

Hearing Loss and Rheumatoid Arthritis

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Abstract

Background: Rheumatoid arthritis (RA) is a chronic, inflammatory condition that impacts approximately 1% of the population. While RA primarily affects the joints and surrounding areas, it can also have systemic effects involving organs such as the heart, lungs, skin, and eyes. Similarly, the auditory system can experience various issues during the progression of the disease. The prevalence of different types of hearing loss in individuals with RA varies significantly. Sensorineural hearing loss (SNHL) stands out as the most frequently observed form of hearing impairment in RA patients, with rates ranging from 25% to 72%. Less commonly, conductive hearing loss (CHL) and mixed hearing loss (MHL) have also been identified in the assessment of patients with RA early on the disease journey.

Case: We present a case of a 39-year-old male who presented to the rheumatology clinic complaining of the gradual onset of worsening pain in the MCP and PIP joints of the bilateral hands associated with significant morning stiffness and swelling. It was associated with a previous history of decreased hearing in the bilateral ear, aural fullness, and occasional tinnitus a few months before being started on Plaquenil; pure tone audiometry confirmed minimal conductive hearing impairment on the right ear and mixed hearing loss with dominant conductive component on the left ear. His tinnitus resolved entirely, and his hearing improved significantly after treatment with steroids and methotrexate. Based on this case and previous literature, we conclude that rheumatoid arthritis is the cause of hearing loss in our patients.

Conclusion: While it is widely acknowledged that there are numerous potential factors and various contributors to the development of sensorineural hearing loss (SNHL) in individuals with rheumatoid arthritis, the timing of our patient's hearing impairment, in the absence of substantial alternative evidence, suggests that rheumatoid arthritis is the likely cause of their SNHL. Although the use of ototoxic medications for different purposes and the influence of disease-modifying antirheumatic drugs (DMARDs) could be potential complicating factors, our patient has no record of prior usage. We also emphasize the variability in how autoimmune SNHL responds to steroids and underscore the importance of considering steroid-sparing agents, as they may offer benefits. Several studies have demonstrated improved outcomes with timely and appropriate medical intervention.

Introduction

Rheumatoid arthritis (RA) is a long-term autoimmune condition characterized by chronic inflammation, affecting various systems in the body and significantly impacting patients' overall well-being. Initially, it primarily affects small joints, but it has been associated with additional health issues known

as extra-articular manifestations (EAMs), mainly attributed to the inflammatory processes involved. Recent research involving 67 studies with 742,246 RA patients and 211,592,925 healthy individuals estimated the global prevalence of RA to be approximately 0.46% [1]. One of the reported EAMs in RA patients is hearing impairment (HI). Given

the potential negative impact on a patient's quality of life, there has been growing interest in understanding the underlying causes, associations, and potential management of HI in RA patients over the past two decades [2]. Various types of hearing impairment have been observed in RA patients, including sensorineural (SNHL), conductive (CHL), or mixed (MHL), affecting the middle ear, cochlea, or auditory nerve. SNHL is the most common type, with prevalence ranging from 12% to 80%, primarily affecting high frequencies. CHL or MHL are less common, occurring in approximately 20% of RA cases [3]. The precise mechanism by which RA leads to hearing loss remains unclear. However, it is suggested to involve inflammation affecting the middle ear or cochlea, auditory neuropathy, and potential ototoxic effects of prescribed antirheumatic medications [4]. Drugs commonly used in RA treatment, such as methotrexate and hydroxychloroquine, have been documented to have ototoxic side effects [5,6]. Other proposed mechanisms include the involvement of the external and/or middle ear due to the fixation of rheumatoid ossicular joints or RA-related damage to the joints and ligaments of auditory ossicles, which can explain certain types of tympanograms [3]. Different types of tympanogram can be observed in RA, including as (associated with ossicular chain fibrosis), Ad (possibly due to inadequate perfusion of the ossicles related to vasculitis leading to dislocation), and sometimes type B (indicating ossicular chain stiffness and limited movement) [7]. Various audiometry assessment tools have been used in studies, ranging from pure tone audiometry (PTA) for routine hearing loss detection to extended high-frequency audiometry (EHFA), which can sensitively detect early stages of hearing loss, particularly high-frequency hearing loss before involvement of medium and lower frequencies in advanced cases [3]. Oto-acoustic emissions, which are sounds emitted by the cochlea in response to acoustic stimuli, have also been found to be affected in RA, serving as an early indicator of impaired hearing. They can be a valuable tool for early detection of hearing issues, potentially leading to adjustments in treatment protocols to minimize ototoxic effects, especially in cases where conventional hearing assessments show normal results [8].

Case Presentation

The patient is a 39-year-old male, an engineer by occupation with no significant past medical history, who presented to the rheumatology clinic with a gradual onset of worsening pain in the MCP and PIP joints of the bilateral hands associated with significant morning stiffness. He also noticed on-and-off swelling of these joints and decreased grip strength. He used

to work out frequently, and he was prescribed steroids for his symptoms by his gym instructor. However, the symptoms were not relieved. He also reported significant fatigue in the past few weeks, needing him to cut down on his workout. However, he denied fevers, chills, night sweats, weight loss, or rash. He denied alcohol use, smoking, or using any other recreational drugs. Family history was unremarkable. Vital signs were within normal limits on presentation. On physical examination, the patient had significant swelling of multiple joints, including the right wrist and right elbow. The joints were erythematous and tender to touch. Due to pain, he had limited range in the involved joints. Initial laboratory workup for the swollen joints included a complete blood count, which revealed an average white blood cell count (WBC) of 7.810 with neutrophil predominance, ESR of 20 mm per hour, and CRP of 0.2 mg/dL. A comprehensive metabolic panel was within normal limits. The infectious workup, which included blood and urine cultures, was negative. Immunological workup revealed negative ANA, CRP 0.3(0.0-0.05 mg/dl), negative anti CCP 7.0(7.0-17.0 U/ml), ESR 12.0(0.00-15.0 mm/hr.), rheumatoid factor negative 5.9(3.4-7.0 mg/dl), uric acid 5.9(3.4-7.0 mg/dl). Anterior/posterior view of the hand X-rays of the right and left were unremarkable. Ultrasounds of the right and left hands showed grade 1 joint effusion and tenosynovitis. Based on the clinical and laboratory evidence, the patient was diagnosed with Rheumatoid Arthritis by the rheumatologist and was started on Plaquenil. On a later clinic visit, the rheumatologist noticed that the patient visited the ENT clinic. Upon further history taking, the patient endorsed having left ear fullness and hearing difficulty for the past few months before being started on Planiquel. Plaquenil was instantly discontinued, and the patient was started on methotrexate 2.5 mg and steroids. Physical examination of his auricular cartilages, ear canals, and tympanic membranes showed no erythema, swelling, or tenderness. Ear canals were patent and intact. The whisper test revealed significantly reduced hearing in the left ear and mild hearing impairment in the right ear; normal oral aperture; no oral ulcerations, and no skin ulcerations or pits on fingertips. He was evaluated by an otorhinolaryngologist four months back and underwent pure tone audiometry (PTA) (Figure 1). His evaluation was remarkable for minimal conductive hearing impairment on the right ear and moderately severe mixed hearing loss on the left. (Figure 1) Audiometry threshold assessment showed mild conductive hearing loss in the right ear and severe mixed hearing loss in the left ear. CT scans of the bilateral ears showed bilateral fenestral and retro-fenestral otosclerosis. He was advised to use hearing aids and to avoid noise exposure and

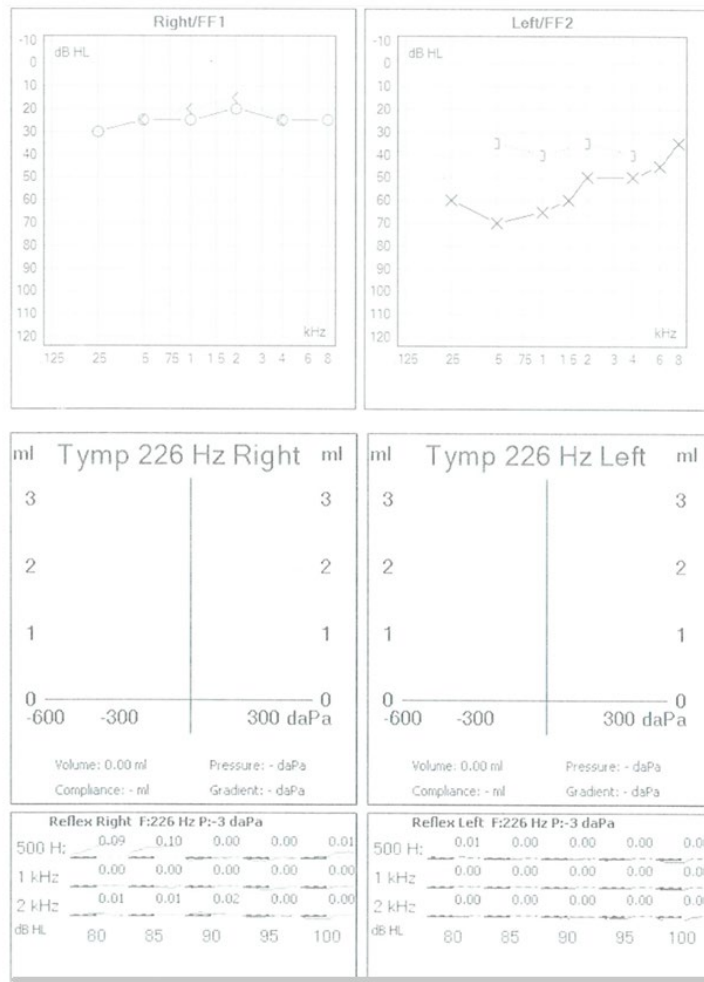


Figure 1 Audiometry threshold assessment showed mild conductive hearing loss in the right ear and severe mixed hearing loss in the left ear.

ototoxic drugs. Symptoms of the patient improved with treatment.

Discussion

Rheumatoid arthritis (RA) is one of the most prevalent autoimmune diseases, primarily manifesting as bilateral joint inflammation, usually symmetrically affecting the small joints of the hands and feet. However, RA is a systemic disease and can have several extra-articular manifestations, including rheumatoid nodules (most common), Sjogren's syndrome, and pulmonary manifestations. Elevated disease activity in active rheumatoid arthritis has been linked to a higher likelihood of experiencing specific characteristics. Risk factors include being male, smoking, severe joint disease, impaired function, elevated levels of pro-inflammatory markers, high levels of rheumatoid factor, and possessing the HLA-related shared epitope have been identified as predictive clinical markers for the development of these complications associated with rheumatoid arthritis [9].

Immune-related inner ear conditions can be either primary, wherein the immune system targets the inner ear directly, or secondary, where the ear is affected in conjunction with systemic autoimmune conditions. Sensorineural hearing loss is the prevalent audiovestibular symptom linked with systemic autoimmune diseases, although conductive hearing issues may also arise [10]. In a systematic review conducted by Emamifar et al., individuals with RA are more susceptible to hearing loss compared to individuals without RA [3]. Despite the considerable variation in published findings, it is evident that multiple factors influence hearing impairment in RA. These factors include environmental elements like smoking, disease-specific factors such as the presence of rheumatoid nodules, and patient-specific traits like age. Even some of the disease-modifying antirheumatic drugs (DMARDs) commonly used to treat RA can have an ototoxic effect. In our case presentation, the patient complained of left ear fullness and progressive hearing loss after starting treatment with hydroxychloroquine,

raising the question: Could his hearing loss symptoms be secondary to the ototoxic effects of hydroxychloroquine (HCQ)? Few cases have been reported linking hearing loss in RA with hydroxychloroquine. Seckin et al. report a case of reversible ototoxicity in a 34-year-old female who developed mild bilateral neurosensory dysacusia and tinnitus, which improved on discontinuation of the treatment [11]. In another report, a 52-year-old female developed tinnitus and bilateral hearing loss after three years of treatment with HCQ for RA, which did not resolve four months after discontinuing treatment [12]. HCQ is commonly used to treat connective tissue diseases with known side effects like hyperpigmentation and retinopathy, routinely monitored clinically. The mechanism of how it can cause ototoxicity is not fully understood. Quinines can accumulate in melanocytes, and melanin is present in the inner ear in highly vascular areas. Thus, HCQ accumulation could lead to vascular damage and delayed hearing issues. Common symptoms are tinnitus, irreversible hearing loss, and vertigo [12]. While hearing issues in RA may have a hidden or subtle presentation, it is recommended to undergo routine audiometric testing and transient evoked otoacoustic emissions (TEOAEs). These assessments can aid in the early detection of hearing loss [13]. The management of hearing loss in RA patients lacks a unanimous

approach. However, it has been recommended to begin treatment with oral steroids while discontinuing ototoxic medications. The intratympanic administration of steroids at an optimized dosage may lead to a more favorable response, particularly at frequencies above 2000 Hz. Limited data suggests considering steroid-sparing agents like methotrexate and TNF inhibitors (such as infliximab), either individually or in combination with other medications, as they can help reduce the side effects associated with prolonged corticosteroid use [3].

Conclusion

Rheumatoid arthritis (RA) can lead to a decrease in hearing capabilities. The cause of hearing impairment in RA may be attributed to various factors within the condition, such as auditory neuropathy and damage to cochlear hair cells. We believe that including Otoacoustic Emissions (OAEs) as a valuable diagnostic tool for assessing rheumatoid arthritis patients could assist rheumatologists in making informed decisions about medication adjustments or interventions to delay the anticipated hearing loss as much as possible. This proactive approach is essential to prevent a decline in the patient's quality of life, making regular hearing assessments a recommended practice.

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