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TEMPOROMANDIBULAR DISORDERS IN ORTHODONTICS: AN OVERVIEW.

Dental Science

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ABSTRACT

The relationship between orthodontic treatment and temporomandibular disorders (TMDs) has long been of interest to the practicing orthodontist, but only during the past decade have a significant number of clinical studies been conducted that have investigated this association. This interest in orthodontics and TMD in part was prompted in the late 1980s after litigation that alleged that orthodontic treatment was the proximal cause of TMD in orthodontic patients. This litigious climate resulted in an increased understanding of the need for risk management as well as for methodologically sound clinical studies. The findings of current research investigating the relation of orthodontic treatment and TMD can be summarized as follows: (1) signs and symptoms of TMD may occur in healthy persons; (2) signs and symptoms of TMD increase with age, particularly during adolescence, until menopause, and therefore TMDs that originate during orthodontic treatment may not be related to the treatment; (3) in general, orthodontic treatment performed during adolescence does not increase or decrease the chances of development of TMD later in life; (4) the extraction of teeth as part of an orthodontic treatment plan does not increase the risk of TMD; (5) there is no increased risk of TMD associated with any particular type of orthodontic mechanics; (6) although a stable occlusion is a reasonable orthodontic treatment goal, not achieving a specific gnathologic ideal occlusion does not result in signs and symptoms of TMD; and (7) thus far, there is little evidence that orthodontic treatment prevents TMD, although the role of unilateral posterior crossbite correction in children may warrant further investigation.

KEYWORDS

INTRODUCTION:

The temporomandibular articulation is composed of bilateral, diarthrodial, temporomandibular joints (TMJs). Each joint is formed by a mandibular condyle and its corresponding temporal cavity (glenoid fossa and articular eminence). Muscles of mastication are primarily responsible for movement of this joint. The TMJ and its associated structures play an essential role in guiding mandibular motion and distributing stresses produced by everyday tasks, such as chewing, swallowing, and speaking.

Temporomandibular disorders (TMD) is a collective term for a group of musculoskeletal conditions involving pain and/or dysfunction in the masticatory muscles, temporomandibular joints (TMJ) and associated structures. Temporomandibular disorders (TMD) are characterized by craniofacial pain involving the joint, masticatory muscles, or muscle innervations of the head and neck[1]. TMD is a major cause of non-dental pain in the orofacial region. Up to 70% of TMD patients suffer from pathology or malpositioning of the TMJ disc, termed "internal derangement" (ID).

General incidence of TMD:

Population-based studies show that TMD affects 10% to 15% of adults, but only 5% seek treatment[2,3]. A large multisite prospective cohort study in the USA (OPPERA study) estimated that each year 4% of TMD-free adults aged 18–44 years develop clinically confirmed first-onset painful TMD, and that annual incidence increases with age (18–25 years = 2.5%; 25–34 years = 3.7% and 35–44 years = 4.5%)[4]. Some studies also indicate the percentage of population affected by temporomandibular disorders (TMD) to be as high as 56% to 87.7% of the world population [5,6]. The incidence of TMD peaks from 20 to 40 years of age and symptoms occur disproportionately between the sexes, TMD is twice as common in women than in men and carries a significant financial burden from loss of work[7,8].

Etiology and predisposing factors for TMD:

Factors predisposing to the development of TMD can be systemic, psychological (personality and behavior), and structural (malocclusion and other types of occlusal discrepancies, joint laxity, and others)[9,10]. The etiology of TMD is multifactorial and can also includes biologic, environmental, social, emotional, and cognitive triggers. Factors consistently associated with TMD include other pain conditions (e.g., chronic headaches), fibromyalgia, autoimmune disorders, sleep apnea, and psychiatric illness. A prospective cohort study with more than 6,000 participants showed a twofold increase in TMD in persons with depression (rate ratio = 2.1; 95% confidence interval, 1.5 to 3; $P < .001$) and a 1.8-fold increase in myofascial pain in persons with anxiety (rate ratio = 1.8; 95% confidence interval, 1.2 to 2.6; $P < .001$).5 Smoking is associated with an increased risk of TMD in females younger than 30 years[11].

TMD is categorized as intra-articular (within the joint) or extra-articular (involving the surrounding musculature)[12]. Musculoskeletal conditions are the most common cause of TMD, accounting for at least 50% of cases[13,14].

Scientific investigation in to TMD's began in 1950s and during this period advances were made such as the development of arthrography, refinement of transcranial technique, TM tomography, & cine fluorography. In1960s, TMD was related to muscular, emotional and psychological influences and application of muscle therapy and stress counseling for TMD was suggested. The 1970s saw significant improvement in radiographic and surgical techniques. In 1980s the focus of attention turned on disc displacement.1980s and 1990s can be characterized as the decade of TM gadgetry, both diagnostic and therapeutic. With the development of newer techniques TMD were better classified and better treatments could also be provided for the same.

The diagnosis of TMD is based largely on history and physical examination findings. The symptoms of TMD are often associated with jaw movement (e.g., opening and closing the mouth, chewing) and pain in the preauricular, masseter, or temple region. Another source of orofacial pain should be suspected if pain is not affected by jaw movement. Adventitious sounds of the jaw (e.g., clicking, popping, grating, crepitus) may occur with TMD, but also occur in up to 50% of asymptomatic patients.1 A large retrospective study (n = 4,528) conducted by a single examiner over 25 years noted that the most common presenting signs and symptoms were facial pain (96%), ear discomfort (82%), headache (79%), and jaw discomfort or dysfunction (75%)[15].

A variety of diseases affects the TMJ and includes the following:

1) Congenital and developmental malformations of mandible and

cranial bones
2) Acquired disorders including neoplasia and fractures, dislocation, ankylosis and disc displacement
3) Inflammatory diseases that produce synovitis and capsulitis
4) A wide variety of arthritis
5) Various post treatment conditions
6) Habits related to stress such as clenching, bruxism.

According to some studies, the occlusal factors are of minor etiological importance for pain and functional disorders in the masticatory system, but the role of occlusion in the etiology of TMD is still controversial[16,17].

Malocclusion and TMJ disorders are 2 separate entities, but both are quite prevalent in different groups of population. As the function of TMJ is directly related to the mandibular movements as guided by occlusion, researchers from every part of the world have been trying to find the association between malocclusion and TMJ disorders. Some investigators have stated that joint sounds are related to orthodontic malocclusions, but a final conclusion has not been reached[18,19].

The role of malocclusion as a potential risk factor for development TMDs has been progressively disproved in the past[20]. As a consequence, all treatment modalities and plans to correct malocclusions and/or to achieve ideal functional occlusion are not reliable treatment option for TMD management[21,22].

The currently available literature suggests that the orthodontic treatment does not provide any further advantages in management/prevention of TMD[23,24]. Hence, Orthodontic treatment cannot be considered to neither decrease nor increase the risk for TMD[24].

As there is very limited literature on correlation between TMD and orthodontic treatment. As most of the studies are based on anamnestic self-reported surveys and very limited prospective/longitudinal clinical studies. Several studies in spite of being longitudinal gave heterogeneous results, since they failed in defining TMD management as their primary treatment goal and include uninform sample with diverse forms of malocclusion and age groups including older individuals[25].

Even the studies using modern and sophisticated diagnostic tools such as magnetic resonance imaging(MRI) and long-term follow-up studies have failed to resolve the controversy concerning Orthodontic treatment-TMD correlation. The focus of etiological factors of temporomandibular disorders TMD has progressively shifted from physical to central factors[26].

Based on such an ongoing paradigm change, a much-diminished role is assigned to the features of natural dental occlusion as risk factors for TMD, in favor to central factors (ie, psychological and psychosocial factors, pain sensitivity, genetic determinants)[27].

SUMMARY AND CONCLUSIONS

This article reviews the current literature regarding the relation of orthodontic treatment to the TMDs. Although the orthodontic community has had a persistent interest in the association between orthodontics and TMD, this association became a focus of conversation within the dental and legal communities in the late 1980s, resulting in a burst of research activity during the past decade. The findings of current research on the relation of orthodontic treatment to the TMDs can be summarized as follows:

1. Signs and symptoms of TMD may occur in healthy persons.
2. Signs and symptoms of TMD increase with age, particularly during adolescence, until menopause. Therefore TMDs that originate during orthodontic treatment may not be related to the treatment.
3. In general, orthodontic treatment performed during adolescence does not increase or decrease the odds of developing TMD later in life.
4. The extraction of teeth as part of an orthodontic treatment plan does not increase the risk of TMD.
5. There is no evidence of an elevated risk for TMD associated with any particular type of orthodontic mechanics.
6. Although a stable occlusion is a reasonable orthodontic treatment goal, not achieving a specific gnathologic ideal occlusion does not result in the development TMD signs and symptoms.
7. Thus far, there is little evidence that orthodontic treatment prevents TMD, although the role of unilateral posterior crossbite correction in children may warrant further investigation.

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