Dental Treatment of Headache and Force-Related Problems

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LEARNING OBJECTIVES
After participating in this CE activity, the individual will learn:
• To describe how force related dental disease affects the head, orofacial, and dentomandibular areas.
• To identify the assessment and treatment modalities in a systematic approach to treating dental headache pain.

ABOUT THE AUTHOR
Dr. Harrell is a practicing dentist in Charlotte, NC. His practice focuses on treating advanced restorative and TMD cases with the latest digital technologies. He has also pioneered the concept of the dental-based headache center for treatment of patients with chronic headaches, TMD, and facial pain. He can be reached at drharrell@charlotteheadachecenter.com.

Disclosure: Dr. Harrell is a paid consultant for Dental Resource Systems, Inc.

INTRODUCTION
Dentomandibular sensorimotor dysfunction (DMSD) is associated with such conditions as chronic headaches, migraines, temporomandibular joint (TMJ) disorders, and numerous other symptoms. When no definitive pathology exists, more emphasis has been devoted to the masticatory muscles, soft tissues in the head and neck area, and altered central nervous system pain processing in the trigeminal area. Dentists are trained and experts in assessing and treating the anatomical areas affected by these conditions and can provide patients with dental headache care, pain resolution, and treatment of force related problems.

This article reviews the need for providing care to patients with chronic and unresolved headache pain. It also demonstrates the typical use of a complete, proprietary system (TruDenta [Dental Resource Systems]) for providing comprehensive assessment, treatment, and management protocol to achieve consistent, long-lasting, and effective relief from pain and dental foundation rehabilitation.

For millions of Americans affected by DMSD, pain is part of their daily lives. Dentomandibular sensorimotor dysfunction—a disorder of the head and neck, TMJs, jaw function, dental forces, and neurology of these structures and functions resulting from imbalanced or improper forces—lies at the root of many conditions. These include, but are not limited to: chronic headaches, migraines, TMJ disorders, and numerous other symptoms, such as TMJ sounds or vibrations (eg, clicking and popping of the jaw), and pain in the head, neck, face, or jaw.1,2

The scope and negative impact of these conditions are significant. According to the National Headache Foundation, an estimated 90% of the population suffers from headaches, with migraine sufferers losing more than 157 million work and school days a year because of headache pain.3 More than 29 million Americans suffer from migraines.4 Additionally, the National Institute of Dental and Craniofacial Research indicates that anywhere from 10 to 45 million Americans suffer from some type of TMJ issue.5

Finding little or no relief from over-the-counter medications or nonpharmacological techniques, thousands of patients look to different healthcare professionals for treatment solutions to their often debilitating pain. Dentists, trained and knowledgeable in assessing and treating the anatomical areas affected by these conditions, are uniquely suited to offer such patients dental headache care, pain resolution, and treatment of force-related problems.6-8

ASSESSMENT TOOLS AND TREATMENTS FROM OTHER DISCIPLINES
Dentistry has applied many technological and material science innovations to assess and treat oral-based problems. High-strength ceramics or in-office CAD/CAM systems address the need to restoratively correct the destructive effects of wear, bruxism, and tooth decay.9,10 The development of such enhanced materials has been based on clinical and research knowledge of the effects of the oral environment on restoration longevity, natural teeth
opposition, and the masticatory system.\textsuperscript{11} Cervical range of motion (CROM) devices or occlusal analysis equipment (T-Scan) have helped shed light on possible functional and physiological issues influencing the dentomandibular area and/or contributing to related health problems.\textsuperscript{12-16} Dentists have applied these technologies to implant procedures and restorative rehabilitations centering on occlusal adjustments. For instance, electronic axiographic tracers are used to resolve the movements of the condyles, magnetic resonance tomography imaging can be utilized to analyze the anatomical relation of joint surfaces to the disc,\textsuperscript{14} and pressure sensitive foils in conjunction with time resolution enable an accurate analysis of masticatory forces.\textsuperscript{11-13}

These assessment and restorative approaches have contributed to greater comprehension of the interrelationship between force overload and disease/dysfunction within the oral environment and the masticatory system. In restorative dentistry, awareness of the symptoms of malocclusion has been key to offering predictable, consistent, and durable dental treatments.\textsuperscript{11,17}

When malocclusion (ie, abnormal forces between some or all of the dentition resulting in pain and/or damage to the tooth anatomy or periodontal interface) is present, alterations and adaptations may occur to the masticatory musculature, the TMJ, and the function of the condyle.\textsuperscript{18-22} These adaptations sometimes may contribute to acute or chronic pain in the head and neck region served by the trigeminal cervical nucleus. Subsequently, this can lead to additional neurochemical adaptations and compensatory muscle activity that can limit range of motion (eg, cervical or mandibular) and/or result in trigger point muscle spasms.\textsuperscript{20,21,23-25}

When the occlusion is force balanced, a person is comfortable at rest and in full closure exhibits mandibular range of motion within normal limits, and is free from acute or chronic pain. The person demonstrates normal tooth anatomy and mobility, normal posture and work abilities, and has no dietary restrictions due to dental function limitations.\textsuperscript{11,26-29}

Practical measuring instruments have successfully identified occlusal interferences and heavier forces, as well as muscle responses and pain symptoms during masticatory function.\textsuperscript{26-28} Technology has helped to accurately show significant discrepancies in jaw position and muscle function that contribute to chronic daily headaches.\textsuperscript{30} Such objective data concerning pain stimuli, in conjunction with masticatory function combined with research on TMJ, orofacial, headache, and other systemic pain responses related to muscle forces, have shifted how dentistry deals with patients experiencing debilitating discomfort issues.

When there is no definitive tissue pathology, more emphasis has been devoted to understanding that pain in some patients may arise from altered central nervous system pain processing, especially in the masticatory muscles and soft tissues in the head and neck area.\textsuperscript{31} Heightened muscle tension and force—as related to parafunctional habits and stress—signal the likelihood of jaw and facial pain.\textsuperscript{32} Many types of headaches are now understood to be referred pain from myofacial trigger points in the posterior cervical, head, and shoulder muscles.\textsuperscript{33}

Reversing parafunctional habits (eg, bruxing, clenching, and grinding) through behavior modification has proven effective in minimizing pain from TMJ disorders and myofacial issues.\textsuperscript{34,35} Deprogrammers have played a role in “retraining” the masticatory muscles, recognizing the muscles’ role in the forces contributing to pain, as well as the fact that controlling the perpetuating factors (ie, force) can help control, reduce, or eliminate pain.\textsuperscript{35,36}

For years, sports medicine technologies (eg, low-level laser therapy, therapeutic ultrasound, and microcurrent nerve stimulation) have been used successfully to enhance, accelerate, and improve athletes’ recovery from musculoskeletal and force related injuries.\textsuperscript{37} Such treatment methods—when combined with neuroscience and systematic and objective assessment/monitoring—now are being increasingly applied in dental practices.\textsuperscript{38-42}

A COMPREHENSIVE AND INNOVATIVE SYSTEM

The availability of a patented, proprietary system (TruDenta) enables dentists to provide comprehensive assessment, treatment, and management protocol to achieve consistent, long-lasting, and effective relief from pain and dental foundation rehabilitation for patients suffering from the symptoms of DMSD. The system incorporates proven combinations of sports medicine...
rehabilitation and advanced dentistry techniques, as well as well-developed and tested equipment, technology, software, and therapeutic protocols (Figure 1). These have been cleared by the US FDA. They also have been shown to objectively measure and visually illustrate the cause of patient symptoms relating to DMSDs, as well as contribute to predictable outcomes when combined with conservative care.38-45

The system uses T-Scan technology (TruDentaScan digital force measurement) for evaluating the amount and balance of forces at closure and while chewing, and a computerized ROM assessment tool (TruDentaROM), which measures the CROM as expressed in the patient’s head movements. A CROM disability can be correlated with mandibular ROM disability and/or an imbalance in the dental foundation. The system’s rehabilitation technology features therapeutic ultrasound, transcutaneous electrical stimulation (ie, subthreshold microcurrent), low-level laser therapy, and intraoral orthotics.

The following case demonstrates the typical TruDenta assessment and treatment protocol for individuals presenting with chronic headache pain and other discomfort resulting from DMSD.

**CASE REPORT**

**Diagnosis and Treatment Planning**

A 36-year-old woman presented, complaining of various symptoms of DMSD. As with any assessment and clinical treatment protocol, the first step was determining the condition(s) that may be amenable to treatment. Therefore, the patient completed—and the dentist reviewed—comprehensive head health, medical, and headache history. A review of the patient’s pharmacological treatments also was undertaken prior to the clinical evaluation. Dental, periodontal, airway, orthodontic, and occlusal examinations also were undertaken. Additionally, a computed tomography scan had been done recently by her neurologist to rule out the existence of any underlying organic condition.

The patient showed symptoms of bilateral frontal headaches. She experienced occipital and temporal head pain, jaw pain bilaterally with opening and closing, and limited mandibular ROM with limited vertical opening. In addition to frequently experiencing jaw pain when chewing, talking, and at rest, she noted jaw clicking, teeth clenching, and grinding, as well as recurring eye pain, pressure behind the eyes, and shoulder pain and stiffness.

The patient was allergic to codeine and reported taking over-the-counter pain medications (eg, Tylenol [McNeil Consumer Healthcare]; Advil [Wyeth]; and Aleve [Bayer]), which did not provide relief. She also reported taking a prescription antihistamine medication (Allegra [Perrigo]) for seasonal allergies. Additionally, she reported seeking the care of an oral surgeon after awakening one morning with a locked jaw. The oral surgeon had recommended joint surgery.

Upon muscle palpation examination, the patient showed tenderness of the anterior and middle bands of the temporalis muscle. In addition, bilaterally, the masseter, occipital, and trapezius neck/shoulder area, pterygoids, and sternocleidomastoid (SCM) were severely sensitive. The patient rated the pain a 10 on a pain scale of one to 10, with 10 being the worst. Severe tenderness also was detected upon palpation of the posterior and lateral capsules of the TMJ. In
brief, all of the muscles of mastication, TMJ ligaments, and the jaw position produced stark myalgia, which negatively altered her normal daily living and social habits.

Crucial to establishing the severity of sensorimotor dysfunction, any abnormal, excessive, or imbalanced forces were identified objectively using mandibular ROM disability, cervical range of motion disability (digitally), and digital force analysis (TruDentaScan). These technologies were combined with panoramic radiographs. It is important to note that the ROM portion of the diagnostic process provides objective data conforming to AMA guidelines.

The patient's T-Scan testing showed that 38.5% of the pressure from her bite was localized to the left side of her mouth; the right side of her mouth received 61.5% of biting pressure (Figure 2). This demonstrated an imbalance of the stomatognathic system, which adversely impacted the patient's overall well-being.

Clinical examination revealed bilateral crepitus upon opening and closing. Cervical ROM measurements showed pain on extension and limited extension. The patient presented with forward head posture, a back sleeping position, and a sitting and standing work position. A digital ROM study revealed extension of the neck limited to 50° (60° is the normal ROM). The patient's left lateral rotation was at 37° (45° is the normal neck stretch) (Figure 3). These findings were thought to likely account for the severe pain at the occipital, trapezius, and SCM muscles.

Based on assessment codes that are in agreement with the AMA insurance codes, it was determined that the patient suffered from the following: atypical face pain, cervicalgia, eye pain/pressure, headache, limited mandibular ROM, TMJ pain, muscle spasms, and myalgia.

Treatment Protocol
Treatment was directed toward conservative therapy in an attempt to avoid surgery, establish orthopedic realignment of the mandible, improve myalgia, reduce inflammation, strengthen the musculoskeletal system, and alleviate headaches as well as pain, pressure, and sensitivity in the eyes. First steps in the treatment process would involve assessment conforming to AMA insurance codes, would include manual muscle testing, TMJ ultrasound, and ROM testing. Then, an individualized treatment plan would involve therapeutic in-office appointments consisting of applied electrical stimulation, manual muscle therapy, cold laser therapy, and therapeutic ultrasound. Additional components of the weeks-long therapy to be incorporated would be therapeutic exercises, an occlusal orthopedic device, and self-care home management training, based on periodic occlusal analysis.

Stabilization goals were directed toward maintaining muscle comfort, joint stability, and orthopedic stabilization of the mandible. This normal function restoration was achieved through an occlusal orthopedic device or rehabilitation orthotic. The rehabilitation orthotic helps to balance, stabilize, and support the mandible. At the time she presented, the patient experienced symptoms from an injured TMJ from excessive clenching and grinding, and longstanding occlusal force imbalances. This overuse typically results in spasms and pain/sensitivity in the muscles of mastication.
It was important to ensure that the orthotic was fabricated in a manner that stabilized the jaw position to a healthy placement to minimize muscle activity and the patient's pain and symptoms. The patient was taught therapeutic exercises by the dental team. These exercises first were done in-office, and then continued by the patient at home. The importance of continuing the regimen at home was emphasized to the patient. If treatment did not continue after the patient left the office, she would not progress in her care. By purchasing—and correctly and regularly using—the home care kit, including the Alpha-Stim AID (Electromedical Products), the patient learned and benefited from the proper preventative measures and methods to stabilize and maintain her jaw health.

**Treatment Outcome**
The patient underwent in-office therapeutic rehabilitation as previously described for 6 weeks. In addition to fabricating a custom rehabilitation orthotic for the mouth, 3 sequential occlusal equilibrations, or bite adjustments, were performed to correct bite imbalances.

At 6 weeks, the patient's health and stability were confirmed with a digital ROM test. Range of motion values were found to be equal to or above physiologic norms (Figures 4 and 5). Dental bite force balance also was confirmed with the T-Scan analysis, which revealed left/right balance at 52%/48%, well within physiologic norms and tooth force readings at normal levels (Figure 6).

**CONCLUSION**
Dentists can create a pathway of care that offers predictable, reliable, and long-lasting relief from pain and restored function to patients suffering from the symptoms of DMSD. These include chronic headaches and force-related dental conditions. Using a systematic approach to assessing and treating these conditions that incorporates technologies used for years in sports medicine (TruDenta), they can confidently provide much needed care to individuals who haven’t yet found the relief they’ve been seeking. Additionally, as in the case presented here, restoring balance, function, and overall well-being to the lives of long-suffering patients provides dentists and their teams with pride and professional satisfaction.
REFERENCES


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POST EXAMINATION QUESTIONS

1. Dentomandibular sensorimotor dysfunction (DMSD) is associated with which of the following?
   a. Chronic headaches.
   b. Temporomandibular joint disorders (TMJ).
   c. Migraines.
   d. All of the above.

2. Technologies that provide insight into possible functional and physiological influences that contribute to health problems are which of the following?
   a. In-office CAD/CAM systems.
   b. Cervical range of motion devices (CROM).
   c. Occlusal analysis equipment.
   d. Both b and c.

3. Pain and headache pain in some patients may arise from which of the following?
   a. Altered central nervous system pain processing.
   b. Heightened muscle tension and force.
   c. Myofacial trigger points.
   d. All of the above.

4. Which technology can be used to evaluate the amount and balance of dental forces at closure and while chewing?
   a. TruDenta Scan/T-Scan.
   b. Computerized ROM assessment tool.
   c. Transcutaneous electrical stimulation.
   d. All of the above.

5. What can a cervical range of motion disability be correlated with?
   a. Mandibular ROM disability.
   b. Imbalance in the dental foundation.
   c. Both a and b.
   d. None of the above.

6. Objectively identifying abnormal, excessive, or imbalanced forces is crucial to determining what?
   a. The severity of sensorimotor dysfunction.
   b. Tenderness of the anterior temporalis bands.
   c. Sensitivity of the pterygoids.
   d. All of the above.

7. Rehabilitation for DMSD includes which of the following technologies?
   a. Therapeutic ultrasound.
   b. Transcutaneous electrical stimulation.
   c. Low-level laser therapy.
   d. All of the above.
8. Symptoms of DMSD that can be assessed and treated with a proprietary system include which of the following?
   a. Chronic headaches.
   b. Force-related dental conditions.
   c. Both a and b.
   d. None of the above.

9. What may be achieved through the use of an occlusal orthopedic device or rehabilitation orthotic?
   a. Restoration of normal function.
   b. Stabilization and balancing of the mandible.
   c. Both a and b.
   d. None of the above.

10. How are bite imbalances corrected?
    a. Fabrication of a custom rehabilitation orthotic for the mouth alone.
    b. Sequential occlusal equilibrations or bite adjustments alone.
    c. Low-level laser, ultrasound, and low-level electrical stimulation therapy alone.
    d. A combination of low-level laser, ultrasound, low-level electrical stimulation therapy, orthotic wear, and bite adjustments.
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