Incidence of CSOM Unsafe Type in Rural Population of Central India

Authors
Naveen Agrawal[1*], H.S. Sharma[2], Varsha Raghuvanshi[3], Pulkit Khandelwal[4],
Mohit Shamadia[5], Anand Sharma[6]
[1]Associate Professor, [2]Professor, [3-6]Postgraduates
Department of Otorhinolaryngology (ENT), IMCHRC, Indore MP INDIA
[*]Corresponding Author
Naveen Agrawal
Email: *navinagrawal12@gmail.com*

Abstract
Background: *Chronic suppurative otitis media (CSOM) presents with a typical history of recurrent otorrhea with tympanic membrane perforation. High resolution computed tomography (HRCT) of temporal bone is indicated to evaluate the extension and complications of CSOM. This prospective study is aimed to find the incidence of CSOM unsafe type in rural population of central India.*
Material and Method: *This prospective study was conducted between 2014 to 2015 in the department of Otorhinolaryngology, Index medical college hospital and research center Indore (M.P.) which is a tertiary care institute. A sum total of 80 patients with unsafe CSOM were included in the study. All patients underwent preoperative HRCT scanning followed by surgical exploration of the mastoid.*
Result: *Age distribution of the patients ranges from 6 to 70 years. Incidence of CSOM (unsafe) was 29(36.3%) patients in age group 11-20yrs followed by 24(30%) patients in age group from 21-30yrs. Female preponderance was seen in the study group. Most common presenting feature was chronic ear discharge with hearing loss. Other features were also associated with the CSOM. The preoperative HRCT scan findings like cholesteatoma, granulation tissues, ossicular chain erosion and SCC dehiscence have good correlation with the intraoperative findings.*
Conclusion: *Children and young adults were more susceptible for CSOM unsafe type to be related to socioeconomic factors. The result of this study reflect preoperative HRCT imaging in cases of cholesteatoma, ossicular chain erosion and SCC dehiscence have good correlation with intra-operative finding. HRCT is useful tool in early detection of cholesteatoma where more conservative surgical procedures can be done to eradicate the disease.*
Keywords: *Cholesteatoma, Csom Unsafe, Hrct Temporal Bone.*

Introduction

Chronic suppurative otitis media (CSOM) is a chronic middle ear infection with or without discharge and permanent perforation in the tympanic membrane. Incidence Of CSOM is higher in developing country because of overcrowding, inadequate health care, poor hygiene, recurrent upper respiratory tract infections, poor nutrition and pollution.[1] Many Otolaryngologists consider it important to

differentiate between the two types of CSOM: The chronic mucosal disease and the CSOM with cholesteatoma; this is because of higher risk of complications are associated with the cholestea-toma group, which can lead to life threatening conditions. CT scan is useful to know, location, extent of disease and complication and congenital malformations while Surgery is widely done to eradicate various pathologic conditions of the middle ear.

However, there are concerns that CT cannot reliably distinguish cholesteatoma from mucosal disease and that it lacks guaranteed sensitivity for erosive complication such concerns have cast doubts on its value.[2]

The aim of this study is to evaluate preoperative CT scanning and to determine the accuracy and the usefulness of this imaging method in patients with unsafe CSOM and its correlation with operative findings.

Material and Method

This prospective study was conducted between 2014 to 2015 in the department of Otorhinolaryngology, Index medical college hospital and research center Indore (M.P.) which is a tertiary care institute. A sum total of 80 patients with unsafe CSOM were included in the study. All patients underwent preoperative HRCT scanning followed by surgical exploration of the mastoid.

A detailed history with associated symptoms such as otorrhea, deafness, tinnitus, otalgia, vertigo, headache and fever was recorded. Clinical examination in detail with pure tone audiometry, pus culture and sensitivity was routinely performed. Each of the case was subjected to HRCT temporal bone. All preoperative and intraoperative finding were recorded and data was analyzed.

Result

Age distribution of the patients ranges from 6 to 70 years. Incidence of CSOM (unsafe) in order of frequency according to age group was 29(36.3%)

patients in the age group 11-20 years, 24 (30%) in the age group 21-30 years, 18 (22.5%) in the age group 31-40 years, 6 (7.5%) in the age group 41-50 years, 2 (2.5%) in the age group 51-60 years and 1 (1.3%) in the age group 61-70 years.(table 1)

Table No. 1:- Distribution According to Age

Age Group	Number	Percentage
11-20 years	29	36.3
21-30 years	24	30.0
31-40 years	18	22.5
41-50 years	6	7.5
51-60 years	2	2.5
61-70 years	1	1.3
Total	80	100.0

Out of all, 31 cases were males and 49 cases were Females. The study group was showing a female preponderance in comparison to the males(table 2).

Table No. 2:- According to Sex Distribution

Gender	Number	Percentage
Female	49	61.3
Male	31	38.8
Total	80	100.0

Chronic ear discharge with hearing loss was the main clinical presentation. No associated factors were seen in 8 (10%) of the patients, pain was seen in 20 (25%) of the patients, tinnitus was seen in 20 (25%) of the patients, vertigo was seen in 12 (15%) of the patients, headache was seen in 20 (25%) of the patients, nausea / vomiting was seen in 7 (8.8%) of the patients, vomiting was seen in 7 (8.8%) of the patients, fever was seen in 6 (7.5%) of the patients, itching was seen in 4 (5%) of the patients, postaural sinus was seen in 3 (3.8%) of the patients and facial deformity was seen in 2 (2.5%) of the patients (table 3). At surgery cholesteatoma, granulation tissues and mucosal thickening was common findings while polyp & tympanosclerosis were rare findings.

All cases had soft tissue density on HRCT, operative findings confirmed presence of soft tissue density in typical location, but characters of soft tissue were difficult to comment on HRCT.

Cholesteatoma and granulation tissue were sent for histopathological diagnosis.

Table No. 3:- Clinical Features Of Presentation

Associated Factors	Number	Percentage
Ear discharge	80	100.0
Hearing loss	71	88.7
No associated factors	8	10.0
Pain	20	25.0
Tinnitus	20	25.0
Headache	20	25.0
Vertigo	12	15.0
Nausea / vomiting	7	8.8
Vomiting	7	8.8
Fever	6	7.5
Itching	4	5.0
Postaural sinus	3	3.8
Facial deformity	2	2.5

Table No. 4:- Intra-Operative Findings in 80 Cases.

Surgical finding	Number	Percentage
Granulation	30	37.5
Polyp	7	8.8
Tympanosclerosis	6	7.5
Cholesteatoma	26	32.5
Mucosal thickening	15	18.8

Discussion

CSOM is divided in two types; mucosal disease (safe type) and epithelial type (cholesteatoma) unsafe type, unsafe type of this clinical entity is characterized by bone erosion, caused by cholesteatoma and collagen activity hence surgery is treatment of choice aiming:-

1. Complete removal of disease.
2. Restoration of hearing.

Preoperative HRCT in such case is important investigation which provides important information about the extent of disease, thereby helps in planning the surgery. Fuse *et al* reported role of preoperative C.T. scan of temporal bone is controversial[3]. HRCT showing soft tissue mass, ossicular erosion which is highly suggestive of cholesteatoma and granulation. [4,5,6]. In present study we found soft tissue mass with smooth expansion in 80 patients on HRCT and cholesteatoma was found during surgery. Our cases were coming from rural population and

presented with advanced disease. In early stage with limited disease to diagnose cholesteatoma on scan is difficult.[7]

Parameter	CT scan	Surg Fnd	False +ve	False -ve	Sensitivity	Specificity	PPV	NPV	P VALUE
Middle ear mass	80	80	0	0	100	-	100	-	-
Scutum Erosion	55	55	0	0	100	100	100	100	0.000
Incus Erosion	58	56	2	0	100	91.7	96.5	100	0.000
Dura Exposure	22	24	0	2	91.7	100	100	96.5	0.000
Sigmoid Sinus	16	14	2	0	100	96.9	87.5	100	0.000
Canal Fistula	2	2	0	0	100	100	100	100	0.000
Facial Canal erosion	5	4	1	0	100	98.7	80.0	100	0.000
Brain Abscess	2	2	0	0	100	100	100	100	0.000

Visualization of the bodies of the malleus and the incus on HRCT is relatively easier however it is of little clinical value unless the whole ossicular chain can be demonstrated [8]. Mafee et al[9]. were able to demonstrate the state of ossicular chain in 89% of the cases scanned while Jackler et al[6] were able to predict the state of ossicular chain in only 7% cases. According to O'Donoghue[10] the sensitivity of the incus erosion was 81.4% and Payal Garg et al[11]. reported a sensitivity of 40% and a specificity of 26.6%. In our study we were not able to satisfactorily detect integrity or disruption of ossicular chain, but found Incus erosion by HRCT. We found Incus erosion to be 100% sensitive on HRCT and 91.7% specific with a PPV and NPV of 96.6 & 100% respectively when compared with operative findings.

O' Donoghue et al [10] reported 50% sensitivity on tegmen tympani erosion but did not report their false positive data. O'reilly et al[8]. In 1991 reported the sensitivity of 46% and specificity of 84% , Jackler et. al. reported a sensitivity of 100% and PPV of 33.33% in this regard. Mafee et. al[9]. reported a sensitivity of 50% and a PPV of 100% in their study in 1988. We found the sensitivity of 91.7% with a PPV of 100% in this regard and a specificity of 100% for detecting tegmen erosion. This vast difference in the values of our study when compared to earlier studies mentioned above may be attributed to the advancement of technologies over time and availability of better and reliable machines, also the knowledge of fact

stated by O'reilly[8] in 1991 that only axial cuts can never demonstrate reliably a dehiscence in the tegmen, also coronal cuts will give false positive results due to effect of partial volume averaging with adjacent soft tissues; HRCT helped us in minimizing our false positive values.

We found identification of sinus plate erosion to be 100% sensitive with specificity of 96.9%, PPV of 87.5% and NPV of 100%, hence can conclude HRCT is highly effective in detecting patients with sinus plate erosion in unsafe CSOM.

The erosion of fallopian canal along its pathway through the temporal bone, especially of the tympanic segment of the canal, may be difficult to interpret. We found facial erosion having a sensitivity of 100% and a specificity of 98.7% with a PPV of 80% and NPV of 100%. In previous studies, the sensitivity of HRCT in detecting facial canal dehiscence varied widely with values of $0^9, 25^{12}, 44^8$ and 100^{10}. The specificity of 85% reported by O'Reilly[8] and 95% by Payal et al. High resolution infra-milimetric CT slices and complete immobilization of the patient during CT is necessary for accurate and complete study of facial nerve canal.

Lateral semicircular Canal fistula and brain abscess identification on HRCT were highly selective and specific in our study (both 100%). O'Rielly et al[8]. stated that axial scans are more satisfactory as they depict LSC in its entirety and are less likely to produce false positives. Nevertheless both sections should be obtained. In conclusion HRCT was highly successful in finding LSC in cases of unsafe CSOM. The finding of brain Abscess in unsafe CSOM is itself neither much sensitive or specific, but its sensitivity of appearing on HRCT is 100%.

In our study complication was delineated by computed tomography with great accuracy. One subdural abscess was detected with pre-operative CT scan which was confirmed on surgery; accuracy of 100%.

Virtually all complication of cholesteatoma is related to osseous destruction. This ability to destroy bone may be lead to the serious and potentially fatal intracranial complication. Although these complications may produce obvious signs and symptoms, they may be subtle and unrecognized without computed tomography. M.F. Mafee *et al* [9] reported in their study three cases of intracranial complication with epidural abscesses, although one patient was quite ill, while the other abscesses were not clinically obvious until CT scan were obtained.

Conclusion

The result of this study suggests that CSOM (unsafe) is more prevalent in rural population of central India. Children and young adults were more susceptible for CSOM unsafe type to be related to socioeconomic factors. The result of this study reflect preoperative HRCT imaging in cases of cholesteatoma, ossicular chain erosion and SCC dehiscence have good correlation with intra-operative finding. However, there was weak specificity for preoperative HRCT in detecting facial canal dehiscence, sigmoid plate erosion in unsafe CSOM patients. The role of HRCT lies on the early detection of cholesteatoma, and thereby using a more conservative surgical procedure to eradicate the disease. We conclude HRCT can act as a guide to know the nature and extent of disease, potential dangers and possible complications pre-operatively which give valuable information and help surgeon to decide choice of surgery to be performed and better advise to the patients on the degree of hearing attainable after surgery.

References

1. Shrikrishna BH, Ossicular in patients with non cholesteatoma CSOM, OJ Otol HNS 2010;4:14-7
2. Banerjee A, Floor LM, Yates P, Clifford K (2003)computed tomography in suppurative ear disease : does it influence management? J laryngo Otol 1117:454-458.
3. Fuse T,Tade Y, Aoyagi M, Sugai Y)1996) CT detection of facial canal dehiscence and semicircular canal fistula:comparison

with surgical findings. J comput assits Tomogr 20:221-224.

4. Swartz JD,Goodman RS, Russell KB et al (1983) high resolution compuled tomography of middle ear and mastoid. Part II Tubotympanic disease. Radiology 148:455-459.

5. phelps PD, wright A (1990) imaging cholesteatoma. Clin radiol 41:156-162.

6. Jackler RK, Dillon WP, Schindler RA(1984) computed tomography in suppurative ear disease :a correlation of surgical and radiographic findings. Laryngoscope 94:746-752.

7. Yates PD, Flood LM , Banejee A, Clifford K (2002) scanning of middle ear cholesteatoma : what does the surgeon want to know? Br J Radiol 75:847-852.

8. O' Reilly BJ, Chevretton EB ,Wylie I et al (1991) the value of CT scanning in chronic suppurative otitis media. J Laryngol Otol 105:990-414.

9. Mafee MF, Levin BC, , Applebaum EL, et al (1988) Cholesteatoma of middle ear and mastoid: a comparison on CT scan and operative findings. Otolaryngol clin north Am 21:265-293.

10. O'Donoghue GM, Bates GJ, Anslow P,et al the predictive value of high resolution computerized tomography in chronic suppurative ear disease .Clin Otolaryngo Allied Sci. 1987;12:89-96.

11. Garg payal , Kulshreshtha pranjal, Motwani Gul,M.K. Mittal, A.K. Rai. Computer Tomography in Chronic Suppurative Otitis Media Value in Surgical Planning Indian J Otolaryngol (JULY-SEP 2012) 64(3):225-229

12. Freng A, Larsen PL, Nordshus T,(1988) Cholesteatoma of the temporal bone. Preoperative CT versus preoperative findings. Scand Audiol Suppl 30:185-188.