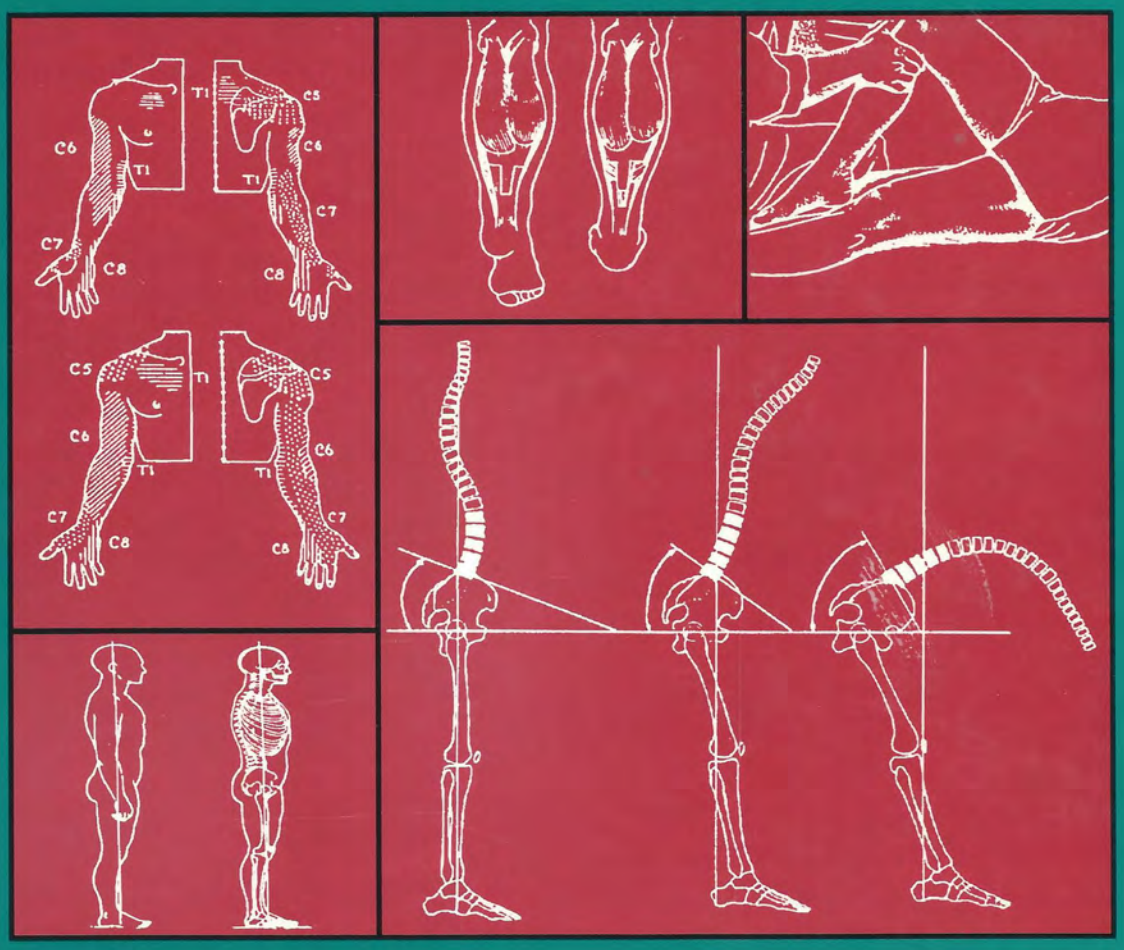
ORTHOPAEDIC PHYSICAL THERAPY

Edited by Robert Donatelli · Michael J. Wooden



Orthopaedic Physical Therapy

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Influences of the Cervical Spine on the Stomatognathic System

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Physical therapists see patients presenting with a variety of upper quarter symptoms. Treatment for such symptoms may be helped by addressing the dysfunction of the cervical and thoracic spine, the shoulder girdle, and/or the upper extremity. During treatment of upper quarter dysfunction, the physical therapist should ask the patient if the treatments offered are affecting his symptoms. The patient's response will depend on the area and degree of dysfunction, the age and overall physical condition of the patient, and the skills of the therapist rendering the treatments.

During the initial evaluation or during treatment, the physical therapist may question the reliability of a patient who complains of certain symptoms that may not be thought of as associated with upper quarter dysfunction. The patient may even suggest that these symptoms are being affected either for better or for worse as the upper quarter dysfunction is treated. Such unrelated symptoms cannot always be explained on the basis of referred pains or pathologic involvement. For the therapist trying to determine whether such unrelated symptoms are clinically possible, an understanding of how the cervical spine influences the stomatognathic system may provide some answers.

The suggestion that a specific dysfunction (e.g., of the cervical spine) can cause or contribute to a dysfunction that results in specific symptoms in an adjacent region (stomatognathic) must be made cautiously. The actual experience of symptoms by an individual and their expression involve a very complicated and detailed series of events that is yet to be fully understood. These events involve a variety of excitatory and inhibitory reflexes occurring at the spinal cord, the brain stem, the thalamus, and the cortex of the central nervous system. With such a complex series of events occurring, the clinician seldom observes a specific dysfunction contributing to a specific symptom. A precise correlation between signs of dysfunction and symptoms is the exception rather than the rule. Dysfunction, in fact, can exist in the absence of any subjective complaints.

The treatment goals that physical therapists establish for patients vary depending on their clinical experience and expertise. A common treatment goal is to achieve normal function and position for the area being treated. But what are the normal values for the upper quarter region? For example: what is normal head-neck-shoulder girdle posture? What is normal muscle tone? What is normal active-passive mobility of the cervical spine? The word *normal* implies conformity with the established norm or standard for its kind. If one were to apply this definition to an asymptomatic population, one would probably find that what is "normal" or average is actually varying degrees of dysfunction. By definition, then, when we attempt to restore normal function we may actually be treating toward an ideal condition that does not commonly exist.

These elaborations on normalcy may seem to be a lot of rhetoric. The point, however, is that goals established for patients should be what is functional and not what is normal. It is not clinically possible to resolve all dysfunction. Achieving as much mobility

as is consistent with stability, and educating the patient on appropriate exercise and means of prevention, would be reasonable goals for most patients. These goals will help the patient to help himself to maintain his individual physiologic adaptive range.

The treatment techniques used and their sequence depend largely on the experienced judgment and level of expertise of the physical therapist. Caution should be exercised before asserting that one treatment approach is better than another for a particular dysfunction or symptom. The effectiveness of physical therapy treatments in a clinical environment has seldom been evaluated through rigid experimentation. Clinically controlled studies also need to consider the measurement of pain, which remains elusive. Rather, the application of a particular technique or treatment approach is largely based on clinical opinions. Sicher warned us many years ago that "clinical success does not prove anything but the acceptability of the method employed; any attempt to prove an anatomical concept by clinical success is merely a rationalization and certainly is not to be regarded as truly scientific evidence."[1] The approach to treatment for functional involvement should be reversible, unless of course pain, dysfunction, and neurologic signs suggest otherwise. Treatment should not be given if the clinician is not willing to treat the complications that may result.

The objective of this chapter is to heighten the reader's awareness of the influence the upper quarter has on the stomatognathic system. The clinical symptoms associated with the dysfunction of the stomatognathic system are discussed. Cervical spine dysfunction indicates altered mobility and position of the cervical spine. Altered positioning of the cervical spine often is recognized by the acquired forward head posture (FHP). However, patients can have good position of their cervical spine but lack proper mobility. Conversely, patients can have what is suspected to be improper positioning of the head and neck due to congenital and/or genetic factors but have good mobility. The emphasis in treatment of the cervical spine should be on mobility and not just position.

I do not want to mislead the reader into believing that the following interrelationships have been documented. Documentation does confirm that a neurophysiologic and anatomic relationship exists between the cervical spine and portions of the stomatognathic system. References on the "normal" functional relationships are provided when possible. Any conclusions drawn about dysfunctional relationships and associated symptoms and any mention of treatments are entirely a matter of clinical opinion.

THE STOMATOGNATHIC SYSTEM

The word *stomatognathic* is one that is not often used and probably not understood by physical therapists. *Stoma* is the Greek word for "mouth", and *stomato* denotes relationship to the mouth.[2] *Gnathos*[2] likewise means "jaw," and *gnathology*[3] refers to the study of relationships of the temporomandibular joint, the occlusion (teeth), and the neuromusculature. The phrase *stomatognathic system* refers to the muscles of mastication (the mandibular and cervical musculature), the tongue, the temporomandibular joint (TMJ), the occlusion, and all of the associated vessels, ligaments, and soft tissues.

The stomatognathic system functions continuously during breathing and in the maintenance of an upright postural position of the mandible and tongue. The daily activity of this system is intermittently increased during such activities as chewing, talking, yawning, coughing, and licking the lips.

The following areas of the stomatognathic system are suggested to be directly influenced by cervical spine dysfunction:

The upright postural position of the mandible
The upright postural position of the tongue
Swallowing
Occlusion (In reference to the mandibular teeth and their initial contact with the maxillary teeth during jaw closure.)

The Upright Postural Position of the Mandible

The rest or upright postural position of the mandible (UPPM) is maintained nearly 23 hours a day. When the mandible is in this position, the teeth are held slightly apart. The vertical space (freeway space) between the tips of the mandibular anterior

teeth and the maxillary anterior teeth is on the average about 3 mm. The anteroposterior relationship of the UPPM to the maxilla is with the mandibular teeth positioned below the point of occlusion (maximum intercuspation) of the maxillary teeth (Fig. 4-1).

The muscles and soft tissues attaching to the mandible are in a state of equilibrium in the UPPM.[4] The least amount of muscle and soft tissue effort is then needed to elevate the mandible from the UPPM to maximum intercuspation. Once movement of the mandible has occurred such as to make tooth-to-tooth contact, or following any other functional movements of the mandible, the mandible will return to the UPPM. Essentially all movement begins and ends in the UPPM.[5] Individuals who talk or eat excessively or have acquired certain habits such as chewing gum or biting their fingernails will spend less time with the mandible in the UPPM. Individuals who brux or clench their teeth will spend even less time with the mandible in this position. Less time spent in the UPPM means more muscle and soft tissue activity is occurring. Such an increase in muscle activity over a period of time is not therapeutic.

Cervical Spine Influences

Many short- and long-term factors have been suggested to influence the UPPM.[6] However, head posture appears to have the most significant and immediate effect upon the UPPM.[7] Several studies have demonstrated that changes in the UPPM occur in response to short term changes in the position of the head on the neck.[8,9] Cervical spine dysfunction (FHP) influences the UPPM.[10] Long term positioning or mobility changes as seen in cervical spine dysfunction has not yet been entirely documented.

The mandible can be visualized as being engulfed in the web of muscles and soft tissue attaching to it. The FHP plus the influence of gravity changes the mandibular position by altering the tone and tension of the muscle and soft tissue attaching to the mandible.[10] This altered muscle and soft tissue tone is suggested to develop a force of elevation and retrusion on the mandible.[10] This force can vary from person to person as well as within the same person. To what degree and for how long a change in the vertical and or anteroposterior positioning occurs with the UPPM will depend upon the degree of cervical spine involvement.[10]

Symptoms

A common symptom relating to a change in the UPPM is the patient's complaint that "I don't know where to rest my jaw." This complaint may result from a change in head positioning influencing the UPPM. Cervical spine dysfunction changing the UPPM may give the patient the perception of not knowing where to position his jaw.

This perception may be exaggerated in those individuals who have a very keen sense of their teeth. Studies have shown significant differences between

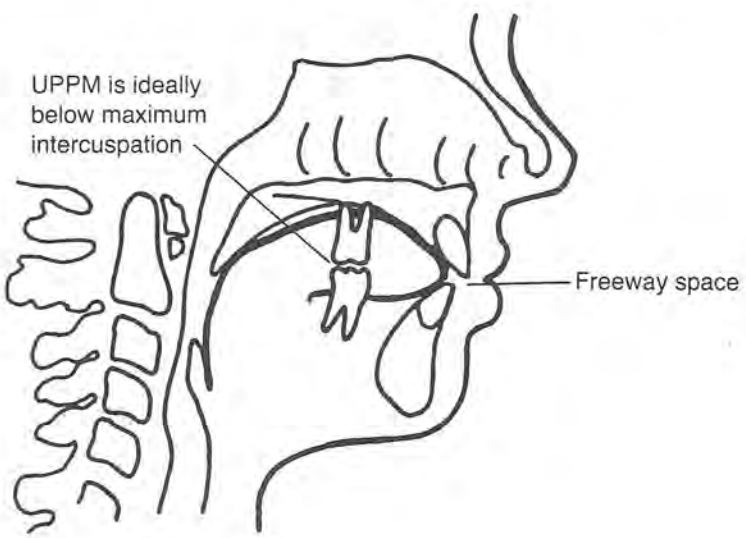

Fig. 4-1. The upright postural position of the tongue and mandible. (From Kraus,[54] with permission.)

individuals with respect to the occlusal receptors' sensory threshold.[11] Occlusal receptors provide a great deal of proprioceptive feedback to the mandibular muscles, which in turn influence the UPPM.[11] As previously stated, the anteroposterior position of the UPPM should be below maximum intercuspation. Patients who have a keen sense of their occlusion will not allow for much variability in their UPPM. Cervical spine dysfunction changes both the vertical and horizontal positions of the UPPM. The end result is both the occlusion (whether "normal" occlusion or malocclusion) and cervical spine dysfunction influence the mandible to position itself in different ways. The altered proprioceptive feedback from muscles, soft tissue and occlusion may influence the ability of the patient to know where to position the mandible.

A consequence of not knowing where to rest the mandible may be that the patient tries to "brace" the mandible. The patient may brace the tip of the anterior mandibular teeth against the posterior part of the anterior maxillary teeth. Bracing the mandible gives the patient some point of reference for jaw positioning. Bracing does require an isometric contraction of the mandibular muscles, but should not be confused with bruxism, which is covered later. Some patients, however, place their teeth in maximum intercuspation as another way of having some point of reference with their mandible. The symptoms expressed by such a patient would be those associated with muscle hyperactivity (myalgia) of the mandibular muscles. In addition, the patient may complain of a decrease or tightness in jaw movement as observed clinically.

The Upright Postural Position of the Tongue

The tongue is composed of two muscle groups, the extrinsic and intrinsic muscles. The extrinsic muscles suspend the tongue from the skull (styloid process) to the anterior portion of the mandible. The mandible itself is also suspended from the skull. The intrinsic tongue muscles begin and end within the tongue and have no attachment to skeletal structures. The only intrinsic muscle of the tongue to be mentioned is the genioglossus, since it is the only muscle that protrudes the tongue,[12] and the majority of electromyographic (EMG) documentation has been done on the genioglossus. Clinical observations to be covered will emphasize tongue protrusion.

The tongue is active during almost all oral and mandibular functions. When the stomatognathic system is in a state of equilibrium, the upright postural position of the tongue (UPPT) is up against the palate of the mouth.[13] In this position, the tip of the tongue will touch lightly, if at all, against the back side of the upper incisors (Fig. 4-1). The UPPT enhances the UPPM. As Fish has stated,[14] ". . . the rest position of the mandible is related to the posture of the tongue . . ."

Cervical Spine Influences

The FHP is proposed to influence the UPPT in several ways. The main supports of the extrinsic tongue muscles are the styloid process at one end and the front of the mandible at the other end (Fig. 4-2). The tongue can be visualized as being suspended like a sling between the styloid process and the mandible.[15] As the head moves forward (FHP), the cranium extends (rotates posteriorly) on the upper cervical spine.[16] The styloid process, being a part of the cranium, moves anteriorly as posterior rotation of the cranium occurs as a result of the FHP (Fig. 4-2).

Forces of elevation and retrusion are placed on the mandible during the acquired FHP. The FHP causes the two points of attachment of the extrinsic muscles to come closer together (Fig. 4-2). This positional change of both the styloid process and the mandible causes the tongue to "drop" from the top of the palate (the UPPT) to the floor of the mouth. A change in the resting length of the extrinsic muscles of the tongue will more than likely change the resting length of the intrinsic muscles.

In addition to a change in the length of the extrinsic muscles, a change in EMG activity of the genioglossus secondary to a change in head-neck positioning will occur. Studies have documented that a change in mandibular position will alter genioglossus (intrinsic muscle) activity mediated through the TMJ receptors.[17,18] Mandibular position is altered by a change in head position. It is conceivable, then, that a change in head posture that alters the UPPM

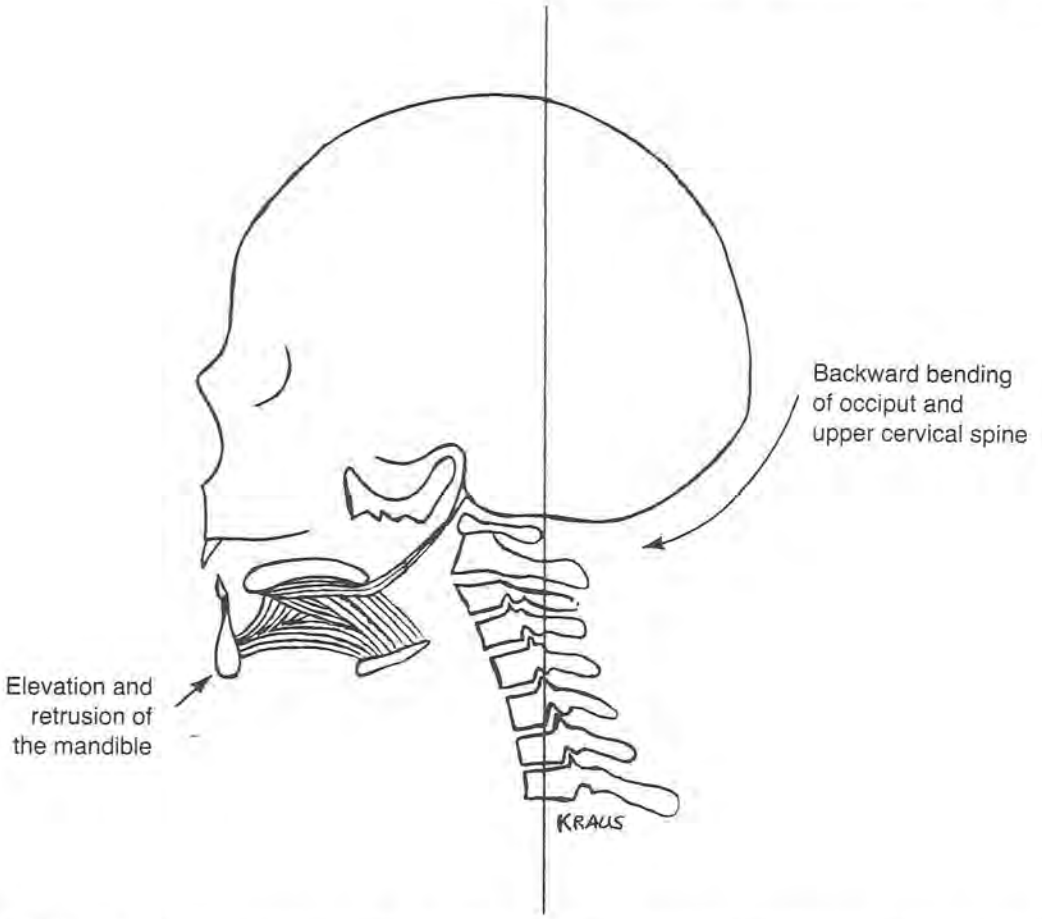

Fig. 4-2. FHP with a cutaway section of the mandible for easier viewing of the tongue and its muscles. The primary insertions of the extrinsic tongue muscles are to the styloid process and the anterior portion of the mandible. The arrows represent the proposed anatomic positional changes that occur secondary to FHP. The result is that the two points of insertion for the extrinsic muscles come closer together, thereby influencing the UPPT.

will in turn alter the TMJ receptors influencing genioglossus activity.

A second way in which head and neck position may alter genioglossus activity is through the tonic neck reflex. Extension of the head on the neck has been shown to produce an increase in genioglossus activity.[19] Backward bending (extension) of the head on the upper cervical spine occurs in the FHP (Fig. 4-2). Therefore, the previous discussion suggests that the FHP can cause an increase in genioglossus activity, either indirectly through the TMJ receptors or directly through the tonic neck reflex.

Cervical spine dysfunction (FHP) will result in the tongue lying on the floor of the mouth, with the tip of the tongue pressing against the posterior side of the anterior mandibular teeth.

Symptoms

Patients often are not aware of where they position their tongues until they are asked. When cervical spine dysfunction is present, the patient often states that his tongue is lying in the floor of his mouth with the tip of the tongue pressing against the back side

of his bottom teeth. Some patients, when asked to place the tongue up against the palate of the mouth (in the UPPT), may say that such a position feels awkward or difficult.

An altered tongue position contributes to symptoms of fullness or tightness in the floor of the mouth and/or the front of the neck. The pressing of the tongue against the teeth contributes to discomfort felt in the angle of the mandible. This discomfort is often mistaken for discomfort stemming from the TMJ. The reader can experience such discomfort by pressing the tip of the tongue against the front teeth for a period of time.

Maintaining the UPPT will keep the teeth out of the maximum intercuspated position. If the teeth were to come together, then the patient could not maintain the UPPT. Such a natural phenomenon of the tongue up and teeth apart is enhanced in the majority of patients by overbite, where the maxillary anterior central incisors overlap the mandibular anterior central incisors by approximately 1 to 1½ mm. If the patient maintains the correct UPPT, he must keep his teeth apart or he will either bite the tip of the tongue or move the tongue away from its upright postural position. Therefore an altered rest position of the tongue (usually in the floor of the mouth) secondary to cervical spine dysfunction allows the teeth to come together, resulting in hyperactivity of the elevator muscles of the mandible as observed clinically. Patients may then complain of myalgia of the mandibular muscles.

Finally, in the supine position, the tonic activity of the genioglossus is markedly increased.[20] This increased activity plays an important role in maintaining an open air passage in the oropharyngeal region in the supine position.[20] It is generally agreed that supine sleeping with proper support is best for the cervical spine. However, cervical spine dysfunction with or without proper cervical support influences the UPPT. To maintain an adequate airway, the patient may lie on his stomach in order to keep the tongue out of the oropharyngeal area. The prone-lying position, which places a great deal of stress on the cervical spine tissues, may produce or increase cervical symptoms. One way to discourage the prone-lying position is to maintain the tongue in its upright postural position, thereby maintaining an open airway. Training of the patient to maintain the UPPT will have to be done first during the conscious waking hours. Achieving good mobility and positioning of the cervical spine, educating the patient on the normal UPPT, and providing good cervical support at night will encourage supine and/or side-lying sleeping postures.

Swallowing

Although it is generally acknowledged that swallowing involves nearly all the muscles of the tongue, the muscles that seem to be of particular importance are the geniohyoid, the genioglossus, the mylohyoid, and the anterior digastric.[21] Of these four muscles, emphasis will be on the activity of the genioglossus. Swallowing or deglutition is the process by which a fluid or solid is passed from the mouth to the stomach. There are three stages of swallowing: oral, pharyngeal, and esophageal.[22] The oral stage is voluntary and involves the passage of the bolus to the fauces (the passage from the mouth to the pharynx). The other two stages of swallowing are involuntary. During a 24-hour period, we swallow subconsciously many times. The amount of subconscious swallowing added to the number of times we swallow during eating and drinking adds up to a significant amount of muscle activity even when done correctly.

The oral stage is the only stage of swallowing for which some documentation is available regarding the influence of positional changes of the head and neck. It is also the only stage over which we have conscious control in order to correct altered swallowing patterns. For these reasons, the oral stage will be the only stage covered.

During the normal oral stage of swallowing (Fig. 4-3), once the fluid or solid is in the mouth, the tip of the tongue moves forward and upward to contact the palatal mucosa behind the upper incisors.[23] Then, like a wave in the ocean, the tongue reaches the junction of the hard and soft palate.[24] At this point the oral stage of swallowing ends, with the tongue returning to its upright postural position.

Cervical Spine Influences

The UPPT has been described as the foundation of all swallowing movements.[24-26] Cervical spine influence on the UPPT has been discussed previously. Because the swallowing begins and ends in the

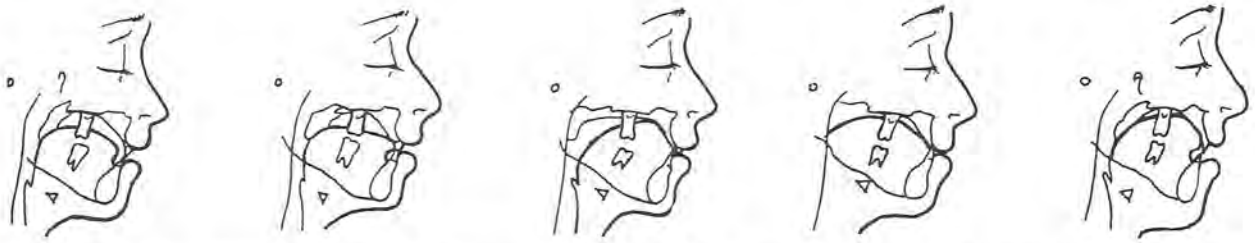

Fig. 4-3. Normal sequence of swallowing described in five stages. (From Kraus,[54] with permission.)

UPPT, the entire oral stage of swallowing will be altered in the presence of cervical spine dysfunction.

During an altered sequence of swallowing, the patient often will push the tip of the tongue off the back side of the upper or lower incisors. The tongue pressing anteriorly diminishes the effectiveness of the middle and posterior parts of the tongue in pressing up at the junction of the hard and soft palate. Continuation of an altered sequence of swallowing contributes to an increase in the duration of swallowing. The duration of normal swallowing ranges from 1.42 to 2.74 seconds.[27] It has been suggested that swallowing can occur with the teeth together or apart.[28] It is the author's belief that in the presence of good mobility and positioning of the cervical spine swallowing should occur without tooth contact. Cervical spine dysfunction, by causing the oral stage of swallowing to be altered, contributes to an increase in tooth-to-tooth contact time for each swallow. Tooth contact lasting for a longer duration contributes to muscle hyperactivity of the tongue and mandibular muscles.

In a recent study involving 12 normal subjects, significant measurements of the genioglossus were noted as subjects assumed the FHP.[29] The duration of conscious swallowing and maximal genioglossus EMG activity were significantly greater in the FHP.

To appreciate the influence of head posture on swallowing, simply look up and swallow. You will find it difficult to swallow. However, you may find it to be slightly easier to swallow if you press the tip of your tongue firmly against the back side of your upper or lower incisors. This tongue position of course encourages more dysfunction. Now bring your eyes level but exaggerate the FHP. Again you will find it to be more difficult to swallow correctly with the middle to posterior third of the tongue pressing against the palate of the mouth.

Symptoms

Symptoms associated with an altered sequence of swallowing secondary to cervical spine dysfunction will consist of difficulty in swallowing (food gets caught in the throat or there is a fullness in the throat) or tightness in the front of the neck. Discomfort in the angle of the mandible associated with an altered UPPT will be further increased. Secondary symptoms will be related to myalgia of the tongue and masticatory muscles. Some patients will feel as though their tongue is swollen. Patients may complain of biting their tongue because of the lack of coordination between tongue positioning, swallowing, and chewing.

Occlusion

Occlusion in dentistry refers to the way teeth meet, fit, come together, or touch. Much has been written about malocclusion of the natural teeth and the relationship between occlusion and myofascial pain and/or TMJ dysfunction.[11,30–32] The modification of occlusal relationships is regarded by some dentists as a specific and definitive treatment for muscle and TMJ involvement.[33,34] Some individuals consider occlusal modification to be specific treatment because it deals directly with the presumed etiologic factor, and definitive because it eliminates or corrects the occlusal problem. On the basis of this concept, some clinicians treat patients with muscle and TMJ involvement by altering the occlusion in various ways. Occlusal relationships may be altered by any one or a combination of techniques including

equilibration (selective grinding to modify the occlusion), orthodontics, or full-mouth reconstructions, to name a few.

The rationale behind altering the occlusion is based on several biomechanical hypotheses. Some believe that malocclusion causes displacement of the mandible, and that proper occlusal treatment allows repositioning of the mandible to its optimal position.[35,36] The other, more popular theory holds that malocclusion initiates neuromuscular reflexes of accommodative activity in the masticatory muscles. Such muscle activity in response to the malocclusion is suggested to lead to muscular fatigue and spasm.[37,38]

However, many individuals with obvious malocclusion have no dental, muscle, or joint complaints.[39,40] In fact, malocclusion is the rule rather than the exception. Because of this common observation a theory of physiologic versus pathologic of the occlusion has been espoused.[40] By definition,[40] a "physiologically acceptable occlusion is one free of patient complaints and recognizable pathological conditions, by the dentist, at the time of examination."

When to treat or not to treat the occlusion in the absence or, for that matter, the presence of symptoms becomes largely a clinical judgment. It has been shown that the same types of occlusal disharmonies are distributed equally among populations of patients with muscle and/or TMJ symptoms and randomly selected normal individuals.[41] It has also been shown that four out of five patients with muscle and/or TMJ symptoms are women; however, no consistent differences with respect to occlusion have been shown to exist between the sexes.[42]

When muscle and/or TMJ symptoms do appear, it becomes important for the dentist to use reversible treatments, for example, by utilizing an interocclusal appliance.[43,44] Other forms of treatment such as equilibration and orthodontics are irreversible. Interocclusal appliances must be designed, applied, and modified for each individual patient; otherwise orthodontic movement of the teeth can occur, which of course should be avoided in the symptomatic patient. It should be recognized that the patient's response to either occlusal adjustment or splint therapy is a complex interaction between the psychology of the patient, the type of treatment offered, and how the treatment may be influenced by other adjacent areas. Simply to suggest that a response by a patient to treatment of the occlusion, or for that matter of any dysfunctional problem, is a cause-and-effect phenomenon is not justified.[1,45]

With such differences in opinion as to the role of occlusion in producing symptoms, the dentist and physical therapist should be alert to other adjacent areas that influence how the teeth meet in maximum intercuspation. An area often overlooked by the clinician that may decrease the patient's ability to accommodate to a malocclusion is the cervical spine.[10,44] Treating patients with symptoms related to the muscle and/or the TMJ will require that more than just the occlusion be dealt with. To help the patient achieve a painfree functional physiologic adaptive range, treat not only the occlusion by reversible procedures but also those areas that influence the occlusion. One such area believed to influence how the teeth come into maximum intercuspation, is the cervical spine. There are of course other forms of malocclusions which are not a part of this discussion.

Cervical Spine Influences

How cervical spine dysfunction influences the occlusion can be understood by appreciating the influence the cervical spine has on the adaptive (habitual) arc of closure. The adaptive arc of closure is an arc directed by a conditioned reflex[40]: "The entire proprioceptive neuromuscular mechanism sets up the conditioned reflex and guides this arc of closure."[40]

What is obviously acknowledged by the dentist is that at one end of this arc is the occlusion. Ideally, the teeth should meet in maximum intercuspation as the mandibular teeth approach the maxillary teeth during closure. If any portion of a tooth or teeth makes contact prior to maximum intercuspation, this is considered a form of malocclusion. Such an interference or premature contact stimulates the mechanoreceptors of the periodontium (the tissues investing and supporting the teeth).[11] This in return causes abnormal recruitment of the muscles of mastication to reposition the mandible into a more favorable position as maximum intercuspation is approached.[11,44] The neuromuscular system, by positioning the mandible so as to avoid the interference, changes the adaptive arc of closure. A change

in the adaptive arc of closure occurs at the expense of additional muscle activity.[44] As previously suggested, when such interferences cannot be accommodated by the neuromuscular system, muscular symptoms develop. Muscle hyperactivity contributes to symptoms arising from the muscle and is also believed to be a cause of temporomandibular disorders.

However, what is often totally overlooked in this ordering of events is the other end of the adaptive arc of closure. The end of the arc from which jaw closure begins is the UPPM. Posselt has stated, "the conclusion that the rest position can generally be considered a position on the path of closing movement is almost self-suggestive."[46] Changes in cervical spine position (FHP) change the UPPM.[10] As Mohl stated regarding head and neck posture, ". . . we must logically conclude that, if rest position is altered by a change in head position, the habitual path of closure of the mandible must also be altered."[47] Cervical spine dysfunction may alter the arc of closure to maximum intercuspation.[10] Such a change in the path of closure will cause premature contacts of the teeth prior to maximum intercuspation. If premature contacts secondary to a malocclusion may eventually cause muscle and/or TMJ symptoms, premature contacts secondary to cervical spine dysfunction may also result in muscle and/or TMJ symptoms. The neuromuscular system will try to accommodate for such interferences. When such accommodative responses are exhausted and muscle and/or TMJ symptoms develop, the cervical spine needs to be evaluated and treated.

Symptoms

Symptoms will be those that have been attributed to a malocclusion (interferences prior to maximum intercuspation). A physiologic occlusion may be present, yet there is interference of the mandibular teeth approaching the maxillary teeth to maximum intercuspation. Such an interference may be secondary to cervical spine dysfunction and would actually be a pseudomalocclusion.[10] Clinically, a combination of malocclusion and a pseudomalocclusion is usually more common, thus complicating the clinical picture even more.

Bruxism is considered by some a symptom of malocclusion. Bruxism is the clenching or grinding of the teeth when the individual is not chewing or swallowing.[48] Bruxism has been implicated in producing a variety of symptoms such as headache, TMJ and myofascial pain, tooth mobility, and occlusal wear.[49] Bruxism has been associated with the presence of occlusal interferences.[11] Cervical spine influences may contribute to occlusal interferences as teeth come into contact and therefore bruxism. Other causes of bruxism (muscle hyperactivity) have been suggested to be related to daily stress and emotional tension.[50]

Patients may also complain of their "bite" (occlusion) being off. The dentist may not find any indication that this patient's complaint is related to the occlusion. In this case the patient's perception is of a pseudomalocclusion caused by cervical spine dysfunction. Some patients may feel they cannot get their supporting teeth together (usually in the molar region) on one or both sides even after an occlusal adjustment or during splint therapy. Again the cervical spine may be implicated.

If a patient is undergoing splint therapy with a dentist and is not responding, several factors may be involved:[10]

1. The splint is not indicated, but therapy to the cervical spine is.
2. The splint is indicated, but due to the degree of cervical spine dysfunction present, accommodation to the splint is not possible.
3. The splint may have helped, but the patient cannot be weaned off of the splint without his symptoms returning. The cervical spine again may be a factor in such a response.

TREATMENT

The physical therapist should always perform an evaluation of the cervical spine to determine if treatment is needed. The specifics of the evaluation are not within the scope of this chapter; the reader is referred to the bibliography.[51] The type of treatment of the cervical spine used to reduce its influence on the stomatognathic system is the same treatment offered for involvement of the cervical spine alone. Even if the patient does not complain of any of the symptoms of dysfunction of the stomatognathic system, instructing the patient on the normal function

of the stomatognathic system will enhance treatment of the cervical spine.

Awareness Exercises for the Stomatognathic System

The patient needs to be told what is normal jaw and tongue positioning at rest. First instruct the patient on the normal rest position of the tongue. The tongue should be up against the mouth, with the tip lightly touching, if at all, the back side of the upper central incisors (Fig. 4-1). Patients tend to overcompensate, so inform the patient not to press the tongue hard against the roof of the mouth.

The UPPM (rest position) is with the teeth apart. As was discussed earlier, if the patient's tongue is up and an overbite exists, the teeth will be apart. The patient should not be concerned with how far apart the teeth are. Inform the patient not to work hard at keeping the teeth apart ("Just let the jaw float"). Reassure the patient that the position with the tongue up and the teeth apart will become easier as the cervical spine dysfunction is treated.

Patients who have developed an altered sequence in swallowing secondary to cervical spine dysfunction will need to be instructed on the normal sequence in swallowing. Swallowing will be practiced with water. Inform the patient to practice swallowing with their teeth slightly apart.

In stage 1 (Fig. 4-3), the tongue drops from its normal rest position to allow water to enter into the mouth.

In stage 2, the tip of the tongue is directed to its rest position. Emphasize to the patient that no pressure should be felt from the tip of the tongue pressing upward or forward against the teeth.

In stage 3, the main force of swallowing occurs with the middle third (middle to posterior) of the tongue. From stage 2 to stage 3 the patient should feel the tongue moving like a wave in the ocean.

Stage 4 is essentially the end of stage 3, as the water is pressed into the pharynx, where involuntary control takes over.

Stage 5 is the completion of the swallowing cycle. The tongue is in its rest position and the teeth are apart.[52]

A pseudomalocclusion is treated by treating the cervical spine. The therapist should not dwell on the patient's perception of his occlusion too often after the initial evaluation. Occasionally asking the patient about how his bite feels is acceptable. Otherwise, the repeated mention of the bite, especially if the patient has a keen sense about the occlusion, may result in too much of an awareness by the patient. This is important to realize, because even after occlusal therapy malocclusion may still persist.

The awareness exercises should be practiced numerous times during the day. Awareness exercises must be practiced with good head and neck posture. If good head and neck posture cannot be achieved as yet, then the patient should practice with the existing head and neck posture at that time. Above all do not have the patient force a good head and neck posture.

SUMMARY

This chapter expresses clinical opinion about the influence of the cervical spine on key portions of the stomatognathic system, which are often not recognized by the clinician. By having an understanding of how the cervical spine influences the stomatognathic system, certain symptoms may be better understood.

The influence of the cervical spine on the TMJ has been covered indirectly. The cervical spine influences mandibular positioning and mobility, and thus indirectly the TMJ. Apart from symptoms related to minimal inflammation of the TMJ, the majority of cases of symptomatic capsular and intercapsular (disk-condyle derangements) involvement will more than likely require the use of an intraoral appliance from a dentist.[53] Where the cervical spine plays a key role in the treatment of a symptomatic TMJ is in the presence of muscle hyperactivity secondary to cervical spine dysfunction. In such cases the sequence and design of the intraoral appliance may need to be changed.[10]

Muscles of the stomatognathic system have been discussed only as needed, not to de-emphasize the importance of the muscles, because muscles are in fact the key to interrelating the cervical spine with

the stomatognathic system. The topic of cervical spine influence on muscle activity of the craniomandibular region has been covered in detail elsewhere.[10]

The symptoms discussed in this chapter are only those symptoms of the stomatognathic system secondary to cervical spine dysfunction; the reader should be alert to referred symptoms from the cervical spine to the stomatognathic system.[10]

Treatment of stomatognathic dysfunction is through patient education in the application of the awareness exercises. Of course, treatment of cervical spine dysfunction must also be offered. Involvement of the masticatory muscles and the TMJ beyond that responsive to physical therapy treatment requires consultation with a dentist.

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