Original Article

The influence of immediate complete anterior guidance development technique on subjective symptoms in Myofascial pain patients: Verified using digital analysis of occlusion (Tek-scan) for analysing occlusion: A 3 years clinical observation

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Abstract

Objectives: The purpose of this study is to evaluate the effect of occlusal equilibration using immediate complete anterior guidance development (ICAGD) technique by Kerstein and Farrell on the subjective symptoms of myofascial pain. This technique is the most advanced verifiable and measurable way of digitally analyzing the occlusion using T-scan technology. The primary objective is to reduce the anterior disclusion time to <0.4 s and the secondary objective is to reduce the signs and symptoms of myofascial pain.

Materials and Methods: This study is to assess the reducing effects of subjective symptoms of 100 patients diagnosed as myofascial pain patients treated by ICAGD technique as described by Kerstein and Farrell. The common complaints of the patients were a pain in the masseter and temporal muscles, jaw tiredness in the mornings, night bruxing and difficulty in chewing. In this technique occlusal equilibration involves removal of posterior interferences and establish anterior guidance. The patients were treated over three visits 1-week apart and followed for 3 years with an interval of 3 months for the subsequent visits. A visual analog ordinal scale is used to rate the symptoms. The symptoms reduction occurred for all the patients after the first correction in about 5–10 days. In about a period of 3 years review, no recurrence was seen of the chronic myofascial symptoms.

Results: In spite of the chronic nature of the patient's symptoms, symptom reduction occurred in a week's time. This was assessed by the results of the ordinal scale values. This agrees with the studies of Kerstein and Farrell.

Conclusion: Equilibration of occlusion using digital analysis by T-scan in which force is quantified against time, should be done to establish free functional movements without any interference; otherwise the disturbances in the excursive movements may lead to muscle dysfunction at later years.

Key Words: Digital analysis of occlusion, electromyography, enameloplasty, immediate complete anterior guidance development, joint vibratography, myofascial pain, occlusal discrepancy, T-scan

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INTRODUCTION

The signs and symptoms of chronic Myofascial pain are pain in the face, limited mouth opening, muscle tenderness, deviation of the jaw on opening, noises in the temporomandibular joint (TMJ) and pain in and around TMJ area.[1-5] The etiologic factors and treatment modalities for chronic myofascial pain are widely studied and debated.

Occlusal therapy constitutes a deliberate intervention for the purpose of changing the occlusal status. It should be based on an objective diagnosis and evaluation in each case. It has been reported that the reduced dysfunctional activity with the use of bite planes would return if the bite planes were left out of the mouth at night; but it never happened to patients who had occlusal equilibration by immediate complete anterior guidance development (ICAGD) technique, even if they stopped using the bite planes.[4-6]

Occlusal equilibration as a treatment modality for relieving the symptoms of myofascial pain has been successful for some people and not so for some people.[7] The present study reports the result of 100 patients with chronic myofascial pain symptoms treated by "occlusal equilibration using ICAGD technique" by Kerstein and Farrell as the treatment option with computer-guided ICAGD enameloplasty and simultaneously recorded T-scan data.

Aims and objectives

To assess the therapeutic efficacy of T-scan III guided and measured ICAGD occlusal calibration procedure in creation of the occlusal scheme in which disclusion time is < 0.4 s/excursion and assess their effect in bringing down the subjective symptoms of myofascial pain.

Inclusion criteria

- Pain in the face
- Limited mouth opening
- Muscle tenderness
- Deviation of the jaw on opening
- Noises in the TMJ and pain in and around TMJ area
- Dentulous patients.

Exclusion criteria

- Patients with the Edentulous mouth.

MATERIALS AND METHODS

This study included 100 patients diagnosed as myofascial pain cases. Of these 100 cases, 32 men and 68 women having an age range of 18 to 60 years were presented. Of this, 17 men were between 18 and 35 years and 15 of them between 36 and 60 years. 52 women were in the age group of 18 to 35 years and 16 of them between 36 and 60 years. The areas of pain reported are in the region of masseter, temporalis, and lower border of the mandible near molar area and in the ear or TMJ region [Table 1].

All the patients were screened with the biometric diagnostic investigations like T-scan (digital analysis of occlusion), electromyography (EMG) and joint vibratography (JVA) to study existing dentition. JVA analysis will give us, whether the case is intracapsular or extracapsular disorder. Extracapsular cases were studied by using T-scan and EMG, for the tooth contact sequence, changing occlusal forces and fluctuating muscle activity levels of the temporalis and masseter muscle. The recorded details are from an intercuspal position followed by excursive movements till the muscle shutdown occurred.

About the location and nature of pain, a total of 180 sites of chronic discomfort with some patients showing more than one area were recorded. In this, temporalis area showed the maximum in 69 patients and then the masseter area 54 patients. The onset of the pain or discomfort was described by 69 people as tension and pain in the temporal area and the next pattern was pain in the masseter area while chewing and stiffness in the face in the mornings. The lower border of the mandible was the next point of discomfort. Twenty-one patients had unilateral or bilateral joint disturbances in the form of clicks or pops. The symptom distribution subjectively has been shown region-wise and numbers in Tables 2 and 3.

About the intensity of symptoms, an ordinal scale of visual analog scale having ratings from 0 to 5 were used to categorize the symptoms in to 0 = no pain/1 = very little/2 = mild/3 = moderate/4 = severe/5 = very severe; as shown in Tables 4 and 5 before treatment and after 1-week.

Technique of immediate complete anterior guidance development treatment protocol

The protocol for ICAGD is to start by recording the traces of all mandibular movements using T-scan and EMG after JVA being recorded. Once the traces are studied for occluding time and discluding time details, the occlusal interferences in excursive mandibular movements are eliminated like all Class I

Table 1: Age and sex distribution

Age	Male (32)	Female (68)	Total	Grand total
18-35	17	52	69	100
36-60	15	16	31	

Table 2: Regions of chronic pain

	n (%)		
Masseter/buccinators	Temporalis	Lower border of mandible	TMJ region
54 (97)	69 (124)	36 (65)	21 (38)

TMJ: Temporomandibular joint

Table 3: Subjective distribution of symptoms

Subjective symptom distribution	Number of patients
Temporal headaches	69
Jaw pain in the masseter area	54
Jaw fatigue on chewing	36
TMJ area pain and noises	21
Night bruxing and night guards	09

TMJ: Temporomandibular joint

to III interferences described by Glickman [Figures 1 and 2]. Once this is achieved, either by reduction-enameloplasty or by addition to teeth, immediate posterior disclusion in <0.4 s should be achieved. The intentions are to establish ICAGD with <0.4 s disclusion time in excursive mandibular movements.

When we equilibrate occlusion by ICAGD technique, keep asking -where is the highest pressure point in the bite, do you have any rocking points, is it equal on left and right side, is it very light at the back end when you bite, is it hurting in temples, face, neck or ears when you bite, do you feel blocked when you want to glide from side to side, is there raised tension in your face when you bite and do you have anything that you do not like about your bite.

Immediate complete anterior guidance development is done in two phases. In the first phase after analyzing the digital data of T-scan, enameloplasty (reduction) or addition to teeth with composites is done in such a way, immediate posterior disclusion in <0.4 s is achieved. This reduces muscular contraction in masticatory muscles by suppressing the mechanoreceptor activity due to shortened disclusion time. There by lessened lactic acid produced with increased availability of oxygen for the muscular tissues. This reduced muscle hyper activity will be immediately shown as muscle relaxation, decreased pain, stress released from the face etc., for the patient's.

The arch relation between maxillary and mandibular teeth is as follows; 79 of them Angles Class I, 7 of them Class II inclusive of both the divisions and 14 of them Class III. All of them were subjected to complete occlusal examination, which revealed centric relation to centric occlusal (CR-CO) discrepancy of 0.25 to 3 mm in both the horizontal and vertical direction. In this, 51 patients had gone through orthodontic corrections. Even though they had good vertical relationship; 16 people had posterior cross bites and 3 of them anterior open bite.

All these patients were having inability or limited ability to right and/or left excursive movements when anterior teeth are in contact. This was primarily due to both

Table 4: Symptoms assessment ordinal scale-pretreatment

Symptoms assessed	No symptoms	Very little	Mild	Moderate	Severe	Very severe
	0	1	2	3	4	5
Temporal head aches	10	16	11	21	33	09
Jaw pain in the masseter area	04	14	23	13	29	18
Jaw fatigue on chewing	00	02	27	33	37	01
TMJ area pain and noises	06	39	21	23	11	00
Night bruxing and night guards	78	03	09	10	00	00

TMJ: Temporomandibular joint

Table 5: Symptoms assessment ordinal scale-posttreatment (after 1-week)

Symptoms assessed	No symptoms	Very little	Mild	Moderate	Severe	Very severe
	0	1	2	3	4	5
Temporal head aches	87	06	07	00	00	00
Jaw pain in the masseter area	96	04	00	00	00	00
Jaw fatigue on chewing	100	00	00	00	00	00
TMJ area pain and noises	73	05	13	09	00	00
Night bruxing and night guards	100	00	00	00	00	00

TMJ: Temporomandibular joint

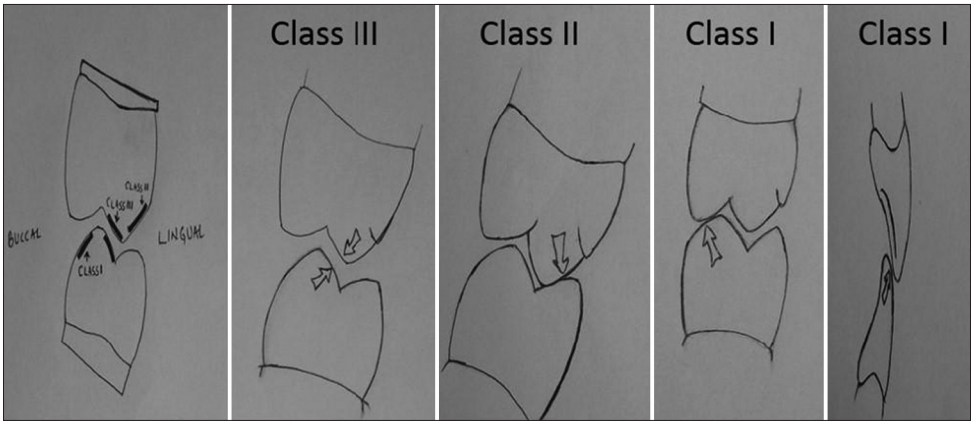

Figure 1: Glickman's classification of interfaces

working and nonworking interferences in the posterior teeth [Figures 3 and 4]. Some of these patients could move a bit from their habitual maximum contact and others move laterally if they first separated their teeth vertically. Twenty one of them had protrusive interferences too, even though all of them could protrude mandible. Most of them had anterior worn out (wear out facets) incisal edges especially canines, there by anterior guidance being lost [Figure 5]. The 23 patients who were using acrylic resin splints (night guards) were subjected to occlusal evaluation without the splints. All these patients were unable to do lateral movements from ICP due to working and nonworking interferences. The major factor in all these patients was missing freedom for the mandibular excursive movements in all directions in contact with the opposing teeth due to lack of anterior guidance. Since this is a subjective description of the findings, no control group is used.

In the second phase, on 8th day (after 1-week) pre- and post-treatment records are recorded [Figure 6]. Occlusal interferences are looked for and cleared till the new habitual bite is eventless by having <0.4 s disclusion time and the entire craniofacial physiology is at its best health. This is confirmed with the Bio-metric reports of T-scan, EMG and JVA and disappearance of MPDS symptoms over a period of 4 to 6 weeks completely. Patient is reviewed periodically to avoid changes in disclusion timings at regular interval of 1, 3, 6 months and every 6 months afterwards for 3 years. Follow-up visits showed that after reduction, the pretreatment levels of excursive muscular hyperactivity were lessened.[9]

Treatment

Treatment objective was to free the contact mandibular movements in all eccentric directions by occlusal equilibration as described by Glickman[11] and Kerstein's[8] ICAGD technique. But no attempt is being made to modify the closure position to CR and neither an attempt was made to correct the CR-CO discrepancy.[10] The sole treatment purpose was to remove all nonworking and working interferences and develop an anterior guidance. For patients with anterior open bite and Class II angles relation, guidance was established on canines and first premolars, Class III angles relation it was provided on incisors and canines and Class I relation it was on canines and incisors.

After the first visit for occlusal equilibration, all patients in the second visit after 1-week reported of easy jaw movements and

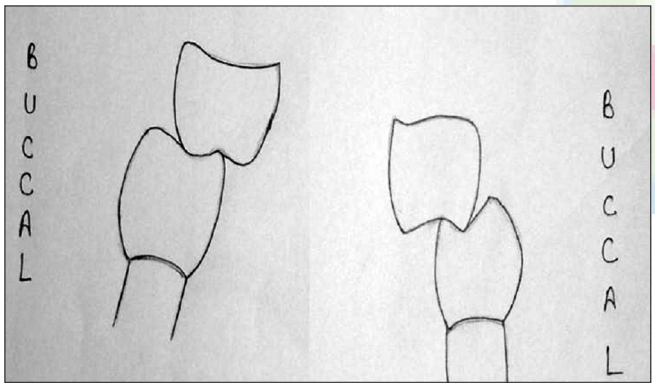

Figure 2: Cross bite

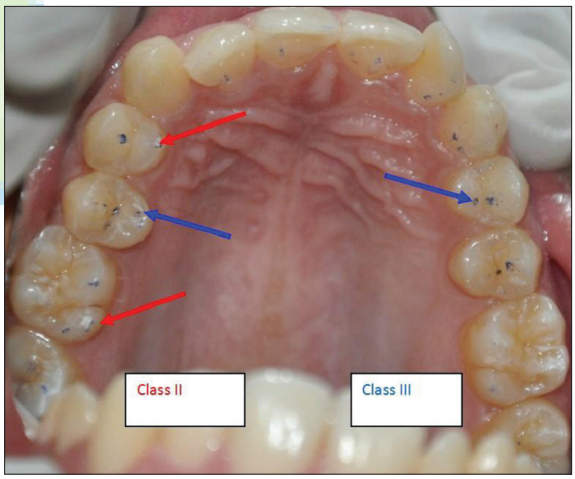

Figure 3: Working and nonworking interferences

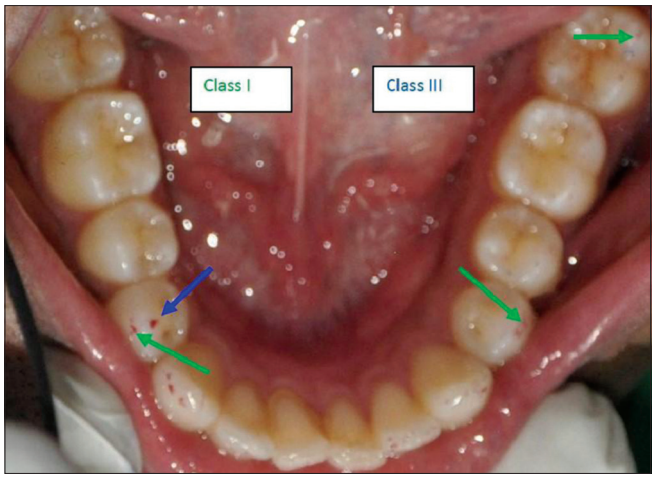

Figure 4: Working and nonworking interferences

Figure 5: Worn out teeth

Figure 6: T-scan & EMG traces

fresh feeling in the face, lack of stiffness in the face indicating stress free facial tissues and no muscle pain. Sixty seven patients were very happy, five of them still complained of 10% to 20% of symptoms who had few more interference. After the second visit corrections, even these five patients were very much comfortable. The other three patients were having flat occlusal surfaces and needed couple of visits to gain anterior guidance after which even they were comfortable.

RESULTS

Regardless of the chronic nature of the patient's symptoms, symptom reduction occurred in a week's time. This agrees with the studies of Kerstein and Farrell.[8] All the 100 patients reported no facial tension or fatigue on eating. The bruxing patients reported of relaxed muscles and no pain. The episodes of bruxing had reduced as reported by their spouses or relatives. The patients who complained of pain near ear or TMJ, the frequency of pain greatly reduced, but the clicking and popping persisted. These patients recalled over 3 years showed that the results were maintained and no recurrence was seen.

DISCUSSION

From the data [Table 1] it is seen that, these problems are predominantly seen in women aged between 18 and 35 years. Out of 68 women patients from 100 treated cases, 52 are in the age group of 18–35.

As per Glickman's classification[11] the maximum number of interferences were Class III, followed by Class II and Class I. Removal of Class III interferences on nonworking side during equilibration procedure, which is on the buccal inclines of the upper palatal cusps and lingual inclines of the lower buccal cusps will facilitate better visualization of Class II and I interferences on the working side. Once all the faulty contacts are eliminated and anterior guidance established with all freedom of Jaw movements.

As reported by Williamson and Lundquist,[12] Dawson,[13] Kerstein and Farrell,[8] there will be masticatory muscle activity leading to contraction in the muscles during closed position and this will continue when the posterior teeth are in contact during excursive movement. In turn this will lead to release of contractile by-products like lactic acid which results in muscle spasm, muscle fatigue, pain. Due to spasmic contractions, blood supply is reduced with decreased muscle function, oxygen and increased ischemic changes.[13] This will lead to increased pain as nerve endings are sensitive to lactic acid and ischemic changes.

Since the nonworking and working interference were removed and anterior guidance was established, the excessive muscle activity is being interrupted during closing contacts giving rest to muscles.[14,15] This will eliminate the muscle hyperactivity, fatigueness, tenderness and pain in the muscles reliving the symptoms of all myofascial pain symptoms from musculoskelatally based issues.

In all the 100 patients, 51 (51%) of them have developed symptoms long after their orthodontic treatment. This gives a direction to think about, mere establishment of ideal vertical tooth relation may not lead to functionally and neuromuscularly healthy excursive movements. If free excursive mandibular movements are not established after postorthodontic treatment may lead to muscle dysfunction at later years. Thus, equilibration should be done to establish good and free functional movements without any interference after orthodontic treatment is completed and the teeth have assumed stable positions.

CONCLUSION

In this report, it is seen that the treatment of 100 patients having myofascial pain with occlusal equilibration using digital analysis of occlusion by T-scan, EMG and JVA technology; which is quantifying of occlusal forces against time has brought relief of symptoms in about week to 10 days time. Further long-term and control studies are required to know the relation between neuromuscular health and teeth contacts.

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