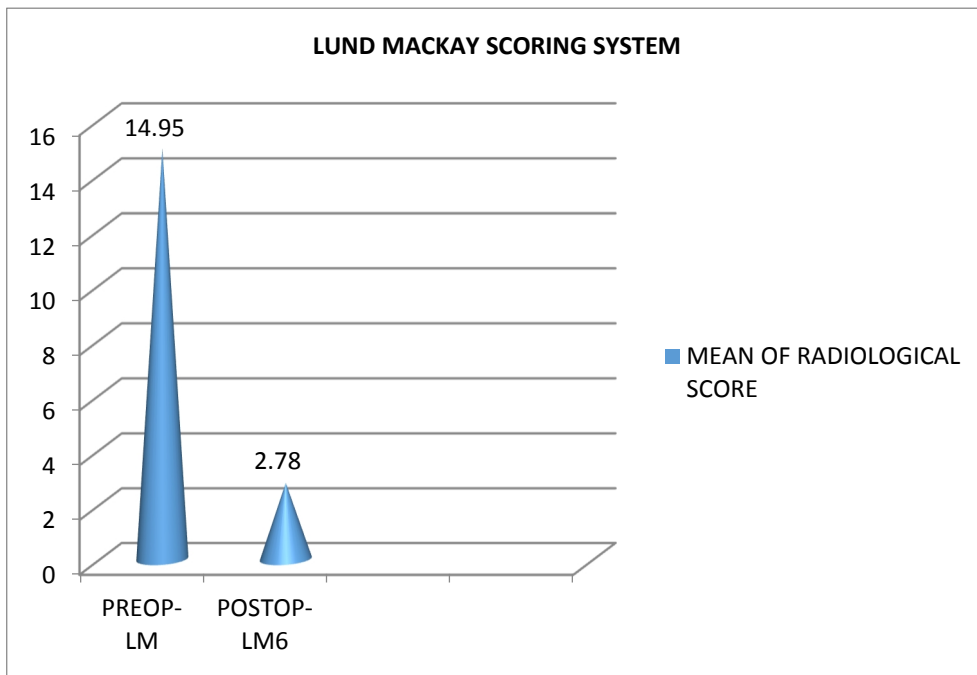
PREOP-LM : preoperative lundmackay radiological score

POSTOP-LM6 : postoperative lundmackay score after 6 months.

Overall there was significant statistical improvement in the clinical symptoms after surgery.

Radiological score(LM)

- Mean preoperative value is 14.95 +/- 5.37.
- Mean 6-month postoperative value is 2.78 +/-2.56 (p<0.001).
- Obvious improvement was seen in the CTPNS images.



DISCUSSION

Chronic rhino sinusitis has been reported worldwide with increasing frequency in the last three decades. It poses a serious health problem in the society. Clinical history, examination and relevant investigations are essential for diagnosis of CRS with or without nasal polyps. A total of 150 cases studied during the study period.

In our study 115 (76.66%) patients were males and 35 were females (23.33%). Male to female ratio is 3.2:1 which exactly coincides with other studies elsewhere showing male preponderance. In a study by Dr. Shruith satyanarayana, the male female ratio is about 3:1 and another study by Dr. Amitakumari shown ratio of 2:1. Similarly in a study by Dr. Dhibakhar Perya virtaaz.G.B. it was found that the ratio is 2:1.

In our study, the common age group involved was 21-30 years for both sexes (42.2%), followed by 31-40 years (25.33%). In a study by Dr. Dhibakhar Perya virtaaz.G.B et al. found out that 31-40 years was commonly involved followed by 21-30 years. Dr. Shruith satyanarayana also found that the commonest age group involved was 20-40 years followed by 40-60 years.

Among the clinical presentation in our study, it found out that, the most commonest presentation is nasal obstruction (n=105,70%), followed by headache (n=99,66%), nasal discharge (n=97,64.66%), fever was not one of

the presenting complaint in any of the patients. symptoms of minor criteria were facial pain(n=15,10%),facial congestion (n=22,14.66%) and halitosis(n=4,2.66%) dental pain (n=12,8%) fatigue (n=10,6.66%) cough (n=15,15%),ear pain (n=20,13.33%).

Post operatively 70% of patients with nasal obstruction as a symptom showed marked improvement.64.66% of patients with rhinorrhoea,20% of patients with postnasal drip,66% of patients with headache,13.33% of patients with anosmia showed marked improvement post FESS after 6 months follow up.100% improvement was observed with all minor symptoms.The findings of our study were consistent with many other similar series of study.They required no medical treatment after 6 months follow up .

Dr.Dhibakhar Perya virtaaz.G.B et al documented the commonest symptoms was nasal obstruction 86.66% followed by headache 80%,postnasal drip 70%, facial pain 73.33%.

In our study preoperatively, mucosal abnormality of sinus on CT scan maxillary sinus was most commonly involved in 98.66% of cases followed by anterior ethmoid, posterior ethmoid ,frontal and sphenoid sinus .Similar observations were also made by Dr.Amita kumari and Dr.manojmathur.

In our study, we observed that DNS ,concha bullosa, haller cells, onodi cells and paradoxical middle turbinate were common anatomical

variants in 46.66% ,33.33% ,25.33% ,28.66% and 8.66%. respectively. Anatomical variations are important for that they may narrow normal drainage channels,thereby predispose to chronic recurrent sinusitis.

CT and endoscopy : CT is the most sensitive and specific radiological diagnosis of chronic sinusitis. The peroperative findings of CRS reflect the exact pathology and is superior to CT .CT is a complementary procedure that required complete evaluation of mucosal and polypoidal changes caused by CRS.

In our study, we found that CT is more sensitive and specific but peroperative findings during FESS remains superior to CT as it reflects the exact pathology of CRS. Our results are comparable with Dr.Amita kumari who observed that the CT PNS is the most sensitive and specific radiographic modality.

Our results showed a clear correlation between symptoms and Lund-Mackay scores preoperatively.Also we found strong correlation between endoscopy and Lund-Mackay CT scores.The 150 patients selected for study underwent the standard steps of FESS involving clearance of the CT-involved sinuses and OMC.Patients underwent repeat CT scans after 6 months and repeat scoring were done at 6months.

CONCLUSION

FESS is the accepted modality of surgical management of CRS with or without nasal polyps in the failure of medical management.

The most common symptoms were nasal obstruction, headache, postnasal drip & nasal discharge.

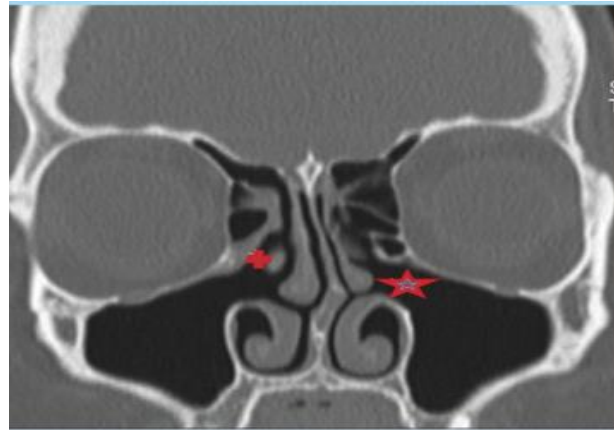
The symptoms that responded well were nasal obstructions and headache. Post FESS after 6 months follow up no medical treatment required by the patients.

The NCCT PNS preoperatively showed the pathology in maxillary sinus predominantly followed by anterior ethmoid, posterior ethmoid, sphenoid and frontal sinus.

The CT PNS detected more CRS but endoscopy helped in further evaluation. Direct visualisation using endoscopy allow surgeons to assess the exact nature of disease during surgery .so changes noted in CT PNS should be correlated well with symptoms and endoscopic findings.



**CT SHOWING BILATERAL
MAXILLARY SINUSITIS**



**POST OPERATIVE CT SHOWING
WIDE OSTIUM**



**MUCOPUS DRAINING FROM MAXILLARY SINUS
PEROPERATIVELY.**



CT PNS SHOWING LEFT ANTROCHOANAL POLYP



NASOENDOSCOPY SHOWING ANTROCHOANAL POLYP



PREOP CT PNS WITH WIDE OSTIUM OF LEFT MAXILLARY SINUS



**PREOP CT PNS SHOWING
FUNGAL SINUSITIS**



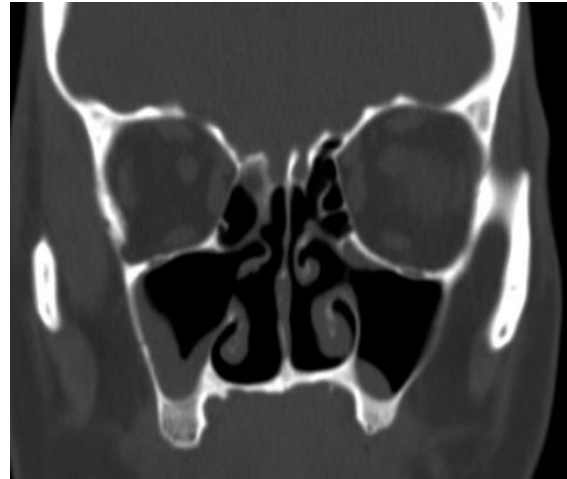
**POST OP CT SHOWING MUCOSAL
THICKENING**



FUNGAL DEBRIS SEEN IN THE MAXILLARY SINUS



**=PREOPERATIVE CT PNS
SHOWING BILATERAL
SINONASAL POLYPOSIS**



**POSTOP CT SHOWING MILD
MUCOSAL OEDEMA**



**ANTERIOR RHINOSCOPY SHOWING POLYP IN THE NASAL
CAVITY**



CT PNS SHOWING FRONTAL SINUSITIS



CT PNS SHOWING PANSINUSITIS



POST OP CT PNS

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PROFOMA

NAME:

AGE:

SEX:

ADDRESS:

CLINICAL SYMPTOMS :

Major criteria	Score –preop & postop. (0,1,2,3,4,5)	Duration
Facial pain		
Facial congestion		
Nasal obstruction		
Postnasal drip		
Minor criteria	Score –preop & post op (0,1,2,3,4,5)	Duration
Hyposmia/anosmia		
Headache		
Fever		
Halitosis		
Dental pain		
Cough		
Ear pain/fullness		

Past history :

Personol history :

Family history :

Drug history :

Examination of nose :

Anterior rhinoscopy

Septum		
Turbinates		
Mucosa		
Discharge		
Bleeding		
Crusting		
Polyps		
Posterior rhinoscopy		
PNS tenderness		

Examination of ear :

Examination of throat :

Peroperative endoscopic findings :

CT PNS (preoperative & postoperative)

Sinuses	Right	left
Anterior ethmoid		
Posterior ethmoid		
Maxillary		
Frontal		
Sphenoid		
Septum		
OMC		

Follow up :

**நோயாளிகளுக்கு அறிவிப்பு மற்றும் ஒப்புதல் படிவம்
(மருத்துவ ஆய்வில் பங்கேற்பதற்கு)**

ஆய்வு செய்யப்படும் தலைப்பு:

பங்கு பெறுவரின் பெயர்:

பங்கு பெறுவரின் வயது:

		பங்கு பெறுவர் இதனை குறிக்கவும் ✓
1.	நான் மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்களை படித்து புரிந்து கொண்டேன். என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டுள்ளது என அறிந்து கொண்டேன்.	<input type="checkbox"/>
2.	நான் இவ்வாய்வில் தன்னிச்சையாக தான் பங்கேற்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும், எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்வில் இருந்து விலகி கொள்ளலாம் என்றும் அறிந்து கொண்டேன்.	<input type="checkbox"/>
3.	இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்து மேலும் ஆய்வு மேற்கொள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன்.	<input type="checkbox"/>
4.	இந்த ஆய்வின் மூலம் கிடைக்கும் தகவலையோ, முடிவையோ பயன்படுத்திக் கொள்ள மறுக்க மாட்டேன்.	<input type="checkbox"/>
5.	இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக் கொள்கிறேன் எனக்கு கொடுக்கப்பட்ட அறிவுரைகளின் படி நடந்து கொள்வதுடன், ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்று உறுதியளிக்கிறேன். என் உடல் நலம் பாதிக்கப்பட்டாலோ, அல்லது எதிர்பாராத, வழக்கத்திற்கு மாறான நோய்குறி தென்பட்டாலோ உடனே இதை மருத்துவ அணியிடம் தெரிவிப்பேன் என உறுதி அளிக்கிறேன்.	<input type="checkbox"/>

பங்கேற்பவரின் கையொப்பம் / இடம்

கட்டைவிரல் ரேகை

பங்கேற்பவரின் பெயர் மற்றும் விலாசம்

ஆய்வாளரின் கையொப்பம் / இடம்

ஆய்வாளரின் பெயர்

மையம்

கல்வியறிவு இல்லாதவற்கு (கைரேகை வைத்தவர்களுக்கு) இது அவசியம் தேவை

சாட்சியின் கையொப்பம் / இடம்

பெயர் மற்றும் விலாசம்

S.NO	NAME	AGE	SEX	PRE OP-SS	POST OP-SS6	PER OP-ES			PRE-LM-RS			POST-LM-RS6		
						RT	LT	T	RT	LT	T	RT	LT	T
1	JEBARAJ	55	M	2.1	1.3	5	5	10	12	12	24	2	3	5
2	SUDALAIMANI	29	M	2.5	0.91	7	5	12	12	12	24	0	2	2
3	NATARAJAN	33	M	1.67	0.33	1	3	4	6	4	10	1	2	3
4	KAVITHA	25	F	2.5	0.91	5	7	12	14	7	21	1	1	2
5	NAMBI	28	M	1.4	0	4	4	8	10	7	17	1	1	2
6	IYYAPPAN	68	M	1.58	0.33	3	3	6	2	10	12	0	1	1
7	THAMBIRAN	36	M	1.91	0.33	1	3	4	4	4	8	0	1	1
8	MD KADAR	50	M	2.5	0.42	4	8	12	6	18	24	2	2	4
9	SAVARIRAJAN	46	M	2.8	0.13	5	6	11	16	7	23	1	3	3
10	NADARAJAN	83	M	2.1	1	2	3	5	5	5	10	2	2	4
11	SUBRAMANIYAN	52	M	2.45	0.42	4	4	8	10	8	18	0	3	3
12	RAMALAKSHMI	39	F	2.5	0.32	4	5	9	3	14	17	1	2	3
13	KUMAR	45	M	1.91	0.25	2	3	5	6	7	13	2	1	3
14	LAXMI	29	F	2.1	0	3	5	8	7	7	14	1	1	2
15	SIVARAJAN	68	M	2.2	0.42	1	4	5	7	7	14	2	1	3
16	PUNITHA	23	F	1.84	0.17	2	3	5	3	6	9	2	2	4
17	SORNAM	55	F	2.5	0.25	3	5	8	5	6	11	1	1	2
18	DIVAKAR	28	M	2.1	0.17	2	2	4	7	4	11	2	2	4
19	PAKKIYAM	35	F	1.67	0.36	2	2	4	3	3	6	2	2	4
20	RAJKUMAR	42	M	1.75	0.25	3	5	8	7	8	15	1	1	2
21	GOVIND	43	M	2.1	0.16	4	6	10	12	12	24	3	2	5
22	SEKAR	45	M	2.5	0.31	7	3	12	12	12	24	1	1	2
23	RAJMOHAN	48	M	1.67	0	4	4	8	6	4	10	1	2	3
24	ESSAKIAMMAL	29	F	2.5	0.42	4	2	6	14	7	21	1	1	2
25	SURESH KUMAR	42	M	1.4	0.25	2	2	4	12	5	17	1	1	2
26	RAJESH	41	M	1.58	0.32	7	5	12	4	8	12	0	1	1
27	ARUL MUTHU	43	M	1.91	0.45	5	6	11	4	4	8	1	0	1
28	SAMY	46	M	2.5	0.42	2	3	5	12	12	24	1	3	4
29	RAJU	48	M	2.8	0.21	4	4	8	10	13	23	2	1	3
30	AMUTHAN	49	M	2.1	0.45	3	6	9	5	5	10	3	1	4
31	RAM PRASAD	44	M	2.42	0.32	3	2	5	9	9	18	1	2	3
32	LAVANYA	25	F	2.5	0.12	4	4	8	5	12	17	1	2	3
33	VENKATESH	43	M	1.91	0.25	3	5	8	6	7	13	2	1	3
34	MAHESWARI	28	F	2.1	0.17	2	3	5	7	7	14	1	1	2
35	VIJAY	46	M	2.2	0.12	2	3	5	7	7	14	3	0	3
36	LAILA	27	F	1.84	0.16	2	2	4	6	3	9	2	2	4
37	VIJAYA	30	F	2.5	1.2	2	2	4	5	6	11	1	1	2
38	ANTHONY	47	M	2.1	0.42	3	5	8	6	5	11	2	2	4
39	SANKARI	26	F	1.67	0.42	3	7	10	4	2	6	2	2	4
40	GOWTHAM	42	M	1.75	0.33	6	6	12	8	7	15	1	1	2
41	PRINCE	59	M	2.1	0.52	2	2	4	12	12	24	2	3	5
42	KINGSTON	54	M	2.5	0.44	1	3	4	12	12	24	1	1	2
43	JEEVANATHAN	57	M	1.67	0.52	4	6	10	5	5	10	1	2	3
44	SASIKALA	28	F	2.5	1.2	5	7	12	14	7	21	1	1	2
45	MADHAVAN	55	M	1.4	1	5	6	11	7	10	17	1	1	2
46	FAIZAL	53	M	1.58	0.4	4	4	8	6	6	12	0	1	1
47	MUTHURAM	55	M	1.91	1.6	2	3	5	4	4	8	1	0	1
48	STANLEY	52	M	2.5	0.33	1	4	5	12	12	24	2	2	4
49	JANAKIRAM	56	M	2.8	0.42	3	5	8	13	10	23	2	1	3
50	VASANTHKUMAR	59	M	2.1	1.2	2	2	4	5	5	10	2	2	4
51	ROBIN	68	M	2.42	0.4	2	2	4	9	9	18	2	1	3
52	SELVI	25	F	2.5	0.52	2	3	5	10	7	17	2	1	3
53	GUNA	66	M	1.91	1.4	3	7	10	3	10	13	1	2	3
54	JEYA	26	F	2.1	1.3	1	3	4	7	7	14	1	1	2
55	SAKTHIVEL	65	M	2.2	0.44	4	8	12	0	7	7	1	2	3
56	KUMARI	29	F	1.84	0.18	4	5	9	6	3	9	2	2	4
57	RAJESWARI	23	F	2.5	1.3	4	4	8	6	5	11	1	1	2
58	RAMAN	62	M	2.1	0.12	2	6	8	5	6	11	2	2	4
59	RAMYA	28	F	1.67	0.33	3	1	4	3	3	6	1	0	1
60	LAKSHMANAN	61	M	1.75	0.22	2	2	4	9	6	15	1	1	2

S.NO	NAME	AGE	SEX	PRE OP-SS	POST OP-SS6	PER OP-ES			PRE-LM-RS			POST-LM-RS6		
						RT	LT	T	RT	LT	T	RT	LT	T
61	PANDISELVI	38	F	2.1	0.42	2	1	3	12	12	24	2	3	5
62	RAMALINGAM	64	M	2.5	0.32	3	2	5	12	12	24	1	1	2
63	KANAGASABAI	72	M	1.67	0.25	3	2	5	5	5	10	1	2	3
64	KALAISELVAM	71	M	2.5	1	4	6	10	14	7	21	1	1	2
65	SEETHA	32	F	1.4	0.21	2	2	4	11	6	17	1	1	2
66	BALASENTHIL	74	M	1.58	0.52	3	5	8	6	6	12	0	1	1
67	VIJAYAKUMAR	70	M	2.5	0.44	3	9	12	4	4	8	1	0	1
68	GEETHA	35	F	1.91	0.32	8	2	10	12	12	24	2	2	4
69	IRUDHAYARAJ	28	M	2.5	1	5	7	12	10	13	23	1	2	3
70	PALANISAMY	27	M	2.8	1.2	2	2	4	6	4	10	2	2	4
71	KARUPPASAMY	24	M	2.1	0.19	4	8	12	8	9	17	2	1	3
72	KRISHNA KUMAR	22	M	2.42	1.6	3	1	8	6	7	13	1	2	3
73	ESSAKI RANI	39	F	2.5	1.1	3	3	6	8	6	14	2	1	3
74	LAKSHMI NARAY	21	M	1.91	0.26	2	2	4	6	8	14	1	1	2
75	DEVANAND	28	M	2.1	0.18	7	5	12	4	5	9	1	2	3
76	MADHUMITHA	36	F	2.2	0.23	6	5	11	8	10	18	1	3	4
77	VISHAL	27	M	1.84	0.32	3	2	5	10	1	11	3	1	4
78	RAJADURAI	26	M	1.91	1.2	6	2	8	5	6	11	2	2	4
79	BANU	33	F	1.67	0.4	6	3	9	3	3	6	1	1	2
80	SREEKANDAN	25	M	2.5	0.33	2	3	5	6	7	15	3	2	5
81	ESWARI	42	F	2.1	0.41	5	3	8	12	12	24	1	1	2
82	PALANIRAJ	26	M	1.67	0.22	2	6	8	4	10	14	0	0	0
83	CHEZHIAN	29	M	1.75	0.32	3	2	5	5	5	10	0	1	1
84	JEBASREE	48	F	2.1	0.42	3	2	5	7	14	21	1	0	1
85	GANAPATHY	28	M	2.5	1	1	3	4	10	7	17	1	1	2
86	ESWARIAMMAL	74	F	2.8	1.2	3	1	4	7	8	12	1	0	1
87	RAGHAVAN	27	M	2.42	0.44	6	2	8	5	3	8	2	2	4
88	SUNDARI	45	F	2.6	0.35	4	6	10	12	12	24	1	2	3
89	DEEPA	49	F	1.67	0.31	6	3	9	12	11	23	2	2	4
90	SELVAM	29	M	1.4	0	2	2	4	4	6	10	2	1	3
91	MATHEW	24	M	1.58	0.32	1	3	4	7	11	18	2	1	3
92	JOHN	27	M	1.91	1.4	1	4	5	10	7	17	1	2	3
93	MARIAPPAN	21	M	1.95	1	3	2	5	5	6	13	1	1	2
94	LATHA	50	F	1.84	0.4	2	8	10	7	7	14	2	1	3
95	STALIN	23	M	1.67	1.4	6	5	11	7	7	14	1	2	3
96	SYED ALI FATHIM	56	F	1.75	0.44	2	3	5	6	3	9	2	2	4
97	RAJENDRAN	26	M	1.9	0.42	6	3	9	6	5	11	1	1	2
98	SORNALAKSHMI	58	F	2.3	0.52	5	1	8	5	6	11	2	2	4
99	ANANDH	25	M	1.81	1.2	7	3	10	3	3	6	2	2	4
100	PAULRAJ	21	M	1.42	0.52	1	3	4	7	8	15	1	1	2
101	GLADYA	62	F	2.8	0.33	3	2	5	12	12	24	2	3	5
102	KARUPPAN	28	M	2.5	0.33	3	5	8	12	12	24	1	1	2
103	LAKSHMI NARAY	26	M	2.1	1.6	6	3	9	5	5	10	1	2	3
104	RADHA	67	F	2.6	1.3	6	6	12	14	7	21	1	1	2
105	SATHISH	24	M	2.3	0.91	5	5	10	7	10	17	1	1	2
106	MOHAMMED	27	M	1.58	0.33	6	3	9	8	4	12	1	0	1
107	DIVAKAR	25	M	1.91	0	5	3	8	4	4	8	0	1	1
108	JANAKI	74	F	2.5	0.33	2	2	4	12	12	24	2	2	4
109	KANDHASAMY	27	M	2.8	0.33	3	2	5	12	11	23	1	2	3
110	MURUGAN	24	M	2.9	0.42	4	1	8	5	5	10	2	2	4
111	SIVARAYAN	26	M	3.1	1	6	4	10	10	8	18	1	2	3
112	BALAJI	21	M	1.67	0.42	4	8	12	10	7	17	2	1	3
113	SIVAKUMAR	22	M	1.85	1	5	3	8	7	6	13	1	2	3
114	DEEPANATHAN	29	M	1.65	0.45	3	3	6	10	4	14	1	1	2
115	JUDE	23	M	1.78	0.42	9	3	12	4	10	14	1	2	3
116	PATTURAJ	21	M	2.48	0.33	7	4	11	6	3	9	2	2	4
117	JAMES	28	M	2.58	0.25	2	3	5	5	6	11	1	1	2
118	FERNANDO	26	M	2.1	0	6	2	8	5	6	11	3	1	4
119	NAVEEN KUMAR	28	M	1.54	0.42	6	3	9	3	3	6	2	2	4
120	SANKAR	25	M	1.69	0.17	3	2	5	7	8	15	1	1	2

S.NO	NAME	AGE	SEX	PRE OP-SS	POST OP-SS6	PER OP-ES			PRE-LM-RS			POST-LM-RS6		
						RT	LT	T	RT	LT	T	RT	LT	T
121	JABARAJ	27	M	2.42	0.25	2	6	8	12	12	24	2	3	5
122	RAJU	29	M	2.3	0.26	5	3	8	12	12	24	1	1	2
123	RAVIKUMAR	21	M	2.67	0.17	3	2	5	5	5	10	2	1	3
124	ARAVIND	27	M	2.56	0.33	2	3	5	12	7	21	1	1	2
125	RATHINAM	28	M	3.2	0.25	3	1	4	9	8	17	1	1	2
126	MEHABOOB	27	M	2.89	0.33	1	3	4	6	6	12	1	0	1
127	SURAAJ	24	M	1.91	1	5	3	8	4	4	8	0	1	1
128	SANJAY	32	M	1.84	1.4	5	3	8	12	12	24	2	2	4
129	MADHAN	35	M	2.1	1.6	4	4	8	11	12	23	1	2	3
130	RAJESH	37	M	2.5	1.2	2	3	5	5	5	10	2	2	4
131	RAHUL	39	M	2.67	0.52	2	3	5	8	10	18	1	2	3
132	PRASAD	40	M	1.67	0.22	2	2	4	9	8	17	2	1	3
133	MAHADEVAN	34	M	2.5	0.33	4	5	9	6	7	13	1	2	3
134	ESWARAN	36	M	1.4	0.42	5	6	11	7	7	14	1	1	2
135	CHINTHAN	34	M	1.58	0.52	1	3	4	7	7	14	1	1	2
136	ARUN	38	M	1.91	0.62	2	3	5	3	6	9	2	1	3
137	DEVANAND	31	M	2.5	1	1	3	4	6	5	11	2	2	4
138	NALINAKUMAR	32	M	2.8	1.96	5	7	12	5	6	11	0	2	2
139	GEBIN	39	M	2.2	1.21	6	4	10	3	3	6	2	2	4
140	VIKRAM	38	M	2.42	1.21	3	6	9	8	7	15	2	2	4
141	GOPI	40	M	2.56	0.32	2	3	5	12	12	24	1	1	2
142	AJMAL	31	M	1.95	0.52	2	6	8	12	12	24	2	3	5
143	GUNA	36	M	1.56	0.44	3	2	5	5	5	10	1	1	2
144	NIXON	40	M	1.63	0.32	3	5	8	7	14	21	2	1	3
145	ROBIN	38	M	1.58	0.22	1	3	4	8	9	17	1	1	2
146	ERICSON	35	M	2.6	0.25	4	6	10	6	6	12	1	1	2
147	SANDEEP	33	M	2.1	0.23	5	6	11	3	5	8	1	0	1
148	ANDREWS	32	M	1.32	0.42	3	2	5	8	7	15	0	1	1
149	GOWTHAM	38	M	1.82	0.17	2	3	4	3	3	6	2	2	4
150	MURUGAN	31	M	2.3	0.33	1	3	4	8	7	15	1	2	3