International Journal of Orofacial Myology and Myofunctional Therapy
Official Journal of the International Association of Orofacial Myology
50th ANNIVERSARY

Volume 20 | Number 1 | pp. 27-31 1994

Case Report

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Hiroshi Sasaki
Yoshinobu Shibasaki

Suggested Citation
Sasaki, H., & Shibasaki, Y. (1994). Application of myofunctional therapy in cases with craniomandibular disorders. *International Journal of Orofacial Myology, 20(1)*, 27-31.
DOI: https://doi.org/10.52010/ijom.1994.20.1.4

Application of Myofunctional Therapy in Cases with Craniomandibular Disorders

Hiroshi Sasaki, DDS, DDSc
Orthodontic Clinic, Utaka Dental Office
Tokyo, Japan

Yoshinobu Shibasaki, DDS, PhD
Department of Orthodontics
Showa University

Modern technology for diagnosis and treatment planning in the management of craniomandibular disorders is described. Three cases are presented to demonstrate how myofunctional therapy is used to 1) stop the damaging hyperactivity of masticatory and perioral muscles and 2) to restore normal muscle function at rest and for chewing and swallowing.

Symptoms such as pain in the masticatory system and temporomandibular joint dysfunction are common complaints in the dental clinic. Craniomandibular (CMD) or temporomandibular disorders are important in themselves. They also make other related dental treatment procedures more difficult, even when the patient does not complain about them.

During the last decade, a multidisciplinary approach to the management of CMD disorders has been used by many researchers and practitioners. Especially significant has been the recent development of imaging technology. It has increased the reliability of initial diagnostic procedures. For example, Magnetic Resonance Imaging (MRI), a non-invasive procedure, provides a dynamic image of the condition of the soft tissue in the TMJ region. In cases of craniomandibular disorder associated with skeletal deformity, three dimensional computer tomograph modeling allows the surgeon and orthodontist to make accurate advance plans for surgical reconstruction.

These imaging techniques are making it possible to study the interrelationships of function and pathology of the temporomandibular joint. Results from multiple analysis of mandibular movement or muscle activities combined with pathological findings from dynamic imaging will clarify the biomechanics of the TMJ. This will become one of the exciting aspects of basic TMJ research in the near future.

Will these approaches lead to a completely successful treatment for CMD by the end of this century? Unfortunately, the answer may be *no* because a significant amount of CMD dysfunction is caused by the patient's muscle parafunction in daily life. Management of CMD in Japan begins with the diagnostic classification system proposed by the Japanese Society for the Temporomandibular Joint in 1987:

Category I: Masticatory muscle disorders including myositis, spasm and contracture of muscles

Category II: Traumatic inflammation of soft tissues such as synovitis and capsulitis

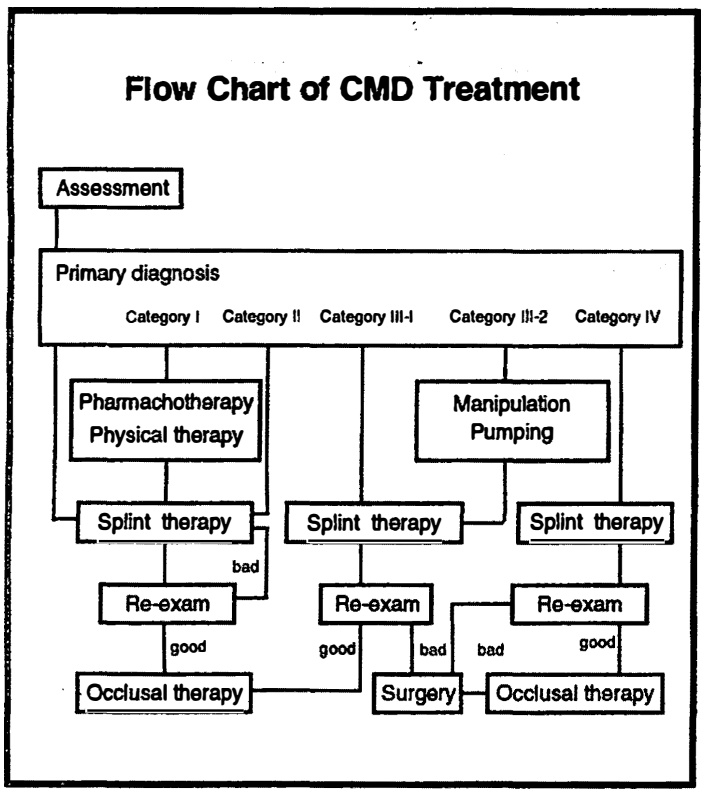
Category III: Disc displacement

division 1: with reduction

division 2: without reduction, so called closed lock

Category IV: Degenerative arthritis

Category V: Chronic pain and unidentified symptoms about stomatic organs caused by psychogenic factors



Most patients with CMD achieve good symptomatic relief with conservative therapy. Conservative treatment such as behavioral modification, physical therapy, medications and orthopedic appliances are, therefore, endorsed for the initial care of CMD.

Orofacial Functional Disorders in CMD Patients

The signs and symptoms of CMD may be various and interchangeable. Often the clinical analyses made in the hospital do not agree with the symptoms experienced by the patients. In these cases, it is important to view the patient from the perspective of orofacial myology. Assessment must include identification of damaging orofacial habits, poor head and neck posture and abnormal tongue and lip function. Hyperactivity of the masticatory and perioral muscles (often due to jaw clenching) may cause pain and dysfunction of the muscles and the TMJ. Forward head posture, a common phenomenon in these patients, involves deviated posture of the head, neck, shoulder and mandible at rest or in the active state. Low tongue posture and tongue thrust have been considered as a secondary result of CMD; however, they can be also a causative factor in CMD. Lack of a stable mandibular position is a difficult problem during treatment. Because of this, the patients are unable to develop a normal rhythmic chewing pattern. Jaw clenching and bruxing are parafunctional behaviors which contribute to CMD. Lack of knowledge about normal orofacial functioning may result in patient anxiety. All of these conditions indicate a need for myofunctional therapy.

In 1990, Williamson and coauthors published their paper titled "Swallowing patterns in human subjects with and without temporomandibular dysfunction" in the *American Journal of Orthodontics and Dentofacial Orthopedics*. The subjects of their study were 25 adult orthodontic patients already known to have TMJ dysfunction, and 25 adult control subjects without such dysfunction. Swallowing patterns were examined with the aid of MKG and EMG recordings taken while the subjects were sipping water. Analysis of the data revealed that 19 patients with TMJ dysfunction used a tongue thrust open jaw swallowing pattern, while only nine control subjects used such a swallowing pattern. They concluded that TMJ patients apparently revert to a teeth-apart swallow and contraction of the genioglossus muscles that cause the tongue to protrude in an effort to prevent noxious stimuli. However, such a deviate swallowing pattern can contribute to hypercontraction in the perioral muscles and possibly bring an abnormal load to the TMJ.

Orofacial functional problems related to CMD, were addressed in a paper published in the *European Journal of Orthodontics* in 1991. Dr. Pahkala and coauthors compared 157 children referred to a hospital for speech therapy to a control group of 130 first-graders. The results showed that in the hospital referral group the mean value for maximal mouth opening was smaller than in the control group. The study group also more often had CM disorders and occlusal interferences than children of the first grade sample. A higher frequency of subjective symptoms and several clinical signs of CMD were related to certain articulatory speech disorders.

The authors concluded that both craniomandibular disorders and disorders in speech sound production seem to reflect to a considerable extent immaturity in the fine motor control of the orofacial muscles in children.

Many patterns are encountered in an orthodontic clinic. How can patients achieve a stable mandibular position after splint therapy? How can they learn an appropriate, relaxed oral rest posture during orthodontic treatment? How can they enhance their masticatory function after surgical correction of cranio-facial deformity accompanied by CMD? How can patients recover sufficient strength in the muscles of mastication for adequate chewing after the final occlusal treatment? What can be done to relieve the patient's anxiety which accompanies the difficulties in chewing and swallowing or when there is vague pain along the lateral borders of the tongue?

The following case reports are presented to explain the role of myofunctional therapy in treating actual individuals.

Case I: Change of mandibular position after use of an anterior positioning splint

This 17 year old female came to the university hospital complaining of asymmetric facial appearance and TMJ sounds. In centric occlusion (CO), her mandible shifted to the right. Her face (frontal view) appeared slightly asymmetric. She had a unilateral crossbite from the right canine to the molars in centric occlusion bite. A stable centric relation (CR) mandibular position was not found during initial examination. Her swallowing looked normal, but her tongue at rest seemed to be low in the dental arch.

Tender points on palpation were limited to the posterior part of the left TMJ and the left lateral pterygoid muscle. These seemed related to late clicking on the same side. In the trace of habitual jaw movement recorded with Mandibular Kinesography, reciprocal clicks were observed at the late phase of the mandible's opening and closing. From the time the patient first noticed this TMJ noise at 9 years of age, it had continued without pain until this examination. Ranges of maximum opening and lateral excursion were sufficient.

Since the TMJ sound had a long pathological history, an anterior repositioning splint was selected for the first splint after physical therapy (moist heat, stretching, and manipulation of the TMJ).

The mandibular position for the anterior repositioning splint therapy, *the therapeutic position,* is determined by the following conditions: The disc in place on the condyle and the condyle near the terminal position. Generally, the most posterior point before the closing click is determined to be the therapeutic position. An anterior repositioning splint has a lingual guide plane, which keeps the mandible in a forward position without undue muscular effort. In this case, after recapturing the disk on the condyle, the habitual position of the mandible became more anterior than prior to treatment. Because of the increase of posterior height, the patient now exhibited a posterior open bite. This called for a change to a stabilization splint. During the treatment period with the stabilization splint, the condyle spontaneously returned to the glenoid fossa. This phenomenon is known as *walk back.*

The patient's symptoms decreased during the splint treatment. Meanwhile, her disordered perioral functions remained. Myofunctional therapy was delayed until after the conservative therapy for CMD to avoid excessive pressure on the TMJ and hypercontracted muscles. This delay is especially necessary in cases with a deranged disc and/or acute inflammation of the related soft tissue. For example, in this case, the patient was asked to wear the splint when doing strength exercises such as *popping* her tongue and *open and bite* to avoid an unfavorable load on the TMJ.

The main objectives of myofunctional therapy in this case consisted of (1) relaxation of the perioral muscles to stop muscular

hypercontraction during the *walk back* stage of splint therapy; (2) posture training of the head, neck and shoulder, as well as tongue and mandible; and (3) patient education for self care to control the masticatory systems and achieve a relaxed, teeth apart rest posture without jaw clenching or bruxing. After splint therapy, the midlines of the patient's upper and lower arches were completely aligned and her face looked symmetrical.

Case II: Ortho-surgical treatment with myofunctional therapy for CMD

This 21 year old male complained of trismus (muscle spasm of the muscles of mastication) associated with pain of the left TMJ and TMJ sound. The patient first noticed the TMJ sounds during the first year of high school. Since then most of the symptoms, except the trismus, had been getting worse. X-ray and serial examinations of masticatory functions revealed that both condyles were positioned in a retruded position in the glenoid fossa. The right disc seemed to be displaced forward and/or medially. He had a bilateral open bite due to edge to edge occlusion of the incisors.

Since the central incisors only contacted vertically in CR, the patient shifted his mandible to the right or left slightly and kept this terminal position during mastication. This unique behavior required hyperactivity of the lateral pterygoid muscles which prevented him from chewing on one side for more than 10 or 20 strokes before experiencing muscle pain. The same situation occurred on both sides. Tracing of his habitual gum chewing cycles with MKG revealed dual CO bites.

The patient's signs and symptoms before treatment included tenderness on palpation of the right pterygoid muscle related to a middle click on the same side, and crepitus in the left TMJ. The trace of habitual jaw movement suggested reciprocal clicking. Range of maximum opening and lateral excursion were sufficient.

Since the main cause of the patient's symptoms seemed to be his occlusion, a surgical orthodontic treatment was selected as a first approach. The third molars, upper bicuspids and a lower incisor were removed. Presurgical orthodontic treatment was then started.

The body of the mandible was set back 8mm on both sides by osteotomy. The ramus was rigidly fixed to the body with titanium pins. A lateral open bite subsequently appeared due to post surgical relapse. Neither intra oral nor extra oral fixative mechanics, such as class III elastics or chin cap had been used to prevent relapse after removal of the surgical splint. Rather, a stabilization splint was worn for one entire day after the surgery to relax the muscles and allow the condyles to settle spontaneously into a neutral position in the glenoid fossa.

When forced to choose between retention of the postoperative occlusion and position of the condyle, maintenance of a neutral condyle position within the glenoid fossa should be the first consideration, especially in cases with CMD. The following conditions are recommended for optimal results: (1) recovery from CMD symptoms during pre-surgical treatment, (2) a well defined plan and prompt surgical procedure, (3) establishment of appropriate behavioral patterns of the perioral muscles after surgery and (4) long term continuation of this relaxed state of the masticatory and perioral musculature.

Inappropriate muscle pressure or strain from artificial mechanics may adversely effect TMJ recovery. Therefore, a combination of myofunctional therapy and a stabilization splint might provide the most effective post-surgical retention.

Posture training was started before the surgery to enable the patient to keep his tongue elevated and away from his teeth immediately after surgery. A mark on the splint provided a landmark for tongue placement. Muscle training with the splint began one month after the surgery to enhance range of mouth opening.

Occlusion in the molar segment was stable.

Smooth movement and satisfactory range of mandibular opening and lateral excursion were achieved along with a stable terminal point (anterior teeth in appropriate overjet, overbite relationship, and normal chewing patterns.

Case III: Long term treatment for CMD with dual objectives - to improve strength of masticatory function for chewing while achieving relaxation in these muscles at rest

The final case is a 27 year old female with a closed lock of the left TMJ. Her complaints were pain in the left TMJ, an open bite, which developed after splint therapy in another facility, and a protrusive profile. The bite was such that only the most posterior molars contacted vertically. The mandibular position was so unstable that the patient did not know where she could bite. Chewing and swallowing patterns were abnormal. Excessive contraction of the perioral muscles was observed during mastication and swallowing.

Tender points on palpation existed in various regions before treatment, including moderate pain in the left TMJ related to the closed lock. One month after a new stabilization splint was put in the lower arch, the left disc was recaptured. An additional four months of splint therapy was needed to achieve a stable mandibular position. Third molars and four bicuspids were removed before orthodontic treatment was started.

At the end of the serial treatment, occlusion in the molar segment was stable. Smooth movement and adequate range of mandibular opening, a stable terminal point, and normal chewing patterns were achieved. Superimpositions of lateral cephalograms taken before and after splint therapy and orthodontic treatment, showed that the patient's condyles were deviated backwards before splint therapy. After the recapture of the left disc, they moved forward. However, during the orthodontic treatment, the condyles *walked back* without dysfunction. This good response to the treatment was clearly enhanced by the myofunctional therapy.

Conclusion

The above cases illustrate a successful treatment outcome when surgical, orthodontic and orofacial myofunctional interventions are combined. The patient presented last gives strong testimony to the effectiveness of this approach. At the interview, after myofunctional therapy, this patient described the many physical changes she had achieved: *I have come to enjoy eating a meal. Before therapy I especially disliked noodles because it took me 40 minutes to eat a serving. Now, I can bite and chew any foods easily and enjoy the taste.. I was even able to eat dry soybeans at the seasonal ceremony this spring!* (The Japanese have a custom of eating as many dry soy beans as their age on the third day of March). *I remember another thing, I used to drool from the corners of my mouth before this therapy. I don't drool anymore. Now I can trap the collected food tightly within my mouth before I swallow it. In addition, though I was often annoyed by persistent shoulder pain before, it has disappeared completely. I am now able to sleep well, too. I noticed these changes after I started this training . . . . I now understand that the way I used to eat was a lot of strain and effort. Before my treatment, I used to wake up with my back gums feeling numb every morning. One of my friends was kind enough to tell me that I had ground my teeth in bed during a trip. Fortunately, I never hear this complaint from my husband these days.*

Regarding the training she mentioned: *Since you showed me a lot of pictures, I could see how I should gather the food onto my dish shaped tongue and them move it back into my throat to swallow. However, I could rarely do so. At first I was really confused. Once you told me 'Even a good athlete cannot at first move her muscles automatically. 'Those words changed my attitude. You added 'Don't think that you cannot control your own body. You need only to repeat awakening your sensation, as in physical rehabilitation.' It took some weeks to be aware that I had less sensitivity on the ridge of my tongue. To help me, you told me 'Some day you will be able to feel even the lightest touch. You don't need to worry about it.' This suggestion was a big turning point in my therapy.*