LONG TERM EFFICIENCY OF OCCLUSAL SPLINT THERAPY IN SELF-REPORTED BRUXISTS AND TEMPOROMANDIBULAR DISORDERS PATIENTS

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR

THE DEGREE OF MASTER OF SCIENCE
(PROSTHODONTICS)

FACULTY OF GRADUATE STUDIES

MAHIDOL UNIVERSITY

2008

Thesis
Entitled

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was submitted to the Faculty of Graduate studies, Mahidol University for the degree of Master of Science (Prosthodontics)
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June 20, 2008

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ACKNOWLEDGEMENTS

I would like to express my deep appreciation and gratitude to my advisory committee: Assistant Professor Panupen Sitthisomwong, Dr. Somsak Mitrirattanakul and Associate Professor Widchaya Kanchanavasita for their guidance, supervision, encouragement, comments, suggestions, understanding and patience.

My special thanks go to Associate Professor Potchaman Sinavarat for patronage

Thanks to Ms. Sirikamon Inphawi for the helpful on data collection.

I deeply thank my colleagues in Prosthodontics for all their assistances. I have learned much from them and hope to repay in kind.

Finally, a very special thank to my parents, family and friends who provide me the time and support needed to complete my study.

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ABSTRACT

The aim of this study was to evaluate the long-term efficiency of occlusal splint therapy in bruxists and temporomandibular disorders (TMD) patients. Two hundred and forty-five bruxists and TMD patients from the Special Clinic and Occlusion Unit, Faculty of Dentistry, Mahidol University were interviewed. Forty patients (32 females, 8 males) treated with occlusal splints were selected according to the inclusion criteria. Patients were interviewed and completed a questionnaire on demographic data, changes in symptoms and attitude to and use of occlusal splints. The subjects were examined to determine their occlusal condition. Chi-square was used to analyze the relationship between demographic and occlusal data as well as subjects' attitudes toward the efficiency of their occlusal splints. The results showed that the subjects had been wearing occlusal splints for periods ranging from 6 months to 68 months (mean 21.5, S.D. 15.68). Thirty five patients or 87.5% (20 TMD patients and 15 bruxists) reported that their symptoms had improved after occlusal splint therapy. There was a significant relationship between occlusal splint efficiency and subjects' attitudes. ($p = 0.01$) Neither demographic nor occlusal data was related to the efficiency of occlusal splints. It can be concluded from this study that the attitude of patients can play a major role in the long term self-reported efficiency of occlusal splint therapy.

KEY WORDS: OCCLUSAL SPLINT/ EFFICIENCY/ BRUXIST/

TEMPOROMANDIBULAR DISORDERS

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ประสิทธิภาพในระยะยาวของเฝือกสบฟันในผู้ป่วยนอนกัดฟันและผู้ป่วยความผิดปกติบริเวณขมับร่วมขากรรไกร รายงานด้วยตนเอง

(LONG TERM EFFICIENCY OF OCCLUSAL SPLINT THERAPY

IN SELF-REPORTED BRUXISTS AND TEMPOROMANDIBULAR DISORDERS PATIENTS)

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บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อประเมินประสิทธิภาพของการใช้เฝือกสบฟันในระยะยาวเพื่อรักษาผู้ป่วยนอนกัดฟันและผู้ป่วยที่มีความผิดปกติบริเวณขมับร่วมขากรรไกร จากการสัมภาษณ์ผู้ป่วยนอนกัดฟันและผู้ป่วยความผิดปกติบริเวณขมับร่วมขากรรไกร 245 คนที่รับรักษาที่คลินิกพิเศษและภาควิชาวิทยาระบบบดเคี้ยว คณะทันตแพทยศาสตร์ มหาวิทยาลัยมหิดล ผู้ป่วย 40 คนผ่านเกณฑ์การคัดเลือกเป็นเพศหญิง 32 คน เพศชาย 8 คน ผู้ป่วยถูกสัมภาษณ์และตอบแบบสอบถามเกี่ยวกับข้อมูลทางประชากร การเปลี่ยนแปลงของอาการ การใช้เฝือกสบฟัน และทัศนคติเกี่ยวกับเฝือกสบฟันของผู้ป่วย ตรวจผู้ป่วยและบันทึกข้อมูลการสบฟัน ข้อมูลวิเคราะห์โดยสถิติไคกำลังสองเพื่อศึกษาความสัมพันธ์ระหว่างข้อมูลทางประชากร ข้อมูลการสบฟัน และทัศนคติของผู้ป่วยต่อประสิทธิภาพของเฝือกสบฟัน ผลการศึกษาพบว่าผู้ป่วยใส่เฝือกสบฟันเป็นเวลาตั้งแต่ 6 เดือนถึง 68 เดือน (ค่าเฉลี่ย 21.5 ส่วนเบี่ยงเบนมาตรฐาน 15.68) ผู้ป่วย 35 คน หรือร้อยละ 87.5 (20 คนเป็นผู้ป่วยความผิดปกติบริเวณขมับร่วมขากรรไกร 15 คนเป็นผู้ป่วยนอนกัดฟัน) รายงานว่าอาการดีขึ้นจากการรักษาด้วยเฝือกสบฟัน จากการวิเคราะห์พบว่ามีความสัมพันธ์อย่างมีนัยสำคัญระหว่างประสิทธิภาพของเฝือกสบฟันและทัศนคติของผู้ป่วยซึ่งมีต่อเฝือกสบฟัน ($p=0.01$) ข้อมูลทางประชากรหรือข้อมูลการสบฟันไม่มีความสัมพันธ์กับประสิทธิภาพของเฝือกสบฟัน จากการศึกษานี้ สรุปได้ว่าทัศนคติของผู้ป่วยมีบทบาทสำคัญต่อประสิทธิภาพในระยะยาวของเฝือกสบฟัน

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LIST OF ABBREVIATIONS

mm	millimeter
TMD	temporomandibular disorders
TMJ	temporomandibular joint
RCP	retruded contact position
ICP	intercuspal position
VAS	visual analog scale
et al.	et alii, et alia
cont.	continue

CHAPTER I

INTRODUCTION

Temporomandibular disorders (TMD) is a collective term referring to a variety of pathogenic conditions that affect the masticatory musculature, the temporomandibular joints (TMJ) or both. The clinical presentation is variable and can include facial pain that is aggravated by jaw function, tenderness upon joint and muscle palpation, limited mandibular range of motion, deviation or deflection of the mandible on mouth opening, and TMJ sounds. Occasionally, patients may also complain of tinnitus, earaches, headaches, and dizziness.

Temporomandibular disorders rarely have a single cause. Any one of the following factors may contribute to TMD; trauma, bruxism, malocclusion, emotion, ergonomic. Each patient presents with an individual combination of factors that are determined during history taking and clinical examination.

In the field of Dentistry, two major etiologic factors including bruxism and malocclusion are in focus. Bruxism is an oral habit consisting of involuntary rhythmic or spasmodic nonfunctional gnashing, grinding, or clenching of teeth, in other than chewing movements of the mandible. In most patients, minor damage occurs; in others, the consequences may be severe and range from abnormal tooth wear to sore and mobile teeth, TMJ and masticatory muscle pain, and temporal headaches. The etiology of bruxism is unclear, but the condition has been associated with stress, allergies and sleep positioning and occlusal conditions including occlusal interferences.

Numerous clinical studies have investigated the relationship of occlusal factors, bruxism and the signs and symptoms associated with TMD in relatively large patient and non-patient populations. Some studies reported statistically significant associations, while others did not, and few common trends were apparent.

At present, no sound scientific evidence proves the etiology of TMD. There are varieties of management for TMD which aim to control the etiologic factors. Most

of them are conservative treatment including home care instruction, physical medicine, pharmacotherapy, behavioral therapy and intraoral appliance therapy. There are no studies showed which therapy is superior to the others. Each patient must be treated differently depending on the uniqueness of their problems and the contributing factors.

The intraoral appliance therapy is widely accepted in management of many TMD. The most common intraoral appliance that dentists use for management of bruxists and TMD patients is a stabilization splint or an occlusal splint.

Occlusal splints have several uses. There are several theory about the mechanism of occlusal appliance for instant, temporarily provide a more orthopedically stable joint position, introduce an optimum occlusal condition that reorganizes the neuromuscular reflex activity which in turn, reduces abnormal muscle activity while encouraging more normal muscle function. For bruxists, occlusal splints are also used to protect the teeth and supportive structures from abnormal forces that may create breakdown, tooth wear, or both. Although we use this splint for decades, the mechanism of it is still unclear.

For TMD, occlusal splints are useful in reducing patients' symptoms. An extensive critical review of the literature revealed that its effectiveness is between 70%-90%. The precise mechanism has been debated and is inconclusive at present. What is evident is that they are generally a reversible noninvasive modality that can help manage the symptoms of many TMD. The success or failure of occlusal splint depends on the selection, fabrication, and adjustment of the appliance, as well as on patient cooperation. Although occlusal splints are often indicated in the initial and in some long-term treatments of many TMD, we still do not know the long-term efficiency of the occlusal splint therapy in management of bruxists and TMD patients

Thus this study will evaluate long-term efficiency of a treatment with occlusal splint and relationship of occlusal factors in bruxists and TMD patients.

CHAPTER II

LITERATURE REVIEW

I. Signs and Symptoms of TMD

TMD are the most common disorders of chronic orofacial pain condition. TMD comprises of a group of conditions affecting the temporomandibular joint, and/or the muscles of mastication.[1] Synonyms of TMD are temporomandibular joint dysfunction syndromes, temporomandibular joint diseases, myofascial pain syndromes, myofascial pain, craniomandibular disorders, Costen's syndrome and facial arthromyalgia. The characteristics of these disorders are (1) pain in the temporomandibular region or in the muscle of mastication either during mandibular movement or at rest , (2) limitations or deviation in mandibular range of movement, and (3) TMJ sound during jaw functioning.[2] Pain is the main reason for TMD patients to consult clinical practitioners. The characteristics of TMD pain is recurrent and can be chronic in many patients if it has not been treated properly.

TMD are classified into 3 main categories: (1) masticatory muscle disorders, (2) articular disc derangements, and (3) TMJ disorders.[3]

According to the American Academy of Orofacial Pain,[4] masticatory muscle disorders can be divided into 4 subtypes: (1) myofascial pain, (2) myositis, (3) myospasm, and (4) local myalgia. The most frequent given by patients with functional disturbances of the masticatory system is muscle pain. Patients commonly report pain associated with functional activities that is aggravated by manual palpation or functional manipulation of the muscles. Restricted mandibular movement is also common. This is of extracapsular origin and primarily induced by the inhibitory effects of the pain. The restriction is most often not related to any structural change in the muscle itself. Sometimes accompanying these muscle symptoms is an acute malocclusion. Typically, the patient reports that his or her bite has changed. As previously stated, muscle pain disorders can so alter the resting mandibular position

that, when the teeth are brought in to contact, the patient perceives a change in the occlusion.

Articular disc derangements are usually characterized by disc placement of the articular disc anteriorly and medially. Alterations in the disc-condyle structural relation may result from elongation of the discal ligaments, secondary to trauma. High level of anxiety and clenching and grinding of the teeth have also been implicated as risk factors. Examination reveals joint sounds during opening and closing. Any limitation is due to pain and not a true structural dysfunction. When reciprocal clicking is present, the two clicks normally occur at different degrees of opening, with the closing click occurring very near the intercuspal position. Pain may or may not be present, but when present it is directly related to joint function. Articular disc derangements can be divided into 2 subtypes: (1) disc displacement with reduction and (2) disc displacement without reduction

TMJ disorders can be divided into (1) synovitis and capsulitis and (2) osteoarthritis. TMJ disorders are characterized by continuous deep pain, usually accentuated by function. Since the pain is continuous, it can produce secondary central excitatory effects. These usually appear as referred pain, excessive sensitivity to touch, or increased protective co-contraction.

Signs and symptoms of TMD are very prevalent among the general population. It is estimated that 40% to 75% of non-patient adult have at least one sign, and 33% at least one symptom of TMD.[3] The sex ratio for symptoms is at least 2:1 females:males. The condition is uncommon in children, prevalence increasing in the late teens and peak prevalence occurring in 35-45 year olds. It has been suggested that sex predilections are due to one of three factors: physiological or anatomical differences, behavioral differences, genetic differences.[5]

In Thailand, studies of TMD are rare comparing to other studies of oral diseases such as dental caries and periodontitis. Sirirungrojying and Akkayanont[6] did the survey of 1,000 new dental patients who seek general dental treatments at the dental hospital, Faculty of Dentistry Prince of Songkla University using self-reported

questionnaire and found that of the 10.9% of patients reported at least one symptom and the majority of them (85%) reported of TMD pain (pain in the TMJ, facial muscle pain, tiredness or strain in the TMJ). Laohapan and Kasetsuwan[7] did survey in 3,000 new dental patients seeking dental treatments at the faculty of Dentistry, Mahidol University and found that 73.1% reported at least one symptom. The prevalent age group was in 21-30 year old (average 37.5 year-old) followed by 10-20 year old (26.1%). At present, the epidemiology of TMD in Thailand is inconclusive.

II. Etiology of TMD

The etiology of TMD has been considered to be multifactorial.[8-10] There are five major factors associated with TMD. These factors are (1) trauma, (2) deep input pain, (3) emotional stress, (4) occlusal condition, and (5) parafunctional activities.[11] The importance of those factors varies from patient to patient.

2.1 Trauma

Trauma and adverse loading from parafunction may cause injury to masticatory structures and are often implicated as etiologic factors leading to TMD signs and symptoms.[12-13] According to Pullinger and Seligman 38%-39% of adults in different diagnostic groups have history of trauma compared to only 12% to 18% of non-patients.[14] Blows and abuse involving being struck in the mandible by a fist or an object precipitating TMJ noise and pain occur more often in women than in men.[15] There are widely accepted evidences to support that trauma on orofacal region is one of etiologic factors.

2.2 Deep pain input

Deep pain input can centrally excite the brainstem.[11] This represents a normal healthy manner in which the body responds to injury or threat of injury when patient who suffered with pain, such as toothache, have limited mouth opening. This represents the body's response to protect the injured part by limiting its use. This clinical finding is common in many toothache patients. Once the tooth pain resolved, normal mouth opening returns. The limited mouth opening is merely a secondary response to the experience of deep pain. Any source of constant deep pain input can represent an etiologic factor that may lead to limited mouth opening and therefore

clinically present as TMD. Tooth pain, sinus pain, and ear pain can create this response. However there is a strong need for further study to support this factor.

2.3 Emotional stress

Many TMD patients report that their symptoms begin or become worse when they experience depression, anxiety or an increase in emotional stress. Many patients increase their level of tooth clenching and grinding when they experience emotional stress, psychological imbalance or pain.[16] There is a study revealed that high-risk patients with acute TMD have higher levels of depression than the low-risk ones.[17] In contrast, Bojardim LR et. al. report that depression does not have a strong correlation with TMD like anxiety.[18] It is still unclear whether depression or anxiety contributes to the cause of TMD, or whether the chronic pain associated with TMD leads to depression and anxiety.

2.4 Occlusal conditions and TMD

Multiple factors have been suggested in the cause of TMD. The role of dental occlusal factors remains unclear. To date, the relationship between occlusal condition and TMD has not been confirmed, although there is a current trend toward making a weak correlation between occlusal interference and TMD. Furthermore, several types of occlusal discrepancies have been considered as variable features of the norm. But unstable occlusion in the intercuspal position may cause TMD.

Two of the most comprehensive reviews that have considered the relationship of occlusion to TMD have been published by Seligman and Pullinger.[19,20] The first review considers morphological occlusal relationships while the second one concentrates on functional occlusal relationships. These reviews were complied in an attempt to determine consensus on the roles of various occlusal factors on the pathophysiology of TMD.

I. Static occlusal conditions

Seligman and Pullinger[19,20]considered five identifiable factors related to the static occlusion.

1. Overbite/open bite

The vertical overlap of the teeth should be considered as a continuous variable. Large overbite is common in non-patient populations, so this variable cannot be used to define a patient population. Studies that do not consider overbite as a continuous

variable report mixed results, with a majority reporting no or very selective associations.[21-24] If overbite is considered as a continuous variable, there is consensus that minimal overbite in adults is associated with osteoarthrosis. A reduced overbite maybe a result of osseous changes in the joint, rather than vice versa.[25]

Skeletal anterior open bite is of particular significance. This condition is characterized as a negative vertical overlap of the anterior teeth that often is combined with occlusal contacts only in the molar region. Skeletal open bite is not common in asymptomatic nonpatients and usually is associated with disease states demonstrating intracapsular changes (e.g. osteoarthosis). Larheim and co-workers[26] among others have noted that these occlusal change maybe a result of, rather than the cause of, these osseous changes.

The highest odds ratio was for anterior open bite, and this occlusal manifestation was seen predominantly in both the osteoarthrosis and the myalgia-only groups, an observation noted previously by Seligman and Pullinger.[19] For anterior open bite to be shown as an etiologic factor in the development of osteoarthritis, some evidence of this occlusal factor should exist in other diagnostic groups thought to be conditions often preceding osteoarthrosis. However, anterior open bite was not common in disk displacement disorders, with or without reduction. Further, Pullinger and co-workers[27] noted that most osteoarthrosis and myalgia patients did not have anterior open bite.

2. Overjet

The horizontal overlap of the teeth does not seem to be associated with TMJ symptoms or disease. Seligman and pullinger[19] note one exception, namely the higher prevalence of large overjet in patients with osteoarthropathies of the TMJ. Pullinger and Seligman[28] found that although larger overjets were associated with osteoarthrosis patients who had a prior history of disk derangement, no such association was evident in derangement patients without osteoarthrosis. Despite the association with osteoarthrosis, large overjet is common in nonpatient populations as well, and thus this measure lacks specificity in defining patient groups.

Overjets greater than 4 mm were associated with the likelihood of osteoarthrosis, the same disease groups as the anterior open bite populations. There was no

contribution to the patients with TMJ derangement. Pullinger and co-workers[28] stated that some large overjets in adults can be secondary to the condylar repositioning seen with advanced osteoarthrosis. An overjet of 6 mm or larger was needed for a subject to be assigned to one of these disease classifications with an odds ratio of at least 2:1. the occurrence of a progressively increasing overjet in adults should alert the clinician to evaluate a patient for other signs of TMD disease.

3. Crossbite

There is little evidence that this type of morphologic relationship leads to TMJ symptomatology.[29,30] Most patient studies report no greater prevalence of crossbite in patients as compared to nonpatients.[28] Crossbite persisting in adults typically are skeletal in origin and do not appear to provoke TMD symptoms or disease. Thus, the correction of crossbite in adults to prevent potential TMD problems does not seem warranted

Unilateral maxillary lingual crossbite occurs in about 10% of adult population, has a greater risk for assignment to TMJ derangement groups. Nearly one-fourth of the non-reducing disk displacement patients had this feature, and the odds ratio that a person with this type of crossbite also would have TMJ disk displacement with reduction was over 3:1. Similar odds ratios were seen for disk displacement group without reduction (2.6:1) and also in the osteoarthrosis patients with a history of disk displacement (1.96:1).[27]

4. Posterior occlusal support

Loss of posterior support has been associated with osteoarthrosis, but this association becomes questionable when the evaluation is controlled for age effect.[31-33] However, research on this topic in patient populations is scant. One of the few research groups to consider the longitudinal relationship of the loss of posterior teeth to the health of the masticatory system has been conducted by Kayser and associates.[34] They have shown that the adaptive capacity of the masticatory system over years is great, and that most people with loss of molar support have acceptable masticatory function and no increased amount of TMD signs and symptoms. Thus, no conclusions

can be drawn regarding the benefits of prosthetically replacing missing posterior teeth as a preventative measure for TMD.

In the samples studies by Pullinger and colleagues[35], extensive posterior tooth loss was not common. Five or more posterior teeth needed to be missing before odds ratio of assignment to disease groups assumed a minimal critical ratio of 2:1 for osteoarthrosis with disk displacement history and primary osteoarthrosis and also for disk displacement with reduction. Age is associated with both osteoarthrosis[36] and tooth loss[37], indicating that the increase in odds ratio in patients with osteoarthrosis with more four missing teeth also maybe a reflection of age.

5. Asymmetrical contact in retruded cuspal position

Imbalance tooth contacts in retruded cuspal position (RCP)/centric relation are most obvious in younger patient populations.[38] A loss of posterior dental support maybe associated with age. No associations of this type of disorder and TMD have been reported in older populations. Prophylactic adjustment of the natural occlusion is not indicated based on published studies, but the establishment of bilateral contact in RCP maybe a prudent restorative goal.

II. Dynamic occlusal conditions

Seligman and Pullinger[20] reviewed similar published research concerning the relationship of the functional movement of mandible to TMD

1. Balancing and working occlusal contacts

Most controlled surveys fail to demonstrate any association between occlusal supracontacts and TMD signs or symptoms in symptomatic nonpatients or in population of TMD patients.[39] Occlusal supracontacts are so common and variable that they lack the sensitivity and specificity for defining a present or potential TMD population.[40] However, a precise and reproducible method for determining the presence of occlusal supracontacts does not exist.

2. Slides between centric relation and centric occlusion

According to Seligman and Pullinger[20], most past studies report little association between the length of the slide between RCP/centric relation and ICP (intercuspal position)/centric occlusion and signs or symptoms of disorders in

asymptomatic persons. Studies of patients with radiographically determined osteoarthrosis report longer slides in arthrosis patients than in controls, a finding that indicates that osseous remodeling or condylarlysis can be accompanied by an increased slide.[41,42] In none of the studies is the amount of the slide handled as a continuous variable, thus adding bias to the interpretation of the data.

RCP-ICP occlusal slides mostly under 1 mm, were common in all patient groups and normals, but sagittal slides longer than 2 mm were found in the disease groups only. None of the asymptomatic subjects had occlusal slides greater than 2 mm, and only 6% had slides longer than 1 mm. Pullinger and co-worker[27] found that larger slides occasionally were associated with degenerative changes within TMJ. A slide of 5 mm or greater would be necessary to reach a 2:1 odds ratio threshold for notable risk, and this ratio never was observed in patients. Thus, the effective clinical contribution of this factor was minimal.

3. Occlusal guidance pattern

While there is evidence that occlusal guidance patterns can alter muscle activity levels, there is little evidence to suggest that a given guidance pattern can provoke TMD symptomatology.[43,44] Little is known concerning the role of specific guidance patterns in particular patient populations.

4. Parafunction

Bruxism and clenching often are cited as etiologic factors in the development of TMD, but similar to occlusal interferences, these activities (especially bruxism) seem to be endemic in the general population.[45] Furthermore, comparisons of groups identified according to self reports of parafunctional activities are suspect because of the universality of this activity and the lack of definition as to the quantification of severity measures. Seligman and Pullinger[20] stated that there is increasing evidence that parafunctions not associated with chronic occlusal factors, and thus reversible rather than nonreversible treatment should be provided in attempts to prevent or minimize possible harmful effects of this activity.[11]

Dental attrition

There is no evidence from most nonpatient studies that dental attrition is associated with signs or symptoms of TMD. Men show greater attrition severity than do women, yet they have fewer TMD symptoms. Patients with osteoarthrosis have the most notable occlusal changes, often demonstrating advanced rates of attrition.[46] These changes maybe secondary to the occlusal changes resulting from the arthrosis.

The multifactorial analysis of Pullinger and co-workers[27] has shown that, except for a few defined occlusal conditions, there is a relatively low risk of occlusal factors associated with TMD. In a subsequent reanalysis of these data, Seligman[42] has estimated that overall contribution of occlusal factors in defining TMD patients probably ranges from 10% to 20%, which leaves 80-90% of the characteristics of TMD patients unexplained by their occlusion.

2.5 Parafunctional activities

Bruxism is an oral habit consisting of involuntary rhythmic or spasmodic nonfunctional gnashing, grinding, or clenching of teeth, in other than chewing movements of the mandible, which may lead to occlusal trauma.[47] Bruxism occurs in approximately 15 percent of children and in as many as 96 percent of adults.[48] The etiology of bruxism is unclear, but the condition has been associated with stress, occlusal disorders, allergies and sleep positioning. Because of its nonspecific pathology, bruxism may be difficult to diagnose. In addition to complaints from sleep partners, signs of teeth grinding include masticatory pain or fatigue, headaches, tooth sensitivity and attrition, oral infection and temporomandibular joint disorders. Signs of bruxism include tooth wear and mobility, as well as tender or hypertrophied masticatory muscles and joints. Children with bruxism are usually managed with observation and reassurance. Adults may be managed with stress reduction therapy, alteration of sleep positioning, drug therapy, biofeedback training, physical therapy and dental evaluation.[48] The earlier discussion was based on the assumption that bruxism is a significant cause of TMD.[49] The mechanism is suggested to be via muscle spasm, which is actually the primary factor responsible for signs and symptoms of TMD since bruxism causes muscle spasm via muscle fatigue.[49,50] It was also suggested

that the condition became self-perpetuating and could lead to organic disease including not only TMD but also degenerative arthritis.[49,50]

III. Management of TMD

For the dentist attempting to manage a TMD patient, it is critical to appreciate the major etiologic factors that may be associated with the condition. It is appropriate to begin a thorough discussion of the major etiologic factors that lead to TMD. Proper identification of the correct factor is basic for therapeutic success. Management of patients with TMD symptoms is similar to management of patients with other orthopedic or rheumatologic disorders. The goals of TMD management include decrease in pain, decrease in adverse pressure or "loading" on the jaw joints, restoration of function of the jaw and normal daily activities. These goals are best achieved by identifying all contributing factors and implementing a well defined management program to treat physical, emotional and psychological factors. The management options and sequence of treatment for TMD are consistent with other musculoskeletal disorders found in the body. As in many musculoskeletal conditions, the signs and symptoms of TMD may be temporary and self-limiting without serious long term effects. For these reasons, special effort should be made to avoid aggressive or nonreversible therapy such as surgery, extensive dental treatment or orthodontic treatment.

Conservative management techniques such as behavior modification, physical therapy, medication, jaw exercise and intraoral appliances have proven to be safe and effective in the majority of TMD cases. Most patients suffering from TMD achieve good long term relief with conservative therapy.[11] TMD constitutes the most common cause of chronic pain in the orofacial region. Approximate 12% of the general population is affected by TMD, and 5% of the population has symptoms severe enough to warrant treatment.[11, 51]

Occlusal appliances are commonly used in the treatment of patients with TMD, and their effectiveness in reducing symptoms has been reported to vary between 70% and 90%.[52] An occlusal appliance or an occlusal splint is a removal device, usually made of hard acrylic resin 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, a night guard, an interocclusal appliance, or even as an orthopedic device.

Occlusal splint can be used as a diagnostic device. When an Occlusal appliance is specifically designed to alter a cause of a TMD, even temporarily, the symptoms are also altered. An occlusal splint can affect a patient's symptoms in several ways. It is extremely important that when it reduces symptoms, the precise cause-and-effect relationship must be identified before irreversible therapy is begun. Occlusal splints are helpful in ruling out certain causes. When a malocclusion is suspected of contributing to a TMD, occlusal appliance therapy usually indicated to verify the influent of occlusal condition to TMD. If it does not affect the symptoms, the malocclusion is probably not a cause and certainly the need for irreversible occlusal therapy should be questioned

Another favorable quality of occlusal appliance therapy in managing TMD is that it is useful in reducing symptoms. When the appliance is in place, the condyles are in their most musculoskeletally stable position at the time that the teeth are contacting evenly and simultaneously. Canine disocclusion of the posterior during eccentric movement is also provided. The treatment goal of the stabilization appliance is to eliminate any orthopedic instability between the occlusal position and the joint position, thus removing this instability as an etiologic factor in TMD. But the precise mechanism of this issue has been debated and is inconclusive at present. What is evident is that they are generally a reversible noninvasive modality that can help manage the symptoms of many TMD. Therefore they are often indicated in the initial and in some long-term treatments of many TMD. However, in the systematic review shows that occlusal splint does not give significantly different benefit in reducing pain severity, at rest and on palpation from other therapy such as acupuncture, bite plates, biofeedback/stress management, visual feedback, relaxation, jaw exercises, non-occluding appliance and minimal/no treatment.[53] There is still insufficient evidence either for or against the use of stabilization splint therapy for the treatment of TMD.

IV. Limitations and Complications of Oral Appliances

Stabilization Appliances

Several limitations and caveats must be discussed with a patient when the use of an oral stabilization appliance is contemplated. One concern is that some patients may actually clench their teeth more with an oral appliance than they do without the appliance.[54] This response is not the common reaction, but it can occur and should be considered when appliance effects are explained to the patient. Another concern with any appliance is that it is possible to induce an inadvertent change in the occlusion.[55,56] For this reason, most dentists do not recommend that patients use any of these appliances 24 hours a day, including meals; constant use can lead to an alteration in the position of the individual teeth or of the mandible to such a degree that the teeth no longer achieve intercuspation when the appliance is removed.

The efficiency of occlusal appliances therapy is a subject of controversy. Systemic review of randomized controlled clinical trial could not reach any definitive conclusion about their efficacy for treating TMD, with the methodologically strongest studies reaching opposing conclusions.[57] Earlier reviews have reached similarly equivocal conclusions about their effectiveness.[58-61] Despite the mixed evidence regarding their effectiveness and unclear mechanism of any action, 6 oral splints are used extensively by dentists to treat myofascial pain.[62-64] Study by Greene & Laskin[65], 40% of patients with myofascial pain-dysfunction syndrome showed an improvement when treat with a non occluding splint. Rubinoff et al.[66] found both non occluding and occluding appliances effective in ameliorating subjective symptoms in myofascial pain patients, but the occluding appliance used was reported to be more effective in relieving clinical sign. In a controlled study of myofascial pain patients treated with stabilization or control appliances, Dao et al.[67] found a positive treatment outcome but no differences between the groups regarding the effect on pain. Major and Nebbe[68] concluded from their review that splint therapy has not been demonstrated to be the treatment of choice to manage joint pain. The review by Marbach and Raphael[69] was also not able to identify evidence for their long-term efficacy. They therefore recommended in another study that appliances should not be used for musculoskeletal facial pain. [70] Furthermore, a published systematic review of randomized controlled trials on the occlusal treatment of TMD concluded that occlusal splints may be of some benefit in the treatment of TMD and that there is an obvious need for well-designed controlled studies to analyze the current clinical practices.[71] Indeed, the few

randomized controlled studies that have been published have led to inconclusive results.[72-74] A further problem, as reported by Dao and Lavigne[61] in a comprehensive literature review, is the fact that it is still largely unknown how splints work.

On the contrary, a third randomized controlled trial comprising patients referred for treatment of TMD of mainly arthrogenous origin reported that both symptoms and signs improved significantly with a stabilization appliance than with a control, non-occlusal appliance.[74] In short-term evaluation, the stabilization appliance is more effective in alleviating symptoms and signs in patients with TMD of mainly myogenous origin.[75] Because of these diverse opinions, there obviously is a strong need for further study to identify if a stabilization appliance is really effective.

CHAPTER III

MATERIALS AND METHODS

This study was designed as a clinical study. This study was approved by the committee on human rights related to human experimentation Mahidol University.

I. Subject selection

Subjects in this study were patients in recall list of Occlusion Unit, Faculty of Dentistry, Mahidol University. They were recalled and screened follow the selected criteria as the following:

1. Patients had signs and symptoms of bruxism and/or orofacial pain/TMD and were treated with stabilization occlusal splints more than 6 months.
2. Patients were treated by Orofacial pain and Temporomandibular disorders specialists.

Patients who can not communicate efficiently in Thai language were excluded from the study. The patients were informed about the aim, time needed and risks of this study. After reviewing the information about the study, patients, who wanted to enroll in the study, signed the consent form to accept the research protocol.

II. Data collection

We collected the data from patients by (1) interview and complete the questionnaire and (2) clinical examine the occlusal condition.

2.1 Patients were interviewed and completed 2 parts of questionnaire. The first part was about general information including: age, gender, race, religion, married status, education level, occupation and monthly income. The second part was divided into 2 issues: (1) diagnosis, duration, intensity, and frequency of the patient's facial pain and (2) detail of usage splint including frequency of splint usage. In the second issue, the additional questions about patients' attitude were added.

In this study, patients were asked to rate the pain intensity on a Visual Analog Scale, VAS (the VAS is described as a 10 cm line anchored at one end by the phrase “no pain” and on the other end by the phrase “unbearable pain”). The patient was simply told to indicate his/her pain by marking on the line between the two extremes. They were also asked to report the discomfort associated with the appliance therapy, the frequency of occlusal appliance usage.

2.2 The clinical examination was performed by the same examiner. Occlusal variable were noted as the follows: occlusion classification, vertical overbite, horizontal overjet, incisor midline discrepancy, RCP-ICP slide length, cross bite, occlusal interferences, attrition, number of unreplaced missing posterior teeth, number of occlude posterior teeth and splint condition.

Data analysis

The SPSS version 11.5 microcomputer program was used to perform the following statistical analysis

1. Descriptive statistics.
2. Chi-square test to analyze the relationship between occlusal splint efficiency and associated factors such as demographic data, presence of pain prior to the treatments as well as various occlusal variables.

CHAPTER IV

RESULTS

After the proposal was approved by the committee on human rights related to human experimentation Mahidol University, from July 2007 until December 2007, 245 patients from Special clinic and patients in recall list of Occlusion Unit, Faculty of Dentistry, Mahidol University were screened. Forty patients passed the selected criteria. The results were obtained from questionnaires and examination sheet. The analysis of data was divided into two parts:

Part 1 Descriptive statistics

Part 2 The relationship between occlusal splint efficiency and associated factors.

Part I Descriptive statistics

4.1 Characteristics of subjects

Forty from 245 patients were included in this study. The age was ranged 23-65 years-old with the average age and standard deviation 42.95 and 12.92 respectively. The prevalent age group is in 31-40 year old (25%) followed by 41-50 year old and 51-60 year old (22.5% both groups). They were females more than males. The background characteristics of patients in terms of gender, race, religion, married status, education level, occupation and monthly income were shown in table 4.1

Table 4.1 Background characteristics of patients

Characteristics	Frequency (%)
Gender	
- Male	7 (17.5)
- Female	33 (82.5)
Race	
- Thai	36 (90)
- Thai-Chinese	4 (10)
Religion	
- Buddhist	38 (95)
- Christian	2 (5)
Marital status	
- Single	19 (47.5)
- Married	18 (45)
- Widow	2 (5)
- Divorce	1 (2.5)
Education level	
- Under bachelor degree	6 (15)
- Bachelor degree or higher	34 (85)
Occupation	
- Professional, Industrial personnel, Administrative and Management personnel	14 (35)
- Clerk, Trade worker, Agricultural worker	9 (22.5)
- Government officer	6 (15)
- Student, House-wife, Retire	11 (27.5)
Monthly income	
- Less than 30,000 baht	23(57.5)
- 30,000 baht or over	17(42.5)

4.2 Self reported facial pain

From the interview and completion of the questionnaire, there were 23 patients out of 40 patients (57.5%) reported that they had facial pain before treatment. In this study, this group of patients was called “painful group”. The rest (17 patients or 42.5%) were bruxists; bruxist group. Table 4.2 was a summarized data of the patients who answered “yes” for each question.

Table 4.2 A summarized data of the patients who answered “yes” for each question

Questions	Patients with pain prior to treatment; painful group (n= 23)	Patients with bruxism only; bruxist group (n=17)
Frequency of pain at 2-3 times per week or less	19 (82.6)	17 (100)
Intensity of pain (VAS scale) at score 5 or less	17 (73.9)	16 (94.1)
Duration of pain at less than 4 hours	19 (82.9)	16 (94.1)
The appliance can help and decreased the pain	21 (91.3)	15 (88.2)
Wore the appliance 4-5 days per week or more	17 (73.9)	15 (88.2)

In the painful group, there were 21 females (91.3%) and 2 males (8.7%). When they were asked to rate the facial pain in VAS scale, 17 patients (73.9%) reported intensity of pain at score 5 or less (average = 2.7+2.25, maximum= 7, minimum = 0). Nineteen patients (82.6%) reported duration of pain at less than 4 hours and frequency of pain at 2-3 times per week or less.

In the bruxist group, there were 12 females (70.6%) and 5 males (29.4%). All patients (100%) reported frequency of pain at 2-3 times per week or less. Sixteen patients (94.1%) reported intensity of pain at score 5 or less and duration of pain at less than 4 hours. (Table 4.2) In this study, we did not have the VAS scale before the treatment.

4.3 Occlusal splint using and pain

Patients were treated with occlusal splints from 6 months until 68 months (21.5+15.68 months). Thirty-eight patients (95%) still used occlusal splint. Thirty-two (80%) were females and 6 (15%) were males. Two patients stopped using the appliance because they stopped grinding their teeth and did not have any symptom. In the painful group, twenty-one patients (91.3%) reported that the appliance could help and decreased their pain. Seventeen patients (73.9%) wore the appliance 4-5 days per week or more.

In patients with bruxism only, 15 patients (88.2%) reported that the appliance could help and decreased the pain. Fifteen patients (88.2%) wore the appliance 4-5 days per week or more.

4.4 The efficiency of the occlusal splint therapy

In this study, long term efficiency of occlusal splint therapy in this study was determined subjectively by the specific question that “Do you think that occlusal splint was helpful or not?”. If the patient answered “yes”, the occlusal splint was efficient. Most patients reported that occlusal splints helped and decreased their symptoms. Between the painful group and the bruxist group, there was no significant difference in efficiency of the appliance (p- value = .345).

Of the 40 individuals interviewed, 35 patients (87.5%) thought that the appliance could decrease their symptoms. None of them reported that the occlusal splints did not reduce any symptoms. For the rest (n=10, 25%), They could only protect teeth from wearing. In those patients, 8 patients of them (20%) were bruxists.

In addition, there was a significant higher efficiency of splint in the group of patients who felt that splint will improve their over all symptoms than the group of patients who felt that the appliance only protected their dentition from wearing only. (p-value = 0.010)

4.5 Occlusal variable examination

Patients were classified the molar relationship followed by Angle's classification. Most of them were class I molar relationship. The detail was presented in the table 4.3

Table 4.3 Classification of patients' molar relationship according to Angle's classification

Angle's classification (molar relationship)	Painful group (n=23)	Bruxist group (n=17)	Total (n=40)
Classification I	13(56.5%)	11(64.7%)	24(60%)
Classification II	5(21.7%)	4(23.5)	9(22.5%)
Classification III	5(21.7%)	2(11.8%)	7(17.5%)

The other characteristics of occlusal variable were shown in table 4.4. The painful group had most of occlusal variable higher in frequency than the bruxist group except the dental attrition. Thirteen patients (32.5%) had dental prosthesis. Nine patients were in painful group, the rest was in the bruxist group.

Table 4.4 Characteristics of subject's occlusal variable

Characteristics	Painful group (n=23)	Bruxist group (n=17)	Total (n=40)
Overbite more than 2 mm	11 (47.8%)	3 (17.6%)	14 (35%)
Overjet 4 mm or more	5 (21.7%)	3 (17.6%)	8 (20%)
Incisor midline discrepancy	17 (73.9%)	11 (64.7%)	28 (70%)
RCP-ICP slide more than 2 mm	0	1 (5.9%)	1 (2.5%)
Crossbite	5 (21.7%)	2 (11.8%)	7 (17.5%)
- Anterior crossbite	3 (13.0%)	1 (5.9%)	4 (10%)
- Posterior crossbite	5 (21.7%)	1 (5.9%)	6 (15%)
Occlusal interferences	13 (56.5%)	5 (29.4%)	18 (45%)
- Mediotrusive interferences	9 (39.1%)	2 (11.8%)	11 (27.5%)
- Laterotrusive interferences	8 (34.8%)	3 (17.6%)	11 (27.5%)
Dental attrition	21 (91.3%)	17 (100%)	38 (95%)
- Anterior attrition	19 (82.6%)	16 (94.1%)	35 (87.5%)
- Mediotrusive attrition	15 (65.2%)	9 (52.9%)	24 (60)
- Laterotrusive attrition	18 (78.3%)	15 (88.2%)	33 (82.5)
Posterior teeth missing 5 teeth or more	3 (13.0%)	2 (11.8%)	5 (12.5)

Part II The relationship between occlusal splint efficiency and associated factors.

The indication of occlusal splint efficiency was determined by the answer to the question whether occlusal splints helped or decreased the patients' symptoms or not. When they answered "yes", the occlusal splint was efficient. The data was self-report in nature. It was analyzed by the Chi Square test to find the relationship between the occlusal splint efficiency and associated factors. The critical value was set at .05.

The results of the analyses were showed in Table 4.5-4.8. In summary, there were no significant association between occlusal splint efficiency and any associated factors such as demographic data and occlusal variables.

Table 4.5 The relationship between occlusal splint efficiency and demographic data including occlusal splint used

Characteristics	Studied subject (%) (n=40)	Splint can help		p-value
		Yes (%) (n=35)	No (%) (n=5)	
Gender				
- male	17.5	17.1	20	
- female	82.5	82.9	80	.639
Education level				
- under bachelor degree	15	17.1	0	
- bachelor degree or higher	85	82.9	100	.423
Monthly income				
- Less than 30,000 baht	57.5	62.9	20	
- 30,000 baht or over	42.5	37.1	80	.093
Patient still wear splint				
- yes	95	94.3	100	
- no	5	5.7	0	.763
Frequency of splint wearing				
- less than 4-5 days per week	82.5	82.9	80	
- 4-5 days per week and more	17.5	17.1	20	.639

Table 4.6 The relationship between occlusal splint efficiency and occlusal variables

Characteristics	Studied subject (%) (n=40)	Splint can help		p-value
		Yes (%) (n=35)	No (%) (n=5)	
Overjet 4 mm or more				
Yes	20	17.1	40	
No	80	82.9	60	.257
RCP-ICP slide present				
Yes	55	51.4	80	
No	45	48.6	20	.240
Anterior crossbite				
Yes	10	11.4	0	
No	90	88.6	100	.573
Posterior crossbite				
Yes	15	17.1	0	
No	85	82.9	100	.423
Mediotrusive interferences				
Yes	27.5	28.6	20	
No	72.5	71.4	80	.578
Laterotrusive interferences				
Yes	27.5	28.6	20	
No	72.5	71.4	80	.578
Anterior attrition				
Yes	87.5	85.7	100	
No	12.5	14.3	0	.493
Mediotrusive attrition				
Yes	60	57.1	80	
No	40	42.9	20	.323
Leterotrusive attrition				
Yes	82.5	80	100	
No	17.5	20	0	.361

Table 4.7 The relationship between occlusal splint efficiency and associated factors (occlusal variables) in patients who had pain before group

Characteristics	Studied subject (%) (n=23)	Splint can help		p-value
		Yes (%) (n=21)	No (%) (n=2)	
Overjet 4 mm or more				
Yes	26.1	23.8	50	
No	73.9	76.2	50	.462
RCP-ICP slide present				
Yes	52.2	52.4	50	
No	47.8	47.6	50	.739
Anterior crossbite				
Yes	13	14.3	0	
No	87	85.7	100	.757
Posterior crossbite				
Yes	17.4	19.0	0	
No	82.6	81.0	100	.676
Mediotrusive interferences				
Yes	30.4	33.3	0	
No	69.6	66.7	100	.474
Laterotrusive interferences				
Yes	30.4	33.3	0	
No	69.6	66.7	100	.474
Anterior attrition				
Yes	82.6	81.0	100	
No	17.4	19.0	0	.676
Mediotrusive attrition				
Yes	60.9	57.1	100	
No	39.1	42.9	0	.360
Leterotrusive attrition				
Yes	78.3	76.2	100	
No	21.7	23.8	0	.605

Table 4.8 The relationship between occlusal splint efficiency and associated factors (occlusal variables) in patients who had bruxism only group

	Studied subject (%) (n=17)	Splint can help		p-value
		Yes (%) (n=15)	No (%) (n=2)	
Overjet 4 mm or more				
Yes	17.6	13.3	50	
No	82.4	86.7	50	.331
RCP-ICP slide present				
Yes	58.8	53.3	100	
No	41.2	46.7	0	.331
Anterior crossbite				
Yes	5.9	6.7	0	
No	94.1	93.3	100	.882
Posterior crossbite				
Yes	5.9	6.7	0	
No	94.1	93.3	100	.882
Mediotrusive interferences				
Yes	11.8	13.3	0	
No	88.2	86.7	100	.772
Laterotrusive interferences				
Yes	17.6	20	0	
No	82.4	80	100	.669
Anterior attrition				
Yes	94.1	93.3	100	
No	5.9	6.7	0	.882
Mediotrusive attrition				
Yes	52.9	53.3	50	
No	47.1	46.7	50	.735
Leterotrusive attrition				
Yes	88.2	86.7	100	
No	11.8	13.3	0	.772

CHAPTER V

DISCUSSION

In this study, we found 82.5% of patients were female. Females tend to report pain on Orofacial region more than males.[76,77] Females were more likely to report multiple symptoms and painful oral sores, with trends also observed for female sex as a risk factor for jaw joint pain and face pain.[78] Based on clinical populations, chronic TMD occur more frequently (range: 2:1 to 9: 1) in women than men. The reasons for this difference were unclear. The higher ratio of women versus men seeking TMD care is consistent with greater health awareness or interest in symptoms by women than by men. In chronic TMD patients, women exhibited significantly more psychosocial distress and impairment than ones who did not develop chronic TMD. The biopsychosocial differences between men and women suggest that some treatments may be more beneficial for women than for men.

From our study, improvement of overall subjective symptoms was reported. Patients with pain prior to treatment (91.3%) reported that after used the appliance more than 6 months their pain decreased. In other word, the subjective symptoms were improved. For objective symptoms, visual analog scale (VAS) was generlly used to indicate the level of patients' pain. The changes of VAS before and after treatment reflected the efficiency of that treatment. In our study, the records about VAS before treatment were incomplete so we could not study the differences in VAS.

This finding supported by the study of Sheikholeslam et al. [79]. They studied about the effects of an occlusal splint on chronic signs and symptoms of TMD patients. The results revealed the improvement of signs and symptoms of TMD with the long-term use of the occlusal splint. In contrast, controlled clinical trials concluded that appliances were not effective[67,69]. Marbach & Raphael[69] had suggested that the positive effect of appliances in uncontrolled studies might be from the methodological artifacts, based on the fluctuating course of TMD, the spontaneous

improvement with time, and the placebo effect, and did not recommend the use of appliances for facial pain.

In the group of patients with bruxism only, 88.2% reported the improvement in their symptoms. Some patients (25%) gave additional opinion that occlusal splint only protected dentition from tooth wear. It did not reduce their symptoms, in other word; it did not stop them from grinding/clenching their teeth. This finding similar to the 1985 study by Kydd and Daly[80], occlusal splints worn at night did not significantly reduce bruxing-clenching activity in bruxing subjects. However, another study showed that bruxing decreased by about 50% during two weeks of splint therapy, but that, following withdrawal of treatment, it returned to baseline levels.[81,82] Klineberg[83] suggested that occlusal splints protected the teeth, but did not alter the habit in the long term. Splints became worn when in use and wear and tear on the splint indicates continuation of the habit, even though patients might report that they were no longer aware of clenching their teeth.

Currently no known treatment methods existed that permanently eliminate bruxism. The dentist should select conservative reversible therapy. Although occlusal appliances did not cure a patient of bruxing, they could reduce the harmful effects of tooth wear and can help reduce musculoskeletal pains.

From our observation, we detected much occlusal morphology that might related to signs and symptoms of TMD but we could find any relationship the patients' symptoms and the efficiency of occlusal splint. There were great controversies on the role of occlusion as an etiologic factor of TMD. Several studies showed the association the signs and symptoms of TMD with occlusion[84-89]. Other studies stated that occlusion was partially associated to TMD.[29,90-92] Pullinger et al.[27] suggested that no single occlusal factor was able to differentiate patients from healthy subject. Four occlusal features were detected mainly in TMD patients and were rare in normal subjects: (1) the presence of a skeletal anterior open bite, (2) RCP/ICP slides of greater than 2 mm, (3) overjets of greater than 4 mm and (4) five or more missing and unreplaced posterior teeth. Unfortunately, all of these signs are rare not only in healthy individuals but also in patient populations as well, indicating limited diagnostic usefulness of these features. When we examined our patients, we found

that there was less percentage of those occlusal features when comparing in the same group of patients.

There were limitations in our study. Since we had limited time for developing this study, we designed our study as a retrospective study. We could very small number of subjects. The result from our study might not a strong evidence to support the efficiency of the occlusal splint. However, we suggested that treatment of TMD should always base on accurate clinical examination and diagnosis. Basic attention should be given to conservative therapy, including occlusal splint therapy, occlusal adjustment and physical therapy that facilitated the natural healing capacity of the musculoskeletal system and to treatment that involved the patients in the physical and behavioral management of their problems.

CHAPTER VI

CONCLUSION

The results from this study revealed that patients attitude can play a major role in long term efficiency of occlusal splint treatment.

APPENDIX

No. MU 2007-091

Documentary Proof of Ethical Clearance
The Committee on Human Rights Related to
Human Experimentation
Mahidol University, Bangkok

Title of Project: Long Term Efficiency of Intraoral Appliance Therapy in Patients with Temporomandibular Disorders
(Thesis for Master Degree)

Principle Investigator: Miss Kanjana Chavalertsakul

Name of Institution: Faculty of Dentistry

Approved by the Committee on Human Rights Related to Human Experimentation

Signature of Chairman: .....
(Professor Dr.Srisin Khusmith)

Signature of Head of the Institute: (for) .....
(Professor Dr.Pornchai Matangkasombut)

Date of Approval: 14 MAY 2007

Date of Expiration: 13 MAY 2008

Questionnaire No.....

Part 1 General Information

1. Age.....
2. Gender **O** Female **O** Male
3. Race
   - **O** Thai **O** Etc…….
   - **O** Thai-Chinese
4. Religion
   - **O** Buddhist **O** Etc…….
   - **O** Christian
   - **O** Islam
5. Marital status
   - **O** Single **O** Widow
   - **O** Married **O** Divorce
6. Education level
   - **O** Under Bachelor degree
   - **O** Bachelor degree or higher
7. Occupation
   - **O** Professionals **O** Student
   - **O** Industrial personal **O** House-wife
   - **O** Administrative and Management personal
   - **O** Clerks **O** Retire
   - **O** Trade workers **O** Government officer
   - **O** Agricultural workers **O** Etc…….
8. Monthly income
   - **O** Under 30,000 baht
   - **O** Over 30,000 baht

Part 2 Questions about occlusal splint and pain

1. Wearing splint for _____ months
2. You had pain before treatment

   O Yes **O** No
3. Until now, you still use an occlusal splint

   O Yes **O** No
4. How often are you use an occlual splint ?

   O Less than 4-5 days per week

   O 4-5 days per week or more
5. Frequency of your pain

   O More than 2-3 times per week

   O 2-3 times per week or less
6. Intensity of your pain

   0 1 2 3 4 5 6 7 8 9 10

   No pain Unbearable pain
7. Duration of your pain

   O More than 4 hours

   O 4 hours or less
8. After treated occlusal splint, your symptoms

   O Better **O** No change **O** Worse
9. Do you think that splint can help you ?

   O Yes **O** No

Occlusal Variable Examination Form

Diagnosis _____

1. Occlusion classification
   a. Molar relationship
      Right o Class I o Class II o Class III o unclassified
      Left o Class I o Class II o Class III o unclassified
   b. Canine relationship
      Right o Class I o Class II o Class III o unclassified
      Left o Class I o Class II o Class III o unclassified
   c. Classification
      o Class I o Class II div I o Class II div II
      o Class III o unclassified
2. Vertical overbite _____ mm.
3. Horizontal overjet _____ mm.
4. Incisor midline discrepancy _____ mm.
5. RCP-ICP slide length _____ mm.
6. Anterior crossbite O Yes O No
7. Posterior crossbite O Yes O No
8. Mediotrusive interferences O Yes O No
9. Laterotrusive interferences O Yes O No
10. Anterior attrition O Yes O No
11. Mediotrusive attrition O Yes O No
12. Laterotrusive attrition O Yes O No
13. Number of unreplaced missing posterior teeth
    Upper acrh _____ Lower arch _____
14. Number of occluded posterior teeth _____
15. Patient has prosthesis O Yes O No
    o Upper arch
    o Fixed prosthesis _____
    o Removable prosthesis Kennedy Cl. ___ Mod.___
    o Lower arch
    o Fixed prosthesis _____
    o Removable prosthesis Kennedy Cl. ___Mod.___
16. Occlusal Splint condition
    o Normal
    o Crack
    o Broken
    o Missing

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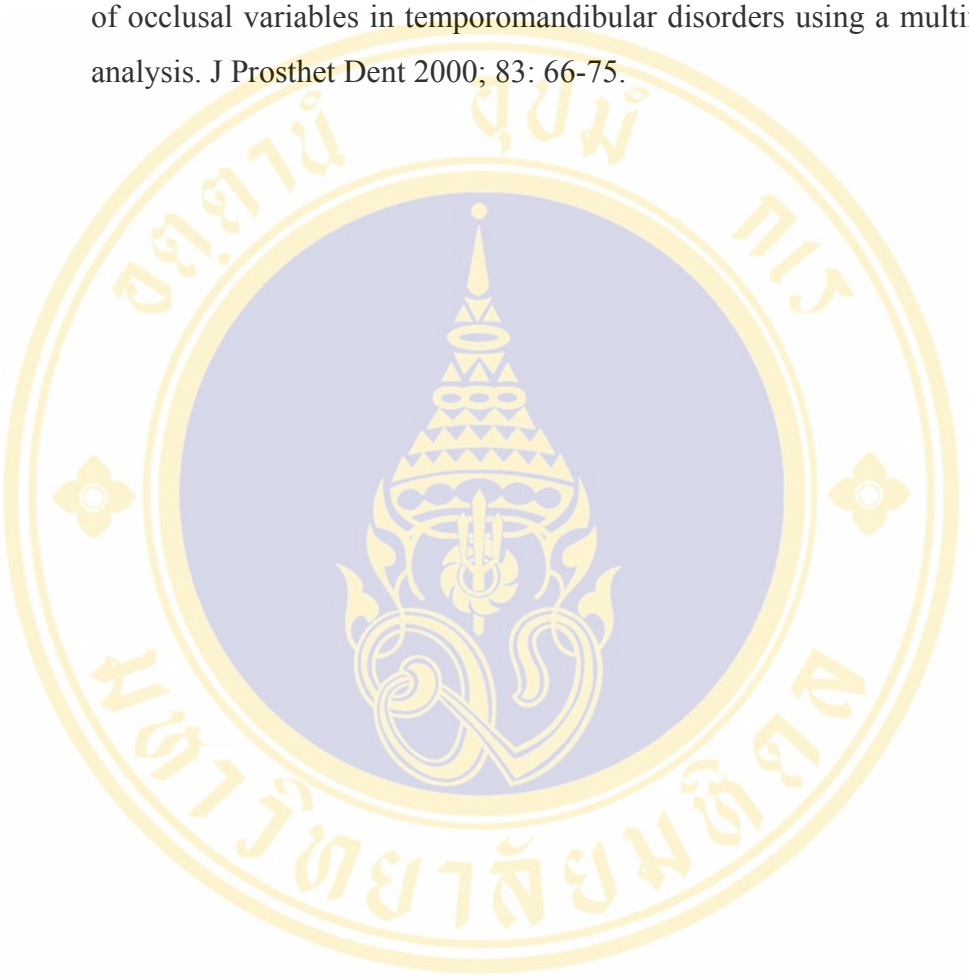

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