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Temporomandibular Joint Disorders in the Elderly and Aging Population

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Abstract

Objective—To review the literature and summarize the evidence of Temporomandibular Joint Disorders (TMD) in elderly and older individuals. The goal of this review is to focus on clinical manifestations of TMD in the elderly by highlighting the increased incidence of Temporomandibular Joint (TMJ) degeneration in the elderly, the sexual dimorphism and the role of sex hormones in this process. The review concludes with potential treatment options of TMD in elderly.

Design—Two review authors performed the literature search, study inclusion and data extraction. Pubmed, Embase and Google scholar were searched for literature until August 2017(Figure 1). We adopted a combination of Medical Subject Headings with related free text word for the search in pubmed and optimized the search in other search engines. Traditionally, it was believed that temporomandibular joint disorders (TMD) predominantly afflicted women of childbearing ages. However, recent very large sample size studies in Europe and in the United States have shown that the prevalence for TMD peaks between past child bearing ages (45–64 years of age) and then only gradually decreases with age. However, not much is known of the disease in the elderly.

Conclusion—In the elderly, the majority of patients have TMJ degeneration and it afflicts women more than men. In the majority of elderly patients, the symptoms of TMD are mild and self-limiting and usually can be treated by patient self management.

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Keywords

Temporomandibular joint disorders; cartilage degeneration and temporomandibular joint

Introduction

Temporomandibular joint disorders (TMD) are a broad group of clinical problems involving the masticatory musculature, the temporomandibular joint (TMJ), surrounding bony and soft tissue components, and/or any combinations of these anatomical structures¹. Symptoms of TMD include decreased mandibular range of motion, pain in the muscles of mastication, joint pain, associated joint noise during function, and a functional limitation or deviation of jaw opening¹.

TMD is a fairly common disease and is currently estimated to afflict approximately 5–12% of the United States population². Traditionally, all diseases that make up TMD were thought to be sexual dimorphic and predominantly afflict women^{3–5}. However, in a recent large prospective clinical trial that investigated the natural history of acute and chronic TMD diseases (Orofacial Pain: Prospective Evaluation and Risk Assessment.the Oppera study), it was shown that only the chronic form of TMD disease predominantly afflicted women and that the acute form of TMD had an equal prevalence between the sexes⁶. It has been further speculated that the increased prevalence of TMD found in women in a number of cross-sectional studies⁷ is due to its increased duration of TMD symptoms in women so that at any given moment of time more women than men would have TMJ symptoms⁸.

In regards to age, TMD prevalence has been shown to follow an inverted U curve³. Recent studies have shown that the peak prevalence occurs in 45–64 year-olds^{9,10}, whereas older studies showed that the prevalence peaked in women of child bearing ages (20–40 year-olds)⁵. Nevertheless, the prevalence of TMD in adults over 65 years of age is still relatively high at 3–5% of the US population,^{9,11,12}. Despite the relatively high prevalence of TMD in the elderly population, there are no current review articles that focus on this specific age group.

Therefore, the goal of this review is to focus on clinical manifestations of TMD in the elderly by highlighting the increased incidence of TMJ degeneration in the elderly, the sexual dimorphism, and the role of sex hormones in this process. Following this discussion, theories to explain why the elderly do not seek treatment are presented. The review concludes with potential treatment options of TMD in the elderly.

TMJ Degeneration Increases with Age

TMD encompasses a number of acute and chronic diseases. One established method to classify the disease that is most widely used in the published literature is by dividing the diseases into three groups: Group 1) muscle disorders, Group 2) disc disorders, and Group 3) joint disorders¹³. A more recent TMD classification has been proposed²; however, there are only a few TMD epidemiological studies published that have used the new classification of TMD. Similar to other joints, studies have found that the TMJ degenerates with age^{14,15,16}. In a series of papers, Guarda-Nardini et al. have shown an increasing prevalence of

TMJ degeneration with advancing age^{15,17}, suggesting that in people over the age of 65, the majority of patients with TMD have the degenerative joint disorder form of the disease. Human autopsy materials have also shown increased TMJ degeneration up to 60–70 years of age^{18,19}. In addition, radiographic evidence has shown approximately 45–70% of people over the age of 65 with evidence of TMJ degeneration^{20–22}. However, in the majority of TMJ degeneration patients, the clinical symptoms are minimal²². Further, in patients with clinical symptoms from TMJ degeneration, the process is usually self-limiting. After 5–8 years of initial diagnosis, the clinical symptoms resolve^{23–25}. Still, there are approximately 15% of TMJ degeneration patients who experience progression of the disease process²⁵.

The etiology of TMJ degeneration is not fully known. Shi et al. studied the association between bone loss and osteoarthritis (OA) in the condylar bone of the TMJ complex. They found that low condylar bone quality was significantly correlated with TMJ-OA development and that condylar bone mineral density and bone volume fraction can be used together as a potential diagnostic tool for TMJ-OA²⁶. Another theory for the etiology of TMJ degeneration is that the remodeling capacity of TMJ fibrocartilage decreases with age²⁷. Therefore, it is possible as one ages that the functional demands of the TMJ may exceed the repair and remodeling capacity of the joint resulting in degeneration²⁸

Role of Female Sex Hormones in Mediating TMJ degeneration

The vast majority of studies have shown that women over the age of 50, are more likely, than age-matched men to suffer from TMJ degeneration^{29, 1614}. Since TMJ degeneration is a chronic form of TMD, this is consistent with a recent longitudinal study that found that the prevalence of chronic TMD is greater in women than in men even though the prevalence of acute TMD is similar between the sexes⁸. The reason for prevalence of chronic TMD in women over 50 years old could be associated with menopause, suggesting that the incidence of chronic TMD/TMJ degeneration is correlated with a reduction of endogenous female hormones levels.

There are four studies that have looked at the effects of hormone replacement therapy (HRT) collectively on all TMD diseases. In the first study, they found a significant increase in TMD prevalence in post-menopausal women on HRT compared to women who were not⁴. However, at the time when the study was done, a high portion of the post-menopausal women on HRT had undergone hysterectomy³⁰ that can cause an increase in TMD prevalence because of intubation³¹, potentially biasing the results. In contrast, three recent studies found no difference in the prevalence of TMD in post-menopausal women on HRT compared to those who were not undergoing treatment^{10,32,33}; albeit the sample sizes were small for these particular studies. Taken together, the aforementioned studies suggest that HRT may have no significant effect on the prevalence of TMD overall. However, to date, there is currently no human clinical data that investigates the effect of HRT specifically on TMJ degeneration.

The published literature is inconclusive on the effects of estrogen in mediating TMJ degeneration. Studies have shown that certain Estrogen Receptor alpha (ER α) polymorphisms are more prevalent in patients with TMJ degeneration³⁴ and specifically in

patients with moderate to severe pain compared to patients with mild pain³⁵. Furthermore, these clinical studies have been validated in animal models to understand the mechanism behind it. Two studies that looked at the effects of ovariectomy on TMJ degeneration. One was done in young growing rats³⁶ while the other was performed on adult rats³⁷. In both studies, they found that 8–12 weeks after ovariectomy, there was histological evidence of TMJ degeneration^{36,37}. These specific studies suggest estrogen protects the TMJ from degeneration. However, studies have also looked at the role of estrogen in mediating collagenase activity and promotion of degradation in the TMJ disc. In the disc, estrogen has been shown to increase both protease and protease inhibitor expression^{38–40}. However, the TMJ disc and mandibular condylar fibrocartilage that interfaces with the subchondral bone differ in their collagen type 1 and type 2 content. Thus, the effects of estrogen may be different in these tissues⁴¹. Finally, there is a study that looked at the effects of altered estrogen levels in mediating TMJ degeneration in young growing rats in a chemical model of osteoarthritis⁴². In this study, they found that supraphysiological doses of estrogen potentiated TMJ degeneration. However, the studies were performed in young growing rats, and it is established that estrogen inhibits TMJ growth in the young³⁶. Therefore, the effects of estrogen in potentiating TMJ degeneration in the young may be overridden with inhibiting TMJ growth as opposed to modifying the progression of degeneration. Additional studies investigating the role of estrogen concentration on the mandibular condylar fibrocartilage and TMJ disc as a function of age in older samples will provide more accurate evidence to decode the sexual dimorphism of TMJ degeneration.

We are currently examining the role of estrogen through estrogen receptor alpha and estrogen receptor beta signaling in mediating TMJ homeostasis. We have found that estrogen causes the upregulation of critical extracellular matrix macromolecule collagen type 2 in the mandibular condylar fibrocartilage⁴³. Therefore, decreased estrogen levels in menopausal women may result in decreased mechanical stiffness and integrity of the mandibular condylar fibrocartilage increasing the likelihood of TMJ degeneration.

Other common TMD diseases in the elderly

It is unclear whether the incidence of TMD muscle disorders decrease or remain the same with advancing age^{10,44–46}. In contrast, the majority of studies have found that TMJ disc disorders decrease with advancing age^{47,15,17}. In addition, if disc displacement is found in the elderly it is usually associated with TMJ degeneration⁴⁸.

Elderly are Unlikely to Seek Treatment for TMJ degeneration

It is interesting that most studies have shown that self-reported TMJ pain decreases with advancing age⁴⁹, whereas the radiographic signs of TMJ degeneration increase with advancing age^{20–22}. The exact reason behind this discrepancy is unknown. However, there are many possible explanations. One explanation is the subjectivity of the interpretation of pain. The majority of people with TMJ pain describe it as mild and only 5% of patients describe it as severe^{44,50,51}. However, as the average life expectancy increases, the number of diseases with more severe symptoms that affect other areas of the body may take

precedence. This results in elderly patients less aware of TMJ pain and/or degeneration and unlikely to seek treatment ⁵².

Another explanation is that the main causes of TMDs involve both pathophysiological and psychosocial factors. Several psychosocial factors can not only predispose a person to TMD pain, but also prolong it ^{53,54}. Since most mental disorders decline in people over the age of 60 ^{55,56}, this may cause a dampening of TMJ pain in the elderly. Another explanation is that the majority of studies have shown that the natural progression of TMD are self-limiting ^{23,24,57}. In a recent study, people diagnosed with TMJ degeneration were followed with magnetic resonance imaging and computed tomography after 8 years. It was found that about 80% of the people diagnosed with TMJ degeneration remained stable or showed improvement ²⁵. Therefore, in general the prevalence of TMJ degeneration is not cumulative or progressing.

Treatment Considerations

Since it is difficult to differentiate the self-limiting from the progressive TMD patients, conservative treatments strategies are recommended. Conservative treatments consist of patient education, jaw exercises, massage, thermal therapy, dietary advice and nutrition, parafunctional behaviour identification, monitoring and avoidance ⁵⁸. The use of NSAIDs and muscle relaxants have also been shown to be effective in the relief of TMJ pain ⁵⁹. If these initial methods do not provide relief in TMJ degeneration patients, arthrocentesis of the TMJ should be advocated as the next step of treatment ^{60,61}. Total replacement of TMJ is the end stage management of TMD ⁶². Long term studies have confirmed the safety and efficacy of the new generation of alloplastic TMJ implants ⁶³. The use of alloplastic TMJ implants for the treatment of TMD has increased over the last last decade in the United States and expected to increase by 58% in the next 10–15 years ⁶⁴.

Summary

TMD encompasses many disorders that affect multiple tissues of the TMJ complex and cause both functional disturbances and orofacial pain. While much focus has been placed on TMD in young and adult populations, the diagnostics and treatment of symptoms for the elderly has not been largely investigated. In the elderly, the majority of patients have TMJ degeneration and it afflicts women more than men. In the majority of elderly patients, the symptoms of TMD are mild and self-limiting and usually can be treated by patient self management. In the few patients that are refractory from conservative treatment, arthrocentesis and TMJ replacement are both available. A major challenge in the field that must be addressed to avoid the risk of morbidity from TMJ replacement surgery is the development of new pharmaceutical therapies (such as estrogen replacement) for patients in which conservative treatment fails.

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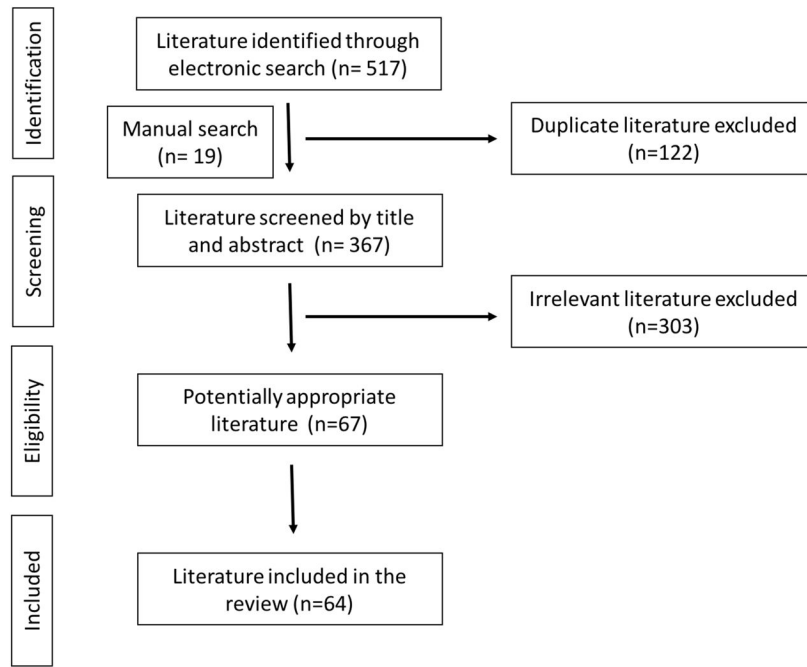


Figure 1.
Flow Diagram of the Study Selection