http://jmscr.igmpublication.org/home/
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v8i4.24

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

A Correlative Study between HRCT Findings with Operative Findings in Chronic Otitis Media with Cholesteatoma

Authors
Dr Ravi Baniya[1], Dr Vaibhav Kuchhal[2*], Dr Shahzad Ahmad[3], Dr Varun Rawat[4], Dr Aakankasha Rawat[5]
[1,4,5]PG Resident 3rd yr ENT Dept, GMC Haldwani Uttrakhand
[2]Professor and Head of ENT Dept, GMC Haldwani Uttrakhand
[3]Associate Professor ENT Dept, GMC Haldwani Uttrakhand
*Corresponding Author
Dr Vaibhav Kuchhal
Professor and Head of ENT Dept, GMC Haldwani Uttrakhand, India

Abstract
Background: *Chronic Otitis Media (COM) is a commonly occurring disease worldwide. Timely management is required as this disease is capable of causing serious complications and can lead to long term pain and discharge from the ear. The assessment and management of active squamosal type of chronic otitis media presents many challenging and fascinating problems. Radiologic studies are a valuable aid in the diagnosis and management of ear diseases associated with changes in the osseous structure.*
Methods: *We conducted a study on 30 patients of 12-58 years of age with complaints of ear discharge and hearing loss. After detailed history, examination and relevant investigation findings were documented. HRCT Temporal bone was done and ear was operated. All pre-operative CT findings was correlated with intraoperative findings.*
Results: *The CT scan is the standard imaging technique for the temporal bone. Preoperative CT scan is helpful in relation to diagnosis and decision making for surgery in cases of cholesteatoma and ossicular erosion. CT scan accurately predicts the evidence of cholesteatoma. HRCT is precisely helpful in detection of malleus and icus erosion but not helpfull in detection of stapes erosion. It is helpful in detection of extent of disease specially in areas like epitympanum, mesotympanum, mastoid air cells and aditus.*
Conclusions: *Therefore, it is concluded that CT despite its pitfalls such as more radiation exposure and higher cost delineates the location and extent of cholestaetoma.*
Keywords: *Chronic otitis media, Cholesteatoma, HRCT temporal bone.*

Introduction

Chronic Otitis Media (COM) has been defined as a chronic inflammation of the middle ear or mastoid cavity, which presents with recurrent or persistent ear discharges or otorrhoea through a tympanic membrane perforation and can be associated with cholesteatoma[1.] Prior to the availability of high resolution C.T. diagnosis of cholesteatoma was conventional filming and complex motion tomography. The precise extent of the soft tissue mass was very difficult to delineate with these methods and one relied on

indirect findings such as bony erosions and displacement. High resolution computed tomography can demonstrate the soft tissue mass of a small cholesteatoma as well a typical attico antral erosion and ossicular displacement and destruction that occur. Careful and thorough evaluation is needed for the early diagnosis and treatment of the disease, to prevent complications and preserve hearing. The extent of disease often will determine the aggressiveness of the surgical approach.

Materials and Methods

Patient Selection

The study was conducted in the department of Otorhinolaryngology, Dr Susheela Tiwari Hospital, Haldwani from January 2018 to October 2019. It was a cross sectional study. 30 patients in the age group of 12yr-58yr with chronic otitis media with cholesteatoma were selected for the study. The patients with mucosal disease, acute otitis media, middle ear malignancy, congenital cholesteaoma, active squamosal type without cholesteaoma and who not willing to give consent for surgery were excluded from the study.

Patient Assessment

Detailed otolaryngologic history pertaining to hearing impairment, ear discharge, vertigo, tinnitus etc. was noted down with complete ENT examination to look for status of otorrhea, site, size of perforation and active infection in nose and throat. High-resolution CT scan was done prior to surgery.

The assessment points were:

1) Evaluate patients with chronic otitis media with cholesteatoma.
2) Find out extension of disease using HRCT temporal bone.
3) Find out extension of disease intraoperatively.
4) Correlate HRCT findings with operative findings.

Statistical Analysis

Correlation of the CT scan and surgical findings for bone erosion was determined by the kappa coefficient using SPSS statistical analysis software (version 18). The kappa coefficient ranged from 0–1; with 0 indicating no correlation and 1 indicating complete correlation between the two factors. Kappa coefficients in the range 0–0.4, >0.4–0.6, >0.6–0.8, and >0.8–1.0 indicated poor, moderate, good, and excellent correlation, respectively

Results

This study was based on 30 patients who underwent mastoid exploration for cholesteatoma ear disease during period between January 2018 to october 2019. All the patients included in the study were above the age of 12 years. Among them the majority were in the age group of 16-30 years (56.66%) followed by middle age group 31-45 yrs (20%).

CT Findings

A. Ossicular status on CT finding

Destruction of malleus could be identified in 13 (43.3%) cases. Incus was eroded in 26(86.6%) cases.

Ossicles	No of patients	Percentage
Malleus	13	43.3
Incus	26	86.6
Stapes suprastracture	3	10

Figure 1

B. Evidence of cholesteatoma on CT finding

Computed tomography was done in 30 patients. Preoperative computed tomography diagnosis of cholesteatoma was made in all cases. The hall mark of cholesteatoma was non-dependent soft tissue mass alone or bony erosion or smooth bony expansion was present in all cases.

Evidence of choleasteaoma	No of patients	Percentage
Soft tissue density	30	100
Soft tissue density+ bone erosion	24	80

Figure 2

C. Extent of disease on CT finding

On HRCT, mesotympanum and epitympanum were commonest sites of cholesteatoma 96.6% and 83.3 respectively. While mastoid air cells and Aditus were found in 24(80%) & 21(70%) each. Prussak space ,sinus tympani ,facial recess and hypotympanum area involvement were seen in 30% ,10% ,6.6% ,3.3% respectively

Extent	No of patients	Percentage
Epitympanum	24	83.3
Mesotympanum	29	96.66
Hypotympanum	1	3.3
Mastoid air cells	21	70
Aditus	24	80
Prussak space	9	30
Sinus tympani	3	10
Facial recess	2	6.6

Figure 3

2. Intraoperative Findings

A. Intraoperative Ossicular status.

On surgery it was noticd that incus 28 (93.3) was frequently involved following by malleus (53.3%). Only 9 (30%) had necrosis of stapes suprastructure

Ossicles	No of patients	Percentage
Malleus	16	53.33
Incus	28	93.33
Stapes suprastructure.	9	30

Figure 4

B. Intraoperative extension of disease

On intraoperative findings, mesotympanum and epitympanum were commonest sites of cholesteatoma 96.6% and 90% respectively. While mastoid air cells and Aditus were found in 18(60%) & 28(93.33%) each. Prussak space ,sinus tympani , and facial recess area involvement were seen in 60% ,46.6% ,16.6% , respectively.

Extent	No of patients	Percentage
Epitympanum	27	90.00
Mesotypanum	29	96.66
Aditus	28	93.33
Mastoid air cells	18	60
Sinus tympani	14	46.66
Facial recess	5	16.66
Prussak space	18	60

Figure 5

3. Correlation of CT scan with surgical findings.

A. Correlation of evidence of disease

The HRCT found to be very sensitive in diagnosing cholesteatoma accurately according to statistically analysis kappa value was found to be 1.0 which was found statistically excellent correlation.

Correlation	CT	SURGERY	kappa value
Evidence of cholesteatoma	30	30	1.0

Figure 6

B. Correlation of Ossicular status

HRCT could not help in diagnosing stapes erosion as statistically analysis kappa value was found to be 0.27 which was found to be poorest HRCT-Surgerical adaptability. But HRCT-Surgical similarity was good in detection of malleus erosion and which have kappa value of 0.61.while radio-surgical correlation is excellent in detection in incus erosion which have kappa value of 0.81.traoperative and HRCT finding.

Ossicles involved	CT	Surgical findings	kappa value
Malleus	13	16	0.61
Incus	26	28	0.81
Stapes	3	9	0.27

Figure 7

C. Correlation of extension of disease

HRCT found to be excellent in diagnosing extension of disease in Mesotympanum and Epitympanum as statistically analysis kappa value was found to be 1.0 & 0.81 respectively.. HRCT-Surgical correlation for Mastoid air cells and Aditus was good as statiscally analysis kappa value was 0.735,0.7. which was found statistically significant therefore it was found tht there is no difference in the intraoperative and HRCT finding.

Correlation	CT	Surgical findings	kappa value
Epitympanum	24	27	0.81
Mesotympanum	29	29	1.0
Hypotympanum	1	0	No value
Aditus	24	28	0.7
Mastoid air cells	21	18	0.735
Sinus typmani	3	14	0.4
Facial recess	2	5	0.4
Prussk space	9	18	0.3

Figure 8

Discussion

The diagnosis of cholesteatoma is usually made on otologic examination[2,3]. In cases in which diagnosis is not obvious, computerized tomography may demonstrate a soft tissue mass with characteristic ossicular displacement and erosion of the bone. Cholesteatoma in the hidden areas, such as the posterior tympanic recess, may be revealed by radiological examination even if it is not detected by on otological examination.

Clinical features

Commonest presenting complaints were otorrhoea (100%) followed by hearing loss 26(86.6%). These results are comparable to the studies done by Glasscock et al[4], and Millan[5], but was not agreeable with the studies performed by Sheahan P[6] which showed 80% of cases with hearing impairment and 70% cases with ottorhoea. In this study 24 (80%) patients presented with the characteristic foul smelling discharge. When an infected cholesteatoma is present or there is bone destruction, the purulent discharge tends to be thick, scanty and fetid[7]. This did not correlate with the findings of the studies done by Browning GG[8] which suggests that there is no apparent difference in the smell associated with cholesteatoma compared with the active mucosal disease.

HRCT and Operative Correlation

A CT scan provides information about congenital anatomic variations that may be encountered during surgery, as well as the complications of cholesteatoma[2] .Complete opacification of the middle ear with no bony destruction makes radiological differentiation of middle ear effusion and granulation tissue difficult, if not impossible.[9] [10]

1 Evidence of Disease

Preoperative CT scan could diagnose soft tissue density mass in all the 30 patients, Mafee[11] had similar results, whereas Jackler[12] and Garber[13] found it to be less sensitive and specific. However Mafee et al[11] believed it was possible to identify cholesteatoma by its low attenuation value. Cholesteatoma sac, associated with granulation tissue, mucosal oedema and effusion may be indistinguishable on CT scanning[8,11]. Bony erosion, an additional sign for the presence of cholesteatoma was identified in 20 of the 30 cases. This is comparable to the reports by Jackler et al[12] who found cholesteatoma to be present in 80% of the cases with bony erosion who were explored. Mafee et al[15] found bone destruction in 9 out of 9 cases of acquired cholesteatoma

2 Ossicular erosion

In this study, Malleus was reported to be eroded in 13 patients by HRCT ,while intraoperatively, it was eoded in 16 patients making statiscally good correlation as kappa value is 0.61. so making HRCT as good tool of diagnosis of malleus erosion .According to a study conducted by Rogha et al[16] , there is a good radiosurgical correlation for malleus.

Incus was observed to be eroded in 26 cases on HRCT, while intraoperatively it was eroded in 28 cases making statiscally excellent correlation as kappa value is 0.81 so HRCT is excellant tool for diagnosis of incus erosion**.** Kanorta S et al[17] reported malleus eosion in 28 patients while intraoperatively they found 31 patients having incus eosion, showing similar result of excellent correlation for malleus. A good radio- surgical correlation was reported by Rogha et al[16] and chee and tan[18] for incus. In this study incus was most commonly involved and CT could identify involvement of the incus in 26 while Mafe [2] and Jackler[12] had similar results.

Stapes erosion was reported by HRCT in 3 patients while intraoperatively, it was found in 9 patients, making statiscally poor correlation as kappa value is 0.27. Rogha M et al[16] found similar results of poor radio-surgical correlation having kappa statistics of 0.27. Chee and Tan[18] have reported a good radiosurgical correlation for stapes while Zhang et al[19] and Datta et al[20] have reported HRCT to be poor in detecting stapes. In our study Involvement of the stapes could be analyzed in only 3 (10%) patient on CT scan. In other cases analysis was not possible due to the inconsistent visualization.

3 Extension of Disease

In Mesotympanum, HRCT reveled disease in 29 cases having statiscally kappa value of 1.0 which showsexcellent radio-surgical correlation in mesotympanum area these findings are similar to findings by Walshe et al[11].

In mastoid air cells, HRCT reveled disease in 21 cases having kappa value of 0.735 which shows good radio-surgical correlation in MAC these findings are similar to observations by Gerami[21] and Naghavi[21].

In aditus, HRCT reveled disease in 24 cases having kappa value of 0.7 which shows good radio-surgical correlation in aditus area these findings are highly comparable to observations by Sirigiri and Dwarakanth[22].

In Epitympanum, HRCT reveled disease in 24 cases having kappa value of 0.81 which shows excellent radio-surgical correlation in epitympanum area these findings are similar to observations by Sirigiri and Dwarakanth[22]

In sinus tympani, facial recess area, and prussak space HRCT shows poor radio-surgical correlation as statiscally analysis kappa value are not more than 0.4 however observations by Sirigiri and Dwarakanth[22] shows good correlation in HRCT and surgical findings.

Conclusion

This study was conducted in sushila tiwari government hospital, from January 2018 to October 2019 and was based on 30 patients who were treated for cholesteamatous ear disease.

- In 30 patients CT scan was obtained and all cases revealed soft tissue density suggestive of cholesteatoma Surgical exploration revealed all 30 cases with evidence of cholesteatoma making statiscally kappa value 1.0 which shows excellent correlation.
- HRCT could not help in diagnosing stapes erosion as statistically analysis kappa value was found to be 0.27 which was found to be poorest HRCT-Surgerical adaptability. but HRCT-Surgical similarity was good in detection of malleus erosion and which have kappa value of 0.61.while radio-surgical correlation is excellent in detection in incus erosion which have kappa value of 0.81.
- HRCT found to be excellent in diagnosing extension of disease in Mesotympanum and Epitympanum as statistically analysis kappa value was found to be 1.0 & 0.81 respectively.. HRCT-Surgical correlation for Mastoid air cells and Aditus was good as stariscally analysis kappa value was 0.735,0.7. Which was found statistically significant therefore it was found tht there is no difference in the intraoperative and HRCT finding. but could not helpful in diagnosing extension particular in prussak space and facial recess area and sinus tympani area which have kappa value less than 0.3,0.4,0.4.

The CT scan is the standard imaging technique for the temporal bone Preoperative CT scan is helpful in relation to diagnosis and decision making for surgery in cases of cholesteatoma and ossicular erosion. CT scan accurately predicts the evidence of cholesteatoma. HRCT is precisely helpful in detection of malleus and icus erosion but not helpfull in detection of stapes erosion .The minimal accuracy for stapes erosion observed may be the result of the small size of the bone and larger 3 mm CT cuts. Studies have used less than 3 mm slices of temporal bone CT scan to detect stapes status It is helpful in detection of extent of disease specially in areas like epitympanum, mesotympanum, mastoid air cells and aditus. Some findings with a low correlation are due to the partial volume effect can be improved by employing finer cuts of the CT scan.

Therefore, it is concluded that CT despite its pitfalls such as more radiation exposure and higher cost delineates the location and extent of the disease and provides information on anatomical variations and complications. It serves as a roadmap to assist the surgeon during surgery.

References

1. Acuin J; Extracts from "Concise clinical evidence": chronic suppurative otitis media. British Medical Journal 2002; 325; 73: 1159–60.
2. Mafee MF, Levin BL, Applebaum EL, Campos CF. Cholesteatoma of the middle ear and mastoid. Otolaryngol Clin North Am. 1988; 21:p. 265-8.
3. Buckingham RA, Vavassori GE. Tomographic evaluation of cholesteatoma of the middle ear and mastoid. Otolaryngol Clin North Am. 1973; 6: p. 363-77.
4. Glasscock ME, Dickins JRE, Welt R. Cholesteatoma in children. Laryngoscope 1981; 91:p. 1743-53.
5. Mac Millian AS: radiologic diagnosis of Neuro-otologic problems byconventional radiology. Arch Otolaryngol 1969; 89: p. 78-82.
6. Brunner S, Peterson O, Sandberg LE. Tomography in cholesteatoma of thetemporal bone. Correlation between the standard roentgenographic examinations and tomography. AJR 1966; 97: p. 588-96.
7. Coel MN, Godwin D. Simplified plain film screening examination for erosive otitis media. AJR 1979; 133.
8. Phelps PD, Wright A. Imaging choleste-atoma. Clin Radiol 1990; 41:156-62.
9. Lin DPC, Bergeron RT. Contemporary radiological imaging in the evaluation of the middle ear – attic – antral complex cholesteatoma. Otolaryngol Clin North Am 1989; 22: 897-09.
10. Swartz JD, Goodman RS, Russel KB. High resolution computed tomography of the middle ear and mastoid. Part 11: tubotympanic disease. Radiology 1983; 148: 455-9.
11. Walshe P, McConn. 'The role of CT in preoperative assessment of CSOM'. ClinOtolaryngol. Allied Sci.2002 Apr; 27 (2):95-7.
12. Jackler RK, Witham P. Dillon, Schindler RA. Computed tomography insuppurative ear disease: a correlation of surgical and radiographic findings. Laryngoscope 1984; 94:746-52.
13. Garber LZ, Dort JC. Cholesteatoma: diagnosis and staging by CT scan. J Otolaryngol 1994; 23:121-4.
14. Mafee MF, Kumar A, Yannias D. Computed tomography of the middle ear in the evaluation of cholesteatoma and other soft tissue masses: comparison with Pluridirectional tomography. Radiology 1983; 148:465-72.
15. Rogha M ,Hashemi SM, Mokhtarinejed F,Eshaghian A,Dadgostar A,Comparison of preoperative temporal bone CT with intraoperative findings in patients with cholesteatoma. Iranian Otorhinolarynology 2014;26(1);7-12
16. Kanorta S, Gupta R, Gupta N, Sharma R, Gupta S, Kotwal S. Correlation of high-resoluation computed tomography temporal bone findings with intraoperative findings in patients with cholesteatoma .Indian J Otol.2015;21:(4).
17. Chee NW, Tan TY. The value of pre-operative high resolution CT scans in cholesteatoma surgery. Singapore Med J 2001;42(4):155–9.
18. Zhang X, Chen Y, Liu Q, Han Z, Li X. The role of high-resolution CT in the preoperative assessment of chronic otitis media. Lin Chuang Er Bi Yan Hou Ke Za Zhi 2004;18:396-8.
19. Datta G, Mohan C, Mahajan M, Mendiratta V. Correlation of preoperative HRCT findings with surgical findings in Unsafe CSOM. J Dent Med Sci 2014;13:120-5.
20. Gerami H, Naghavi E, Wahabi-Moghadam M, Forghanparast K, Akbar MH. Comparison of preoperative computerized tomography scan imaging of temporal bone with the intra-operative findings in

patients undergoing mastoidectomy Saudi Med J. 2009 Jan; 30(1):104-8.

21. Sirigiri RR, Dwaraknath K. Correlativestudy of HRCT in Attico-Antral Disease Indian J Otolaryngol Head Neck Surg. 2011 Apr;63(2):155-8.