Temporomandibular Joint Dysfunction Syndrome

A Clinical Report

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The purpose of this article is to describe pertinent clinical data used by periodontists and physical therapists and to give examples of coordinated treatment. This will be done by using two case reports of patients who have typical temporomandibular joint (TMJ) dysfunction syndrome.

Within the last several years, TMJ dysfunction syndrome has received attention from many medical disciplines. Because of the increased knowledge about its existence and treatment, numerous allied professionals have become involved with its management and have contributed greatly to the efficacy of treatment. Included among these medical specialties are periodontics, orthodontics, prosthodontics, oral and maxilla facial surgery, orthopedics, neurology, physiatry, otolaryngology, and physical therapy.

Historically, clinicians have considered a patient with head, neck, and TMJ pain to have TMJ dysfunction syndrome.[1] This syndrome was considered to be in relation to the joint proper. Dentists in the past have been concerned primarily with certain physiological and psychogenic etiological factors, including bruxing and clenching, parafunctional habits, occlusal disorders, tension, and anxiety. Because of this primary orientation within the oral cavity, dental treatment for TMJ dysfunction syndrome previously has been confined to the use of night guards or other various removable intraoral appliances to interrupt the parafunctional habits and therapy to gain some muscle relaxation within the group of masticatory muscles.[2]

Because of the interrelationship of various disciplines, clinicians now have realized that TMJ dysfunction syndrome is not concerned only with the TMJ and the muscles of mastication.[3] We now understand that this condition is a myofascial pain dysfunction syndrome and treatment may involve balancing the musculoskeletal relationships of the upper and lower quarters.[1(pp47-52)] Postural imbalance of the mandible in relation to the rest of the skeletal system is often seen as a contributory factor in correlated problems with the musculature of the upper quarter.[4(p103)] The resting length of the numerous muscles attached to the mandible is dramatically affected by the position of the mandible. This difference in muscle lengths, in turn, will often cause compensatory changes in other more peripherally-located muscles that can alter the musculoskeletal balance. For instance, a forward head posture is often related to a postural imbalance of the mandible and can cause overuse of the musculoskeletal structures that comprise the cervical erector spinae, upper trapezius, levator scapulae, and anterior vertebral neck flexor muscles and associated joints.

Thus, patients with mandibular imbalance commonly have involvement of the soft tissues of the upper quarter and ultimately have muscular tenderness in the more distal-related musculature. This interruption in normal structure and function of the musculoskeletal tissues results in hyperextension of the upper cervical spine, flattening of the lower cervical spine, elevation and forward protraction of the shoulders, and increased thoracic kyphosis. All these conditions accompany the forward head posture.[5]

Conversely, a patient with a leg-length discrepancy can show muscular and skeletal imbalances in the lumbosacral region and ultimately in the upper quarter. A leg-length discrepancy is compensated by pelvic rotation; therefore, the shoulders posturally adjust to keep in alignment. The adjustment indirectly affects the normal head and jaw alignment.[6]

PATIENT DATA

Case Report #1

C. F. is a 37-year-old white woman initially referred to the physical therapist by her family physician in August 1982 because of persistent upper quarter and thoracic pain. Her symptoms, which were bodily tremors, hyperactivity, severe left temporal and suboccipital headache pain, and dizziness, began in October 1981 after gynecological surgery. The patient had consulted approximately 20 physicians of various specialties within the previous two years for this problem with no conclusive diagnosis.

Objective physical therapy evaluation revealed the following in the standing static posture: slightly forward head, protracted scapulae, and moderately increased lumbar lordotic curve. Cervical range of motion was essentially within normal limits, although pain was experienced in the left paracervical musculature on bilateral-lateral rotation and lateral flexion secondary to moderate soft tissue tightness of the

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suboccipital musculature. Manual muscle testing results of the upper extremities demonstrated good muscle strength; however, manual muscle testing yielded pain in bilateral trapezius muscles on moderate to maximum resistance. Neurological examination showed all tests to be within normal limits including reflexes, sensation, cervical compression, and distraction testing. She had severe point tenderness over the lateral aspect of the occiput and T-6 to T-12 spinous processes, with moderate to severe muscle spasm palpated in the suboccipital, upper and lower trapezius, rhomboid major, and sternocleidomastoid muscles bilaterally.

Physical therapy treatment consisted of the use of hot packs and high voltage galvanic stimulation, followed by ultrasound, deep trigger-point massage, and manual stretching techniques. These modalities were applied to the cervical area, shoulder girdle, and upper lumbar areas to facilitate relaxation and reduce pain in the affected areas of musculature and spasm. The physical therapy team gave instruction in muscle stretch flexibility and relaxation exercises for the cervical and shoulder girdle musculature (ie, cervical range-of-motion exercises and shoulder shrugs and circles). Abdominal and lumbar strengthening exercises were given to correct the increased lordotic curve (ie, Williams flexion exercises, partial sit-ups, and McKenzie prone trunk extension exercises). Proper postural maintenance and body mechanics during the patient's activities of daily living were demonstrated.

Emphasis of treatment was directed toward stretching the suboccipital, pectoral, sternocleidomastoid, scalene, and trapezius muscles and strengthening the rhomboid, trunk flexor, cervical paraspinal, and pectoralis major muscles. Specific exercises were directed to increase flexibility and improve postural alignment, respectively. After the physical therapy team treated the patient three times a week for two and one-half months and noted only temporary relief immediately after treatment, the patient was referred to a periodontal office for a dental-orthopedic evaluation.

Initial dental-orthopedic examination by the periodontist revealed severe pain on palpation of the left temporalis, cervical paraspinal, sternocleidomastoid, medial pterygoid, and trapezius muscles. She had crepitus of the left TMJ, a painful left TMJ, tinnitus of the left TMJ, pathological tooth migration, right mandibular deflection upon opening caused by a spasm in the left internal pterygoid, and popping of the left TMJ. She also had pain in the following areas: left deltoid, right and left thoracic paraspinal, and right pectoralis muscles. The patient clenched her teeth and had numerous drifting posterior teeth that had caused a posterior bite collapse. Posterior bite collapse results in the reduction of the vertical distance between the maxilla and mandible. She had a normal (46 mm) maximum opening of the mandible.

The dental examination showed that the patient had generalized, moderately inflamed and enlarged gingiva and moderately bleeding gingiva on provocation; these conditions are consistent with a diagnosis of generalized, moderate marginal gingivitis. Numerous teeth had drifted because of loss of teeth without replacements. Transcranial radiographic analysis revealed a posterior-superior positioning of both condyles within the respective infratemporal fossae. She had a Class II, Division II malocclusion and a deep vertical overbite (ie, the posterior aspects of the jaws were too close together). The dental-orthopedic diagnosis was bilateral acute facial rhabdomyositis and polyalgia.

We initiated Phase I of dental-orthopedic treatment, which is a combination of dental devices, physical therapy, and injections. After the insertion of a flat-plane mandibular orthopedic repositioning appliance and a prescription for a Wal-Pil-O,* her periodontist treated the patient weekly with trigger-point injections of 2% lidocaine hydrochloride and no epinephrine. Such injections were given at appropriate times bilaterally at 5- to 10-day intervals to the trapezius, paracervical, sternocleidomastoid, and both pairs of pterygoid muscles at trigger points determined by areas sensitive to pain upon palpation. Two percent lidocaine injections were given to accomplish the following physiological goals: mechanical disruption of the trigger points, release of intracellular potassium, "wash-out" of any nerve sensitizing substances, local vasodilatation, and interruption of the feedback mechanisms between trigger points and the central nervous system.[4(p79)] Physical therapy was continued in conjunction with three series of two to four trigger-point injections a week for four months in conjunction with physical therapy. Physical therapy was continued as we have described three times a week for four months and then decreased to twice a week. In addition to the trigger-point injections, the periodontist and the physical therapist gave stretch and spray application with ethyl chloride at appropriate times. These two modalities of therapy effectively reduced pain and thus permitted further stretching of the affected muscles. Typical response to such treatment was elimination of pain and increased range of motion; this effect lasted 20 minutes to several days at a time, depending on factors that included environmental stress, physical activity level, and psychological well-being.

Numerous adjustments to the mandibular orthopedic repositioning appliance were made in order to distribute lateral forces more evenly on the cervical and neck musculature (including the cervical paraspinal, sternocleidomastoid, and trapezius muscles) to minimize the tendency toward spasm in any one of the above muscles. Indication of spasm was severe muscular pain.

The dental team inserted a second mandibular orthopedic repositioning appliance with grooves to bring the mandible into a more protrusive position. Eventually, this second appliance was adjusted several times to reduce (approximately 1 mm at a time) the vertical dimension gradually to facilitate Phase II of the dental-orthopedic treatment, which added orthodontic treatment to the treatments of Phase I. On one occasion, the severe symptoms reappeared and persisted and the vertical dimension was increased 1 mm; the head pain along the temporalis and sternocleidomastoid areas again disappeared within two weeks. The original vertical dimension, thereby, was reduced a net total of 2 mm during the intervals between adjustments to the appliances, concomitant trigger-point injections, and physical therapy as we have outlined. The patient occasionally had remission of pain for as long as one week as well as recurrent exacerbation of pain. Although biofeedback therapy was recommended because of the coincidence of emotional stress and head pain, the patient refused such therapy. The periodontist and physical therapist consistently gave the patient psychological reassurance in dealing with the stress. After about five months of intensive dental-orthopedic therapy and physical therapy, the patient was no longer in pain. Subjectively, most of the head and

* Wal-Pil-O, Roloke Co, Los Angeles, CA 90069.

neck pain was eliminated within the first month. The trapezius and sternocleidomastoid muscles, however, continued to radiate trigger-point pain to the right and left temporalis, supraocular, retro-ocular, and occipital areas. The remainder of therapy was focused on eliminating the trigger-point referral patterns by using trigger-point injections followed by deep frictional massage at the source of the trigger-point pain.

The patient was then placed on periodic observation approximately once every three weeks for a total of three additional months. She is now scheduled to see an orthodontist for movement of her teeth to coincide with the new maxillomandibular position; such treatment will take approximately two to two-and-a-half years and often is called Phase II of dental-orthopedic treatment.[1(pp328–338)] To date, no noticeable changes have been noted in the patient's static posture.

Case Report #2

H. L. is a 45-year-old man referred to our team by his neurologist in September 1982 because of persistent upper quarter, cervical, and headache pain. Questioning of the patient revealed a shoulder dislocation four years previously, a lower back muscular strain injury three years previously that was related to a skiing accident, and within the last year, a sudden recurrence of neck and upper back pain without provocation. The patient also reported difficulty sleeping. Before consulting the neurologist, the patient sought the services of an orthopedist for diagnosis of a possible nerve impingement.

The history given by the patient to the physical therapist included complaints of intermittent bilateral pain in the suboccipital musculature (right greater than left), pain in the right midthoracic region, and occasional pain in the left sacroiliac joint during activities of daily living. Objective evaluation by the physical therapist revealed that his standing static posture appeared essentially within normal limits with the exception of slightly increased forward neck bending (15°) and increased protrusion of the right paravertebral thoracic musculature (secondary to marked muscle spasms). The shoulder posture did not appear excessively protracted or elevated.

Active range of motion of the cervical spine was painful and limited during rotation toward the left at 20 degrees, neck extension to 15 degrees, and extreme forward flexion. These movements produced pain in the right paracervicals and upper trapezius musculature. Abduction of his right shoulder with neck rotation toward the right side elicited radiating pain into the posterior shoulder joint. Active range of motion of his right shoulder was within normal limits; however, active shoulder flexion or internal rotation caused pain in the right upper trapezius and deltoid musculature. Resistance to shoulder elevation did not increase his symptoms.

Palpation elicited marked point tenderness over the paravertebral C-6 and C-7 musculature, T-4 and T-8 spinous processes, and right-sided rhomboid muscles. On palpation, his right scapulothoracic musculature appeared considerably tauter than the left. Palpable soft tissue tightness was noted in the bilateral paravertebral suboccipital musculature, including the scalene, sternocleidomastoid, and splenius capitis muscles. There were no apparent signs of decreased reflexes or sensory involvement in the upper extremity on the right side.

Dental-orthopedic examination by the periodontist revealed no significant painful findings in the muscles of mastication. Headache pain was present and of varying intensity but was always localized to the suboccipital area (right greater than left). Observation of mandibular movement revealed displacement to the right side on maximal opening; this displacement suggested a left lateral pterygoid muscle problem. Bruxism and parafunction were noted also. The patient consistently complained of tightness in these pterygoid muscles upon awakening. A Class II dental occlusal relationship (deep bite) was noted. Transcranial radiographic analysis revealed posterior-superior positioning of both condyles within the respective infratemporal fossae.

The dental examination showed that the patient had first-molar occlusion. The past dental history revealed that second and third molars were removed because of impaction and periodontal disease. An endodontic restoration was present on the maxillary left first molar tooth. Several moderate to large amalgam restorations were present throughout the mouth. The oral gingival tissues were in good periodontal health. Some evidence of minor shifting because of loss of contact between teeth was present.

After initial examination and diagnosis, we determined that the patient was suffering from an acute myofascial rhabdomyositis. We inserted a flat plane mandibular orthopedic repositioning appliance in conjunction with the physical therapy modalities outlined below and with weekly trigger-point injections of 2% lidocaine. Trigger points were found in the paraspinal, trapezius, occipital, paracervical, and sternocleidomastoid muscle groups. We adjusted the appliance in conjunction with trigger-point injections over seven months. On several occasions, to supplement muscle injections, we sprayed the area with ethyl chloride and stretched the involved muscles. The initial appliance was modified from a flat plane by marking in the occlusal aspect of the plastic to bring the mandible to a forward position. We did this to reorient the condyles to an anterior position in the infratemporal fossae. The patient wore the appliance most of the time, but because of business circumstances, he removed the appliance for short periods of time during the day. He always wore it while sleeping.

Physical therapy modalities provided in conjunction with dental-orthopedic treatment consisted of hot packs, high voltage galvanic stimulation, ultrasound, and deep muscle massage to the cervical and interscapular musculature followed by intermittent cervical traction (with a skeletal halter to avoid mandibular compression). The patient was instructed in postural exercises and range-of-motion exercises for the cervical spine. He did not tolerate cervical traction because pain intensity increased after six treatments. We discontinued traction and initiated manual stretching with good results (ie, the patient reported a decrease in stiffness and pain immediately after stretching the trapezius and cervical musculature). Postural awareness and exercises were reinforced throughout the treatment.

The seven months of physical therapy began at three times a week for two months and then dropped to twice a week for three months, followed by once a week for one month, and finally, bi-monthly. On reevaluation, he had full range of motion of the cervical spine without pain, improved head posture (ie, head in neutral position), and minimal point tenderness in the right side of the neck and upper thoracic musculature. He reported that headaches had disappeared, and he experienced only slight pain in the right upper trape-

zius muscle occasionally after strenuous work-related activities.

No clinical evidence of radiculopathy was present. He was essentially free of the initial dental-orthopedic symptoms, and he was referred to his neurologist for a final evaluation.

DISCUSSION

Past dental theories maintained that full-mouth prosthetic rehabilitation was indicated to reestablish a plane of occlusion that had been obliterated by numerous causes, including natural wear on the dentition, extraction of teeth without appropriate replacements, orthodontic treatment, trauma, or worn prosthetic devices.

In constructing or reconstructing occlusions, dentists have been concerned with two primary concepts. The first, centric occlusion, is defined by the position of the mandible in relation to the maxilla when teeth show maximum intercuspation (ie, maximum contact of teeth during complete closure). The second, centric relation, is defined by Posselt as "the terminal hinge relationship of the mandible to the maxilla as governed by the muscles of the joints."[7] This position of the mandible, which is the most retruded, will position the condyle in a more posterior-superior position within the infratemporal fossae than many patients can tolerate. Until recently, the concept of adjusting the occlusion in TMJ dysfunction syndrome was based on a repositioning of the mandible in an anterior-posterior plane.

We now know that the mandible's relationship to the maxilla must be viewed in a three-dimensional aspect: saggital, transverse, and horizontal.[1(pp109-116)] Furthermore, we have long understood that the contact of the teeth can alter the position of the mandible within these three dimensions. Several factors can also cause significant alterations of the position of the mandible in relation to the maxilla, which, in turn, will ultimately create muscle-length discrepancies within this portion of the upper quarter. Some of these are tooth eruption, occlusal wear, premature extractions and concomitant pathological migration of teeth, and defects during growth and development of both the jaw and tooth eruption. We are dealing with those muscles that counterbalance the system such as the suprahyoid and infrahyoid groups that insert in the sternum and clavicle.

In Phase II of treatment, if the patient's missing posterior teeth were not properly aligned or if the patient had missing anterior teeth, crown and bridge treatment or partial dentures would be needed after the orthodontic treatment to 1) replace the existing teeth, 2) create proper masticatory function, and 3) create proper cosmesis. A mandibular overlay partial denture that is a removable appliance and fits over the lower teeth could be used instead of orthodontics. This appliance is esthetically quite compromising and must be replaced fairly often, but its benefit is reduced expense and time in fabrication in comparison with other dentures.

We should also mention that preparing the patient periodontally is necessary before head and neck pain treatment. If periodontal health is not achieved before the orthodontic or crown and bridge treatment, the long-term prognosis for the teeth is not good because additional occlusal stress on abutments for fixed bridges or partial dentures would put additional jeopardy on the periodontally weakened teeth.

If the patient had missing teeth, a similar orthopedic appliance could be placed over the lower dentures or teeth. If an upper denture was in place, it could be remade either alone or in conjunction with a lower denture or existing teeth, depending on the dental status. The occlusal plane of new dentures could be built to coincide with the same inter-jaw position that was created with the mandibular orthopedic repositioning appliance during head and neck pain therapy.

In the past, little has been documented showing the interdependence of dentists' and physical therapists' approaches to TMJ dysfunction syndrome. Previous studies in physical therapy, however, have shown a significant relationship between head posture and the rest position of the mandible.[8,9] Important changes have been observed after correction of forward head posture and resting vertical dimension of the mandible.[10] Treatment effectiveness has been greatly enhanced through a multidisciplinary approach to this problem.

Physical therapy management of TMJ dysfunction focuses on treatment of the TMJ and surrounding structures and on postural and structural changes in the entire upper quarter region. This syndrome involves not only the relationship between the mandible and the cranium but also the interrelationships between the cranium, cervical spine, suprahyoid and infrahyoid structures, shoulder girdle, thoracic spine, and, ultimately, the lumbosacral spine. These structures function as an interrelated biomechanical unit. Dysfunction in any one part of this unit may often lead to the dysfunction of the unit as a whole.[11] For example, internal derangement within the TMJ may lead to inflammation and spasm of the masticatory musculature and ultimately pain, muscle spasm, and postural changes within the upper quarter region. Conversely, cervical trauma may lead to postural changes in the upper quarter region, which may ultimately affect the rest position of the mandible and lead to TMJ dysfunction syndrome.[12]

Postural changes in this syndrome tend to follow a similar pattern that typically includes extension of the occiput on the atlas, flexion of the cervical spine, increased upper thoracic kyphosis, protraction and elevation of the shoulder girdle, and internal rotation of the shoulders. These postural changes are often accompanied by secondary problems. These may include a change in the rest position of the mandible, peripheral neuropathies (including thoracic outlet syndrome), facet joint hypomobility or compression or both, facet joint hypermobility, soft tissue shortening, compression of the acromioclavicular and sternoclavicular joints, and muscle imbalance in the shoulder girdle and between the anterior and posterior cervical musculature.

The focus of physical therapy treatment in this syndrome consists of 1) reducing inflammation, pain, and muscle spasm in the TMJ and upper quarter regions and 2) restoration of normal joint mechanics and soft tissue relationships in the entire upper quarter. Physical modalities such as moist heat, ice, ultrasound, galvanic stimulation, and transcutaneous electrical nerve stimulation are often used for reduction of muscle spasm and inflammation. Restoration of normal biomechanics at the TMJ is attained through exercise instruction and joint mobilization, if indicated. Manual therapy techniques and selective stretching and strengthening of muscle groups are important for restoring normal joint and soft tissue relationships necessary for postural correction.

The simultaneous, interrelated treatment approach of patients with TMJ dysfunction syndrome and upper quarter

dysfunction by dentistry and physical therapy has provided effective long-term management of these problems. These patients rarely have an isolated problem, especially if the pattern of dysfunction has been present for a more prolonged period of time. Clinicians must realize the intricate interrelationship of the upper quarter region and treat all aspects of dysfunction in this area. Obviously, good communication and close working relationships between the various disciplines are also important because changes effected in one treatment program will have an impact on the treatment procedures by other members of the interdisciplinary team. For example, as occlusive changes are altered through dentistry, the soft tissue and postural relationships change in the upper quarter that must be dealt with in the physical therapy program.

SUMMARY

We have presented two clinical case reports of patients with TMJ dysfunction syndrome as an example of coordinated treatments between dentists and physical therapists. The clinical profiles of these patients with craniocervical pain were compiled from comprehensive physical therapy and dental-orthopedic evaluations. The significance of the relationship between the rest position of the mandible and forward head posture has been shown by the changes observed after correction of the postural deviations and vertical resting dimensions by dental treatments and physical therapy. Additional research is necessary to determine long-term effects of this combined approach in TMJ dysfunction syndrome.

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