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A Study of Correlation between Clinical Features, Radiological and Operative Findings in Safe and Unsafe CSOM

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Abstract

Background: Chronic Suppurative Otitis Media (CSOM) is one of the most common chronic childhood infections worldwide. People are relatively less aware regarding the complications of this disease and so less effective measures are employed resulting in high rate of complications. **Aims:** 1. To evaluate the relation of the clinical features with intraoperative findings in CSOM, and 2. To compare the preoperative X-ray/HRCT findings with intraoperative findings in patients with safe and unsafe CSOM with or without complications. **Methods and Methodology:** A total number of 100 patients of CSOM were included after they satisfied the eligibility criteria. Written informed consent was taken from all the study participants. The standard procedure of examination of ear, nose, throat, oral cavity was carried out on each patient in the outpatient department of the hospital. The detailed history of the patient was as per the proforma. Dry aural toilet was done to remove adherent debris. Otoscopic examination was done and the details were noted. **Results and Conclusion:** CT scan and X-ray have proved to be valuable diagnostic tools in determining the accuracy with which there was an agreement (correlation) between the clinical features, intraoperative findings and radiological findings in safe and unsafe CSOM. It was determined by the kappa coefficient using SPSS statistical analysis software.

Keywords: Chronic Suppurative Otitis Media, Complications, ENT

1. Introduction

Chronic Suppurative Otitis Media (CSOM) is the chronic inflammation of the middle ear cleft which is composed of Eustachian tube, hypotympanum, mesotympanum, epitympanum, aditus and mastoid air cells which presents with recurrent ear discharge through tympanic membrane perforation[1]. Continuing mucosal infection of the middle ear by resistant organisms, nasopharynx with secondary infection of the middle ear cleft and mucosal changes of

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the middle ear secondary to eustachian tube dysfunction may contribute to the development of chronic otitis media[2]. Clinically CSOM is of two types- tubotympanic type (safe)and atticoantral type (unsafe) depending on the likelihood of developing complications, that can be life threatening and may involve the vital structures such as facial nerve, inner ear, and intracranial components.[3,4]

In a study done by Sandeep and colleagues, intraoperative finding showed around 66% cases with granulation in attic, aditus and antrum. Surprisingly 2% cases had cholesteatoma sac and histopathological finding of the specimens taken showed cholesteatoma in 8% of cases[5]. Similarly, in a Japanese study, 28 of 2948 years with central perforation of the Tympanic membrane had cholesteatoma[6].

In the past, people were relatively less aware regarding the complications of this disease[7]. In the modern era, frequency of complications is markedly reduced due to aggressive treatment but still in developing countries, the complications are comparatively higher leading to any disability or even death[7,8].

2. Material and Methods

A Prospective study was done in the Department of Ear Nose Throat of a Medical College and Tertiary Health care centre for 2 Years from August 2015 to August 2017 in a sample Size of 100 Patients.

- Eligibility Criteria**:**
  - Inclusion Criteria:
- patients with tubotympanic type of CSOM.
- patients with atticoantral type of CSOM.
- patients with complications of CSOM.
  - Exclusion Criteria:
- suspicion of ear pathology to be malignant.
- congenitally ear disease.
- patients unfit for ear surgery.
- old operated ear cases.

Table 1. Agreement (Correlation) between otoscopic findings and surgical findings

Type of Perforation	Clinical findings (N=100)		Surgical finding(N=100)	
	Number	Percentage	Number	Percentage
Anterosuperior	4	4 %	4	4 %
Anteroinferior	7	7 %	7	7 %
Posterosuperior	3	3 %	3	3 %
Posteroinferior	4	4 %	4	4 %
Central	9	9 %	9	9 %
Marginal	1	1 %	1	1 %
Anterior	5	5 %	5	5 %
Posterior	3	3 %	3	3 %
Subtotal	4	4 %	3	3 %
Size of Perforation				
Small	21	21 %	21	21 %
Medium	14	14 %	15	15 %
Large	5	5 %	3	3 %
Cholesteatoma				
Attic Cholesteatoma	53	53 %	54	54 %
Posterosuperior Chol.	06	06 %	05	05 %
Granulation tissue	02	02 %	01	01 %
Both	18	18 %	19	19 %
Polyp	06	06 %	06	06 %

3. Methodology

The standard procedure of examination of ear, nose, throat, oral cavity was carried out on 100 patients in the outpatient department of the hospital after they satisfied the eligibility criteria. Written informed consent was obtained from all the study participants. The detailed history of the patient was taken as per the proforma.

Table 2. Sensitivity andspecificity of otoscopy in diagnosis of disease of ear among CSOM study subjects (correlation between otoscopic findings and surgical findings)

	Pathology seen on surgery	Otoscopic findings	Sensitivity	Specificity
Perforation	39	40	100 %	97.5%
Cholesteatoma	59	59	100%	100%
Granulation tissue	01	02	100%	50%
Both	19	18	94.7%	100%
Polyp	06	06	100%	100%
Chi Square Value	0.369			
Significance 'p' Value	0.985(NS)			

Table 3. Agreement (correlation) between radiological findings and surgical findings

Finding	Radiological finding(N=59)		Surgical findings (N=59)	
	Number	Percentage	Number	Percentage
Malleus Head	13	22.03%	13	22.03%
Malleus Handle	03	5.08%	03	5.08%
Malleus	03	5.08%	03	5.08%
Incus Body	24	40.67%	24	40.67%
Incus Long Process	16	27.11%	16	27.11%
Incus	14	23.72%	14	23.72%
Stapes Suprastructure	32	54.23%	34	57.6%
Stapes footplate	0	0.0%	01	1.69%
Sinus Plate	2	3.38%	2	3.38%
Dural plate	2	3.38%	2	3.38%
Mesotympanum	33	55.9%	33	55.9%
Posterior tympanum	40	67.8%	40	67.8%
Epitympanum	55	93.22%	55	93.22%
Plffistula	5	8.47%	5	8.47%
Hypotympanum	29	49.15%	29	49.15%
Antrum	53	89.8%	55	93.2%
Aditus	43	72.8%	46	77.9 %
Mastoid Tip	44	74.5%	44	74.5%
Fascial Dehiscent	3	5.08 %	0	5.08 %

Dry aural toilet was done daily to remove adherent debris. Otoscopic examination was done. Septic foci in the nose and throat were tackled prior to ear surgery.

Correlation of the CT scan and surgical findings for bone erosion was determined by the kappa coefficient and the data collected was analysed using statistical software

4. Observations and Results

Table 1 reveals Agreement (Correlation) between Otoscopic findings and Surgical findings. By Otoscopic examination in 40 cases perforation found while by surgical exploration 39 cases had perforation. Agreement was good. In Otoscopy 14 & 5 cases had medium and large perforation while on surgical exploration, 15 had medium and 3 had large size perforation. Attic and Posterosuperior Cholesteatoma were found in 53 & 6 cases by otoscopy while on surgical exploration, it was 54 & 5 respectively. Granulation tissue was seen only in one case during surgery. Polyp was seen in 6 % cases by both.

Table 2 reveals Sensitivity and Specificity of Otoscopy in diagnosis of disease of ear among CSOM study

Table 4. Sensitivity andspecificity of HRCT temporal in diagnosis of erosion of ossicles among CSOM study subjects (correlation between radiological findings and surgical findings)

Finding	Radiological finding(N=59)	Surgical findings (N=59)	Sensitivity	Specificity
	Number	Number		
Malleus Head	13	13	100%	100%
Malleus Handle	03	03	100%	100%
Malleus	03	03	100%	100%
Incus Body	24	24	100%	100%
Incus Long Process	16	16	100%	100%
Incus	14	14	100%	100%
Stapes Suprastructure	32	34	94%	100%
Chi Square Value	1.02			
p-Value	0.995 (Not Significant)			

Table 5. Correlation between radiological findings and surgical findings (Disease extention in Middle Ear)

Finding	Radiological finding (N=59)	Surgical findings (N=59)	Sensitivity	Specificity
	Number	Number		
Sinus Plate	2	2	100 %	100%
Dural plate	2	2	100 %	100%
Mesotympanum	33	33	100 %	100%
Posterior tympanum	40	40	100 %	100%
Epitympanum	55	55	100 %	100%
Plffistula	5	5	100 %	100%
Hypotympanum	29	29	100 %	100%
Antrum	53	55	96.4%	100%
Aditus	43	46	93.4%	100%
Mastoid Tip	44	44	100 %	100%
Chi Square Value	3.13			
Significance p-Value	0.926(NS)			

subjects (Correlation between Otoscopic findings and Surgical findings). ROC Curve analysis was done to find out sensitivity and specificity. Otoscopy diagnosed Cholesteatoma and polyp with 100% Sensitivity and 100% Specificity. Perforation was diagnosed by otoscopy with 100% Sensitivity and 97.5% Specificity. Otoscopy diagnosed Granulation tissue with 100% Sensitivity and 50.0% Specificity. Cholesteatoma with granulation tissue was diagnosed by otoscopy with 94.7% Sensitivity and 100 % Specificity. Chi square analysis was also done to find association between HRCT temporal and surgical findings. It shows there is no significant difference in finding of both **(p=0.995)**.

Table 3 reveals Agreement (Correlation) between Radiological findings and Surgical findings. Among most of the findings, good agreement was seen. Stapes Suprastructure was seen in 32 cases by HRCT while on surgical exploration it was seen on 34 cases. Stapes foot plate was not seen by HRCT while it was seen in one case on surgical exploration. Antrum and aditus was seen in 53 and 43 cases by HRCT while on surgical exploration it was seen in 55 & 46 cases respectively. Fascial Dehiscent was not seen on surgical exploration which was diagnosed in 3 cases by HRCT.

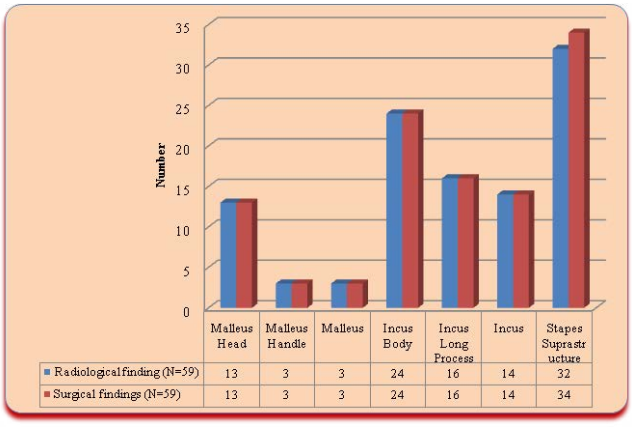

Figure 1. Correlation between radiological findings and surgical findings(Ossicles).

Table 4 and Figure 1 reveal Sensitivity and Specificity of HRCT Temporal in diagnosis of erosion of ossicles among CSOM study subjects. It was done by ROC curve analysis. CT diagnoses accurately erosion of Malleus, handle of malleus, head of malleus, Incus body, incus process and incus with 100% sensitivity and specificity. It diagnoses erosion of Stapes Suprastructure with 94% sensitivity and 100% specificity. CT shows inconsistent visualization of stapes foot plate in our study and cannot detect erosive changes of stapes foot plate. Chi square analysis was also done to find association between HRCT temporal and surgical findings. It shows there is no significant difference in finding of both **(p=0.995).**

Table 5 and Figure 2 reveal Sensitivity and Specificity of HRCT Temporal in diagnosis of extension of disease in middle ear among CSOM study subjects. It was done by ROC curve analysis. CT diagnoses accurately Mesotympanum, Posterior tympanum, Epitympanum and hypotympanum with 100% sensitivity and 100% specificity. It diagnoses Antrum with 96.4% sensitivity and 100% specificity and it diagnose Aditus with 93.4% sensitivity and 100 specificity. Chi square analysis was also done to find association between HRCT temporal and surgical findings. It shows there is no significant difference in finding of both **(p=0.926).**

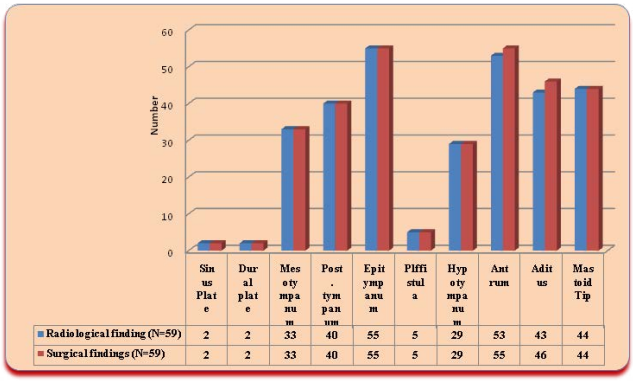

Figure 2. Correlation between radiological findings and surgical findings (Disease extention in Middle Ear).

5. Discussion

A total of 100 cases were studied. Majority of patients had ottorhea and decreased hearing as predominant symptoms and having otosopic diagnosis of disease in pars tensa region, posterosuperior and attic region, requiring mastoid exploration and tympanoplasty, were treated in ENT Department of our hospital within the period of 3 year.

Joselito L, Gaurano MD, Ismail A Joharjy, MD conducted retrospective review of CT scan and surgical and histopathological reports in 64 patients with middle ear cholesteatoma. CT scans were evaluated for presence of intra tympanic non dependent soft tissue density, extent of middle ear involvement, bone expansion and thinning and bone erosion involving ossicles and adjacent structure.

Another study carried out at PGI Chandigarh "Study of Clinico Pathological and Radiological Spectrum of Cholesteatoma in Children and Correlation of Computerized Tomographic Findings with Surgical Findings" by Dr. Prahalada N.B. This study consisted of 25 children below 14 years of chronic, suppurative, otitis media of unsafe type requiring mastoid exploration, admitted with the Otolaryngology services of the Nehru Hospital, PGIMER, Chandigarh. Both these studies are comparable with our study.

In our study, on CT scan aditus and antrum was the commonest site of involvement by disease in 72% and 89% respectively. Same results were obtained in PGI study (84%, 88%) and Joselito Study (67%, 85%). In our study, malleus and incus body were erosed in 42.3% and 47.4%, stapes suprastructure was erosed in 61.01% cases. While joselito found stapes to be eroded in 65.62% on HRCT and malleous and incus in 40% and 75%. In both studies bone erosion was seen in more patients compared to our study because they studied only cases with cholesteatoma.

In our study, on surgical exploration disease was present, in aditus in 48% and in antrum in 57%. Stapes suprasturcture was the most common ossicle to be eroded followed by incus body and malleus. PGI study shows incus to be eroded in 68% followed by malleus 64% and stapes (24%). More cases with ossicular erosion were seen per operatively as they studied only cases with cholesteatoma.

CT scan was 100% sensitive and 100% specific for epitympanum and 100% sensitive and 100% specific for antrum. These results are in consonance with PGI study with 95% sensitivity, 100% specificity for epitympanum and 95% sensitivity, 66% specificity for antrum.

In our study CT scan was 100% sensitive and specific in identifying erosion of malleous while 100% sensitive and 100% specific for erosion of incus. Stapes shows inconsistent visualization in both our study and PGI study. However joselito find agreement of 92% of cases of stapes erosion with CT scan.

Cases of brain abcess were with 100% agreement in both our study and joselito study. Sensitivity and Specificity of HRCT Temporal in diagnosis of extension of disease in middle ear among CSOM study subjects. It was done by ROC curve analysis. CT diagnoses accurately Mesotympanum, Posterior tympanum, Epitympanum and hypotympanum with 100% sensitivity and 100% specificity. It diagnoses Antrum with 96.4% sensitivity and 100 specificity, and it diagnose Aditus with 93.4% sensitivity and 100 specificity. Chi square analysis was also done to find association between HRCT temporal and surgical findings. It shows there is no significant difference in finding of both **(P value = 0.926).**

Sensitivity and Specificity of HRCT Temporal in diagnosis of erosion of ossicles among CSOM study subjects. It was done by ROC curve analysis. CT diagnoses accurately erosion of Malleus, handle of malleus, head of malleus, Incus body, incus process and incus with 100% sensitivity and specificity. It diagnoses erosion of Stapes Suprastructure with 94% sensitivity and 100% specificity. CT shows inconsistent visualization of stapes foot plate in our study and cannot detect erosive changes of stapes foot plate. Chi square analysis was also done to find association between HRCT temporal and surgical findings. It shows there is no significant difference in finding of both **(P value = 0.995).**

Tegmen tympani - overlying the epitympanum and antrum, tegmen is thin bony roof that is clearly visualized on coronal sections. In 2 patients tegmen was completely erosed and showing temporal lobe abscess in CT scan. During operation it was in complete agreement with CT scan.

Sinus tympani-in 2 patient's sinus plate was eroded with mastoid abcess and cerebellar extension same thing was observed during surgery.

6. Conclusion

- Most of patients with CSOM unsafe having disease in attic region presents with chief complains of decreased hearing (80%) followed by decrease hearing (60%).
- CSOM is more common in third decades with more incidence in females (1.5 times).
- Otosopy and confirmation by microscopy is to clinical diagnosis of disease in attic region.
- Attic Cholesteatoma is most common finding (53%) followed by PSQ Cholesteatoma (6%) followed by cholesteatoma with granulation tissue (18%) and granulation tissue (2%).
- Most of patients presents with (86%) conductive hearing loss suggesting bone (ossicular) erosive property of disease.
- On HRCT epitympanum, aditus and antrum was the commnest site of involvemeny by disease in 93%, 72.8% and 89% respectively.

- CT scan is 100%sensitive in diagnosing disease in epitympanum and 96.4% sensitive in antrum and 93.4% in aditus.
- The HRCT found to be very sensitive (96%) in diagnosing cholesteatoma accurately. However, HRCT could not differentiate cholesteatoma from granulation.
- Role of HRCT early in the course of disease can potentially reduce the risk of late complications associated with under diagnosed cholesteatoma. Therefore, HRCT is the method of choice for examination of middle ear structure and pathology in unsafe otitis media.
- CT scan is 100% sensitive and specific in identifying erosion of malleous while 100% sensitive and 100% specific in identification of erosion of incus. Stapes shows inconsistent visualization.
- On surgical exploration cholesteatoma or granulation tissue or both are the commonest surgical finding (78%).
- On surgical exploration Attic aditus and antrum (key area) is the commnest site of involvement.

7. References

1. Jahn AF. Chronic otitis media: Diagnosis and treatment, Med. Clin. North Am. 1991; 75(6):1277–91. http:// www.ncbi.nlm.nih.gov/pubmed/1943320, https://doi.org/10.1016/S0025-7125(16)30388-1.
2. Hall IS, Colman BH. Diseases of Nose, Throat, Ear and Head and Neck; 1987.
3. Goycoolea M, Ruah C, Bequer N. Otitis media: The pathogenesis approach. General surgical approach based on pathogenesis. An overall approach, Otolaryngol Clin. N. Am. 1991; 24(4):957–66.
4. Varshney S, Nangia A, Bist SS, Singh RK, Gupta N, Bhagat S. Ossicular chain status in chronic suppurative otitis media in adults, Indian J. Otolaryngol Head Neck Surg. 2010; 62(4):421–26. DOI: https://doi.org/10.1007/s12070-010-0116-3. PMid: 22319706, PMCid: PMC3266081.
5. Sandeep S. How safe is safe ear? A Hospital Based Study, Int. J. Sci. Study. 2014; 2(2):3–6.
6. Yuasa Y, Yuasa R. Cholesteatoma with Central perforation of tympanic membrane, Otol Japan. 2005; 15(2):129–32.
7. Alam J, Zaidi SH, Mohammad I, Hasan S, Siddiqui I, Ahmed R. Is cholesteatoma on the decline, Pak. J. Otolaryngol. 1999; 15:2–3.
8. Datta PG, Das Chowdhury RK, Newton VE. Epidemiological survey of chronic suppurative otitis media in Banglades, Spec Q. KARACHI. 1995; 12:31–38.

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