



REVIEW ARTICLE

Biometrics in dentistry: The boom in the management of Tmds

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ABSTRACT

‘Temporomandibular disorders’ is a collective term embracing number of clinical problems that involve the masticatory musculature, the temporomandibular joint and occlusion. Decision making in prosthetic dentistry & in the management of patients suffering from temporomandibular disorders is strongly influenced by the clinical & educational background of the dentist. The role of occlusion is often overlooked, minimized, or ignored in many dental practices. Many dentists find it difficult to understand occlusal concepts, or perhaps cannot fathom where or how to begin to find it difficult to understand occlusal concepts, or perhaps cannot fathom where or how to begin to incorporate occlusal technologies into their busy practices. Implementing an easy-to-learn and easy-to-use biometric approach gives clinicians a powerful tool for incorporating occlusal analysis into their practices. The biometric approach provides recordable and reproducible objective data, which can lead to improved clinical results and fewer failures. Requiring far less clinical chair time, the biometric approach gives dentists the critical information they need to create harmony of the teeth, muscles, and joint complex. Therefore in this review article we discussed the working of this emerging system and its application in the clinical practice.

INTRODUCTION

Temporomandibular joint (TMJ) function and temporomandibular disorders (TMDs) have been the subject of enormous importance for many years. TMJ dysfunction is a cryptic issue even today, because of its multifactorial etiology.¹ TMDs is a collective term that describes a sub-group of painful oro-facial disorders, involving complaints of pain on the TMJ region and fatigue of the cranio-cervicofacial muscles, especially mastication muscles, limitation of mandibular movement and presence of articular clicking. However, it is generally assumed that TMDs would mainly affect adult

patients; nevertheless, children have also shown a similar incidence of signs and symptoms in other studies.² They may be categorized into extra articular (extra capsular), as myofascial pain disorders, and intra articular (intra capsular) disorders. Intra articular disorders comprise internal derangements (with the sub categories of disc displacement with or without reduction), degenerative joint disorders, and inflammatory TMD. The diagnostic process is seldom straight forward as TMD might comprise different disorders with similar sign and symptoms. Tests used in diagnostics should be accurate, reliable and valid for the purpose.

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BIOMETRIC SYSTEM

Biometrics is the gathering of the objective data from the patient's body and is used widely throughout all fields of medicine. The term refers to the gathering of recordable, measurable, and reproducible data from the patient. Blood pressure, cholesterol levels, and blood chemistry are only a few examples of recordable biometric data that physicians routinely gather to evaluate, diagnose, and treat patients. The significance of being able to record data for analysis, comparison, and archiving cannot be overstated. This is what elevates occlusal analysis to a true science as compared with subjective analytical methods. Generating recordable data is important, and recordable, objective data points cannot be obtained with articulating paper. Historically, articulating paper has been used as the sole instrument for gathering data from the patient's occlusion. However, it is impossible to use articulating paper to obtain specific defined data to measure, archive, compare, and study occlusion. This fact alone prevents research to obtain parameters to analyze, study, and therefore, standardize the use of articulating paper. In contrast, using biometrics in dentistry does provide objective data that has been studied, researched, and evaluated for more than 40 years. Research has defined specific pathologies related to the objective data obtained from biometrics. Therefore, a clear and objective understanding of the interrelationships that exist with the teeth, muscles, and joints of the patient is now possible with a high degree of accuracy.³ This data and its accuracy provide practitioners with the ability to evaluate, diagnose, and treat occlusion as never before.

COMPONENTS OF BIOMETRIC SYSTEM

The biometric system encompasses all three aspects of the stomatognathic system including the teeth, muscles, and joints, which interrelate and define a patient's occlusion. This approach can be used to motivate the patients to realize their diseased condition more easily. Moreover it is easily accessible, and can be applied purposefully to all type of dental patients. With the use of the system, clinicians can catch potential problems very early, often preventing many overlooked and debilitating conditions. This approach also provides for scalable treatment that is driven by patients and built on objective data and findings, not a subjective belief system, which unfortunately is necessary when diagnosing in the absence of data. The system involves following components:⁴

- Joint Vibration Analysis (Bio JVA)
- Jaw Tracking 3D (JT-3D)
- Electromyography (Bio EMG)
- T-Scan III Images

Joint Vibration Analysis (BioJVA)

BioJVA is a diagnostic aid used to measure how the patient's joints are functioning before starting any case that repositions the mandible. In less than 5 minutes, one can provide a highly accurate, quantitative test analyzing

the stability and function of the Temporomandibular Joint. BioJVA or "Joint Vibration Analysis" is a quick, non-invasive method for objectively evaluating the Temporomandibular Joints. Much like the way one evaluate the wear on the teeth, JVA enables the dentist to get a sneak peek into the health of the jaw joint. BioJVA Joint Vibration Analysis is based on simple principles of motion and friction. When smooth surfaces rub together, they create little friction and little vibration. If these surfaces become rough, then friction and vibration are created when these surfaces articulate.

Jaw Tracking (JT-3D)

JT-3D, or "Jaw Tracking", allows the clinician to analyze jaw movement in a dynamic way. The most relevant procedures include chewing, speaking, range of motion, and swallowing. The analysis of the pattern and speed provides tremendous insight in diagnosis and treatment planning. It records incisor-point movements in three dimensions. A small magnet, attached to the labial surfaces of the mandibular incisors, is tracked by an array of sensors to produce vertical, antero-posterior and lateral components of movement. It mounts simply, yet securely on the head, and provides an incredibly stable base for the sensors. This provides spectacular resolution even on the smallest of mandibular movements.

Electromyography (Bio EMG)

BioEMG, or "electromyography" allows the clinician to evaluate the efficiency of the patient musculature in rest, chewing, and clenching. Using EMG allows for identifying improper muscle function over a period of time. Proper muscle function ensures the long term stability of the dental work.

T-Scan III Images

The T-Scan III brings unprecedented accuracy to analysis of dental occlusion. This, in turn, ensures higher quality results. If you are practicing quality dentistry, the T-Scan III will elevate clinician's potential. Employing this remarkable solution will make it easier for you to demonstrate the quality of your work, with images your patient can understand right in your office, in real-time.

DISCUSSION

It is evident from the numerous epidemiologic studies on the occurrence of TMDs in the general population where there are a number of consistent findings. Firstly, signs of TMD appear in about 60 to 70% of the general population and yet only about one in four people with signs are actually aware of or report any symptoms.⁵ Furthermore, only about 5% of the population will have symptoms severe enough for them to seek treatment. Another consistent finding is that of those who seek treatment for TMD, by far the greatest majority is females outnumbering males by at least four to one. It is suspected that TMD affects both males and females in almost equal numbers in general population although

females are possibly more likely to seek treatment. Although, TMD may occur at any age, the most common time of presentation is early adulthood.⁶ The prevalence of TMD signs and symptoms²⁰ in a large elderly sample was composed of medicare recipients, where the sample size was 429 subjects derived from an eligible sample of 866 subjects. The mean age of the sample was 74.4 years and 42% were males overall, 12% of the subjects reported a history of TMD and 6.5% reported pain with jaw function. Joint noise was documented in 35.2% of the sample, joint tenderness in 8.4%, muscle tenderness in 12.8% and limitation of jaw motion in 22.4%. In pediatric populations,⁷ it has been reported that on a sample of 11 and 15 years subjects, who had been examined for signs and symptoms, the sample was composed of 119 subjects where the point prevalence of subjects reporting one or more symptoms of TMD increased with age (35% at age 7, 61% at age 11, and 66% at age 15), 60% of the sample reported one or more TMD symptoms, 66% reported one or more symptoms at age 15.

In order to treat temporomandibular joint disorders it is necessary to understand etiology and to establish a systematic procedure for differential diagnosis. If we treat only symptom, then there are chances of recurrence, whereas, if the causes are eliminated then prognosis is much more favorable. To accomplish this objective more knowledge is needed about the etiology of TMJ disorders, so that specific treatment procedures for each patient may be designed. Whereas successful diagnosis and treatment plan of temporomandibular joint disorders involving functional and structural changes constitutes for various diagnostic aids; with a systematic history and detailed examination being the initial and principal requirements. Implementing an easy-to-learn and easy-to-use biometric approach gives clinicians a powerful tool for incorporating occlusal analysis into their practices. The biometric approach provides recordable and reproducible objective data, which can lead to improved clinical results and fewer failures. Requiring far less clinical chair time, the biometric approach gives dentists the critical information they need to create harmony of the teeth, muscles, and joint complex. Biometric system has been shown to be 98% sensitive and 98% specific in the diagnosis of joint pathology.^{8,9} Simply stated, this means it has the ability to show both the true presence and absence of disease. Further, it is easy to replicate and allows different practitioners the ability to obtain the same diagnosis 98% of the time. This is in contrast to 14% and 48% consistency of diagnosis with the respective use of a stethoscope or Doppler ultrasonography.¹⁰⁻¹² The ability to diagnose the condition of the joint easily and accurately is significant because, as early as 1984, an American Dental Association committee stated in its findings that dentists should be the primary source of evaluation and treatment of temporomandibular disorders (TMDs).¹³

CONCLUSION

With a more accurate diagnosis, the dentist can define the current state of the patient's stomatognathic system, and therefore, treatment plan with greater clarity and purpose. The subsequent treatment is guided by the objective data and feedback from biometrics. Finally, the dentist has a very powerful tool to assess the outcome and determine with objectivity whether the intended treatment goals were obtained. The data help the dentist clearly diagnose and understand the patient's occlusion.

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