

**A STUDY ON THE INFLUENCE OF SINUSITIS IN A
CASE OF PERSISTENT CHRONIC SUPPURATIVE
OTITIS MEDIA OF TUBOTYMPANIC TYPE**

Dissertation submitted to

THE TAMIL NADU DR.M.G.R. MEDICAL UNIVERSITY

**In partial fulfillment of the regulations
For the award of the degree of
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Branch – IV**

**Upgraded Institute of Otorhinolaryngology
Madras Medical College, Chennai.**



**THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY
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CERTIFICATE

This is to certify that the dissertation on **“A STUDY ON THE INFLUENCE OF SINUSITIS IN A CASE OF PERSISTENT CHRONIC SUPPURATIVE OTITIS MEDIA OF TUBOTYMPANIC TYPE”** presented herein by **Dr. M.VENUGOPAL**, is an original work done in the Department of Oto-Rhino-Laryngology, Govt. General Hospital, Madras Medical College and Research Institute, Chennai, and submitted in partial fulfillment of the regulations laid down by The Tamil Nadu Dr. M.G.R. Medical University, Chennai for M.S., Degree Examination Branch IV – Oto-Rhino-Laryngology, under my guidance and supervision during the academic period 2003-2006.

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INTRODUCTION

Chronic suppurative otitis media is defined as inflammation of the mucoperiosteal lining of the middle ear cleft. In chronic suppurative otitis media with central perforation the pathologic process may be due to one of the three types : tubo tympanic, tympanomastoid or permanent perforation syndrome due to epitheliasation of the edges of the perforation.

In our study we analyse cases of tubo tympanic type only. Chronic sinusitis acts as a focus of sepsis in the development of chronic suppurative otitis media of tubo tympanic type. That such an inter relationship exists is supported by clinical experience.

Eustachian tube patency and its proper functioning is highly essential for normal maintenance of middle ear function. The mucociliary transport mechanism of the Eustachian tube is of paramount importance in the pathogenesis and prognosis of chronic suppurative otitis media and also in the outcome of myringoplasties. Patency of the Eustachian tube is affected by pathology in nose and nasopharynx. Out of various etiologies, sinus disease is the most important etiology for middle ear pathologies.

Deviation of nasal septum, hypertrophy of turbinates, anatomical variations in the lateral nasal wall and adhesions, all interfere with ventilation and the free passage of air through the nasal chambers and with the secretion and movement of the mucus blanket and thus predispose to infection.

Tubo tympanic type of CSOM patients with concurrent active sinusitis have chronically discharging ears. Surgery on the ear without correction of sinusitis has frequently led to failures and poor prognosis.

This study correlates that sinusitis is the main etiological factor for middle ear disease of tubo tympanic type and that clearance of sinusitis in these patients results in good outcome of tubo tympanic disease clearance.

AIMS OF THE STUDY

1. To establish the role of sinusitis as focus of sepsis in tubotympanic disease
2. To study the anatomic variations of nose and paranasal sinuses that predispose to sinusitis in patients with persistent C.S.O.M.
3. To study the improvement in middle ear mucosal status following clearance of sinus disease in these patients.
4. To emphasize that clearance of sinusitis by endoscopic sinus surgery in tubotympanic disease patients results in good outcome of tubotympanic disease clearance.

ETIOPATHOGENESIS OF SINUS PATHOLOGY CAUSING TUBOTYMPANIC DISEASE

The nose, paranasal sinuses and eustachian tube lined by respiratory epithelium that is essentially a pseudo stratified ciliated columnar epithelium with interspersed goblet cells.

The cilia are approximately 6µm long, 0.25 µm in diameter and number about 100-200 per cell. In cross section each cilium can be seen to have two central microtubules surrounded by a ring on nine doublet microtubules protruding from one side of which are inner and outer dyenin arms composed of ATP ase protein responsible for the energy production required for the beating of the cilium. On each ciliated and non ciliated cell there are 200-400 microvilli, the number of increase towards the nasopharynx.

The goblet cells are unicellular mucus secreting glands found above the basement membrane. The distribution and densing of goblet cells is more in the nasopharynx, around the eustachian tube orifice, inferior turbinate and low over the nasal septum.

In lateral nasal wall, two major routes of mucociliary transport identified, first route combines secretion from the frontal and maxillary

sinuses and ant. ethmoidal complex, drains along the free rear margin of uncinat process and along the medial face of the inferior turbinate towards the nasopharynx. At this point the secretions pass anteriorly and inferiorly to the eustachian tube orifice.

Second route is secretions from the post ethmoid cells and sphenoid sinus meet at sphenoethmoidal recess are transported towards the nasopharynx posteriorly and superiorly to the Eustachian tube orifice.

In case of pathological conditions of paranasal sinuses, the nature of secretion alters. In chronic sinusitis purulent (or) highly viscous thickness secretions drain around the eustachian tube orifice. Consequences of this on the normal function of eustachian tube may be severe.

Due to its own mucociliary clearance, a previously normal eustachian tube can remain resistant to abnormal secretion. Due to the virulence and duration of such condition, congestion and obstruction of the orifice can occur due to inflammation of its lymphoreticular tissue with slowing down of the mucociliary clearance may result in impeded ventilation leading to changes in the middle ear cleft.

ANATOMY OF NASOPHARYNX

Nasopharynx is the upper part of pharynx situated behind the nose and above the lower border of soft palate and Passavant's muscle.

1. Anteriorly it communicates with posterior nasal apertures.
2. Inferiorly it communicates with oropharynx at the pharyngeal isthmus.
3. Lateral wall present
 - a. Pharyngeal opening of the auditory tube
 - b. Tubal elevation bounds the tubal opening
 - c. Salpingopharyngeal fold with salpingopharyngeus muscle.
 - d. Levator Palati Muscle.
4. Behind tubal elevation and upper part of the fold there is a narrow vertical slit that leads to a flat pocket of mucous membrane called the pharyngeal recess or fossa of Rosenmuller or lateral recess.

5. Roof and posterior walls forms a slope opposite the body of sphenoid, basiocciput and anterior arch of atlas. It has
- a. Pharyngeal (nasopharyngeal) tonsil-pathologically enlarged nasopharyngeal tonsil is known as adenoids.
 - b. Lateral prolongation of nasopharyngeal tonsil behind the tubal opening is known as tubal tonsil.
 - c. Pharyngeal bursa is a small median recess in the mucous membrane.

ANATOMY OF EUSTACHIAN TUBE

Eustachian tube is a trumpet shaped channel which connects the middle ear cavity with the nasopharynx.

Length - 36 mm (adult) 18mm (children)

Parts - Medial Part – Cartilaginous

Lateral Part – Osseous infratemporal part.

Direction - Downwards, forwards and medially.

In children the tube is shorter due to a smaller cartilaginous part, and is more horizontal. Adult size of E.T. is attained at the age of 7 years.

BONY PART

It is 12mm long and lies in the petrous temporal bone near the tympanic plate. Lateral end is wider, oval in shape, 5 x 2 mm in size, opens in the anterior wall of the middle ear. The medial end (isthmus) is narrow 0.6 - 1.2mm in diameter and 1-2mm in length and attaches with the cartilaginous part. Lumen is oblong in shape being widest from side to side.

CARTILAGINOUS PART

It is 24mm long and lies in the sulcus tube (ie) in a groove between the greater wing of sphenoid and apex of petrous temporal. In cross section the cartilage is like an inverted “J” shape. The medial and superior walls are made of cartilage. The lateral wall and floor are completed by fibrous membrane. The apex of the cartilaginous plate is attached to the medial end of isthmus and free part forms the tubal elevation (tours tubarius) in the nasopharynx. The nasopharyngeal opening is about 1-1.25 cm behind and little below the posterior end of inferior turbinate and 2 cm above the plane of hard palate.

MUCOSAL LINING

The tube is lined with respiratory mucosa containing goblet cells and mucosal glands with pseudostratified ciliated epithelium. At the nasopharyngeal end, the mucosa is truly respiratory but near the middle ear end the number of goblet cells and ciliary density is less.

In the bony part it is thin and firmly adherent to the periosteum and in the cartilaginous part, it is thick and contains many mucosal glands.

The direction of ciliary beat is towards the nasopharynx.

BLOOD SUPPLY

Arterial supply is from ascending pharyngeal, middle meningeal and artery of pterygoid canal.

Veins drain into pharyngeal and pterygoid plexus of veins.

Lymphatics pass to retropharyngeal nodes.

NERVE SUPPLY

Pharyngeal branch of pterygopalatine ganglion (maxillary nerve) cartilaginous part by nervus spinous (mandibular nerve) and bony part by the tympanic plexus (glossopharyngeal nerve)

MUSCLES ASSOCIATED WITH E.T.

- a. Tensor Veli Palatini
- b. Levator Veli Palatini
- c. Salpingopharyngeus

ANATOMY OF PARANASAL SINUSES

Intranasal sinus surgery has significantly evolved in the past 2 decades through a confluence of advances in optics, radiographic imaging and surgical technique, all of which are intricately related to a better understanding of the nasal anatomy.

Mosher (1929) wrote that “ if the ethmoid were placed in any other part of the body it would be an insignificant and harmless collection of bony cells. In the place where nature has put it, it has major relationships so that diseases and surgery of the labyrinth often lead to tragedy. Any surgery in this region should be simple but it has proven one of the easiest ways to kill a patient”. The above statement emphasizes the need for thorough knowledge of sinus anatomy for proper execution of endoscopic sinus surgery.

ETHMOID BONE

This is a paired bony scaffold, held together by a horizontal plate (cribriform plate). Between the 2 cribriform plates is the crista galli. Across from the crista medially along the entire length between the two lamina cribrosae and at right angles to them inferiorly is the perpendicular plate. Medially, towards the nasal cavity, the ethmoid is

bordered by the middle turbinate and the superior turbinate. Laterally the lamina papyracea forms a thin bony divider from the orbit. The ethmoid bone is open cranially. The frontal bone extends with its foveolae ethmoidalis across the top of the ethmoidal cells and clefts.

FRONTAL SINUS

The frontal sinus starts developing during the 3rd and 4th fetal month by invagination from the frontal recess. It is absent at birth and develops at approximately 3 years of age and is complete by 20 years. The drainage of the sinus is through the nasofrontal duct or ostium. The duct is absent when the sinus has developed directly as an extension of frontal recess.

SPHENOID SINUS

These are 2 hollow asymmetric spaces in the body of the sphenoid bone. This is present at birth and is an invagination of the sphenoethmoidal recess of the posterior nasal capsule into the body of the sphenoid bone. The pneumatization continues from 3 years to early adulthood. The sinus may be conchal (almost non pneumatic), presellar (anterior surface of pituitary is exposed), or sellar (hypophyseal fossa completely exposed on inferior surface) which is the commonest. The

sphenoid ostium is located on the superior part of its anterior wall a few millimeters below the cribriform plate and 0.5cm lateral to the septum. The internal carotid artery and optic nerve are seen on the lateral wall as ridges. The optic nerve may be dehiscent in 25% of cases.

LATERAL NASAL WALL

Embryology

The ethmoidal turbinates originate from ridges in the lateral nasal wall of the foetus. In the 9th to 10th week, 6 major furrows develop that may be reduced by fusion to 3 or 4. The furrows are separated by ridges that have an anterior ascending portion (ramus descendens).

The bony structures on the medial wall of the ethmoid, known as the turbinates are really only the ends of the bony lamellae that traverse the entire ethmoid. They extend laterally to the lamina papyracea, superiorly to the lamina cribrosa and, between the ethmoidal foveolae, to the frontal bone. The first lamella is represented by the uncinate process. The second is the bulla lamella and separates the frontal recess from the more posteriorly located segments of the anterior ethmoid. Pneumatization of the bulla lamella results in the formation of the ethmoidal bulla.

The third lamella corresponds to that of the ground lamella of middle turbinate. It is most constant and complete lamella formation and separates the anterior and posterior ethmoidal labyrinths.

The fourth lamella is formed by the attachment of the superior turbinate, while the occasionally present, small supreme turbinate adds a fifth lamella.

The uncinate process is a thin almost sagittally oriented bony leaflet that runs from an anterosuperior position to posteroinferiorly. Its posterosuperior margin is sharp, concave and lies largely parallel to the anterior surface of the ethmoidal bulla which is located just behind it. The bony spicules at the posterior end of the uncinate process attach to the lamina perpendicularis of the palatine bone and inferiorly to the corresponding ethmoidal process of the inferior turbinate.

The ascending, anterior convex margin of the uncinate process is in contact with the bony lateral nasal wall and can extend as far as the lacrimal bone.

In the bony skeleton there are always defects between the uncinate process and the inferior turbinate that are covered with a dense connective tissue, which is a continuation of the periosteum, and by the

mucous membranes. These are called the anterior and posterior fontanelles.

Hiatus Semilunaris

This is a sickle shaped 2 dimensional cleft 1-2mm wide between the free margin of the uncinate process and the anterior surface of the bulla ethmoidalis. Through it the path leads anteriorly into a 3-dimensional space lateral to the uncinate process which is called the ethmoidal infundibulum.

Ethmoidal bulla is the most constant and usually the largest air cell in the anterior ethmoid. It is formed by the pneumatization of the bulla lamella.

There may be a direct communication between the frontal recess and a pneumatized space located above and behind the bulla, the lateral sinus or sinus lateralis. It is bounded by the roof of the ethmoidal bulla (below), the lamina papyracea (laterally) and the middle turbinate (medially).

Ground lamella of the middle turbinate

The most anterosuperior insertion of the middle turbinate is adjacent to the crista ethmoidalis of the maxilla, which produces an

anterior bulge, known as the agger nasi. The posterior end of the middle turbinate is attached to the crista ethmoidalis of the perpendicular process of the palatine bone. The anterior third of the middle turbinate inserts vertically in purely sagittal direction onto the lateral end of the lamina cribrosa. In the middle third, the middle turbinate is fixed to the lamina papyracea by its ground lamella, which runs in an almost frontal plane.

In the posterior third, the almost horizontal ground lamella forms the roof of the most posterior section of the middle meatus and is fixed to the lamina papyracea and/or to the medial wall of the maxillary sinus.

PHYSIOLOGY OF THE PARANASAL SINUSES

Drainage and ventilation are the two most important factors in the maintenance of normal physiology of the paranasal sinuses and their mucous membranes. The sinuses are lined with ciliated stratified or pseudostratified columnar epithelium under which is the tunica propria, which contains mucous and serosanguinous glands. Covering the epithelium is a biphasic mucous blanket forming the mucociliary system.

The mucous blanket normally contains mast cells, polymorphonuclear leucocytes, eosinophils, lysozyme and immunoglobulin A. The upper layer (gel layer) is highly viscous, which enables the cilia to move the blanket forwards. The system captures 80% of inspired particles larger than 3-5 microns and 60% of those larger than 2 microns and exposes them to mast cells, polymorphonuclear leucocytes etc. while sweeping them into the pharynx to be swallowed.

Hilding (1944) in experiments on dogs showed that ciliary streaming in the sinus always leads to the ostium. India ink placed on the floor of the maxillary sinus spirals somewhat laterally and then upwards to the anterior lateral wall, across this anteromedially and upwards to the ostium. In none was the ink seen to pass through the artificial window in the inferior meatus. In frontal sinus also the flow of mucus occurs in a circular fashion centering at the natural ostium. In sphenoid and ethmoid sinuses the flow is directly towards the natural ostium. The thicker and more tenacious the mucus the more rapidly can the cilia evacuate it (Hilding 1932).

The cilia beat in a synchronized (transverse) and metachronized (longitudinal) manner. The cilia move almost exclusively in the sol phase of the secretion. The gel phase is actively transported over the sol

phase like a “carpet” by the cilia when their tips touch this overlying “carpet” during their short active beat. There is no contact between the cilia and the gel phase during their slower recovery stroke.

Altered mucociliary drainage and disease processes

Chronic sinusitis implies a breakdown in the mucociliary system. In obstructed sinus there is accumulation of inflammatory cells, mucous and bacteria. The partial pressure of oxygen (pO_2) of the sinus falls with obstruction. Growth of anaerobic and facultative organisms is favoured by limited air access. Granulocyte function is also impaired due to reduced oxygen tension. These changes usually involve the anterior ethmoid first which are ideally located and anatomically constructed to suffer chronic obstruction. These delicate ‘prechambers’ to the frontal and maxillary sinuses contain numerous small air cells and their narrow ostia are obstructed easily. Whenever there is mucosal swelling and obstruction to drainage in the ethmoid, the drainage and ventilation of the larger dependent sinuses can be seriously interfered with. Superimposed infection causes further mucosal swelling and obstruction thus creating a vicious cycle.

Thus integrity of the mucociliary system is essential to the prevention of chronic sinusitis.

REVIEW OF LITERATURE

Chronic otitis media is recurrent or persistent infection of the middle ears. When there is a dysfunction of the eustachian tube, air cannot fill the middle ear. This creates a negative pressure, which can lead to fluid buildup in the middle ear, infection of the middle ear, a retraction of the eardrum, and/or a perforation of the eardrum. Major causes of eustachian tube dysfunction include: immature eustachian tube development in the child, the common cold, allergic rhinitis, non-allergic rhinitis, acute or chronic sinusitis, adenoid hypertrophy, and nasopharyngeal tumours. If the function of the Eustachian tube does not improve, chronic otitis media will develop in one of three forms: recurrent secretory otitis media or chronic otitis media with a perforation, retraction pocket, or cholesteatoma.

The American academy of allergy and immunology has officially recognized that inflammation in the middle ear is simply an extension of chronic mucosal disease of the nasal and upper airway passages. Furthermore, it has been demonstrated that the mucosa of the middle ear is capable of mounting an allergic immunologic response similar to that seen in the rest of the upper respiratory system mucosa when confronted by an antigen challenge. Inflammation in the nasopharynx and the

pharyngeal portion of the Eustachian tube is considered to be closely related to the tubal constriction, which represents a considerable part of the cause of tubal ventilatory dysfunction.

The lining mucous membrane of the middle ear and eustachian tube is connected with and is the same as membrane of nose, sinuses and throat. Infection of these areas results in mucous membrane swelling which in turn may result in eustachian tube obstruction.

Blue stone in 1989 studied about 40 patients found eustachian tube dysfunction is the main reason for middle ear disease. He emphasized on disease of the sinuses and upper respiratory tract which causes ET dysfunction. Adenoids contribute less in comparison to the sinus disease causing eustachian tube blockage.

Bluestone, 1971; Bluestone et al; 1970, 179.b; and Hanjo et al 1981.

In 1869 Politzer first described in his literature and in 1931 it was also noted by Proetz that there is a relationship between patients with rhinosinusitis and chronic otitis media. KOCHS study of 222 patients was the first to include observations of Eosinophila in Otorrhea “ Supporting the contention that the middle ear takes part in allergic reactions similar to those seen in the nose and sinuses”

In the article “role of nasal and sinus surgery in otitis media” Dr. S.P.Wagh and Dr. Mahesh Bhaya emphasize that the effect of changes in the nose and paranasal sinuses are often felt in the middle ear. The conduit that reflects these changes is the Eustachian tube. Otitis media is frequently secondary to Eustachian tube dysfunction, which in turn is often a result of infections originating in the nose and paranasal sinuses. The rest of the respiratory tract is also influenced by disease that occur in the nose and sinuses . Thus it is logical to treat nasal and paranasal disease simultaneously to achieve a positive outcome in the treatment of otitis media.

They further said that normal function of the nasal and sinus cavities is influenced by the structures in the nasal cavity. Structural problems in the nose and sinuses will adversely affect their normal functions, leading to disease and possibly disrupting the function of the Eustachian tube. Surgery to correct nasal and paranasal will prevent these problems from affecting the eustachian tube. Nasal and paranasal surgery has dual purposes. They are (1) restoration of the normal functioning of the nose and paranasal sinuses, and (2) prevention of recurrent attacks of otitis media and infection of the respiratory tract.

As described by Dr. Anand Shah, (BH & MRC, Bombay 2002), he explained that nose and paranasal sinuses by their situation are the cause of most ear diseases. Diagnosis and treatment of nasal condition is important for successful treatment of the Ear Pathology. Proper evaluation of the nasal and sinus condition in relation to the ear pathology can avoid many unnecessary nasal and otological surgeries. Patience in trying out conservative treatment before suggesting surgery is a necessary virtue. It is mandatory for every otologist to be able to carry out a good diagnostic nasal endoscopy to detect nasal and paranasal pathology causing persistent otitis media.

In an observation made by Mark. J Lerenson (Esic 2002), when persistent discharge develops in ear, then it is extremely important to rule out history of upper respiratory infection, colds and sinusitis.

As otologists our primary aim is resolution of ear pathology and successful outcome in cases of surgical intervention. Very often, overlooking the basic pathology in nose or sinuses may result in compromising the results.

In a 1996 publication of Operative Techniques in Otolaryngology / Head and Neck Surgery, DeSouza and coworkers state that the effects of changes in the nose and paranasal sinuses are often felt in the middle

ear and that OM is frequently secondary to dysfunction of the ET resulting from such nasal and sinus diseases. They conclude that it is logical to treat nasal and paranasal sinus disease when it is clinically evident that these processes are a contributing cause of OM. These investigators proposed that surgery to correct nasal and paranasal sinus problems restores the normal functioning of the nose and paranasal sinuses., prevents these problems from affecting the ET, and assists in the treatment of patients with OME or COM. DeSouza and colleagues also proposed that pathologic nasal conditions can cause OM as a result of edema in proximity to the ET and subsequent obstruction of this orifice and by insufflation of contaminated nasal secretions into the middle ear. These investigators support the use of surgical procedures, such as septoplasty, turbinoplasty, creation of nasal antral windows, and endoscopic sinus surgery, to correct anatomic conditions that results in chronic and recurrent nasal and sinus diseases and thereafter in OM.

PROFORMA

Name:

Age:

Sex:

IP/OP.No:

Address:

Occupation:

Chief Complaints:

EAR

A. Discharge

I. Duration

II. Onset

III. Nature

IV. Colour

V. Amount

VI. Smell

VII. Blood stained

VIII. Aggravating / Relieving Factors

IX. Associated Symptoms

B. Hard of Hearing

Onset

Unilateral / Bilateral

Gradual / Fluctuating

C. Earache**D. Vertigo / Tinnitus****NOSE****A. Nasal Obstruction**

- Unilateral / Bilateral

- Continuous / Intermittent

B. Nasal Discharge

- Unilateral / Bilateral

- Scanty / Profuse

- Colour

- Smell

C. Headache**D. Anosmia****E. Post Nasal Drip****F. Sneezing**

H/o Previous Treatment – Medical / Surgical

Clinical Examination:**EAR****Right****Left**

Pinna

Preauricular Region

Postauricular Region

External Auditory Canal

Tympanic Membrane

Perforation

Site

Size

Small

Large

Subtotal

Middle Ear Mucosa

Moist

Boggy (Polypoidal)

NOSE

Anterior Rhinoscopy

Posterior Rhinoscopy

Sinus Tenderness

Cold Spatula Test

THROAT

Tonsils – Normal / Hypertrophied / Shrunken

Posterior Pharyngeal Wall – Normal / Granular / Congested /

Postnasal Drip

DIAGNOSTIC NASAL ENDOSCOPY:

First Pass

Right

Left

Turbinoseptal

Classification

Inferior Turbinate

Ridges / Spicules

Eustachian Tube Orifice

Mucosa

Movement

Secretions

Nasopharynx

Choana

Others

Second Pass

Head of Middle Turbinate

Uncinate Process

Ethmoidal Bulla

Accessory Ostia

Middle Meatus Discharge

Third Pass

Sphenoethmoidal Recess

Superior Turbinate

Superior Meatus

Others

CT SCAN PNS (According to Mark May)

Grade 0 : Normal

Grade 1 : Minimal – Disease limited to OMC

Grade 2 : Moderate – Incomplete opacification of one or more sinuses (Frontal, maxillary, sphenoid).

Grade 3 : Maximal – Complete opacification of one or more major sinuses, but not all

Grade 4 : Most severe – Total opacification of all sinuses

OTOENDOSCOPY

1. Perforation : Small / Large / Subtotal
2. Ear Discharge: Scanty / Copious
3. Middle Ear Mucosa: Moist / Boggy

Medical management of Chronic Sinusitis: - Antibiotics

- Antihistamines

- Decongestants

Surgery : FESS / FESS with septal correction

Otoendoscopy after clearance of sinus disease:

Middle Ear Mucosal Status: Improved mucosal status / No Improvement

MATERIALS AND METHODS

The study population consists of tubotympanic type of C.S.O.M. patients who attended the U.I.O.R.L. at Government General Hospital, Chennai during a 2 year period.

Patients with tubotympanic type of CSOM were randomly selected from out patient department of U.I.O.R.L. Ear discharge of these patients was sent for culture and sensitivity. The patients were treated with culture directed topical and systemic antibiotics and mucolytic agents and were followed up for a period of 1 month. X-ray of the mastoids were also taken. Patients who had cellular type of mastoids on x-ray and also with persistent ear discharge after 1 month were selected for the study. The patients selected were subjected to diagnostic nasal endoscopy and computed tomography of paranasal sinuses. Patients with evidence of chronic sinusitis were treated with antibiotics, antihistamines and decongestions for a period of at least 6 wks. Though they had temporary symptomatic improvement they showed frequent relapse of symptoms. So they underwent endoscopic sinus surgery and were followed up post operatively every 2 weeks for a period of 3 months. The patients were assessed every 2 weeks by otoendoscopy for decrease in ear discharge and improvement of middle ear mucosal status.

INCLUSION CRITERIA

1. Age : 20-40yrs
2. Sex : Both Sexes (randomly selected)
3. Tubotympanic type of C.S.O.M. patients with persistent ear discharge even following culture directed topical and systemic antibiotics.
4. Duration of ear discharge : 3 months and more
5. Hearing loss : 25-40 db (mild cond. HL).

EXCLUSION CRITERIA

1. Unsafe type of ear diseases
2. Postoperative patients
3. Fungal infection of the ear
4. Patients with sclerosed mastoids on x-ray
5. Hearing loss more than 40dB.
6. Patients with nasal polyposis, hypertrophied adenoids, mass lesion of nose and nasopharynx, signs of allergic rhinitis on diagnostic nasal endoscopy.

About 50 patients who met the above criteria were selected for the study. All these patients underwent diagnostic nasal endoscopy.

DIAGNOSTIC NASAL ENDOSCOPY

Using 4% xylocaine (local anaesthetic) with oxymetazoline (decongestant) nose packed along the inferior meatus, middle meatus and septum on both sides.

After 15 minutes pack removed, using 0°Hopkins telescope rod diagnostic nasal endoscopy done. The main aim is to see the (1) patency of the Eustachian tube (2) structural change of tubal eminence (3) discharge from middle meatus or sphenoethmoidal recess which was flowing over the Eustachian tube orifice.

In osteomeatal complex area, anatomical variants like (1) medialised uncinate (2) prominent bulla (3) enlarged middle turbinate (4) accessory ostium (5) circulus phenomenon (6) discharge from frontal recess and maxillary sinus were noted.

Turbinoseptal deformity TS (determined endoscopically after decongestion). This grading is regarding septal deviation in relation with visibility of middle turbinate.

TS I - Medial and lateral aspect of middle turbinate visible

TS II - Part of middle turbinate obscured by septal deviation.

TS III - Septal deflection completely blocks view of any portion of middle turbinate.

COMPUTED TOMOGRAPHY SCANNING OF PARANASAL SINUSES

All the selected patients underwent CT scan paranasal sinuses both coronal and axial view, 3000 Hu units bone window.

Following findings were noted:

1. Medialised uncinate
2. Blockage of osteo meatal complex
3. Mucosal thickening / Retention cyst in maxillary sinus
4. Concha bullosa
5. Mucosal thickening in anterior and posterior ethmoids
6. Type of skull base. Keros classification
7. Enlarged middle turbinate
8. Agger nasi cells with obstruction to frontal recess
9. Type of frontal cell causing obstruction to frontal recess

OTOENDOSCOPY

Using 0° Hopkins rod, 4mm otoendoscopy done for all the patients. Following findings were documented.

1. Type of perforation
2. Quadrants involved
3. Middle ear mucosal status
4. Discharge

The patients selected for the study had various anatomic variations in the nose and paranasal sinuses, and signs suggestive of chronic sinusitis on diagnostic nasal endoscopy and computed tomographic scanning of paranasal sinuses. When these patients were put on medical treatment for a period of at least 6 wks they were either unresponsive or showed frequent relapse of symptoms.

The patients underwent functional endoscopic sinus surgery by Messerklingers technique. Concurrent septal correction was done if required. The surgery in each case was based on the extent of disease. Simultaneous with the post operative care given to the healing nasal cavity, the patient was assessed every 2 weeks by otoendoscopy for decrease in ear discharge and improvement of middle ear mucosal status. The patients were followed up for a period of at least 3 months.

OBSERVATIONS

Observation of 50 patients who had persistent chronic suppurative otitis media of tubotympanic type and underwent functional endoscopic sinus surgery for clearance of concomitant sinus disease is as follows:

1. Age and Sex incidence

Age of patients included in this study ranged from 20-40 yrs. Out of 50 patients, 25 (50%) were males and 25 (50%) were females.

Table.1

Age Group (yrs)	Males	Females	Total
20-25	8	11	19
26-30	11	9	20
31-35	4	3	7
36-40	2	2	4
Total	25	25	50

2. Economic Status wise distribution of cases

Table.2

Economic Status	No.of cases	Percentage %
Upper class	2	4
Middle Class	10	20
Lower Class	38	76

3. Population wise distribution of cases

Table 3

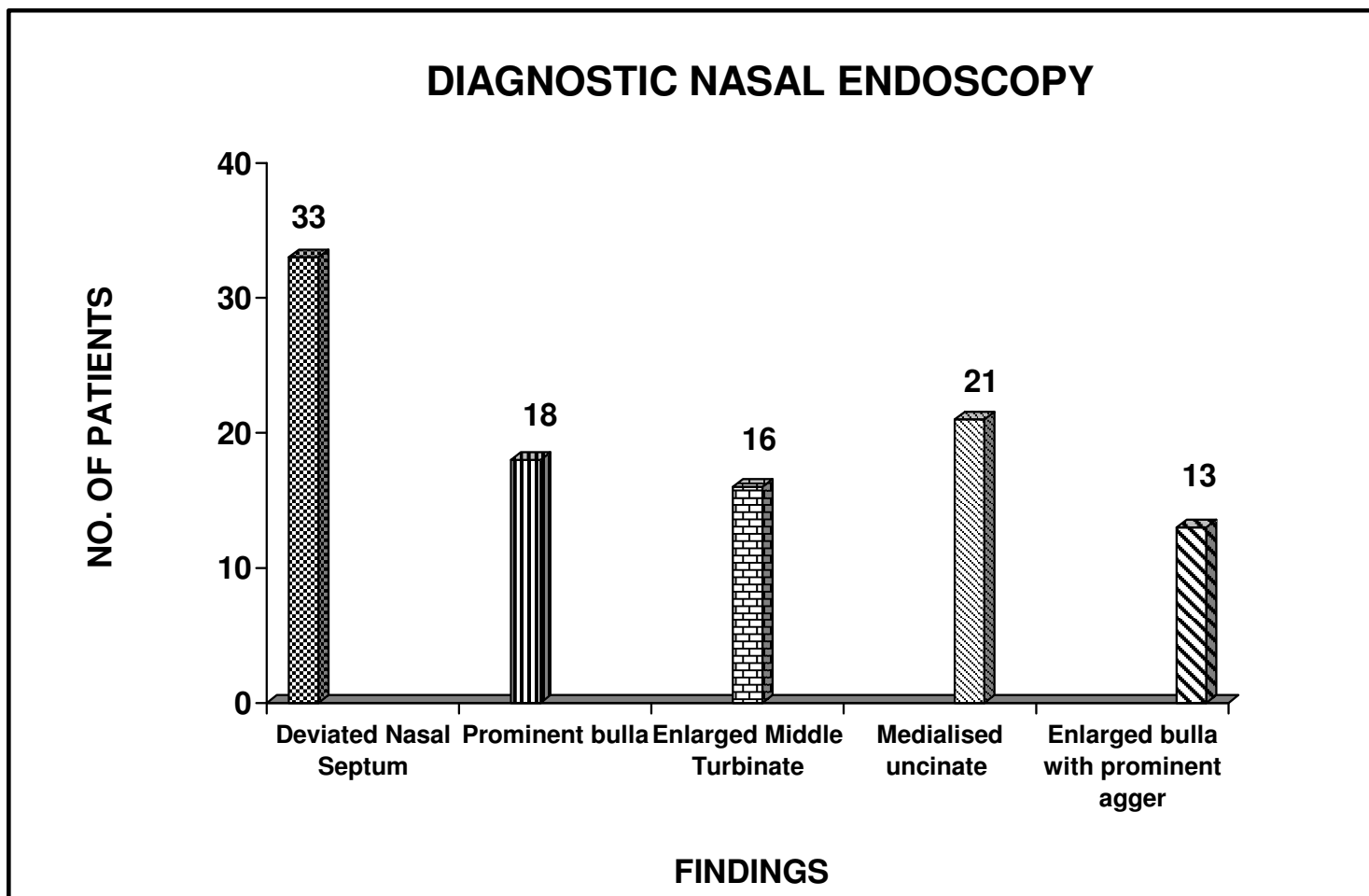
Population	No. of Cases	Percentage %
Urban	18	36
Rural	32	64

4. Diagnostic Nasal Endoscopy: Anatomical Variants

On DNE the most common anatomical variant noted was deviated nasal septum / turbino septal deformity in 66% of patients, followed by enlarged bulla in 36%, medialised uncinate 42%, enlarged middle turbinate 32%, enlarged bulla with prominent agger 26% and paradoxical middle turbinate 20%.

Table 4.

Anatomical Variants	Patients	Percentage %
Deviated nasal septum / turbino septal deformity	33	66
Enlarged bulla	18	36
Medialised uncinate	21	42
Enlarged middle turbinate	16	32
Enlarged bulla with prominent agger	13	26
Paradoxical middle turbinate	10	20



5. Diagnostic Nasal Endoscopy: Site of Accessory Ostium

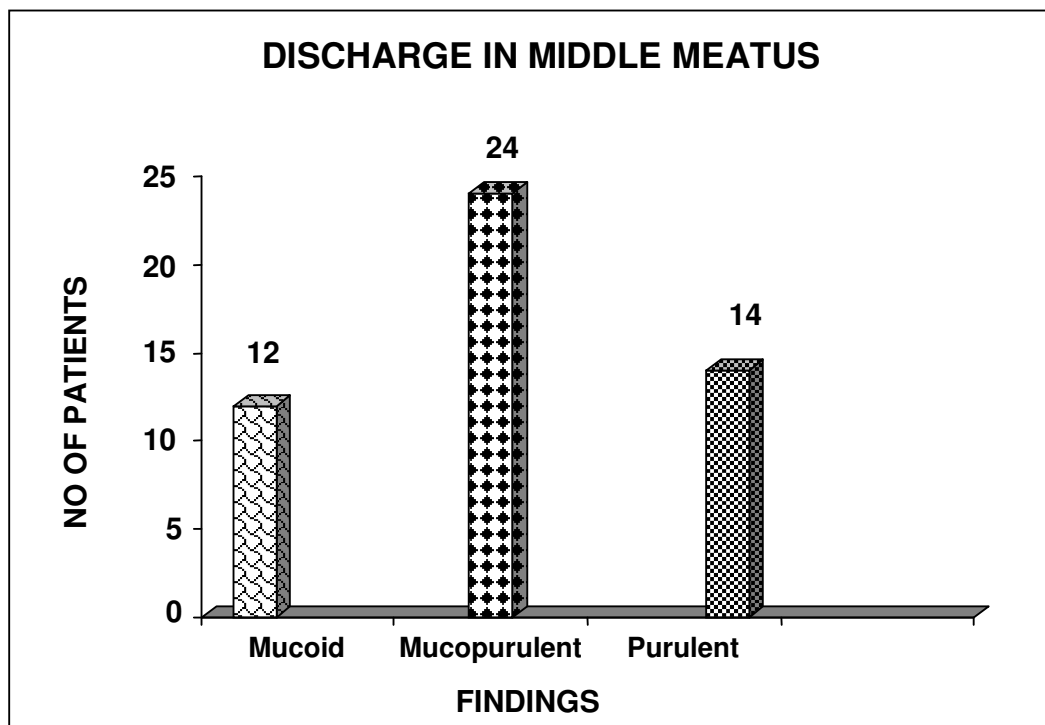
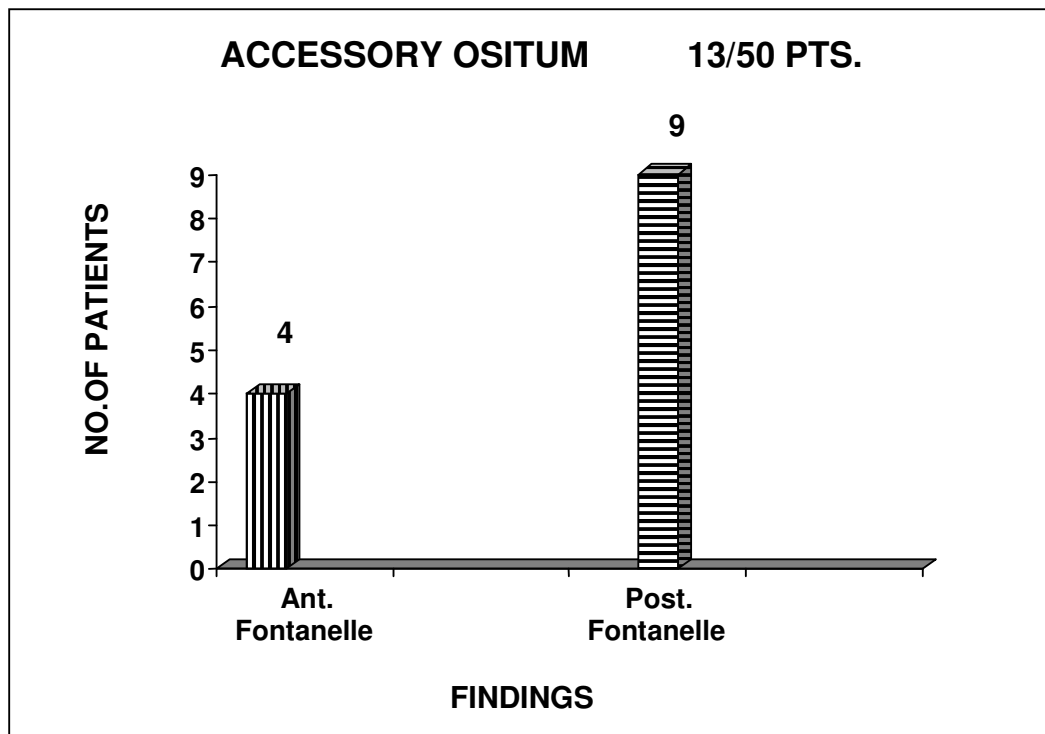
Table 5.

Site of Accessory Ostium	No.of patients	Percentage %
Anterior Fontanelle	4	8
Posterior fontanelle	9	18

6. Diagnostic Nasal Endoscopy: Discharge in Middle Meatus

Table 6

Nature of discharge	Patients	Percentage %
Mucopurulent	24	48
Purulent	14	28
Mucoid	12	24



7. CT scan PNS findings

Majority 52% had. Grade I findings i.e. disease limited to OMC, 24% had grade II (Incomplete opacification of one/more sinuses) 14% had grade II (complete opacification of one or more major sinuses) and 6% had grade IV findings – total opacification of all sinuses. 4% had normal CT findings.

Table 7

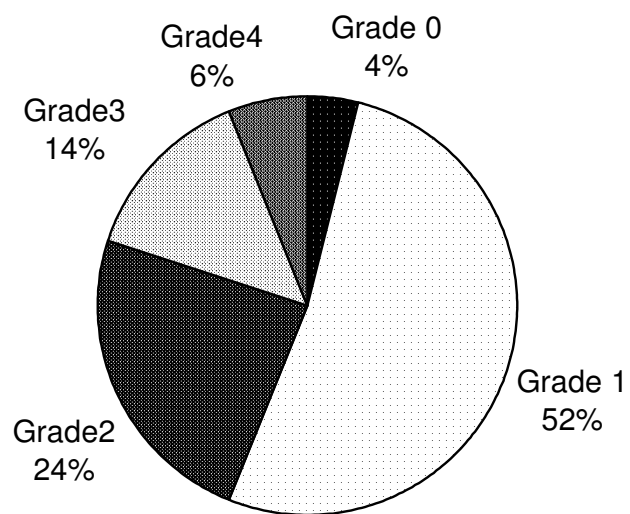
CT Scan PNS finding	Patients	Percentage %
Grade 0	2	4
Grade I	26	52
Grade II	12	24
Grade III	7	14
Grade IV	3	6

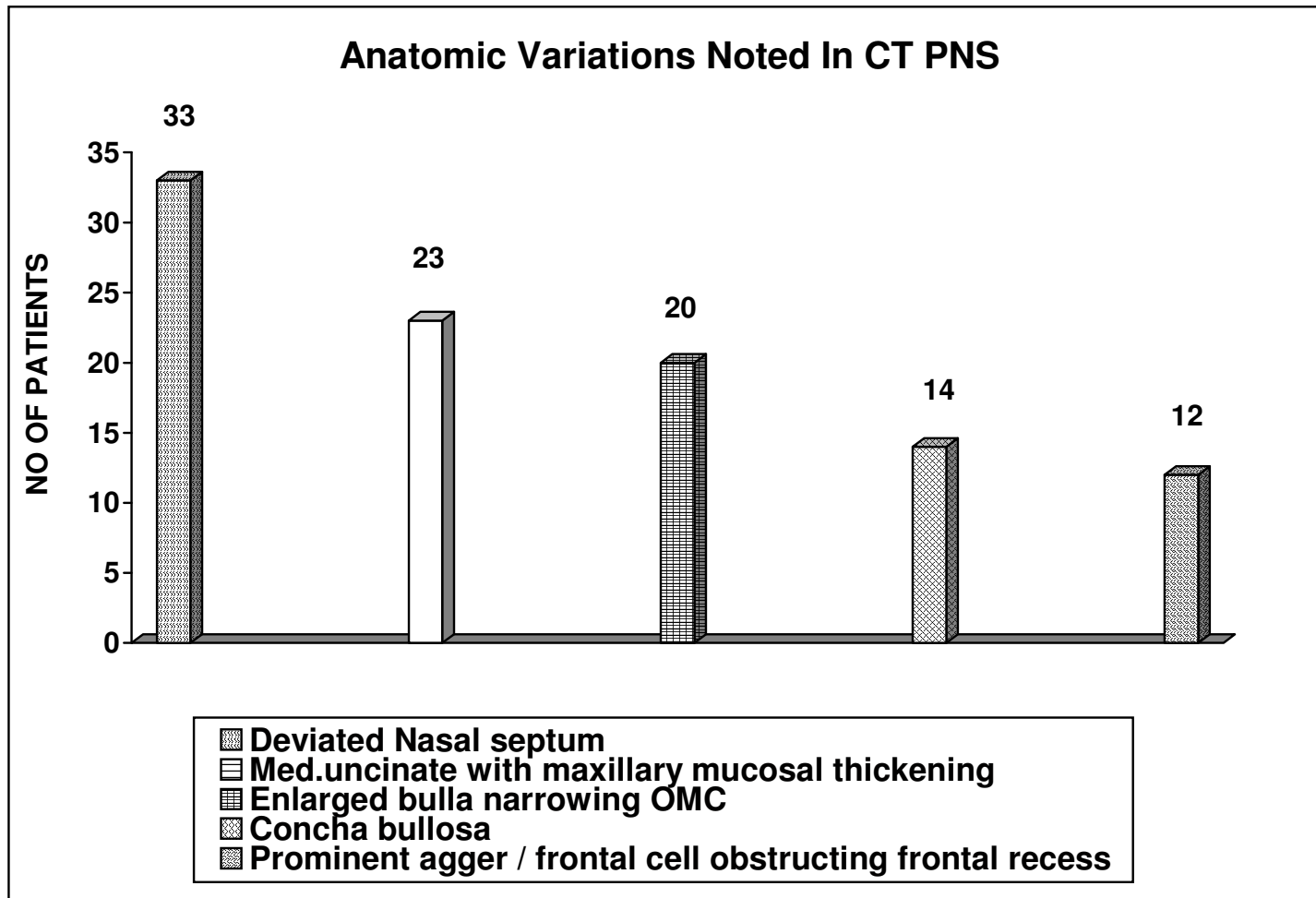
8. CT Scan PNS: Anatomic Variations Noted

Table 8.

Anatomic Variants	Patients	Percentage %
Deviated Nasal septum	33	66
Med.uncinate with maxillary mucosal thickening	23	46
Enlarged bulla narrowing OMC	20	40
Concha bullosa	14	28
Prominent agger / frontal cell obstructing frontal recess	12	24

CT SCAN PNS FINDINGS





9. Otoendoscopy: Type of Perforation

Table 9.

Type of perforation	Patients	Percentage %
Large CP	22	44
Subtotal CP	16	32
Small CP	12	24

10. Otoendoscopy: Middle Ear Mucosal Status

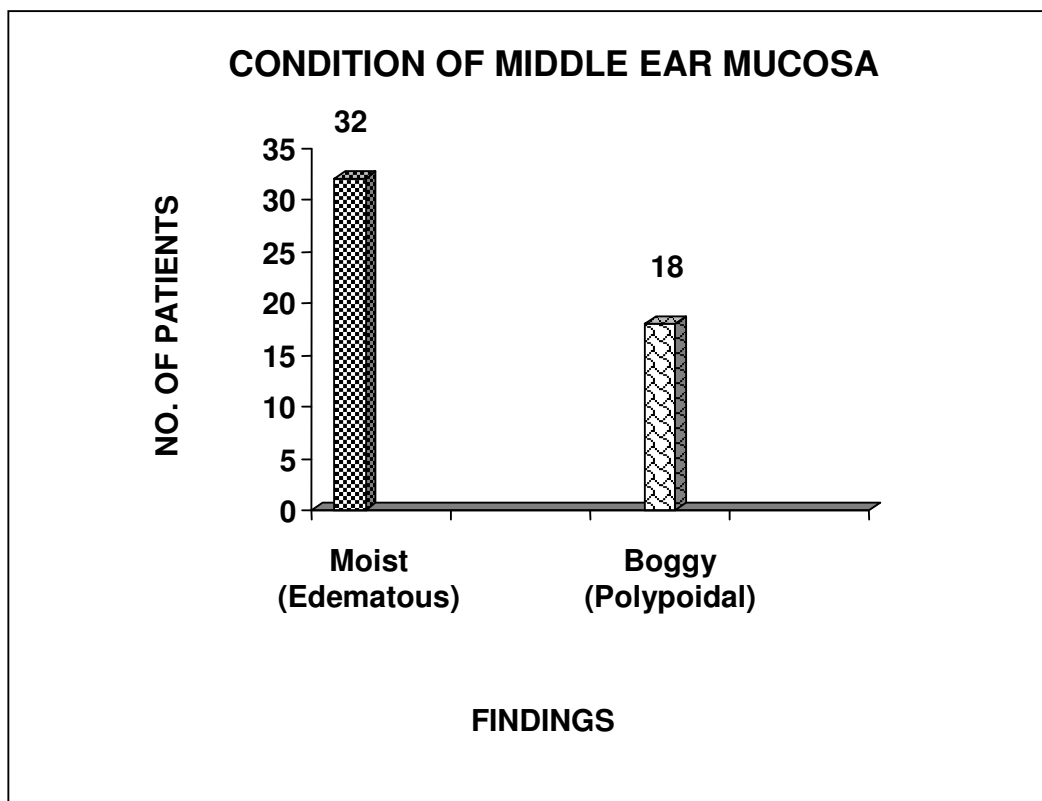
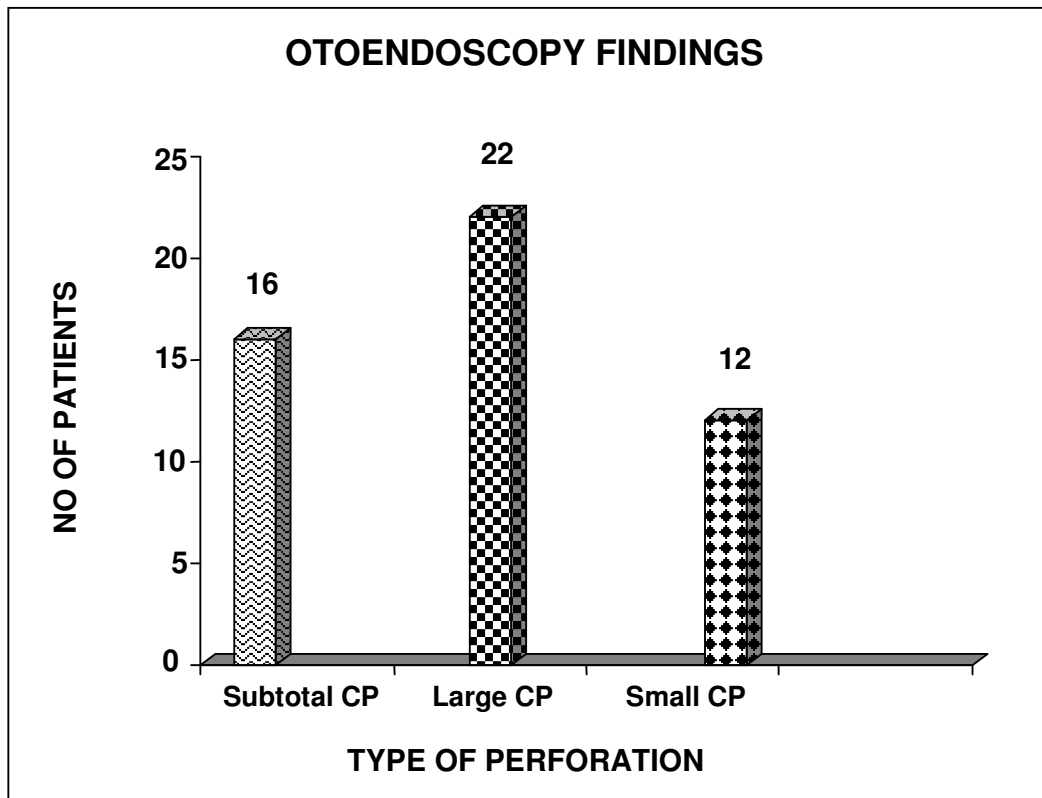
Table 10.

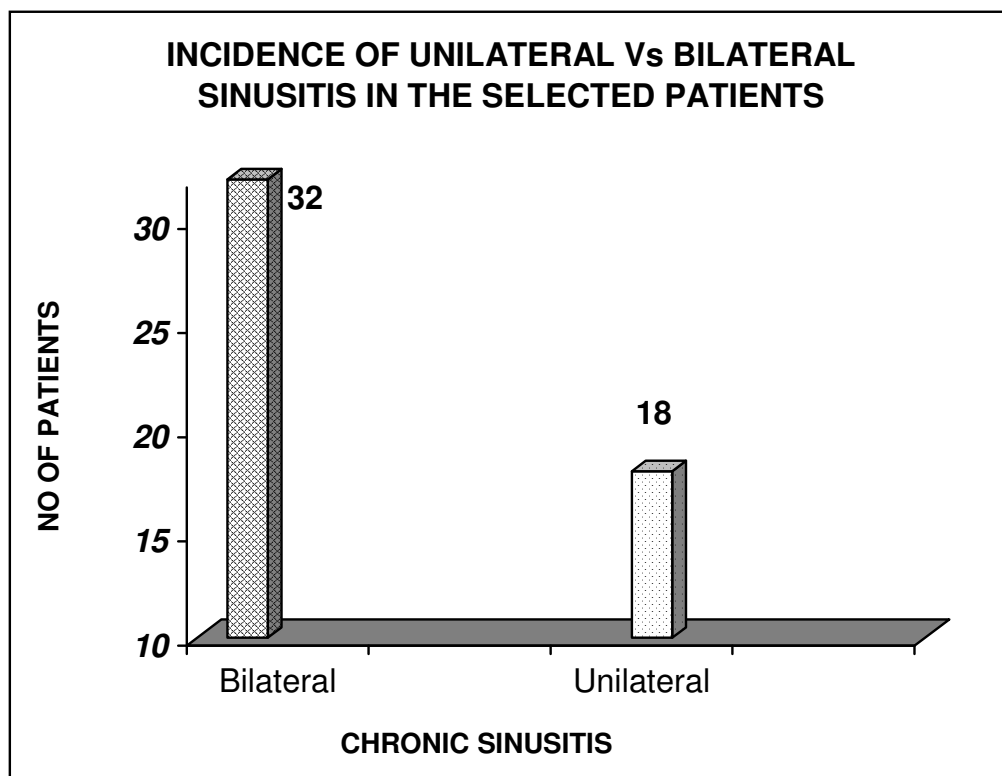
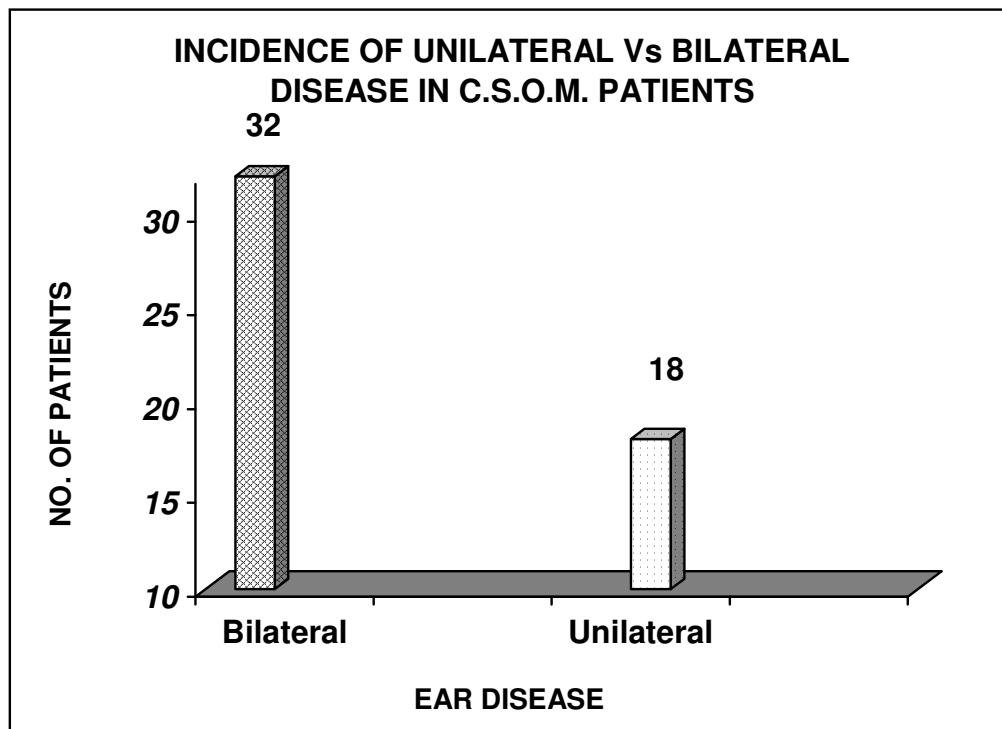
Middle ear mucosa	Patients	Percentage %
Edematous (Moist)	32	64
Polypoidal (Boggy)	18	36

11. Incidence of Unilateral and Bilateral disease in the selected patients

Table 11

Pathology	Patients with Persistent C.S.O.M	Patients with Sinusitis	Percentage %
Unilateral	18	18	36
Bilateral	32	32	64





12. Surgical Procedure done for clearance of sinusitis

Table12

Surgical procedure	Patients	Percentage %
FESS	17	34
FESS with septal correction	33	66

13. Improvement of middle ear mucosal status with clearance of sinusitis

Table13.

Nature of mucosa prior to treatment	Nature of mucosa after treatment	With Endoscopic sinus surgery + mucolytic + Antibiotics	Surgery + regular suction cleaning + topical antibiotics (culture directed)
MOIST	Improved	24	27
	No improvement	8	5
BOGGY	Improved	12	15
	No improvement	6	3

DISCUSSION

A total of 50 patients were selected for the purpose of this study. These patients with tubotympanic type of chronic suppurative otitis media had persistent ear discharge even following culture directed topical and systemic antibiotics. Further they had cellular type of mastoids on x-ray.

In this study we try to emphasize that sinus pathology is a major factor for persistently active tubotympanic disease. Even though other septic foci like chronic tonsillitis, adenoids exist, the percentage is less in comparison to sinus disease.

This study of 50 patients over the study period. January 2004 to January 2006 included 25 males and 25 females. Maximum number of patients belonged to age group 21-30 yrs.

38 cases (76%) belonged to the lower socio-economic group. The poor hygiene and poor living conditions in this group was the cause for its higher prevalence in this group. 10 cases (20%) belonged to middle economic group and 2 cases (4%) belonged to the higher socio – economic group.

Of the 50 cases, 32 cases were from the rural population and 18 cases from the urban population. The poor living conditions in rural population were the predisposing factor for the high prevalence in the population.

In our study, diagnostic nasal endoscopy was done for all patients. 33 patients (66%) had septal deviation / turbinoseptal deformity which was the most common anatomical variant 36% had enlarged bulla, 42% had medialised uncinate, 32% had enlarged middle turbinate, 26% had paradoxical middle turbinate.

Accessory ostium which is one of the signs of chronic sinusitis was found in 13 patients. It was present in the anterior fontanelle in 4 patients (8%) and in the posterior fontanelle in 9 patients (18%).

All patients had discharge in middle meatus. While the discharge was mucopurulent in 24 patients (48%) it was purulent in 14 patients (28%) and mucoid in 12 patients (24%). In 80% of cases the discharge was seen below the Eustachian tube and in 20% of cases, the discharge was seen above Eustachian tube orifice.

On CT Scan paranasal sinuses, majority of cases had Grade I disease (56%) i.e. minimal disease limited to OMC followed by Grade II

(24%) i.e. moderate incomplete opacification of one or more sinuses, 14% had Grade III – complete opacification of one or more major sinuses, not all and 6% of patients had Grade IV disease – total opacification of all sinuses. In 4% of patients CT scan PNS was normal.

The most common anatomic variant on CT scan was deviated nasal septum in 33 patients. Medialised uncinate with maxillary mucosal thickening was found in 23 patients while enlarged bulla narrowing OMC was seen in 20 patients. Concha bullosa was found in 14 patients. Prominent agger or a type of frontal cell obstructing the frontal recess was found in 12 patients.

All the patients had anatomic variants and signs strongly suggestive of chronic sinusitis on diagnostic nasal endoscopy and CT scan PNS.

On otoendoscopy, 12 patients (24%) were found to have a small central perforation involving the anterior quadrant. 22 patients (44%) had a large central perforation involving anterior and posterior quadrants while 16 patients had a subtotal central perforation.

Middle ear mucosal status assessed by otoendoscopy is a reflection of Eustachian tube function. 32 patients had oedematus

(moist) middle ear mucosa while 18 patients had polypoidal (boggy) mucosa reflecting poor Eustachian tube function.

On comparing the incidence of unilateral and bilateral ear discharge in the selected patients it was found to be 18 (36%) and 32 (64%) respectively. When the incidence of unilateral and bilateral sinusitis was compared in these patients it was found to be the same. The patients with unilateral ear discharge had signs of chronic sinusitis and discharge over the Eustachian tube orifice only on the side of the discharge. These findings are in concurrence with our study.

The patients underwent functional endoscopy sinus surgery by Messerklinger technique for the treatment of chronic sinusitis. Patients with unilateral sinusitis underwent surgery only on the diseased side. 33 (64%) patients also underwent septal correction.

Following clearance of sinusitis, improvement in middle ear mucosal status was assessed. Out of 32 patients with moist mucosa 24 patients showed improved mucosal status while 8 patients had no improvement in mucosal status. Further treatment by way of regular betadine wash of the ear, suction cleaning and culture directed topical antibiotics improved the mucosal status of 3 more patients.

Out of 18 patients with boggy mucosa 12 patients showed improved mucosal status after surgery alone, while 3 more patients had improved mucosal status with antibiotic and regular suction cleaning.

Overall out of 50 patients, 42 patients (84%) had improved mucosal status after clearance of sinusitis while 8 patients (16%) showed no improvement at all in the mucosal status and nature of ear discharge. If these patients with improved mucosal status are further treated with cortical mastoidectomy or myringoplasty as the case may be they will definitely have a better outcome.

The 8 patients who had no improvement of middle ear mucosal status were further investigated. Three patients had hypo function of the eustachian tube as demonstrated by the dye test. Four patients had recurrence of sinusitis due to failure of the surgical procedure. One patient had primary ciliary dysfunction with associated bronchiectasis.

CONCLUSION

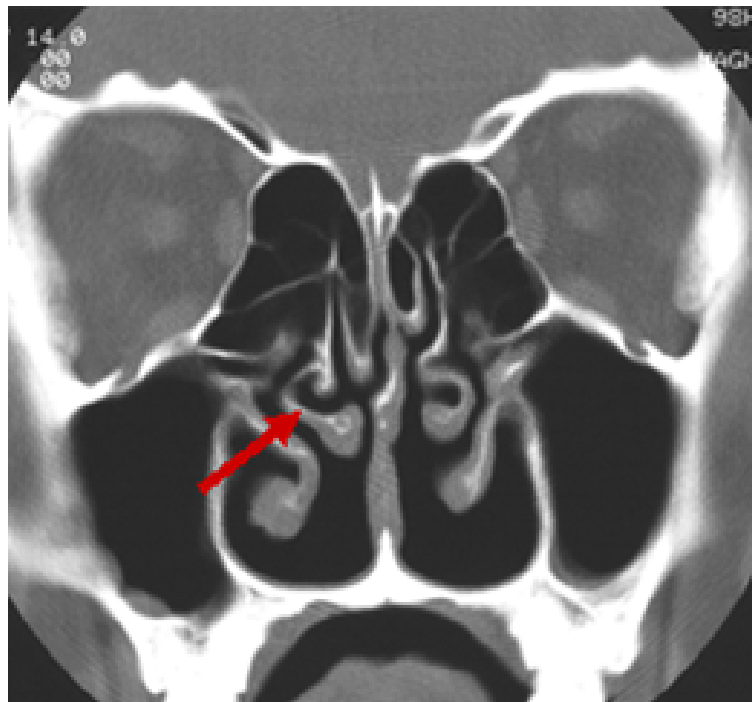
- ❖ In the adult population sinusitis is the most important cause of persistent ear discharge in tubotympanic disease.
- ❖ Unilateral ear discharge is associated with sinusitis only on the corresponding side, which is in concurrence with our study.
- ❖ Deviated nasal septum, medialised uncinate and enlarged bulla in order of frequency are the most common anatomical variants of nose and paranasal sinuses predisposing to sinusitis.
- ❖ The clearance of sinusitis has a favourable effect on improving the middle ear mucosal status.
- ❖ The clearance of sinusitis by endoscopic sinus surgery in tubotympanic patients results in good outcome of tubotympanic disease clearance.
- ❖ Functional endoscopic sinus surgery has emerged as a effective and reliable procedure for clearance of sinusitis.

CT PARANASAL SINUSES

CONCHA BULLOSA WITH MAXILLARY SINUSITIS

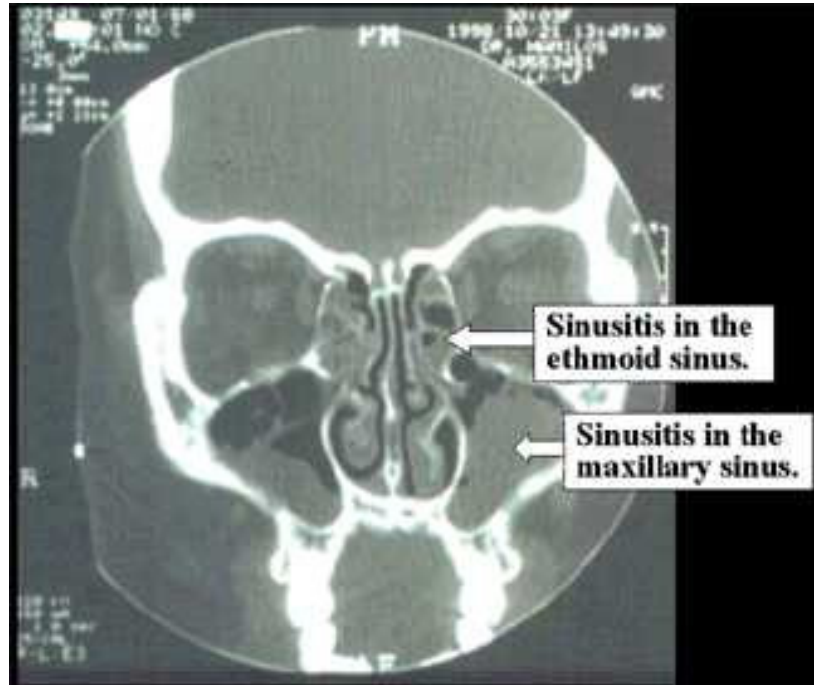


PARADOXICAL MIDDLE TURBINATE WITH NARROWED OSTEOMEATAL COMPLEX



CT PARANASAL SINUSES

PANSINUSITIS



UNILATERAL MAXILLARY SINUSITIS



OTOENDOSCOPY

MUCOID EAR DISCHARGE WITH MOIST MIDDLE EAR MUCOSA



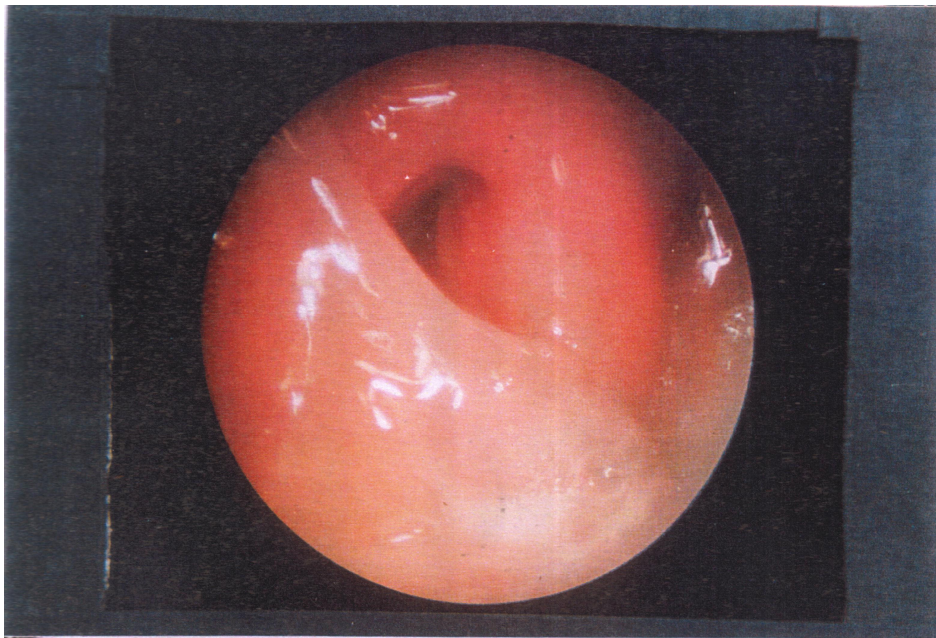
NORMAL MUCOSAL STATUS AFTER CLEARANCE OF SINUSITIS



DIAGNOSTIC NASAL ENDOSCOPY
CONCHA BULLOSA WITH LATERALISED UNCINATE



MUCOID DISCHARGE OVER ET ORIFICE

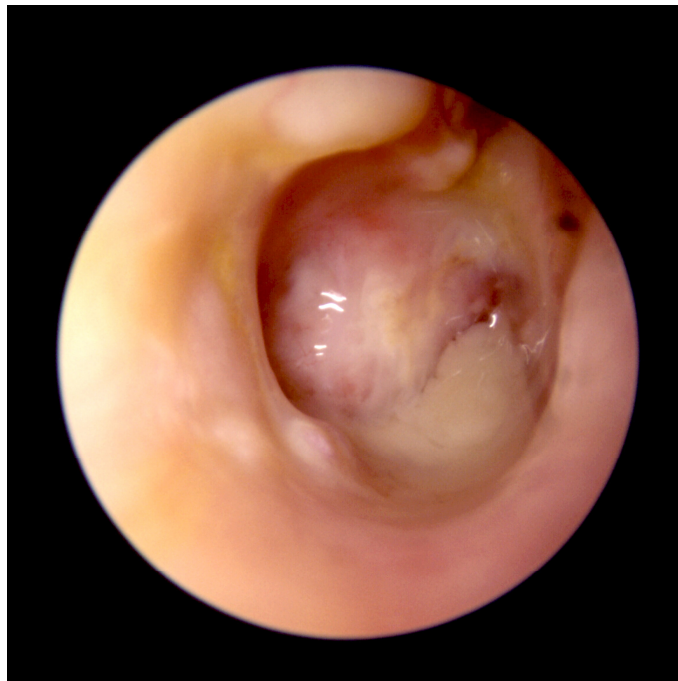


OTOENDOSCOPY

CENTRAL PERFORATION WITH BOGGY MIDDLE EAR MUCOSA



CSOM WITH MUCOPUS DISCHARGE



MASTER CHART

S.No.	Name Age/Sex IP.No.	Otoendoscopy		DNE Findings	Diagnosis	Surgery	Middle Ear Mucosal Status after surgery.
		Type of Central Perforation	Middle Ear Mucosal Status				
1.	Murugan 29/M 689805	Large	Boggy	TS II / Left Medialised uncinate / enlarged bulla	DSR with left ch. sinusitis with LT CSOM with cp.	FESS with septal correction	Improved
2.	Nagarajan 29/M 689803	Small	Moist	TS I / Left Enlarged bulla with prominent agger	DSR with left ch. sinusitis with LT CSOM with cp.	FESS with septal correction.	Improved
3.	Ramalingam 26/M 690339	Large	Moist	Medialised uncinate / enlarged bulla	Ch. Sinusitis with B/L CSOM with cp.	FESS	Improved
4.	Hemalatha 20/F 693859	Large	Moist	TS II / Paradoxical middle turbinate	DSL with ch. Sinusitis B/LCSOM with cp.	FESS with septal correction	Improved
5.	Bagyalakshmi 21/F 698044	Subtotal	Boggy	Enlarged bulla with prominent agger	Ch.Sinusitis with B/L CSOM with CP	FESS	Not Improved
6.	Suresh 20/M 706065	Large	Moist	TS II / Enlarged MT / Prominent bulla	DSR with ch. Sinusitis with B/L CSOM with CP	FESS with septal correction	Improved
7.	Maheshwari 22/F 706063	Subtotal	Boggy	TS I / Paradoxical middle turbinate	DSR with ch. sinusitis with B/L CSOM with CP	FESS with septal correction	Not Improved
8.	Sulakshana 28/F 707384	Large	Moist	TS II / Enlarged bulla with prominent agger	DSL with ch. sinusitis with B/L CSOM with CP	FESS with septal correction	Improved
9.	Narayanan 30/M 707690	Small	Moist	TS I / Enlarged MT	DSL with ch. sinusitis with B/L CSOM with cp.	FESS with septal correction	Improved
10.	Ravanamma 20/F 708713	Subtotal	Moist	TS II / Right Medialised uncinate / Enlarged bulla.	DSL with right ch. sinusitis with RT CSOM with CP	FESS with septal correction	Not Improved

S.No.	Name Age/Sex IP.No.	Otoendoscopy		DNE Findings	Diagnosis	Surgery	Middle Ear Mucosal Status after surgery.
		Type of Central Perforation	Middle Ear Mucosal Status				
11.	Nirmala 22/ F 710115	Subtotal	Boggy	TS II / Medialised uncinate / enlarged bullae	DSR with ch. sinusitis with B/L CSOM with subtotal perforation.	FESS with septal correction	Not Improved
12.	Mani 30 / M 714469	Large	Moist	TS II / Medialised uncinate / Enlarged bullae.	DSR with ch. sinusitis with B/L CSOM with cp.	FESS with septal correction	Improved
13.	Suresh 22 / M 714470	Subtotal	Moist	Enlarged bullae with prominent agger	Ch. Sinusitis with B/L CSOM with cp.	FESS	Improved
14.	Nagappan 21 / M 715772	Large	Moist	TS III / LT Enlarged middle turbinate	DSL with LT ch. Sinusitis LT CSOM with cp.	FESS with septal correction	Not Improved
15.	Rukmani 38/F 718150	Large	Boggy	Prominent middle turbinate.	Ch. Sinusitis with B/L CSOM with CP	FESS	Improved
16.	Sarala 27/F 719264	Small	Moist	TS II / Medialised uncinate / enlarged bullae	DSR with ch. Sinusitis with B/L CSOM with CP	FESS with septal correction	Improved
17.	Parvathi 30/F 720557	Small	Moist	RT Medialised uncinate / enlarged bullae	RT Ch. sinusitis with RT CSOM with CP	FESS	Improved
18.	Bhavani 25/F 720945	Subtotal	Boggy	TS II / Paradoxical middle turbinate	DSR with ch. sinusitis with B/L CSOM with CP	FESS with septal correction	Improved
19.	Jaya 24/F 721816	Large	Moist	TS III / LT Enlarged middle turbinate / enlarged bullae	DSL with LT ch. sinusitis with LT CSOM with CP.	FESS with septal correction	Not Improved
20.	Parimala 24/F 724428	Large	Boggy	Enlarged bullae / Medialised uncinate	Ch. sinusitis with B/L CSOM with CP	FESS	Not Improved

S.No.	Name Age/Sex IP.No.	Otoendoscopy		DNE Findings	Diagnosis	Surgery	Middle Ear Mucosal Status after surgery.
		Type of Central Perforation	Middle Ear Mucosal Status				
21.	Edwin 37/M 724423	Small	Moist	TS II /Enlarged bulla Medialised uncinata.	DSL with ch. sinusitis with B/L CSOM with CP.	FESS with septal correction	Improved
22.	Anusya 24/F 728088	Large	Moist	LT Enlarged middle turbinate / Enlarged bulla.	LT Ch. sinusitis with LT CSOM with cp.	FESS	Improved
23.	Allamelu 23/F 729420	Subtotal	Boggy	Enlarged bulla with prominent agger	Ch. Sinusitis with B/L CSOM with cp.	FESS	Improved
24.	Thilagavathy 22/F 729799	Large	Moist	LT Enlarged bulla / medialised uncinata	LT Ch. Sinusitis with LT CSOM with cp.	FESS	Not Improved
25.	Devaraj 34/M 732601	Small	Moist	RT Paradoxical MT / Medialised uncinata.	RT Ch Sinusitis with RT CSOM with CP	FESS	Improved
26.	Prakesh 38/M 733608	Subtotal	Boggy	TS II / enlarged middle turbinate	DSR with ch. Sinusitis with B/L CSOM with CP	FESS with septal correction	Improved
27.	Udayakumar 29/M 735290	Subtotal	Moist	TS II / LT Enlarged bulla / medialised uncinata.	DSL with LT Ch.sinusitis with LT CSOM with CP	FESS with septal correction	Improved
28.	Tamilbegum 38/F 736343	Large	Moist	TS III / Enlarged bulla with prominent agger	DSL with ch. sinusitis with B/L CSOM with CP	FESS with septal correction	Not Improved
29.	Sujatha 28/F 736348	Large	Moist	Paradoxical MT	Ch. sinusitis with B/L CSOM with CP.	FESS	Improved
30.	Maliga 27/F 738465	Large	Boggy	TS II / Enlarged MT / Enlarged bulla	DSL with Ch. sinusitis with B/L CSOM with CP	FESS with septal correction	Improved

S. No.	Name Age/Sex IP.No.	Otoendoscopy		DNE Findings	Diagnosis	Surgery	Middle Ear Mucosal Status after surgery.
		Type of central Perforation	Middle Ear Mucosal Status				
31.	Silambarasan 29/M 749785	Small	Moist	TS II /Enlarged bulla with promment agger.	DSR with ch. sinusitis with B/L CSOM with CP.	FESS with septal correction	Improved
32.	Saravanan 20/M 754096	Large	Boggy	TS II / Medialised uncinata / Enlarged bulla.	DSR with ch. sinusitis with B/L CSOM with cp.	FESS with septal correction	Not Improved
33.	Raji 22/F 754082	Small	Moist	LT Medialised uncinata / Enlarged bulla	LT Ch. Sinusitis with LT CSOM with cp.	FESS	Improved
34.	Mohan 26/M 760766	Subtotal	Boggy	TS I / RT Enlarged bulla	DSR with RT ch.sinusitis with RT CSOM with cp.	FESS with septal correction	Not Improved
35.	Vinodh Kumar 24/M 776434	Subtotal	Moist	TS I / Paradoxical MT	DSR with ch. Sinusitis with B/L CSOM with CP	FESS with septal correction	Improved
36.	Mani 23/M 788357	Large	Moist	TS II / RT Enlarged bulla / Enlarged MT	DSL with RT ch.sinusitis with RT CSOM with CP	FESS with septal correction	Not Improved
37.	Sivarasu 32/M 793412	Large	Boggy	Enlarged MT / Enlarged bulla	Ch. sinusitis with B/L CSOM with CP	FESS	Improved
38.	Abdul Yousuf 32/M 676463	Small	Moist	Enlarged bulla with promment agger	Ch. sinusitis with B/L CSOM with CP	FESS	Improved
39.	Bhuvaneswari 27/F 678521	Large	Boggy	TS II / LT Enlarged bulla with promment Agger	DSL with LT Ch.sinusitis with LT CSOM with CP.	FESS with septal correction	Improved
40.	Kala 27/F 679702	Small	Moist	Medialised uncinata / Enlarged MT	Ch. sinusitis with B/L CSOM with CP	FESS	Improved

S.No.	Name Age/Sex IP.No.	Otoendoscopy		DNE Findings	Diagnosis	Surgery	Middle Ear Mucosal Status after surgery.
		Type of Central Perforation	Middle Ear Mucosal Status				
41.	Raji 20/F 682187	Large	Boggy	Paradoxical MT / Enlarged bulla.	Ch. sinusitis with B/L CSOM with CP.	FESS	Improved
42.	Daisy Rani 31/F 685762	Subtotal	Boggy	TS I / LT Enlarged bulla with prominent agger	DSR with LT ch. sinusitis with LT CSOM with cp.	FESS with septal correction	Not Improved
43.	Kamalam 31/F 685818	Subtotal	Moist	TS II / Paradoxical MT	DSL with Ch. Sinusitis with B/L CSOM with cp.	FESS with septal correction	Improved
44.	Saravanan 26/M 690790	Small	Moist	Medialised uncinate / Enlarged MT	Ch. Sinusitis with B/L CSOM with cp.	FESS	Improved
45.	Pattu 35/F 693064	Large	Boggy	TS I / RT Enlarged bulla with prominent agger.	DNS with RT ch. Sinusitis with RT CSOM with CP	FESS with septal correction	Improved
46.	Gajendharan 35/M 697812	Subtotal	Boggy	TS II / Medialised uncinate / Enlarged MT	DNS with ch. Sinusitis with B/L CSOM with CP	FESS with Septal correction	Improved
47.	Sathish 29/M 701494	Subtotal	Moist	TS II / Enlarged bulla with prominent agger / Enlarged MT	DSL with Ch. sinusitis with B/L CSOM with CP	FESS with septal correction	Not Improved
48.	Ameer 27/M 710261	Large	Moist	TS II / RT Enlarged MT / Enlarged bulla	DSR with RT Ch. sinusitis with RT CSOM with CP	FESS with septal correction	Improved
49.	Saravanan 24/M 717030	Small	Moist	TS I / paradoxical MT / Medialised uncinate	DNS with Ch. sinusitis with B/L CSOM with CP.	FESS with septal correction	Improved
50.	Santhosh Kumar 22/M 723456	Subtotal	Boggy	TS I / Enlarged bulla with prominent agger	DNS with Ch. sinusitis with LT CSOM with CP	FESS with septal correction	Improved

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