Recording Myocentric Relation in a Partially Edentulous Patient: A Case Report
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How to cite the article:
Manchanda S, Bhawsar SV, Manchanda J, Ramchandani A. Recording myocentric relation in a partially edentulous patient: A case report. J Int Oral Health 2015;7(Suppl 2):92-95.

Abstract:
The masticatory system constitutes four closely interrelated components: Teeth, muscles, nerves, and temporomandibular joints (TMJ). The stable and physiologic rest position of the TMJ is based on the muscle guidance (mainly masticatory, and partially facial), neurally determined and controlled occlusion, integrated together with its peripheral proprioceptors and relax mechanism of the central nervous system. Oral rehabilitation procedures should emphasize on a holistic approach to establish a physiologic relationship of the lower jaw to the base of the cranium resulting in a neuromuscular rest position. This position then would support an occlusion for the stability of the TMJ, the masticatory muscles of the orofacial region and the teeth along with their supporting periodontium. Such a holistic approach becomes more important in cases where the patient not only requires oral rehabilitation but also presents with related TMJ problems. This is a case report where an attempt is made to rehabilitate a patient in a neuromuscular rest position by establishing a myocentric relation.

Key Words: Electromyograph, jaw tracking device, masticatory system, myocentric relation, physiologic rest position, and transcutaneous electrical nerve stimulation

Introduction
Oral rehabilitation along with craniomandibular disorders presents the multifaceted musculoskeletal occlusal signs and symptoms. Treatment of such cases require consideration to study of occlusion that relates the maxillary and mandibular teeth, temporomandibular joints (TMJ), relation of mandible to the base of the cranium, and dynamic interplay of physiologic muscle activity, and muscle rest that oblige the masticatory element of occlusion. Like often, it is the supporting element that is overlooked in the health care field which concedes the human body in proper posture and optimum function as a complete healthy system.1

It is indubitable after a more careful understanding, diagnosis, and evaluation by the dentist that musculoskeletal, postural, emotional/psychological, biochemical and/or functional issues may be a part of the distressed patients complaints.2 Many of the signs and symptoms associated with these disorders pose a challenge to one and all of the dental profession who fail to believe that the signs and symptoms which are presented go beyond the occlusal perspective of how teeth articulate and where the centricity of condyle to glenoid fossa relationship exists.

The recording of centric relation is influenced by numerous factors, one of which is the neuromuscular system. This system has a strong adaptive capacity to permit the function and protection of the stomatognathic system. Deflective occlusal contacts will induce the conditioning of neuromuscular system, which will be constantly reinforced with each closure through proprioceptive feedback. This conditioning may induce changes at the level of any component of the masticatory unit reducing its efficiency or may even cause temporomandibular disorders.3-5

Patients with this condition present with numerous signs and symptoms and can be treated neuromuscularly.

The following case report has been presented in which the myocentric relation has been established, using computerized jaw tracking device, electromyograph (EMG) electrodes, and transcutaneous electrical nerve stimulation (TENS) machine.

Myocentric relation
Myocentric is the spatial relationship of the mandible to the maxilla and the skull in all the three planes. It is an involuntary position and jaw to jaw relationship rather than tooth to tooth relationship. There is no voluntary action on the part of the patient or the dentist to guide the mandible into the myocentric position. Those who believe in the neuromuscular occlusion believes that the myocentric is the optimum maxillomandibular relationship that is the most compatible and least stressful to the patient’s musculature.2,6
Myocentric relation is established along the neuromuscular path, most commonly ranging between 1 and 2 mm of vertical closure initiating from the physiologic rest position. Such a neuromuscular path is an induced isotonic closure trajectory of the mandible that occurs when postural and masticatory muscles are together at the same time in their resting length and in balanced tone with respect to each other, to a selected terminal contact therapeutic position (myocentric occlusion).

Case Report
A 49-year-old female reported to the Department of Prosthodontics, MGV Dental College and Hospital complaining of pain on the right side of the face near the ear, headache in the right frontal region and worn out previous removable partial prosthesis.

The patient did not report any systemic illness and past major illness. Patient gave the past dental history of extraction of maxillary posterior teeth 3 years back followed by immediate replacement of teeth by a removable partial denture.

Extra oral examination of the patient revealed pain and tenderness in right side TMJ, deviation of the mandible to the left side on opening and closing and clicking in TMJ on both sides. On palpation, there was tenderness in the masseter and temporalis muscles on the right side.

On intraoral examination, it was found that there was an edentulous space with missing 14, 15, 16, 17, 23, 24, 25, 26, and 27 (Federation Dentaire Internationale system of tooth numbering). The ridge was well formed and round in shape. The horizontal span and vertical space was normal.

Investigations
Orthopantomogram was taken to rule out any possibility of root piece, impacted third molar or any other pathology.

 Provisional diagnosis
Partial edentulism and myofacial pain dysfunction syndrome.

Treatment plan
The replacement of the worn out removable partial denture with the cast partial denture or implant supported prosthesis was advised to the patient. However, the patient was not ready to bear the cost of the either suggested prosthesis.

It was then planned to give a conventional heat cured acrylic removable denture as an interim prosthesis. We decided to fabricate the prosthesis by recording the myocentric relation to restore the neuromuscular harmony of the masticatory system.

Treatment procedure
It was carried out in the following steps:

Impression
Primary impressions were made in alginate, and the study models were mounted on a Whipmix articulator to analyze and plan the treatment procedure. This was followed by making of final impressions by pick-up impression technique.

Recording of the myocentric relation
It was carried out in three following stages:
I. Recording of jaw movements and EMG
The jaw movements were recorded with the help of jaw tracking device, and the muscle activity was recorded by an EMG machine (Figures 1-3).

II. Deconditioning or relaxing the mandibular musculature by the application of TENS (myomonitor)
With the help of TENS, complete relaxation of the muscles was achieved, and the mandibular musculature was induced to guide the mandible in the physiologic position.

Mode of application of TENS
- TENS application was done with the help of the J5 myomonitor (Figure 4)
• Three electrodes were used to apply TENS - positive, negative, and ground electrode
• Positive and negative electrodes were pasted in the mandibular notch region in front of the ear, and ground electrode was pasted in the midline behind the neck
• The magnitude of the TENS was gradually increased to achieve the muscular twitching. It was further increased to achieve the mandibular jerk which was the clinical threshold value for the patient (5 mV)
• At this clinical threshold, the muscle relaxation was carried out for 45 min.

III. Continuing the impulse of the myomonitor activating the musculature to elevate the mandible from rest position through the freeway space to correct functional position, i.e., myocentric position
• After the complete muscle deconditioning, the magnitude of the TENS was increased to 1.5 times of the clinical threshold value which was 7.5 mV
• With the help of the jaw tracking device and the EMG machine the myocentric position was identified on the scan (Figure 5)

The myocentric position was captured using elastomeric interocclusal record material (Figure 6).

Mounting of the myocentric relation and arrangement of the teeth
• The casts were mounted on Whipmix articulator in the myocentric relation. Appropriate teeth were selected and arranged so that the centric occlusion (maximum intercuspation) and myocentric relation record coincided
• The protrusive and lateral records were transferred to the articulator, and balanced occlusion was achieved.

Try in and denture insertion
• During try in, balanced occlusal contacts were checked in myocentric relation, protrusive and right/left lateral positions
• The denture was processed and inserted into the patient’s mouth. It was checked and verified for extensions, occlusion, and comfort of the patient.

Follow-up
• Patient recall visits were made each after 24 h, 1-week, 4 weeks, 6 weeks and 1-year. Patient reported relief from
a headache, pain in the right side TMJ and the masseter muscle region area over a period of time.

- She also reported better masticatory efficiency with the removable partial denture.

Discussion

Dawson insightfully has written, “Because muscle controls all function, the muscles must have a static resting relationship from which functional activity begins and returns.” And he further states, “There can be no occlusal harmony when any part of the masticatory system is at war with muscles.”

The bio-physiologic aspects of mandibular and condylar posture and their relation to the masticatory system (TMJ, teeth, muscles and nerves) is often neglected in an occlusal rehabilitation procedure by just using face-bows, articulators, and manual manipulative techniques of establishing a maxillary to mandibular position.

The conventional manual manipulation techniques of recording centric relation in a repeatable and consistent manner ignores the fact that the muscle physiology of orofacial region is sensitive to anatomical and structural imbalances and plays a major role in mandibular posture and occlusal stability in patient’s dental health and overall well-being. The neuromuscular school of thought adds another attribute to understand the interrelation of the various components of the craniomandibular system. With the use of computerized technology in diagnosis and treatment, the clinician can visualize dynamic dimension of muscle physiology and activity along with mandibular positioning in a synchronous manner and at the same time can guide the patient in an optimal myocentric position in space eliminating the need for manual intervention.

Although mandibular border movements have been recommended to confirm the parameters of cusp fossa occlusion and disclusion, the neuromuscular concepts recognize the importance of muscle rest and establish an accurate physiologic myocentric occlusion which complies with all the requirements of masticatory function.

The ultimate goal of oral health is the normal mandibular function where the patient is relieved of pain, musculoskeletally balanced, esthetically gratified, and occlusally stable.

Use of computerized technology scientifically measures the physiologic responses of the orofacial muscles (especially masticatory muscles) and augments ones vista of where to establish an occlusion during the diagnostic phase. More relevant is the fact that the objective, measurable data obtained can be practically implemented during every stage of the clinical treatment, especially during the finishing phase to verify when a mode of treatment is complete and successful. Harmony of the TMJ and muscles of mastication to a physiologic occlusion plays a dynamic role in the effective treatment of the craniomandibular symptomatic patient.

Conclusion

The use of face bows, semi/fully adjustable articulators is done to relate the teeth properly to each other in such a way that they will have a non-interfering, harmonious relation to the mandibular movements and jaw joint. However, we still fail to achieve the physiologic science and objective ideals in treating day to day clinical patients, especially the more challenging craniomandibular disorder cases. The neuromuscular method, as confirmed by the use of scientific instrumentation, finds the missing link to perceive all border movements of the mandible, the determining factors of occlusion and the physiology between occlusion (teeth), the supportive and functioning muscles, and the optimal condylar position within the glenoid fossa.

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