

The cranosacral mechanism and the temporomandibular joint

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A review of the extensive work by dentists Fonder and Smith to resolve temporomandibular joint (TMJ) syndrome shows awareness of the unity of the body and the effect of TMJ dysfunction on all body systems. However, the role of the cranosacral mechanism has not been appreciated sufficiently. Results of a retrospective study of 130 TMJ patients evaluated for cranosacral dysfunction over a 9-year-period are reported. More than 57 percent of the patients had a history of trauma. The number of upper cervical restrictions was also impressive. A viscerosomatic reflex is postulated as a mechanism for the association of cervical and cranial restrictions and TMJ dysfunction. Osteopathic cranial treatment will assist resolution of TMJ symptoms and improve results with the dental splint. The benefits of a team approach by dentists and physicians are discussed.

Temporomandibular joint (TMJ) dysfunction has been estimated to affect 20 percent of the American population.¹ Of these patients, 60 percent are symptomatic.² There is an increasing interest in this clinical problem by the dental and medical professions across the country. The 1985-86 Cranial Academy³ reports 227 active D.O. members. Also, the Academy has 89 dentists who are "associates," and this is a rapidly growing membership segment. There continues to be a strong demand from the dental profession to learn more about the cranial concept.

This paper will present some physical findings of my TMJ patients. It will also provide an anatomicophysiological theory as to how the commonly used

mandibular overlay dental appliance functions in patients.

I think that many of the TMJ research projects, studies, and observations are actually studies and observations of the cranosacral mechanism, and that dentists for years have been using this mechanism unknowingly to treat TMJ dysfunction and to improve the health and well being of their patients.

Effects of dental stress

In his 1977 book *The Dental Physician*, Dr. Aelred Fonder⁴ presented a well-researched and organized collection of theories and documented observations. This dentist quoted sources from Pottenger to Selye defining dental stress and its effect on the total body.

Fonder emphasized that the unity of the organism is a primary and fundamental medical principle that has not been sufficiently explored. He also discussed the adaptation syndrome in relation to the musculoskeletal system in health and disease, and he explored the relationship between the endocrine system and the central and autonomic nervous systems.

Fonder theorized that an imbalance in the neuromuscular system of mastication and deglutition inhibits normal synergistic action of all muscles controlling the mandible. He expressed the view that confusion arises in the relay of neural impulses to and from the brain. These confused impulses result in erratic, unnatural contractions of the musculature, which lead to muscle spasm and improper muscle tonus.

He stated that TMJ dysfunction routinely coexists with the imbalance of the masticatory muscles. This distress continues until there is a physiologic change in the rest position of the mandible. He defined this improper contraction of the muscles as a proprioceptive dysfunction relayed directly to the brain, and he said that findings such as premature contact of occlusal surfaces and other abnormalities in the occlusion prevent rhythmic, well-coordinated mandibular movement.

One source estimates that 38 percent of the nervous input to the brain and output to the rest of the body is mediated through the face, mouth, and TMJ region.² When confused stimuli are received by the

brain, it will, in turn, send out faulty information to the body that will affect the entire organism.

In light of these observations, Fonder proposes that the most important element of TMJ treatment is the establishment of a physiologic rest position of the mandible through correction of occlusal position. Often this is achieved with an acrylic template or "splint," which is periodically adjusted to accommodate changes in mandibular position while muscles heal and gain tone. In other cases correction is accomplished with removable appliances or occlusal fillings.

Fonder has successfully treated an extraordinary number of clinical problems with these procedures. For instance, with serial postural x-rays, he was able to demonstrate reduction in the anteroposterior and lateral spinal curves in two young men with scoliosis and/or kyphosis and lordosis.

Fonder conducted a controlled study of 247 patients with TMJ dysfunction. All of these subjects had the classic symptoms of crepitus, subluxation, pain or tenderness at the joint, and disruption of the opening and closing mechanism. In addition to auriculotemporal problems, there were multiple symptoms involving respiratory, visceral, ocular, gynecologic, psychologic, postural, and other general symptoms.

Individual treatment varied but always was directed to the maxillomandibular relationship and normalization of mandibular positions, often by means of an acrylic template. Fonder reported that 91-92 percent of the treated subjects became asymptomatic, whereas only 6 percent of untreated patients improved. Normalization of the spinal posture and resolution of recurrent upper respiratory infections occurred with treatment.

Fonder's book shows that when physiologic occlusion was provided, the mouth chemistry and pH normalized, and teeth remained clean and relatively free of caries. The alleviation of signs and symptoms throughout the body reflect rebalancing of the autonomic nervous system throughout the total person, and a rebalancing of the endocrine system.

In a separate study, Fonder⁴ performed dental health evaluations of 100 children. Other competent professionals also evaluated the children by questionnaire, audiometric testing, determination of intelligence quotient, assessment of academic output, and judgment of psychologic adjustment. The children, who ranged in age from 9 to 14 years, were divided into either "gifted" or "remedial" groups according to their test scores.

Children in the remedial group generally had malocclusion leading to a dental distress syndrome. The gifted children possessed relatively better dental occlusion. All children working below their ability possessed varying degrees of maloc-

clusion. Of the 40 students with severe malocclusion, only one worked up to tested ability. All children whose occlusion was normal functioned to their tested ability or above.

All students who worked below their ability had psychologic problems. The depth of psychologic problems was related to the severity of the malocclusion.

Of children in the remedial group who had severe malocclusion, all had scholastic problems, and 53 percent performed far below their tested ability. Also, 53 percent had more than a 25 percent hearing loss.

Of the children working to or above their tested ability, 75 percent complained of less than 33 percent of the symptoms of dental distress. Well over 50 percent of the dental distress symptoms about which the children were questioned were among those working below ability.

Audiometric studies showed that children in the gifted group possessed much better hearing than students in the remedial group. The acuteness of the hearing was related to the normality of the occlusion.

Role of craniosacral dysfunction

There is no question but that Fonder has made a tremendous contribution to both medicine and dentistry with his outstanding documentation of the "dental distress syndrome" and its many manifestations. However, is there a common factor that was not recognized in his examination of these children with ear problems, respiratory problems, and malocclusion? As a practicing osteopathic physician, I believe that what was not recognized was the status of the craniosacral mechanism. Is there a cranial membranous distress syndrome present? The findings of other investigators lend support to this possibility and to Fonder's observations.

Dr. Stephen Smith,⁵ who is the director of the TMJ clinic at the Philadelphia College of Osteopathic Medicine, has demonstrated an association between TMJ dysfunction and coronary problems in a middle-aged woman. Her history included traumatic injury of the sacrum and coccyx, structural imbalance, myocardial infarctions, hearing problems, menstrual disorders, bladder problems, speech and swallowing difficulties, osteopathic lesions in the thoracic region, and poor cervical and head posture. After prosthodontic treatment providing molar support, increased vertical dimension, and an ideal head-neck balance, her overall clinical health improved greatly.

Smith⁶ also has described two other cases. One patient had a maxillary right toothache of nondental origin, which had been preceded by right-sided mastoid and cervical pain. A week prior to the development of the cervical pain, he had fractured

the fourth toe of his right foot. As a result his gait pattern had shifted with pronation and inversion of the foot, which consequently altered his body mechanics. Once the swelling of the foot diminished and the patient's foot posture and gait normalized, the pain in the tooth and neck gradually disappeared.

Another patient presented with low-back pain and left ear, mastoid, and temporal pain. TMJ clicking and an irregular opening-closing pattern of the mandible were evident. The upper molar was missing. To bring the last molar into occlusion on closure, it was necessary for musculature to re-trude the jaw with extra pressure, with the result of stress to the TMJ. Significant sacral base unleveling was present with shortening of the leg length on the same side.

Treatment consisted of building up the occlusal contact on the biting surface of the molar to correct the closure problems. Radiographs taken a month later showed that the sacral base was completely level without any osteopathic manipulative treatment, heel lift, or arch support therapy. The TMJ-facial pain diminished.

These two clinical studies show complex neuromuscular patterns and reflexes that exist among the foot, the lower extremity, the sacral base, and the TMJ as well as the occlusal relationships. The relationship to the sacral base leveling and reduction of the vertebral stress component was previously observed and documented in Fonder's book.

Preliminary study

In 1978, I worked in the office of a dentist who specialized in the treatment of TMJ dysfunction. I examined the cranial patterns of patients who were receiving treatment with an acrylic appliance. (Cranial evaluation for patterns is motion testing for all the major base bones [occiput, temporal, sphenoid] and the frontal bone through their normal planes of motion. The examiner is screening for "give" or mobility of the temporal bones, one side compared with the other, and a give of the frontal bone with its articulations with the sphenoid and temporal bone articulations.) I performed 21 cranial evaluations on 13 women and 2 men; 6 patients were examined twice.

When questioned concerning their response to the appliance, 4 of the 15 patients reported 90-100 percent improvement. I found that 3 of these 4 patients had totally normal cranial motion and 1 had a moderate restriction of the temporal bone, which was locked in internal rotation. A total of 7 patients reported some improvement; all of these patients had temporal restriction.

The remaining 4 patients had varying degrees of change with the splint, but they continued to have severe symptoms. Each of these patients had re-

stricted motion of the temporal bones, and all of them lacked normal sphenobasilar symphysis motion. Every patient who had restriction of the sphenobasilar symphysis had a history of trauma. Overall, 6 of the 15 patients had symptoms or signs of cervical restriction.

During this period I also had the opportunity to examine a middle-aged woman who presented with complaints of headache, dyspnea, chest pain, face pain, and difficulty walking. The patient also had low-back symptoms and anxiety. Cranial examination revealed a generalized restriction in cranial motion, with poor sutural mobility and lack of general dural flexibility. The patient's dental evaluation revealed a poor occlusion and missing posterior teeth. Two weeks after the patient was fitted with an acrylic overlay appliance, she was asymptomatic. Her headaches had resolved, her breathing was full, her chest pain had disappeared, she felt good, and she smiled freely. The cranial examination at that time revealed good cranial motion, with exaggeration in the anteroposterior motion of the cranium primarily in flexion.

From this experience in the dentist's office, I made the following conclusions: (1) The more severe the locking of the cranial mechanism (defined as an immobility of the cranial articulations to move with directed pressure and/or a total lack of dural membrane flexibility), the more symptoms the patients had; (2) free sphenobasilar symphysis motion was necessary for good results with the acrylic appliance; (3) sphenobasilar symphysis motion appeared to be exaggerated in patients wearing an appliance who had good mobility of their craniosacral mechanism; and (4) free bilateral motion of the temporal bones was not imperative for improvement of TMJ symptoms with the dental appliance.

Nine-year retrospective study

Impressed with the therapeutic effects of the acrylic overlay, I subsequently did a retrospective evaluation of patients with TMJ syndrome whom I have seen in my own practice over a 9-year-period. The vast majority of these patients were referred to me by dentists; most had received dental appliance treatment without successful resolution of their problems.

Materials and methods

Only patients who met the criteria of pain or tenderness with jaw opening, mandibular deviation with opening, and muscle tenderness intraorally or external to the joint were included in the study. A total of 130 patients were evaluated. Of these, 113 were women and 17 were men. This 7:1 ratio is similar to that commonly recognized in the dental literature of 6:1.⁷

TABLE 1. ASSOCIATED SYMPTOMS IN 130 TMJ PATIENTS.		
Location and nature of symptoms	Patients	
	No.	%
Head	107	82.3
Headache (vascular, structural, referred); pain in the head (deep, intermittent, or chronic)		
Neck pain and restriction	77	59.2
Face pain	69	53.1
Jaw		
Clicking, crackling	56	43.1
Pain	39	30.0
Upper back pain	7	5.4
Lower back pain	27	20.8
Cranial nerve symptoms		
Tinnitus	12	9.2
Earaches	7	5.4
Other (visual distortion, dizziness, hearing difficulties)	10	7.7
Systemic (fatigue, irritability, endocrine disorders)	20	15.4

The examination findings were noted on the first patient visit. Grading of the severity of restrictions and full recognition of articulations involved were usually done after the total treatment.

The following standardized evaluation was performed. The vertebral column was motion tested in forward bending and backward bending. Forward bending restrictions were identified by rotational asymmetry while the patient was seated and leaning forward (thoracic and lumbar regions). Backward bending was examined with the patient prone on the table and resting on his elbows. The cervical region was examined by motion testing each segment and identifying restriction in each plane. Motion of the sacrum on stabilized ilia was introduced in the seated position. Motion of the ilia on the sacrum was performed with the standing flexion test. These were screening tests for sacroiliac and iliosacral restrictions. Further sacral evaluation was performed with the patient prone examining sacral landmarks and with backward bending of the vertebral column caused by the elbow support of the patient.

Internally rotated temporal bones were noted when external rotation could not be introduced within its normal range of motion. Externally rotated temporal bones were noted when internal rotation could not be introduced. Sphenobasilar symphysis motion was evaluated with one examining hand on the frontal bone and the greater wings of the sphenoid with the other hand monitoring the occiput. Ranges of motion were introduced into the sphenobasilar symphysis and membranes to detect restriction and the amount of resistance. The greater the resistance, the more severe the restriction in the cranial pattern. Compression of the

sphenobasilar symphysis meant there had been an anteroposterior force through the anteroposterior axis of the head and there was a lack of normal flexion extension (forward bending and backward bending) within the head between the sphenoid and the occiput.

Condylar compression was tested by individually introducing forward and backward motion into each condylar part of the occiput.

In this paper, primary restriction refers to a lack of motion which was induced by a traumatic incident; the restrictions can be severe. Secondary restrictions imply a compensatory or adaptive pattern. These patterns develop in the body in order to cope with the residual effects of traumatic injuries or against the forces of gravity.

Results

The patients presented with a variety of complaints in the face, head, neck, back, and/or with cranial nerve or systemic symptoms. These are listed in Table 1. Depression, which was very common in these patients, was not measured in this study because of the difficulty of evaluating endogenous versus transient depression on an initial evaluation.

Seventy-five patients had a history of trauma to the head, neck, or back, or dental or birth trauma. (Dental trauma refers to dental procedures such as extractions, fractured teeth, ill-fitting bridges, ill-fitting crowns, poorly fitting appliances, et cetera, or direct blows to the mouth.) Poorly fitted crowns and bridges and whiplash injuries were very common precipitating factors. I consider poor crowns and bridgework to be classic examples of microtrauma, but these were not classified as a traumatic cause in this study because an accurate diagnosis of microtrauma cannot be made until major fascial and membranous stress patterns are removed or altered.

The results of cranial evaluation are shown in Table 2. One of the 2 patients with a totally locked craniosacral mechanism had multiple severe injuries, while the other had a history of meningitis. Of the 23 patients with moderate-to-severe sphenobasilar symphysis compression, all but 2 had a history of severe injury.

Compression of the condylar parts of the occiput was associated with a high incidence of the sphenobasilar symphysis restriction. Most of the patients with severe articular strain patterns on the frontosphenoidal articulation also had severe headaches associated with this restriction.

Commonly the cranial strain pattern was manifested by sutural jamming, and felt osseous rather than membranous in nature. Torsion and extension patterns were very common. Because they were lesser patterns and frequently overlapped,

they were not documented in my records often enough to be considered in the study.

In 61 percent of the 130 patients, the pain in the jaw or head was on the same side as the internally rotated temporal bone; in 19 percent, the pain in the jaw or head was on the side opposite the internally rotated temporal bone (usually the hypermobile side). Eight percent of the patients complained of bilateral jaw pain; 2 percent had pain in the side of their head or jaw with no temporal restriction. Ten percent had either non-specific ill-defined pain patterns in the head or no head pain associated with their temporal joint dysfunction.

Examination of the x-ray films of several patients with degeneration of the condyle revealed no firm relationship between the side of the degeneration and the side of the temporal restriction. Occipitomastoid strain always coexisted with internal rotation of the temporal bone.

The cervical findings are listed in Table 3. With the multiple cervical restrictions, it was difficult to differentiate the primary from the secondary restriction. The occipitoatloid restrictions were commonly associated with the condylar compression restriction. Many times C3 restriction was the primary cause of referred pain to the TMJ.

Other vertebral restrictions are shown in Table 4. T1 restrictions are not shown. This is almost a universal restriction and it is difficult to differentiate primary lesions from the universal pattern.

The sacral restrictions were all primary (traumatic) or long-standing secondary. Sacroiliac and iliosacral were both considered to be sacral restrictions in this study. The vast majority of patients exhibited their iliosacral restriction on the side contralateral to their occipitomastoid restriction.

Although not specifically measured in this study, left sacral torsion on a right axis is commonly found in patients with long-standing sphenobasilar symphysis compression. Sacral micromotion (defined as the inherent movement of the central nervous system as manifested by movement of its bony parts and dural attachments) was absent from all 21 percent of the patients who complained of low-back pain, and in the majority of the remaining patients.

Etiology

As noted earlier, more than 57 percent of the patients in this study had a history of trauma, ranging from multiple fractures of the face or jaw to tooth extractions. In my opinion, trauma must be considered the major unrecognized etiology of the TMJ syndrome.

The number of upper cervical restrictions in patients with the TMJ syndrome is impressive. Whether this somatic dysfunction is primary, from

Location and nature of finding	Patients	
	No.	%
Locked cranial mechanism	2	1.5
Sphenobasilar symphysis compression	23	17.7
Sphenobasilar symphysis restriction (mild to moderate) or limited motion	14	10.8
Cranial strain pattern (vertical or lateral)	17	13.1
Compression of condylar parts of occiput (unilateral or bilateral)	35	26.9
Severe articular strain pattern of frontosphenoidal articulation	15	11.5
Dislocation of the disc (total displacement of the disc anteriorly)	5	4.0

Location of restriction	Patients	
	No.	%
Multiple	5	3.8
Occipitoatloid	11	8.5
Atlantoaxial	3	2.3
C3	66	50.8
C4	39	30.0
C5	21	16.2
C6	17	13.1
C7	5	3.8

Location and nature of problem	Patients	
	No.	%
Thoracic restriction		
T2	18	13.8
T3	18	13.8
T4	6	4.6
T5	4	3.1
T6	6	4.6
T7	7	5.4
T8	5	3.8
T9	4	3.1
T10	3	2.3
T11	2	1.5
T12	2	1.5
Lumbar restriction		
L3	1	0.8
L5	37	28.5
Sacral restriction	41	31.5
Scoliosis, gross	18	13.8

injuries such as falling on the head or whiplash, or secondary to the mechanics of the dural attachments at C2-C3 being stretched from above or below or both, is an academic question. The viscerosomatic reflex may be a very likely third possibility for the association of cervical restrictions with cranial restrictions, TMJ dysfunctions, or the cranial membranous distress syndrome.

The trigeminal nerve is the largest of the cranial nerves and carries somatosensory information from most of the face, most of the scalp, part of the

auricle, the external auditory meatus, the teeth, the oral and nasal cavities, the TMJ, the nasal pharynx, and most of the meninges in the anterior middle cranial fossa.⁸ The fifth nerve also carries proprioceptive fibers from the masticatory and probably the extraocular and facial muscles.

The gasserian or semilunar ganglion occupies a recess in the dura mater over the trigeminal impression near the apex of the petrous portion of the temporal bone. All three divisions of the trigeminal nerve give off meningeal branches to parts of the dura. These sensory units feed back to the brain stem and synapse with neurons leading to higher cerebral levels and the spinal levels. In fact, the neurons entering the trigeminal mesencephalic (brain stem) nucleus are the only primary neurons whose cell bodies lie within the CNS.

The trigeminal sensory communications synapse into the spinal trigeminal nucleus, which can be divided cytoarchitecturally into the oral part, the inner polar part, and the caudal part, which extends down to the second cervical segment of the spinal cord. The caudal part of the nucleus resembles a dorsal horn of the cord with afferent fibers descending in the spinal trigeminal nerve tract, synapsing at all three levels.⁸

In addition to the three meningeal branches of the trigeminal nerve, the first, second, and third cervical nerves give sensory innervation to the membranes.⁹ In light of the neural overlap of the meningeal nerves and their close anatomic relationship, I believe that a viscerosomatic reflex and its accompanying facilitation is a probable factor in the association of cervical restrictions with TMJ syndrome and cranial membrane distress.

Treatment of study patients

In the examination and treatment of the 130 patients in my study, attention was directed to the cervical column, upper thoracic vertebrae and ribs, as well as fascia, lumbar column, and sacrum to remove the myofascial strain pattern.

Old severe traumas with long-standing decompensating patterns were difficult to manage. I thought that endocrine imbalances were a major factor for the lack of response to treatment. Patients who suffered from multiple allergies, particularly the chemical allergies, were difficult to treat. These patients lacked the stamina and internal energy to maintain the changes introduced. Patients with inflammatory diseases, such as rheumatoid arthritis or fibromyalgia syndrome with polyarthralgia and associated myositis, were also difficult to treat.

Five patients had a primary problem of dislocation (total displacement) of the temporoman-

dibular disk locked in the anterior position, thus fixing the condyle posteriorly. In these five extreme cases and with the failure of conservative methods, surgery is the treatment of choice.

Most patients with long-standing TMJ dysfunction also had a coexisting depression. As mentioned earlier, this depression had to be differentiated between the transient and the endogenous. Because of frequent locked occipitomastoid articulation, depression should be expected in these patients. Antidepressants were most helpful in reducing pain and promoting improvement of the patient's energy when the depression was endogenous. A cranial rhythmic impulse (CRI) that was decreased in amplitude and rate was found in these patients.

Patients who had impaired motion of the sphenobasilar symphysis, primarily those with moderate-to-severe sphenobasilar compression, were technically the most difficult to treat. As noted in the dentist's office evaluations, patients improve even with internal rotation of the temporal bone as long as the sphenobasilar symphysis was freely moving in flexion and extension.

Patients whose primary problems start with dental work or dental occlusal irregularities are the easiest to treat. A new crown or appropriate equilibration can restore normal cranial motion and TMJ function rapidly, especially with the assistance of osteopathic manipulative treatment. With deficient or absent teeth, especially the posterior molars, there is a basic imbalance that must be restored by dental means to maintain the patient's well being.

Patients wearing a well-balanced mandibular occlusal overlay seem to have an exaggeration of the flexion phase of the flexion-extension motion of the skull. A poorly fitting appliance will impede the flexion-extension motion of the skull and many times will "lock" the cranial rhythmic impulse, with the primary symptom being a constant, severe headache. However, a less-than-perfect acrylic overlay appliance can usually be accepted by the patient after an osteopathic cranial treatment, because the mechanism becomes more flexible and can accommodate the appliance. Moreover, some patients who do well with a dental appliance initially may be able to discontinue its use after successful osteopathic treatment of their TMJ problems.

Ideally, manipulative treatment should be given in the following situations: before all dental evaluations of TMJ dysfunctions; before impressions are taken; before each equilibration of the acrylic appliance; before any kind of permanent restorative work is completed in the mouth; and be-

fore final equilibration of the teeth is performed.

Theoretical basis for treatment

In my early years of treating these patients, I thought that improved cranial motion promoted acceptance of the dental appliance, which changed the spatial relationship of the condyle in the fossa. During temporal external rotation, the fossa moves posteromedially; with internal rotation it moves anterolaterally. The position of the mandible must accommodate to the changing position of the fossa. With temporal internal rotation the fossa entraps the condyle, impeding motion of the condyle on that side. The common TMJ finding on x-ray is the posterior positioning of the condyle in the fossa, that is, intrusion of the condyle into the retrodiskal space on the side of the internally rotated temporal bone.

Changing the balance of the temporal bone along its auditory canal axis is indeed beneficial in relation to the condyle in the fossa. However, this does not explain the increased flexion phase manifested through the frontal and sphenoid bones.

It is within the cranial concept that the frontal bone directly influences the ligamentous structures and facial bones that hang from it. The frontal and the facial bones are controlled by the motion of the sphenoid and ethmoid bones. I believe that the mandible is also controlled by the sphenoid bone because it hangs by the sphenomandibular ligaments as a suspension bridge, anterior and inferior from the sphenoid. Structurally, the mandible hangs and is guided by these ligaments primarily and by muscles secondarily.

The sphenomandibular ligament extends from the spine of the sphenoid bone to the medial wall of the mandible below the lingula. With upward motion of the greater wing of the sphenoid bone there is upward motion of the mandible. The sphenomandibular ligament in its angulation passes inferiorly and laterally from its origin. Because it is attached behind the transverse axis that passes through the body of the sphenoid bone, its function would inhibit the flexion phase of the primary respiratory motion of the head with a relatively long lever arm.

The stylomandibular ligament also suspends the mandible. Functionally it seems to maintain the positional relationship between the mandible and the temporal bone.

The dental acrylic overlay, when placed on the posterior teeth, functions as a fulcrum that disengages the TMJ and promotes the relaxation of hypertonic muscles. In dried skull models, the separation of the mandible from the sphenoid would logically further inhibit the flexion phase. But the fulcrum promotes and improves the ampli-

tude of the flexion phase of cranial motion in the living human skull. This promotes an improved fluid mechanism, which in turn improves the circulation to and nutrition of the ligaments.

Calcified and contracted stylomandibular ligaments are commonly found in patients with longstanding TMJ dysfunction. Calcification indicates lack of circulation and lack of micromotion of these body structures.

Contracted sphenomandibular ligaments restrain functional stretching, and, therefore, inhibit the normal give-take motion of the skull. It is my theory that the stretching and revitalization of this ligament neutralizes its inhibitory function on the flexion motion of the sphenoid bone. As the ligament is stretched, there is an exaggeration of the flexion phase of the craniosacral mechanism; this is carried through the reciprocal tension membranes and promotes the circulation of cerebrospinal fluid as well as changes in the balance of the cranium on the Sutherland fulcrum (the falx cerebri and tentorium cerebelli should be thought of as three sickle-shaped agencies, all of which arise from a common origin at the straight sinus, named "The Sutherland Fulcrum").¹⁰ It also influences the fascia of the vertebral column, the pelvis, and the extremities.

Traditional osteopathic understanding of body mechanics emphasizes the bony, ligamentous, articular relationships of the body that determine muscle balance and muscle tone. Muscles move joints, and they protect joints by splinting and supporting them. Ligaments limit motion, support bony structures, and maintain alignment.

I believe, therefore, that the ligamentous structures of the mandible are really the support cables to that suspension bridge, which is moved to and fro by the chewing of food and speaking. Thus the mechanical key to treatment of TMJ patients is the proper balance of the base bones (sphenoid, temporal, and occiput), the upper arch (frontal, maxillae, vomer, and palatine bones), and the mandible. With this treatment sequence the ligaments will not only be balanced but will be engaged in the motion of the cranial rhythm, and this energy will extend throughout the face and membranes.

Fonder⁴ noted that rest position and occlusal position were the two fundamental mandibular positions. He defined rest position as that in which the mandible was in a stable position, with the head and neck muscles assuming their physiologic length. He stated that this position is constant, is established before tooth eruption, and maintains considerable stability even as the teeth are lost. He contended that the functional mandibular move-

ments all begin and end in rest position.

Up to this point, I agree with Fonder. However, he believes that the rest position is entirely dependent on the musculature,⁴ while I contend that the rest position is entirely dependent on the cranosacral mechanism and the position of the sphenoid and the temporal bones.

Many dentists are treating TMJ dysfunction successfully with judicious balancing of the mandibular and occlusal surfaces in their functional relationships. Proper balance promotes the cranosacral mechanism and affects the reciprocal tension membranes and healing effects of the cerebrospinal fluid. Dentists are finding by trial and error that engagement of the cranosacral mechanism is the secret not only for the resolution of TMJ symptoms but also for the good health and well being of their patients.

Most patients improve with dental treatment alone. However, without good motion of the sphenoid bone and occiput, some TMJ patients' symptoms may become aggravated with the use of a splint, so that a "locking down" of the mechanism results. In these cases, the dental distress syndrome is only a manifestation of cranial dysfunction. I believe that these are the patients who receive dramatic results from osteopathic physicians trained in the cranial concept.

I have found a large number of upper cervical restrictions in TMJ patients. Indeed, the phenomenon of upper cervical restrictions associated with altered cranial motion is an everyday finding in all patient populations. Osteopathic physicians who are teaching cranial work to dentists are omitting something vital if they do not also address cervical problems. I believe that the average practitioner underestimates the involvement of the cervical column in relation to the total cranosacral mechanism.

Comment

This presentation has dealt primarily with the structural relationships of patients with TMJ dysfunction, which by no means constitute the entire picture. I do not believe that TMJ dysfunction is a

single entity, any more than systemic lupus is. It is dependent on a combination of structural and usage factors, congenital weakness, nutritional, psychologic, circulatory, neural, and allergic factors, occlusal relationships, iatrogenic factors, and the all-important traumatic episode.

"Finishing a case," as the dentists say, is the most difficult step. The best work is done by physicians and dentists who can appreciate, evaluate, and include in their treatment all the factors that have been mentioned. A team approach is very advantageous for good results when treating patients with multiple or complex problems. A team approach or at least a holistic approach is usually the only way to "finish" or complete patient treatment.

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