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"OSSICULAR CHAIN STATUS IN CHRONIC OTITIS MEDIA "- OUR EXPERIENCE

ENT

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ABSTRACT

Aim: To clinically evaluate the ossicular chain status in patients with chronic otitis media and to correlate the clinical status of ossicles with radiological findings using HRCT temporal bone.

Objectives:

1. To evaluate the ossicular chain status in middle ear by clinical examination among Chronic otitis media patients
2. To identify the pathologies in ossicles like erosions, dislocations, fixations and tympanosclerosis by obtaining a HRCT temporal bone
3. To correlate clinical findings with radiological findings

Results : In this study, it was observed that majority (48.3%) of study population were in 31 – 40 years of age group; majority (55%) of study population were females and 45% were males. Majority (80%) of study population had war discharge; 66.7% had hearing loss and 58.3% had otalgia. Around 6.6% of study subjects had fever with chills & rigors; 13.3% had vertigo and 25% had tinnitus. Almost 10% had swelling behind ear and 6.6% had facial weakness. In the present study, majority (55%) of study population had conductive deafness and 6.7% had SNHL. Almost 5% had both conductive and SNHL. On oto-endoscopy it was observed that majority (80.4%) of study population had central perforation; 8.9% had marginal perforation, 10.7% had attic perforation and 63.3% had ossicular necrosis. CT scanning revealed that majority (88.3%) of study population had soft tissue mass and 36.7% had intact ossicles. In about 20% of patients attic involvement was seen and 46.7% had mastoid antrum involvement. Around 83.3% had absent aeration mastoid. Almost 40% had malleus erosion, 50% had incus erosion and 41.6% had stapes erosion. Intraoperatively it was observed that majority (78.3%) of study population had soft tissue mass and 31.6% had intact ossicles. In about 20% of patients attic involvement was seen and 41.7% had mastoid antrum involvement. Around 88.3% had absent aeration mastoid. Almost 46.7% had malleus erosion, 55% had incus erosion and 46.7% had stapes erosion. It was observed that CT scanning had highest sensitivity of 100% in identifying intact ossicles, soft tissue mass, attic involvement and highest specificity of 100% in identifying attic involvement, aeration mastoid absence, malleus erosion, Incus erosion, stapes erosion and Cholesteatoma. In this study, highest accuracy (100%) was noted for identification of attic involvement followed by intact ossicles (95.2%) for HRCT temporal bone. In this study, the accuracy of oto-endoscopy in identifying the pathology in CSOM patients was very high. About 100% accuracy was noted for intact ossicles, tympanic membrane perforation and ossicular necrosis. A 95% of accuracy was found for cholesteatoma and 93.3% for attic involvement. In this study, it was also observed that intact ossicles, tympanic membrane perforation, attic involvement and ossicular necrosis can be predicted accurately with otoendoscopy and CT scan prior to uptake of patient for surgery. **Conclusions:** In this study, it was observed that intact ossicles, tympanic membrane perforation, attic involvement and ossicular necrosis can be predicted accurately with otoendoscopy and CT scan prior to uptake of patient for surgery. HRCT temporal bone imaging should be used as an investigative tool in pre-operative evaluation of chronic suppurative otitis media attico-antral disease cases. Early diagnosis of the bony status, granulations, discharge, facial canal dehiscence with the help of HRCT temporal bone can help the surgeon in predicting the prognosis of patient better preoperatively.

KEYWORDS

HRCT Temporal Bone , Ear ossicles, Cholesteatoma ,Erosions, CT Findings ,Correlation with Ear surgery

INTRODUCTION:

Chronic Suppurative Otitis Media (CSOM) is one of the most common childhood chronic infectious disease. It is one of the leading cause of hearing impairment and disability among children in the developing nations.[1] Chronic Suppurative Otitis Media (CSOM) is a persistent infection of a part or whole of the middle ear cleft and is characterized by ear discharge and most of the times results in a permanent perforation. The definition of Chronic Suppurative Otitis Media varies and is widely defined as a perforated tympanic membrane with persistent drainage from the middle ear for more than 2-6 weeks.[2]

Incidence of CSOM is typically higher in developing countries due to various factors like poor socioeconomic standards, poor nutrition and lack of health education. It affects both sexes equally and can be seen among all age groups. In India, the overall prevalence rate is 46 and 16 persons per thousand in rural and urban population, respectively. CSOM is one of the single most important cause of hearing impairment in rural population.[3]

CSOM can be classified clinically into tubo-tympanic type and attico-antral type. Tubo-tympanic type involves anterio-inferior part of middle ear cleft, i.e. Eustachian tube and mesotympanum and is associated with a central perforation. Most of the times there is no risk of serious complications in this type of disease. Attico-antral type involves posterosuperior part of the cleft (i.e. attic, antrum and mastoid) and is associated with an attic or a marginal perforation. The disease is often associated with a bone-eroding process such as cholesteatoma, granulations or osteitis. Ossicular necrosis and erosion is commonly seen in CSOM with cholesteatoma but can also occur in tubo-tympanic CSOM.[4]

The Attico-antral type of CSOM is also known as unsafe or dangerous type because of its associated complications which sometimes are life-threatening. The complications arise mainly due to granulation tissue and cholesteatoma which cause bone erosion and necrosis. This can involve the vital structures which are near proximity anatomically such as facial nerve, inner ear, and intracranial components. Erosion of the ossicles can lead to hearing loss.[5]Mechanism of ossicular erosion in middle ear disease is majorly attributed to overproduction of cytokines—TNF alpha, interleukin-2, fibroblast growth factor, and platelet derived growth factor which promotes hyper vascularization, osteoclast activation, and bone resorption. Resorption of bone is a feature of active mucosal CSOM and the affected ossicles show hyperemia, proliferation of capillaries and prominent histiocytes.

Ossicular necrosis is commonly seen in the long process of the incus, followed by stapes crurae, body of incus and manubrium.[6]

The major function of the middle ear is to transmit the sound pressure from air of external ear to the fluid of internal ear. This is accomplished by tympanic membrane and ossicular chain composed of malleus, incus and stapes. In CSOM, this function of middle ear is majorly affected due to damage to ossicular necrosis.[7]

Most of the times ossicular necrosis is diagnosed intra- operatively. Pre-operative knowledge of ossicular damage is of immense importance as it helps surgeon to plan operative procedure correctly and minimizes last minute emergent procedures intra operatively. Thorough clinical examination can help in predicting ossicuar damage before proceeding to surgery. High resolution three dimensional computed tomography can help define the middle ear and identify ossicular erosion and discontinuity.

Some literature has shown that presence of both cholesteatoma extension into the tympanic sinus and persistently draining ears were predictive of ossicular discontinuity. Perforating edges adhering to the promontory also revealed a higher incidence of ossicular discontinuity.[8]

Another study has suggested that presence of middle ear granulations pre operatively is a sign of incus necrosis. It also suggested that presence of moderate or severe hearing loss is also a sign of ossicular necrosis.[9]

A study also suggested that presence of higher air-conduction threshold and air-bone gap are reliable indicators to identify the ossicular conditions in patients with chronic suppurative otitis media.[10] Some studies have shown that High Resolution Computerized Tomography (HRCT) also plays a crucial role in diagnosing ossicular damage. Erosion of malleus and incus, Pneumatization of mastoid, anterior lying sigmoid, extent of cholesteatoma in the middle ear have high sensitivity and specificity in predicting ossicular damage.[11]

The present study was also undertaken with an intention to identify pre-operative clinical findings and radiological findings which may predict ossicular necrosis.

Material and Methods:

Type of study: An observational cross- sectional study.

Area of study: Department of Otorhinolaryngology/Ear, Nose and Throat (ENT), Bhaskar Medical College (a Tertiary health care center) Moinabad, Ranga Reddy District, Telangana.

Study period: January 2021 – September 2022.

Sample Size: Convenient sample of 60 patients was taken

Study Population: Diagnosed cases of CSOM squamous type

Inclusion Criteria: Chronic otitis media patients between the age group of 10 – 60 years.

Exclusion Criteria: Patients not willing to take part in study and patients requiring revision surgeries

Data Collection: Diagnosed cases of CSOM squamous type, attending the out – patient department of ENT, Bhaskar General Hospital will be taken for the study. Sixty consecutive cases who were willing to participate were included in the study. A thorough clinical examination including tuning fork assessment, otoscopic examination and pure tone audiogram was conducted to all the patients. All these patients were sent for radiological evaluation. A HRCT was performed of the temporal region so as to assess the ossicular chain status.

Ethical Considerations: Ethical Clearance Certificate was issued by the committee. Informed consent was taken from the patients prior to enrollment in to study.

Data Analysis: The data obtained was compiled, tabulated and statistically analyzed using MS Excel and Epi-info software. Descriptive statistics are expressed in terms of percentages. Analytical statistics are expressed with help of correlation values and tests of significance.

RESULTS

A total of 60 patients with Chronic Suppurative Otitis Media (CSOM) were taken and following observations were noted.

Table 1: Distribution of study population as per age

Age group (in years)	No. of patients (%)
11 – 20	10 (16.7)
21 – 30	12 (20)
31 – 40	29 (48.3)
41 – 50	6 (10)
51 – 60	3 (5)
Total	60 (100)

In this study, it was observed that majority (48.3%) of study population were in 31 – 40 years of age group; 20% in 21 -30 years of age group and 16.7% in 11 – 20 years of age group. Around 10% of study subjects were 41 – 50 years old and 5% were 51 – 60 years old.

Table 2: Distribution of study population as per Gender

Gender	No. of patients (%)
Male	27 (45)
Female	33 (55)
Total	60 (100)

In this study, it was observed that majority (55%) of study population were females and 45% were males.

Table 3: Distribution of study population as per age and gender

Age group (in years)	Males (%)	Females (%)
11 – 20	4 (14.8)	6 (18.2)
21 – 30	6 (22.2)	6 (18.2)
31 – 40	11 (40.7)	18 (54.4)
41 – 50	4 (14.9)	2 (6.1)
51 – 60	2 (7.4)	1 (3.1)
Total	27 (100)	33 (100)

In this study, it was observed that majority (40.7%) of males and 54.4% of females were in 31 – 40 years of age group; 22.2% of males and 18.2% of females were in 21 -30 years of age group.

Table 4: Distribution of study population as per occupation

Occupation	No. of patients (%)
Student	10 (16.7)
Business	3 (5)
Farmer	40 (66.7)
Professional	7 (11.6)
Total	60 (100)

In this study, it was observed that majority (66.7%) of study population were farmers; 11.6% were professionals and 16.7% were students. Around 5% of study subjects were into business.

Table 5: Distribution of study population as per presenting complaint (Multiple options can be present)

Chief/presenting complaint	No. of patients (%)
Otorrhea	48 (80)
Hearing loss	40 (66.7)
Otalgia	35 (58.3)
Tinnitus	15 (25)
Vertigo	8 (13.3)
Facial Weakness	4 (6.6)
Swelling behind ear	6 (10)
Fever with chills and rigors	4 (6.6)

In this study, it was observed that majority (80%) of study population had war discharge; 66.7% had hearing loss and 58.3% had otalgia. Around 6.6% of study subjects had fever with chills & rigors; 13.3% had vertigo and 25% had tinnitus. Almost 10% had swelling behind ear and 6.6% had facial weakness.

Table 6: Distribution of study population as per past history

Past history	No. of patients (%)
History of Recurrent Upper Respiratory Tract Infection	21 (35)
History of Trauma to ear	3 (5)

In this study, it was observed that majority (35%) of study population had history of recurrent Upper Respiratory Tract Infection and 5% had history of trauma to ear.

Table 7: Distribution of study population as per side of ear affected

Side of ear	No. of patients (%)
Right	32 (53.3)
Left	28 (46.7)

In this study, it was observed that majority (53.3%) of study population had right side infection and 46.7% had left side ear affected.

Table 8: Distribution of study population as per type of deafness

Type of deafness	No. of patients (%)
Conductive	33 (55)
Sensorineural hearing loss	4 (6.7)
Mixed hearing loss	3 (5)

In this study, it was observed that majority (55%) of study population had conductive deafness and 6.7% had SNHL. Almost 5% had both conductive and SNHL.

Table 9: Distribution of study population as per degree of disability hearing impairment (DHI)

Degree of DHI	No. of patients (%)
Normal (<30dB)	20 (33.3)
Mild (31 – 40 dB)	21 (35)
Moderate (41 – 60 dB)	13 (21.7)
Severe (61 – 80 dB)	4 (6.7)
Profound (>80 dB)	2 (3.3)
Total	60 (100)

In this study, it was observed that majority (33.3%) of study population did not have any hearing loss. Around 35% had mild hearing loss and 21.7% had moderate hearing loss, 6.7% had severe hearing loss and 3.3% had profound hearing loss.

Table 10: Distribution of study population as per otoendoscopy findings – External Auditory canal (Multiple options can be present)

Oto endoscopy findings – External Auditory canal	No. of patients (%)
Narrow	16 (26.7)
Wide	6 (10)
Bony overhanging's	8 (13.3)
Discharge	48 (80)
Granulations	8 (13.3)

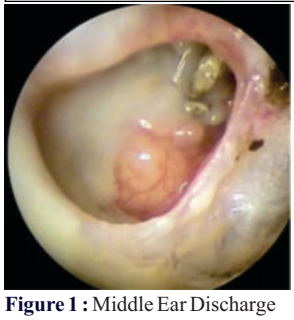

Figure 1 : Middle Ear Discharge

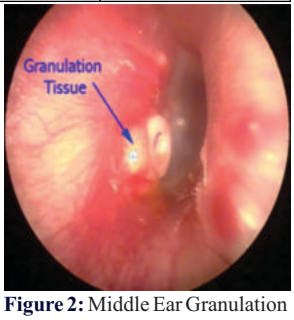

Figure 2: Middle Ear Granulation

In this study, on otoendoscopy it was observed that majority (80%) of study population had discharge; 26.7% had narrow canal and 10% had wide canal. Around 13.3% of study subjects each had bony overhanging's and granulations respectively.

Table 11: Distribution of study population as per oto-endoscopy findings – Tympanic membrane

Otoendoscopy findings – Tympanic Membrane	No. of patients (%)
Normal	4 (6.7)
Perforated	56 (93.3)
Total	60 (100)

In this study, it was observed that majority (93.3%) of study population had perforated tympanic membrane and 6.7% had normal tympanic membrane.

Table 12: Distribution of study population as per otoendoscopy findings – Perforated Tympanic membrane

Otoendoscopy findings – Perforated Tympanic Membrane	No. of patients (%)
Pars tensa/Marginal perforation	5 (8.9)
Pars tensa/Central perforation	45 (80.4)
Pars flaccida/Attic perforation	6 (10.7)
Total	56 (100)

Fig. 3 : Marginal Perforation

Fig. 4: Central Perforation

Fig. 5: Attic Perforation:

In this study, on otoendoscopy it was observed that majority (80.4%) of study population had central perforation; 8.9% had marginal perforation and 10.7% had attic perforation.

Table 13: Distribution of study population as per otoendoscopy findings – Perforated Tympanic membrane

Oto endoscopy findings – Perforated Tympanic Membrane	No. of patients (%)
Small	12 (21.5)
Moderate	28 (50)
Large	16 (28.5)
Total	56 (100)
Retraction pockets	22 (36.7)

In this study, on otoendoscopy it was observed that majority (50%) of study population had moderate degree of perforation; 21.5% had small degree of perforation and 28.5% had large degree of perforation.

Table 14: Distribution of study population as per otoendoscopy findings – Middle Ear

Otoendoscopy findings – Middle ear	No. of patients (%)
Ossicular necrosis	38 (63.3)
Round window visualization	42 (70)
Granulations	21 (35)
Polyps	18 (30)
Oedeomatous Middle Ear mucosa	21 (35)
Discharge	48 (80)

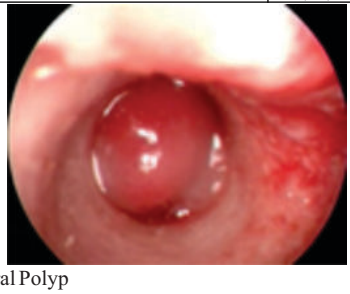

Figure 6: Aural Polyp

In this study, on oto-endoscopy it was observed that majority (80%) of study population had discharge and 63.3% had ossicular necrosis. In about 70% of patients round window could be visualized. Around 35% of study subjects had granulations and edematous middle ear mucosa each. Almost 30% of study subjects had polyps.

Table 15: Distribution of study population as per CT findings (Multiple options may be present)

CT findings	No. of patients (%)
Intact ossicles	22 (36.7)
Soft tissue mass	53 (88.3)
Attic involvement	12 (20)
Mastoid antrum involvement	28 (46.7)
Aeration mastoid absent	50 (83.3)
Malleus erosion	24 (40)
Incus erosion	30 (50)
Stapes erosion	25 (41.6)
Tegmen tympani erosion	20 (33.3)
Facial Canal dehiscent	10 (16.7)
Sinus plate erosion	10 (16.7)

Dural plate erosion	4 (6.7)
Cholesteatoma	15 (25)
Lateral semicircular canal dehiscence	19 (31.6)

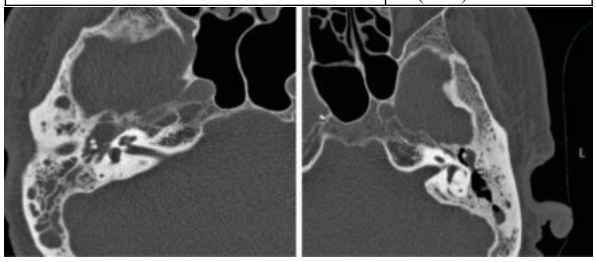

Figure 7 : HRCT Temporal Bones Showing soft tissue density in the middle ear and ossicular erosion

In this study, on CT scanning it was observed that majority (88.3%) of study population had soft tissue mass and 36.7% had intact ossicles. In about 20% of patients attic involvement was seen and 46.7% had mastoid antrum involvement. Around 83.3% had absent aeration mastoid. Almost 40% had malleus erosion, 50% had incus erosion and 41.6% had stapes erosion. Around 33.3% had tegmen tympani erosion and 16.7% each had facial canal dehiscence and sinus plate erosion. Around 6.7% had dural plate erosion and 25% had cholesteatoma and 31.6% had lateral semicircular canal dehiscence

Table 16: Distribution of study population as per Intra operative (Multiple options may be present)

Intra operative findings	No. of patients (%)
Intact ossicles	19 (31.6)
Soft tissue mass	47 (78.3)
Attic involvement	12 (20)
Mastoid antrum involvement	25 (41.7)
Aeration mastoid absent	53 (88.3)
Malleus erosion	28 (46.7)
Incus erosion	33 (55)
Stapes erosion	28 (46.7)
Tegmen tympani erosion	23 (38.3)
Facial Canal dehiscent	8 (13.3)
Sinus plate erosion	12 (20)
Dural plate erosion	6 (10)
Cholesteatoma	18 (30)
Lateral semicircular canal dehiscence	20 (33.3)

Fig. 8 : Soft tissue mass

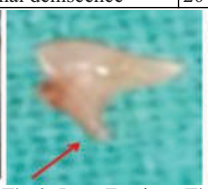

Fig. 9 : Incus Erosion

Fig. 10 : Malleus Erosion

In this study, intraoperatively it was observed that majority (78.3%) of study population had soft tissue mass and 31.6% had intact ossicles. In about 20% of patients attic involvement was seen and 41.7% had mastoid antrum involvement. Around 88.3% had absent aeration mastoid. Almost 46.7% had malleus erosion, 55% had incus erosion and 46.7% had stapes erosion. Around 38.3% had tegmen tympani erosion and 13.3% had facial canal dehiscence. Almost 20% had sinus plate erosion and 10% had dural plate erosion. About 30% had cholesteatoma and 33.3% had lateral semicircular canal dehiscence.

Table 17: Comparison of study population as per CT and Intra operative findings

Variables	CT Scan	Intra operative	Sensitivity	Specificity	PPV	NPV	Accuracy
Intact ossicles	22 (36.7)	19 (31.6)	100%	93.2%	86.3%	100%	95.2%
Soft tissue mass	53 (88.3)	47 (78.3)	100%	68.4%	88.6%	100%	90.9%
Attic involvement	12 (20)	12 (20)	100%	100%	100%	100%	100%
Mastoid antrum involvement	28 (46.7)	25 (41.7)	100%	92.1%	89.2%	100%	95.2%
Aeration mastoid absent	50 (83.3)	53 (88.3)	94.3%	100%	100%	70%	95%
Malleus erosion	24 (40)	28 (46.7)	85.7%	100%	88.8%	100%	93.3%
Incus erosion	30 (50)	33 (55)	90.9%	100%	100%	85%	94%
Stapes erosion	25 (41.6)	28 (46.7)	89.2%	100%	100%	91.4%	95%
Tegmen tympani erosion	20 (33.3)	23 (38.3)	86.9%	100%	100%	92.5%	95%
Facial Canal dehiscent	10 (16.7)	8 (13.3)	100%	95.4%	80%	100%	96.1%
Sinus plate erosion	10 (16.7)	12 (20)	83.3%	100%	100%	96%	96.6%
Dural plate erosion	4 (6.7)	6 (10)	66.7%	100%	100%	96.4%	96.6%
Cholesteatoma	15 (25)	18 (30)	83.3%	100%	100%	93.3%	95%
Lateral semicircular canal dehiscence	19 (31.6)	20 (33.3)	95%	100%	100%	97.5%	98.3%

In this study, CT findings and intra operative findings were compared and it was noted that CT scanning had highest sensitivity of 100% in identifying intact ossicles, soft tissue mass, attic involvement, mastoid antrum involvement and facial canal dehiscence. A sensitivity of 94.3% was noted in identification of aeration mastoid absence, 85.7% - malleus erosion, 90.9% - Incus erosion, 89.2% - stapes erosion, 86.9% - tegmen tympani erosion, 83.3% - sinus plate erosion, 66.7% - dural plate erosion, 83.3% - Cholesteatoma and 95% for lateral semicircular canal dehiscence.

In this study, CT findings and intra operative findings were compared and it was noted that CT scanning had highest specificity of 100% in identifying attic involvement, aeration mastoid absence, malleus erosion, Incus erosion, stapes erosion, tegmen tympani erosion, sinus plate erosion, dural plate erosion, Cholesteatoma and lateral semicircular canal dehiscence. A 95.4% Specificity was observed for facial canal dehiscence, 93.2% - intact ossicles, 68.4% - soft tissue mass, 92.1% - mastoid antrum involvement.

In this study, CT findings and intra operative findings were compared and it was noted that CT scanning had highest positive predictive value of 100% in identifying attic involvement, aeration mastoid absence, Incus erosion, stapes erosion, tegmen tympani erosion, sinus plate erosion, dural plate erosion, Cholesteatoma and lateral semicircular canal dehiscence. 80% of PPV was noted for facial canal dehiscence, 86.3% - intact ossicles, 88.6% - soft tissue mass, 89.2% - mastoid antrum involvement and 88.8% - malleus erosion.

In this study, CT findings and intra operative findings were compared and it was noted that CT scanning had highest negative predictive value of 100% in identifying intact ossicles, soft tissue mass, attic involvement, mastoid antrum involvement, malleus erosion and facial canal dehiscence. A NPV of 70% was noted in identification of aeration mastoid absence, 85% -Incus erosion, 91.4% - stapes erosion, 92.5% - tegmen tympani erosion, 96% - sinus plate erosion, 96.4% - dural plate erosion, 93.3% - Cholesteatoma and 97.5% for lateral semicircular canal dehiscence.

The accuracy of CT in identifying the pathology was greater than 90% for all the parameters. Highest accuracy (100%) was noted for identification of attic involvement; 95.2% - intact ossicles; 90.9% - soft tissue mass; 95.2% - mastoid antrum absence; 95% - aeration mastoid absence; 93.3% - malleus erosion; 94% - incus erosion; 95% - stapes erosion; 95% - tegmen tympani erosion; 96.1% - facial canal dehiscence; 96.6% - sinus plate and dural plate erosion each; 95% - cholesteatoma and 98.3% - lateral semicircular canal dehiscence.

Table 18: Comparison of study population as per oto-endoscopy and CT findings

Variables	Otoendoscopy	CT scan	Sensitivity	Specificity	PPV	NPV	Accuracy
Intact ossicles	22 (36.7)	22 (36.7)	100%	100%	100%	100%	100%

Tympanic membrane perforation	56 (93.3)	56 (93.3)	100%	100%	100%	100%	100%
Attic involvement	8 (13.3)	12 (20)	66.7%	100%	100%	92.3 %	93.3 %
Ossicular necrosis	38 (63.3)	38 (63.3)	100%	100%	100%	100%	100%
Cholesteatoma	12 (20)	15 (25)	80%	100%	100%	93.7 %	95%

In this study, CT findings and oto endoscopy findings were compared and it was noted that oto endoscopy had highest sensitivity of 100% in identifying intact ossicles, tympanic membrane perforation, ossicular necrosis. 80% sensitivity was noted for cholesteatoma and 66.7% for attic involvement.

In this study, CT findings and otoendoscopy findings were compared and it was noted that otoendoscopy had highest specificity of 100% in identifying intact ossicles, tympanic membrane perforation, attic involvement ossicular necrosis and cholesteatoma.

In this study, CT findings and otoendoscopy findings were compared and it was noted that otoendoscopy had highest PPV of 100% in identifying intact ossicles, tympanic membrane perforation, attic involvement ossicular necrosis and cholesteatoma.

In this study, CT findings and otoendoscopy findings were compared and it was noted that otoendoscopy had highest NPV of 100% in identifying intact ossicles, tympanic membrane perforation and ossicular necrosis. A 93.7% NPV was found for cholesteatoma and 92.3% for attic involvement.

The accuracy of otoendoscopy in identifying the pathology in CSOM patients was very high. About 100% accuracy was noted for intact ossicles, tympanic membrane perforation and ossicular necrosis. A 95% of accuracy was found for cholesteatoma and 93.3% for attic involvement.

Table 19: Comparison of study population as per otoendoscopy and Intraoperative findings

Variables	Otoendoscopy	Intra operative	Sensitivity	Specificity	PPV	NPV	Accuracy
Intact ossicles	22 (36.7)	19 (31.7)	100%	93.1%	86.3%	100%	95.2%
Tympanic membrane perforation	56 (93.3)	56 (93.3)	100%	100%	100%	100%	100%
Attic involvement	8 (13.3)	12 (20)	66.7 %	100%	100%	92.3%	93.3%
Ossicular necrosis	38 (63.3)	41 (68.3)	92.6 %	100%	100%	86.3%	95%
Cholesteatoma	12 (20)	18 (30)	66.7 %	100%	100%	87.5%	90%

In this study, otoendoscopy findings and intraoperative findings were compared and it was noted that otoendoscopy had highest sensitivity of 100% in identifying intact ossicles, tympanic membrane perforation. Around 66.7% of sensitivity for attic involvement, 92.6% - ossicular necrosis and 66.7% for cholesteatoma.

In this study, otoendoscopy findings and intra operative findings were compared and it was noted that otoendoscopy had highest specificity of 100% in identifying tympanic membrane perforation, attic involvement ossicular necrosis and cholesteatoma. A 93.1% of specificity was noted for intact ossicles identification.

In this study, otoendoscopy findings and intra operative findings were compared and it was noted that otoendoscopy had highest PPV of 100% in identifying tympanic membrane perforation, attic involvement ossicular necrosis and cholesteatoma. A 86.3% of PPV was noted for intact ossicles identification.

In this study, otoendoscopy findings and intra operative findings were compared and it was noted that otoendoscopy had highest NPV of 100% in identifying intact ossicles and tympanic membrane perforation. A 92.3% NPV was noted for attic involvement, 86.3%-ossicular necrosis and 87.5% for cholesteatoma.

The accuracy of otoendoscopy in identifying the pathology in CSOM patients was very high. About 100% accuracy was noted for tympanic membrane perforation; 95.2% - intact ossicles, 93.3% - attic involvement; 95% - ossicular necrosis and 90% for cholesteatoma.

Table 20: Comparison of study population as per oto-endoscopy, CT and Intraoperative findings

Variables	Oto-endoscopy	CT Scan	Intra operative	P value
Intact ossicles	22 (36.7)	22 (36.7)	19 (31.7)	0.01*
Tympanic membrane perforation	56 (93.3)	56 (93.3)	56 (93.3)	0.01*
Attic involvement	8 (13.3)	12 (20)	12 (20)	0.04*
Ossicular necrosis	38 (63.3)	38 (63.3)	41 (68.3)	0.02*
Cholesteatoma	12 (20)	15 (25)	18 (30)	0.5

*statistically significant

In this study, it was observed that intact ossicles, tympanic membrane perforation, attic involvement and ossicular necrosis can be predicted accurately with otoendoscopy and CT scan prior to uptake of patient for surgery.

DISCUSSION

In this study, it was observed that majority (48.3%) of study population were in 31 – 40 years of age group; majority (55%) of study population were females and 45% were males. Majority (80%) of study population had war discharge; 66.7% had hearing loss and 58.3% had otalgia. Around 6.6% of study subjects had fever with chills & rigors; 13.3% had vertigo and 25% had tinnitus. Almost 10% had swelling behind ear and 6.6% had facial weakness.

In the present study, majority (55%) of study population had conductive deafness and 6.7% had SNHL. Almost 5% had both conductive and SNHL.

On oto-endoscopy it was observed that majority (80.4%) of study population had central perforation; 8.9% had marginal perforation, 10.7% had attic perforation and 63.3% had ossicular necrosis.

CT scanning revealed that majority (88.3%) of study population had soft tissue mass and 36.7% had intact ossicles. In about 20% of patients attic involvement was seen and 46.7% had mastoid antrum involvement. Around 83.3% had absent aeration mastoid. Almost 40% had malleus erosion, 50% had incus erosion and 41.6% had stapes erosion. Intraoperatively it was observed that majority (78.3%) of study population had soft tissue mass and 31.6% had intact ossicles. In about 20% of patients attic involvement was seen and 41.7% had mastoid antrum involvement. Around 88.3% had absent aeration mastoid. Almost 46.7% had malleus erosion, 55% had incus erosion and 46.7% had stapes erosion.

It was observed that CT scanning had highest sensitivity of 100% in identifying intact ossicles, soft tissue mass, attic involvement and highest specificity of 100% in identifying attic involvement, aeration mastoid absence, malleus erosion, Incus erosion, stapes erosion and Cholesteatoma.

In this study, highest accuracy (100%) was noted for identification of attic involvement followed by intact ossicles (95.2%) for HRCT temporal bone. In this study, the accuracy of oto-endoscopy in identifying the pathology in CSOM patients was very high. About 100% accuracy was noted for intact ossicles, tympanic membrane perforation and ossicular necrosis. A 95% of accuracy was found for cholesteatoma and 93.3% for attic involvement.

In this study, it was also observed that intact ossicles, tympanic membrane perforation, attic involvement and ossicular necrosis can be predicted accurately with otoendoscopy and CT scan prior to uptake of patient for surgery.

CONCLUSIONS & RECOMMENDATIONS:

In this study, it was observed that intact ossicles, tympanic membrane perforation, attic involvement and ossicular necrosis can be predicted accurately with oto-endoscopy and CT scan prior to uptake of patient for surgery. HRCT temporal bone imaging should be used as an investigative tool in pre-operative evaluation of chronic suppurative otitis media attico-antral disease cases. Early diagnosis of the bony status, granulations, discharge, facial canal dehiscence with the help of

HRCT temporal bone can help the surgeon in predicting the prognosis of patient better preoperatively.

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