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Case Report

Post-Meningitis Labyrinthitis on MRI: A Cause of Delayed Sensorineural Hearing Loss

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Abstract

Post-meningitis labyrinthitis is an uncommon but potentially disabling neuro-otologic complication that may result in permanent sensorineural hearing loss. It reflects the extension of central nervous system infection to the inner ear through anatomical communications between the subarachnoid space and the labyrinth [1]. Magnetic resonance imaging (MRI) plays a key role in early detection, allowing diagnosis before the stage of irreversible labyrinthine ossification [2].

We report the case of a 62-year-old woman with a history of successfully treated pneumococcal meningitis who presented with delayed, progressive unilateral sensorineural hearing loss. MRI of the temporal bones demonstrated loss of the normal T2 hyperintensity of the right inner ear structures, associated with delayed post-contrast enhancement, consistent with post-infectious labyrinthitis.

This case highlights the importance of recognizing auditory symptoms as potential neurological sequelae of meningitis. MRI is essential for early diagnosis and plays a pivotal role in guiding clinical management and follow-up.

Keywords: *Labyrinthitis; Hearing Loss; MRI; Meningitis; Inner Ear*

Introduction

Labyrinthitis following bacterial meningitis is a rare but clinically significant condition that may lead to irreversible sensorineural hearing impairment [1]. The spread of infection from the subarachnoid space to the inner ear is facilitated by anatomical pathways such as the cochlear aqueduct and the internal auditory canal [1].

Historically, diagnosis was often delayed until the stage of labyrinthine ossification, which could only be detected on computed tomography (CT) [2]. With the advent of MRI, earlier stages of inflammatory involvement can now be identified, allowing timely diagnosis and improved clinical management [2,3].

This report presents a case of unilateral post-meningitis labyrinthitis in an adult patient and emphasizes the diagnostic value of MRI in detecting early inner ear involvement.

Case Report

A 62-year-old woman with a history of diabetes mellitus was previously hospitalized for pneumococcal meningitis, which was successfully treated with appropriate antibiotic therapy. Two months after recovery, she presented with progressively worsening hearing loss in the right ear. She denied vertigo or balance disturbances.

Clinical examination confirmed unilateral sensorineural hearing loss. MRI of the temporal bones was performed to investigate the underlying cause.

Imaging revealed a marked loss of the normal high signal intensity of the right inner ear structures on T2-weighted sequences (Figure 1A), involving the cochlea and vestibular apparatus. Post-contrast T1-weighted images with fat suppression demonstrated delayed enhancement of the affected labyrinth (Figure 1B). The left inner ear appeared normal.

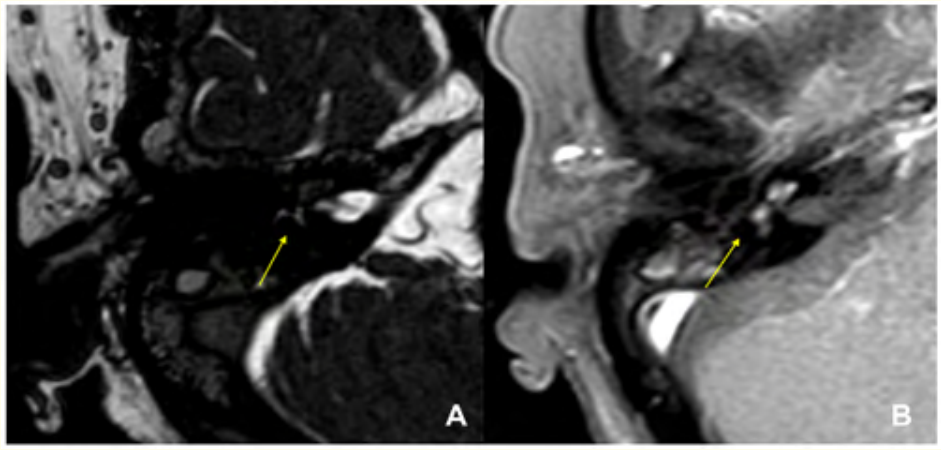

Figure 1: (A) Axial FIESTA sequence showing marked hypointensity of the right membranous labyrinth, reflecting loss of normal fluid signal. (B) Axial post-contrast T1-weighted image with fat suppression demonstrating delayed enhancement of the right inner ear structures, consistent with inflammatory involvement.

These findings were consistent with post-infectious labyrinthitis involving the right ear.

Discussion

Post-meningitis labyrinthitis represents a serious complication of bacterial meningitis, resulting from the spread of infection into the membranous labyrinth via pre-existing anatomical communications [1].

Clinically, patients most commonly present with sensorineural hearing loss, which may be accompanied by vestibular symptoms such as vertigo [1]. In adults, the involvement is often unilateral, whereas bilateral cases are more frequently observed in pediatric populations [3]. Any new auditory complaint following meningitis should prompt urgent evaluation, including imaging and otolaryngologic assessment [3].

MRI is the imaging modality of choice for early detection. In the acute or subacute phase, inflammatory changes lead to a decrease or loss of the normal fluid signal on T2-weighted sequences within the labyrinthine structures. Following gadolinium administration,

enhancement of the inner ear, particularly on delayed images, reflects disruption of the blood-labyrinth barrier and confirms active inflammatory involvement [2].

Before the widespread use of MRI, diagnosis was often made at a late stage when CT could demonstrate labyrinthitis ossificans, representing irreversible fibrosis and ossification of the inner ear [2]. Today, MRI enables detection at a stage when structural damage may still be evolving, allowing closer monitoring and earlier therapeutic considerations [2,3]. CT remains useful in selected cases, particularly when cochlear implantation is planned, as it helps assess the degree of ossification [2].

Management of post-meningitis labyrinthitis remains challenging. While prompt antibiotic treatment of meningitis is essential for prevention, there is no well-established therapy once inner ear involvement occurs [4]. The role of corticosteroids in preventing hearing loss remains controversial, with inconsistent evidence regarding their benefit [1,4].

Prognosis depends on the severity and extent of involvement. While unilateral hearing loss may be functionally compensated, bilateral involvement can result in profound disability and may require cochlear implantation [1]. However, successful implantation depends on the preservation of cochlear anatomy, which may be compromised by ossification [2].

This condition also highlights the importance of a multidisciplinary approach involving radiologists, neurologists, infectious disease specialists, internists, and otolaryngologists to ensure optimal patient care. Differential diagnoses, including vascular complications or auditory neuropathy, should be considered and excluded through appropriate clinical and imaging evaluation.

Conclusion

Post-meningitis labyrinthitis is a rare but potentially disabling condition that should be suspected in any patient presenting with hearing loss after meningitis. MRI with contrast is essential for early diagnosis, revealing characteristic signal abnormalities and enhancement of the inner ear structures. Early recognition is crucial for guiding follow-up and management, even though therapeutic options remain limited.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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