Physiognomy in the Classification of Individuals With a Lateral Preference in Mastication

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Chronic habitual chewers usually present with a lack of passive laterotrusive range of mandibular motion at maximum intercuspation, and many have some form of mandibular asymmetry. This study attempted to discover mechanisms that may be responsible for this association and proposes a system by which such persons can be classified based on physiognomy and patterns of mandibular deviation. The influence of facial biotype and altered head posture on the selection of a preferred chewing side was also analyzed.
J OROFACIAL PAIN 1994;8:61–72.

The decision to chew is voluntary; however, as mastication progresses, it becomes an involuntary act that is dependent on complex central and peripheral neural mechanisms.[1] When bolus placement during mastication is performed consistently on either the right or left side of the dentition, it is commonly referred to as masticatory lateral preference.[2]

Using an electronic jaw-tracking system and computer software capable of complicated graphic and statistical analyses, Neill and Howell[3] found that 10% of their sample of 140 dentate British dental students exhibited a unilateral dominance to the same side throughout their mastication sequences. They defined "unilateral dominance" as a situation in which mastication was confined to one side of the mouth for more than 66.6% of the mastication sequence.

In a questionnaire survey on a nonpatient population, Tay et al[4] found that a similar proportion (9.45%) of the sample could be categorized as "chronic habitual unilateral chewers" (CHUCs), ie, as individuals who were very aware they masticated on one particular side either "a lot of the time" or "almost all the time" for as long as they could remember. In contrast, 53% of a temporomandibular disorder (TMD) patient population reported unilateral chewing at frequency levels corresponding to the CHUC category.[5]

A lateral preference in mastication could not be predicted from hand laterality and was believed to be mainly an expression of motivational chewing behavior.[2] Since habitual behaviors are largely a product of functional convenience as well as the avoidance of discomfort and pain, peripheral factors like the size and consistency of the ingested food, the character of the occlusal interface (eg, missing teeth, presence of occlusal interferences/crossbite/open bite, steepness of the anterior guidance, etc), and the presence of nociception in the pulpal, periodontal, and articular tissues doubtless play important roles.[6] Goodwin and Lushei[7] have also provided experimental evidence for the role of central factors in masticatory lateral preference. Their creation of a lesion in the trigeminal mesencephalic tract of primates resulted in a strong tendency for chewing on the opposite side. By comparison, not much is known about the role of head posture or facial form in the selection of a preferential chewing side.

In 1983, Lagaida and White[8] reported an interesting association between the high eye and the habitual chewing side in children and speculated that unilateral mastication could influence dentofacial formation. The present author's clinical observations and investigations on CHUCs over the past 7 years revealed that these individuals usually had some form of mandibular asymmetry at maximum intercuspation.

The following is a summary of an attempt to unravel the basic mechanisms responsible for the curious association between masticatory lateral preference and mandibular asymmetry. The paper discusses the possible roles of altered head posture and facial biotype in the selection of the preferential chewing side and proposes a system to classify CHUCs based on physiognomy and patterns of mandibular displacement.

Physiognomic Characteristics

If the postulation that a lateral preference in mastication in growing children could influence dentofacial formation[8] were true, then it should be possible to characterize adult CHUCs physiognomically. A simple visual system was thus developed to characterize these subjects based upon facial biotype, the presence and degree of head tilt, pattern of chin deviation, and other distinguishing features such as a deviated nasal septum and altered lip posture.

Facial Biotype

Little information on physiognomy could be found in the dental literature; however, history teaches that "Ming Xiang" (the art of face-reading) has its roots in Chinese culture. For the Chinese, the face not only revealed certain personality traits and the spirit of the person but also the past, present, and future.[9] Although the Chinese face reader describes 10 different frontal face shapes, these can be broadly grouped into the triangular, oval, and square forms, which roughly correspond to the dolichofacial, mesofacial, and brachyfacial molds described in orthodontic literature.

In addition to the frontal physiognomic classification, lateral and submentovertex (perpendicular to Frankfort plane) cephalometric views allow a better conceptualization and definition of facial biotype in three dimensions as follows:

1. Horizontal axis—dolichocephalic, mesocephalic, and brachycephalic
2. Vertical axis—Low, average, and high Frankfort mandibular angle (FMA)
3. Sagittal axis—Skeletal Class II, I, and III

From Fig 1 it can be clearly seen that the mesofacial (mesocephalic, Class I, average FMA), dolichofacial (dolichocephalic, Class II, high FMA), and brachyfacial (brachycephalic, Class III, low FMA) stereotypes represent only 3 of the possible 27 basic facial biotypes. A dolichocephalic Class III facial biotype, for example, is not an uncommon finding since there are more dolichocephalics than brachycephalics and more Class III malocclusions than Class II malocclusions in the local immigrant Southern Chinese population that was studied.[10,11]

Head Posture Evaluation

To assess standing orthoposture,[12,13] subjects were told to spin around with their eyes tightly closed until they felt disoriented. They were then instructed to alternately extend and flex their necks in progressively decreasing oscillations until they steadied in a position of equilibrium with respect to the horizon.

The presence of any significant head and shoulder tilt as well as the relation of the postural higher eye to the side of the chin deviation were noted together with other distinguishing characteristics such as a crooked nose and/or an upper lip droop. Subjects were then instructed to very slowly open the eyes, and the side with the narrower eye was

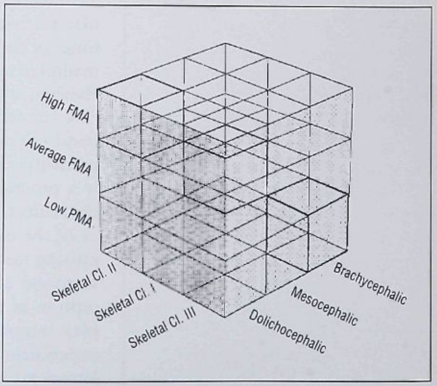

Fig 1 Classification of facial biotype.

Figs 2a and 2b Measuring the passive laterotrusive ROM from frenale: *(left)* MI (note frenale is not at the NUS point in this patient); *(right)* left maximum laterotrusion. (A = MI, B = NUS, C = frenale.)

noted. If the significantly narrower eye was opposite the side of chin deviation, it was referred to as exhibiting a positive "soft tissue drape" relationship. A negative "soft-tissue drape" relationship existed when the narrower eye was on the same side of the chin deviation.

Laterotrusive Range of Motion

Since CHUCs frequently exhibited some form of lateral jaw deviation at maximum intercuspation (MI), a novel technique for monitoring the mediolateral coordinate was devised to better qualify and quantify patterns of mandibular displacement.

Although previous researchers[14] measured the active laterotrusive range of motion (ROM) of the mandible against a constant landmark on the maxilla (eg, the maxillary labial frenum or upper dental midline) in calculating research norms for various population samples, it was found to be more clinically valuable to record the maximum left and right passive ROM from frenale (ie, the root of the mandibular labial frenum) using a triangular millimeter ruler (TMJ Trimeasure, Clinitec Dental, Irvine, CA) (Figs 2a and 2b).[15]

The positions of frenale at the left and right maximum passive laterotrusive ROM, at MI, and at the iatrogenic superior medial close-packed position (ISMCP; ie, centric relation as obtained via Dawson's bimanual jaw manipulation technique) were either marked on the labial surfaces of the maxillary teeth or on a transferable anterior jig.[16,17] The point of laterotrusive symmetry (navigational usage of symmetry [NUS] point) was then calculated and recorded. The details and diagnostic significance of this exercise have been described elsewhere.[16,18]

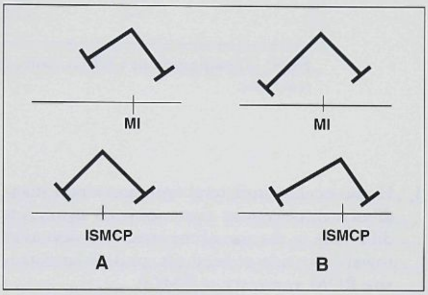

Fig 3 Schematic representation of mandible, as seen in SMV cephalogram, depicted against frontal measure of maximum laterotrusive ROM from frenale. A = mandibular horizontal displacement asymmetry; B = true mandibular structural asymmetry.

It is important to realize that a mandibular asymmetry observed at MI in the frontal plane could be the result of either a true mandibular structural asymmetry, a mandibular displacement asymmetry, or a combination of both mechanisms.[19] A mandibular horizontal displacement asymmetry may be diagnosed whenever the passive laterotrusive symmetry improves from MI to ISMCP, whereas a true mandibular structural asymmetry should be suspected whenever there is a lack of passive laterotrusive symmetry at ISMCP (Fig 3).[18]

Classification of CHUCs

CHUCs could now be classified into five broad descriptive categories based on physiognomy and characteristics of passive laterotrusive ROM (Fig 4):

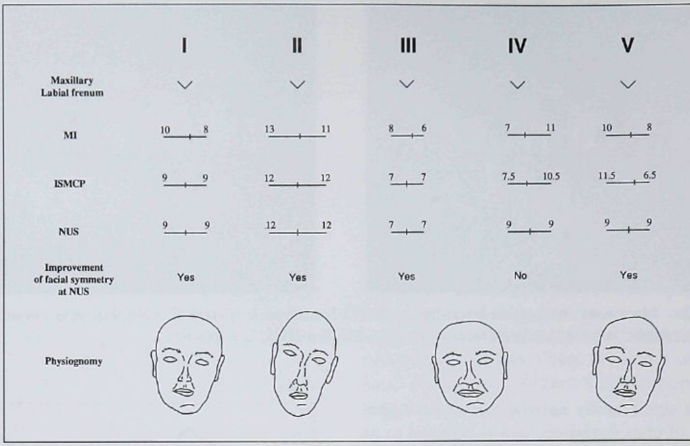

Fig 4 Classification of CHUCs (note: categories III and IV share the same physiognomic template).

1. Homo-ocular, ipsilateral-type horizontal mandibular displacement asymmetry: no significant difference in the size of the eyes, chin deviation toward the side of head tilt, passive laterotrusive ROM symmetry at ISMCP
2. Hetero-ocular, ipsilateral-type horizontal mandibular displacement asymmetry: significant difference in the size of the eyes, chin deviation opposite the narrower eye, narrower eye posturally higher, passive laterotrusive ROM symmetry at ISMCP
3. Hetero-ocular, contralateral-type horizontal mandibular displacement asymmetry: significant difference in size of eyes, chin deviation opposite narrower eye, narrower eye posturally lower (head tilt may be insignificant), passive laterotrusive ROM symmetry at ISMCP
4. Hetero-ocular, contralateral-type true mandibular structural asymmetry: significant difference in the size of the eyes, chin deviation opposite the narrower eye, head tilt usually insignificant, lack of passive laterotrusive ROM symmetry at ISMCP, usually some form of anterior/posterior crossbite/open-bite present
5. Hetero-ocular, reverse drape, true mandibular structural asymmetry: significant difference in size of eyes, chin deviation toward side of narrower eye, passive laterotrusive symmetry, ROM worsening from MI to ISMCP, lack of passive laterotrusive ROM symmetry at ISMCP

Methods of Subclassification

These CHUCs can be further subdivided according to the magnitude of the total (left + right) laterotrusive ROM. The mean total laterotrusive ROM of asymptomatic adult ethnic Chinese subjects was 17.9 mm (SD = 3.3 mm).[20] It was thus reasonable to further divide the CHUCs into three groups based on the magnitude of this measure:

1. < 15 mm
2. 15 to 21 mm
3. > 21 mm

Electrognathics

Although "unilateral dominance" has been defined as where mastication is confined to one side of the mouth for more than 66.6% of a masticatory sequence, some individuals have been found in whom mastication has been electrognathically shown to be confined to one side of the mouth for more than 95% of the chewing sequence when averaged over three different test foods.[20] These individuals are referred to as obligate unilateral chewers.

SMV Analysis

Using the Lew-Tay SMV cephalometric analysis,[21]

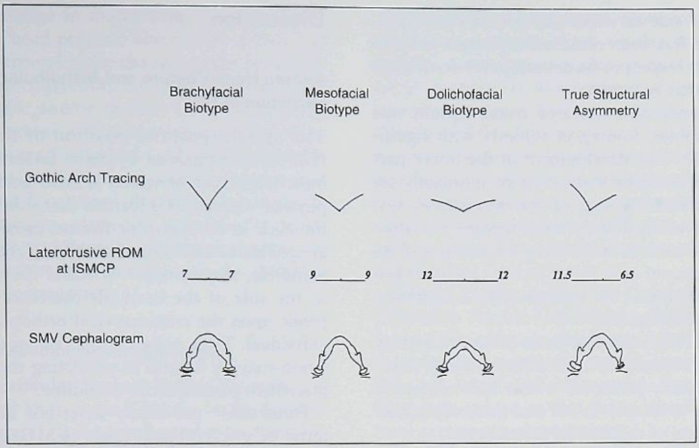

Fig 5 Typical laterotrusive ROM, graphic tracing, and condylar morphology in the different facial biotypes.

CHUCs can be further subdivided according to their condylar morphology and condylar interaxes angulation.

Graphic Tracings

Central bearing point tracings can also be used diagnostically to subclassify these individuals. The length, shape, and symmetry of the gothic arches traced by the sagittal pin in the different facial types are shown in Fig 5.

NUS Point

Further, it was important to note whether there was a general improvement in facial symmetry when the mandible was repositioned such that frenal was at the NUS point.

Clinical Observations and Associations

Although it was never clarified whether the high eye described by the Lagaida and White[8] referred to an actual superior displacement of the bony orbital cavity or merely to a higher eye position secondary to head orthoposture, the CHUCs in the present study were generally found to prefer the side of the "postural" high eye whenever there was significant head tilt. Class III individuals and those with dolichocephalic features tended to exhibit more head tilt compared to their Class II and/or brachycephalic counterparts.

The association between the postural high eye and the preferential chewing side was weaker, however, in the structural asymmetry physiognomic categories where the presence and location of the malocclusion (eg, crossbite, open bite, nonworking side interferences) and/or degenerative joint disease seem to play a more important role in the selection of the mastication side.

Chin deviation, when present, can either be in an ipsilateral or contralateral relationship to the head tilt. Hetero-ocular, ipsilateral-type mandibular displacement asymmetry physiognomy was found to be more associated with dolichocephalic CHUCs, and brachycephalic biotypes were overrepresented in the hetero-ocular contralateral-type mandibular displacement asymmetry and the hetero-ocular contralateral-type true mandibular structural asymmetry categories.

Some CHUCs, especially those who reported unilateral chewing since childhood, tended also to exhibit a noticeable difference in the size of their eyes. Alert orthodontists may have encountered this positive soft tissue drape phenomenon when treating growing children with lateral orthopedic mandibular repositioning appliances.[16] The eye opposite the side to which the jaw was iatrogenically moved has been observed in certain cases to narrow with respect to its counterpart—sometimes within a matter of weeks.

The presence of a deviated nasal septum was another common finding in subjects with significant head tilt. The development of the lower part of the nasal complex seemed to be intimately related to the development of the masticatory system. The lower third of the nasal septum was often found to be parallel with the plumb-line, and its vertical alignment may prove to be a useful radiographic landmark in the orthopostural orientation of frontal cephalograms.[23]

Some CHUCs, especially those without a history of extensive restorative work or orthodontic intervention, typically presented with a lack of passive laterotrusive symmetry at MI and generally exhibited some form of dentofacial asymmetry.

The CHUCs exhibiting true mandibular structural asymmetries (ie, those with radiographic evidence of significant length discrepancies[24–26] in the ramus and/or corpus) usually have asymmetric gothic arch tracings that reflect the presence of asymmetric kinematic rotational centers.

The CHUCs who exhibited total laterotrusive ROM greater than 21 mm tended to have dolichocephalic features, and those exhibiting total laterotrusive ROM less than 15 mm tended to have brachycephalic characteristics. It was interesting, however, that CHUCs exhibiting total laterotrusive ROM greater than 21 mm and those with dolichocephalic features both tended to masticate on the side with the larger maximum passive ROM, whereas subjects exhibiting a total laterotrusive ROM less than 15 mm and/or possessing brachycephalic features usually preferred the side with the shorter maximum ROM.

In the case of obligate unilateral chewers, a distinct difference in the morphology and angulation of the condyles with respect to the intermeatal plane can be observed in the submento-vertex cephalogram.[21] One side (usually the mastication side) tends to be longer, more barrel-shaped, and flatter in orientation, and the other might be more elliptical and more angulated. The significance of these remodelling changes has been discussed previously.[27]

For most CHUCs, even those in the hetero-ocular reverse drape true mandibular structural asymmetry category, facial symmetry improved when the mandible was repositioned such that frenale was at the NUS point. Only those CHUCs in the hetero-ocular contralateral-type true mandibular structural asymmetry did not symmetricalize at the the NUS point.

Discussion

Altered Head Posture and Mandibular Deviation at MI

The upright postural position of the mandible (UPPM) is influenced by many factors, one of the most important of which is head posture.[28] From physical therapy, it is learned that side flexion with the neck in extension or flexion usually results in an ipsilateral and contralateral displacement of the mandible, respectively.[29] Whether the jaw deviates to the side of the head tilt therefore largely depends upon the craniocervical orthoposture of the individual. Thus, values in the craniocervical angulation may be helpful in predicting the lateral displacement pattern of the mandible.[30,31]

Funakoshi[32] previously described different patterns of electromyographic (EMG) response to altered head posture. In dentofacial development, the influences of postural activity of the soft tissue have been found to be more important than the effects of muscle contraction and jaw movements.[33] It is speculated that the EMG categories are somehow linked to these physiognomic categories. The hetero-ocular ipsilateral-type mandibular displacement asymmetry physiognomy, for instance, may be the growth or skeletal unit[34] end result of a particular pattern of postural muscle activity associated with an unbalanced ipsilateral-type EMG response to altered head posture.

Funakoshi showed how the introduction of experimental occlusal prematurities affected the EMG readings. He also elegantly demonstrated that simple occlusal therapy could symmetricalize or convert an unbalanced EMG response pattern of the postural masticatory and accessory masticatory musculature into a balanced one. The implications if such symmetricalization occurred during, as opposed to after, the growth phase are unclear.

Others working in the field of complete dentures have observed a tendency for the jaw to deviate to the side of posterior vertical dimension loss in skeletal Class III and I patients and to the contralateral side in the skeletal class II patient.[35] They also reported a compensatory head tilt in the same direction, as if to balance the lateral mandibular shift. This was usually marked in the large and heavy Class III jaw, moderate in the Class I jaw, and insignificant in the smaller Class II jaw. Such researchers believe that the restoration of the (unilateral) loss in posterior vertical dimension and the correction of the midline alignment would automatically reestablish the original upright head posture.[35]

There is already some indirect evidence that an iatrogenic change in mandibular posture could alter existing head posture. The present author has documented frontal plane changes in the head posture of some patients, especially those with dolichocephalic and/or skeletal Class III features, after mediolateral jaw repositioning. Secondary responses in craniocervical orthoposture in the sagittal plane resulting from anteroposterior jaw repositioning have been described by others.[36] There is, however, a need to scientifically verify whether these craniocervical postural changes are predictable or as significant in all the different physiognomic categories.

Patterns of Mandibular Displacement

Altered Mandibular Posture During Growth. It is speculated that those CHUCs in the hetero-ocular ipsilateral- and contralateral-type mandibular displacement asymmetry physiognomic categories who exhibited positive soft tissue drape relationships were individuals who developed an altered mandibular position in consequence to a sustained alteration of the lateral craniocervical posture (eg, scoliosis or congenital torticollis[23,29]). The form-function interaction includes not only the effects of active movement but also the long-lasting effects of the soft tissues on the developing skeletal and dental structures. Soft-tissue stretching has been proposed as a possible control factor in morphogenesis by Solow and Kreiborg.[37]

Mongini and Schmid[38] believed that an uncorrected mandibular displacement asymmetry during growth secondary to occlusal factors could develop into true mandibular structural asymmetry, but they did not functionally differentiate these entities according to laterotrusive symmetry or physiognomy. The success of functional orthopedic therapy in growing children is based upon such an assumption. The classification of these secondary adjustive variants is shown in Table 1.

There could be diagnostic problems sometimes since these patients share similar features with CHUCs in the hetero-ocular ipsilateral-type horizontal mandibular displacement asymmetry physiognomic category and present with passive laterotrusive ROM symmetry at ISMCP despite the fact that the length discrepancy between the rami may be quite apparent on the orthopantomogram. It must be reemphasized that the present laterotrusive ROM measurements at MI versus ISMCP can only disclose horizontal displacements of the mandible.

Defect in the Adjustive Condylar Growth Capability During Childhood. Individuals diagnosed with arthrosis deformans juvenile[39] or early condylar fractures[40] and certain congenital disorders (eg, hemifacial microsomia) usually develop the hetero-ocular reverse drape mandibular structural asymmetry physiognomy.

In the two former conditions, the diminished "adjustive" growth of the ramus is probably related to the injury or destruction of the condylar cartilage during childhood.[41] Although ramus length discrepancies are commonly seen on the radiographs, corpus length differences are evident only in cases where trauma or injury to the condylar cartilage had occurred in very early childhood. This is consistent with the idea that corpus development is derived from the posterior relocation of the ramus during growth remodelling. These true mandibular structural asymmetries are classified as secondary maladjustive variants. (Table 1).

Facial symmetry, however, improved when the mandible was repositioned to the point of passive laterotrusive symmetry (the NUS point). This was because essentially normal soft tissue was involved. The normalization of the patient's postural muscle vectors could be expected once the jaw was encouraged to function from an UPPM conditioned by the reorganization of MI at the NUS point. In the presence of occlusal stability, there is

Table 1 Classification of Mandibular Asymmetry

	Radiographic evidence	Presence of laterotrusive symmetry at MI	Presence of laterotrusive symmetry at ISMCP	Improvement in facial symmetry at NUS point
Mandibular horizontal displacement asymmetry	No	No	Yes	Yes
True mandibular structural asymmetry				
Primary (autonomous)	Yes	No	No	No
Secondary (adjustive)	Yes	No	Yes	Yes
Secondary (maladjustive)	Yes	No	No	Yes

ample evidence[42,43] that the mandible can function adequately even without a condylar fulcrum.

Hemifacial microsomia is an example of a congenital condition attributed to the early loss of neural crest cells whereby the primary disturbance lies in the soft tissue on the affected side of the face, usually in the area of the mandibular ramus and external ear. Nevertheless, functional appliance therapy instituted at an early age has been shown to be effective in obtaining some development of the soft tissue or at least in stretching the soft tissues for a better surgical result.[44]

Hemimandibular Elongation. Excessive and/or uncontrolled unilateral growth activity in the condylar fibrocartilage may also result in mandibular deviation in conjunction with contralateral crossbites and/or ipsilateral open-bites. (Hemimandibular hyperplasia is a rare occurrence in comparison to hemimandibular elongation.[45]) Accordingly, one would not expect an improvement in facial symmetry even if the mandible was repositioned to the NUS point. These true mandibular structural asymmetries have been classified as primary autonomous variants (Table 1).

Severe cases should be managed orthognathically. To maintain a symmetrical arch form for esthetic lip support, two-jaw surgery with the aim of shifting the pogonion to the NUS point must be considered.[18] Occlusal plane correction as well as the removal of the condylar growth center (if still active) are the other important considerations.[45]

Mandibular Displacement Occurring After Completion of Growth. The CHUCs with homoocular ipsilateral-type horizontal mandibular displacement asymmetry usually exhibit no significant difference in the size of their eyes. It is believed that these are individuals in whom there is no asymmetrical mandibular displacement during growth and facial development proceeded without event. Thus, any alteration in head posture probably occurred after maturity as a secondary response to, rather than a cause of, the lateral jaw displacement. Craniocervical posture in this physiognomic category might therefore be more amendable to correction, and it is believed that its maintenance may be facilitated by mandibular repositioning to the NUS point.

Lack of Passive Laterotrusive Symmetry at MI

The most common mastication pattern is quadriphasic or teardrop-shaped when viewed in the frontal plane. In common sequencing,[46] the mandible moves downward during the opening phase and then deviates to the side of the bolus during the closing phase. This basic, repetitious, and ordered pattern of masticatory muscle contraction is provided by a programmed neural pattern generator[47] as well as reflexes that control the magnitudes of lateral and dorsoventral deviations during a chewing cycle. If the influence of the occlusal interface was negated (eg, via the employment of a flat full-coverage occlusal splint), head posture and intrinsic factors (such as facial form, muscle quality, and characteristics of the individual's central pattern generator) become the primary factors determining the shape of the movement pattern in empty mouth mastication.

If head posture is kept constant, it can be seen that there will be greater opportunity for tooth contact on the side of the larger lateral ROM by merely coordinating MI asymmetrically (Fig 6). (Patients who were not originally CHUCs, but have been "finished" more than 1.5 mm away from the NUS point, will consistently favor the side with the larger laterotrusive range.) This can be readily observed in dolichocephalic patients with skeletal Class III jaw relationships. Indirect support for this postulation could also be found in Proschel's work.[48]

This simplistic model does help to partly explain why CHUCs so often present with an absence of symmetry in their laterotrusive ROM at MI. Interestingly, individuals who profess to be bilateral chewers but present with, for example, heteroocular reverse drape true mandibular structural asymmetry were found to have their MI within 0.5 mm of the NUS point.

Brachycephalic vs Dolichocephalic CHUCs

The masticatory stroke comprises both chopping and grinding movements. Brachycephalics typically

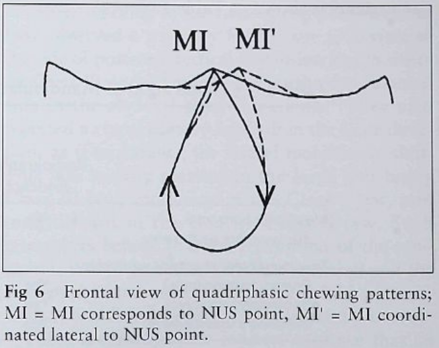

Fig 6 Frontal view of quadriphasic chewing patterns; MI = MI corresponds to NUS point, MI' = MI coordinated lateral to NUS point.

masticate in a verticalized "chopping" fashion and dolichocephalics tend to exhibit a more horizontal "grinding" pattern. The orientation of the pterygomasseteric sling and lateral pterygoid musculature is significantly different in the above facial forms.[49] The dolichocephalic individual is laterotrusively efficient whereas the brachycephalic subject is laterotrusively inefficient.

From the resolution of the medial pterygoid vectors, it can be appreciated that the vertical biting force in the dolichocephalic person is very much weaker than that in the brachycephalic subject. Thus, in the presence of head tilt, the compensatory ipsilateral mandibular movement commonly observed in the dolichocephalic individual would further weaken the vertical vector on the ipsilateral side but strengthen that on the contralateral side (Fig 7). It seems reasonable to believe the dolichocephalic child in such a situation would serendipitously select the side of the postural high eye whenever he encounters a resistant bolus of food. This, as previously discussed, happens to be on the side with the larger laterotrusive range.

Brachycephalic CHUCs, on the other hand, show much less head tilt than their dolichocephalic counterparts (Fig 4, III). The typical contralateral mandibular displacement pattern exhibited by brachycephalic CHUCs brings the side of the postural higher eye into a more lateral position from which it can more easily make grinding movements. The side selected by the brachycephalic CHUC exhibiting unbalanced contralateral-type mandibular displacement asymmetry would usually be that with the shorter laterotrusive range.

It is postulated that in the presence of altered head posture, the preferential chewing side in the dolichocephalic was selected because of the differential improvement in crushing capability. In the laterotrusively inefficient brachycephalic, one side was favored because of the comparative improvement in grinding capability.

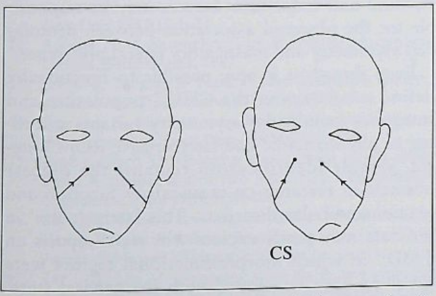

Fig 7 Relationship between postural high eye and preferential chewing side in dolichocephalic CHUCs.

True Structural Mandibular Asymmetries

Most CHUCs, particularly the obligate unilateral chewer, fall under this category. As was earlier discussed, they usually possess identifiable morphologic and positional adaptations in the TMJ complex.[27] The difference in the condylar polar angulations between the sides may be responsible for the lack of laterotrusive symmetry at ISMCP.

Head posture did not seem to be as important a factor in the selection of the mastication side in these categories as, perhaps, occlusal table factors (eg, crossbite/open bite/occlusal interferences) or childhood degenerative joint disease. Reversed sequencing[46] was commonly seen in CHUCs with hetero-ocular contralateral-type true mandibular structural asymmetry. Patients classically diagnosed as having "condylar hyperplasia" or, more specifically, hemimandibular elongation will usually come under the hetero-ocular contralateral-type mandibular structural asymmetry category.

The lack of symmetry in the midsagittal gothic arch tracings is pathognomonic of individuals with true mandibular structural asymmetry and reveals the presence of asymmetric kinematic rotation centers. The clinical significance of the latter is discussed elsewhere.[18]

Association With TMD

It is a common clinical finding that patients with TMJ complaints usually prefer to masticate on the more painful side.[50] Masticatory movements in subjects with severe TMJ impairment tend to deviate toward the lesion side and are generally more restricted. These characteristic movement patterns appear to be adaptive responses that allow the masticatory task to be performed in the least damaging and painful manner.[51] Some clues as to why the dysfunctional side is selected may be found in research. Replicator studies[52] have shown that the working-side condyle performed movements that are considerably shorter than its nonworking counterpart, and the results of primate experiments[53] support the idea that the working-side condyle was less subjected to biomechanical loads than its counterpart.

In a questionnaire survey on a nonpatient population,[4] positive associations were found between the subject's awareness of a unilateral chewing habit and complaints of "noises from the joints," "difficulty in opening the mouth wide," "an uncomfortable bite," "soreness in the teeth," "painful cheek muscles," "pain in the temples," "tension in the muscles of the face and jaws," and/or "neck pains."

Although the observed alterations in the parameters of mastication seen in TMD patients are likely direct consequences of TMJ and/or muscle dysfunction, this still does not eliminate the possibility that chronic habitual unilateral chewing during growth may predispose these individuals to develop certain intracapsular joint dysfunctions such as internal derangements. Some hold the view that TMDs are mere extensions of growth[54] and postural disturbances[36] that began very early in life.

A clinical impression is gained that CHUCs will generally be asymptomatic so long as they can go on functioning on their habitual chewing side. It must be assumed that the condylar form that developed during growth was the best morphofunctional option for that particular pattern of jaw function.[34] Trouble usually begins when circumstances (eg, pulpitis, periodontitis, loss of posterior teeth, or some form of iatrogenic orthodontic or prosthodontic intervention) force them to masticate on their uncharacteristic side. Thus, if an adult patient presents with a significantly narrower eye on the side of mandibular deviation, one should either rule out a hetero-ocular reverse drape true mandibular structural asymmetry or at least be aware the lateral mandibular deviation could be iatrogenically caused and that the latter may have been a rather recent development.

A Reduction in the Posterior-Lateral Joint Buffer Space. It is hypothesized that the maximum lateral range at MI is a convenient frontal plane measure that reflected the amount of functional posterior-lateral joint buffer space demanded by the functional masticatory jaw movement pattern habitually exhibited by the individual during growth.[16] As a clinical rule of thumb, whenever there is an asymmetry in laterotrusive range at MI, the CHUC patient should be advised not to switch from the side that has been preferred since childhood or else to favor the longer side (ie, the side with the larger posterolateral TMJ buffer space).

The risky combination of lateroretrusive tooth inclines[55] and reduced posterolateral joint buffer space found (usually on the side to which the mandible deviates) in subjects exhibiting a wide horizontal mastication pattern or parafunctional habits may explain the close association reported in the literature between posterior condylar position and TMJ internal derangements.[56–58]

Association With Lateral Centric Slides. The association of lateral centric slides with TMD has been frequently reported in the literature.[59–62] The present author and others[63] maintain that these asymmetric centric slides are more likely the effect of childhood TMD rather than its cause.

CHUCs in the hetero-ocular reverse drape true mandibular structural asymmetry category usually had some radiographic evidence of TMJ degeneration and more often than not experienced some discomfort or pain when forcefully verified using Dawson's bimanual jaw manipulation technique.[18,64] There was a lack of passive laterotrusive ROM at ISMCP although the affected condyle usually adopted a more anterior position at MI when compared to the opposite condyle. These variations in condylar position can be easily appreciated on cephalometrically oriented lateral-oblique transcranial radiographs.

Weinberg[65] was probably describing this very group of patients when he introduced the concept of a Dysfunctional Centric (situations when the documented condylar position in TMJ radiographs did not correlate with the mandibular deflection found clinically, Fig 3). It is believed that CR rehabilitation techniques should be contraindicated, both from a biologic and convenience perspective, whenever there is a lack of passive laterotrusive ROM symmetry at ISMC.[16,18]

Furthermore, some authorities[66] are of the view that TMJ degeneration is the principle cause of both acquired facial skeleton remodelling and unstable occlusion in patients with intact dentition and without previous mandibular fracture. Perhaps it is time that the conspicuous lack of symmetry in jaw function and dentofacial morphology be considered one of the key signs of TMD.

Conclusion

Postural and facial form factors may be responsible for the observed association between dentofacial asymmetry and masticatory lateral preference.

Even though it is now possible to functionally define subgroups in the CHUC population and categorize mandibular asymmetry variants according to physiognomic and laterotrusive ROM criteria, sample identification remains the biggest obstacle in research on masticatory function and craniomandibular disorders. This latent 'noise' in the data may partly explain why most reports on TMD[67] in which morphofunctional factors were involved have concluded with the general statement that "no significant difference could be found between control and test populations."

Knowledge of subjects is important, for only through tightly controlled prospective studies can a better understanding of the unilateral mastication phenomenon be gained. Further research is necessary to accurately work out the specific roles played by peripheral and central factors in each situation, identify those patterns that are modifiable, and/or predict, with some reliability, the extent to which the latter can be accomplished.

Acknowledgments

The author wishes to express his thanks to Miss Tan Siew Hong for her assistance in the preparation of the illustrations and to Michael Lim, BDS, MDS for critically reviewing the manuscript.

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Resumen

La fisionomía en la clasificación de individuos cuya masticación es preferentemente lateral.

Las personas que mastican habitual y crónicamente carecen usualmente del radio de acción laterotrusivo pasivo en los movimientos mandibulares en la intercuspidación máxima, y pueden tener algún tipo de asimetría mandibular. Este estudio intentó descubrir mecanismos que puedan ser responsables de esta asociación, y propone un sistema por medio del cual tales personas pueden ser clasificadas basados en la fisionomía y los patrones de desviación mandibular. Se analiza también la influencia del biotipo facial y la posición cefálica alterada en la selección del lado preferido para efectuar la masticación.

Zusammenfassung

Die Bedeutung der Physiognomie in der Einteilung von Individuen mit einer bevorzugten Kauseite.

Die Kaubewegungen von Individuen, die habituell auf einer Seite kauen, haben oft einen fehlenden passiven laterotrusiven Anteil in die maximale Interkuspidation. Viele dieser Individuen weisen auch eine Unterkieferasymmetrie auf. Diese Studie versuchte den Mechanismus herauszufinden, der für diese Zusammenhänge verantwortlich sein könnte und schlägt ein System vor, mit Hilfe dessen solche Personen aufgrund ihrer Physiognomie und Muster der Unterkieferbewegungsabweichungen klassifiziert werden könnten. Der Einfluss des facialen Biotypus und der veränderten Kopfhaltung auf die Wahl der bevorzugten Kauseite wird ebenso analysiert.