Occlusion Confusion

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Second opinions are common in health care; whether a doctor is sorting out a difficult case or a patient is not sure what to do next. In the context of our magazine, the first opinion will always belong to the reader. This feature will allow fellow dental professionals to share their opinions on various topics, providing you with a "Second Opinion." Perhaps some of these observations will change your mind; while others will solidify your position. In the end, our goal is to create discussion and debate to enrich our profession. — Thomas Giacobbi, DDS, FAGD, Editorial Director, *Dentaltown*

I believe that all dentists want to do their best for their patients. We chose dentistry as our profession to be helpers and healers. Yet, there are various, often contradictory, occlusal philosophies practiced by these well-meaning dentists. Why is that the case? Dental training and education should equip us to come to our own conclusions on the validity of these occlusal philosophies, which are reviewed here. In my opinion, choosing an occlusal methodology should be entirely based on what we would use for our own families when financial considerations are not a factor. This is our profound obligation to our patients. Therefore, it matters not who and with what credentials or titles makes pronouncements about occlusion.

"TMJ" has produced more confusion among dentists than any other area of dentistry. Of course, I am not referring to the actual joint itself, but rather the syndrome of symptoms that has been variously labeled as "Temporo mandibular joint disorder (TMJD)," "Temporo mandibular dysfunction (TMD)," "Cranio Mandibular Dysfunction (CMD)," etc. No wonder it is confusing! We can't even agree on a label, let alone the cause(s) and treatment. For simplicity, I will use "TMD" here.

Another area of confusion is TMD symptoms themselves. Familiar "dental" symptoms of TMD include TMJ pain, crepitus, internal derangement of the articular disc, limited opening, open locks, unexplained tooth pain and unexplained temperature sensitivity of teeth. However, TMD can also cause many "medical" symptoms such as headaches, migraine, facial pain, neck pain, limited cervical range of motion, ear pain, tinnitus, vertigo, trigeminal neuralgia, fibromyalgia and paresthesia of fingers. Therefore TMD has earned the nickname "Great Impostor."

A third area of confusion is the etiology of TMD. There are those that firmly believe that TMD is a neurological phenomenon from a hyper-sensitized central nervous system. The symptoms require management with mostly anti-epileptic pharmaceuticals that attenuate *all* CNS functions. Others believe that it is a psychosocial disorder requiring counseling or medical management with psychotropic pharmaceuticals. Still others believe that the etiology is related to the occlusion of teeth – the mandibular position, correcting which requires an occlusal paradigm.

This situation reminds me of a story of four blind men who decide to determine the nature of a new animal at the zoo. The first blind man concludes that this animal is flat and wide like a wall. The second is sure that it is cylindrical like a tree trunk. The third is certain that it is smooth and sharp like a spear. The fourth is convinced that it is like a python. Each man is absolutely certain that his friends are wrong since he "knew" the truth. If only these blind men had the ability see the whole animal, they would have realized that an elephant is all of that and more.

Similarly, many factors contribute to the whole picture of TMD. These load the metaphoric camel's back of "adaptive capacity." When this capacity is exceeded, symptoms appear. The last factor that breaks the camel's back often receives the blame or credit, as though that factor alone "triggered" the symptoms. Genetics and gender are well-known factors that affect adaptive capacity but are unchangeable. Factors we *can* change include mandibular position, head/neck posture, biochemistry such as hormones, nutrition, overall posture, sleep apnea and mental stress.

Stress is often cited as causing TMD. But mandibular position, which is functionally connected to head/ neck position,[1,2] is perhaps the most important factor. It affects airway, cranio-cervical vertebrae alignment, the cerebral blood flow through vertebral arteries and tension on the dura-mater[3] through myo-neural junction.[4] The exciting part is that dentists alone can change mandibular position. But how exactly do we determine the optimal position? The occlusal philosophies differ in their answers to this question. Hence "occlusion confusion" is created.

There are essentially three variables that contribute to mandibular position: TM joints, teeth and masticatory muscles – the "stomato-gnathic triad." All occlusal philosophies can be classified into three groups based on which of this triad is given primacy.

I. Joint based philosophies (anatomy of the joints is determinant):

1. The Centric Relation (CR) philosophy is the most widely accepted occlusal philosophy. Almost all North American Dental schools teach CR philosophy. It is based on a definition of where the condylar head is placed in relation to the glenoid fossa. Over the past 50 years, the definition of CR has changed from most retruded (one hand on the chin), to most superior and anterior/superior (bimanual manipulation) in the glenoid fossa. As recently as 2007, Dr. Peter Dawson wrote that "the two stopping points for jaw closure in a perfected occlusion are the CR (uppermost) position for the joints."[5] A literature review produces between seven[6] and 26[7] different definitions of CR.

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Further, there appears to be little agreement on CR practice methodology. In 2000, Jasinevicius, et. al., reported in the *Journal of Prosthodontics* that there was not a unified definition of CR within departments, schools or between schools based on a survey of prosthodontic and restorative faculty and fourth year dental students from seven US Dental schools.[8] Additionally, Rinchuse and Kandasamy concluded that there is no scientific substantiation of CR records being a benefit in treatment in their 2006 *JADA* review on the validity of CR records. Other authors have come to similar conclusions regarding this confusion about CR.[10,11]

Finally, how is CR position validated in practice? Routinely imaging the condyle position with corrected tomograms would seem to be the appropriate standard protocol for a joint position based philosophy. However, "repeatability" is the most commonly used standard by which CR practitioners operate.

2. Musculo-skeletally stable (MSS) position is proposed by Dr. Jeffrey Okeson. This is a bimanually manipulated joint position that is essentially the same as anterior superior CR position. While repeatability is utilized, radiographic verification of joint position or objective measures to validate musculo-skeletal stability is not taught as standard operating protocol.

3. Orognathic Bioesthetics International (OBI) philosophy is a form of CR. It is theorized that the center of rotation of the TMJ can be diagnosed using a MAGO splint (maxillary anterior guided orthotic) that has anterior guide plane and no posterior contact. Clinicians have reported that this leads to joint compression and posterior hypo-occlusion. Once CR is determined, tooth forms that provide steep cusp fossa relationships are utilized for reconstruction.

4. Restorative Centric is another form of CR. Using anterior deprogrammers such as NTI-tss, Lucia jig, Kois deprogrammers and many others, it is theorized that the masticatory muscles are deprogrammed and condyles are seated into CR. The maxillo-mandibular relation is recorded at this "deprogrammed" status. There is no standard protocol regarding the length of deprogrammer wear, to determine or objectively measure the muscles to confirm that deprogramming has been accomplished or radiographic imaging of the condylar seating into CR.

5. Functional TMJ philosophy is generally attributed to Dr. Harold Gelb whose "Gelb 4/7 position" is a "down and forward" position of the condyle in the glenoid fossa. Splints are used to functionally align the mandible often using Applied Kinesiology to determine the appropriate position. Radiographic imaging of the joints is standard protocol to verify joint position. Most members of American Academy of Craniofacial Pain follow this occlusal philosophy to treat TMD.

II. Teeth based philosophies (anatomy of teeth is determinant):

1. Centric Occlusion (CO) is also known as Maximum Intercuspation Position (MIP) and Habitual occlusion: the position with which the patient presents where the teeth usually fit together best to chew food. Most day-to-day restorative dentistry is done at this position. To accomplish restorative treatment of few teeth in an arch, this position is the most practical one.

Even when full arch or full mouth restorative rehabilitation is planned, some clinicians keep the maxillo-mandibular relation unchanged. Their belief is that the freeway space is unchangeable. If there are worn down teeth, then in order to restore them, osseous crown lengthening surgeries are done to expose tooth structure to accomplish restorations while maintaining the inter-jaw relationship. If the underlying etiology of the severe wear being repaired is not addressed, then it is logical to expect the wear to continue.

If TMD is present, CO approach would perpetuate that condition. But since many of us "don't know, what we don't know," we might not see the all the "signs" of TMD. As such, there is a risk that previously "asymptomatic" patients would manifest TMD symptoms after even simple restorative treatment. These patients could attribute their pain symptoms to the recently performed treatment.

3. Gnathologic philosophy is based on the importance of perfect tripodization of cusp fossa relationships. Occlusal equilibrations are often utilized to accomplish this ideal. This might or might not be in conjunction with finding the CR position of the joints.

III. Muscle based philosophies (physiology of muscles of mastication are determinant)

Neuromuscular (NM) – "Myocentric" is based on the primacy of the physiology of the masticatory system. "The dentist should do everything possible to see that centric relation and centric occlusion do coincide, since instability can trigger hypertonic contraction of muscles…." wrote Dr. Bernard Jankelson in 1960. As a prosthodontist his training was firmly based in CR. Yet through collaboration with renowned muscle physiologist Dr. H.H. Dixon of University of Oregon School of Medicine, Dr. Jankelson developed the idea of neurally stimulating jaw muscles through an ultra low frequency TENS device. The objective is to provide an occlusal relationship of mandible to maxilla that minimizes need for muscle accommodation.

To begin, jaw muscles are relaxed through an Ultra Low Frequency Trans-cutaneous Electro Neural Stimulation (ULF-TENS) at coronoid notch to pulse cranial nerves V (Trigeminal) and VII (Facial). The two key points are that 1. It is ULF – one pulse per 1.5 seconds compared to 100 Hz used by chiropractors for pain relief and 2. The pulse is neurally mediated. Neural mediation of the pulse has been established through several studies very early on.[12,13] In essence, this method is a way of "massaging" every muscle innervated by that particular nerve, even the well-hidden ones such as Lateral pterygoid, Tensor veli palatini and Tensor tympani muscles. Once the muscles of mandibular posture attain a more unstrained status as measured by surface Electromyography (sEMG) tests, that mandibular position is recorded. The American Academy of Neurology has concluded that "SEMG is considered an acceptable tool for kinesiologic analysis of movement disorders because it is a method for recording and quantifying clinically important muscle-related activity with the least interference on the clinical picture."[14]

1. Classic NM occlusion uses ULF-TENS to determine bite. As Dr. Jankelson described nearly 50 years ago, the bite is taken on trajectory of involuntary mandibular movement while under ULF-TENS typically 1 to 2mm from physiologic rest position of mandible. It is telling to note that these fundamentals of NMD remain unchanged over five decades. They provide the solid foundation upon which improvements have been made.

2. Phonetic or Swallow bite NM techniques record mandibular position during these functions. Some clinicians use NM equipment such as joint vibration and sEMG to document and diagnose presenting conditions. ULF-TENS might be used therapeutically, but usually not as part of bite taking protocol. Phonetics or swallow techniques are used to take a bite relation in a "functional" position. Applied Kinesiology is often used to modify the treatment bite position during splint therapy. Many NM purists do not accept these protocols as really "Neuromuscular."

3. LVI – Neuromuscular occlusion: The Las Vegas Institute for Advanced Dental Studies (LVI) adopted NM concepts around 1998. In the decade since, many innovations and refinements have been added to this "LVI- NM protocol." Ninety percent of all pain is muscle-related.[15] So it makes sense to measure the electrical activity of the muscles. So a guiding premise is "EMG rules." Real time measurements of muscle physiology, sEMG readings are used to refine final bite positions. Another premise is the inter-connectedness of cervical posture, airway and overall posture with mandibular position (bite). As such, protocols are constantly improved. Since 2006, ULF-TENS pulsing of the cranial nerve XI (Spinal Accessory) in the posterior cervical triangle has been adopted as standard protocol. This protocol has been shown through CT scans, to correct even cranio-cervical misalignments and open airways to further improve the optimal final bite position. The treatment goals can be far reaching. Many medical symptoms such as migraine, ear pain, tinnitus, vertigo, arm paresthesia, sleep apnea and more have been corrected through these techniques.

While NM bite relation is often determined using K7 computer system's sEMG and mandibular scanning, to treat most cases, ULF-TENS relaxation of muscles alone is quite enough. A NM mandibular orthotic is used to reversibly correct the bite. Over a three to six month period, this bite relation is refined while correcting the other issues such as airway and posture through co-therapy with Otolaryngologists, physical therapists or Atlas orthogonal/Upper Cervical chiropractors. Both objective measures such as sEMG, CT scans of joints, muscle palpations and subjective patient reports are used to track progress. Only when the symptoms are corrected or greatly improved, Phase II options are used to stabilize the bite correction. NM orthodontics, coronoplasty, restorations of a few teeth to full arch or full mouth are some of the options utilized.

Upon review of these occlusal philosophies, it is important to reiterate that each of us has the freedom to determine our role in our respective practices. For most of us, it is serving our patient's desires to keep their dentition and relive tooth pain. It is a perfectly honorable and needed service. Carefully maintaining the bite relation without making any deleterious changes is a worthwhile goal. "Above all else, do no harm."

However, if a change of occlusion is planned to reconstruct the dentition to repair damage or even to treat TMD, then each clinician needs to consider the various philosophies discussed. Our dental degrees obligate us to do our due diligence to honor the trust that our patients have placed in us. For my TMD – Aesthetic practice, LVI-NM philosophy that "sees the whole elephant" helps me provide the highest level of care possible.

While it is unlikely that there will ever be a "unified" occlusal philosophy upon which *all* dentists agree, we should be unified in our duty to educate ourselves on all occlusal philosophies. Only then, can we best communicate treatment options and consequences of each of those options to our patients, which lead to "informed decisions." ■

References

1. *Ehrlich R, Garlick D, Ninio M., The effect of jaw clenching on the electromyographic activities of 2 neck and 2 trunk muscles.. J Orofac Pain. 1999 Spring;13(2):115-20.*
2. *Kibana Y, Ishijima T, Hirai T., Occlusal support and head posture. J Oral Rehabil. 2002 Jan;29(1):58-63.*
3. *Hack GD, Hallgren RC. Chronic headache relief after section of suboccipital muscle dural connections: a case report. Headache. 2004 Jan;44(1):84-9.*
4. *Hack GD, Koritzer RT, Robinson WL, Hallgren RC, Greenman PE. Anatomic relation between the rectus capitis posterior minor muscle and the dura mater. Spine (Phila Pa 1976). 1995 Dec 1;20(23):2484-6.*
5. *Dawson PE, Integrating cosmetic dentistry into a complete dentistry format, J Cosmetic Dentistry, Fall 2007 volume 23-3*
6. *Centric Relation: The Glossary of Prosthodontic Terms, Sixth Edition, GPT-6, Academy of Prosthodontics, Mosby*
7. *Shore NA: Temporomandibular Joint Dysfunction and Occlusal Equilibration, 2nd Ed. Philadelphia: J.B. Lippincott; 1959; 89-90.*
8. *Jasinevicius TR, Yellowitz JA, Vaughan GG, Brooks ES, Baughan LW, Cline N, Theiss LB., Centric relation definitions taught in 7 dental schools: results of faculty and student surveys. J Prosthodont. 2000 Jun;9(2):87-94.*
9. *Rinchuse DJ, Kandasamy S, Centric relation: A historical and contemporary orthodontic perspective, J Am Dent Assoc, Vol 137, No 4, 494-501.*
10. *Truitt J, Strauss RA, Best A., Centric relation: a survey study to determine whether a consensus exists between oral and maxillofacial surgeons and orthodontists. J Oral Maxillofac Surg. 2009 May;67(5):1058-61.*
11. *Keshvad A, Winstanley RB., An appraisal of the literature on centric relation. Part III. J Oral Rehabil. 2001 Jan;28(1):55-63.*
12. *Jankelson B, Spark S, Crane P, Neural conduction of the Myo-monitor stimulus: A quantitative analysis, J Prosth Dentistry Vol 34 No 3 ppp 245-253, Sep 1975*
13. *Fujii H, Evoked EMG of master and temporalis muscles on man, J Oral Rehab Vol 4, pp. 291-303, 1977*
14. *Pullman SL, Goodin DS, Marquinez AI, Tabbal S & Rubin M. Clinical utility of surface EMG: Report of the Therapeutic and Technology Assessment Subcommittee of the American Academy of Neurology, Neurology 2000; 55: 171-177*
15. *Simons D, Travell J. Myofascial pain and dysfunction: the trigger point manual. Vol 1, upper half of body. 2nd ed. Baltimore: Williams & Wilkins:1999.*

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