**Original Research Article**

# Comparative Study Between Radiological Findings AndIntra-Operative Findings In Patients With Unsafe CSOM – A Prospective Cross Sectional Study.

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**Abstract:**
**Background**: Unsafe chronic suppurative otitis media (atticoantral) is one of the common conditions in otolaryngologic practice in developing countries.The disease manifests most commonly as hearing loss and otorrhea. Unsafe CSOM has long been acknowledged as one of the most common diagnoses in primary care setting worldwide.Severalinvestigations have been used in the evaluation of CSOM like X ray, HRCT, and MRI.

**Method:** Prospective comparative study conducted From May 2021 to April 2023 at tertiary care hospital .70 patients presenting to ENT OPD and casualty and getting operated for unsafe CSOM are included in the study. Demographic data, nature of ear discharge, and presence or absence of symptoms showing complications, otoscopic examination, hearing assessment by Pure tone Audiometry was recorded for all the patients. Radiological investigations namely-X-RAY MASTOID SCHULLER'S VIEW and HRCT TEMPORAL BONE were advised to all the patients. NCCT BRAIN was done to rule out or detect intracranial complications in selected cases suspicious of having the same.
**Results**: In our study the patients were between 5 to 66 years of age with mean age of 26.2 years, showed a male preponderance. the commonest complaint was otorrhoea (100%) Most, 68(97.14%) patients, presented with complaints of foul smelling discharge, Blood- stained discharge is often noted with granulation tissue or polyps and was presented by 31 (44.29%) patients, Tympanic membrane pathology was noted in 34 (48.57%) patients with perforation in 15 (21.42%) patients and retraction pockets in 19(27.14%) patients. Among 70 patients 57 (81.43%) patients were found to have mastoid sclerosis on digital X-ray mastoid Schuller's view, Pre operative HRCT could diagnose soft tissue density suspicious of cholesteatoma in all 70 (100%).Bony erosion, an additional sign for the presence of cholesteatoma was identified in 25(35.71%) case. HRCT was 100% sensitive for cholesteatoma in petrous apex followed by mastoid antrum 97.1 %, aditus 97

%,and epitympanum 94.9 %, HRCT to be 80% sensitive and 86.7 % specific in identifying ossicular destruction. Out of 70 patients, NCCT Brain was done in 20 (28.57%) patients. In out of 20 patients, 3 (4.28%) patients had abnormal findings.
**Conclusions:** We made an attempt to compare the usability of radiological findings (X-ray, HRCT, and NCCT) in preoperative assessment of unsafe CSOM but **INTRAOPERATIVE FINDINGS** by skillful surgeon still remains the mainstay of successful diagnosis and treatment of unsafe CSOM.

**Keywords:** Cholesteatoma; mastoidectomy; attico-antral. .X-ray , HRCT temporal bone

## Introduction

Chronic suppurative otitis media (CSOM) is the chronic inflammation of the lining formed by mucoperiosteum ofthe middle ear cleft.Overcrowding, poor socioeconomic status, illiteracy and poor hygiene are all factors, which play an essential role in this disease. CSOM as per estimation affects 65 to 330 million individual globally. India has the second highest prevalence of chronic suppurative otitis media (7.8%) in the world. The disease burden of chronic suppurative otitis media accounts for 91% of childhood and young adulthood hearing impairment in India[1]. In developing countries like India due to certain social customs and widespread lack of health care facilities the incidence of the disease is very high and patients do not seek medical treatment until the disease is fairly advanced. Middle ear infection is the commonest cause of tympanic membrane perforation[2]. Unsafe chronic suppurative otitis media (atticoantral) is one of the common conditions in otolaryngological practice in developing countries. Its importance lies in the fact that it is associated with high morbidity and at times even with mortality. The diagnosis of CSOM is made clinically by otoscopic examination, in addition to microscopic and endoscopic evaluation. Special imaging as computed tomography (CT) and magnetic resonance imaging (MRI), may suggest the presence of cholesteatoma within the temporal bone, and may be used to complement the clinical diagnosis[3]. With the availability of antibiotics, operating microscope, the microsurgical operating instruments and advanced radiological imaging, it has become easier to successfully treat atticoantral type of chronic suppurative otitis media. It can be with or without cholesteatoma. It is one of the most fascinating and challenging task in otology when studying its various aspects in depth. This has stimulated much research and debates worldwide[4,5]. The most common locations of cholesteatoma are the attic, posterior mesotympanum; although they may develop anywhere within the pneumatized portions of the temporal bone. Cholesteatoma may be acquired or congenital, with a similar morphologic appearance[6]. In attic cholesteatoma, erosion of the scutum (the first sign of aural cholesteatoma) in the coronal view can be assessed clearly. Bony erosion occurs more commonly in the long process of the incus, the body of the incus, and the head of the malleus. Cholesteatoma of the pars tensa extends to the long process of the incus and the superstructure of the stapes. Expansion of aditus ad antrum increases the probability of attic cholesteatoma[7].Every cholesteatoma demands a surgical approach for management. The difficulty of eradicating the invasive disease in the complex anatomy of the temporal bone demands prior radiological imaging to guide the surgeons in their surgical approach to get an idea about the extent of disease. The history of radiology of chronic suppurative otitis media dates back to**1905**, when **Schuller** described the first view to visualize pathologic lesions in the area frequently involved in chronic ear disease, namely attic–aditus–antrum or the key area. Otoscopic examination is the most important diagnostic technique. In primary acquired cholesteatoma, a retraction pocket is seen in the attic and contains keratin debris.HRCT temporal bone has significantly altered the contribution of radiological imaging in pre-operative diagnosis of cholesteatoma of middle ear cleft. It also allows identification of potential risks such as bony dehiscence of the tegmen tympani, fallopian canal, jugular bulb, sigmoid sinus and lateral semicircular canal fistulas and thus makes the surgeon well aware before surgery. Co-operation between radiologist and an otologist sufficiently flexible to tailor surgical management according to radiological findings is the ideal. This study was done to evaluate clinical presentation and to find correlation between pre-operative radiological findings and intra-operative

findings in patients with unsafe chronic suppurative otitis media. The role, value and impact of these investigations in detection, evaluation, and diagnosis of unsafe chronic suppurative otitis media are assessed.

**Materials and Method**

This is a prospective study conducted From May 2021 to April 2023 at tertiary care hospital. After obtaining approval from the institutional ethical committee this study was done on 70 patients with CSOM. Written informed consent was obtained from patients. Each case was assessed for following parameters-age, sex, socioeconomic strata, laterality of ear complaints, nature of ear discharge (profuse, scanty, foul smelling, blood stained), presence or absence of symptoms showing complications (otalgia, vertigo, headache, vomiting, post-aural swelling, facial weakness), otoscopic examination, hearing assessment by Pure tone Audiometry. Radiological investigations namely-X-RAY MASTOID SCHULLER'S VIEW and HRCT TEMPORAL BONE were advised to all the patients. NCCT BRAIN was done to rule out or detect intracranial complications in selected cases suspicious of having the same. Parameters like Presence or absence of soft tissue density lesion, Presence or absence of bone erosion, Presence or absence of ossicular erosion, Extent of disease at various sites of temporal bone and Involvement of ear ossicles due to disease were noted.

**Results**

In this comparative type of prospective study a total number of 70 cases were studied in detail.
In our study the patients were between 5 to 66 years of age with mean age of 26.2 years (Table1). The overall sex distribution showed a male preponderance. Overall 62.86 % were males while 37.14 % were females (Table2). The commonest complaint was otorrhoea (100%) Most, 68(97.14%) patients, presented with complaints of foul smelling discharge.58 (82.85%) patients present with scanty ear discharge. Blood- stained discharge is often noted with granulation tissue or polyps and was presented by 31 (44.29%) patients, which were supported by the presence of granulation tissue with or without cholesteatoma on otoscopic examination and all these cases correlates well with surgical findings. In 18(25.71%) patients findings were misleading as profuse discharge was seen which is not a characteristic of atticoantral CSOM. (Table3). There were 11 (15.71%) cases which showed characteristic cholesteatoma flakes on examination, with or without granulation tissue or polyp. All these were in agreement with the surgical findings. 12 (17.14%) cases showed granulation tissue on examination (Table4). In this study of the 70 patients reviewed, 57 (81.43%) patients were found to have mastoid sclerosis on digital X-ray mastoid Schuller's view. Out of these 57 patients ,36 (51.42%) patients had lytic shadow and in 21 (30%) patients lytic shadow was absent.13 (18.57%) cases showed pneumatisation on X-ray. Lytic shadow on X-ray is suggestive of various pathologies such as- Cholesteatoma, large antral cell, large periantral cell, and operated mastoidectomy cavity, chronic mastoiditis with granulations, multiple myeloma, eosinophilic granuloma, tuberculosis, malignancy or metastasis from kidney, bronchus or breast malignancy (Table 5). HRCT could diagnose soft tissue density suspicious of cholesteatoma in all 70 (100%).(Table 6). Bony erosion, an additional sign for the presence of cholesteatoma was identified in 25(35.71%) cases.(Table7). HRCT was 100% sensitive for cholesteatoma in petrous apex followed by mastoid antrum 97.1 %, aditus 97 %,and epitympanum 94.9 %.For posterior tympanum, mastoid air cells and mesotympanum sensitivity varied from 83-87% . HRCT was 100% specific for petrous apex and perilabyrinthine cells followed by EAC 98.1 %, retrofacial 94.4%, protympanum 90.4%, For cholesteatoma in hypotympanum, tip cells and posterior tympanum specificity varies from 81-87%.Dehiscence of the horizontal part of the facial canal was accurately diagnosed in 8 cases (sensitivity 72.7% and specificity 98.3%) and there were 1 false positive and 3 false negative interpretation. HRCT is most sensitive (100%) in diagnosing mastoid cortex dehiscence and sinus plate erosion. This is in agreement with studies with most authors. Specificity of HRCT is 98.4% and 93.7% for diagnosis of sinus plate erosion and mastoid cortex dehiscence respectively. Dural plate erosion was diagnosed with 84.6% specificity and 93% sensitivity. Out of

70 patients, NCCT Brain was done in 20 (28.57%) patients. In out of 20 patients, 3 (4.28%) patients had abnormal findings in the form of temporal lobe abscess on CT hence contrast enhancement was done for further evaluation. NCCT findings of brain abscess were accurately confirmed intraoperatively in all 3 patients and were drained by transmastoid route. Transmastoid route clears the offending mastoid cavity, at the same time it drains the brain abscess in the same route as it has spread. So recovery is achieved by reversal of disease process. Follow up CT scan was done for confirming the resolution of abscess.

**Discussion:**

This study was based on 70 patients who underwent mastoid exploration for cholestematous ear disease during the study period. In our study the mean age of 26.2 years. In a study by Jose Evandro Andrade Prudente de Aquino et al comprised 960 were adults Patients aged 16 complete years were considered as adults[7]. In our study, the overall sex distribution showed a male preponderance. Overall 62.86 % were males while 37.14 % were females. Nelson et al divulged the incidence of cholesteatomas as being about 1.4 times higher in men compared to women[8]. The diagnosis of cholesteatoma is usually made on otologic examination Our study results are comparable to the studies done by Glasscock et al[9] and Triglia.[10], but were not agreeable with the studies performed by Sheahan P**[11],** which showed 70% cases with otorrhoea. In our study 3 (4.28%) patients presented with intracranial complications. Marco Algarra J. et al (1991) in their study of 52 patients ( 55ears ) showed that the commonest presenting symptoms were otorrhoea plus hearing loss (54%), otorrhoea only (29%), hearing loss only (7.6%), mastoiditis (5.4%),pain (13%), dizziness (3.8%),tinnitus (3.8%), fever (1.9%).none presented with any facial nerve involvement or any intra cranial complications.[12] In this study of the 70 patients reviewed, 57 (81.43%) patients were found to have mastoid sclerosis on digital X-ray mastoid Schuller's view. Chlesteatoma was detected surgically in 48 (68.57%) patients in similar with Mac Millian**[11]**detected cholesteatomas in 45% of cases with law projection and Brunner et al[12]. detected cholesteatoma in 58% of cases with multiple plain films. Our Pre operative HRCT could diagnose soft tissue density suspicious of cholesteatoma in all 70 (100%). Mafee[13] andO'Rilley[14] have similar results, where as Jackler[15] and Garber[16] found it to be less sensitive in differentiating cholesteatoma from granulations. Most authors are in agreement with these findings. Bony erosion, an additional sign for the presence of cholesteatoma was identified in 25(35.71%) cases. Jackler et al[15]. and O'Donoghue et al.[17], found cholesteatoma to be present in 80% of the explored cases with bony erosion. Most authors had problems with visualization of stapes except O'Donoghue who reported that they could diagnose destruction of stapes suprastructure in 86% of the cases. Thus our findings are similar to that of Joselito L. Gaurano et al.10 they had 59 (92.19%) cases with ossicular erosions, the incus was mostly affected (n=48, 75%) (The long process of the incus was the most commonly eroded). Dehiscence of the horizontal part of the facial canal Our findings are not in agreement with that of Mafee et al who found CT to be very accurate in the diagnosis of erosion of facial canal.

**Conclusion**

Most common type of unsafe CSOM clinically found to have retraction pockets on otoscopy (primary acquired cholesteatoma.). X-ray Mastoid schuller's view could not give accurate idea about presence and extent of disease in few patients and hence it does not help surgeon in accurately planning the type of surgery. Considering only presence or absence of disease in diagnosing unsafe CSOM, HCRT was accurate in comparison with intraoperative findings. HRCT could diagnose petrous apex cholesteatoma most accurately.Intraoperative findings were considered as gold standard for calculating specificity and sensitivity of Digital X-Ray mastoid Schuller's View and HRCT temporal bone in this study.

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**TABLE 1**-AGE INCIDENCE

| Age groups | Number | Percentage |
|---|---|---|
| 1-10 | 4 | 5.71 |
| 11-20 | 23 | 32.86 |
| 21-30 | 24 | 34.29 |
| 31-40 | 7 | 10 |
| 41-50 | 7 | 10 |
| > 50 | 5 | 7.14 |

**TABLE 2**-SEX INCIDENCE

| Sex | Number | Percentage |
|---|---|---|
| Male | 44 | 62.86 |
| Female | 26 | 37.14 |

**TABLE 3**-SIGNS AND SYMPTOMS SUGGESTIVE OF COMPLICATIONS OF UNSAFE OTITS MEDIA

| Symptom | Number | Percentage |
|---|---|---|
| Otalgia | 7 | 10 |
| Headache | 6 | 8.57 |
| Giddiness | 2 | 2.86 |
| Projectile Vomiting | 4 | 5.71 |
| Postural swelling | 8 | 11.43 |
| Facial weakness | 4 | 5.71 |
| Neck pain | 5 | 7.14 |

**TABLE 4**-FINDINGS OF OTOSCOPIC AND OTOMICROSCOPIC EXAMINATION

| Otoscopic and otomicroscopic findings | Number | Percentage |
|---|---|---|
| Perforation /retraction | 34 | 48.57 |
| Cholesteatoma flakes | 11 | 15.71 |
| Granulations | 12 | 17.14 |
| Aural polyp | 5 | 7.14 |
| Post canal wall sagging | 1 | 1.43 |
| Scutum erosion | 7 | 10 |

**TABLE 5**-DIGITAL X-RAY MASTOID SCHULLER'S VIEW FINDINGS

| X-ray findings | Number | Percentage |
|---|---|---|
| Sclerosed with lytic shadow | 36 | 51.42 |
| Sclerosed without lytic shadow | 21 | 30 |
| Pnematised | 13 | 18.57 |

**TABLE 6**-COMPARISON OF INTROPERATIVE FINDINGS AND RADIOLOGICAL FINDINGS

| Temporal bone findings | HRCT | Surgery | Cases in agreement (True +ve) | False ve | False - ve | Sensitivity | Specificity |
|---|---|---|---|---|---|---|---|
| Soft tissue density | 70 | 70 | 70 | 0 | 0 | 100% | 100% |
| Bone erosion | 25 | 23 | 20 | 5 | 3 | 87% | 89.4% |
| Ossicular erosion | 46 | 55 | 44 | 2 | 11 | 80% | 86.7% |

**TABLE 7**-COMPARISON OF INTRA-OPERATIVE VS RADIOLOGICAL FINDINGS

| INTRA-OPERATIVE FINDINGS | | SOFT TISSUE DENSITY | | TOTAL |
|---|---|---|---|---|
| | | YES (%) | NO (%) | |
| RADIOLOGICAL FINDINGS | YES | 70 (100) | 0 (0) | 70 (100) |
| | NO | 0 (0) | 0 (0) | 0 (100) |
| TOTAL | | 70 (100) | 47 (100) | 70 (100) |

SENSITIVITY – 100%

SPECIFICITY – 0%

**TABLE 8**-COMPARISON OF INTRA-OPERATIVE VS RADIOLOGICAL FINDINGS (BONE EROSION)

| INTRA-OPERATIVE FINDINGS | | BONE EROSION | | TOTAL |
|---|---|---|---|---|
| | | YES (%) | NO (%) | |
| RADIOLOGICAL FINDINGS | YES | 20 (87) | 5 (10.6) | 25 (35.7) |
| | NO | 3 (13) | 42 (89.4) | 45 (64.3) |
| | TOTAL | 23 (100) | 47 (100) | 70 (100) |
| CHI-SQUARE TEST VALUE – 39.17; P VALUE < 0.01; SIGNIFICANT DIFFERENCE | | | | |
| SENSITIVITY – 87%<br>SPECIFICITY – 89.4% | | | | |

**TABLE 9**- COMPARISON OF HRCT FINDINGS AND INTRA-OPERATIVE FINDINGS-(EXTENT OF DISEASE)

| **Extent of disease** | **HRCT** | **Surgery** | **Cases in agree- ment (True +ve)** | **False +ve** | **False -ve** | **Sensitivity** | **Specificity** |
|---|---|---|---|---|---|---|---|
| EAC | 12 | 17 | 11 | 1 | 6 | 64.7% | 98.1% |
| Pro tympanum | 19 | 18 | 14 | 5 | 4 | 77.8% | 90.4% |
| Meso tympanum | 45 | 45 | 39 | 6 | 6 | 86.7% | 76% |
| Post tympanum | 42 | 47 | 39 | 3 | 8 | 83% | 87% |
| Epi tympanum | 59 | 59 | 56 | 3 | 3 | 94.9% | 72.7% |
| Hypo tympanum | 18 | 12 | 7 | 11 | 5 | 58.3% | 81% |
| Antrum | 67 | 68 | 66 | 1 | 2 | 97.1% | 50% |
| Aditus | 66 | 67 | 65 | 1 | 2 | 97% | 66.7% |
| Mastoid Air cells | 51 | 53 | 45 | 6 | 8 | 84.9% | 64.7% |
| Peri-labyrinthine cells | 8 | 13 | 8 | 0 | 5 | 61.5% | 100% |
| Petrous apex | 2 | 2 | 2 | 0 | 0 | 100% | 100% |
| Retrofacial | 15 | 16 | 12 | 3 | 4 | 75% | 94.4% |
| Tip cells | 23 | 25 | 17 | 6 | 8 | 68% | 86.7% |

**TABLE 10**-COMPARISON OF HRCT AND INTRAOPERATIVE FINDINGS OSSICULAR INVOLVEMENT

| **Ossicle absent** | **HRCT** | **Surgery** | **Cases in agree ment (True +ve)** | **False +ve** | **False** –ve | **Sensitivity** | **Specificity** |
|---|---|---|---|---|---|---|---|
| Malleus handle | 33 | 31 | 25 | 8 | 6 | 80.6 | 79.5 |
| Malleus partial head | 32 | 29 | 24 | 8 | 5 | 82.8 | 80.5 |
| Malleus complete head | 38 | 38 | 32 | 6 | 6 | 84.2 | 81.2 |
| Incus long process | 42 | 53 | 40 | 2 | 13 | 75.5 | 88.2 |
| Incus short process | 4 | 5 | 2 | 2 | 3 | 40 | 96.9 |
| Incus body | 35 | 32 | 28 | 7 | 4 | 87.5 | 81.6 |
| Stapes head | 22 | 20 | 15 | 7 | 5 | 75 | 86 |
| Stapes supra-structure | 20 | 17 | 13 | 7 | 4 | 76.5 | 86.8 |

**TABLE 11**-COMPARISON OF HRCT FINDINGS AND INTRA-OPERATIVE FINDINGS-COMPLICATIONS OF DISEASE

| **Complications** | **HRCT** | **Surgery** | **Cases in agree-ment (True +ve)** | **False +ve** | **False** -ve | **Sensitivity** | **Specificity** |
|---|---|---|---|---|---|---|---|
| Facial canal dehiscence | 9 | 11 | 8 | 1 | 3 | 72.7% | 98.3% |
| Lat SCC erosion | 8 | 8 | 7 | 1 | 1 | 87.5% | 98.4% |
| Mastoid cortex dehiscence | 11 | 7 | 7 | 4 | 0 | 100% | 93.7% |
| Sinus plate erosion | 9 | 8 | 8 | 1 | 0 | 100% | 98.4% |
| Dural plate erosion | 15 | 13 | 11 | 4 | 2 | 84.6% | 93% |