Is there a relationship between temporomandibular disorders and tinnitus? A review of the literature

Peer review status:
No

Corresponding Author:
Dr. Silvia Del Prete,
DDS, Department of Oral and Maxillofacial Sciences, Sapienza University of Rome, Via Caserta 6 - Italy

Submitting Author:
Dr. Silvia Del Prete,
DDS, Department of Oral and Maxillofacial Sciences, Sapienza University of Rome, Via Caserta 6 - Italy

Other Authors:
Dr. Doria Tolevski Meshkova,
DDS, Department of Oral and Maxillofacial Sciences, Sapienza University of Rome, Italy - Italy
Dr. Emanuela Coppotelli,
DDS, Department of Oral and Maxillofacial Sciences, Sapienza University of Rome, Italy - Italy
Dr. Anna D'Urso,
DDS, Department of Oral and Maxillofacial Sciences, Sapienza University of Rome, Italy - Italy

Article ID: WMC004784
Article Type: Review articles
Submitted on: 17-Dec-2014, 10:20:33 AM GMT   Published on: 19-Dec-2014, 07:35:20 AM GMT
Article URL: http://www.webmedcentral.com/article_view/4784
Subject Categories: ORTHODONTICS
Keywords: Temporomandibular disorders, TMD, tinnitus
How to cite the article: Tolevski Meshkova D, Coppotelli E, Del Prete S, D'Urso A. Is there a relationship between temporomandibular disorders and tinnitus? A review of the literature. WebmedCentral ORTHODONTICS 2014;5(12):WMC004784
Copyright: This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC-BY), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.
Source(s) of Funding:
None
Competing Interests:
None
Is there a relationship between temporomandibular disorders and tinnitus? A review of the literature

**Author(s):** Tolevski Meshkova D, Coppotelli E, Del Prete S, D'Urso A

**Abstract**

The frequent coexistence of tinnitus and temporomandibular disorders (TMD) has led to the hypothesis that a possible relationship exists between these two conditions. The purpose of this study was to evaluate the association between these two conditions in order to establish an accurate diagnosis and management. Research has shown that the prevalence of tinnitus in TMD patients is much higher than in the general population. The results of this review of the literature showed a significant correlation between tinnitus and TMD.

**Introduction**

Tinnitus can be defined as the perception of sound or noise in the absence of an evident external stimulus\(^1\). This symptom affects the auditory pathways and may have numerous causes. Although there are several theories regarding the pathophysiology of tinnitus, the precise mechanism remains to be elucidated. Tinnitus may be related to otological, neurological and traumatic causes, adverse effects of drugs, nutritional deficiencies, metabolic disturbances, dietary, depression and temporomandibular disorders (TMD).\(^2\)

Patients with TMD often report tinnitus as an associated symptom, and the relationship between the two is still only partially understood.\(^3,4\)

Temporomandibular disorder (TMD) is a collective term that embraces a number of clinical problems involving the masticatory muscle, temporomandibular joints (TMJs), and associated structures. The etiology of TMD has been considered multifactorial, because one or more factors may contribute to its predisposition, initiation, and maintenance.\(^5\)

Studies have observed tinnitus complaints more often in patients with temporomandibular disorders (TMD) than in those without TMD.\(^6,7\), and tinnitus patients had more TMD signs and symptoms.\(^8,9\). Furthermore, signs of TMD may be a risk factor for the development of tinnitus.\(^9\).

**Review**

Several hypotheses have been proposed for the association between TMD and tinnitus, but no consensus for any single theory has been reached.\(^10\)

The first theory was proposed by Costen (1934)\(^11\), who believed that the loss of posterior teeth and vertical dimension of occlusion (VDO) could increase the pressure over the ear structures and cause otologic symptoms. Pinto (1962)\(^12\) described a second theory, the existence of a "tiny-ligament", which could be responsible for the otologic symptoms in TMD patients. The third theory was proposed by Myrhaug (1964)\(^13\), that a muscular TMD could cause a secondary hypertrophy of the tensor tympani and tensor veli palatine muscles, generating aural symptoms. Nowadays, the most acceptable is the sensory motor theory, which suggests that tinnitus modulation can occur by muscular contractions, such as when palpating myofascial trigger-points.\(^14-16\)

Approximately 10% to 15% of the general population complains of tinnitus, and its prevalence increases with age. However, the prevalence of tinnitus in TMD patients ranges from 33% to 76%, which is a much higher rate than that of the general population.\(^17-19\)

A greater incidence of women with tinnitus and normal hearing was reported by different authors.\(^20\) In other studies, the researchers did not find differences between the genders.\(^21\)

Different TMD signs and symptoms were observed in tinnitus individuals. Morais and Gili\(^22\) found that almost one quarter of the patients of their study reported feeling fatigue in their mastication muscles and one third of them reported having clattering. Asymmetrical mouth opening movement was the most most frequently found in the present study. Joint noises, such as crackling and clattering, were present in 45% and 25% of the individuals, respectively; and 30% of the individuals had some type of parafunctional habit, such as bruxism or tightening.

However, approximately 68% patients with tinnitus had both muscular and articular TMD.\(^23\) This is in accordance with previous findings\(^24,25\) according to which patients with tinnitus had significantly more muscles and joint disorders than those without tinnitus.

Also a causal relationship between tinnitus symptoms
and TMD has been deduced from the observation of 2 different clinical phenomena. Ren and Isberg\textsuperscript{[26]} investigated the prevalence of tinnitus and TMD and showed that, in 53 participants with unilateral tinnitus and unilateral anterior disk displacement, both symptoms were observed on the same side in 50 participants (94.3%).

Furthermore, tinnitus intensity and tinnitus can be altered, mostly enhanced, by mandibular movements, by mastication or by pressure applied to the TMJ.\textsuperscript{[27-29]} Conti et al.\textsuperscript{[23]} found that pain intensity was higher for the TMD and tinnitus group, although it was not statistically significant. A similar result was found by Camparis, et al.\textsuperscript{[30]}, where patients with tinnitus also had higher pain intensity than the control group. However, it should be held in mind that both tinnitus and TMD have a fluctuating nature and may have different characteristics of intensity throughout time. They both are influenced by psychological conditions and have other brain areas that may be involved in their perception and modulation.\textsuperscript{[31]} Modulation is brain’s ability of diminishing pain and/or tinnitus perception by altering the intensity of nociceptive stimuli.\textsuperscript{[32]}

Furthermore, tinnitus and chronic TMD are thought to be somatic syndromes, which may be also influenced by anxiety.\textsuperscript{[23]} Likewise, pain levels are also influenced by depression. For these reasons, tinnitus and chronic pain can impair patient’s quality of life. Tinnitus can have a negative correlation with quality of life. Further investigations may improve the understanding of this association. Tinnitus and TMD exacerbated by psychological stress.\textsuperscript{[34]}

The improvement of perceived tinnitus after stomatognathic therapy has been seen as evidence for an association between TMD and tinnitus. Different studies have shown improvement or complete remission of TMD-related tinnitus after various stomatognathic treatment regimens, ranging from 43% to 86%. Even if the two conditions are merely coexistent and not causally connected, a reduction of overall stress by reducing TMD symptoms may positively influence tinnitus. Stress, therefore, may be considered as a predisposing collective trigger for both symptoms. This consideration may explain why some patients with TMD also have tinnitus and why TMD therapies often have a positive effect on the severity of tinnitus. Many methods for treating TMD have been described over the past few years, but oral splints and physical therapy are the most frequently used procedures. Patients with arthrogenic TMD more frequently reported improvement of tinnitus than did patients with myogenic TMD.\textsuperscript{[35-39]}

Conclusion(s)

In conclusion, the present study shows that tinnitus and TMD are frequently associated. However, this association does not imply a causal relationship. Both conditions have a multifactorial etiology, which should be considered in their diagnosis and management, and they have to be considered as complex processes where various physical, psychosocial and environmental factors are involved. The interaction between otolaryngologists and dentists is strongly recommended when evaluating and managing patients suffering from TMD and tinnitus. Further studies are necessary for better understanding the association between tinnitus and TMD.

References

23. Patrícia dos Santos CALDERON, Priscila Brenner
2000;165:733-6.
