

Review

An update on hearing impairment in patients with rheumatoid arthritis

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Received 5 September 2017; revised 9 October 2017; accepted 17 October 2017

Abstract

Rheumatoid arthritis (RA) is a systemic, autoimmune disease that present with intra-articular and extra-articular manifestations. Auditory system may be involved during the course of RA disease due to numbers of pathologies. The link between hearing impairment and RA has been discussed in the previous literature. In this study we provide an update on the clinical aspect of hearing impairment in RA. We suggest to test hearing in all newly diagnosed RA patients at diagnosis as well as regularly during the course of disease.

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Keywords: Rheumatoid arthritis; Hearing loss; Hearing impairment; Audiometry

Contents

1. Introduction	1
2. Characteristic of hearing impairment	2
2.1. Otoacoustic emissions (OAEs)	2
3. Demographics and hearing impairment	2
4. RA disease characteristic and hearing impairment	3
5. Treatment	3
6. Conclusion	4
7. Funding sources	4
8. Conflicts of interest	4
References	4

1. Introduction

In 2015, we performed a literature review respecting hearing impairment in patients with rheumatoid arthritis (RA) which is published in early 2016 (Emamifar et al., 2016a, b, c). In this supplementary review, we presented data using the published literature since then. RA is systemic, autoimmune disease with a prevalence of 1% in the general population (Jensen Hansen et al., 2017). Although patients with RA basically present

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Peer review under responsibility of PLA General Hospital Department of Otolaryngology Head and Neck Surgery.

with articular manifestations, RA may involve other organ systems, mostly due to inflammatory process, with direct effect on long term outcome. In this direction, the probability of auditory system involvement in RA has been one of the areas with great interest. However, the results of previous studies evaluating the link between RA and hearing impairment are really confusing. Therefore we performed a literature review, using Pubmed database, to provide an update on the clinical aspect of hearing impairment in RA [Table 1].

Sensorineural hearing loss (SNHL) has been reported as the most common hearing impairment in RA with a prevalence of approximately 12–80% following by conductive hearing loss (CHL) and mixed hearing loss (MHL) (Emamifar et al., 2016a; Lobo et al., 2016; Ahmadzadeh et al., 2017). The pathogenesis of hearing impairment in RA is not clearly understood, though it may be related to arthritis of incudostapedial and incudomalleolar joints [Fig. 1], causing CHL, or due to vasculitis, neuritis or deposition of immune complex that results in SNHL. Other etiologies e.g. drug induced (salicylates, non-steroidal anti-inflammatory drugs, antimalarial and some kinds of disease modifying antirheumatic drugs), rheumatoid nodules (causing CHL), etc. have also been reported. Environmental factors i.e. smoking, alcohol and noise exposure can affect the auditory system in healthy individuals as well as RA patients (Emamifar et al., 2016a).

2. Characteristic of hearing impairment

SNHL was the most common hearing impairment, detected by pure tone audiometry, and affects particularly high frequency, though involvement of middle and low frequencies have also been reported (Lasso de la Vega et al., 2016; Yildirim et al., 2016; Jeong et al., 2016). Extended high frequency audiometry, which evaluates very high frequencies (>8000 Hz), can detect hearing impairment at earlier stages. In a case control study, Lasso de la Vega et al. found a 33.6 time higher chance of hearing impairment, detected by extended high frequency audiometry compared to pure tone audiometry (Lasso de la Vega et al., 2016). The hearing impairment at high frequencies may be due to vasculitis/neuritis that affects

the cochlea and cochlear nerve leading to SNHL in RA patients. On the contrary to the studies revealed a positive correlation between RA and hearing impairment (Lasso de la Vega et al., 2016; Yildirim et al., 2016; Jeong et al., 2016), Lobo FS and Rahne T in separate case control studies did not find statistically significant increase in the incidence of hearing impairment in patients with RA compared to the control groups (Lobo et al., 2016; Rahne et al., 2017). Besides, Ahmadzadeh A in a case control study of 42 RA patients compared to the age- and sex-matched healthy individuals demonstrated a significantly higher bone conduction threshold in the patients with RA in low frequencies and in the mean of 500–2000 Hz frequencies. The prevalence of CHL, SNHL and MHL, however, were not statistically different between the RA and control groups when definitions of hearing loss were considered (unaided pure tone threshold level of ≥ 25 dB) (Ahmadzadeh et al., 2017).

2.1. Otoacoustic emissions (OAEs)

Otoacoustic emissions (OAEs), where sounds emitted by the cochlea either spontaneously or evoked by acoustic stimuli, can be employed to determine cochlear status, specifically hair cell function. Different methods are available. OAEs can be altered by RA disease, despite of normal hearing in RA patients that represents an early stage of hearing impairment (Emamifar et al., 2016a). Lobo FS with the aim of Distortion product OAEs detected a significant reduced amplitude of OAEs at 2000 Hz bilaterally compared with control subjects (Lobo et al., 2016). However Rahne T and Ahmadzadeh A did not find any decrease in OAE amplitudes evaluated by Distortion product OAEs (Ahmadzadeh et al., 2017; Rahne et al., 2017).

3. Demographics and hearing impairment

Aging, gender, current smoking and level of education may affect prevalence of hearing impairment in RA (Emamifar et al., 2016a; Lasso de la Vega et al., 2016; Jeong et al., 2016). Elderly male patients with RA seem to be more prone to hearing impairment (Lasso de la Vega et al., 2016).

Table 1

A summary of published studies evaluating the link between rheumatoid arthritis and hearing impairment.

Authors	RA patients (n)	Mean of age (year)	Female gender %	Disease duration (months)	Difference in hearing threshold (Hz) ^a
1. Lasso de la Vega et al., 2016	53	50.5	73.6	—	6000 to 18,000 Hz
2. Yildirim et al., 2016	88	46.9	72.7	58.3	1000 Hz, 2000 Hz, 4000 Hz
3. Jeong et al., 2016	297	56.7	75.4	—	Low/mid and high frequencies ^b
4. Lobo et al., 2016	43	48.9	86.6	123.8	6000 Hz
5. Rahne et al., 2017	22	56.6	72.7	49.2	NS
6. Ahmadzadeh et al., 2017	42	53.0	92.9	103.2	500 to 2000 Hz

NS: non significant results.

^a Statistically significant difference in hearing thresholds between RA patients and control groups considering both air conduction and bone conduction detected by pure tone audiometry or extended high frequency audiometry.

^b Hearing impairment was defined according to 2 categories of frequency (low/mid and high) as follows (average values in Hz): low/mid frequency, 500, 1000, and 2000 Hz, and high frequency, 3000, 4000, and 6000 Hz.

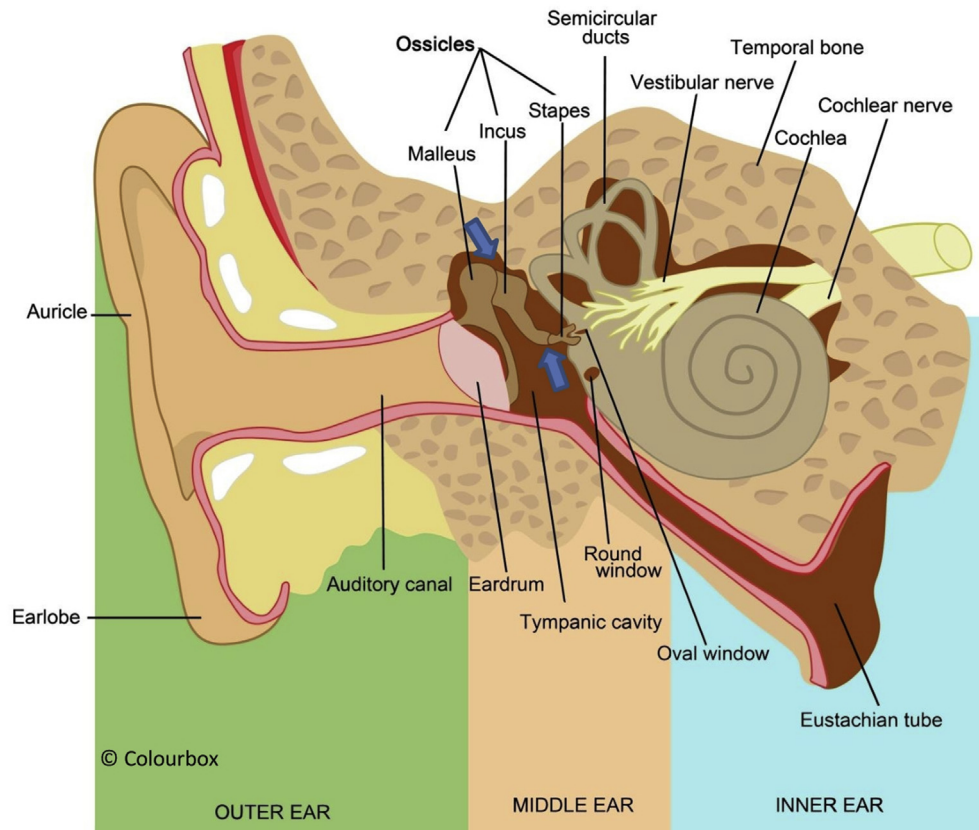


Fig. 1. Possible sites for arthritis in the ear (shown by blue arrows).

Nicotine-related vasoconstriction and subsequent decrease in the oxygen concentration can cause external hair cells damage and declined cochlear function leading to SNHL in both active and passive smokers (Emamifar et al., 2016a). Higher level of education may play a protective role against hearing impairment, since individuals with higher level of education probably work in a better work place with less noise exposure (Jeong et al., 2016).

4. RA disease characteristic and hearing impairment

Lobo FS found a relationship between hearing impairment and longer disease duration (Lobo et al., 2016). This, however, is not independent of age. A significant association, especially at high frequencies, between hearing impairment and disease activity was detected in a study by Yildirim A, where the audiometric results of 62 patients with active disease was compared with 26 patients in remission (Yildirim et al., 2016). Disease Activity Score in 28 Joints–C-Reactive Protein (DAS28-CRP) was measured based on a count of 28 tender joints, 28 swollen joints, patients global assessment and laboratory result of CRP, which is widely used in clinics (Yildirim et al., 2016; Jensen Hansen et al., 2017). Rahne T observed a correlation between the cumulative steroid dose and the air-bone gap of the right ear, since the cumulative steroid dose reflects the disease severity, it can be postulated that incudostapedial and incudomalleolar joints might be affected in

severe cases (Rahne et al., 2017). However, involvement of these joints in RA may cause no clinical symptoms, since these two joints are functionally fixed during sound transmission. In the study by Lobo FS significant correlations between anti-cyclic citrullinated peptide (anti-CCP) as well as anti-mutated citrullinated vimentin (anti-MCV) and hearing impairment were found (Lobo et al., 2016). This is of importance, because there is evidence that anti-CCP and anti-MCV are associated with severe extra articular manifestation (Turesson et al., 2007, 2013). Anti-CCP is frequently used as one of the criteria to diagnose RA in daily practice, however, the performance of anti-MCV is generally limited to the research purposes.

5. Treatment

The goal for the treatment of RA is to achieve sustained remission ($\text{DAS28} < 2.6$) or low disease activity ($\text{DAS28} \leq 3.2$) in every patients (Smolen et al., 2017). If hearing impairment is concurrently diagnosed in RA patients, initiation or intensification of disease-modifying antirheumatic drugs (DMARDs), eventually supplemented with steroid treatment, should be considered. Steroid is the mainstay of the medical treatment if patients are on the maximum doses of DMARDs. Intratympanic application of steroids with optimized dosage may results in better outcome in some instances (Emamifar et al., 2016a).

6. Conclusion

Based on this study and previously published articles, we think that there is an association between RA and hearing impairment. However the extents of the involvement as well as the predisposing factors are not well understood. In addition, the heterogeneity of the study populations in previous studies i.e. different male/female ratios, disease duration and disease severity as well as different treatment strategies resulted in conflicting results. The authors propose the screening of RA patients for hearing impairment at diagnosis and thereafter on a regular basis depending on the clinical symptoms. Extended high frequency audiometry could be of an advantage for earlier diagnosis. Once again, the need for a meta-analysis study in this field, to make a definite conclusion, is clearly felt.

Funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest

None declared.

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