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RESEARCH ARTICLE

A CASE REPORT ON OCCLUSAL SPLINT PRIOR TO ORTHODONTIC THERAPY

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ABSTRACT

Aims: The objective of this case report is to establish splint therapy prior to orthodontic treatment and stabilize the mandibular position for three months on symptomatic case.

Introduction: An occlusal appliance, called a splint, is a removable device, 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 to as a bite guard, night guard, interocclusal appliance, or orthopedic device. Splint therapy is indicated any time that there are symptoms present and when mandibular manipulation is difficult.

Case Description: This case report discussed the splint therapy in a 20 yr old male patient came to dept of orthodontics AJIDS, mangalore with chief complaint of forwardly placed upper front teeth with deviation, clicking sound and crepitus of TMJ on jaw movements. Treatment planned as splint therapy for 3months ie, muscle deprogramming flat plane splint for relaxing muscles of joint followed by PEA- MBT prescription. After 4months of splint therapy the patient experienced no symptoms of muscle tiredness, no clicking sound, no bulging of condyle laterally. On examination of postoperative TMJ view, improvement in articular eminence and hypermobility of condyle on wide opening were noticed. After splint therapy, fixed orthodontic treatment was advocated.

Conclusion: Establishing a stable occlusal reference point prior to initiating orthodontic therapy is the key to preventing undiagnosed skeletal discrepancies.

Clinical Significance: Careful diagnosis and pretreatment planning may help to eliminate unsuspected occlusal relationships that would otherwise result in treatment surprises that require embarrassing alterations of the original treatment plan.

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INTRODUCTION

Interocclusal orthopedic appliances or splints are routinely used in the treatment of disorders of the temporomandibular joint (TMJ) and masticatory system. Hard or soft removable acrylic appliances covering the teeth have been used to eliminate occlusal disharmonies, prevent wear and mobility of the teeth, (Hanamura, 1987; Pavone, 1985) reduce bruxism and parafunction, (Posselt, 1963; Rugh, 1975) treat masticatory muscle dysfunction, (Okeson *et al.*, 1982; Carraro, 1978) and correct derangements of the TMJ (Helms *et al.*, 1983; Lundh *et al.*, 1985). Clark, in an excellent pair of articles published in 1984, reviewed the design, theory and effectiveness for specific symptoms of orthopedic interocclusal appliances (Clark *et al.*, 1984; Boero, 1989). An occlusal splint functions to dissipate the forces placed on individual teeth by utilizing a larger surface area covering all teeth in the arch. Once fabricated, a splint must be continually adjusted to re-establish equal contact (The basics of occlusal splint therapy, 2012) Splints provide diagnostic information, allow muscles in spasm to relax, protect the teeth and jaws from the adverse effects of bruxism, and normalize periodontal ligament proprioception. These devices can also allow repositioning of the condyles and jaws into centric relation (CR) (Dylina, 2001). The objective of this case report was to establish a stable occlusal reference point prior to initiating orthodontic therapy. This case report discussed the splint therapy in a 20 yr old male patient with chief complaint of forwardly placed upper front teeth with deviation, clicking sound and crepitus of TMJ on jaw movements.

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CASE DESCRIPTION

A 20 yr old male patient came to dept of orthodontics AJIDS, mangalore with chief complaint of forwardly placed upper front teeth. On examination patient had convex profile, posterior divergence, incompetent lip and facial asymmetry ie, chin is slightly shifted towards left by 2mm. He had mouth breathing habits due to deviated nasal septum which was corrected by septoplasty 6months back. Facial midline is not coinciding with dental midline which is shifted towards left (Fig.1 a,b,c,d,e,f,g,h).

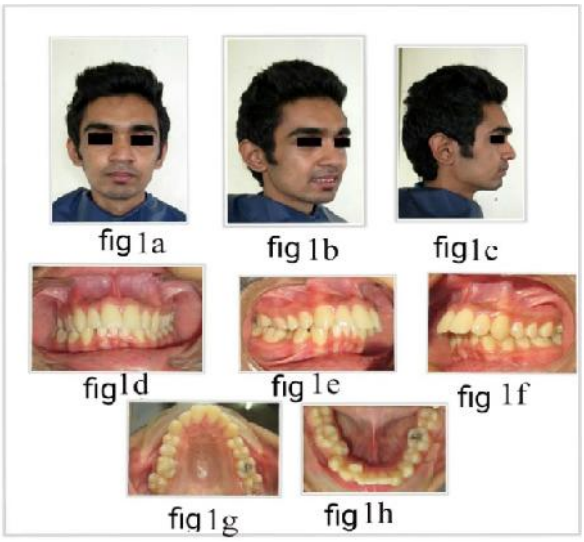

Fig. 1a,b,c,d,e,f,g,h. Pretreatment photographs

On TMJ examination, he had normal mouth opening, no pain, clicking sound and crepitus noticed on both sides and deviation of jaw on left side while opening. On palpation, bulging of right condyle laterally on opening and hyperactive muscles of mastication ie, lateral pterygoid muscle and muscle tiredness. Occlusal cant was present(Fig 2).

Fig. 2. Occlusal cant

On intraoral examination patient showed class II molar and canine on right and Class I molar and canine on left, increased Overjet and overbite, crowding in lower arch, blocked out right lateral incisor, crossbite irt 16 and scissor bite in relation to 15. On cephalometric analysis patient had skeletal class I with average growth pattern proclined upper anteriors and retroclined lower anteriors, reduced nasolabial angle and reduced chin prominence. Patient diagnosed as skeletal Class I with Average growing pattern underlying Angles class II subdivision malocclusion (Fig 3).

Fig. 3. Pretreatment lateral cephalogram

On PA view mandible is shifted towards left by 2mm, Condyles are placed at different levels and Upper midline shifted to left by 4mm (Fig 4). On TMJ view showed displacement of condyle ahead of articular eminence while wide opening. Hypermobility was noticed on both joint(Fig 5).

Fig. 4. Pretreatment PA view showing mandibular deviation

Fig. 5. Pretreatment TMJ view

Treatment objectives were correction of clicking sound and deviation on jaw movements, correction of proclined upper

anteriors and retroclined lower anteriors, correction of crowding in upper and lower anteriors, correction of crossbite and scissorbite and correction of reduced chin prominence. Treatment options were condylar repositioning surgery, augmentation of articular eminence and splint therapy followed by genioplasty. As patient was not willing for surgery, treatment planned as splint therapy for 3months followed by PEA- MBT prescription ie, muscle deprogramming flat plane splint for relaxing muscles of joint. Study models and working models made on patients impression. Facebow transfer was done to replicate patient centric relation on semi adjustable Hanau articulator and bite registration was done in centric relation and cast was articulated accordingly. Splint was fabricated using hard acrylic interocclusally (Fig 6 a,b).

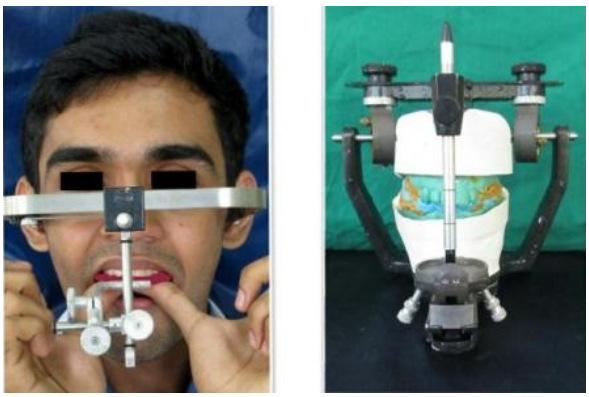

Fig. 6a, b. Facebow transfer and articulated cast

Patient was asked to wear flat plane deprogramming splint night time initially for 1 month and later full time wear with periodic adjustments as necessary to maintain patient comfort. Following a 3-month period of splint wear and adjustment, a substantial CR/CO discrepancy was confirmed (Fig:7a,b,c,d). Continued splint wear for an additional 1 month period demonstrated no further difference in the maxillo-mandibular relationship.

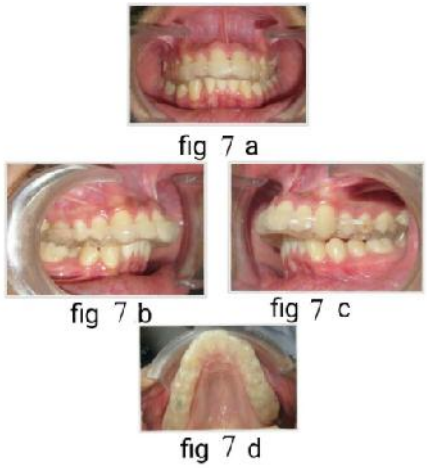

Fig. 7a,b,c,d. Intra oral photographs showing muscle deprogramming flat splint

After 4months of splint therapy the patient experienced no symptoms of muscle tiredness, no clicking sound, no bulging of condyle laterally. On examination of postoperative TMJ view, improvement in articular eminence and hypermobility of condyle on wide opening were noticed (Fig 8 a,b). After splint therapy, fixed orthodontic treatment was advocated.

Fig. 8a,b. Post treatment TMJ view

DISCUSSION

This case report discussed the splint therapy in a 20 yr old male patient with chief complaint of forwardly placed upper front teeth with deviation, clicking sound and crepitus of TMJ on jaw movements. Treatment of occlusal-related disorders is often a challenge for both the dentist and the patient. These disorders are often difficult to diagnose, as the presenting symptoms can be variable. Occlusal splint therapy may be defined as “the art and science of establishing neuromuscular harmony in the masticatory system by creating a mechanical disadvantage for parafunctional forces with removable appliances” (Dylina, 2001). An occlusal appliance, called a splint, is a removable device, 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 to as a bite guard, night guard, interocclusal appliance, or orthopedic device. Splint therapy is indicated any time that there are symptoms present and when mandibular manipulation is difficult. It is wise to institute splint therapy prior to orthodontic treatment and stabilize the mandibular position for three months on any symptomatic case. Occlusal splints promote muscle relaxation by providing a platform for the teeth that allows for equal distribution of tooth contacts, immediate posterior tooth disoclusion in all movements (with anterior guidance), and reduced stress on the joint. Neuromuscular harmony that follows provides for optimal function and comfort.[11]The types of splints currently employed in occlusal splint therapy include permissive, nonpermissive, hydrostatic, and soft rubber (silicone) splints (Dylina, 2001). Studies shown that the occurrence of bruxism have reported prevalence ranging from 6.5% to 88% (Faulkner, 1990). The forces generated during bruxism can be as much as six times the maximal force generated by normal chewing (Nitzan, 1994). Study done by Nitzan suggested another pathologic mechanism (Hellsing, 1984). Cellular hypoxia can take place when capillary perfusion pressure is above 25 mm Hg. Pressures exceeding 200 mm Hg were observed when clenching without the splint, but pressures were less than 25 mm Hg when clenching with the splint. With compression of the vessels, the affected area has reduced blood flow. Hannam and coworkers (Gibbs *et al.*, 1986) found that stimulation of pressure receptors in the periodontal ligament led to a jaw-opening reflex. Hellsing demonstrated that muscle changes occur with tooth contact, and that periodontal afferent feedback (sensory nerve feedback) must be responsible for this rapid adaptation (Hellsing, 1984). The TM joints are load bearing, (Boyd *et al.*, 1990; Korioth and Hannam, 1994) specifically during parafunctional activities and forceful mastication or biting. During loading, the elevator muscles (mainly the temporalis and masseter) can exert maximal force with a totally relaxed

lateral pterygoid and a disc that is physiologically located. Manns *et al.,* (1978) showed that splints that increased vertical dimension 4.4 mm and 8.2 mm were more effective in producing muscular relaxation in patients with bruxism and myofascial pain dysfunction patients than 1- mm splints. Piper (Piper, 1999) suggested a 12- to 15-mm distance (incisal edge to incisal edge) to decrease clenching efficiency. These studies suggest that a minimum of a 4- mm increase in vertical dimension is necessary to protect bruxing patients.

Disk displacement (DD) and osteoarthritis (OA) or degenerative joint diseases (djds) are often associated with TMJ pain. DD with reduction (DDR) is frequently associated with a clicking sound, and DD without reduction (DDN) is often associated with limitation of jaw opening (Katzberg *et al.,* 1996). Recent studies have used arthrography and MRI to evaluate asymptomatic volunteers of disc displacement (Kircos *et al.,* 1987; Kaplan *et al.,* 1986). The prevalence of displacement ranged from 0% - 32% (Kircos *et al.,* 1987; Kaplan *et al.,* 1986; Westesson *et al.,* 1989). Dawson (1989) and Slavicek instruct the patient to relax with cotton rolls between their teeth in an attempt to deprogram the masticatory muscle engrams. Muscles may change the position of the jaw in the presence of occlusal interferences in an attempt to protect the interfering teeth from potentially absorbing the entire force of the closing musculature (Dawson, 1989). The constant repetition of the proprioceptive trigger receptors to the muscles cause them to become patterned to the deviated closure, and these memorized patterns of muscle activity are called muscle splinting or "engrams." (Roth, 1981) This muscle activity may prevent the condyles from seating appropriately when taking a centric relation wax registration (Roth, 1981). Okeson (1993) said of centric relation that the "most orthopedically stable joint position is when the condyles are in their most superior anterior position in the articular fossa, resting against the posterior slopes of the articular eminences, with the articular discs properly interposed."

Conclusion

Establishing a stable occlusal reference point prior to initiating orthodontic therapy is the key to preventing undiagnosed skeletal discrepancies. "Uncomplicated" malocclusions with vague myofascial or joint symptomatologies "may not always be what they appear to be." Careful diagnosis and pretreatment planning may help to eliminate unsuspected occlusal relationships that would otherwise result in treatment surprises that require embarrassing alterations of the original treatment plan.

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