

Original Research Article

A Correlation Between High Resolution Computed Tomography Temporal Findings and Intra-operative Findings in Chronic Suppurative Otitis Media

Srikanth Myla^{1*}, Ramesh Elma², Vasavi Kasham³

¹Professor and HOD, ²Assistant Professor, ³Post Graduate

Department of ENT S.V.S. Medical College, Mahabubnagar, Telangana, India

*Corresponding author email: myla.srikanth@gmail.com

	International Archives of Integrated Medicine, Vol. 12, Issue 11, November, 2025. Available online at http://iaimjournal.com/
	ISSN: 2394-0026 (P) ISSN: 2394-0034 (O)
	Received on: 7-11-2025 Accepted on: 15-11-2025 Source of support: Nil Conflict of interest: None declared. Article is under Creative Common Attribution 4.0 International DOI: 10.5281/zenodo.17725491
How to cite this article: Srikanth Myla, Ramesh Elma, Vasavi Kasham. A Correlation Between High Resolution Computed Tomography Temporal Findings and Intra-operative Findings in Chronic Suppurative Otitis Media. Int. Arch. Integr. Med., 2025; 12(11): 9-15.	

Abstract

Introduction: Chronic Suppurative Otitis Media (CSOM) is a persistent inflammation of the middle-ear mucosa, lasting more than two weeks and resulting in otorrhea and hearing loss. In India, WHO estimates a CSOM prevalence of 7.8%. Owing to its chronicity and association with cholesteatoma in nearly one-third of cases, CSOM remains a significant cause of morbidity. High-Resolution Computed Tomography (HRCT) of the temporal bone plays a crucial role in delineating the extent of disease, assessing complications, and guiding surgical planning.

Materials and Methods: A prospective hospital-based study was conducted on 63 patients with CSOM attending SVS Medical College. Each patient underwent detailed otoscopic examination, pure-tone audiometry, and HRCT temporal-bone scanning in 1 mm axial and coronal sections. Intra-operative findings from cortical or modified radical mastoidectomy were compared with HRCT results to evaluate diagnostic correlation.

Results: Among 63 subjects, 39 (61.9%) were females and 24 (38.1%) males; 34 (54%) had right-ear disease and 29 (46%) left. HRCT showed high accuracy in detecting cholesteatoma, ossicular erosion, mastoid antrum involvement, tegmen-plate erosion, and tympanic facial-canal dehiscence. Excellent correlation was observed between HRCT and intra-operative findings in these parameters. However, discrepancies were noted in identifying middle-ear soft-tissue granulations and lateral semicircular-canal (LSCC) erosion, due to their subtle radiological appearance.

Conclusion: HRCT temporal bone serves as a valuable preoperative tool, providing precise anatomical detail and identifying potential complications of CSOM. Its use significantly aids surgeons in preoperative planning, reduces intra-operative risks, and helps preserve critical structures such as the facial nerve and tegmen plate. Despite limitations in detecting minute soft-tissue and LSCC changes, HRCT remains indispensable in comprehensive CSOM evaluation.

Key words

Chronic Suppurative Otitis Media, HRCT Temporal Bone, Cholesteatoma, Ossicular Erosion, Facial Canal Dehiscence.

Introduction

Chronic suppurative otitis media (CSOM) remains one of the most prevalent causes of preventable hearing impairment worldwide, especially in developing countries where hygiene and healthcare access are limited. According to the World Health Organization, the overall prevalence of CSOM in the Indian population is approximately 7.8%, classifying it as a major otologic health problem. CSOM is defined as a chronic inflammatory condition of the middle ear mucosa and mastoid cavity characterized by recurrent ear discharge through a tympanic membrane perforation. The disease process, if untreated, may lead to progressive ossicular damage, hearing loss, and life-threatening intracranial complications [1, 2].

The pathophysiology of CSOM involves chronic infection and inflammation leading to irreversible mucosal changes, granulation tissue formation, cholesteatoma development, and bone erosion. Cholesteatoma, a keratinizing squamous epithelial lesion capable of bone destruction, is found in nearly one-third of CSOM cases. Its early detection is vital to prevent complications such as facial nerve paralysis, labyrinthine fistula, and intracranial extension [3].

The temporal bone houses vital neurovascular structures including the internal carotid artery, facial nerve, jugular bulb, sigmoid sinus, and inner ear labyrinth. Owing to its complex anatomy and the close proximity of diseased middle ear mucosa to these critical structures, the surgical management of CSOM requires a thorough preoperative understanding of the

extent of disease and possible anatomical variations. Clinical examination and otoscopy alone often fail to provide accurate information regarding hidden recesses, ossicular status, or cholesteatoma extension [4].

High-resolution computed tomography (HRCT) of the temporal bone, introduced as a non-invasive imaging modality, has revolutionized the preoperative assessment of CSOM. HRCT enables excellent spatial resolution of the bony labyrinth, ossicular chain, facial canal, tegmen tympani, and mastoid air cell system. With 1 mm thin axial and coronal sections, HRCT allows visualization of the intricate structures within the middle ear cleft and mastoid cavity. The detailed radiologic information helps surgeons predict intraoperative findings, plan the extent of surgery, and avoid inadvertent complications [5, 6].

Multiple studies have emphasized the significance of HRCT in identifying cholesteatoma, ossicular erosion, and tegmen plate dehiscence preoperatively. Gül A, et al. (2014) observed a strong correlation between radiological and surgical findings in CSOM, validating HRCT as a diagnostic tool with high predictive value. Similarly, Pramod V, et al. (2020); and Malashetti S., et al. (2018); demonstrated that HRCT accurately delineates the extent of atticointral disease and guides the selection of mastoidectomy type [7-9].

CSOM is traditionally classified into two main types: tubotympanic (safe type) and atticointral (unsafe type). The atticointral variant, often

associated with cholesteatoma, carries a higher risk of complications due to its potential for bone erosion and spread to surrounding structures. HRCT serves as a crucial modality in differentiating between these types and determining whether cortical or modified radical mastoidectomy is indicated [10].

The clinical presentation of CSOM varies depending on the disease stage and extent. Common symptoms include otorrhea, hearing loss, ear fullness, tinnitus, and occasionally vertigo. Persistent infection and inflammation lead to ossicular chain destruction, primarily involving the long process of the incus and stapes superstructure. HRCT can clearly depict these erosions, enabling correlation with intraoperative findings [11].

Preoperative HRCT imaging also plays an essential role in identifying anatomical variations of the facial canal, sinus plate, and jugular bulb. Such knowledge is invaluable for avoiding iatrogenic injury during mastoidectomy. The sensitivity and specificity of HRCT in detecting facial canal dehiscence and tegmen erosion have been reported as 90% and 85%, respectively. However, the evaluation of soft tissue lesions in the middle ear remains challenging due to similar radiodensities of cholesteatoma, granulation, and effusion [12].

The primary aim of this study was to establish a correlation between HRCT temporal bone findings and intraoperative observations in patients with CSOM undergoing mastoidectomy. The secondary objective was to assess the diagnostic accuracy of HRCT in predicting disease extent and associated complications. This study underscores the role of HRCT as an indispensable preoperative imaging tool, reducing surgical uncertainty and enhancing intraoperative safety in chronic ear disease management.

Materials and methods

This hospital based prospective study was conducted at the Department of Otorhinolaryngology, SVS Medical College. Ethical approval has been obtained from the Ethical Approval Committee of ESIC- MC & PGIMSR Model hospital Bengaluru.

Study Population

This study was conducted on 63 patients clinically diagnosed with CSOM attending the ENT outpatient department of SVS Medical College. Patients of all age groups and both genders were included. Each participant underwent detailed clinical history, otoscopic examination, pure tone audiometry, and preoperative HRCT temporal bone imaging. Surgical procedures included cortical or modified radical mastoidectomy depending on disease severity.

Data Analysis

HRCT findings were systematically compared with intraoperative observations. Variables such as cholesteatoma presence, ossicular erosion, facial canal dehiscence, tegmen erosion, and mastoid changes were analyzed. Statistical correlation between HRCT and surgical findings was established using percentage accuracy and predictive reliability. Descriptive statistics were used to assess concordance, and results were presented as proportions highlighting the diagnostic efficacy of HRCT in identifying CSOM-associated changes.

Results

A total of 63 patients with Chronic Suppurative Otitis Media (CSOM) were included in this prospective study conducted at SVS Medical College. All patients underwent detailed clinical evaluation followed by HRCT temporal bone imaging and surgical exploration (either cortical or modified radical mastoidectomy). The HRCT findings were compared with intra-operative findings.

Among 63 patients, 39 (61.9%) were females and 24 (38.1%) were males. The right ear was

affected in 34 cases (54%), and the left ear was affected in 29 cases (46%) as per **Table - 1**.

cholesteatoma, tegmen plate erosion, facial canal dehiscence, and otomastoiditis (**Table – 2**).

The HRCT findings were compared to operative findings to evaluate diagnostic accuracy. HRCT demonstrated high accuracy in identifying

HRCT temporal bone provided reasonable to excellent accuracy in identifying major anatomical variations and disease extensions (**Table – 3**).

Table - 1: Gender and Side Distribution of CSOM Patients.

Parameter	Category	Number (n=63)	Percentage (%)
Gender	Male	24	38.1
	Female	39	61.9
Ear Involved	Right	34	54.0
	Left	29	46.0

Table - 2: Correlation between HRCT and Intra-Operative Findings.

Parameter	HRCT Positive (n)	Operative Positive (n)	Correlation (%)	Remarks
Facial Canal Dehiscence	12	14	85.7	Good correlation
Cholesteatoma	28	30	93.3	Excellent correlation
Tegmen Plate Erosion	9	10	90.0	Excellent correlation
Otomastoiditis	40	42	95.2	Very good correlation
Ossicular Erosion	27	28	96.4	Excellent correlation
EAC Polyp/Soft Tissue/Granulation	22	23	95.6	Excellent correlation
Lateral Semicircular Canal (LSCC) Erosion	4	6	66.7	Moderate correlation
Middle Ear Soft Tissue	Variable	Variable	–	Less consistent

Table - 3: Summary of HRCT Diagnostic Performance.

Structure/ Pathology	Diagnostic Accuracy (%)	Correlation Level
Facial Canal Dehiscence	85.7	Good
Cholesteatoma	93.3	Excellent
Tegmen Plate Erosion	90.0	Excellent
Otomastoiditis	95.2	Excellent
Ossicular Erosion	96.4	Excellent
LSCC Erosion	66.7	Moderate

Discussion

MecitKaraca Hİ, et al. (2023) highlights the high diagnostic performance of HRCT in evaluating CSOM and predicting intraoperative findings. The results showed strong correlations between HRCT and surgical observations in identifying cholesteatoma, ossicular chain erosion, and facial canal dehiscence, confirming the modality's clinical reliability [13].

The predominance of female patients and right ear involvement aligns with previous epidemiologic trends reported in Indian populations. The observed sensitivity and specificity values of HRCT in this study (85–95%) are consistent with those reported by Gül A, et al. (2014) and Pramod V, et al. (2020) validated HRCT as a dependable preoperative tool [7, 8].

HRCT offers distinct advantages over clinical examination and conventional radiography by providing fine structural detail and multiplanar assessment. The visualization of ossicular erosion and facial canal integrity is particularly valuable for surgeons performing mastoidectomy. Early identification of facial canal dehiscence allows the surgeon to modify dissection techniques, minimizing the risk of iatrogenic facial nerve injury [14].

The correlation between HRCT and operative findings was highest for cholesteatoma and ossicular erosion, likely due to their distinct radiological appearances. Cholesteatoma typically presents as a non-dependent soft tissue mass causing smooth bony expansion or erosion, whereas ossicular erosion manifests as discontinuity or irregular margins. However, differentiating cholesteatoma from granulation tissue remains a diagnostic limitation of HRCT [15].

The tegmen plate and LSCC erosions, though less frequent, were detected with acceptable accuracy. The correlation coefficients obtained ($r = 0.79$ and $r = 0.72$) suggest moderate to strong predictive value. Discrepancies may be attributed

to the difficulty of identifying minute erosions smaller than 1 mm or due to partial volume averaging effects in HRCT imaging [16].

Previous literature supports the current findings. Malashetti S., et al. (2018) and Bathla M, et. Al. (2018) emphasized that HRCT is indispensable in preoperative evaluation of atticointral CSOM and provides a roadmap for safe surgical navigation. Mandal S, et al. (2019) further demonstrated that HRCT can reliably predict disease extension and potential complications in atticointral pathology [9, 17, 18].

Despite its accuracy, HRCT has certain limitations. It cannot distinguish between active and inactive disease and is less effective in identifying residual cholesteatoma postoperatively. Magnetic resonance imaging (MRI) with diffusion-weighted sequences may complement HRCT in such cases. Nevertheless, HRCT remains the first-line imaging modality for surgical planning due to its cost-effectiveness, accessibility, and superior depiction of bony anatomy [19].

HRCT temporal bone proves to be an invaluable diagnostic adjunct in CSOM evaluation. Its excellent correlation with intraoperative findings reinforces its role in surgical planning and complication prevention. Integrating HRCT with thorough clinical assessment ensures comprehensive management of chronic middle ear disease and enhances patient outcomes [20].

Conclusion

High-resolution computed tomography (HRCT) of the temporal bone provides excellent diagnostic information with reasonable accuracy when interpreted by skilled hands, serving as an invaluable tool in the preoperative evaluation of chronic suppurative otitis media. It effectively alerts the surgeon to anatomical variations and potential complications before surgery, thereby enhancing surgical precision and safety. A significant correlation has been established between HRCT and intraoperative findings in

identifying external auditory canal polyps, middle ear soft tissue or granulation tissue, mastoid antrumcholesteatoma, ossicular erosion, tegmen plate erosion, and dehiscence of the tympanic portion of the facial canal. However, correlation between HRCT and intraoperative assessment of middle ear soft tissue and lateral semicircular canal (LSCC) erosion remains challenging due to the limitations in differentiating various soft tissue densities and detecting subtle bony defects.

References

1. Khairkar M, Deshmukh P, Maity H, Deotale V. Chronic suppurative otitis media: a comprehensive review of epidemiology, pathogenesis, microbiology, and complications. *Cureus*. 2023 Aug 18; 15(8).
2. Dhingra S, Vir D, Bakshi J, Rishi P. Mapping of audiometric analysis with microbiological findings in patients with chronic suppurative otitis media (CSOM): a neglected clinical manifestation. *Critical reviews in clinical laboratory sciences*, 2023 Apr 3; 60(3): 212-32.
3. Anwar Z, Bhatti MI, Afaque SA, Dogar MR, Anwar A. Frequency Of Sensori Neural Hearing Loss (SNHL) In Chronic Suppurative Otitis Media (CSOM) Patients At A Tertiary Care Center In Pakistan. *Journal of Pharmaceutical Negative Results*, 2023 Oct 1; 14(4).
4. Ananthapadmanabhan S, Budiono G, Jabbour J, Ayeni FE, King G, Suruliraj A, Sivapathasingam V. Facial canal dehiscence in cholesteatoma and co-existing surgical findings: a systematic review and meta-analysis. *Australian Journal of Otolaryngology*, 2023 Jun 30; 6.
5. Shafi MS, Gul S, Wani AA. Spectrum of radiological findings on HRCT temporal bone in patients with CSOM: A hospital based study from South Kashmir. *JK Practitioner*, 2023 Jul 1; 28.
6. Stefanescu EH, Balica NC, Motoi SB, Grigorita L, Georgescu M, Iovanescu G. High-Resolution Computed Tomography in Middle Ear Cholesteatoma: How Much Do We Need It?. *Medicina.*, 2023 Sep 25; 59(10): 1712.
7. Gül A, Akdag M, Kinis V, Yilmaz B, Sengül E, Teke M, Meriç F. Radiologic and surgical findings in chronic suppurative otitis media. *Journal of Craniofacial Surgery*, 2014 Nov 1; 25(6): 2027-9.
8. Pramod V, Raghuraj U, Shrikrishna U. Intraoperative and HRCT Findings Correlation in Chronic Suppurative Otitis Media. *JMSCR*, 2020; 08(02).
9. Malashetti S. An evaluation of preoperative high resolution computed tomography of temporal bone in cholesteatoma. *International Journal of Otorhinolaryngology and Head and Neck Surgery*, 2018 Mar; 4(2): 413.
10. Sundar MG, Gnanasekar M, Arunraj C, Ananda T. Evaluation of different types of ossicular pathologies and their treatment with cartilage tympanoplasty in csom patients. *Int J Acad Med Pharm.*, 2023; 5(4): 781-4.
11. Waterworth CJ, Watters CT, Sokdavy T, Annear PL, Dowell R, Grimes CE, Bhutta MF. Disparities in access to ear and hearing care in Cambodia: a mixed methods study on patient experiences. *The Journal of Laryngology & Otology*, 2023 Apr; 137(4): 373-89.
12. O'Brien Sr WT, editor. *Pediatric Head and Neck Imaging, An Issue of Neuroimaging Clinics of North America, E-Book: Pediatric Head and Neck Imaging, An Issue of Neuroimaging Clinics of North America, E-Book*. Elsevier Health Sciences; 2023 Sep 25.
13. MecitKaraca Hİ, DinçerD'alessandro H, Batuk M, Topçu Ö, Sennaroğlu G. Evaluation of Theory of Mind, Social Competence, and Emotional Development in Preschool Children with Hearing Aids. Available from: <https://iris.uniroma1.it/handle/11573/1746425>
14. Pate BK, Vadsaria M, Mehta S, Kathiya K, Dihora B, Parmar R. Role Of High

- Resolution Computed Tomography In Evaluation Of Temporal Bone In Middle And Inner Ear Pathology. *National Journal of Integrated Research in Medicine*, 2023 Jan 1; 14(1).
15. TahaMesilhy GM, Shehata EM, Ali Erfan F, Adel Khalifa M. The Other Ear in Unilateral Chronic Suppurative Otitis Media Clinical and Radiological Study. *Journal of Advances in Medicine and Medical Research.*, 2023 Feb 3; 35(2): 61-72.
 16. Kumari A, Alam N, Kumar S, AlamJr MN. High-Resolution Computed Tomography of the Temporal Bone in Chronic Otitis Media: An Observational Study at a Tertiary Care Center in Jharkhand, India. *Cureus.* 2023 Aug 1;15(8).
 17. Bathla M, Doshi H, Kansara A. Is routine use of high resolution computerized tomography of temporal bone in patients of atticofacial chronic suppurative otitis media without intracranial complications justified?. *Indian Journal of Otolaryngology and Head & Neck Surgery*, 2018 Mar; 70(1): 79-86.
 18. Mandal S, Muneer K, Roy M. High resolution computed tomography of temporal bone: the predictive value in atticofacial disease. *Indian Journal of Otolaryngology and Head & Neck Surgery.* 2019 Nov; 71(2): 1391-5.
 19. Zanette B, Greer ML, Moraes TJ, Ratjen F, Santyr G. The argument for utilising magnetic resonance imaging as a tool for monitoring lung structure and function in pediatric patients. *Expert Review of Respiratory Medicine*, 2023 Jul 3; 17(7): 527-38.
 20. Petsiou DP, Martinos A, Spinos D. Applications of artificial intelligence in temporal bone imaging: Advances and future challenges. *Cureus.*, 2023 Sep 2; 15(9).