



Acute Low-Tone Sensorineural Hearing Loss Presenting With Non-Rotatory Vestibular Prodrome in a High-Risk Patient: A Comprehensive Case Report on Aggressive Systemic Corticosteroid Management and Prognostic Evaluation

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Abstract

Acute Low-Tone Hearing Loss (ALHL) is often recognized as the clinical manifestation of cochlear-restricted endolymphatic hydrops (EH), making it highly prone to recurrence and subsequent conversion into definitive Menière's Disease (MD). Given this risk, necessitate immediate and aggressive therapeutic intervention to stabilize inner ear function. This research aims to study the therapy and observation in patients with ALHL. Case Report A 27-year-old female presented with acute unilateral tinnitus, aural fullness and new-onset subtle, non-rotatory dizziness, unsteadiness and an episode of nausea and vomiting. Pure tone audiometry, showed a low tone sensorineural hearing loss. What do we have to consider in treatment of patient with ALHL to avoid worsening progression and achieve complete recovery? Literature research was carried out through PubMed and Google Scholar with keywords "Acute Low Tone Hearing Loss" AND "Sudden Sensorineural Hearing Loss" AND "Therapy". Based on the search, we found recommendations in managing patient of ALHL, such as high-dose corticosteroids, pure-tone audiometric evaluation, anti-hydrops agents, and other supportive management. There are several considerations in ALHL therapy in patients that should be carried out carefully and with comprehensive, prolonged audio vestibular surveillance.

INTRODUCTION

Acute Low-Tone Hearing Loss (ALHL) occupies a unique and significant niche within the broader classification of Idiopathic Sudden Sensorineural Hearing Loss (ISSHL) (Alexander & Harris, 2013). While the annual incidence of ISSHL spans a wide range, estimated between 5 and 168 cases per 100,000 individuals globally, ALHL specifically accounts for approximately 17% to 23% of all presentations of sudden hearing loss (Klemm et al., 2009; Nakashima et al., 2014). This clinical entity is narrowly defined by hearing loss that preferentially affects the low frequencies (typically 125 Hz, 250 Hz, and 500 Hz), while high frequencies remain relatively preserved, resulting in an ascending audiogram pattern (Diao et al., 2023).

The widely accepted primary etiology of ALHL is Endolymphatic Hydrops (EH) that is initially confined to the apical turn of the cochlea, the region responsible for processing low-frequency sounds (Im et al., 2016). Because EH is the characteristic pathology of Menière's Disease (MD), ALHL is frequently categorized as an early, precursor stage of MD, often termed Cochlear Menière's Disease, if true vertigo is absent (Junicho et al., 2008; Stölzel et al., 2018). Consequently, patients presenting with ALHL carry a high risk of

long-term progression to definite MD, necessitating vigilant monitoring beyond initial treatment and recovery (Roh et al., 2015).

The pathophysiology links the hearing loss to excessive fluid accumulation in the scala media, causing mechanical stress on the sensory hair cells and membrane structures (Jung et al., 2016). Clinical presentation is characterized by a triad of acute, unilateral symptoms: low-frequency hearing loss, subjective sensation of aural fullness or pressure, and low-pitched tinnitus (Yamasoba et al., 1994). Importantly, the presence of accompanying symptoms such as subtle dizziness or unsteadiness, even without true rotational vertigo, significantly increases the likelihood of eventual progression to MD (Stölzel et al., 2018).

The central objective of this detailed case report is to thoroughly document the clinical presentation, the utilization of a distinctly non-standard, high-dose systemic corticosteroid regimen, and the immediate therapeutic response in a young patient diagnosed with high-risk ALHL. Specifically, this report examines the potential rationale for deploying an exceptionally high initial dose of 88 mg Methyl Prednisolone in a patient with significant co-factors (young age, vestibular prodrome, and obesity), which collectively suggest a virulent, difficult-to-treat form of Endolymphatic Hydrops. A secondary purpose is to contribute empirical data to the limited literature on high-dose initial therapy and early prognostic indicators for ALHL patients positioned on the Menière's Disease spectrum (Shin et al., 2021).

The documented application and subsequent immediate clinical response to a rapid, ultra-high-dose systemic steroid regimen in this specific clinical context offer valuable insights into maximal anti-hydrops intervention. This case contributes to the evidence base concerning the efficacy envelope of high-dose systemic glucocorticoids when standard doses fail or are predicted to be inadequate due to severe presentation or poor prognostic indicators (Hu et al., 2021). Furthermore, meticulous recording of the early subjective treatment provides crucial clinical turning points, emphasizing the necessity of immediate contingency planning for salvage therapy in aggressive ALHL phenotypes (Yamasoba et al., 1994).

It is hypothesized that the markedly aggressive initial therapeutic intervention combining a high starting dose of 88 mg Methyl Prednisolone with *Betahistine* was necessary to target the severe, advancing Endolymphatic Hydrops indicated by the patient's presentation profile. This maximalist approach, despite the initial subjective setback, is ultimately predicted to achieve a positive long-term audiological outcome, provided that subsequent monitoring and potential salvage therapy are promptly implemented, thereby challenging the conventional efficacy limits of systemic monotherapy in high-risk ALHL (Fuse et al., 2002).

Anti-inflammatory therapy approaches are aimed at suppressing inflammation in the auditory nerve and cochlea (Li et al., 2025; Rahman et al., 2023). The primary treatment option is a single dose of corticosteroids at 1 mg/kg/day, tapered every 5 days by 20 mg (Bramantyo et al., 2024; Bramantyo & Bashirudin, 2012). Another study suggests an oral PD dose initiation regimen twice daily for 7 days, with the initial daily dose not exceeding 30 mg. For PD with an initial daily dose of ≥ 30 mg, the same dose was administered once daily for 4 days, then tapered by 10 mg every 2 days (Shin et al., 2021; Hu et al., 2021). Moreover, the effectiveness of using *betahistine* as the sole primary anti-hydrops agent, substituting for conventional diuretics like isosorbide or hydrochlorothiazide, in conjunction with an

ultra-high-dose steroid, is an under-researched clinical strategy that this case uniquely addresses (Shin et al., 2021).

Therefore, this study aims to comprehensively describe the clinical presentation, management strategy, and therapeutic outcomes of a high-risk ALHL patient treated with an aggressive high-dose systemic corticosteroid regimen combined with supportive therapy. Specifically, this study seeks to evaluate the rationale and effectiveness of using a maximal initial dose of methylprednisolone, to analyze early prognostic indicators, and to assess short-term audiological recovery in the context of potential progression toward Menière's Disease. The benefits of this study are expected to contribute to the development of more evidence-based and individualized management strategies for ALHL, particularly in high-risk patients. Clinically, the findings may provide practical insights for otolaryngologists in determining optimal treatment intensity and monitoring strategies. Academically, this case report enriches the existing literature by addressing gaps related to high-dose corticosteroid use and early prognostic evaluation in ALHL. Furthermore, this study may serve as a reference for future research aimed at improving therapeutic outcomes and preventing long-term complications such as recurrence and progression to Menière's Disease.

Case report

Our patient is a 27-year-old female with a body weight of 88 kg, who presented to the clinic on August 16th, 2025. Her chief complaint was the acute onset of symptoms in the right ear, first noticed upon waking approximately one day prior. She experienced continuous, high-pitch tinnitus and a severe sense of aural blockage or fullness, specifically analogized to the pressure felt during air travel. This sensation of pressure is a classic indicator of increased fluid volume within the inner ear (Endolymphatic Hydrops).

Significantly, the patient reported systemic symptoms: non-rotatory dizziness (*pusing*), persistent unsteadiness (*sempoyongan*), and a single episode of nausea with vomiting. The patient, however, maintained good speech understanding and communication ability, a feature highly characteristic of hearing loss confined to the apical cochlea (low-frequencies). She denied any associated symptoms of fever or a recent history of infection.

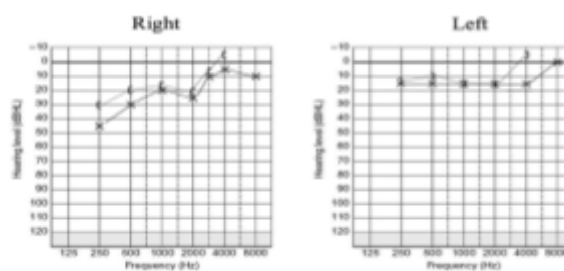


Figure 1. Pure-tone audiometry day 1 from the onset of hearing loss

Source: Primary data obtained from clinical examination using Interacoustics AA 222 audiometer in this study

A complete physical examination, including the Otolaryngology-Head and Neck (THT-KL) assessment, found no visible abnormalities in the tympanic membrane or middle ear structure. A detailed cranial nerve examination was also determined to be entirely within

normal limits. No laboratory results were immediately available at the time of initial consultation. Pure-tone audiometry (PTA) was performed using an *Interacoustics AA 222* audiometer, which underwent weekly calibration. The results revealed a decrease in hearing thresholds at two consecutive low frequencies (Figure 1). The collective clinical presentation of acute onset, low-frequency type hearing loss (inferred from good speech discrimination), prominent aural fullness, tinnitus, and non-rotatory vestibular symptoms led to the clinical diagnosis of Sudden Low Acute Hearing Loss (ALHL). Due to the complexity and the vestibular component, an aggressive treatment plan was immediately put in place.

The initial management strategy was structured around achieving maximum anti-inflammatory and osmotic gradient stabilization rapidly, which necessitated a high-dose systemic corticosteroid approach. The plan also included ongoing pure tone audiometry to evaluate objective monitoring of hearing function.

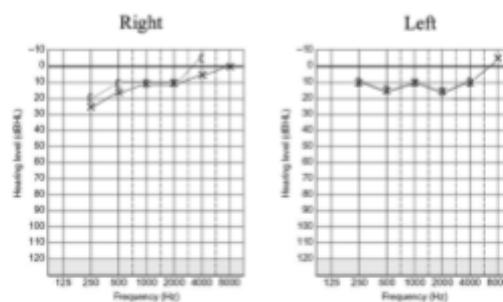


Figure 2. Pure-tone audiometry day 3 from the onset of hearing loss.

Source: Clinical documentation and audiometric records of the present study

At the first visit, MP was given at 88 mg once daily in the morning accompanied with 6 mg of *betahistine* once daily, 30 mg. of lansoprazole every 12 hours, 500 mg of mecobalamin three times daily and 100 mg of ascorbic acid three times daily. The patient's early clinical response is a major concern for pathological refractoriness. At the first follow-up visit on August 19th, 2025, the patient reported persistent ear discomfort despite the medication. Pure tone audiometry results showed hearing improvement, leading to complete recovery (Figure 2). First step down was decided, reduction of 20 mg of MP from the previous dose to be as much as 68 mg of MP once daily. The dose of MP is continuously reduced every 5 days by 20 mg until the lowest dose is reached. Besides, other supportive medication is still given to the patient.

A follow-up visits on September 9th, 2025, PTA evaluation showed no transformation of values indicating worsening of hearing function. The patient had no complaint refers to the persistence of ear discomfort, suggesting that the symptoms of ear fullness and pressure had fully resolved after completing the aggressive treatment regimen. Analysis of pure-tone audiometry revealed no adverse transformations in hearing status (Figure 3).

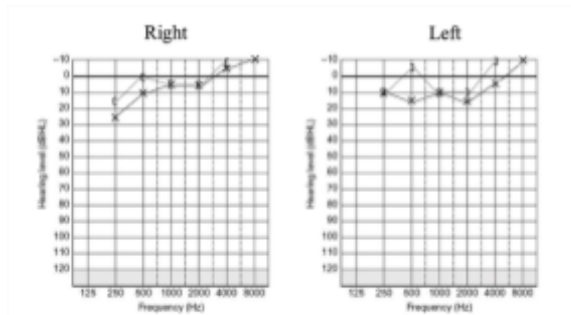


Figure 3. Pure-tone audiometry day 24 from the onset of hearing loss

Source: Processed data from patient follow-up examinations conducted in this study

Clinical Question

What do we have to consider in treatment of patients with ALHL to avoid worsening progression and achieve complete recovery?

METHOD

Literature research was carried out through PubMed and Google Scholar with keywords "Acute Low Tone Hearing Loss" AND "Sudden Sensorineural Hearing Loss" AND "Therapy". It revealed 20 literatures in Pubmed and 376 literatures in Google Scholar. The selection is based on the last ten years interval publication dates, English language, and free full text.

RESULT AND DISCUSSION

The patient's presentation profile represents a high-risk phenotype for Acute Low-Tone Hearing Loss (ALHL), carrying an increased propensity for progression to definite Menière's Disease (MD) (Stölzel et al., 2018). Key adverse prognostic factors include her relatively young age (27 years) and, most critically, the presence of non-rotatory dizziness, unsteadiness, nausea, and vomiting, complicated by multiple adverse prognostic indicators, including obesity. Women have been shown to have a significantly higher tendency towards ALHL than men. Besides hormonal and genetic factors, anxiety also plays a significant role in the occurrence of ALHL. This is in line with findings that women tend to be more susceptible to anxiety (Basso et al., 2020; Miwa et al., 2022).

Studies consistently report that patients with ALHL who present with tinnitus or dizziness have a significantly higher risk of MD conversion compared to those presenting with ALHL as a solitary cochlear symptom (Stölzel et al., 2018; Roh et al., 2015). This symptomatology suggests early, active Endolymphatic Hydrops (EH) that has spread beyond the cochlea (apical EH) to involve the adjacent vestibular structures, placing the patient on the spectrum of "Probable MD" (Lopez-Escamez et al., 2015). The patient faces a high, documented risk of recurrence and transformation into definite Menière's Disease, necessitating rigorous post-treatment surveillance (Roh et al., 2015).

Furthermore, the patient's body weight (88 kg) raises the possibility of underlying metabolic co-factors, which can sometimes be implicated in sensorineural hearing loss such as Iron-Deficiency Anemia (IDA) (Taki et al., 2021). The exclusion of common, definitive

causes through a normal Ear, Nose and Throat (THT-KL) and cranial nerve examination strengthens the diagnosis of idiopathic EH, necessitating a management strategy explicitly focused on controlling the hydrops.

Conventional high-dose systemic corticosteroid therapy for SSNHL and its variants typically involves doses equivalent to 60 mg of oral Prednisone, tapered over 10 to 14 days (Shin et al., 2021). The core decision to initiate the exceptionally high-dose of 88 mg Methyl Prednisolone (MP) as the initial intervention stands out. The initial use of MP (corticosteroid) therapy with a maximum dose of 1 mg/kg/day indicates a deliberate choice by the physician to use the maximum "loading dose". This dose is then tapered every 3–5 days by 20 mg (Bramantyo et al., 2024; Bramantyo & Bashirudin, 2012). This suggests a deliberate choice by the clinician to employ a maximal loading dose, potentially based on the following rationales: (1) Overcoming Blood-Labyrinth Barrier (BLB): A higher systemic dose aims to maximize drug concentration reaching the inner ear fluids, a challenge due to the BLB (Jin et al., 2020). (2) Managing Refractory Inflammation: Given the presence of vestibular symptoms, the underlying EH was presumed to be aggressive or highly inflammatory, necessitating a dose intended to rapidly suppress the pathological cascade (Hu et al., 2021). (3) Body Weight Consideration: Although systemic steroid dosing is often generalized, high body mass may sometimes prompt the use of a higher absolute dose to achieve the desired plasma concentration in a patient whose weight is 88 kg.

Objective Pure-Tone Audiometry (PTA) should be performed immediately to confirm the extent of hearing loss. Hearing improvement, measured by audiometry at the patient's follow up visit after day three, is a positive prognostic sign. Generally, a successful high-dose steroid regimen is expected to initiate rapid subjective stabilization or improvement (Im et al., 2016). Audiometric improvement represents success, indicating the absence of severe HE progressing rapidly after maximal systemic anti-inflammatory intervention, or the absence of substantial cochlear damage refractory to immediate pharmacological reversal (Yamasoba et al., 1994). If the PTA confirms a poor initial response, Intratympanic Steroid (ITS) injection should be immediately deployed as the optimal salvage therapy to maximize local drug concentration and stabilize the cochlear function (Hu et al., 2021; Jin et al., 2020).

The ancillary medications were strategically selected to complement the primary steroid action. *Betahistine* was used explicitly as the anti-hydrops agent, functioning to improve microcirculation in the inner ear and potentially reduce endolymphatic pressure, serving as a suitable alternative to osmotic diuretics commonly used in EH management (Thai-Van et al., 2001). However, some contemporary studies suggest that diuretics (like hydrochlorothiazide or isosorbide) combined with low-dose steroids may be sufficient for initial ALHL management, implying that *betahistine's* anti-hydrops action may not fully substitute for osmotic fluid reduction (Shin et al., 2021). The inclusion of Lansoprazole was a crucial protective measure against the gastrointestinal side effects associated with the ultra-high-dose MP. Furthermore, the initial high dosing of Mecobalamin (Vitamin B12) and Ascorbic Acid (Vitamin C) reflects a supportive strategy aimed at maximizing neurotrophic protection for the vulnerable cochlear neurons and counteracting oxidative stress, although these treatments lack Level I evidence for acute hearing loss.

The long-term outlook for this patient is complicated by her clinical profile. Studies show that ALHL recurrence rates can be significant, occurring in approximately 15.2% of

patients, typically within the first year (Roh et al., 2015). Given the presence of vestibular prodromal symptoms, the risk of progression to definite MD is amplified (Stölzel et al., 2018). Therefore, longitudinal surveillance is mandatory, extending far beyond the typical post-treatment follow-up period (Diao et al., 2023). Electrocochleography (ECoChG) is strongly recommended in any future episodes or if hearing fluctuation is noted, as an increased Summating Potential/Action Potential (SP/AP) ratio is the key objective measure of escalating EH severity and impending MD (Im et al., 2016).

CONCLUSION

This study highlights that Acute Low-Tone Hearing Loss (ALHL) represents a high-risk clinical condition, particularly in patients presenting with vestibular symptoms, which may indicate early progression toward Menière's Disease. The case demonstrates that early recognition and aggressive management using high-dose systemic corticosteroids, combined with supportive therapy such as betahistine, can result in significant audiological improvement and complete recovery. The findings emphasize that individualized treatment strategies are crucial, especially in patients with poor prognostic indicators such as young age, vestibular prodrome, and metabolic factors. Objective monitoring through pure-tone audiometry plays a vital role in evaluating treatment response and guiding dose adjustment. Furthermore, despite favorable short-term outcomes, the risk of recurrence and long-term progression remains substantial. Therefore, continuous and prolonged audio vestibular surveillance is essential to ensure early detection of relapse or transition to Menière's Disease. Future research is needed to further evaluate optimal dosing strategies and long-term management approaches for high-risk ALHL patients.

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