

# Spectrum of Temporal Bone Pathologies on CT: A Retrospective Descriptive Study

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## Abstract

The temporal bone houses critical auditory and vestibular structures and is prone to a wide range of pathological conditions. These include inflammatory and infective processes such as chronic suppurative otitis media (CSOM) and otomastoiditis, as well as congenital anomalies, cholesteatoma, neoplasms, trauma, and postoperative changes.

High-resolution computed tomography (HRCT) of the temporal bone is the imaging modality of choice for evaluating bony anatomy and erosive changes, while magnetic resonance imaging (MRI) provides superior soft-tissue characterization and helps identify intracranial and intratemporal complications. Understanding the imaging spectrum of temporal bone pathologies is essential for accurate diagnosis and appropriate management.

This study aims to evaluate the spectrum and distribution of temporal bone pathologies encountered on CT at our institution.

## Introduction

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## Materials and Methods

### Study Design

A retrospective descriptive study.

### Study Population

Sixty patients who underwent CT of the temporal bone between 2022 and 2024 for otologic complaints

were included.

**Inclusion Criteria**

- Patients of all age groups
- Patients undergoing CT temporal bone with abnormal imaging findings

**Exclusion Criteria**

- Inadequate imaging studies
- Incomplete clinical data

**Imaging Technique**

- **CT Temporal Bone:** High-resolution axial and coronal images to assess bony structures, ossicular chain, mastoid air cells, and erosions.

**Data Analysis**

Patients were categorized based on imaging findings into:

- Infective/Inflammatory
- Cholesteatoma/Keratitis obturans
- Congenital/Developmental
- Neoplastic
- Postoperative
- Traumatic
- Miscellaneous/Normal

Demographic data, laterality, and radiological features were analyzed.

**Results**

**Demographic Profile**

- **Total cases:** 60
- **Age range:** 5–65 years
- **Mean age:** ~31 years
- **Sex distribution:** 32 males, 28 females (M:F ≈ 1.1:1)

**Distribution of Pathologies**

Category	Representative Diagnoses	No. of Cases (%)
Infective / Inflammatory	CSOM, Otomastoiditis, Mastoiditis, Chronic Otitis Media, Otitis Externa	34 (57%)
Cholesteatoma / Keratitis Obturans	Primary, Recurrent, Evolving Cholesteatoma	7 (12%)
Congenital / Developmental	Dilated vestibular aqueduct, congenital anomalies	2 (3%)
Neoplastic / Tumor Mimics	Glomus tympanicum, Bony osteoma, Bony exostosis	3 (5%)

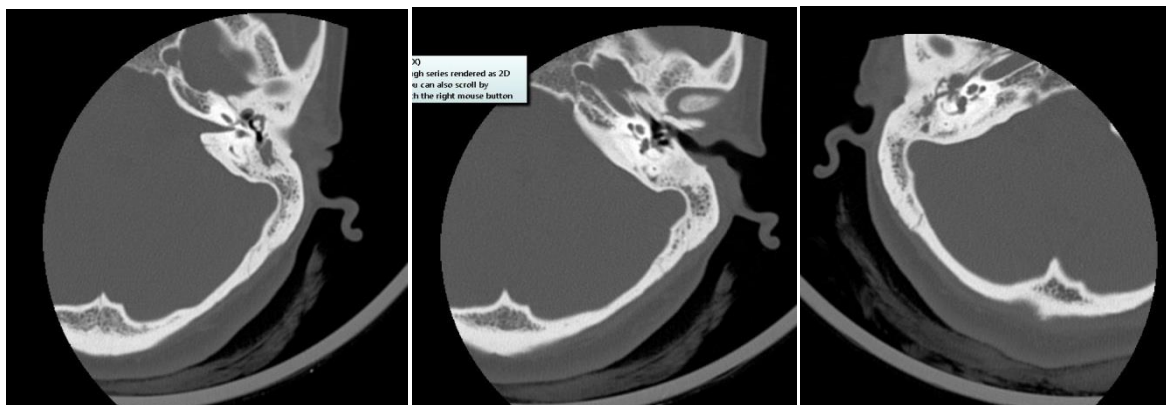
Category	Representative Diagnoses	No. of Cases (%)
Postoperative	Post-mastoidectomy, post-op otomastoiditis	2 (3%)
Traumatic	Temporal bone fracture	1 (2%)
Miscellaneous / Normal	External auditory canal wax, hyperpneumatization, normal findings	11 (18%)

**Imaging Findings**

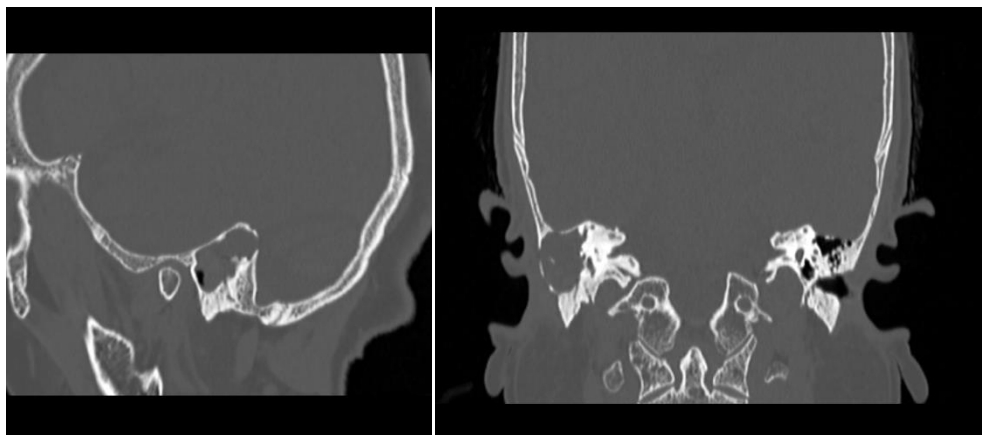
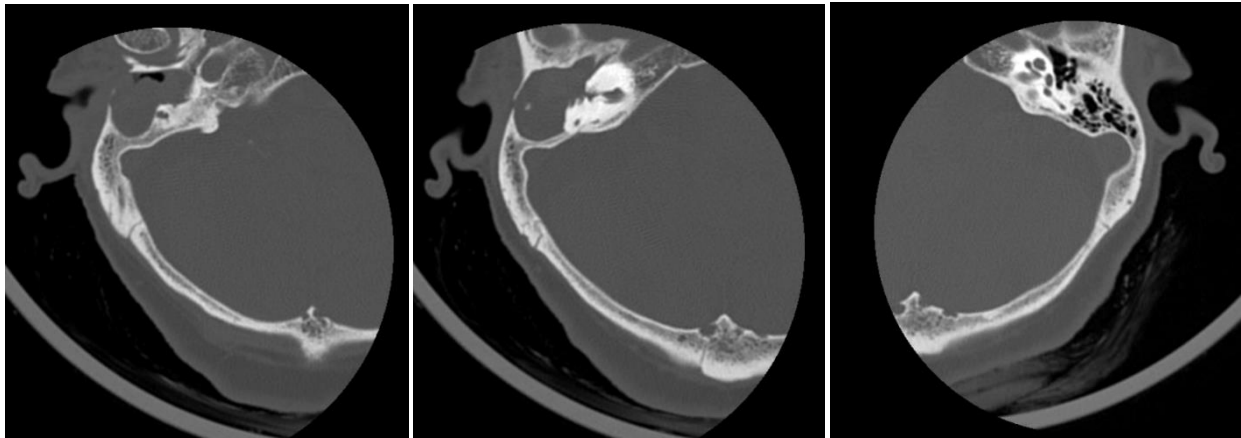
- CT was invaluable in detecting bony erosions, ossicular chain defects, mastoid cell sclerosis, coalescence, and fractures.
- CSOM and otomastoiditis commonly presented with soft-tissue density in the middle ear cleft and opacified mastoid air cells.
- Cholesteatomas showed non-enhancing diffusion-restricted lesions with possible ossicular or scutum erosion.
- Malignant otitis externa demonstrated soft-tissue involvement of the external auditory canal with bone involvement.



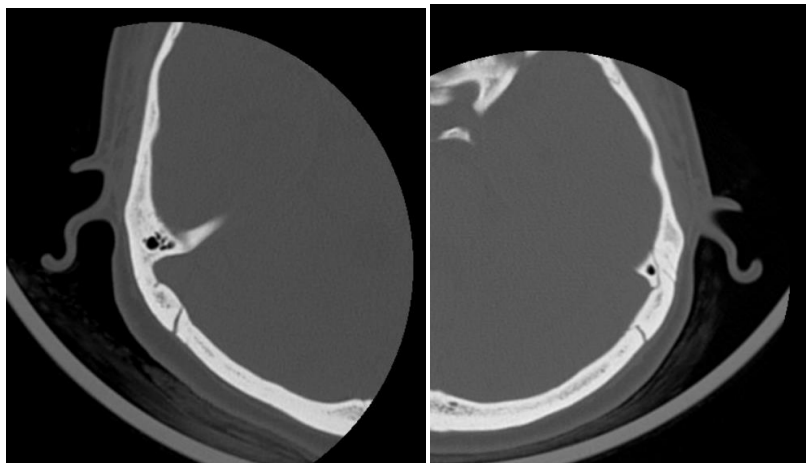
**UNSAFE CHRONIC OTOMASTOIDITIS WITH OTITIS EXTERNA**



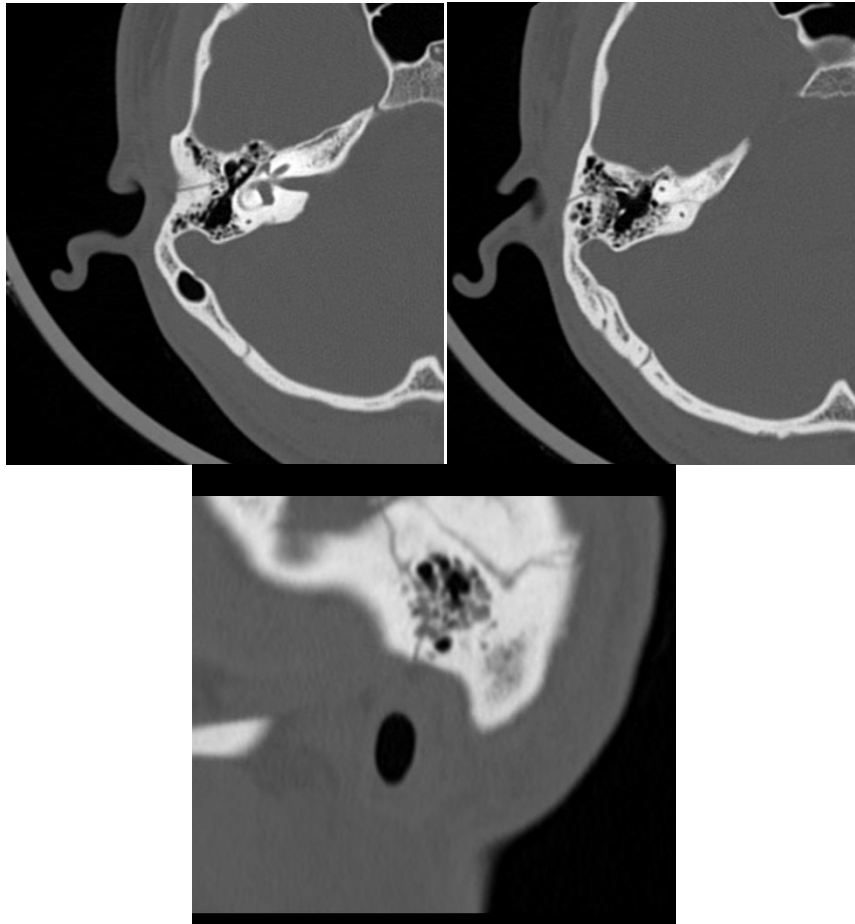
**LEFT SAFE AND RIGHT UNSAFE CSOM**



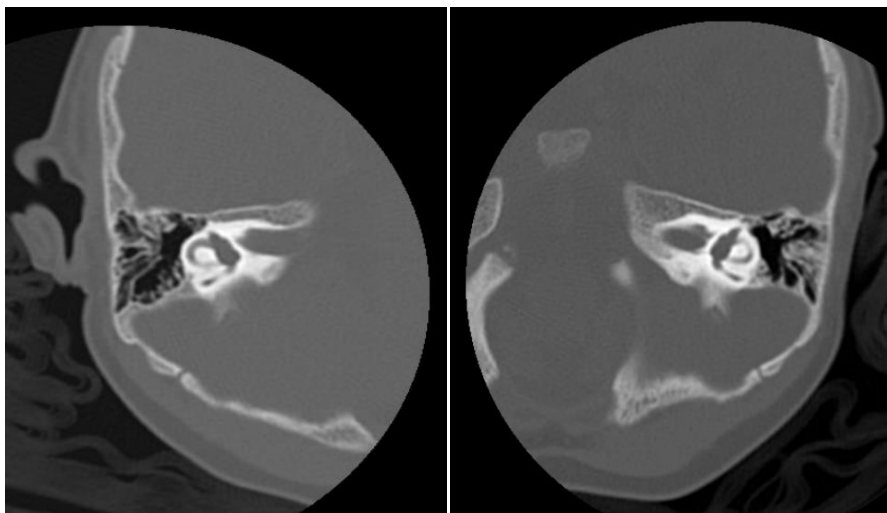
Ill-defined soft tissue density mass epicentered in right middle ear cavity extending to involve eac, mastoid antrum with its expansion and extending into inner ear with sclerosis of cochlea and erosions of semicircular canal – **NEOPLASTIC ETIOLOGY LIKELY GLOMUS TYMPANICUM TYPE IV**



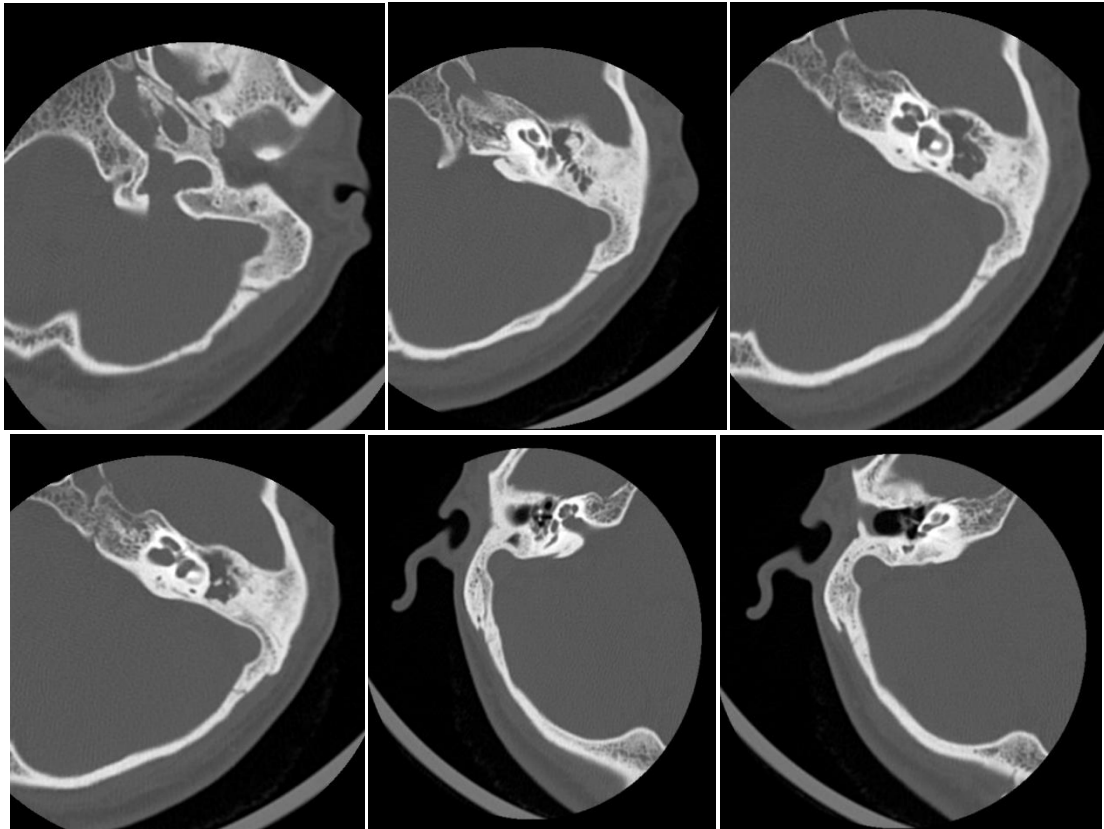
**Linear undisplaced fracture in mastoid part of left temporal bone**



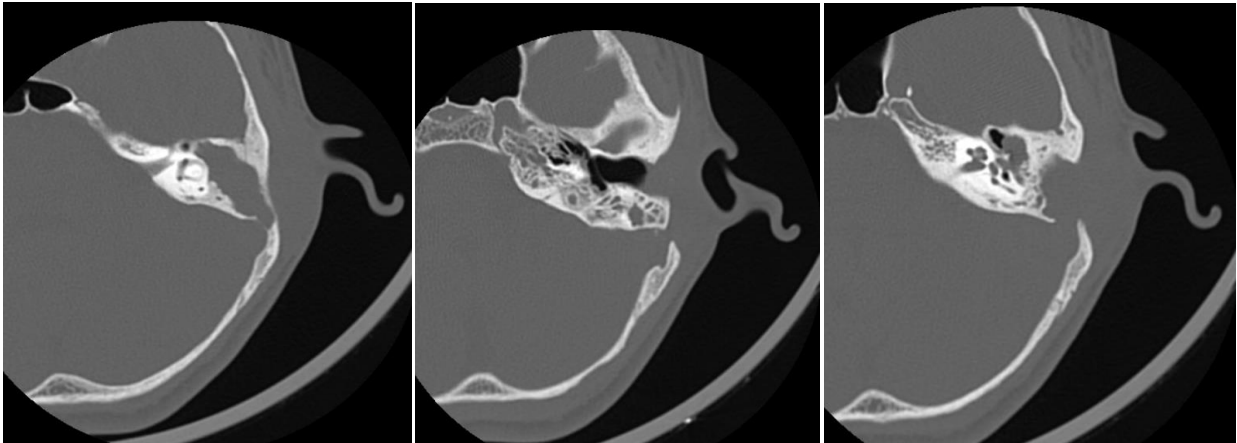
**Linear undisplaced longitudinal fracture involving mastoid part of right temporal bone with fracture line extending upto middle ear cavity with underlying hemomastoid**



**Bilateral dilated vestibular duct**

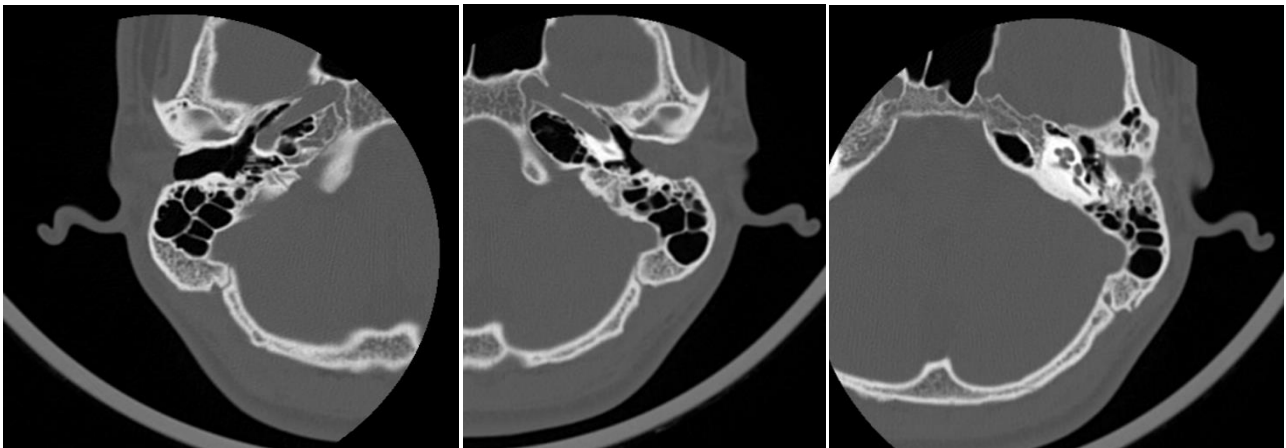


1. Narrowing of distal cartilaginous part of Left external auditory canal and complete non visualization of left bony part of left external auditory canal? atresia? agenesis.
2. Part of malleus and incus is visualized, with abnormal orientation noted. Handle of malleus, long process and stapes of incus not visualized.
3. Rarefaction of Tegmen tympani and mastoid cavity wall with few bony fragments of aditus and antrum noted.
4. Vestibule appears dilated with maximum thickness of 3.8mm.
5. Aberrant intra-diploic thin tubular serpentine hypodense structure noted in left bony labyrinth
6. Fusiform dilatation of along the facial nerve canal.
7. Soft tissue opacification noted in right external auditory canal, middle ear cavity- meso, epi tympanum, prussac space and aditus.
8. Sclerosis of mastoid **air cells**.

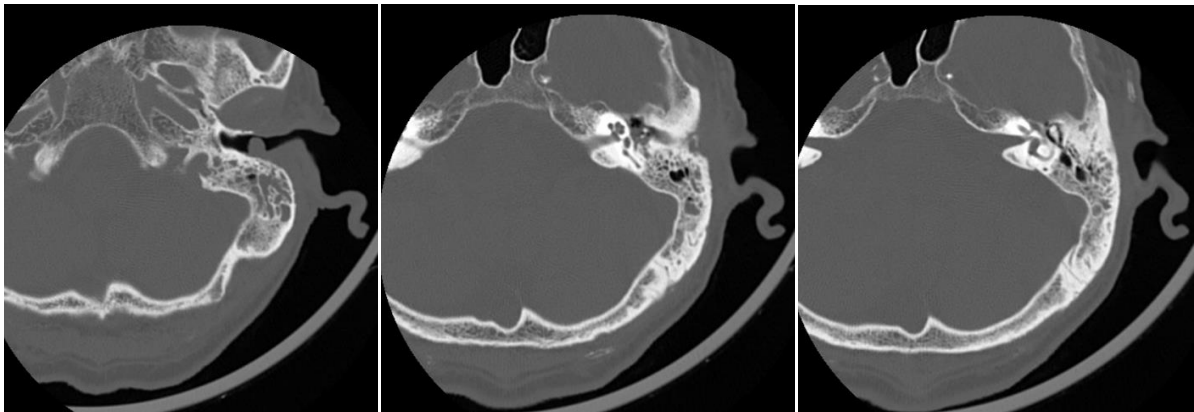


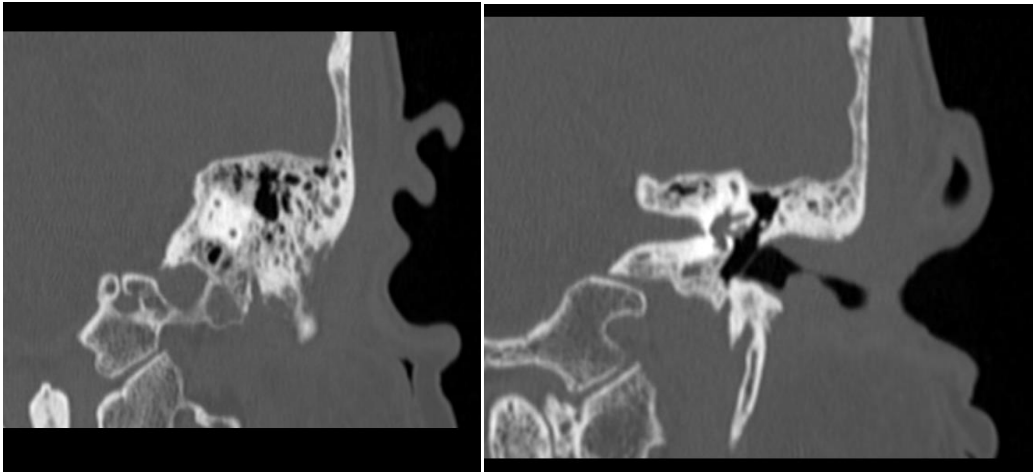
Post-operative status on left side with intact wall mastoidectomy. Stapes foot plate is visualized, rest of the ossicles not visualized likely post operative status.

ill-defined soft tissue density is involving entire mastoid cavity, epitympanum, mesotympanum, prussak's space, eustachian tube. Tympanic membrane is mildly retracted. Severe thinning of tegmen tympani (roof of middle ear) and tegmen mastoideum. These imaging features may represent-recurrent cholesteatoma.

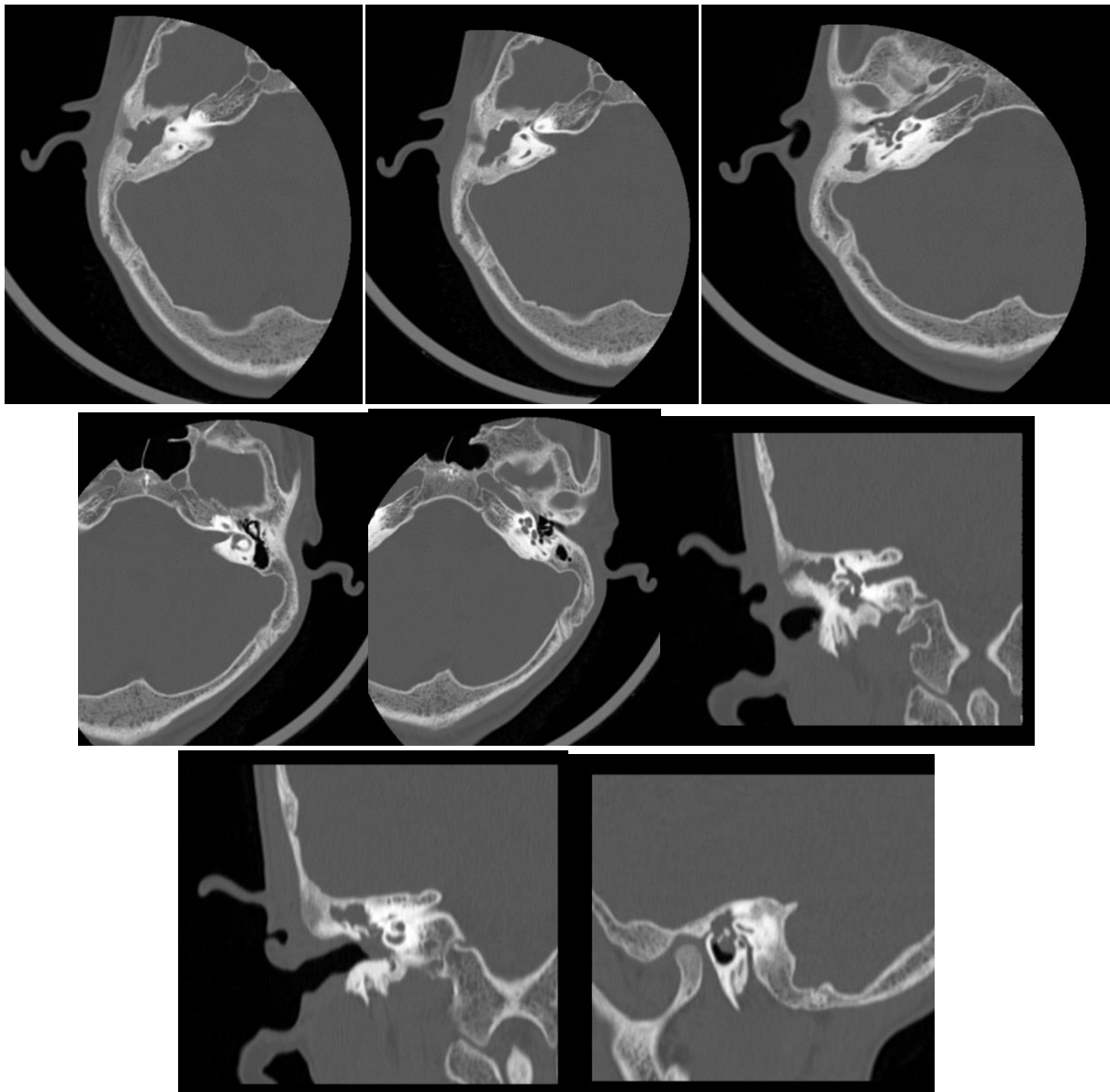


**LEFT KERATOSIS OBLITERANS WITH MASTOIDITIS**





**LEFT MALIGNANT OTITIS EXTERNA**



**Ill-defined soft tissue opacity in middle ear with bony erosion and sinus formation likely suggestive of chronic suppurative otomastoiditis and cholesteatoma formation with sinus formation.**

## Discussion

This study demonstrates that infective and inflammatory conditions constitute the majority of pathologies involving the Temporal bone, accounting for more than half of the cases in our cohort. This predominance reflects the continued high burden of chronic ear infections in developing regions, where limited access to early medical care, recurrent upper respiratory infections, poor hygiene, and socioeconomic factors contribute to the persistence and complications of middle ear disease. Chronic suppurative otitis media (CSOM) and otomastoiditis were the most frequently encountered entities, consistent with epidemiological patterns reported in similar populations.

CSOM typically presents on high-resolution computed tomography (HRCT) as soft-tissue attenuation within the middle ear cavity and mastoid air cells, often accompanied by mastoid sclerosis in long-standing disease. In more advanced cases, HRCT demonstrates ossicular chain erosion, scutum blunting, tegmen tympani thinning, and bony labyrinth involvement. Acute otomastoiditis may show coalescence of mastoid air cells and cortical breach. These findings underscore the indispensable role of HRCT in evaluating bony anatomy and detecting early erosive changes that influence surgical decision-making.

Neoplastic and congenital lesions were relatively uncommon in this study but were distinctly characterized on imaging. Vascular tumors such as Glomus tympanicum demonstrate intense post-contrast enhancement on MRI and may show bone remodeling on CT. Benign bony lesions such as osteomas and exostoses are accurately delineated on HRCT due to excellent spatial resolution. Congenital anomalies, including dilated vestibular aqueduct and external auditory canal atresia, are also best evaluated with CT for bony detail and MRI for inner ear and neural structures. Early identification of these anomalies is crucial for hearing rehabilitation planning and surgical correction.

Traumatic temporal bone fractures, though infrequent in our series, are optimally assessed with HRCT, which clearly delineates longitudinal or transverse fracture patterns, ossicular disruption, hemotympanum, and potential facial nerve canal involvement. Prompt identification of these findings is essential to prevent long-term sequelae such as conductive hearing loss or facial paralysis.

The findings of this study reinforce the importance of a structured and systematic radiologic approach when evaluating temporal bone pathologies. Accurate recognition of characteristic imaging patterns allows differentiation between inflammatory, cholesteatomatous, neoplastic, congenital, traumatic, and postoperative conditions. This distinction is vital because management strategies differ significantly—ranging from medical therapy in uncomplicated infections to urgent surgical intervention in cases with cholesteatoma or intracranial extension.

Timely imaging diagnosis directly influences patient outcomes by guiding appropriate surgical planning, preventing disease progression, and reducing complications such as permanent hearing loss, facial nerve palsy, labyrinthine dysfunction, meningitis, and intracranial abscess. In resource-limited settings where advanced complications are still encountered, radiologic evaluation plays a decisive role in reducing morbidity and mortality.

In summary, infective and inflammatory disorders remain the predominant temporal bone pathologies in our institutional experience. HRCT remains the imaging modality of choice for evaluating bony structures and disease extent.

## Conclusion

Infective and inflammatory pathologies are the predominant temporal bone lesions encountered on imaging. CT provide comprehensive evaluation of temporal bone diseases. Awareness of the imaging

spectrum aids in accurate diagnosis, appropriate management, and prevention of complications.

### Limitations

- Retrospective design
- Relatively small sample size
- Lack of histopathological correlation in all cases

### References

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