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MALOCCLUSION AND TEMPOROMANDIBULAR JOINT (TMJ) DISORDERS

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Abstract

Background: In the practice of dentistry, there is a constant association between malocclusion and temporomandibular disorders. However, contrary to what had been established previously, malocclusion was found not to cause temporomandibular disorders, but to be a secondary result of them. Malocclusion has been found to be a reflection of an underlying joint or muscle diseases.

The aim of work: This literature riview is aimed to understand the association between malocclusion and the temporomandibular disorders and vice versa.

Materials and methods: we conducted this review using a comprehensive search of MEDLINE, PubMed and EMBASE from January 1998 to March 2017. The following search terms were used: malocclusion, TMJ disorders, occlusal changes secondary to TMJ disorders and vice versa, TMD signs and symptoms, anterior open bite, posterior open bite

Results: The association between malocclusion and the development of temporomandibular disorders has been an extremely important issue in the field of dentistry. The recent discoveries in the field of temporomandibular disorders led to the assumption that malocclusion does not cause temporomandibular disorders, but it is rather a secondary change that happens as a result of them.

Keywords: *Occlusal changes secondary to TMJ disorders and vice versa, TMD signs and symptoms, anterior open bite, posterior open bite.*

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INTRODUCTION:

Generally, temporomandibular disorders are a result of several underlying problems and lesions of the jaw, its joint, and the masticatory muscles that move them. Possible problems and lesions can be many, with malocclusion being the most commonly mentioned as an important cause of temporomandibular disorders. Many theories have been established to justify the association between malocclusion and temporomandibular disorders. These theories are based on the improvement of temporomandibular disorders after treatment of malocclusion. The presence of these theories has led to many modalities for the treatment of temporomandibular disorders like the anterior repositioning appliances therapy, occlusal adjustments, occlusal appliance therapy, and orthodontic and orthognathic treatment[1].

Since the 1980s, the association between malocclusion and the development of temporomandibular disorders has been an extremely important issue in the field of dentistry. This assumption started actually with a lawsuit that claimed that an orthodontic treatment led to the development of a temporomandibular disorder [2].

Later in the 1990s, several other studies were conducted and concluded that other occlusal fators, and skeletal factors are also involved in the development of temporomandibular disorders. These include unilateral posterior crossbite, anterior open bite, absence of five or more posterior teeth, centric relation (CR) to maximum intercuspation (MI) discrepancy greater than 2 mm, and overjet greater than 6-7 mm [3,4,5]. On the other hand, many other studies have proven that most people who show these risk factors, do not develop and kind of temporomandibular disorders [6].

These recent discoveries in the field of temporomandibular disorders led to the assumption that malocclusion does not cause temporomandibular disorders, but it is rather a secondary change that happens as a result of them. This is believed to be due to the clear connections between dental malocclusion, and the structures involved in temporomandibular disorders [7]. Any sudden change that occurs in the occlusal relationship and has been caused by a disorder is referred to as an acute malocclusion [5]. Acute malocclusion could be a short- or long-term disease [8].

METHODOLOGY:

- **Data Sources and Search terms**

We conducted this review using a comprehensive search of MEDLINE, PubMed and EMBASE, from January 1998 to March 2017. The following search terms were used: malocclusion, TMJ disorders, occlusal changes secondary to TMJ disorders and vice versa, TMD signs and symptoms, anterior open bite, posterior open bite

- **Data Extraction**

Two reviewers have independently reviewed the studies, abstracted data and disagreements were resolved by consensus. Studies were evaluated for quality and a review protocol was followed throughout.

This study was done after approval of ethical board of King Abdulaziz University.

OCCLUSAL CHANGES SECONDARY TO TEMPOROMANDIBULAR DISORDERS:

It is not usual in clinical orthodontic practice to develop malocclusion associated with temporomandibular disorders manifestations [6]. When temporomandibular disorders lead to the development of a malocclusion, this will cause changes in the position of the mandible, that depends on the structures and muscles involved in the temporomandibular disorder [5]. These changes can lead to clinical signs and symptoms that affect the everyday life of patients leading to a significant decrease in their ability to perform normal functions. Therefore, these conditions must be early recognized and diagnosed properly. Early and proper diagnosis will lead to proper planning of management and treatment before patients suffer from permanent damage that requires extreme measures of treatment like orthognathic surgery, orthodontic treatment, and occlusal adjustment. These surgeries become necessary when there is an unstable relationship between the structures of the joint. Therefore, it is essential to start treatment immediately after diagnosis in order to prevent the disease from progressing to a severe case [6].

Anterior open bite (AOB):

It is relatively common to encounter an anterior open bite in a patient who suffers from temporomandibular disorders [7]. In some cases, the collapse of joint tissue could occur as a result of osteoarthritis of temporomandibular joints that leads to functional overloading of the joint. In some cases, the collapse of the joint occurs in both joints, which leads to the resorption of condyles [8]. This will lead to morphological changes of the temporomandibular joint, therefore, leading to a decrease in the function

of the joint due to decreased ramus height. The final result of this is a progressive retrusion of the mandible leading to an anterior open bite, which is called "acquired open bite associated with TMJ osteoarthritis" [9]. Temporomandibular disorders are sometimes considered systemic diseases. Some authors have suggested the presence of an association between rheumatoid arthritis and other rheumatological conditions, and temporomandibular disorders [10]. Patients who suffer from the previously mentioned conditions have the weaker support of mandible, along with interferences of the mandible and greater discrepancy between the lesser vertical overbite, and Centric Relation and Maximum Intercuspation. In these situations where there is a significant reduction in the opening is the mouth, the most common finding on clinical examination is the anterior open bite [9]. In these patients, wear facets are present along with the absence of incisal edges mamelons, which indicates the previous connection of currently non-contacting teeth. Moreover, muscle pain and joint pain are typically reported in patients who suffer from temporomandibular osteoarthritis. These manifestations are usually precipitated by any movement of the jaw and are seen during physical examination (inspection and palpation) [6].

To establish the diagnosis, several investigations are required including the rheumatoid factor, ESR, ANA, along with other blood tests (these are extremely important when there are systemic manifestations). Imaging of the temporomandibular joint is also essential to view the joint. In cases of the presence of condylar resorption, the stage of this resorption must be assessed for the presence of any active destruction. This is usually done using CT, MRI, or bone scintigraphy imaging modalities. The gold standard for this is the cone-beam CT, as it can find changes in the bone, which are typical findings. On the other hand, MRI is also useful in visualizing the position of the disc, and the presence/absence of any alterations in the articular cartilage [11].

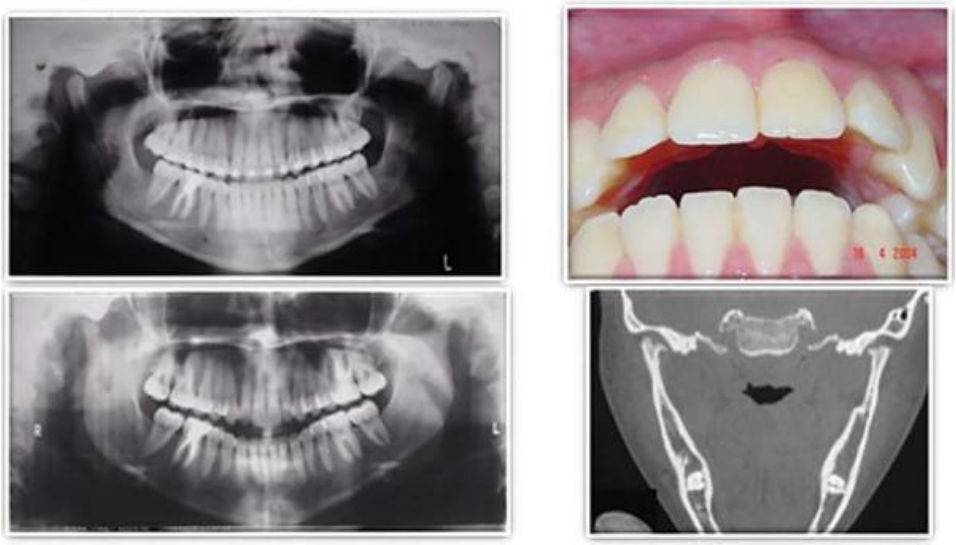

Fig 1: Anterior open bite secondary to rheumatoid arthritis radiographic and clinical images [14].

Despite the relatively slow process in which temporomandibular joint osteoarthritis develop, and despite it causing only minor changes in the open bite, "idiopathic condylar resorption" is faster and more severe. Idiopathic condylar resorption usually affects females, which is believed due to the effects of females' hormones along with other triggers like trauma [10].

Unilateral posterior open bite:

Unilateral posterior open bite Associated:

Generally, condylar resorption can be unilateral or bilateral. When resorption occurs on only one side, it is common to find an intrusion of the condyle that is associated with a shift of the mandible to the side of the lesions. This will eventually result in an anterior open bite on the lesion side, and a posterior open bite on the other side. Moreover, occlusal contact occurs on the posterior part of the lesions side [12].

Fig 2: Joint effusion on the left temporomandibular joint resulting in a posterior open bite on the affected side [14]

Associated with unilateral joint effusion:

Some inflammatory disorders that affect the intra-capsule of the joint can sometimes cause occlusal alterations. The retrodiscal tissues of the temporomandibular joints generally have high vascularization and nerve innervation, which makes them susceptible to retrodiscitis. Retrodiscitis is known as inflammatory processes installation leading to joint effusion. This effusion of joints is a result of liquid accumulations that will prohibit the proper fitting of the temporomandibular joint condyle into its right place within the mandibular fossa. This mechanism will eventually result in an acute posterior open bite on the same side of the lesion, along with a strong contact on the contralateral side. A lower midline deviation results from this shift of the mandible [5].

TEMPOROMANDIBULAR DISORDERS DUE TO MALOCCLUSION:

Costen [12], who was an otorhinolaryngology surgeon, was the first in the history of medicine to suggest the presence of a correlation between the function of the temporomandibular joint and occlusion. He first suggested that changes in the teeth condition like the loss of deep bite or vertical dimension can cause changes in the anatomy of the temporomandibular joint, which will in turn cause symptoms in the ear [13]. He proved his hypotheses when he corrected the overbite, and other dental changes, and observed the significant improvement of clinical manifestations. Since then, it was established that temporomandibular disorders risk factors include all occlusal interferences [12].

Later, Ramfjord [13], conducted a study on over thirty patients where he used electromyographic techniques. He concluded that the discrepancy between centric relation and centric occlusion should be considered the commonest risk factor of temporomandibular disorders. This discrepancy could be associated with a contraction of the masticatory muscles leading to decreased functions. Therefore, he concluded that the muscular balance established by occlusal equilibration are useful in decreasing temporomandibular disorders [13].

After Ramfjord, Thompson [16] theorized that the superior and posterior condylar displacement could occur following malocclusion , making it necessary to move the condyle forward and downward and to free the mandible. He also found that malocclusions can be associated with temporomandibular disorders clinical manifestations.

Later in 1988, a list of ten myths that are thought to be true in this field was published by Greene and Laskin [17]. Interestingly, after about 30 years, may of these myths are still debatable. These myths are:

1. Some types of malocclusion carry a higher risk of developing temporomandibular disorders

especially when left untreated.
2. Open bite, and the absence of incisal guidance carry a higher risk of developing temporomandibular disorders.
3. Maxillo-mandibular disharmonies (especially gross ones) carry a higher risk of developing temporomandibular disorders.
4. Imaging of the temporomandibular joint must be obtained before starting treatment for temporomandibular disorders to assess the condylar positions.
5. Proper orthodontic treatment is associated with significantly less risk of developing temporomandibular disorders.
6. Following the guidelines and the gnathological principles when performing orthodontic treatment is associated with significantly less risk of developing temporomandibular disorders.
7. Some appliances and orthodontic procedures carry a higher risk of developing temporomandibular disorders.
8. Occlusal correction must be done in patients with temporomandibular disorders and occlusal disharmony in order to improve symptoms.
9. One of the important risk factors for temporomandibular disorders is the natural mandibular retrusion.
10. The distalised mandible is associated with slipped condyle.

Initial consultation and the presence of TMD signs and symptoms:

Several protocols and guidelines are present to assess clinical manifestations of temporomandibular disorders. These include the Research Diagnostic Criteria (RDC/TMD) or the Helkimo indices [20]. These protocols and guidelines are considered to be essential in the diagnosis and assessment of temporomandibular disorders. It is crucial that physicians obtain a thorough medical history from the patients that include temporomandibular symptoms, jaw symptoms, and temporomandibular pain. Physical examination should include palpation of the masticatory muscles and the temporomandibular joint [20].

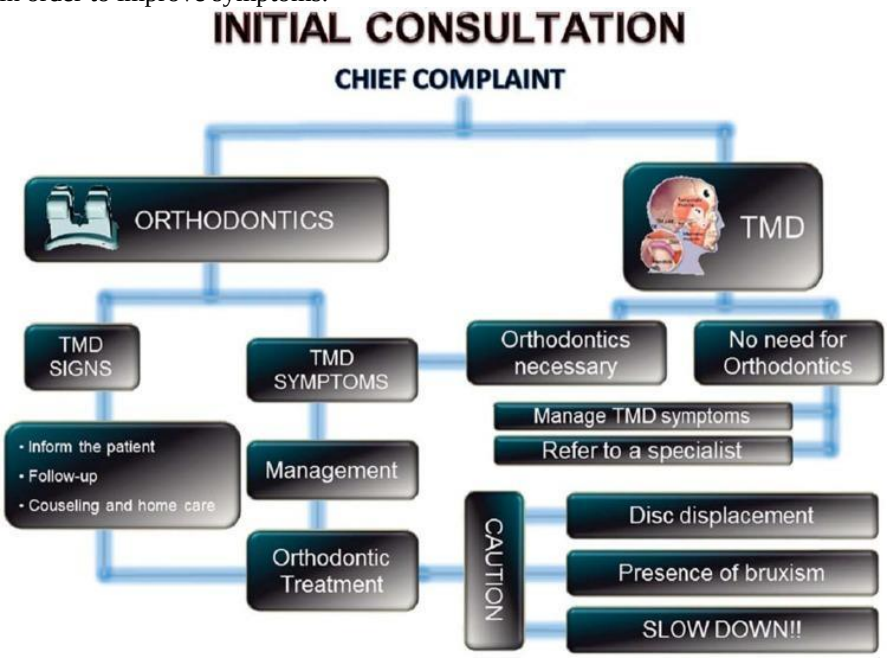

Fig 3: Protocol of management of patients presenting signs and symptoms of temporomandibular disorder before orthodontic treatment [14]

Developing signs and symptoms of TMD during Orthodontic treatment:

In some cases, temporomandibular disorders clinical manifestations could appear during treatment. However, this may not be due to the dental treatment itself, but rather a result of other confounding factors like trauma, and emotional stressors. This is most commonly found among adolescents. All this makes it harder to establish a causal relationship between dental treatment and temporomandibular disorders [6]. NSAIDs and muscle relaxants could be used in these cases to relief symptoms. Physical and behavioral therapy are also considered beneficial [19].

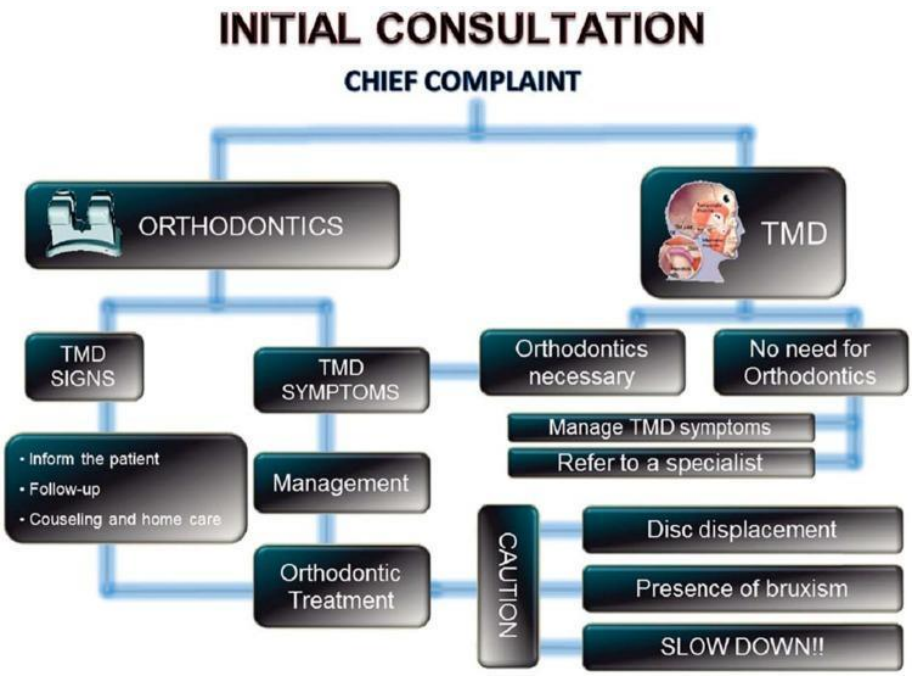

Fig 4: Protocol of management of patients presenting signs and symptoms of the temporomandibular disorder before orthodontic treatment [14]

CONCLUSION:

The presence of occlusal changes could sometimes reflect the presence of a temporomandibular disorder. This is due to the presence of an established association between the temporomandibular joint, and dental occlusions. This makes it necessary to perform a thorough examination along with all important investigations before starting irreversible treatment for temporomandibular disorders.

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