

## TEMPEROMANDIBULAR DISORDERS -ORTHODONTICS –CAUSE OR CURE -A REVIEW

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**ABSTRACT:** There is a long time debate whether orthodontic treatment is the cause of Temperomandibular joint disorders ( TMD) or it is used to alleviate the symptoms associated with these disorders such as clicking joints, Muscular pains etc. This paper reviews different aspects of Temperomandibular disorders in relation to orthodontic treatment.

**KEYWORDS:** Temperomandibular( TMD), Orthodontic treatment , Clicking Joint, Muscle pain

### INTRODUCTION

Temperomandibular disorders (TMD) as suggested by Dr.James Costen<sup>1</sup> as the changes in dental condition responsible for certain ear symptoms which was called as costens syndrome Numerous factors can attribute to TMD.Scientific literature<sup>2</sup> reveals five major factors associated with TMD. Occlusal condition, Trauma, Emotional stress, Deep pain input, Para functional habits. Occlusal condition can affect some TMD in at least two ways, factors that effect the orthopaedic stability of the mandible and acute changes in the occlusal condition that influences the mandibular function.

#### Malocclusion and TMD.

The four occlusal factors<sup>3</sup> that occurred mainly in patients with TMD are Skeletal open bite,RCP-ICP slides of greater than 2mm( greater than 4mm<sup>4</sup>, overjets greater than 4mm (greater than 6mm) and five or more missing unreplaced missing teeth.

A radiographic study<sup>5</sup> of pathologic TMJ cases observed that four distinct types of traumatic joint disturbances seemed to stem from four different types of malocclusion. Type I- Abnormal overjet charecterized by the typical class 2 division 1 Type II -Typical class 2 division 2,Type III-Related to bicuspid and molar interferences,Type IV- represented by cases with loss of posterior teeth.MPDS (myofacial pain dysfunction syndrome) is caused due to occlusal disharmony leading to muscle dysfunction and in turn TMD.the occlusal irregularities<sup>6,7</sup> is one of the etiological factors of muscle dysfunction. According to a study<sup>8</sup> made which concluded that functional malocclusion is more important than morphologic malocclusion in explaining the existence of mandibular dysfunction. In a

cross sectional study<sup>9</sup> done on subjects with 6-17 years of age analyzed for the prevalence of i)specific types of occlusion and ii)subjective symptoms and clinical signs of TMJ dysfunctionresults showed functional shift was negatively associated with TMJ and Muscle tenderness and open bite is positively associated with TMJ and muscle tenderness. Excessive or negative overjets were more likely to have joint tenderness and joint noises,older subjects with cusp to cusp or a class II molar relation were more likely to experience TMJ and muscle tenderness and joint noises and restricted mouth opening.buccal cross bites had a significantly higher prevalence of joint sounds in older children. In another study done to evaluate<sup>10</sup> whether oral dysfunctions and malocclusions can predispose to TMD in young adults,muscle tenderness,jaw deviation,clicking,and occlusion was evaluated. results showed excessive overjet only predictable variable for TMD,and girls are more prone for TMD.

#### Orthodontics and TMD relationship

1. Extractions vs TMD
2. Condylar position vs TMD
3. Head gear and class II elastics
4. Herbst appliance vs TMD
5. RPHG and class III elastics
6. Chin cup vs TMD
7. Cross elastics

#### Extractions Vs TMD<sup>1,12,13,14,15,16,17</sup>

Orthodontic treatment with fixed appliance either with or without tooth extractions did not increase the

prevalence of symptoms and signs or worsen pre existing symptoms and signs of TMD. subjects with class II malocclusion and pre existing signs of TMD of muscular origin seemed to benefit functionally from orthodontic treatment in a 3 year perspective.

#### **Condylar Position and TMD** <sup>18,19,</sup>

Distal pressure exerted on the mandible and ultimately on the condyle induces temporomandibular disorder. In patients treated for Class II division I with extraction of maxillary first premolars and in patients treated for class I with non extraction Condylar position was measured in anterior and posterior displacement from tomographic sections of each joint, the condyles were located more posteriorly in patients with extraction and in cases with clicking than in those without. An apparent association exists between joint sounds and posterior displacement of the condyles.

#### **Head Gear And Class II Elastics** <sup>20,21</sup>

Orthodontic mechanotherapies such as class II and and extractions have little effect or no effect on general TMD signs and symptoms. There is no immediate benefit or risk for children receiving early class II treatment with bionators and head gears/bite planes with respect to temporomandibular joint.

#### **Herbst Appliance Vs Tmd** <sup>22,23</sup>

In studies conducted on cases with herbst appliance all condyles were positioned significantly forwards but returned to normal position after removal of the appliance a temporary capsulitis was present during the course of treatment, but did not have the potential to cause TMD.

#### **RPHG (Reverse pull Head Gear) and class III elastics**

RPHG and Class III elastics produce a distal driving force of the mandible and condyle. This would produce a reciprocal forward displacement of the disc and pressure on retrodiscal tissues.

#### **Chin Cup Vs TMD** <sup>24,25</sup>

A clinical evaluation of TMD treated with chin cup reported that 28 out of 86 subjects showed one or more symptoms of TMD. Spontaneous pain was found most often during active treatment but clicking sound occurred more often during the retention phase. In a longterm follow up of the subjects treated with chin cup indicated that chin cup treatment is neither a risk factor nor prevention for TMD. Age and stress factors should always be considered in the evaluation of TMD.

#### **Cross Elastics**

When cross elastics are used there is a displacement of the mandible and condyle to one side resulting in unilateral distal driving force on the condyle. However they can be used during the day alone when the resting muscle tone can counter act the distal driving force.

#### **Developing The Orthodontic /Temporomandibular Disorder Treatment Plan**

Orthodontic therapy is indicated only when orthopaedic instability is present and this instability is contributing to the TMD. The mere presence of orthopaedic instability is not enough evidence to be certain that it is contributing to the TMD, So clinician should first determine whether orthopaedic instability is contributing to TMD, the best way to identify this relationship is by first providing Orthopaedic stability reversibly with an Occlusal appliance. If the occlusal appliance does not reduce the symptoms orthopaedic stability is not related to the symptoms and orthodontics should not be considered. Orthodontic therapy can only affect TMD symptoms by changing the occlusal contact pattern of the teeth and the resulting function of the masticatory system. If an occlusal appliance successfully reduces the TMD symptoms- Occlusion and Orthopaedic instability is an etiologic factor in the TMD.

Occlusal appliances reduce symptoms associated with TMD by

1. Alteration of the occlusal condition
2. Alteration of the condylar position
3. Increase the vertical dimension
4. Cognitive awareness
5. Placebo effect
6. Increase peripheral input to the central nervous system
7. Regression to the mean

To summarize permanent treatment is delayed until significant evidence exists to determine which factor or factors are in reducing the symptoms. Allow the patient to wear the appliance for several weeks or months to ensure that the symptoms have been controlled adequately. Discontinue use of the appliance and not experience the return of the symptoms indicates the muscle origin. These patients do not need orthodontic therapy.

Splints- an occlusal appliance called a splint is a removable appliance usually made of hard acrylic that fits over the occlusal and incisal surfaces of the teeth in one arch creating precise occlusal contact with the teeth of the opposing arch. It is commonly referred as bite guard, night guard, interocclusal appliance, orthopaedic device.

### Types Of Occlusal Appliances

- Stabilization splints
- Anterior stabilization splints
- Anterior bite plane
- Posterior bite plane
- Pivot splint
- Soft splint

The specific purpose of the splint should be determined before it is designed. Stabilization splint<sup>26,27,28</sup> is a muscle relaxation appliance because it is primarily used to reduce muscle pain. It is generally fabricated on the maxillary arch and provides an optimum functional occlusion for the patient. The treatment goal of the stabilization splint is to eliminate any orthopaedic instability between the occlusal position and the joint position thus removing this instability as an etiologic factor in the TMD.

Anterior repositioning splint<sup>29</sup> is an interocclusal device that encourages the mandible to assume a position more anterior than the intercuspal position, its goal is to provide a better a condylar- disc relationship in the fossa so that tissues have a better opportunity to adapt to repair. The goal is not to alter the the position of the mandible permanently but only to change the position temporarily as to enhance adaptation of retrodiscal tissues, once the tissue adaptation has occurred the appliance is eliminated allowing the condyle to assume the musculoskeletally stable position.

Anterior bite plane is a hard acrylic appliance worn over the maxillary teeth, providing contact with only the mandibular anterior teeth. It is primarily intended to disengage the posterior teeth and thus eliminate their influence on the function of the masticatory system

Posterior bite plane is fabricated for the mandibular arch and consists of of areas of hard acrylic located over the posterior teeth and connected by a cast metal lingual bar. The treatment goal of the posterior bite plane is to achieve major alteration in vertical dimension and mandibular positioning.

Pivoting appliance is a hard acrylic device that covers one arch and usually provides a single contact in each quadrant which is usually established far posteriorly as possible. when superior force is applied under the chin the tendency is to push the anterior teeth close together and pivot the condyles downward around the posterior pivoting point. the appliance reduces interarticular pressure and thus unload the articular surfaces of the joint. where as it was originally suggested that this therapy would be helpful in treating joint sounds, it now appears that anterior repositioning splint is more suitable for this purpose.

Soft or Resilient appliance is a device fabricated of resilient material that is usually adapted to the maxillary

teeth the treatment goals are to achieve even and simultaneous contact with the opposing teeth.

According to classification by Slavicek there are myopathic splint, decompression splint, compression splint, verticalisation splint, anterior repositioning splint. The first four types are reference position splints, the last is a deranged reference position splint.

According to classification by Willis<sup>30</sup> three major types of splints have been used traditionally they are Flat plane, anterior repositioning and canine protected splint- works by prevention of lateral movements which reduces loading in the TMJ. Reduction in para functional activity and immediate complete anterior guidance development which is effective in the treatment of MPDS.

**Rule of thirds by Neff** an aid to determine the appropriate treatment. Each inner incline of the posterior centric cusps is divided into three equal parts if when the mandibular condyles are in their desired position the centric cusp tip of one arch contacts the opposing centric cusp inner incline in the third closest to the central fossa- selective grinding done without damage to the teeth. If opposing centric cusp tip makes contact in the middle third of the opposing inner incline –crown and bridge prosthodontic procedures are appropriate for achieving the treatment goal, as selective grinding is likely to perforate the enamel. If the cusp tips contacts the opposing inner incline on the third closest to the cusp tip or even the cusp tip-orthodontic procedures are initiated as crown and fixed prosthodontics create restorations that cannot adequately direct occlusal forces through the long axis of the roots thus producing unstable occlusal relationship.

### CONCLUSION

The relationship between Orthodontics and patient with TMD is complex and controversial. most of the studies revealed that Orthodontic treatment do not predispose to TMD. Orthodontic therapy in patients with TMD is beneficial only if orthopaedic instability contribute to TMD. Occlusal appliances (Splints) are used to determine the musculoskeletally stable position, splints are also used for muscular and parafunctional abnormalities. If the patient develops TMD during the course of the fixed appliance therapy –patient is evaluated for the stable joint position, the cause for pain, and TMJ dysfunction. conservative approach in the form of medication (NSAID, physical exercises and splints given appropriately. Thus occlusal condition should be in harmony with the musculoskeletally stable position to maximize sound masticatory functional system.

## References

1. Costen, J.B. A Syndrome of Ear sinus symptoms dependent upon disturbed functioning of TMJ. *Ann. Otol (St. Louis)* 1934, 43, 1-15.
2. Mc Neil, C. Danlig, W.M. Farrer, W.B. Gelb. Paper on the American academy of craniomandibular disorders, *Journal of Prosth dentistry*, vol 1, issue 29, page 434, 1982
3. Pullinger, Occlusal factors associated with TMJ tenderness and dysfunction, *Journal of Prosthetic dentistry*, vol 59, issue 3, pag 363-367; 1988
4. James Mc Namara, Condylar adaptation after alteration of vertical dimension in adult. *Seminars in orthodontics*, Vol 1(3) pag 176-87; 1995.
5. Ricketts, The role of cephalometrics in prosthodontic diagnosis, *Journal of Prosth dentistry*, vol 6, issue 4, pages 488-503, 1956.
6. Schwartz, L.M, text book on facial pain and dysfunction, 1968, Saunders
7. Harold, T. Perry; Static and dynamic Orthodontics, *American Journal of orthodontics and dentofacial orthopaedics*, Vol 48, Issue 12, pages 900-910, 1962
8. I. Egermark-Erickson, B. Ingervall, The dependence of mandibular dysfunction in children on functional and morphological malocclusion, *AJO-DO*, vol 83, issue 3, page 187-194, 1983
9. Michael L. Riolo, Douglas Brandt, Association between occlusal characteristics and signs and symptoms of TMJ dysfunction in children and young adults. *AJO-DO*, Vol 92, issue 6, pages 467-477, 1987.
10. Riitta Pahkala, Mari qvarnstrom, Can temporomandibular dysfunction signs be predicted by early morphologic or functional variables, *European journal of Orthodontics*, Vol 26, Issue 4, pages 367-373, 2004. <http://dx.doi.org/10.1093/ejo/26.4.367>
11. Janson, M., Hasund, Function problems in orthodontic patients out of retention, *European journal of Orthodontics*, vol 3, pages 173-179, 1981.
12. Guilherme Janson, class II treatment success rate in 2 and 4 premolar extraction protocol, *AJO-DO*, vol 125, issue 4, pages 472-479, 2004
13. Erik larsson, Adsar Ronnermann, Mandibular dysfunction symptoms in orthodontically treated patients ten years after completion of treatment, *European journal of Orthodontics*, vol 3, issue 2, pages 289-94, 1981.
14. Cyril Sadowsky, Alan M. Polson, Temporomandibular disorders and functional occlusion after orthodontic treatment-results, *AJO-DO*, Vol 86, Issue 5, page 386-390, 1984.
15. Cyril Sadowsky, The risk of orthodontic treatment for producing TMD-A literature over view, *AJO-DO*, Vol 101, issue 1, pages 79-83, 1992.
16. Mc Laughlin, Bennet. The extraction –non extraction dilemma as it relates to TMD. *Angle Orthodontist*, 65(3), pages 175-86, 1995.
17. T. Henrikson, M. Nilner, TMD, Occlusion, and Orthodontic treatment. *Journal of Orthodontics*, Vol 30, No. 2, Pages 129-137, 2003. <http://dx.doi.org/10.1093/ortho/30.2.129>
18. Wyatt W.E, Preventing adverse effects on the TMJ through Orthodontic treatment. *AJO-DO*, Vol 91, Pages 493-499, 1987.
19. A.A. Gianelly. Condylar position and extraction treatment. *AJO-DO*, Vol 93, issue 3, pages 201-205, 1988
20. Mariat, O. Reilley, Don J Rinchuse, Class II elastics and extractions and TMD-Longitudinal study, vol 13, issue 4, pag 480-484, 1993.
21. Temperomandibular joint disorders, Facts and Fallacies, issue 4, Dec, 22-228, 1995.
22. Pancherz H. The biologic effects of clinically treated patients treated with Herbst, *AJO-DO*, Vol 87, Pages 1-20, 1985.
23. Ruff, Pancherz, Does bite jumping damage the TMJ- clinical and MRI study of Herbst Patients, *Angle Orthodontist*, vol 70, no 3, 2000.
24. J. Deguchi et al, Clinical evaluation of TMD in patients treated with chin cup. *Angle orthodontist*, 68(1), page 91-94, 1998.
25. Z. Mirzen arat, M. Okan Akcam, Longterm effects of chin cup therapy on the TMJ, *European journal of Orthodontics*, vol 25, issue 5, 471-475, 2003.
26. Tim TA, Ash, The occlusal bite plane splint-an adjunct to orthodontic treatment, *Journal of Clinical Orthodontics*, 11(6), 383-90, 1977.
27. Carrarojj, Caffesse RG, Effects of occlusal splints on TMJ Symptomatology, *J. Prosth Dent*, Nov 40(5), 563-6, 1978.
28. Okeson JP, Kemper JT, A study of the use of occlusal splints in the treatment of acute and chronic patients with CMD, *J. prosthetic dent*, dec, 48(6), 708-12, 1982.
29. Okeson JP, Long term treatment of disk interference disorders of the TMJ with Anterior repositioning splint. *J. Prosth. Dent* nov 60(5), 611-6, 1988.
30. W.A. Willis, The effectiveness of extreme canine protected splint with limited lateral movement in treatment of temporomandibular dysfunction, *AJO-DO*, Vol 107, issue 3, 229-234

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