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Review Article

Neuromuscular dentistry - A myth or reality: A literature review

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ABSTRACT

Neuromuscular dentistry is the treatment philosophy involving all the important structures like teeth, muscles (associated nerves), temporomandibular joint and the interrelation between them. The ultimate aim of a doctor is to restore and maintain the well being of the patients' stomatognathic system, and to have a long term favourable prognosis of the treatment provided. As the need of the hour, the treatment protocols should be evidence based and must have the approval of independent studies and researches. Relationship between occlusion, posture and TMDs has been a debatable topic in prosthodontics. Rectifying the occlusal and postural abnormalities to treat Temporomandibular disorders according to pathophysiological concepts is under extensive scrutiny. The muscles act as the driving force of the whole system which works in co-ordination with its neural stimulation. This discipline is a comprehensive concept of a dynamic stomatognathic system that are in lines with the biomedical principles governing the other organs to treat the patient. This speciality uses highly advanced instrumentation to quantify the subjective parameters of lower jaw movements and formulate a robust diagnosis and treatment plan. There exists a group of believers and non-believers who still co-exist and the philosophy is still not universally accepted. This literature reviews attempts to provide an insight on the topic.

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1. Introduction

Neuromuscular dentistry is the treatment philosophy involving all the important structures like teeth, muscles (associated nerves), temporomandibular joint and the interrelation between them. The ultimate aim of a doctor is to restore and maintain the well being of the patients' stomatognathic system, and to have a long term favourable prognosis of the treatment provided. As the need of the hour, the treatment protocols should be evidence based and must have the approval of independent studies and researches.^{1,2} Relationship between occlusion, posture and TMDs has been a debatable topic in prosthodontics. Rectifying the occlusal and postural abnormalities to treat Temporomandibular

disorders according to pathophysiological concepts is under extensive scrutiny.

The current trend in development of newer technologies, in the form of both diagnostic aids and treatment modalities has opened up newer never thought before avenues in medicine. Extensive researches have started uncovering the physiologic links between stomatognathic and other systems of the body. Modern research has proved that a scientifically executed reconstruction and rehabilitation of occlusion has a therapeutic effect on other important parameters such as posture, balance, muscle aches, headaches, etc.^{2,3} On the contrary there are also a body of evidence which considers occlusal discrepancies to be a very minor factor if at all in the pathophysiology of TMDs.⁴

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2. Discussion

In the late 1960s Dr. Bernard Jankelson revolutionized the existing occlusion concepts with modern scientific evidence and newer technology driven gadgets. Dr. Jankelson brought newer technology and new paradigms to dental occlusal treatment and was confronted by various levels of older evidence.

Dr Bernard who is better known as father of this subject along with his son Dr Robert has done pioneering work in this subject and are precursors to the principles and fundamental philosophies used in this subject.^{5,6}

Dr Dickerson played a huge role in bringing this concept to the newer generation by incorporating the philosophy in his treatment protocol and teaching curriculum. He believed NMD creates a perfect balance between form & function.

Dr Jim Garry & Dr Brian Alman were the pioneers in relating NMD with sleep dentistry. Dr Mike Mazocco & Dr Jay Gerber showed the utility of Neuromuscular approach in orthodontics.

1. They firmly believe in the concept that the regulatory mechanisms of whole body are interdependent on each other. It cannot be treated organ wise and has to be treated comprehensively. The physiology behind all the systems share a common general framework.
2. The treatment targets an identifying an adequate rest position for the muscles and the joint where the whole surrounding will be in homeostasis in relation to each other. The prosthodontic rehabilitation reference point for each patient should be this point which strikes a balance between the active and passive state.⁵
3. The basis of this treatment philosophy is based on quantifying the diagnosis by measuring the physiologic parameters of the lower jaw and muscles. Not depending on arbitrary assumptions to create a stable treatment reference but using advanced scientific instrumentation.⁷ The famous saying of Dr Bernard, can be applied in this instance 'If it has been measured, it is a fact; if it has not been measured, it is an opinion'

Generalizing the stomatognathic system in the lines of the other systems standardizes and simplifies the whole treatment algorithm.^{8,9} It states the normal principles applying to the nerves, muscles and joints around the body also implies to masticatory system and it is related to each other throughout the body and has to be treated as a whole to be effective. It is believed that closer is the whole system to its rest position better is the stability, comfort and health of the masticatory system.^{10,11} This should be recorded and relaxed to an optimal state with modern equipment like Ultra-Low Frequency TENS and surface Electromyography.¹² It is also believed that muscle relaxation is an important criterion before any jaw relation procedure or diagnosis and examination as the existing

muscle engrams has to be dissolved at the onset to avoid incorporation of erroneous reference point for rehabilitation.

Dr. Clayton played a pivotal role in promulgating and integrating this concept into restorative dentistry. Instead of taking into consideration the mechanical centric position as the the stable reference position without objectively measuring it, the NMD dentists believe on another scientifically measurable position i.e., Myocentric.¹³ This position is supposedly a state of physiologic relaxation where all the components are in its stable and resting position and also can be recorded by the dentist. This position should be the reference point for all rehabilitation techniques and objectively measured with newer jaw tracking devices like computerized mandibular scanning (CMS), K7 Kinesiograph and sonography/Joint Vibration analysis equipment.⁷

Recording precise mandibular movements was the ultimate target for the gnathologists for a long duration of time to develop a perfected occlusion and various mechanical, graphical methods with pantographs and stylus have been tried.¹⁴ These methods though were used for a long time were prone to cause mechanical interferences. Later magnetic force based systems like kinesiograph and sirognathograph were introduced and became very popular and are even used till date with predictable outcome.¹⁵ They measure changes of the flux in the field due to the effect of mandibular movement.^{16,17} Newer optoelectric systems use 3D sensing camera with LEDs to spatially track spatial mandibular position.¹⁸ These newer systems doesnot interfere with the movement patterns.¹⁹ Newer softwares like SICAT is being developed continuously to integrate with the CBCT and MRI findings with the other modalities and give extremely precise results.^{20,21}

Dr. Gary Wolfard published extensively studied mandibular movement trajectory and its relation with NMD. There is a specific pathway how the mandible traverses during closure, any deviation to it would be a pathologic nidus and most commonly it is posterior to the optimal trajectory.²² Myo-trajectory is the isotonic closure of the lower jaw from physiologic rest position. This trajectory utilizes minimum workload of the muscles and are in harmony to the surrounding tissues. Terminal tooth contact should be equilibrated and synchronized to this pathway.²³ Once this is achieved total relaxation will then occur allowing the release of the cranial stresses, strains and torques.

Though the role of occlusion in TMDs is of minor magnitude as of the current consensus. Reversible splint therapy still remains one of the prominent treatment modalities till date. The standardized protocols advices that irreversible long term therapy should only be undertaken if definitive diagnosis can be finalized and patient benefit can be guaranteed.²⁴

Also recently, NMD is suggested to expand and include, besides occlusion and mastication, the complex phenomenon of swallowing thereby involving the skeletal muscles of the tongue and smooth muscles of the pharynx and oesophagus, a new ‘diamond’ concept, was proposed for NMD from the traditional triad concept.²⁵

The concepts pertaining to neuromuscular dentistry are still not so popular because extensive research data beyond the related working group are unavailable. Not many dentists are comfortable with the idea of the correlation between posture and TMJ and their inter related treatment.²⁶ The instruments used in diagnosis and treatment doesn’t have enough evidence to be universally accepted. Mostly the proven concept of Centric relation is still the preferred reference concept for rehabilitation. The role of prosthodontist is reduced to a minor role if at all in treating TMDs through this modalities as an universally accepted consensus.^{27,28}

The relation between occlusion and TMD has been debatable for a long period of time. Most speculative and independent studies in the initial period accepted occlusion as one of the important causative factors in TMDs.^{29,30} Though substantive evidence based studies was unavailable as the disease is multifactorial in nature.^{31,32} The factors like neuromuscular adaptability, psychological factors and extensive prevalence of varied occlusal discrepancies made it difficult to prove occlusion as a causative factor.^{33–35} The reversible splint therapy, deprogramming and physical therapy provided relief to most of the cases thus minimizing the role of occlusion in aetiopathogenesis further.^{36–38} In 2011, ICCMO published a position paper in TMD establishing scientific validity of the physical/functional basis of TMD, efficacy of measurement devices and TENS and their use as aids in diagnosis and in establishing a therapeutic neuromuscular dental occlusion.^{39–41} But since then, extensive scientific review by authors like Manfredini et al. has moved towards a biopsychosocial model approach for TMD which has stated that in absence of a disease-specific association, there is no ground to hypothesise a major role for dental occlusion in the pathophysiology of TMDs.⁴²

3. Conclusion

The science has further evolved into Gneuromuscular dentistry (GNMD) which incorporates the principles of gnathologics into neuromuscular dentistry, thus making it a more robust scientific discipline. It is of utmost importance that today we have a tool in hand to objectify the occlusal conditions and correlate these to improve our restorative treatment outcome. These concept is being embraced by an increasing number of prosthodontist and dental technicians to achieve a holistic and healthy rehabilitation of the stomatognathic system. Neuromuscular dentistry has evolved a long way since its inception and with modern

technological aids at its service this branch of dentistry has proven itself to be a dependable solution for rehabilitating patients in a physiologic homeostatic condition especially in complex cases. The basis of this approach is to gather objective data from the patient before making a diagnosis and starting off an irreversible therapy. Being doubly sure before commencing any extensive therapy strengthens the scientific foundation of the treatment further and can be considered an important treatment philosophy especially with cases with complex occlusal diseases may or may not associated with cranio-mandibular and cranio-cervical system.

4. Conflict of Interest

The authors declare that there is no conflict of interest.

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None.

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