

**“A COMPARATIVE STUDY ON MANAGEMENT OF CHRONIC
SUPPURATIVE OTITIS MEDIA WITH SINUSITIS WITH AND
WITHOUT FESS”**

This dissertation is submitted to

THE TAMILNADU Dr. MGR MEDICAL UNIVERSITY

In partial fulfillment of the requirements for

MS ENT

Branch IV Degree examination 2022



**UPGRADED INTITUTUE OF OTORHINOLARYNGOLOGY
MADRAS MEDICAL COLLEGE
CHENNAI-600 003.**

MAY- 2022

REGISTRATION No.: 221914007

BONAFIDE CERTIFICATE

This is to certify that this dissertation entailed “*A COMPARATIVE STUDY ON MANAGEMENT OF CHRONIC SUPPURATIVE OTITIS MEDIA WITH SINUSITIS WITH AND WITHOUT FESS*” submitted by **Dr.ARUN KUMAR G**, appearing for M.S. ENT., Branch IV Degree examination in May 2022 is a bonafide record of work done by her under my direct guidance and supervision in partial fulfillment of regulations of the Tamil Nadu Dr. M.G.R. Medical University, Chennai, Tamil Nadu, India.

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DECLARATION

I solemnly declare that the dissertation "*A COMPARATIVE STUDY ON MANAGEMENT OF CHRONIC SUPPURATIVE OTITIS MEDIA WITH SINUSITIS WITH AND WITHOUT FESS*" is done by me at the Madras Medical College and Government General Hospital, Chennai during 2019-2022 under the guidance and supervision of Prof. *Dr. N.SURESH KUMAR.M.S., D.L.O.*,

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ABBREVIATIONS

ME	-	MIDDLE EAR
TM	-	TYMPANIC MEMBRANE
ET	-	EUSTACHIAN TUBE
EAC	-	EXTERNAL AUDITORY CANAL
PIF	-	POSTERIOR INCUDAL FOLD
TTF	-	TENSOR TYMPANI FOLD
IMLF	-	LATERAL INCUDOMALLEAL FOLD
COM	-	CHRONIC OTITIS MEDIA
CSOM	-	CHRONIC SUPPURATIVE OTITIS MEDIA
TTD	-	TUBOTYMPANIC DISEASE
AAD	-	ATTICO ANTRAL DISEASE
EPOS	-	THE EUROPEAN POSITION PAPER ON RHINOSINUSITIS AND NASAL POLYPOSIS
MM	-	MIDDLE MEATUS
FESS	-	FUNCTIONAL ENDOSCOPIC SINUS SURGERY
CT	-	COMPUTED TOMOGRAPHY
PNS	-	PARANASAL SINUSES
CRS	-	CHRONIC RHINOSINUSITIS

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INTRODUCTION

Chronic otitis media (COM) is considered as a major otological problem. Chronic otitis media is defined as “persistent inflammation of the mucoperiosteal lining of the middle ear cleft”.¹ Permanent changes like perforation, retraction, atelectasis and tympanosclerosis in tympanic membrane are common in COM.² The Chronic otitis media is one of the major cause of hearing loss in developing countries.³ Globally, nearly 65 to 330 million people are affected with Chronic otitis media and causing around 28,000 mortality yearly.⁴ The prevalence of Chronic otitis media is around 2 to 4 % in South East Asia where as in India, 6 % suffer from the same. The major risk factors for the development of COM is malnutrition, passive exposure to smoking, low socioeconomic status etc.⁵

Chronic sinusitis acts as an infective focus which can result in the development of chronic suppurative otitis media. Literature have shown that inter relationship occurs between them.⁶

To maintain the function of middle ear normally, patency and functioning of eustachian tube is highly essential. The Eustachian tube’s mucociliary transport mechanism is of utmost significance in the pathogenesis and prognosis of chronic suppurative otitis media and it also

has a significant importance in the outcome of treatment of CSOM. Pathology of nose and nasopharynx have an impact on the patency of the Eustachian tube.⁷

Out of various aetiologies, sinus pathology is the most crucial aetiology for middle ear diseases. Pathologies such as deviated nasal septum, anatomical variants in lateral nasal wall, turbinate hypertrophy and adhesions impede with ventilation, free air passage through the nasal chambers and with the movement and secretion of the mucus. These predisposes to infection.

The eustachian tube connects the nasal cavity to the middle ear morphologically and functionally, hence disorders of the nose and paranasal sinuses can lead to middle ear disease. Although otologic symptoms are minor symptoms in the diagnosis criteria of CRS, the severity of otologic symptoms associated with CRS can be severe. Despite this, there has been relatively little research into the effects of endoscopic sinus surgery (ESS) on otologic disorders so far.

Functional endoscopic sinus surgery has become a common surgical procedure in the oto rhino laryngology specialty. It is associated with a higher success rate (approximately 90%) for symptomatic improvement in patients with chronic rhino sinusitis refractory to medical management.⁸

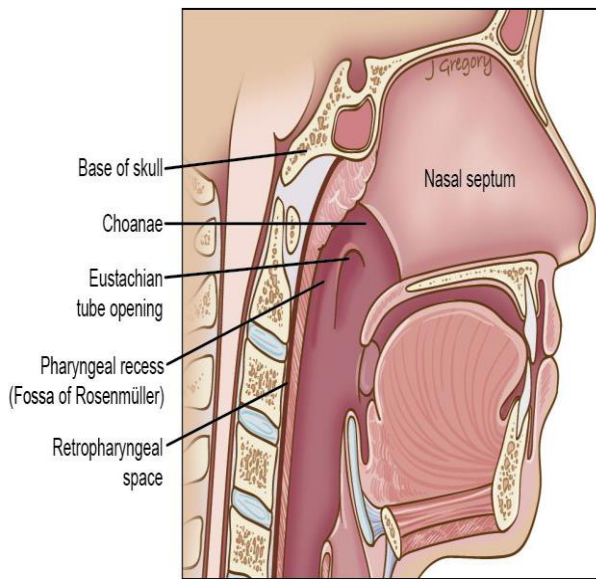
The standard treatment of chronic suppurative otitis media is conservative treatment including aural toilet, systemic and topical antibiotics and precaution for dry ear.⁹ If conservative treatment fails, then surgical management like cortical mastoidectomy with Tympanoplasty is done.¹⁰

OBJECTIVES

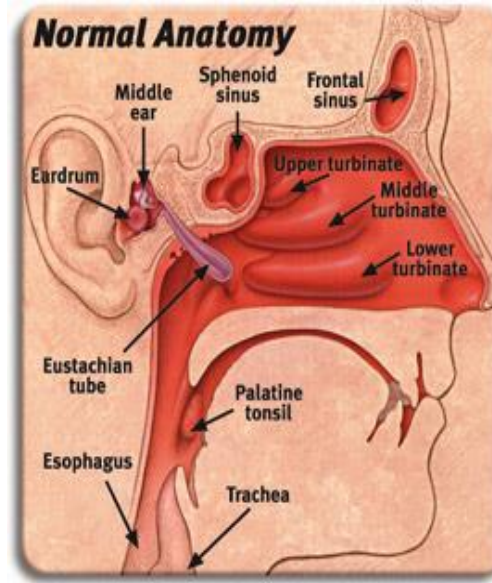
The objective of the study was to

1. To study the effect of Functional Endoscopic Sinus Surgery in patients affected with Chronic Suppurative Otitis Media with Chronic rhinosinusitis.
2. To analyse the association of nasal and paranasal sinus pathologies with Chronic suppurative otitis media.
3. To study the surgical outcome of mucosal type of Chronic Suppurative Otitis Media after Functional Endoscopic Sinus Surgery.

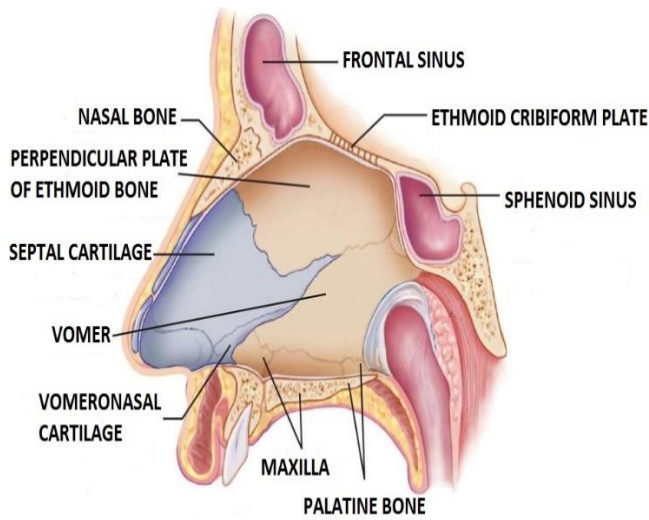
REVIEW OF LITERATURE



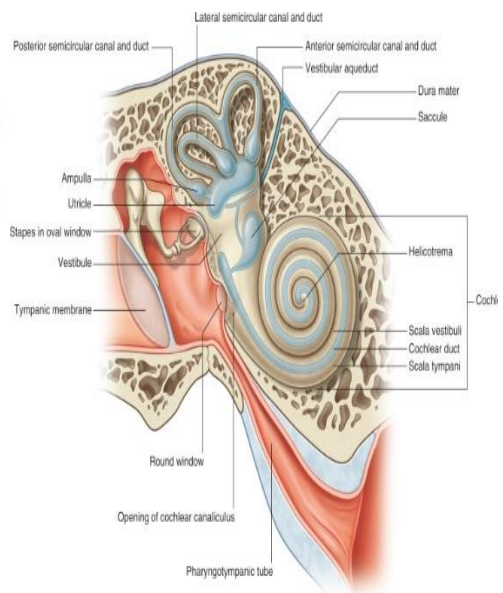
Anatomy of Nasopharynx



Anatomy of Eustachian tube



Anatomy of Nasal septum



Anatomy of Middle ear

Embryology of middle ear

The middle ear cavity is formed by out pouching and extension of first pharyngeal pouch towards the developing inner and middle ear components at 3rd week of intrauterine life ,it then develops into tubotympanic recesses .

Proximal Narrow part forms – Eustachian Tube

Distal Dilated part forms

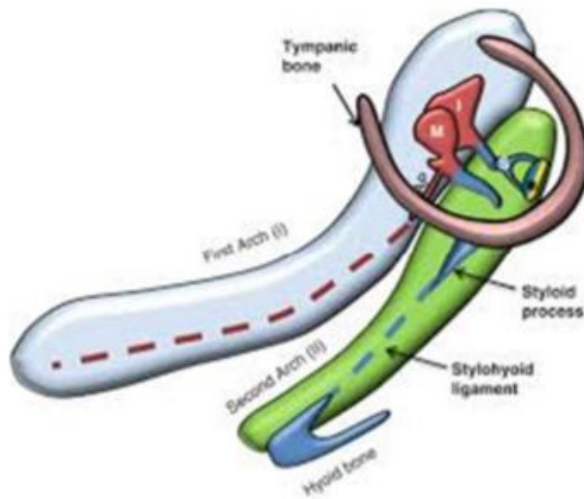
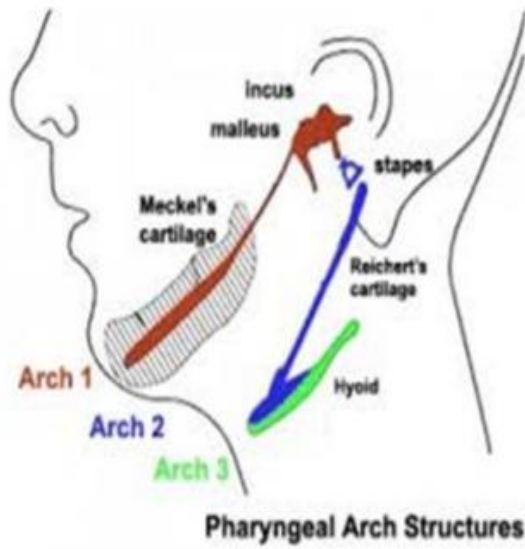
- ✓ Tympanic cavity
- ✓ Antrum
- ✓ Attic
- ✓ Mastoid Air Cells

Ossicles

1st Arch Cartilage (Meckel's cartilage) – forms Malleus and Incus

2nd Arch Cartilage (Reichert's cartilage)– forms Stapes

Otic Capsule – forms Foot Plate of Stapes



Anatomy of middle ear



Tympanic membrane

The tympanic membrane (TM) is a thin semitransparent membrane with a circular shape in the vicinity. It measures 8 mm in width, 9–10 mm in height, and 0.1 mm in thickness, placed obliquely (55°) with the floor of the external auditory canal. The TM is divided into two sections: a small upper section known as the pars flaccida (PF) and a larger lower section known as the pars tensa (PT). The tympanic membrane is made up of three layers.

1. The outer epithelial layer is continuous with the external ear's skin.
2. The middle fibrous layer: known as lamina propria, Collagen fibres are arranged in three patterns in radial, circular, and oblique. The radial fibres are introduced into the fibrous annulus from the umbo.
3. Mucosal inner layer.

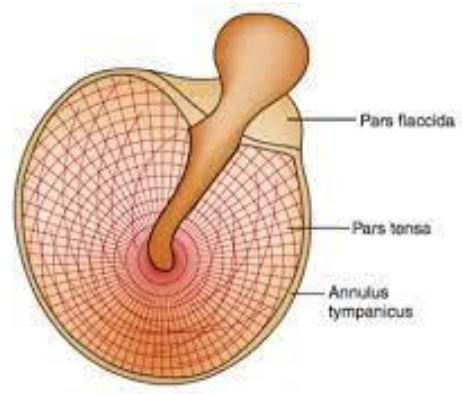
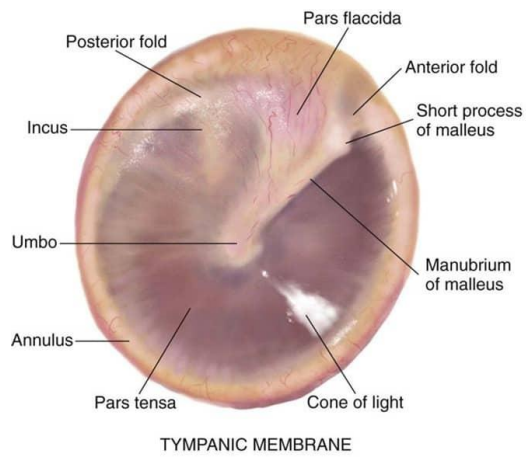


Figure 1.5 Radial, circular and parabolic fibres of pars tensa of tympanic membrane.

Divisions of middle ear cavity:

1. Epitympanum
2. Mesotympanum
3. Hypotympanum
4. retrotympanum
5. protympanum.

Walls of middle ear:

Roof	Tegman tympani separates tympanic cavity from middle cranial fossa
Floor	A narrow bony plate divides the tympanic cavity from the jugular bulb, forming the floor of the cavity. Jacobson nerve enters into tympanic cavity at the junction of floor and medial wall.
Anterior	A thin bone plate that separates the carotid artery from the middle ear. It has openings for caroticotympanic nerve, Eustachian tube, tensor tympani muscle.
Posterior	Except in the upper portion, aditus ad antrum, where it is deficient and connects the attic and the antrum, it divides the tympanic cavity from the mastoid air cells. The fossa incudis, a tiny dip beneath the aditus, houses the short process of the incus. The stapedius muscle and tendon are housed in a pyramid beneath the fossa incudis. Facial recess is lateral to the vertical segment of facial nerve. Sinus tympani is medial to the vertical segment.
Lateral	Tympanic membrane Scutum
Medial	Promontory, produced by the cochlea's basal turn, is a prominent landmark on the medial wall of the tympanic cavity. On the promontory, the tympanic plexus can be seen. The oval window is located behind and above the promontory and is closed by the footplate of the stapes. Posteroinferior to the oval window is the round window, which is separated by the sabciculum and is closed by secondary tympanic membrane. The tympanic parts of the facial nerve and the lateral semicircular canal are located in the medial wall of the tympanic cavity.

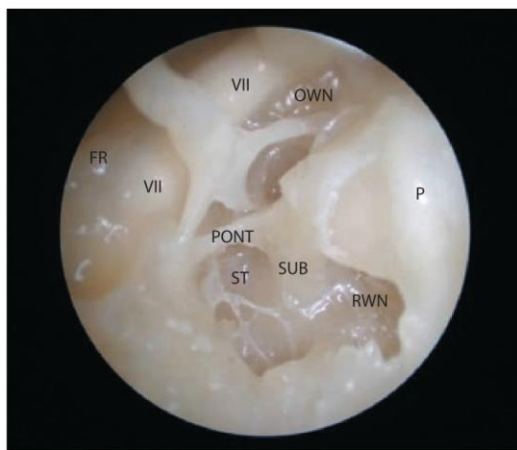
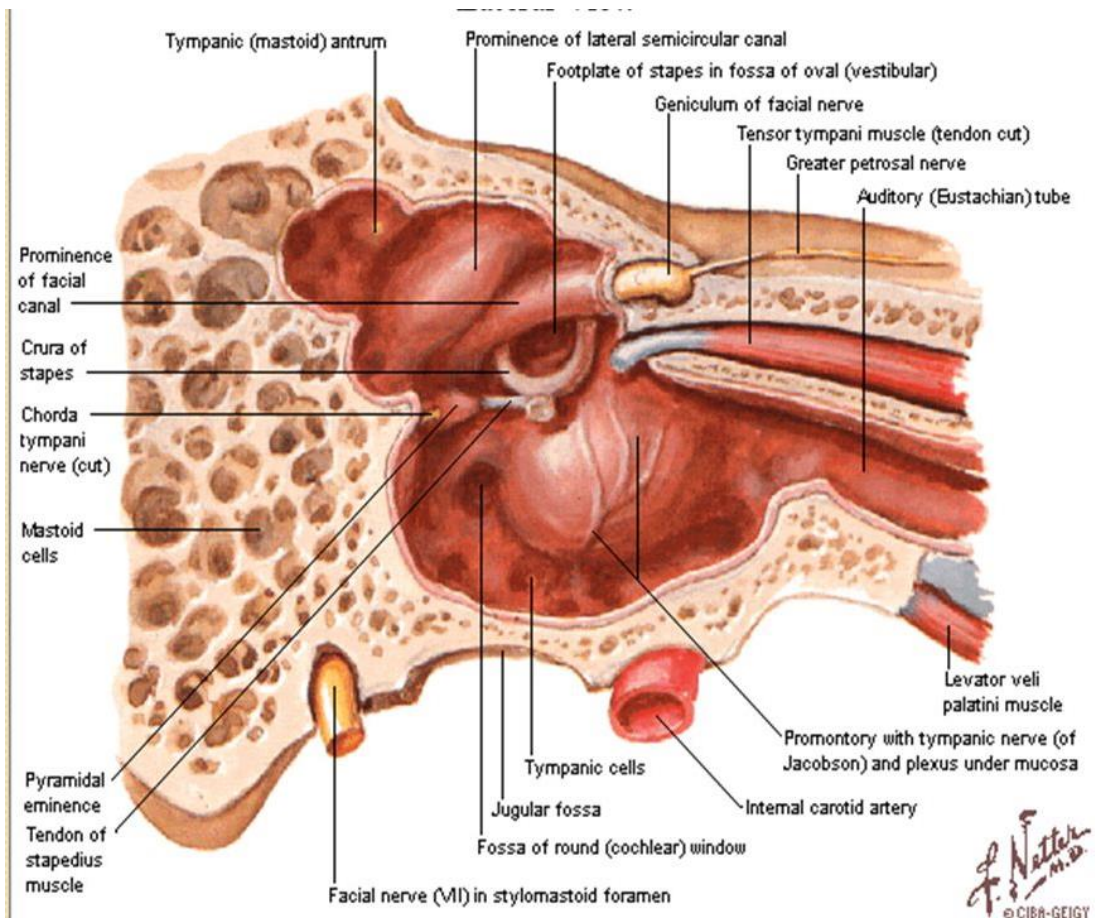
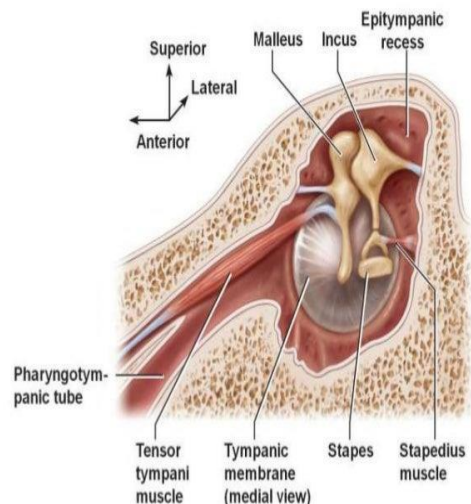


Figure 46.8 Endoscopic view of the retrotympanum showing the relationship between the oval window niche (OWN), round window niche (RWN), promontory (P), facial nerve (VII) and facial



Ear ossicles

THE MALEUS

The malleus, with a length of 9 mm, is the largest ossicle. It has a head, neck, and manubrium (handle).. A synovial junction connects the head of the malleus to the body of the incus. On the tympanic membrane, the lateral process is a noticeable feature. On its medial surface, the chorda tympani crosses the top half of the malleus handle. The anterior ligament attaches to the petrotympanic fissure and emerges from the anterior process.

THE INCUS

The incus has a body and two processes. The body lies in the epitympanum and is suspended by the superior incudal ligament that is attached to the tegmen tympani. The short process projects backwards from the body to lie in the fossa incudis to which it is attached by a short suspensory ligament. The long process descends into the meso tympanum behind and medial to the handle of the malleus, and at its tip is a small medially directed lenticular process. The lenticular process articulates with the head of the stapes.

THE STAPES

The stapes is stirrup shaped and consists of a head, neck, the anterior and posterior crura and a footplate. The head points laterally and

has a small cartilagecovered depression for a synovial articulation with the lenticular process of the incus. The stapedius tendon inserts into the posterior part of the neck and upper portion of the posterior crus. The anterior crus is thinner and less curved than the posterior one. The two crura join the footplate. Its dimensions are 3 mm long-and 1.4 mm wide, and it lies in the oval window where it is attached to the bony margins by the annular ligament.

SLNo.	BRANCH	PARENT ARTERY	REGION SUPPLIED
1.	Ant Tympanic	Maxillary	TM, Malleus, Incus, Ant Tympanic cavity
2.	Stylomastoid	Post Auricular	Post part of tympanic cavity, stapedius muscle
3.	Mastoid	Stylomastoid	Mastoid Air Cells
4.	Petrosal	Middle Meningeal	Roof of Mastoid and Roof of epitympanum
5.	Sup Tympanic	Middle Meningeal	Malleus, incus, Tensor tympani
6.	Inf Tympanic	Ascending pharyngeal	Mesotympanum

Nerve supply:

The Tympanic branch of the glossopharyngeal nerve (Jacobson's nerve) and the Caroticotympanic nerves, which come from the sympathetic

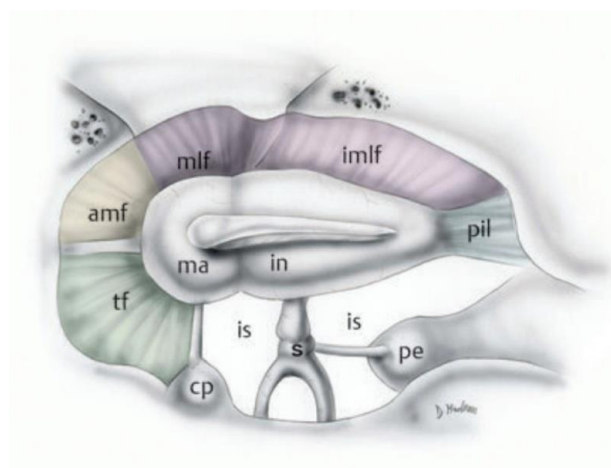
plexus around the internal carotid artery, combine to produce the tympanic plexus on the promontory, the nerves form a plexus that supplies branches to the mucous membrane lining the tympanic cavity, Eustachian tube, mastoid antrum, and air cells.

The Tympanic Diaphragm:

The mucosal folds separates the middle ear space into compartments, The tympanic diaphragm physically divides the middle ear into two compartments, the anteroinferior compartment and the posterosuperior compartment, from a ventilatory perspective.

The tympanic diaphragm is made of :

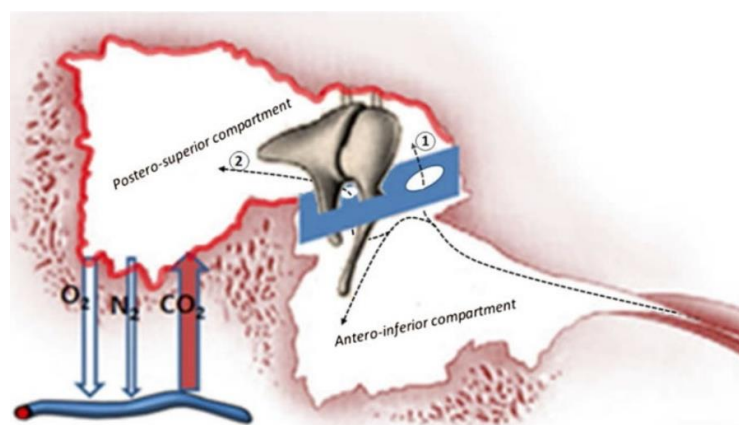
- Three malleal ligamental folds (anterior, lateral, and posterior)
- the posterior incudal fold(pif)
- the tensor tympani fold (TTF)
- the lateral incudomalleal fold. (imlf)
- Along with head of malleus and body of incus



The tympanic isthmus is a 2.5 mm continuous gap in the tympanic diaphragm's posteromedial region. The medial incudal fold divides the tympanic isthmus into two sections. The anterior and posterior isthmus tympani are the only two tiny gaps between numerous mucosal folds that allow air to enter the epitympanic space from the mesotympanum.

Middle Ear Mucosa:

The mucosa of the anteroinferior compartment of the middle ear cleft is an extension of the mucosa of the nasopharynx, but the mucosa of the posterosuperior compartment of the ME has a distinct mucosal lining. The epithelial layer is pseudostratified; there are numerous mucous and ciliated cells in anteroinferior compartment .A monocellular layer of flat epithelial cells covers the posterosuperior compartment; no ciliated or mucous cells are found. The anteroinferior compartment plays a minor role in transmucosal gas exchange and is largely responsible for mucociliary clearance, whereas the mucosa of the posterosuperior compartment is responsible for transmucosal gas exchange.



The Eustachian tube:

The Eustachian tube is a 36-mm tube that connects the middle ear to the nasopharynx. Its lateral third is bony, and its narrowest point is termed the isthmus. The tube's cartilaginous portion is around 24 mm long. The tube opens 1-1.25 cm behind and a little below the posterior end of the internal turbinate in the nasopharynx. The ET is lined with respiratory mucosa containing goblet cells and mucous glands, with ciliated epithelium on its floor.

The Mastoid air cell system:

The mastoid antrum is an air-filled sinus within the petrous part of the temporal bone. It has mastoid air cells arising from its walls communicates with the middle ear via the aditus. At birth, the antrum is fully grown. The floor of the middle cranial fossa is formed by the roof of the mastoid antrum and the mastoid air cell space, while the medial wall is connected to the posterior semicircular canal. The dura of the posterior cerebral fossa and the endolymphatic sac are located deeper and inferiorly. The sigmoid sinus, which curves downwards only to turn sharply upwards to pass medial to the facial nerve and subsequently becomes the dome of the jugular bulb, is posterior to the endolymphatic system.

Function of middle ear:

Conduction

Sound is carried from the outer to the inner ear.

Protection

1. Protects the middle and inner ear from foreign things by forming a barrier.
2. The middle ear muscles may shield you from loud noises.

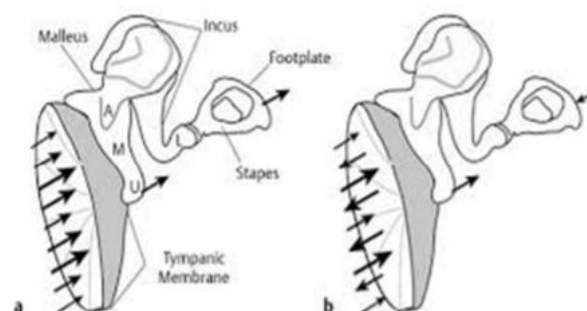
Transducer:

1. The acoustic energy is converted to mechanical energy by the transducer.
2. It transforms mechanical energy into hydraulic energy.
3. Amplifier

The middle ear's transformer action

Only about 1/1000 of the acoustic energy in air is transferred to the fluids of the inner ear (about 30 db hearing loss)

Physiology of the middle ear



Middle ear -Acoustic transformer mechanism

1. Ossicular coupling

- hydraulic lever
- ossicular lever
- catenary lever

2. Acoustic coupling

2 mechanisms:

- TM area to footplate area-17:1
- (17 X1.3==22 Db) 1.3:1 malleus to incus ratio
- The middle ear's combined transformer ratio is 22:1.
- This equates to a volume of 25 decibels.
- Transformer in a condition of sickness

Anatomy of Nasal sinuses

Paranasal sinuses

Maxillary sinus

At 7-10 weeks, the maxillary sinus appears as shallow grooves that grow into the mass of the maxilla and originate from the primordial ethmoidal infundibulum. It is a 7x 4x 4 mm pyramid-shaped hollow filled with fluid upon birth. Sinus growth is biphasic, with growth rates of roughly 2mm vertically and 3mm anteroposteriorly during 0-3 years and

7-12 years. Pneumatisation of the sinus spreads inferiorly during the second phase (7-12 years), when permanent teeth begin to grow.

The sinus may be well pneumatized, with only a thin layer of soft tissue protecting the tooth's root remaining. There may be resorption of the alveolus in old age as a result of tooth loss, resulting in a somewhat larger sinus.

Ethmoid sinus

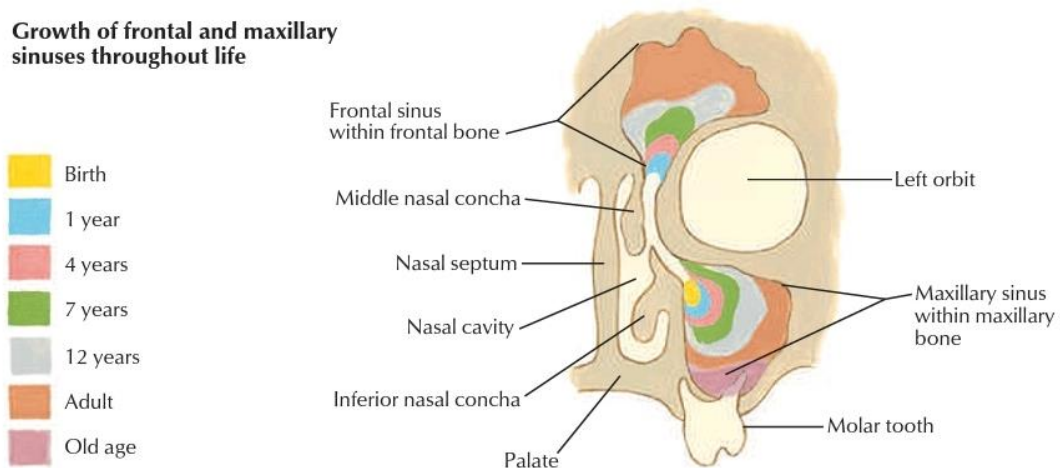
Ethmoid cells can be found in the lateral wall as early as the third month of intrauterine life. At birth, a few fluid-filled cells are present.

The anterior cells are the first to form throughout the intrauterine period, followed by posterior cells. The cells grow slowly, and by the age of 12, they have reached adult size. By the age of one, they can be observed in the radiography. The septa shrink out as the infant grows, resulting in pneumatization.

In ethmoidal cells, variations are widespread in the regions above the orbit (15%), lateral part of the sphenoids (Onodi cells 10%), affecting the upper part/roof of the maxillary sinus (Haller cells 10%), and the frontal sinus involving its floor (10%). (frontal bulla). The cells indicated above have the potential to block and disrupt normal nasal drainage. To be aware of the aforementioned common changes in the anatomy, preoperative imaging is required.

Frontal sinus

In terms of embryological development, this sinus is known as the anterior ethmoidal cell, and it is the most frequent, with varying sizes and shapes. A small frontal recess can be seen as early as the third month of pregnancy, but upward extension rarely happens until after delivery, when the membranous frontal bone begins to ossify during the second year of life. Lateral and medial expansion occurs between the ages of 4 and 7, and sinus expansion is nearly complete by the age of 12. In terms of growth, it is the final sinus to finish its development.



Development of the paranasal sinuses

Sphenoid sinus

By the third month of intrauterine life, it has developed from the recess of the sphenothmoid. The fluid-filled hollow measures 2x2x1.5mm at birth, but it grows to full size in adolescence and may

continue to grow in old life. From the age of four, the rate of pneumatization increases at a variable rate of 13 0.25mm.

Chronic otitis media:¹¹

COM is a chronic infection of the middle ear cleft which is characterized by perforation of tympanic membrane. COM is broadly classified into mucosal type and squamosal type.¹² Based on the frequency of discharge, it may be of active with pus production or inactive. The COM are of following types

Types	Finding
Healed/ Tympanosclerosis	Opacification/ Thinning of pars tensa Absence of perforation/ retraction
Inactive- Mucosal	Perforation of COM Absence of middle ear mucosal inflammation
Inactive- Squamous	Retraction of pars tensa or pars flaccida
Active- Mucosal	Defect in pars tensa Presence of inflammation of middle ear mucosa Presence of pus discharge
Active- Squamous/ Cholesteatoma	Retraction of pars tensa or pars flaccida Production of discharge.

Pathology of otitis media:¹³

Most of the histopathological changes are the result of infection/inflammation or of host response to it.

Inactive – Mucosal:

In inactive mucosal type, there occurs thickening of the fibrous tissue of the lamina propria with medial migration of squamous epithelium to the mucosal layer.

Active- Mucosal:

In active mucosal type there will be edema, fibrosis, increased vascularity and inflammatory cell infiltrates which involves interleukin-1 and 6, prostaglandins, neurotransmitters, nitric oxide and tumor necrosis factor. There can be ulceration in the mucosa and formation of granulation tissue. Thickening of the subepithelial layer occurs as a result of inflammatory edema and the lymphocyte infiltration occurs in mucoperiosteum which will then appear as polypoid.

All the above changes lead to polyp formation, resulting in resorption of the ossicles most of the time with or without tympanosclerotic patch as a result of hyaline degeneration.

Inactive- Squamous:

In inactive squamous type there occurs invagination of ear drum into the middle ear cavity known as retraction pocket. There can be epidermisation where the middle ear mucosa gets replaced by keratinizing squamous epithelium

Active- Squamous:

In active squamous type there occurs formation of cholesteatoma due to the retention of debris along with the biochemical changes which causes growth and migration of squamous epithelium and increased level of osteoclastic bone resorption. Due to inflammation, there will be edema, secretion retention, leading to infection there as the vicious cycle continues.

The common symptoms of chronic otitis media are Ear discharge, Loss of hearing, Perforation and Polyp. There are different types of perforation based on the size of perforation.

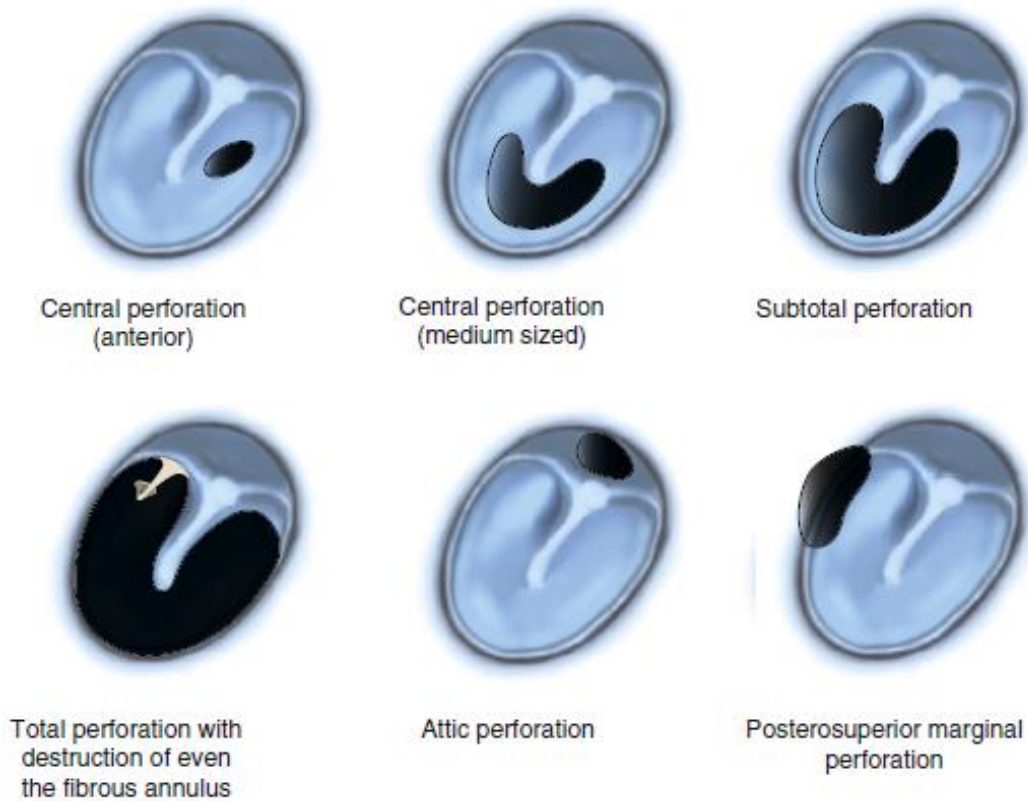


Fig: Types of Tympanic membrane perforation

Histopathology of CSOM:¹⁴

Histologically Chronic Otitis Media is defined as that the “inflammatory process that has entered the chronic phase and there occurs permanent alteration of structures of middle ear”

Tympanic membrane changes are Perforations, Retraction, Myringosclerosis, Pseudo- cystic spaces and Haemorrhage

Common histopathological changes are granulation tissue, fibrous thickening in the mucoperiosteum, osteitis, fluid, cholesteatoma and cholesterol granuloma.

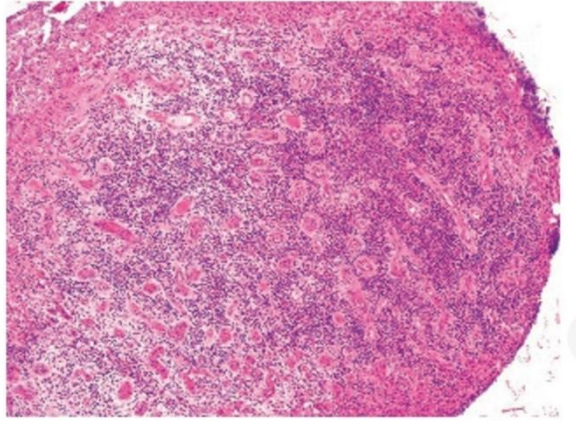


Fig: Granulation tissue with inflammatory infiltrates¹¹

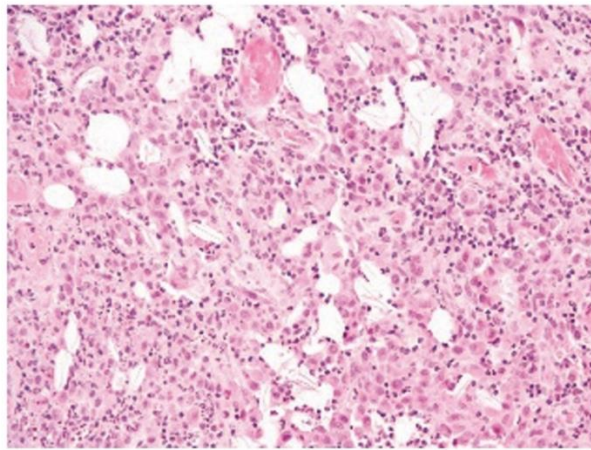


Fig: Presence of Cholesterol cells surrounding the Keratin flakes¹¹

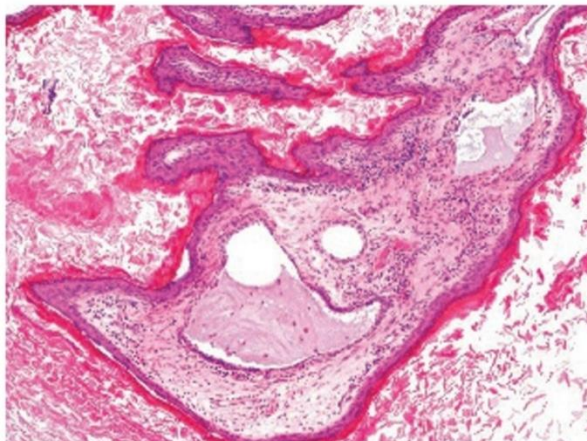


Fig: Cholesteatoma with Keratinizing squamous epithelium¹¹

Management:¹⁵**Investigation:**

The investigation to be done is Pus culture and sensitivity, Audiogram and Radiological examination like X-ray/ CT

Treatment:

Treatment can be non-surgical or surgical. The non-surgical treatment commonly done are aural toileting, topical/ synthetic antibiotics. The common surgical treatment for chronic otitis media is Myringoplasty with or without ossicular chain repair and for Resistant cases Tympanoplasty with cortical mastoidectomy is done.

Tympanoplasty:

Tympanoplasty is a surgical method which involves removal of disease from middle ear and its reconstruction with the tympanic membrane grafting.

History of tympanoplasty¹⁶:

1640	•Banzer- First attempt at TM repair using pigs bladder as graft
1853	•Toynbee- Placed a rubber disc attached to a silver wire over the TM with significant improvement
1863	•Yearsley- Placed a cotton ball on the perforation
1877	•Blake- Used paper patch
1876	•Tried chemical cautery
1878	•Berthold- Coined the word "Myringoplasty"
1956	•Description of 5 types of tympanoplasty
1960	•Heerman- First to use temporalis fascia grafting material
1967	•House Glasscock and Sheehy- Techniques for lateral grafting

Indications and contra-indications for tympanoplasty¹⁷:

S no	Indications	S no	Contraindications
1	Conductive hearing loss because of the TM perforation or ossicular dysfunction	1	Malignant tumours
2	Chronic or recurrent otitis media resulting from contamination	2	Unusual infections like malignant otitis externa.
3	Progressive hearing loss due to chronic middle ear pathology	3	Intracranial complications
		4	Cholesteatoma

Aim of tympanoplasty:¹⁸

- To establish an intact tympanic membrane
- To eradicate the middle ear disease
- To restore hearing through sound pressure transformation

Techniques:¹⁹

- Overlay
- Underlay
- Combined technique
- Swing door technique
- Butterfly and palisade technique cartilage tympanoplasty
- Cartilage shield tympanoplasty
- Button graft tympanoplasty
- Cartilage tympanoplasty with island technique
- Endoscopic and microscopic tympanoplasty

Overlay technique:

It is also called as lateral grafting. Surface epithelium around the site of perforation will be removed and a graft will be put on the fibrous layer of tympanic membrane.²⁰

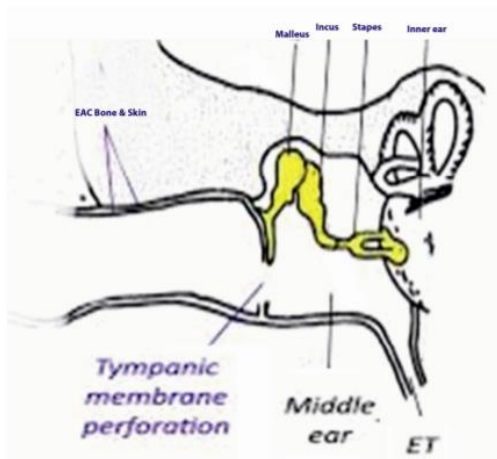


Fig: Tympanic Membrane perforation

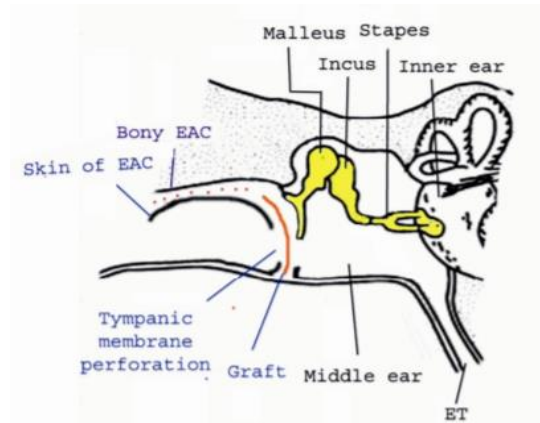


Fig: Graft insertion

Advantage and disadvantage:

The main advantage of the overlay technique was graft remains vascularised, exposure of anterior meatal recess and middle ear space is not reduced

The main disadvantages are graft lateralization, blunting of anterior meatal recess, probability of iatrogenic cholesteatoma formation leading to delayed healing and formation of epithelial pearl.

Interlay technique:

Elevating the flap with middle fibrous layer and placing the graft under it.

Underlay technique:

This is also called as medial grafting. In this method graft will be placed medial to all three layers of TM, either lateral or medial to handle of malleus.

Advantages and Disadvantages:

The main advantages are less lateralization/ blunting and increased graft uptake.

Tympanic Membrane grafts:

The TM grafts gets lined with squamous epithelium on the side of the ear canal and tympanic cavity side of the middle ear mucosa.²¹

Grafting materials:

The various grafting materials that can be used include²²

- Temporalis fascia graft
- Cartilage graft
- Fat graft
- Hyaluronic acid fat graft
- Tragal perichondrium/ cartilage
- Vein graft
- Conchal cartilage
- Fascia lata
- Subcutaneous tissue
- Periosteum

Approach

Endaural approach:

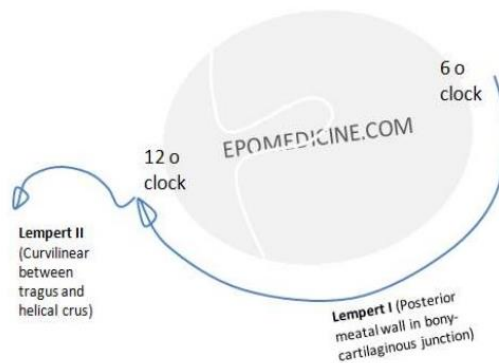


Figure: Endaural approach²³

This approach is done for small and medium sized perforation and if the anterior meatal wall conceals the anterior edge of perforation.

Post auricular approach: (Wilde's incision)

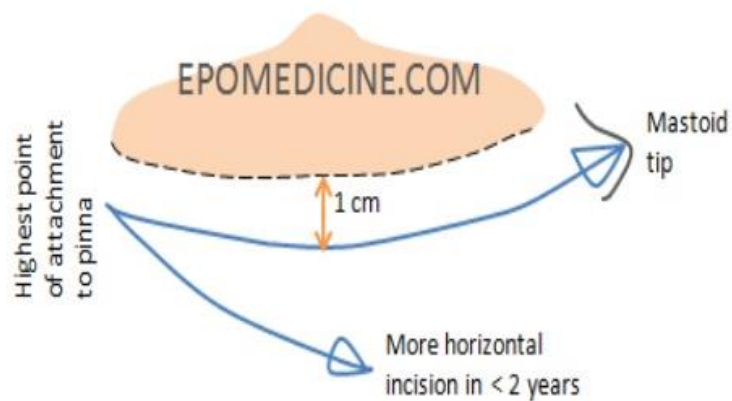
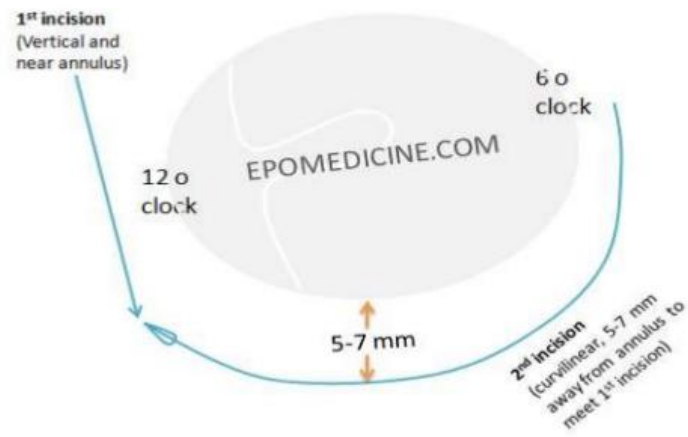


Fig: Post auricular approach²³

This will be done in case of large perforation which extends to the anterior edge of the tympanic membrane.

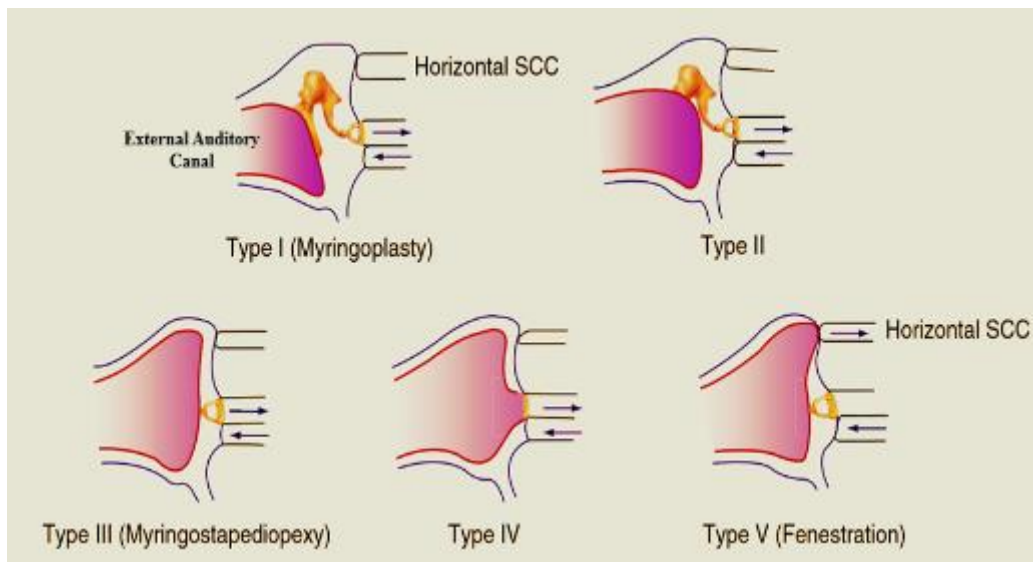
Transcanal approach: (Rosen's incision)



Figs: Transcanal approach²³

This approach will be used if there is small perforation in the posterior quadrant.

Classification of Tympanoplasty²⁴



Wullstein and Zollner Classifications²⁵

Type I	TM is grafted to intact ossicular chain
Type II	Malleus is eroded partially TM is grafted to long process of incus and remaining malleus
Type III	Myringostapediopexy Incus and Malleus are eroded TM is grafted to the stapes
Type IV	Stapes suprastructure is eroded TM is grafted to mobile footplate
Type V	TM is grafted to fenestration in lateral semicircular canal in patients with no ossicles and fixed foot plate

Mirko Tos classification:²⁶

1. Intact chain
2. Short columella
3. Long columella
4. Sound protection
5. a. LSC Fenestration
b. Platinectomy

Belluci classification²⁷:

- Group I- Dry ear
- Group II- Occasional discharge
- Group III- Persistent drainage with mastoiditis
- Group IV- Persistent drainage and nasopharyngeal malformation

Austin Kartush Classification:²⁸

Type A: (M+ I + S+) - Ossicular chain intact

Type B: (M+/S+) OR (M+ /S-)- Good prognosis

Type C: (M- /S +) OR (M- / S+) - Poor prognosis

Type D: (M-/S-) Poor prognosis

Chronic Sinusitis:

Chronic sinusitis is the chronic inflammation of the mucoperiosteal lining of the paranasal sinuses.

According to [EPOS] The European position paper on rhinosinusitis and nasal polyposis, Diagnosis of rhinosinusitis is made on clinical grounds which involves specific characteristic symptoms along with objective evidence of mucosal inflammation.

EPOS – Rhinosinusitis definition	
Characteristic primary symptoms:	Nasal block/obstruction/congestion Nasal discharge
Characteristic additional symptoms:	Facial pain/pressure Olfactory dysfunction
Objective evidence- Endosocpy:	Mucopurulent discharge in MM* Edema/mucosal obstruction in MM* Polps
Objective evidence- CT-PNS:	Mucosal changes within sinuses and/or OMC*

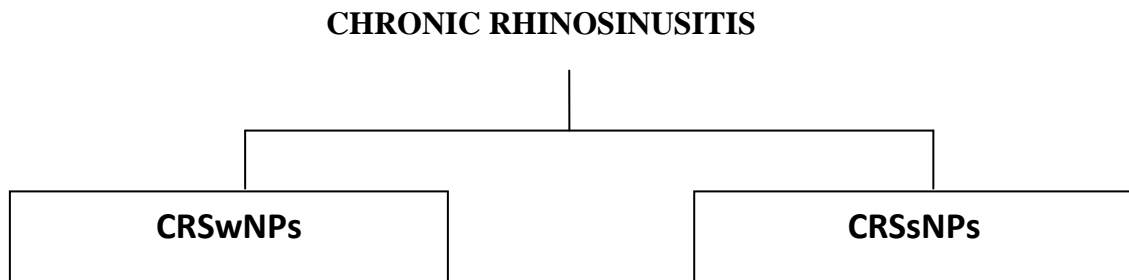
Two primary symptoms/ one primary with one additional symptoms combined with objective evidence are required to diagnose Rhinosinusitis.

Based on duration rhinosinusitis is further divided into two:

Acute rhinosinusitis(ARS)	Chronic rhinosinusitis(CRS)
Less than 12 weeks	More than 12 weeks

Chronic rhinosinusitis(CRS) further classified into two groups

- Chronic rhinosinusitis with polyps (CRSwNPs)
- Chronic rhinosinusitis without polyps (CRSsNPs)



AAOHNSF- The American Academy of Otorhinolaryngologist/ Head and Neck surgeons Rhinosinusitis task force committee –Diagnostic criteria

MAJOR CRITERIA	MINOR CRITERIA
<ul style="list-style-type: none"> • Facial pain or pressure • Facial congestion or fullness • Nasal discharge • Nasal obstruction or blockage • Post nasal drip • Hyposmia or anosmia • Fever(acute) • Purulence on nasal examination 	<ul style="list-style-type: none"> • Headache • Fever(non acute) • Fatigue • Halitosis • Dental pain • Cough • Ear ache or pressure

Two major/one major and two minor criteria are required to diagnose sinusitis

EPOS definition has been backed by the Recent international guidelines , and it is the most widely accepted definition around the world.

Pathophysiology of sinusitis:^{29,30,31}

The normal physiology of the sinus is maintained by

- Normal secretion of the sinus
- Patent sinus ostia
- Normal functioning of cilia
- When there occurs malfunctioning of the above components, it will predispose to sinusitis.

Alteration in mucus quality and quantity:³²

When there occur changes in mucus quantity and quality, there will be impaired clearance activity by the cilia, predisposing to infection.

Causes of qualitative changes of the mucus:

- Cystic fibrosis
- Infection
- Asthma
- Dehydration etc

Causes of quantitative changes of the mucus:

- Goblet cell metaplasia
- Exposure to
 - Pollutants
 - Allergens
 - Irritants etc

Alteration of ciliary motility:

Alteration in the ciliary motility can cause fluid to accumulate and thereby infection.

Causes of decrease in beating frequency:

- Cold air
- Cytotoxins produced by the organisms
- Synechia
- Scarring
- Loss of metachronous coordination

Causes of ciliated cell loss:

- Infection causing cell death
- Irritants
- Pollutants
- Nasal air flow increase
- Inflammatory mediator exposure

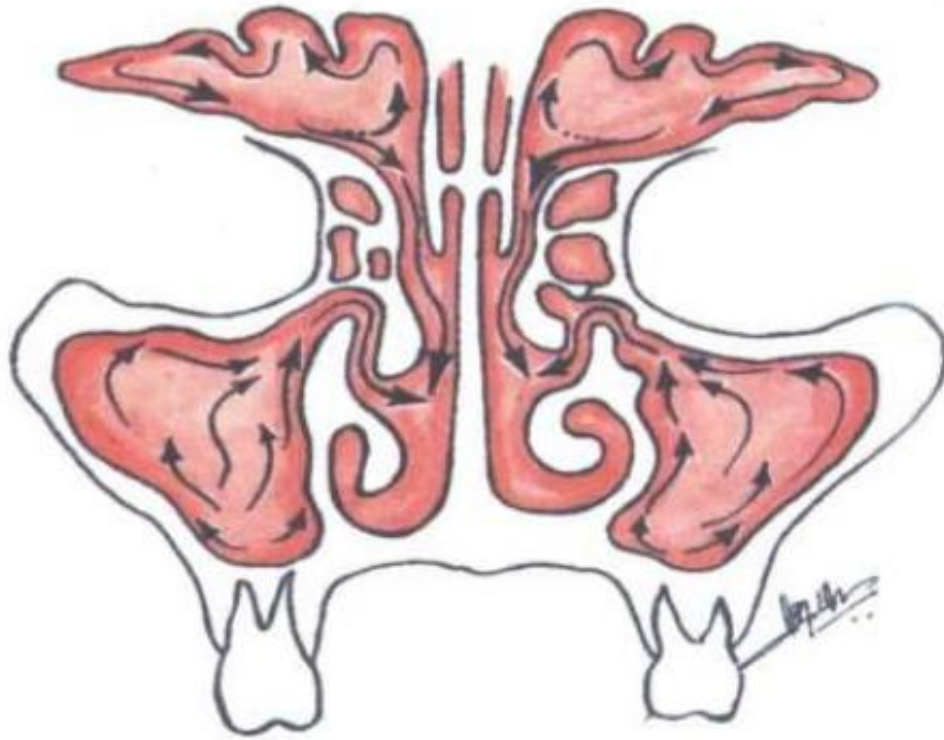


Fig: Normal pathway of secretion

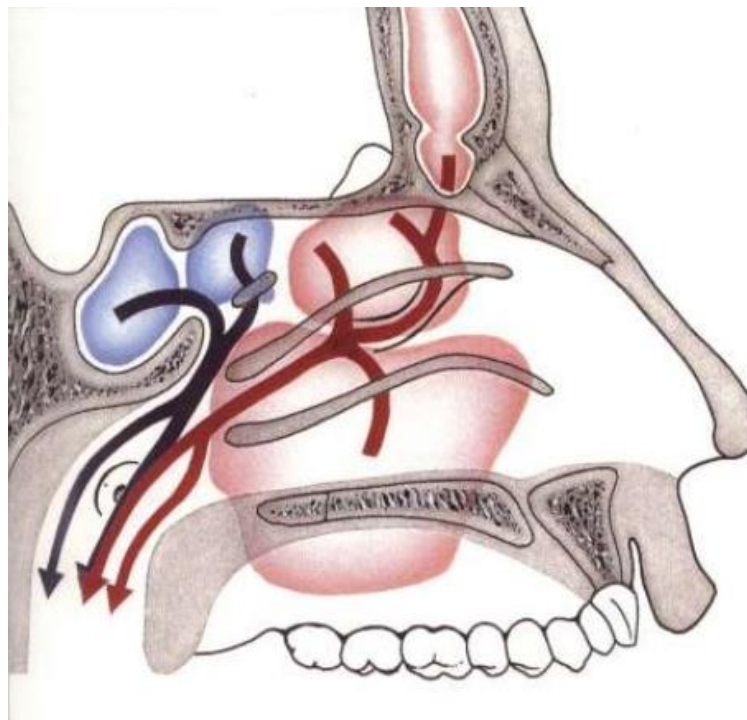


Fig: Pathway of secretion

Pathogenesis of chronic rhino sinusitis:

Initial insult leads to nasal mucosal swelling



Mucosal epithelium undergoes inflammatory changes also mechanical and epithelial changes, epithelial damage and activation of humoral and cellular immunity.



Insufficiently treated cases leads to bacterial super infection leading to epithelial disruption leading to decrease in ciliated cells and increase in secretory goblet cells



Increased mucus secretion which gets trapped in the sinuses due to nasal mucosal swelling which has narrowed the ostium of sinuses leading to impaired drainage.



Stagnation of mucus and reduced aeration favours more microbiological growth
Increase in intra-sinus pressure followed quickly by negative pressure due to lack of ventilation



Vicious cycle of further congestion and mucus trapping is set up



Impaired gas exchange and pH balance



Prevents clearance of inflammatory products and debris from the sinuses



Collected secretions and mucus serves as a suitable culture medium for further bacterial proliferation and favours nasal polyp formation



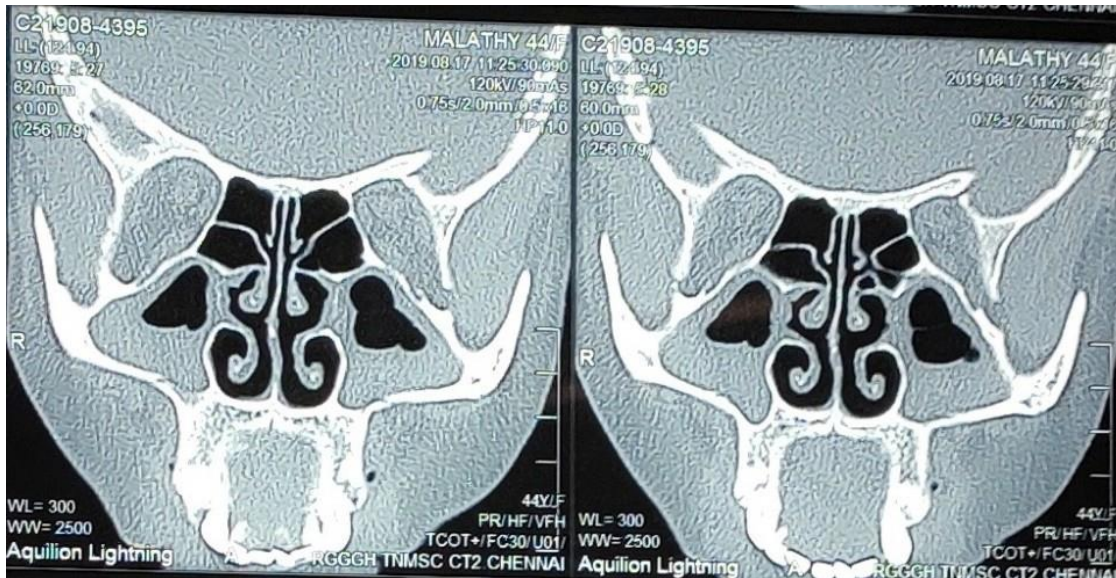
Vicious cycle continues

SNOTT 22 SCORE: obtained from the patients to know the severity of the symptoms

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SNOT 22 Sino-nasal Outcome Test (22 Questions)

fort worth ent EAR NOSE THROAT & SINUS		No problem	Very mild problem	Mild or slight problem	Moderate problem	Severe problem	Problem as bad as it can be	Most important 5 items
1. Need to blow nose	0	1	2	3 ✓	4	5	✓	
2. Sneezing	0	1	2 ✓	3	4	5		
3. Runny nose	0	1	2	3 ✓	4	5		
4. Cough	0	1	2 ✓	3	4	5		
5. Post nasal discharge (dripping at the back of your nose)	0	1	2	3 ✓	4	5	✓	
6. Thick nasal discharge	0	1	2	3	4 ✓	5	✓	
7. Ear fullness	0 ✓	1	2	3	4	5		
8. Dizziness	0 ✓	1	2	3	4	5		
9. Ear pain/pressure	0	1	2	3 ✓	4	5		
10. Facial pain/pressure	0	1	2 ✓	3	4	5		
11. Difficulty falling asleep	0	1	2 ✓	3	4	5		
12. Waking up at night	0	1	2 ✓	3	4	5		
13. Lack of a good night's sleep	0	1	2	3 ✓	4	5	✓	
14. Waking up tired	0	1	2 ✓	3	4	5		
15. Fatigue during the day	0	1	2 ✓	3	4	5		
16. Reduced productivity	0	1 ✓	2	3	4	5		
17. Reduced concentration	0	1 ✓	2	3	4	5		
18. Frustrated/restless/irritable	0 ✓	1	2	3	4	5		
19. Sad	0	1	2 ✓	3	4	5		
20. Embarrassed	0	1	2 ✓	3	4	5		
21. Sense of taste/smell	0	1 ✓	2	3	4	5		
22. Blockage/congestion of nose	0	1	2	3	4 ✓	5	✓	
TOTAL SNOT 22 SCORE	0	3	18	15	8	0	44	



Functional Endoscopic Sinus Surgery:

This is a minimally invasive procedure through which the sinus air cells and sinus ostia are opened by direct visualization. The main aim of this procedure is to restore the normal function and the ventilation of the sinuses.^{33,34} This involves the removing the tissue obstructing the Osteo Meatal Complex (OMC) which in turn facilitates the drainage.

Aim of FESS:³⁵

- Preservation of external and internal configuration of the nose
- Removal of infection source
- Polyp removal along with its roots
- Maintaining the patency of the sinus ostia
- Preservation of the sinus mucosa

Indications of Primary Sinonasal Surgery³⁶

- Chronic Rhinosinusitis
- Acute recurrent Rhinosinusitis
- Nasal Polyposis
- Mucoceles
- Allergic Fungal Sinusitis

Ophthalmic Indications of FESS³⁷

Apart from paranasal sinus disorders, FESS has been used for varied ophthalmic conditions

- Orbital decompression of thyroid orbitopathy
- Lacrimal obstruction
- Optic nerve decompression
- Traumatic loss of vision

Limitations of FESS:

- Acute severe ethmoid and frontal sinusitis
- Nasal and sinus malignancies

Complications:³⁸

Minor complications of FESS:

- Orbital emphysema
- Orbital ecchymosis
- Epiphora
- Disturbance in olfaction
- Dental pain
- Numbness

Major complications of FESS:

- Orbital hematoma
- Optic Nerve Injury
- CSF Fistula
- Brain laceration
- Haemorrhage
 - Ethmoid arteries
 - Internal carotid artery
 - Cavernous sinus fistula
 - Sphenopalatine artery

Intra-operative Complications of FESS:

- Bleeding
- CSF leak
- Fat herniation
- Retro -Orbital Haemorrhage
- Medial rectus damage
- Optic nerve damage

Post- Operative complications of FESS:

- Bleeding
- Nausea/ vomiting
- Adhesion
- Epiphora
- Anosmia
- Frontal recess stenosis
- Infection
- Osteitis
- Neuropathic pain
- Sore throat

Etiopathogenesis of sinus pathology causing ear disease:

The nose, paranasal sinus and eustachian tube are lined by respiratory epithelium which is a pseudo stratified ciliated columnar epithelium interspersed with goblet cells. The cilia are around 6µm in length with diameter of 0.25 µm. They are usually 100 to 200 per cell.

Cilium is seen as two central microtubules bordered by a ring in cross section. They have 9 doublet microtubules projecting from a side of which are outer and inner arms comprised of ATPase protein. This ATPase protein is in charge for the production of energy needed for the beating of cilium. On every non- ciliated and ciliated cell, lies 200 to 400 microvilli. Towards nasopharynx, the number of microvilli increases.³⁹

The mucus is secreted from goblet cells lying above the basement membrane. The density of goblet cells is high in the nasopharynx, surrounding the eustachian tube orifice, inferior turbinate and it is reduced on the nasal septum.

In lateral nasal wall, 2 transport route of mucociliary are identified⁴⁰. First route merges secretion from the frontal and maxillary sinuses and anterior ethmoidal complex, drains down the free end margin of uncinat process and alongside the medial surface of the inferior turbinate towards the nasopharynx. Here, the secretions pass anteriorly and inferiorly onto eustachian tube orifice.

Second route is secretions from the sphenoid and posterior ethmoid cells join at sphenoethmoidal recess and are transferred towards the nasopharynx superior and posterior to the orifice of Eustachian tube. In case of diseases of paranasal sinuses as in sinusitis, the quantity and morphology of the secretion gets altered. In chronic sinusitis, highly viscous/ purulent secretions drain around the eustachian tube orifice. After effects of this on the eustachian tube's function might be severe. Because of its mucociliary clearance, a formerly normal eustachian tube can have resistance to abnormal secretion. Because of the duration and virulence to such disorders, orifice become obstructed and congested owing to the lymphoreticular tissue inflammation with reducing down the mucociliary clearance. This in turn leads to impeded ventilation resulting in changes in the middle ear cleft.⁴⁰

Past literature:

F.Salvinelli, et al.(2004) conducted a study to assess nasal surgery and eustachian tube function: effects on middle ear ventilation, investigated 40 patients who underwent nasal surgery. The majority (95%) of the patients reported a postoperative improvement of ear fullness sensation compared with preoperative.

Teo NW, et al.(2016) performed a study to assess the Impact of endoscopic sinus surgery on otologic symptoms associated with chronic rhino sinusitis, conducted among 343 patients, CRS patients experienced

ear fullness (82%) ,dizziness (58%) and ear pain (57%), ESS is effective in alleviating these symptoms, with the greatest benefit being seen in patients with ear fullness.(40)

Dhanasekaran SV et al (2016),⁴¹ performed a cross sectional study among 100 patients with chronic sinusitis otitis media with the aim to assess the influence of sinusitis in CSOM. The results showed that 40% of the study participants had deviated nasal septum. 54% of them had mucopurulent discharge. CT PNS showed that 48.5% had grade I. 54.2% study participants had large central perforation.

Mohankumar V and Veerasigamani N (2017),⁴² did a study with objective to assess the effect of FESS in middle ear mucosa. The results showed that majority of the study participants belonged to the age group of 21 to 30 years. CT PNS showed 52%, 24%, and 14% had grade 1, 2 and 3 respectively. 66% of the study participants had deviated septum. 24% and 44% of the study participants had small and large central perforation. Among the 32 patients with moist mucosa, 24 had improved mucosal status and 8 had no improvement in mucosal status. Among the 18 patients with boggy mucosa, 12 had improved mucosal status with surgery alone and 3 had improved mucosal status with antibiotic and suction cleaning.

Sachithanandam S et al (2018),⁴³ conducted a study among 80 patients with the objective to assess the impact of FESS on the active

mucosal type of Chronic suppurative otitis media. The results showed that majority of the study participants were males and majority belonging to 35 to 44 years age group. Out of the 104 ears with perforations, 25, 32 and 47 had small, medium and large type of perforation. CT PNS showed majority of the study participants had 2+ scores. DNE showed 76.25%, 71.25%, 60% and 53.25% had enlarged bulla, deviated septum, medialised uncinate and enlarged middle turbinate respectively. During the follow up period of 6 weeks, there was no reduction in perforation size. At 3 months, 56%, 81.2% of small and medium perforation respectively had significant reduction. 44% of small perforation was completely closed.

The objective of the study was to

1. To study the effect of Functional Endoscopic Sinus Surgery in patients affected with Chronic Suppurative Otitis Media with Chronic rhinosinusitis
2. To analyse the association of nasal and paranasal sinus pathologies with Chronic suppurative otitis media
3. To study the surgical outcome of mucosal type of Chronic Suppurative Otitis Media after Functional Endoscopic Sinus Surgery.

MATERIAL AND METHODS

Study design: This study was a prospective study

Study setting: This study was conducted in Upgraded Institute of Otorhinolaryngology, Chennai.

Study duration: The study will for 13 months from June 2020 to September 2021 after the approval of hospital ethical committee.

Study population:

Totally 40 patients were included in the study. Sampling was obtained through convenient sampling.

Inclusion criteria:

- Age >10 to <60 years
- Both gender
- Patient who were willing to participate, able to understand and able to give informed consent
- Patients with history of
 - Chronic Suppurative Otitis Media- Tubotympanic type
 - Chronic Suppurative Otitis Media with chronic rhinosinusitis

- Chronic otitis media with retraction pocket in otoscopic examination.

Exclusion criteria:

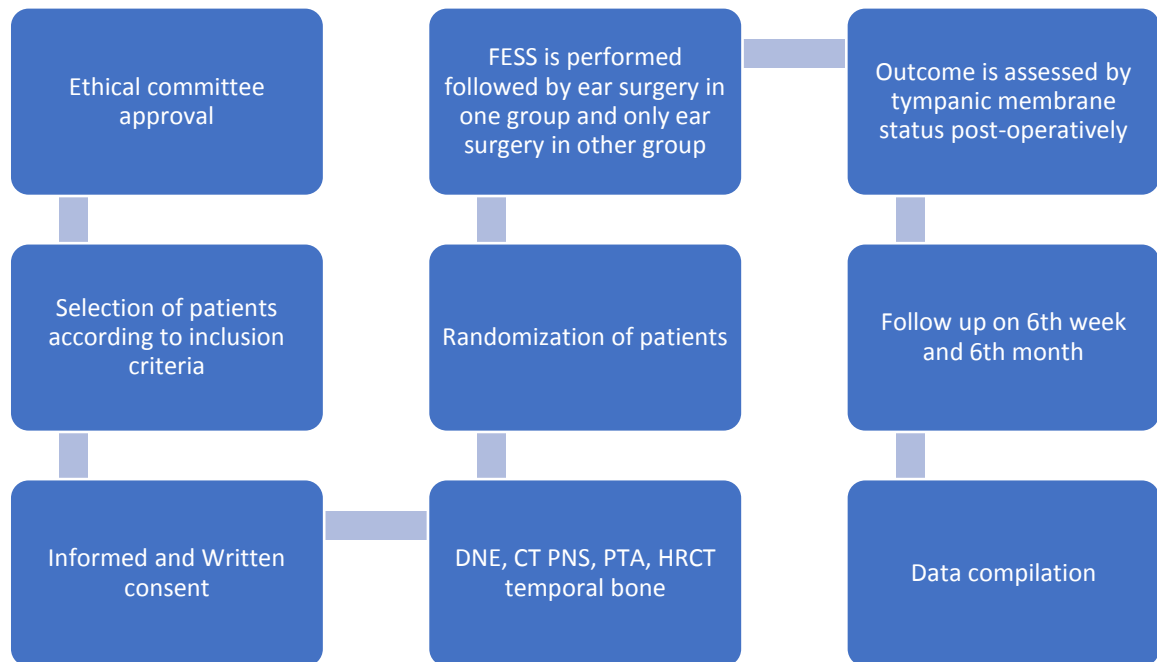
- Age <10 and >60 years
- Pregnant females, uncooperative patients
- Patients with acute infection of nose and paranasal sinuses
- Patients with CSOM with cholesteatoma in otoscopic examination
- Patients with adenoid hypertrophy or other nasopharyngeal masses
- Patients with sensory neural hearing loss
- Patients with associated head and neck malignancies

Investigation

- Complete history taking and clinical examination
- Diagnostic nasal endoscopy
- Blood investigation- CBC, blood urea and serum creatinine, random blood sugar, serum electrolytes, bleeding time and viral markers
- CT-PNS
- HRCT- Temporal bone
- Pure tone Audiometry

Procedures:

Among the patients attending the OPD, patients with CSOM with chronic rhinosinusitis, fulfilling the criteria was selected randomly.



In our study temporalis facia graft was used in all the patients and the underlay technique is done in both the groups

Data collection:

The study was started after obtaining Institutional ethical approval. The purpose and procedure of the study was explained to the enrolled participants in their local language. Patient information sheet and informed written consent was obtained from the participants before initiating the study.

Ethical consideration:

Institutional Ethical Committee approval was obtained before starting the study. The participants were explained that the data collected in this study will be used only for research purposes. The participants were explained about the freedom of withdrawal from the study at any time without penalty or loss of benefits. The confidentiality of the data collected from the enrolled participants was maintained in all the phases of the study. The study participants who required medical attention during the period of intervention will be given appropriate medical care.

Statistical analysis:

The collected data was checked for completeness before entering into the Microsoft excel spread sheet. The validation of the data was checked at regular intervals. Data analysis was performed with an intention to treat approach using Statistical Package for Social Sciences (SPSS IBM) 21. The quantitative data was expressed in proportions. Mann Whitney U test and the chi square test was applied to compare the groups and p value less than 0.05 was considered significant.

RESULTS

Table 1: Age distribution among the study participants

S No	Variable	Tympanoplasty		FESS + Tympanoplasty		P value
		Mean	SD	Mean	SD	
1	Age	28.9	10.82	30.9	7.44	0.284

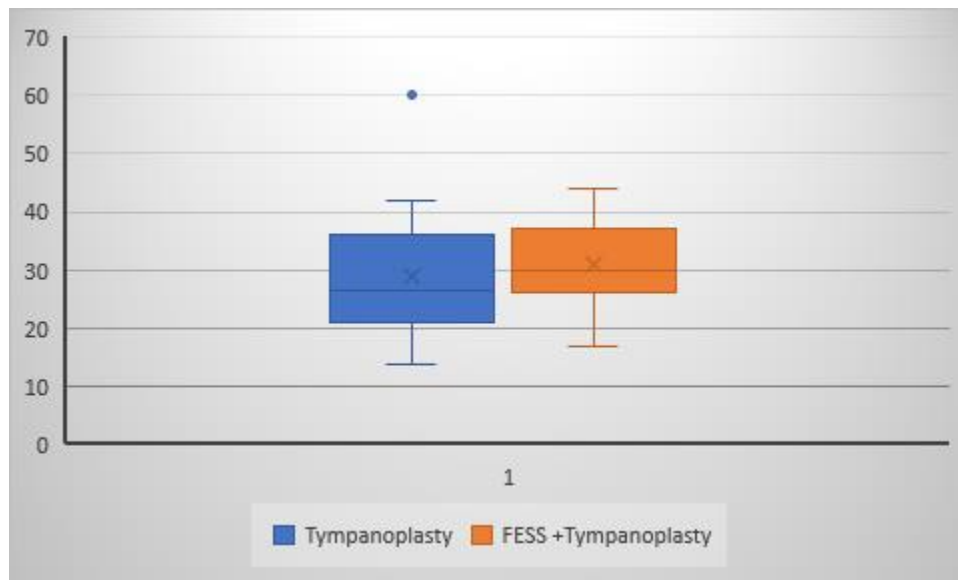


Fig 1: Age distribution among the study participants

Majority of the study participants among both the groups were females

Table 2: Gender distribution among the study participants

S No	Gender	Tympanoplasty		FESS + Tympanoplasty		P value
		Frequency	Percentage	Frequency	Percentage	
1	Female	16	80	13	65	0.303
2	Male	4	20	7	35	

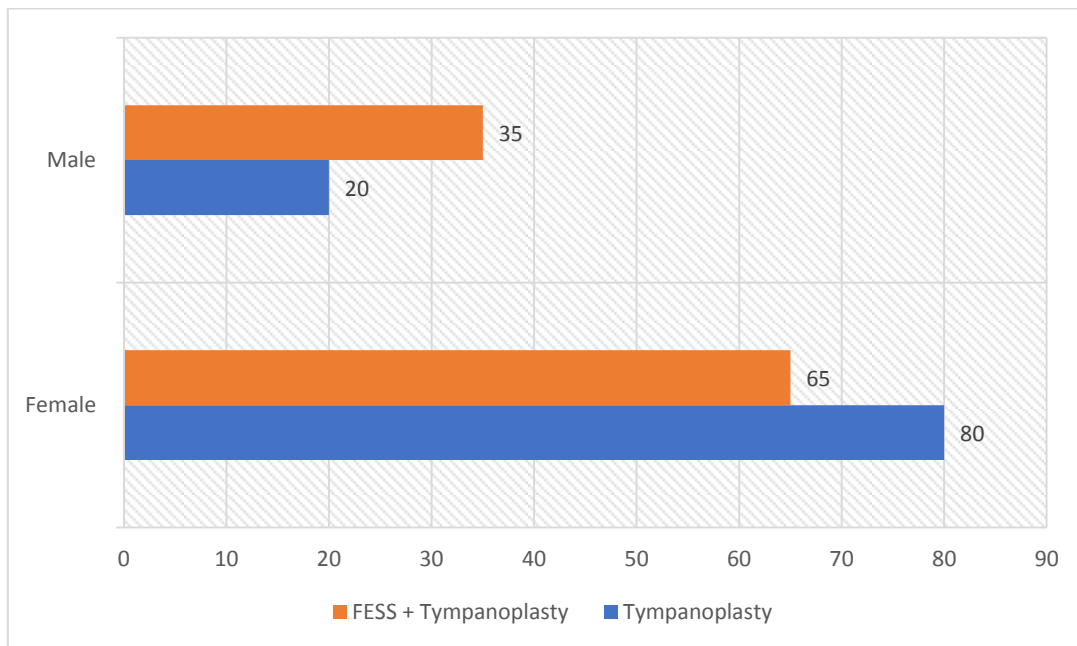


Fig 2: Gender distribution among the study participants

Table 3: Duration of ear discharge among the study participants

S No	Duration	Tympanoplasty		FESS + Tympanoplasty		P value
		Frequency	Percentage	Frequency	Percentage	
1	< 6 month	4	20	1	5	0.044
2	6 m- 1 year	3	15	0	0	
3	1 – 5 year	10	50	18	90	
4	>5 year	3	15	1	5	

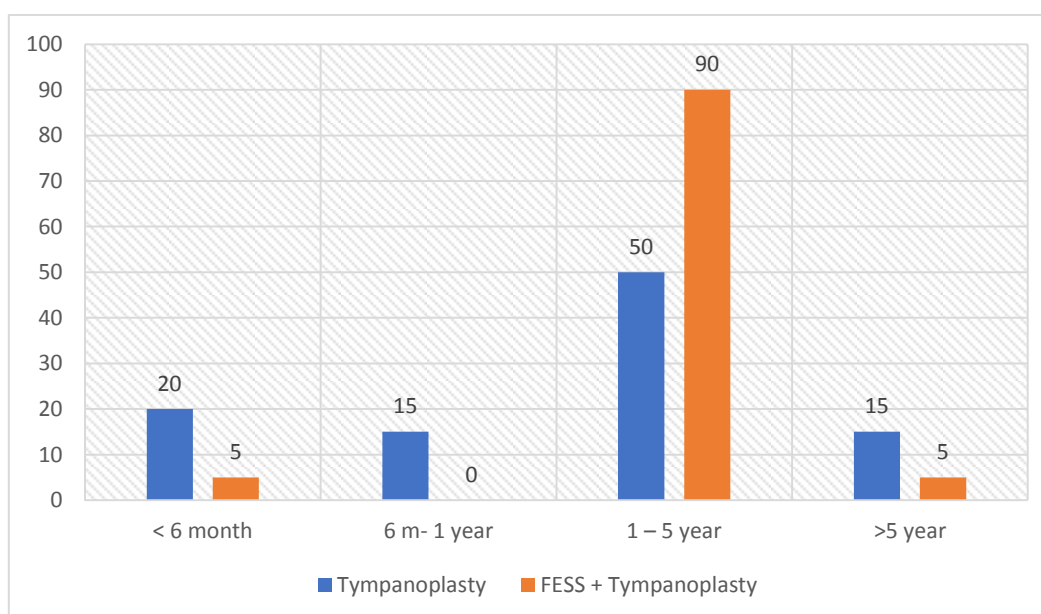


Fig 3: Duration of ear discharge among the study participants

All the study participants in both the group had congested middle ear mucosa

Table 4: Central perforation among the study participants

S No	Central Perforation	Tympanoplasty		FESS + Tympanoplasty		P value
		Frequency	Percentage	Frequency	Percentage	
1	Large	2	10	2	10	1.00
2	Medium	16	80	16	80	
3	Small	2	10	2	10	

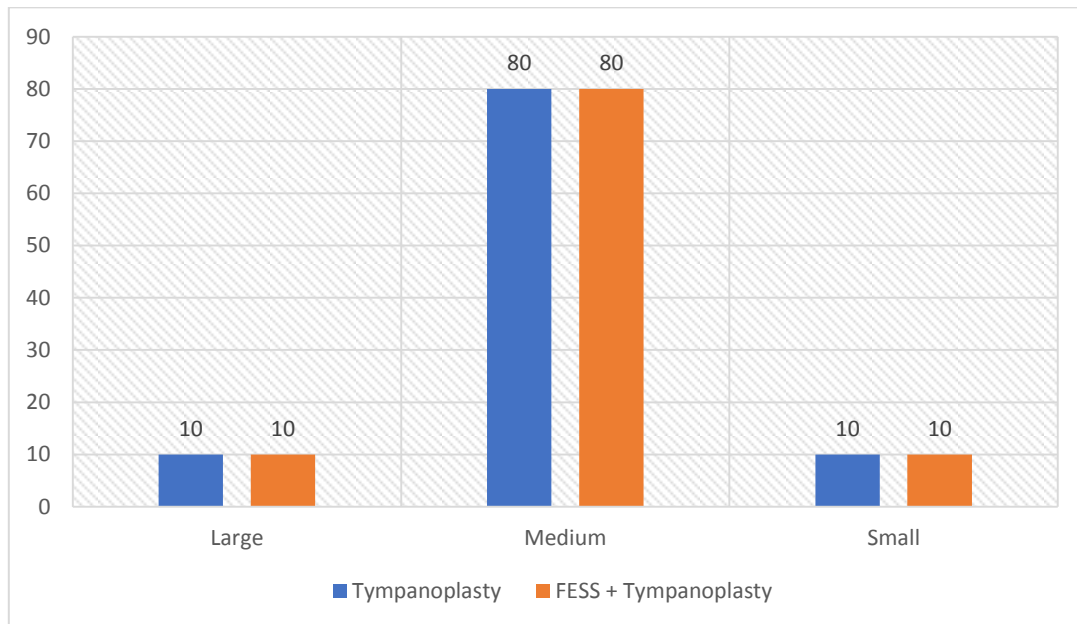


Fig 4: Central perforation among the study participants

Table 5: MERI score among the study participants

S No	MERI score	Tympanoplasty		FESS + Tympanoplasty		P value
		Frequency	Percentage	Frequency	Percentage	
1	2	16	80	13	65	0.303
2	3	4	20	7	35	

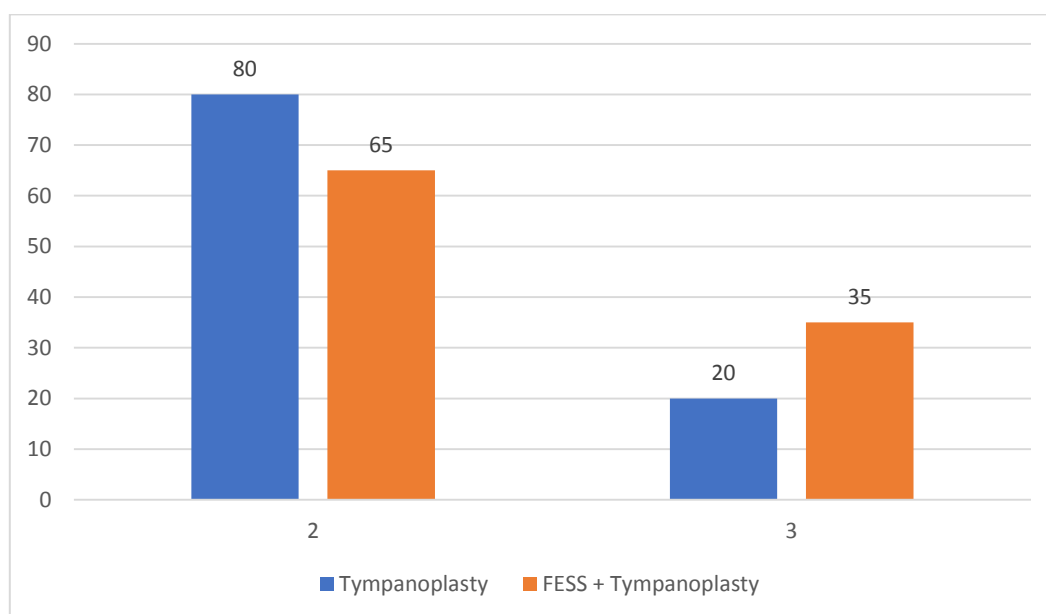


Fig 5: MERI score among the study participants

Table 6: Nasal symptoms among the study participants

S No	Nasal Symptoms	Tympanoplasty		FESS + Tympanoplasty		P value
		Frequency	Percentage	Frequency	Percentage	
1	Nasal block	5	25	20	100	<0.001
2	Nasal discharge	15	75	0	0	

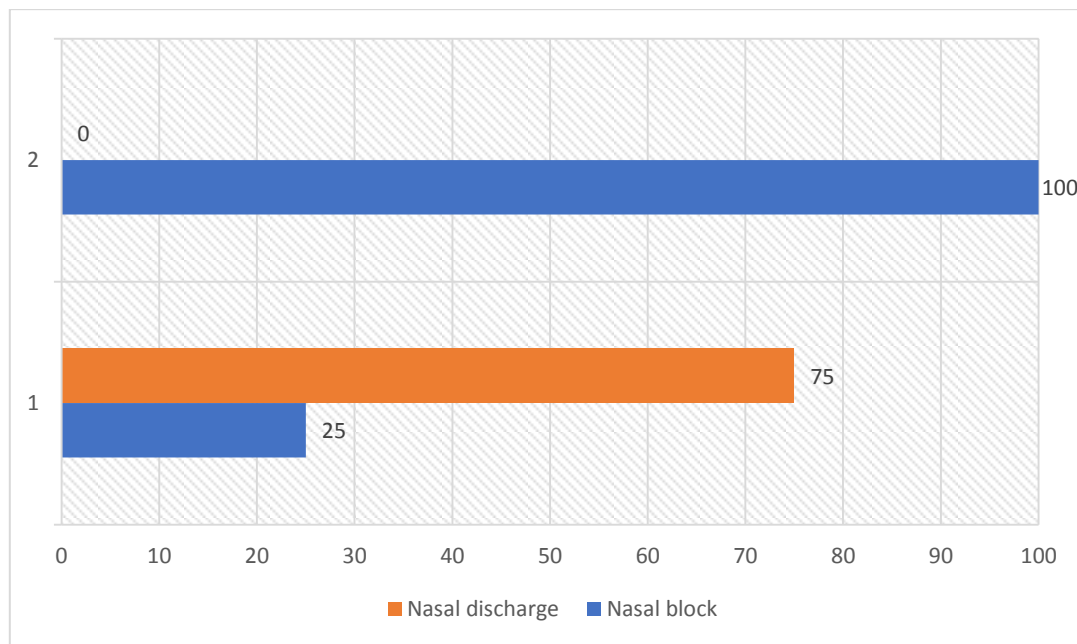


Fig 6: Nasal symptoms among the study participants

Table 7: SNOT 22 score among the study participants

S No	Variable	Tympanoplasty		FESS + Tympanoplasty		P value
		Mean	SD	Mean	SD	
1	SNOT 22	25.25	6.01	34.7	4.26	<0.001

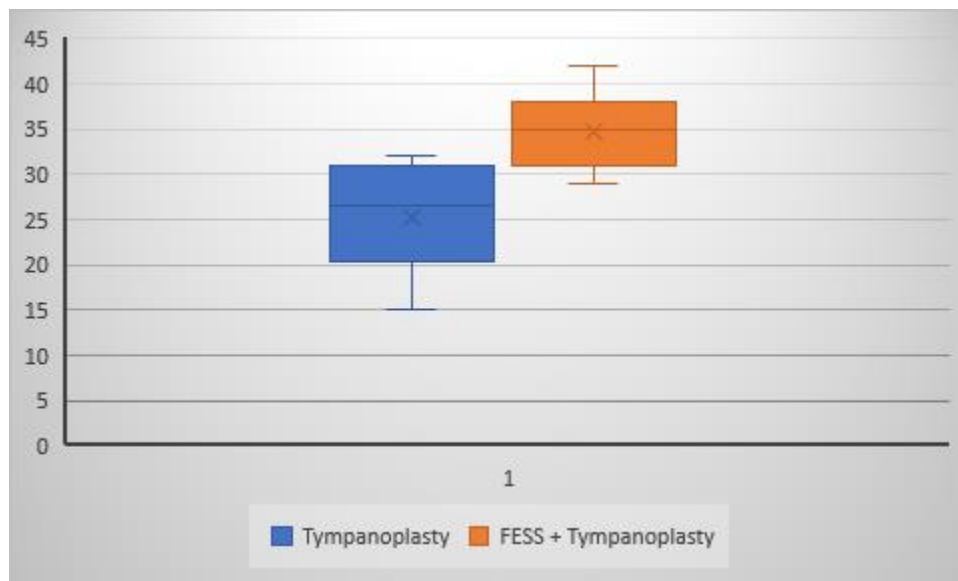


Fig 7: SNOT 22 score among the study participants

Table 8: Deviated septum among the study participants

S No	Deviated Septum	Tympanoplasty		FESS + Tympanoplasty		P value
		Frequency	Percentage	Frequency	Percentage	
1	DNS	17	85	12	60	0.077
2	Midline	3	15	8	40	

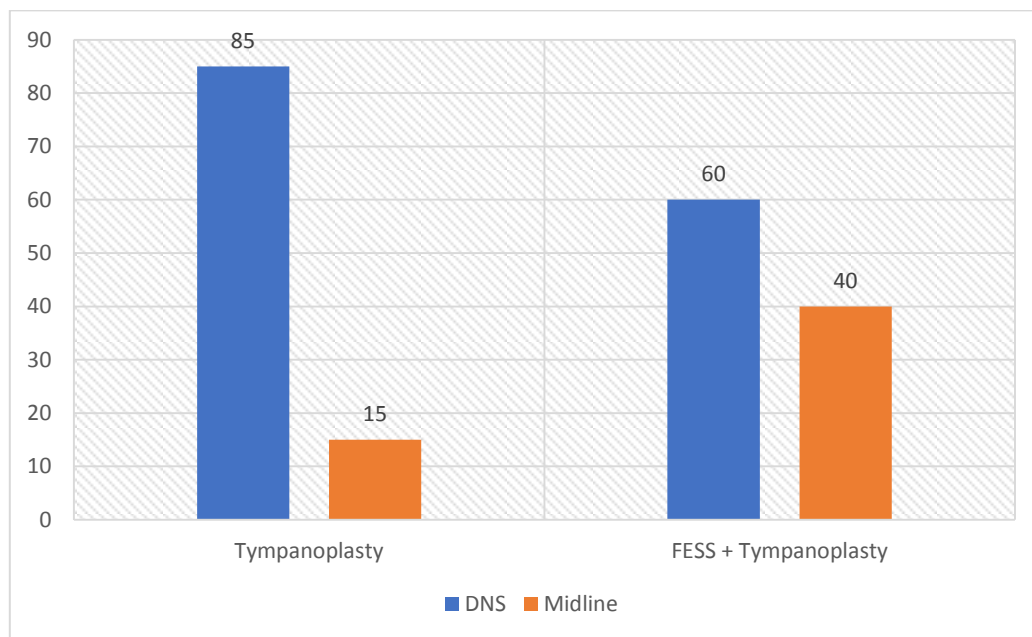


Fig 8: Deviated septum among the study participants

All the study participants in both the group had mucopurulent discharge in diagnostic nasal endoscopy. None of the study participants had polyp

Table 9: CT PNS finding among the FESS patients

S no	Grade	Frequency	Percentage
1	1	1	5
2	2	13	65
3	3	6	30

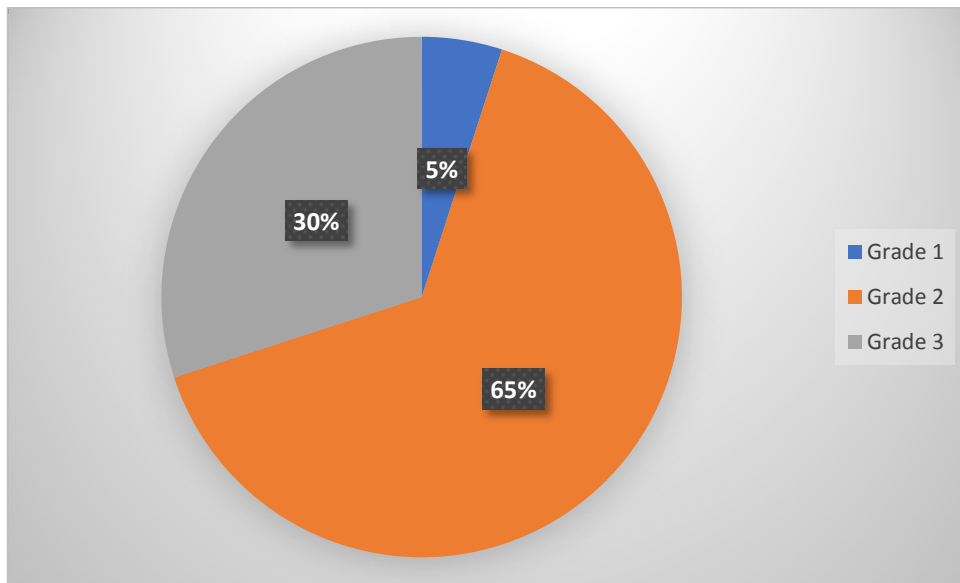


Fig 9: CT PNS findings among the study participants

CT PNS findings among the study participants

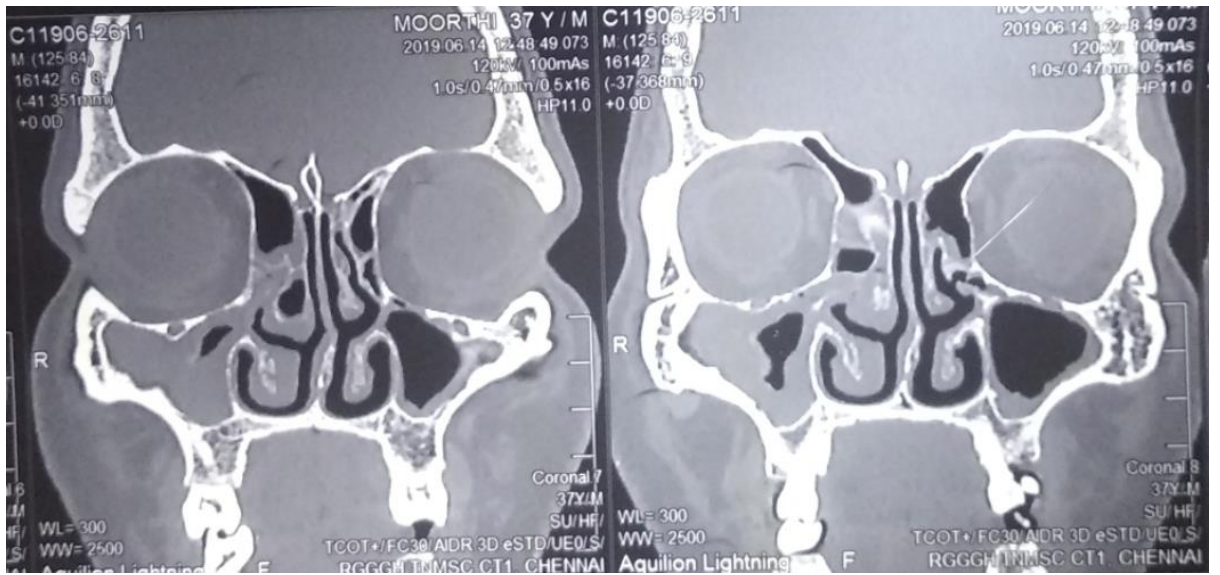
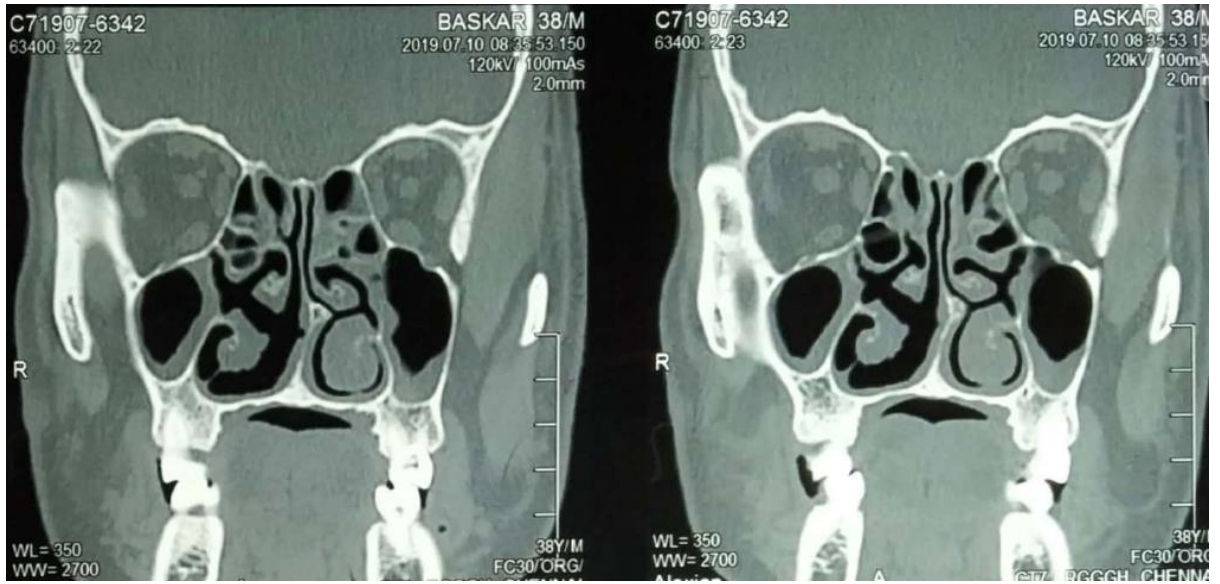


Table 10: Ear discharge –post operatively among the study participants

S No	Ear discharge	Tympanoplasty		FESS + Tympanoplasty		P value
		Frequency	Percentage	Frequency	Percentage	
1	Present	7	35	3	85	0.144
2	Absent	13	65	17	15	

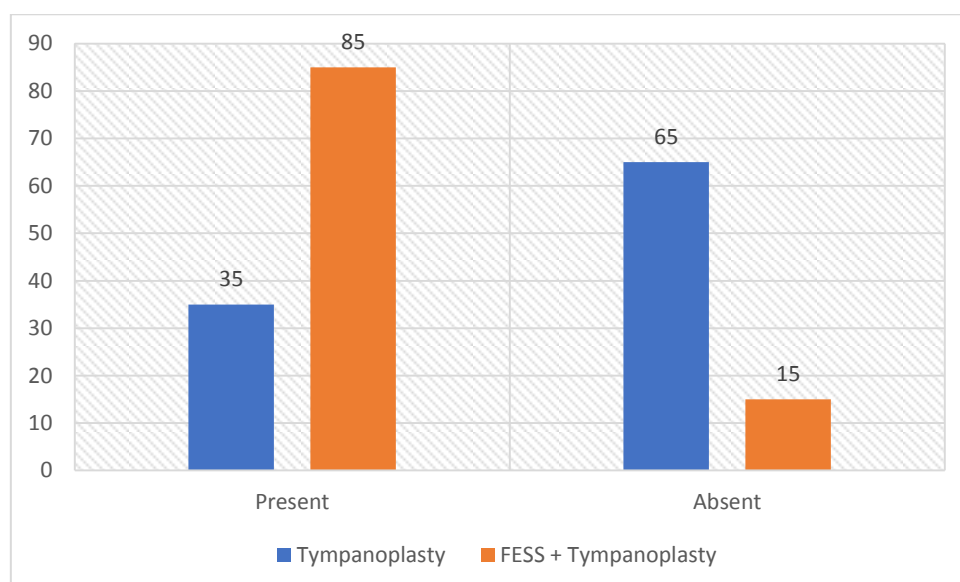


Fig 10: Ear discharge –post operatively among the study participants

In our study temporalis facia graft was used in all the patients and the underlay technique is done in both the groups

The failed graft was higher among the tympanoplasty patients than those with FESS and tympanoplasty (20% versus 15%)

Table 11: Graft status at 6 weeks

S No	Graft at 6 weeks	Tympanoplasty		FESS + Tympanoplasty		P value
		Frequency	Percentage	Frequency	Percentage	
1	Intact	16	80	17	85	0.677
2	Failed	4	20	3	15	

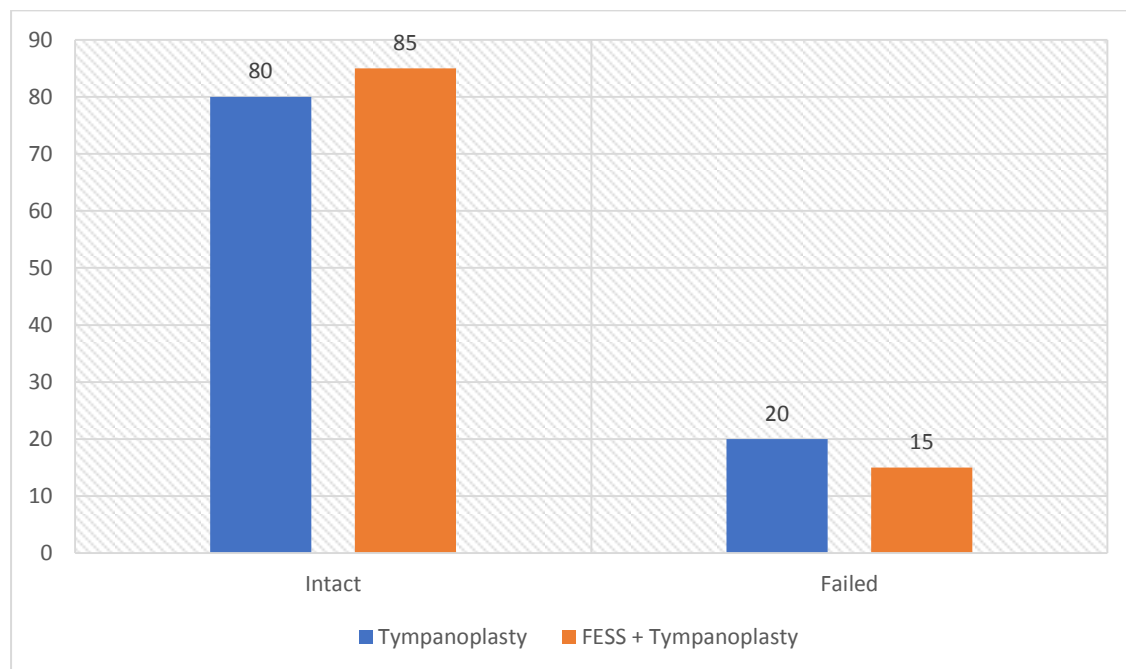


Fig 11: Graft status at 6 weeks

The graft failure was higher among those with tympanoplasty alone than those with FESS + Tympanoplasty (35% versus 15%) at 6 months

Table 12: Graft at 6 months

S No	Graft at 6 months	Tympanoplasty		FESS + Tympanoplasty		P value
		Frequency	Percentage	Frequency	Percentage	
1	Intact	13	65	17	85	0.144
2	Failed	7	35	3	15	

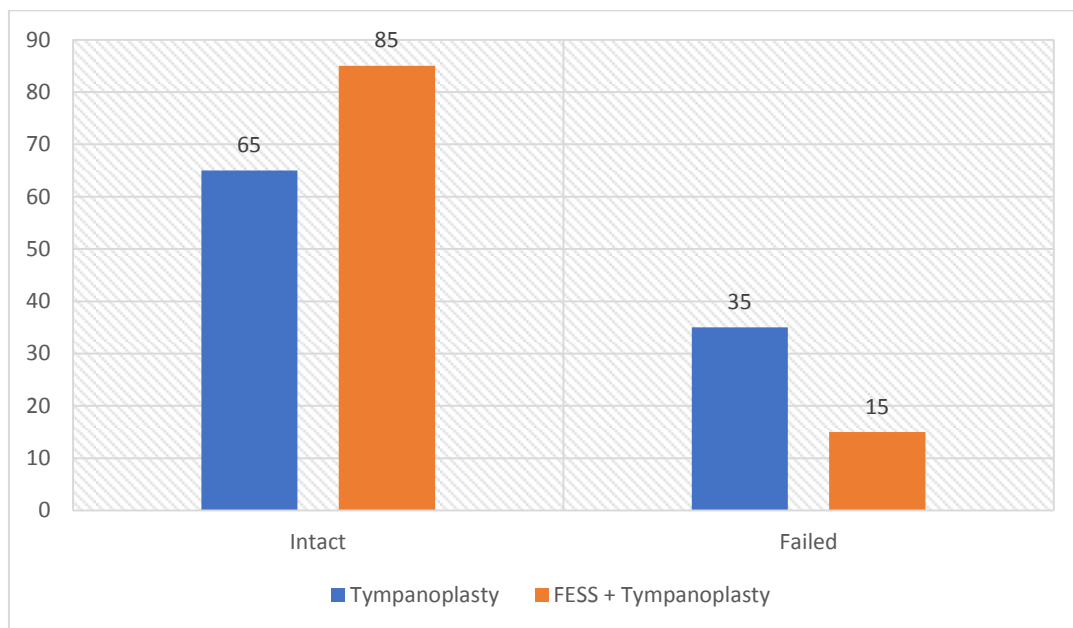
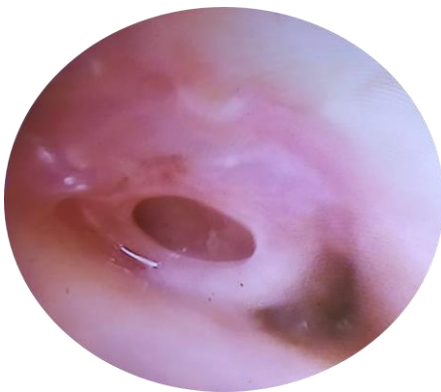


Fig 12: Graft status at 6 months

GRAFT STATUS OF STUDY PARTICIPANTS

After 6 Weeks

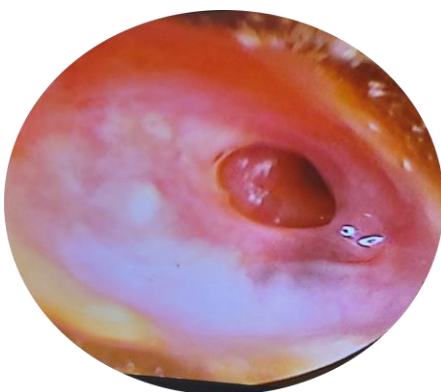
PRE OP



POST OP



PRE OP



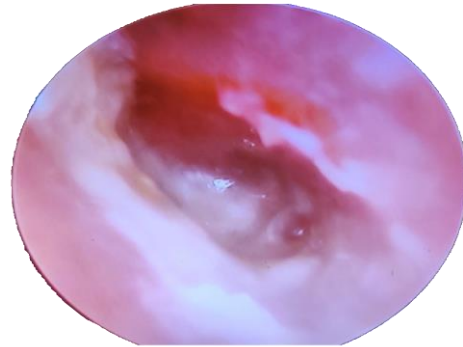
POST OP



PRE OP

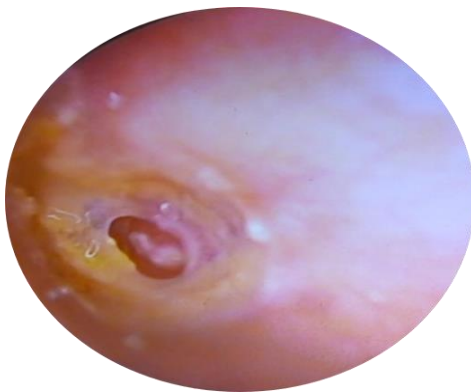


POST OP

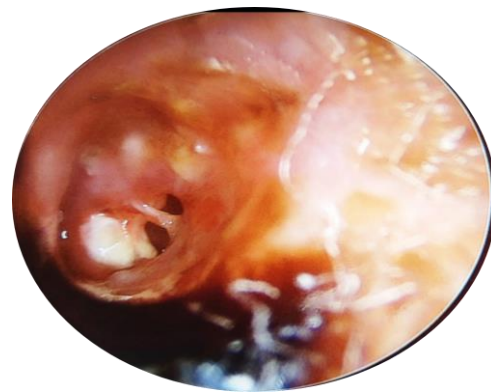


Graft failure

PRE OP



POST OP

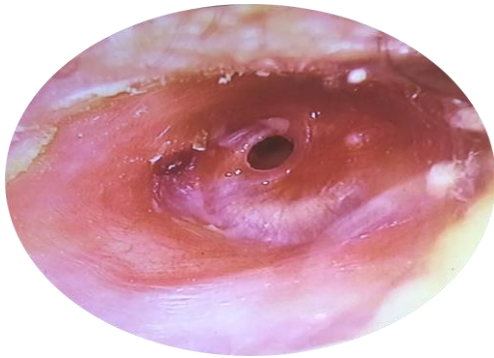


GRAFT STATUS OF STUDY PARTICIPANTS

After 6 Months

Graft Failure With Ear Discharge

PRE OP



POST OP



Graft Failure With Ear Discharge

PRE OP



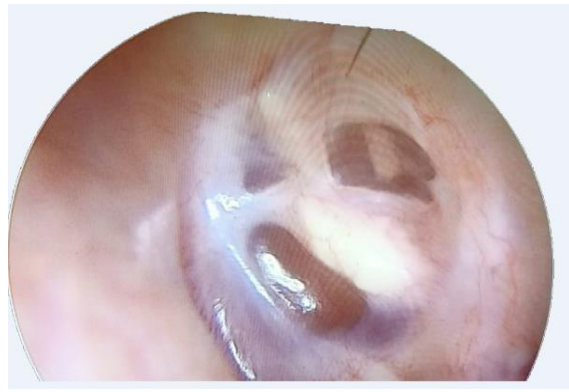
POST OP



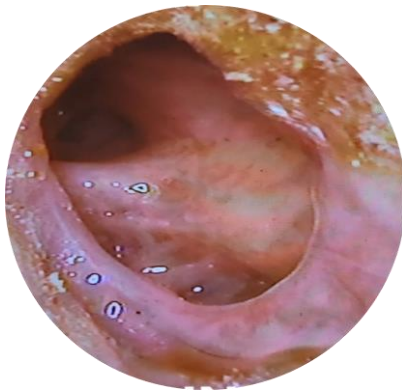
PRE OP



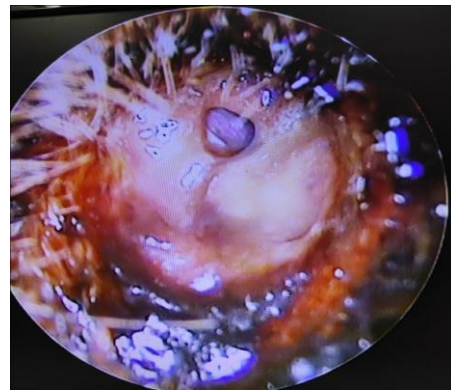
POST OP



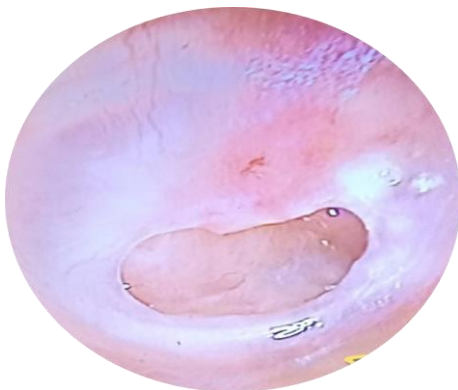
PRE OP



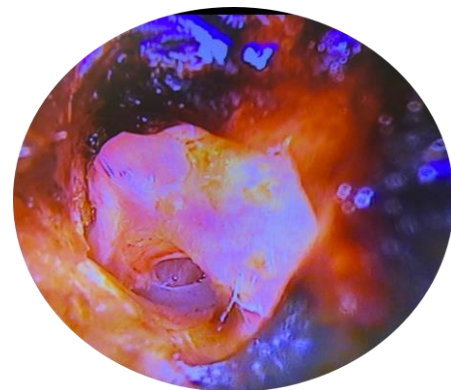
POST OP



PRE OP



POST OP



DISCUSSION

The middle ear cavity is formed by out pouching and extension of first pharyngeal pouch towards the developing inner and middle ear components at 3rd week of intrauterine life ,it then develops into tubotympanic recesses .

The mucous membrane lining the middle ear cavity is covered by a dual embryonic epithelium. The region of the mucosa close to the Eustachian tube is a pseudostratified epithelium rich in goblet cells and ciliated cells that work together to secrete mucus, trapping debris and pathogens, and pushing them towards and along the Eustachian tube to keep the middle ear cavity clear. Further away from the Eustachian tube, the ear mucosal epithelium has been observed to be devoid of ciliated cells and goblet cells, and is composed of a simple epithelium.[1.1]

From a ventilatory perspective, The tympanic diaphragm physically divides the middle ear into two compartments, the anteroinferior compartment and the posterosuperior compartment, . The Eustachian tube opens in the anteroinferior compartment, allowing direct ventilation of the mesotympanic and hypotympanic regions. The upper unit of the attic and the mastoid air cell system make up the posterosuperior compartment. It is located away from the direct air

stream and is only aerated through the tympanic isthmus, which is an orifice in the tympanic diaphragm. The epithelial layer is pseudostratified in the anteroinferior compartment, and there are so many mucous and ciliated cells there that the involvement of the anteroinferior compartment in transmucosal gas exchange is minor, and it is devoted exclusively to mucociliary clearance. The mucosa is extensively vascularized and covered by a monocellular layer of flat epithelial cells in the posterosuperior compartment. This compartment's mucosa is largely responsible for transmucosal gas exchange.

The ostiomeatal complex, which is situated between the middle and inferior turbinates, drains the frontal, ethmoid, and maxillary sinuses.

Normal mucociliary motility is therefore critical for preventing sinus infections. In the lack of adequate secretion clearance by the cilia, the sinuses become a breeding ground for bacteria.

Acute sinusitis is frequently caused by the same bacterial pathogens that cause acute otitis media, because both the paranasal sinuses and the middle ear acquire respiratory infections via the nasopharynx.[2.1]

Stammberger discovered that mucus normally flows around the opening of the eustachian tube, but that abundant or infected mucus can restrict the orifice and promote ascending infections into the middle ear.

Infected mucus can induce persistent inflammation of the mucosa of the eustachian tube or lead to ascending infection[.40]

The commonest organism residing in the nasopharynx are *Haemophilus influenzae*, *Streptococcus pneumoniae*, and *Moraxella catarrhalis*. These organisms can cause upper respiratory tract infections like sinusitis and otitis media.

The eustachian tube connects the nasal cavity to the middle ear morphologically and functionally, hence disorders of the nose and paranasal sinuses can lead to middle ear disease. Although otologic symptoms are a minor sign in the diagnosis criteria of CRS, the severity of otologic symptoms associated with CRS can be severe. Despite this, there has been relatively little research into the effects of endoscopic sinus surgery (ESS) on otologic disorders so far.[40]

The pathogenesis of otitis media relies on the interfaces between the characteristics of host, virulence aspects of viral and bacterial pathogens and the environmental determinants. Eustachian tube upon obstruction can have a vital role in the otitis media development.

The most significant pathological determinant in CSOM is infection by bacteria and dysfunction of eustachian tube. Infective focus in the nose and paranasal sinuses cause obstruction of Eustachian tube can result in development of otitis media.

Chronic Rhinosinusitis is a common disease worldwide. And its prevalence is on rise causing a serious public health problem than debilitating diseases like arthritis or hypertension, diabetes etc. Functional endoscopic sinus surgery is a decidedly sophisticated surgery, which has reformed the surgical management of chronic rhinosinusitis those who failed to respond for the medical treatment. Functional endoscopic sinus surgery has achieved popularity and continues it among the surgeons recently.

The present study was done with the objective to study the effect of Functional Endoscopic Sinus Surgery in patients affected with Chronic Suppurative Otitis Media with Chronic rhinosinusitis.

The present study showed that the mean age of the study participants was 28.9 ± 10.82 and 30.9 ± 7.44 respectively among those with tympanoplasty alone and those with FESS and tympanoplasty respectively and majority of the study participants in the present study was females.

The present study has shown that the majority of the study participants had ear discharge for 1 to 5 years and majority of the study participants had medium central perforation. Similarly in a study done by Dhanasekaran SV et al⁴¹ has shown that nearly 54% of the study participants had mucopurulent discharge.

The present study has shown that majority of patients underwent endoscopic sinus surgery showed significant decrease in otologic symptoms like ear fullness and decrease in ear discharge, similar to : **Teo NW, et al study** where the study participants who underwent FESS has shown improvement in ear symptoms.

The present study has shown that majority of the study participants in both the group had MERI score of 2. In the present study, majority of the study participants in tympanoplasty only group had nasal discharge and all those who had FESS with tympanoplasty had nasal block. Majority of the study participants in the present study had grade 2 in CT PNS. Present study has shown that majority of the study participants in both the group had deviated septum. All the study participants in both the group had mucopurulent discharge in diagnostic nasal endoscopy. This signifies that septal deviation is associated with otitis media. A study done by Mohan Kumar V and Veerasigamani N⁴², 66% of the study participants had deviated septum. 24% and 44% of the study participants had small and large central perforation. CT PNS showed 52%, 24%, and 14% had grade 1, 2 and 3 respectively and majority of the study participants belonged to the age group of 21 to 30 years. Similarly in a study done by Dhanasekaran SV et al⁴¹, it was shown that CT PNS showed that 48.5% had grade I. 54.2% study participants had large central perforation.

The present study has shown that failed graft was higher among the tympanoplasty patients than those with FESS and tympanoplasty (20% versus 15%) at 6 weeks. Similarly, the graft failure was higher among those with tympanoplasty alone than those with FESS + Tympanoplasty (35% versus 15%) at 6 months. CSOM tubo-tympanic type with concurrent active sinusitis has persistently discharging ears. Ear surgery without sinusitis correction can result in failures and poor prognosis. The current study correlates that treating sinusitis in CSOM patients improves their outcome and prognosis.

Similarly, in a study done by Sachithanandam S et al (2018),⁴³ during the follow up period of 6 weeks, there was no reduction in perforation size. At 3 months, 56%, 81.2% of small and medium perforation respectively had significant reduction. 44% of small perforation was completely closed. Thus the study concluded that following FESS, middle ear mucosa showed improvement.

Drawbacks in the study

- Even though the graft failure was higher among the patients who hasn't undergone Functional endoscopic sinus surgery, statistically we couldn't draw any firm conclusion as the sample size is insufficient.
- Despite the fact that the treatment was performed in a single centre, they were carried out by a number of surgeons, raising the

possibility of bias, due to variations in surgical steps and techniques used by different surgeons.

- In spite of being a tertiary/apex centre, an unexpected hindrance in acquiring satisfactory sample size and in planning periodic review and proper check up for the patients due to pandemic covid-19 eventually leading the patient to have inadequate review or be lost to follow up.

CONCLUSION

- It can be concluded that the nasal and paranasal sinus passage obstruction can result in tubo-tympanic disease. Thereby, it can lead to development of otitis media due to inflammation of mucosa, loss of mucociliary action of epithelium and eustachian tube obstruction leading to ascending infection.
- Functional endoscopic sinus surgery has shown some improvement on the middle ear mucosa by improving the eustachian tube function and mucociliary action of the epithelium, thus improving the graft uptake after tympanoplasty.
- Despite the fact that the graft failure rate is significantly lower in patients who had FESS before tympanoplasty, it cannot be concluded that FESS is the sole reason for the better outcome; additionally, the sample size is insufficient to draw such a statistical conclusion.
- To provide statistical evidence in favor of functional endoscopic sinus surgery on tympanoplasty, further prospective trials with high sample sizes and thorough follow-up are required.

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PATIENT CONSENT FORM

**Title of the Project: "A COMPARATIVE STUDY ON
MANAGEMENT OF CHRONIC SUPPURATIVE OTITIS
MEDIA WITH SINUSITIS WITH AND WITHOUT FESS"**

Institution : Upgraded Institute
of Otorhinolaryngology,
Madras Medical College,
Chennai – 600003.

Name: _____ Date : _____
Age : _____ IP No.: _____
Sex : _____ Project Patient No.: _____

The details of the study have been provided to me in writing and explained to me in my own language.

I confirm that I have understood the above study and had the opportunity to ask questions.

I understood that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reason, without the medical care that will normally be provided by the hospital being affected.

I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).

I have been given an information sheet giving
details of the study. I fully consent to participate
in the above study.

Name of the subject

Signature

Date

Name of the Investigator

Signature

Date

சுய ஒப்புதல் படிவம்

“COMPARATIVE STUDY ON MANAGEMENT OF CHRONIC SUPPURATIVE OTITIS MEDIA WITH SINUSITIS WITH AND WITHOUT FESS”

நான் இந்த ஆராய்ச்சியில் விவரங்களை முற்றிலும் புரிந்து கொண்டேன். ஆய்வில் பங்கு எடுத்துபோது, சாத்தியமான அபாயங்கள் மற்றும் பயன்களை பற்றி நான் அறிந்துள்ளேன்.

நான் எந்த வொரு வேளையிலும் ஆய்வில் இருந்து திரும்பமுடியும், அதன் பின்னர், நான் வழக்கம் போல் மருத்துவசிகிச்சை பெறமுடியும் என்று புரிந்து கொள்கிறேன்.

நான் ஆய்வில் பங்கு எடுத்து பணம் எதையும் பெறமுடியாது என்று அறிந்துள்ளேன். இந்த ஆய்வின் முடிவுகள் எந்த மெடிக்கல் ஜர்னலில் வெளியிடப்பட இருந்தால் நான் எதிர்க்கவில்லை, எந்தனிப்பட்ட அடையாளத்தை வெளிப்படுத்தப்பட்டு இருக்கக்கூடாது.

நான் இந்த ஆய்வில் பங்கெடுப்பதன் மூலம் நான் என்ன செய்ய போகிறேன் என்று தெரியும்.

நான் இந்த ஆய்வில் என் முழு ஒத்துழைப்பையும் கொடுப்பேன் என்று உறுதியளிக்கிறேன்.

தன்னார்வளர்

சாட்சி

பெயர்:

பெயர்:

முகவரி:

முகவரி

கையொப்பம்:

கையொப்பம்:

ஆராய்ச்சியாளராக கையொப்பம்

மற்றும் தேதி:

INFORMATION SHEET

We are conducting “*COMPARATIVE STUDY ON MANAGEMENT OF CHRONIC SUPPURATIVE OTITIS MEDIA WITH SINUSITIS WITH AND WITHOUT FESS*”

at the Upgraded Institute of Otorhinolaryngology, Madras Medical College & Rajiv Gandhi Government General Hospital, Chennai – 600003.

At the time of announcing the results and suggestions, name and identity of the patients will be confidential.

Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time; your decision will not result in any loss of benefits to which you are otherwise entitled.

The results of the special study may be intimated to you at the end of the study period or during the study if anything is found abnormal which may aid in the management or treatment.

Signature of Investigator

Signature of Participant

PROFORMA

NAME:

IPNO:

AGE/SEX:

DATE:

OCCUPATION:

ADDRESS:

CHIEF COMPLAINTS:

EAR: DISCHARGE

- DURATION
- ONSET
- COLOUR
- AMOUNT
- SMELL
- BLOOD STAINED
- AGGRAVATING AND RELIEVING FACTORS
- ASSOCIATED SYMPTOMS

HARD OF HEARING

- ONSET
- UNILATERAL/BILATERAL
- GRADUAL/FLUCTUATING

EARACHE

VERTIGO/TINNITUS

NOSE

NASAL OBSTRUCTION

- UNILATERAL/BILATERAL
- CONTINUOUS/INTERMITTENT

NASAL DISCHARGE

- UNILATERAL/BILATERAL
- SCANTY/PROFUSE
- COLOUR
- SMELL

HEAD ACHE

POSTNASAL DRIP

ANOSMIA

PAST HISTORY

PERSONAL HISTORY

FAMILY HISTORY

CLINICAL EXAMINATION:

GENERAL EXAMINATION

LOCAL EXAMINATION

EXAMINATION OF EAR:

RIGHT

LEFT

PREAURICULAR

PINNA

POSTAURICULAR

EXT AUDITORY CANAL

TYMPANIC MEMBRANE

- CENTRAL PERFORATION
- MIDDLE EAR MUCOSA

EXAMINATION OF NOSE :

EXTERNAL CONTOUR

ANTERIOR RHINOSCOPY

POSTERIOR RHINOSCOPY

AIRWAY PATENCY TEST :

COLD SPATULA TEST

COTTONWOOL TEST

COTTLE'S TEST

DNE :

INVESTIGATIONS:

ROUTINE INVESTIGATIONS:

PURE TONE AUDIOMETRY

HRCT TEMPORAL BONE

CT PNS:

SURGICAL PROCEDURE :

FOLLOW UP:

**INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI 600 003**

EC Reg.No.ECR/270/Inst./TN/2013/RR-16
Telephone No.044 25305301
Fax: 011 25363970

CERTIFICATE OF APPROVAL

To
Dr.ARUN KUMAR G,
MS ENT Post Graduate,
Upgraded Institute of Otorhinolaryngology
Madras Medical College &
Rajiv Gandhi Govt. General Hospital,
Chennai-600 003.

Dear Dr. ARUN KUMAR G,

The Institutional Ethics Committee has considered your request and approved your study titled **“A COMPARATIVE STUDY ON MANAGEMENT OF CHRONIC SUPPURATIVE OTITIS MEDIA WITH SINUSITIS WITH AND WITHOUT FESS”- NO.14112020**. The following members of Ethics Committee were present in the meeting held on **17.11.2020** conducted at Madras Medical College, Chennai 3.

- | | |
|--|--------------------|
| 1. Prof.P.V.Jayashankar | :Chairperson |
| 2. Prof.N.Gopalakrishnan,MD.,DM., FRCP, Director, Inst. of Nephrology,MMC,Ch | : Member Secretary |
| 3. Prof. K.M.Sudha, Prof. Inst. of Pharmacology,MMC,Ch-3 | : Member |
| 4. Prof. Alagarsamy Jamila ,MD, Inst. of Pathology, MMC, Ch-3 | : Member |
| 5. Prof.Remam Chandramohan,Prof.of Paediatrics,ICH,Chennai | : Member |
| 6. Prof.S.Lakshmi, Prof. of Paediatrics ICH Chennai | :Member |
| 7. Tmt.Arnold Saulina, MA.,MSW., | :Social Scientist |
| 8. Thiru S.Govindasamy, BA.,BL,High Court,Chennai | : Lawyer |
| 9. Thiru K.Ranjith, Ch- 91 | : Lay Person |

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary – Ethics Committee


Dr.N.GOPALAKRISHNAN, M.D., DM., FRCP.,
Member Secretary
Institutional Ethics Committee
Madras Medical College



Document Information

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Similarity	4%
Analysis address	arunkumar301990.mgrmu@analysis.arkund.com

Tympanoplasty

S.NO	NAME	AGE/SEX	IP NO	EAR DISCHARGE	CENTRAL PERFORATION	MIDDLE EAR MUCOSA	MERI SCORE	NASAL SYMPTOMS	SNOT 22 SCORE	DEVIATED SEPTUM	DNE	POLYP	DIAGNOSIS	SURGERY	GRAFT AT 6 WEEKS	GRAFT AT 6 MONTHS	EAR DISCHARGE
1	SOWMYA DEVI.	17/F	64054	6 MONTHS	MEDIUM	CONGESTED	3	NASAL DISCHARGE	21	DNS	MUCOPURULENT DISCHARGE	ABSENT	LEFT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
2	RUBEENA	14/F	62752	8 YEARS	LARGE	CONGESTED	2	NASAL DISCHARGE	25	DNS	MUCOPURULENT DISCHARGE	ABSENT	LEFT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
3	GAJALAKSHMI.	25/F	61490	6 MONTHS	MEDIUM	CONGESTED	2	NASAL DISCHARGE	28	DNS	MUCOPURULENT DISCHARGE	ABSENT	RIGHT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
4	MAHALAKSHMI.	27/F	66432	10 YEARS	MEDIUM	CONGESTED	3	NASAL DISCHARGE	31	MIDLINE	MUCOPURULENT DISCHARGE	ABSENT	LEFT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
5	VIKRAM	26/M	12291	3 YEARS	MEDIUM	CONGESTED	3	NASAL DISCHARGE	28	DNS	MUCOPURULENT DISCHARGE	ABSENT	LEFT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
6	SUBHA.	42/F	67623	3 YEARS	MEDIUM	CONGESTED	3	NASAL DISCHARGE	32	DNS	MUCOPURULENT DISCHARGE	ABSENT	LEFT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	FAILED	PRESENT
7	SARAN KUMAR	31/M	17111	10 YEARS	MEDIUM	CONGESTED	3	NASAL BLOCK	20	DNS	MUCOPURULENT DISCHARGE	ABSENT	BILATERAL CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	FAILED	FAILED	PRESENT
8	MEENA	39/F	71061	6 MONTHS	MEDIUM	CONGESTED	3	NASAL BLOCK	15	DNS	MUCOPURULENT DISCHARGE	ABSENT	BILATERAL CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	FAILED	PRESENT
9	PARVEEN	36/F	71297	2 YEARS	MEDIUM	CONGESTED	3	NASAL DISCHARGE	32	DNS	MUCOPURULENT DISCHARGE	ABSENT	BILATERAL CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT

10	RANI	60/F	71021	2 YEARS	LARGE	CONGESTED	3	NASAL DISCHARGE	31	MIDLINE	MUCOPURULENT DISCHARGE	ABSENT	BILATERAL CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	FAILED	FAILED	PRESENT
11	KUMARESAN	31/M	61810	10 MONTHS	MEDIUM	CONGESTED	3	NASAL DISCHARGE	16	DNS	MUCOPURULENT DISCHARGE	ABSENT	RIGHT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
12	AAKASH	15/M	62983	2 YEARS	MEDIUM	CONGESTED	2	NASAL DISCHARGE	25	DNS	MUCOPURULENT DISCHARGE	ABSENT	LEFT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
13	SATHYAVATHI	37/F	61494	6 MONTHS	MEDIUM	CONGESTED	3	NASAL DISCHARGE	15	DNS	MUCOPURULENT DISCHARGE	ABSENT	RIGHT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	FAILED	PRESENT
14	USHA	26/F	61551	2 YEARS	MEDIUM	CONGESTED	2	NASAL BLOCK	18	DNS	MUCOPURULENT DISCHARGE	ABSENT	LEFT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
15	VINITHA	24/F	2800	2 YEARS	MEDIUM	CONGESTED	3	NASAL DISCHARGE	22	DNS	MUCOPURULENT DISCHARGE	ABSENT	LEFT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
16	USHA	20/F	12341	1 YEAR	SMALL	CONGESTED	2	NASAL BLOCK	25	DNS	MUCOPURULENT DISCHARGE	ABSENT	LEFT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
17	RITA	19/F	1E+05	5 YEARS	MEDIUM	CONGESTED	3	NASAL DISCHARGE	28	DNS	MUCOPURULENT DISCHARGE	ABSENT	BILATERAL CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
18	KALA	28/F	1E+05	1 YEAR	SMALL	CONGESTED	2	NASAL BLOCK	32	DNS	MUCOPURULENT DISCHARGE	ABSENT	RIGHT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	FAILED	FAILED	PRESENT
19	KAVITHA	36/F	1E+05	4 YEARS	MEDIUM	CONGESTED	3	NASAL DISCHARGE	30	MIDLINE	MUCOPURULENT DISCHARGE	ABSENT	RIGHT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
20	MALLIGA	25/F	1E+05	10 YEARS	MEDIUM	CONGESTED	2	NASAL DISCHARGE	31	DNS	MUCOPURULENT DISCHARGE	ABSENT	LEFT CHRONIC OTITIS MEDIA	TYPE 1 TYMPANOPLASTY	FAILED	FAILED	PRESENT

FESS + Tympanoplasty

S.NO	NAME	AGE/SEX	IP NO	EAR DISCHARGE	CENTRAL PERFORATION	MERI SCORE	NASAL SYMPTOMS	SNOT 22	DEVIATED SEPTUM	DNE	POLYP	CT PNS	DIAGNOSIS	SURGERY	SURGERY DONE AFTER 2 MONTHS	GRAFT AT 6 WEEKS	GRAFT AT 6 MONTHS	EAR DISCHARGE
1	LOGANATHAN	30/M		5 YEARS	MEDIUM	3	NASAL BLOCK	35	MIDLINE	MUCOPURULENT DISCHARGE	absent	GR-3	CHRONIC RHINOSINUSITIS	FESS	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
2	DHATCHAYINI	35/F		4 YEARS	LARGE	3	NASAL BLOCK	31	DNS	MUCOPURULENT DISCHARGE	absent	GR-2	DNS TO LEFT WITH CHRONIC RHINOSINUSITIS	FESS WITH SEPTAL CORRECTION	TYPE 1 TYMPANOPLASTY	FAILED	FAILED	PRESENT
3	JOTHI	30/F		2 YEARS	MEDIUM	3	NASAL BLOCK	32	MIDLINE	MUCOPURULENT DISCHARGE	absent	GR-3	CHRONIC RHINOSINUSITIS	FESS	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
4	VIVEK	26/M		6 MONTHS	MEDIUM	2	NASAL BLOCK	35	DNS	MUCOPURULENT DISCHARGE	absent	GR-2	DNS TO LEFT WITH CHRONIC RHINOSINUSITIS	FESS WITH SEPTAL CORRECTION	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
5	BASKAR	38/M	84772	2 YEARS	MEDIUM	3	NASAL BLOCK	38	DNS	MUCOPURULENT DISCHARGE	absent	GR-2	DNS TO LEFT WITH CHRONIC RHINOSINUSITIS	FESS WITH SEPTAL CORRECTION	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
6	ILAVARASAN	27/M	78660	4 YEARS	LARGE	3	NASAL BLOCK	29	DNS	MUCOPURULENT DISCHARGE	absent	GR-3	DNS TO LEFT WITH CHRONIC RHINOSINUSITIS	FESS WITH SEPTAL CORRECTION	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
7	SHANYA	17/F	79808	3 YEARS	MEDIUM	2	NASAL BLOCK	40	DNS	MUCOPURULENT DISCHARGE	absent	GR-2	DNS TO RIGHT WITH CHRONIC RHINOSINUSITIS	FESS WITH SEPTAL CORRECTION	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
8	SAJAN KUMAR	30/M	77087	2 YEARS	MEDIUM	2	NASAL BLOCK	31	MIDLINE	MUCOPURULENT DISCHARGE	absent	GR-1	CHRONIC RHINOSINUSITIS	FESS	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
9	RANI	36/F	86352	5 YEARS	MEDIUM	2	NASAL BLOCK	35	DNS	MUCOPURULENT DISCHARGE	absent	GR-2	DNS TO RIGHT WITH CHRONIC RHINOSINUSITIS	FESS WITH SEPTAL CORRECTION	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
10	MUMTAJ	41/F	134490	10 YEARS	MEDIUM	3	NASAL BLOCK	34	DNS	MUCOPURULENT DISCHARGE	absent	GR-2	DNS TO RIGHT WITH CHRONIC RHINOSINUSITIS	FESS WITH SEPTAL CORRECTION	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
11	THULASI	30/F	92091	5 YEARS	MEDIUM	2	NASAL BLOCK	42	DNS	MUCOPURULENT DISCHARGE	absent	GR-3	CHRONIC RHINOSINUSITIS	FESS	TYPE 1 TYMPANOPLASTY	FAILED	FAILED	PRESENT
12	MOORTHI	37/M	86770	4 YEARS	SMALL	3	NASAL BLOCK	38	DNS	MUCOPURULENT DISCHARGE	absent	GR-2	CHRONIC RHINOSINUSITIS	FESS	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
13	SUDHA	37/F	78954	3 YEARS	MEDIUM	2	NASAL BLOCK	31	DNS	MUCOPURULENT DISCHARGE	absent	GR-2	CHRONIC RHINOSINUSITIS	FESS	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
14	PARVIN	24/F	90526	5 YEARS	SMALL	3	NASAL BLOCK	29	MIDLINE	MUCOPURULENT DISCHARGE	absent	GR-2	CHRONIC RHINOSINUSITIS	FESS	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT

15	MALATHI	44/F	96260	2 YEARS	MEDIUM	2	NASAL BLOCK	35	DNS	MUCOPURULENT DISCHARGE	absent	GR-2	DNS TO RIGHT WITH CHRONIC RHINOSINUSITIS	FESS WITH SEPTAL CORRECTION	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
16	SAVITHRI	39/f	77829	2 YEARS	MEDIUM	3	NASAL BLOCK	30	MIDLINE	MUCOPURULENT DISCHARGE	absent	GR-3	CHRONIC RHINOSINUSITIS	FESS	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
17	RAJESHWARI	30/F	134058	3 YEARS	MEDIUM	3	NASAL BLOCK	31	DNS	MUCOPURULENT DISCHARGE	absent	GR-2	DNS TO LEFT WITH CHRONIC RHINOSINUSITIS	FESS WITH SEPTAL CORRECTION	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
18	NALINI	27/F	137633	5 YEARS	MEDIUM	3	NASAL BLOCK	42	MIDLINE	MUCOPURULENT DISCHARGE	absent	GR-2	CHRONIC RHINOSINUSITIS	FESS	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
19	ARUN	22/M	139980	2 YEARS	MEDIUM	3	NASAL BLOCK	41	MIDLINE	MUCOPURULENT DISCHARGE	absent	GR-3	DNS TO RIGHT CHRONIC RHINOSINUSITIS	FESS WITH SEPTAL CORRECTION	TYPE 1 TYMPANOPLASTY	INTACT	INTACT	ABSENT
20	BHAGYAVATHI	18/F	78951	4 YEARS	MEDIUM	2	NASAL BLOCK	35	MIDLINE	MUCOPURULENT DISCHARGE	absent	GR-2	DNS TO LEFT WITH CHRONIC RHINOSINUSITIS	FESS WITH SEPTAL CORRECTION	TYPE 1 TYMPANOPLASTY	FAILED	FAILED	PRESENT