Management of Craniomandibular Disorders. Part II: Clinical Assessment of Patients With Craniocervical Dysfunction

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Comprehensive evaluation of mandibular function requires a broader assessment of the head, neck, and jaws than is normally performed. Examining only the teeth and periodontium will fail to assess problems in muscles and joints, which should be considered in the management plan. Recognition of function-related symptoms is important in the prediction of treatment outcomes. Stress-induced muscle tension and traumatic oral habits may be linked with reported symptoms of headache, earache, and temporomandibular joint problems, and the significance of these symptoms should be assessed through detailed clinical examination.
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A comprehensive patient history should give a composite picture of the patient's presenting problem, describe past and present health status (which may bear on a recurrent musculoskeletal problem), indicate how the status may be managed, and provide an insight into the individual's psychological makeup. To obtain essential information in an organized sequence, a history form is preferred.[1–6] Bell[7,8] considered that the questionnaire form is not appropriate, as it does not provide a succinct history; he did acknowledge that it is useful as a guide for what data should be obtained. However, the present authors have developed and use several forms as a means of following a structured approach to clinical assessment and comprehensively documenting general health, craniocervical status, and orofacial assessment (see Questionnaire).

A craniocervical questionnaire may be incorporated into the general medical history questionnaire. If the patient positively answers any of the questions, further specific details of onset, duration, character, and severity of the symptoms may then be obtained at consultation.

General Features

Considerations of the following general features will help in a comprehensive assessment of each patient.

Gait

Observation of the patient on entering the clinic may indicate abnormalities in posture and movement, and the character of the gait may be assessed and correlated with body posture and symmetry.

Body Posture

A healthy adult should stand straight with a slight kyphosis (posterior rounding of the thoracic spine) and lordosis (anterior rounding of lumbar spine), but with the head erect and feet centered under the body. The subject should sit with a basically straight back with the weight centered over the buttocks and with the head erect. Children and the elderly show postural variations. Spinal deviations such as scoliosis (lateral curvature of spine), kyphosis (flexion of spine), or lordosis (swayback) will produce abnormal posture and altered movement. Patients with chronic musculoskeletal pain will develop stooped postures, which possibly help them manage their pain. A sagittal view of posture may indicate erect, slouched, or deviated form and the presence of swaybacked, hunched, or rounded shoulders.

Body Symmetry

Minor variations in body symmetry are common, and the hands, arms, legs, feet, trunk, face, and head are generally similar bilaterally. More significant variations may indicate neurologic or muscular disturbances. Unilateral or bilateral abnormalities in skeletal relationships that may cause chronic myalgia similar to that evoked by temporomandibular (TMJ) joint and cervical dysfunction should be identified. Such skeletal relationships, if not correctly managed, may result in continuation of somatic pain following apparently successful treatment of TMJ and cervical pain.[9]

To assess body symmetry, patients are requested to stand upright without shoes and look straight ahead while the clinician observes and records details of:

1. Head position in relation to the shoulders
2. Eye and eyebrow level
3. Shoulder height
4. Hip level
5. Leg length

Patient Examination

Muscle Examination

Palpation of jaw and neck muscles is considered to be important in clinical analysis.[10–12] Under normal circumstances, jaw muscles are not tender to careful but firm palpation.[10–12] The presence of tender zones or trigger points indicates possible inflammation at the site. There are many causes of such pain[13] and jaw muscles have been shown[14,15] to refer pain to characteristic superficial extraoral and intraoral sites. Muscle palpation is carried out for several reasons[16]:

1. To allow detection of areas that may be associated with abnormal masticatory function
2. To allow confirmation and evaluation of sites that have been described by the patient as uncomfortable, tender, or painful
3. To be a possible aid in differential diagnosis and to possibly allow evaluation of treatment progress

Examination of orofacial musculature includes examination of the lips, tongue, swallowing, speech, head posture during speech, and habits. Habits may include chewing gum or biting fingernails, pipe stems, lips, or tongue, which may result in muscle fatigue and possible development of torque forces that may place excessive loads on TMJ structures. Pressure resulting from improper sleeping posture, such as stomach sleeping, may be detrimental, as may poor jaw and/or head posture in playing musical instruments. Hobbies such as rifle shooting, archery, singing, and playing a string or wind instrument may also overload jaw and neck muscles. Determining details of habits and hobbies adds to the psychometric assessment of the patient and to the complex of presenting symptoms.

Since pain and muscle tenderness are often unilateral,[5,17] one side of the patient may be used as a control with which to compare the degree of pain and dysfunction of the other side. An assessment of location and pain severity is made from questioning and observation. The patient's reaction may be a useful guide to the degree of pain and is obtained by observing the eyes for movement, pupillary response—dilation or constriction, and blinking as well as noting any changes in facial expression and body movement. To more objectively assess each patient's reaction, pain evoked by palpation may be graded on a linear analogue scale where 0 is no pain and 10 is very severe pain. Systematic muscle palpation has been an established clinical assessment procedure.[10–16] However, standardizing the procedure has been emphasized by Dworkin and coworkers[12,15] to ensure reliability of this and other clinical assessment procedures. This is essential in diagnosis and treatment planning. The need to avoid overtreatment is an ever-present concern and can be minimized by ensuring standardization of clinical procedure.

Examination of TMJs

Temporomandibular joints are readily palpated with

Questionnaire: General Health, Pain, and Dysfunction

SURNAME: _____

OTHER NAMES: _____

ADDRESS: _____

TELEPHONE NO: _____ M/F _____

DATE OF BIRTH: _____

1. HISTORY

General Health

a) Have you had the following? Arthritis, Osteoarthritis, Rheumatoid arthritis, Sinus infection, Ear infection, Swollen glands, Blood vessel disease.

b) Do you have frequent headaches? What area of the head?
How long do they last?
Migraine?

c) Have you ever had a severe blow to the head, or had a whiplash injury? What part of head?
Date:

d) Have you ever suffered nutritional deficiencies?

e) Ulcers?

f) Do you regularly take any medication? Yes. No.
Which?

g) Are you allergic to any medication? Yes. No.
Which?

h) If you have any other current non-dental problems or diseases please describe them.

i) If you have any emotional problems regarding your teeth or jaws, please describe them.

j) Please indicate anything else about yourself that you suspect may be related to your condition.

2. CHIEF COMPLAINT

a) What is the main problem that brings you here?

b) Did this problem begin suddenly or gradually? (circle one).

c) Date of onset.

d) How long have you been bothered by this problem?
Years Months

e) The area of onset?

f) Do symptoms affect one or both sides? Right Left Both If both, which side seems most affected?

3. PAIN SYMPTOMS

a) Do you have pain in the following areas? Please circle R for Right and L for Left side.

a.	joint	R	L
b.	vertex occipital (base of skull)	R	L
c.	ear inside the ear	R	L
	in front of the ear	R	L
	ear lobes tender swollen	R	L
d.	upper teeth or jaw	R	L
e.	lower teeth or jaw	R	L
f.	tongue	R	L
g.	facial muscles	R	L
h.	eyes	R	L
i.	forehead	R	L
j.	neck	R	L
k.	shoulder shoulder blade area	R	L
l.	arms	R	L
	does raising arm cause pain?	R	L
m.	fingers	R	L
n.	chest	R	L
o.	upper back	R	L
p.	middle back	R	L
q.	lower back	R	L

b) Type of pain: piercing, paroxysmal, dull, superficial, deep.

c) Quality of pain: burning, aching, sharp.

d) Frequency:

e) Duration: is the pain constant? intermittent?

f) Does the pain last for a moment? minutes? hours? all day? longer?

g) Does the pain stay the same? increase? decrease? remain the same?

h) Does the pain start suddenly? gradually?

i) Does the pain stop suddenly? gradually?

j) The period of greatest intensity: What time of day or night is the pain most severe?

k) How often do you have the pain?

l) Do you know anything that triggers off the pain?

m) How often are you pain free?

n) What is the longest pain-free period you have?

0) What medication, if any, do you take to relieve the pain?

p) Does rest increase or decrease the pain?

q) Please describe any method of positioning the jaw or head that you have found for relieving the pain.

r) Do any of the following normal daily activities cause pain?
If yes, circle and indicate where you feel pain.
yawning chewing swallowing speaking
singing shouting brushing teeth moving head
moving neck moving shoulders moving arms

s) Did the symptoms start after any of the following conditions?
If yes, please circle.
severe emotional upset excessively large bite or yawn
blow to jaw irregular or raised dental filling
excessive opening of mouth during dental extraction
traction for cervical arthritis

4. ASSOCIATED COMPLAINTS

A. Dysfunction

a) Do you have difficulty in opening your mouth: normally? partially? almost not at all?

b) Do you have difficulty in closing your mouth: normally? partially? almost not at all?

c) Do you ever open so wide your mouth locks open? Yes. No.

d) Does opening or closing your mouth cause facial pain? Yes. No.

e) Do you hear any of these sounds in the joint?

Grating	R	L
Clicking	R	L
Snapping	R	L
Popping	R	L

f) If you have any of these problems is it:
frequently? occasionally? constant?

g) Have you noticed any change in your bite? Any change in your ability to chew?

B. Oral Symptoms

a) Are your jaws clenched or teeth sore when you awaken from sleep?

b) Do you clench or grind your teeth when asleep? When awake?

c) Do you clench or grind your teeth during: moments of concentration?
driving? gardening? golfing? bowling? watching TV?

d) Do you chew gum?

e) How do you chew your food: comfortably? angrily? to get it down?

f) Are your jaw muscles ever tired? when?

g) Do you ever notice extreme warmth in your jaw muscles? when?

h) Do you have gingival bleeding or swelling of the gums?

i) Have you ever noticed production of more or less saliva in your mouth?
which?

j) Do you have a salty taste in your mouth? a copper taste? a sour or lemon taste?

k) Do tears form in your eyes for no apparent reason?

l) Do you ever feel pressure or tenderness about the: right eye?
left eye?

m) Does your face swell? what part? when?

n) Do you have dizziness? when? frequency?

0) Do you ever feel faint?

C. Miscellaneous

a) Ear symptoms

Do you have: Tinnitus (ringing in the ear?)	R	L
Popping or whooshing noises on opening or closing your jaw?	R	L
Stuffiness?	R	L
Changes in hearing ability?	R	L

b) Do you have a jaw thrust habit or nervous twitch about the face?
Where?
When?

c) Does anyone else in your family have a similar problem?
Yes. No.
If yes, explain:

d) Have you ever had your teeth straightened?

e) Have you had your "bite" adiusted by your dentist?

f) Have you had cortisone injections in your face or jaw?

g) Are you sensitive to metal rings or earrings?

h) Please describe briefly any changes in location or character of symptoms since this problem began?

i) Is there anything else you wish to tell us?

the fingertips placed lightly over the preauricular areas. The patient is asked to open and close the jaw while the areas are palpated. Simultaneous bilateral palpation is recommended. A comparison of condylar movement bilaterally is made as is an evaluation of pain and its severity. The patient is then asked to move the jaw to each side with the teeth apart while bilateral palpation is made to assess condylar mobility, crepitus, or other joint sounds.

Posterolateral TMJ palpation is determined by bringing the fingers gently forward at the external ear canal. The patient is asked to move the jaw from side to side to determine whether condylar movement is uniform and then to open and close the jaw. Dworkin and coworkers[12] reported that palpation of TMJ lateral pole elicited pain five times more frequently than palpation via the external ear canal.

Palpation of Jaw and Cervical Muscles

Palpation of cervical and upper shoulder muscles in conjunction with the jaw muscles is carried out according to methods established by Travell and Simons.[15] Painful masseter and temporal muscles suggest bruxism or clenching, and pain in lateral pterygoid muscles might indicate adaption to an altered disc-condyle relationship.

Jaw muscle palpation may be readily performed for superficial masseter, temporal, medial pterygoid, and digastric muscles. However, for deep jaw muscles, intraoral palpation is difficult and may be impossible in some individuals.[19] Lateral pterygoid palpation poses a problem, as the upper head (or superior pterygoid muscle) is inaccessible, and it is only the anterolateral and inferior portion of the lower head that may be palpated.[19,20] However, palpation in this area depends on the width of the buccal sulcus since fibers of the temporal tendon that insert into the anteromedial aspect of the coronoid process (often down to the level of the third molar tooth) may be compressed unintentionally. The width of the buccal sulcus determines whether a finger tip or a small mirror head would be more appropriate to palpate the lower head of the lateral pterygoid muscle.

Mandibular Mobility

The interincisal distance on wide opening is measured with a millimeter ruler, and the presence of pain is noted. To determine if the patient is guarding their jaw opening, the operator gently depresses the jaw at wide opening to increase the interincisal distance. The opening range for men was reported by Snow[17] to be 40 to 50 mm and the range for women was 35 to 45 mm. More recent epidemiologic data[12] assessed jaw opening unassisted without pain, maximum unassisted opening, and maximum assisted opening in treatment and control groups; a smaller unassisted opening in treatment and control groups was found.

With the teeth in intercuspal position, the relationship of the lower midline to the upper midline is assessed. Vertical and horizontal overbite is measured, and the patient is asked to protrude the jaw and perform lateral excursions. Difficulties are noted in the ease with which these movements are made. The patient is asked to open and close the jaw from the closed jaw position, and deviations on opening and/or closing are drawn on the appropriate grid. Assessment is also made of deviation on protrusion.

Determining mandibular mobility provides an opportunity for provocation tests, which are used to provoke pain or dysfunction as an aid to diagnosis. Simple provocation tests, such as jaw opening and testing end feel, are routinely used. If these movements show deviation, internal joint displacement is suspected; limited jaw opening with pain could indicate internal joint derangement or a neuromuscular problem. Evoked responses are correlated with the clinical history and other clinical examination data.

A valuable provocation test indicating the association of parafunctional clenching is the development of jaw or muscle symptoms when the jaw is positioned to allow matching of opposing bruxofacets. This sometimes requires the jaw to be postured in apparently extreme laterotrusive positions. Biting in such an eccentric jaw position may provoke acute pain similar to that described by the patient. This procedure may also indicate tooth mobility and pain that would not otherwise be apparent.

Occlusal Analysis

Clinical occlusal analysis allows assessment of intraarch and interarch tooth relationships. Variations from normal and the effects of such variation are noted and correlated. Of particular importance is the analysis of jaw support, ie, posterior tooth relationships, eccentric jaw guidance, the relationship between intercuspal and retruded jaw positions, vertical dimension of occlusion, lower face height, and occlusal plane form.

The presence and extent of a slide between the retruded tooth contact position and intercuspal position are noted, and the initial lateral guidance incline is determined.

These inclines will show the tooth guidance into and from functional tooth contact. Lateral guidance inclines directed distally rather than mesially have been suggested as a possible predisposing cause of joint derangement.[16] The presence and location of bruxofacets are noted and correlated with tooth mobility. An assessment of the clinical effectiveness of any prostheses is also made in relation to occlusal features.

Soft tissue evaluation is made to determine the presence of pathology, changes associated with function (including evidence of lip and cheek biting), "occlusal line" on the buccal mucosa, and scalloping of the borders of the tongue. Although these signs may not be of special importance individually, they may be related to symptoms present. Salivary flow should also be assessed. Complaints of a dry mouth indicating decreased salivary flow is sometimes observed in patients with suspected masseteric spasm; however, there are a number of medical causes that should also be investigated.

Occlusal Analysis of Articulated Study Casts. Interrelationships of the teeth are best evaluated from full-arch casts articulated accurately on a suitable adjustable articulator. Casts may indicate tooth contact interferences that cannot be as readily observed directly in the mouth,[17] and enable examination of bruxofacets and the pattern of tooth wear. Ultrafine plastic foils (Gebr Hanel-Medizinal, Nurtingen, Germany) and Artus shim (Artus, Engelwood, NJ) are used to analyze tooth contacts on the articulated casts in an appropriate sequence.[16]

Dental Status. Dental status in conjunction with radiographs is determined. A periodontal assessment is made, and mobility due to occlusal trauma or periodontal disease is assessed. The presence of tilted, drifted, or extruded teeth are noted; fremitus of the incisors may indicate parafunctional clenching. Restorations are inspected for adequate embrasure space, interproximal contact, cracks or areas of unusual wear, simultaneous bilateral occlusal contact in intercuspal position, and the presence of recurrent caries.

Radiographic Assessment

Radiographic evaluation of TMJs is not routinely carried out by these authors,[18,21,22] but is indicated if the history and examination suggest structural joint changes, pathology, or when the patient presents with a chronic condition.

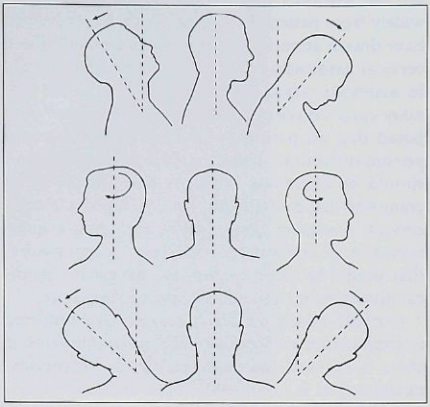

Fig 1 Diagrammatic representation of craniocervical mobility. Upper diagrams show extension *(left)* and flexion *(right)* from upright head posture; the range of mobility is 55 to 60 degrees and 45 degrees, respectively. Middle diagrams show rotation to each side; range = 70 to 80 degrees. Lower diagrams show side bending to each side from head upright; range = 40 to 45 degrees. (Values are from Corrigan and Maitland.[26])

Facial Asymmetry

An assessment of facial symmetry is made when the history is taken and may be completed before examination of the cervical region. It is suggested that the operator stand at arms' length to assess the patient's face, and the patient may be asked to clench to help disclose asymmetry. Asymmetry is usually noted in the area of the temporal muscle or body of masseter and may arise from unusual muscle activity or bony abnormality.

Facial swelling may be apparent and may be related to jaw muscle hypertrophy, nutritional deficiencies, drug idiosyncrasies, or systematic disease. Facial expression may show evidence of neurologic disease, but more commonly provides information about the emotional state of the patient.

Craniocervical Examination (Fig 1)

Disturbances in the usual action of cervical muscles and joints are common clinical problems but are poorly understood by dentists. There are many signs and symptoms that provide diagnostic information of craniocervical structures. However, the differences between healthy and unhealthy states

are not always clear, as normal function varies widely from patient to patient. Several authors[16,22,23] have drawn attention to concomitant postural and cervical associations of TMJ dysfunction (Fig 2). In addition, cervical problems[23,26] may be the primary cause of symptoms in the TMJ. Clarke[22] proposed that all patients who have significant temporomandibular musculoskeletal dysfunction should be examined for signs and symptoms of craniocervical dysfunction. He developed a craniocervical screening examination, including a questionnaire of cervical function (see Questionnaire) that should be incorporated into the general medical history form, and an examination sequence.

Cervical muscle palpation is routinely completed in conjunction with examination of jaw muscles. If there is cervical muscle pain, the craniocervical examination is completed. This includes assessment of cervical mobility and joint sounds, palpation of vertebral processes, and assessment of neurologic abnormalities and craniocervical posture.

Cervical Mobility (see Questionnaire). Restriction of head and neck movement is a common feature of craniocervical dysfunction. A number of authors[22-26] have described techniques for examining the spine and give ranges of movement. It should be noted that if there is limited movement either a muscular or vertebral problem could exist, and a significantly reduced range of movement usually indicates both a muscular and a vertebral problem. In some patients with a decreased range of cervical voluntary motion, increased movement can be obtained by passive stretching, ie, by mobilizing the cervical spine. When this is possible, there is usually a soft tissue problem. If no increased movement is possible with passive stretching, the restriction is likely to be of articular origin with intracapsular derangement or adhesions. Inability to move the head or neck could be due to hysterical trismus, torticollis, nerve impingement, facet locking, or an acute cervical muscle spasm. The range of cervical mobility is generally accepted as: flexion 45 degrees; extension 55 to 60 degrees (maximum 130 degrees); lateral flexion 45 degrees; and rotation 70 to 80 degrees.

Clinical Assessment. The cervical spine is examined for mobility both actively and passively, and, in so doing, an attempt is made to reproduce the patients' cervical or facial pain. A goniometer is recommended to assess the range of angular movement. The patient is seated upright with thoracic and lumbar spine supported by the back of the chair. The cervical spine is held in 0 degrees of rotation and lateral flexion for measuring flexion and extension; in 0 degrees of flexion, extension, and rotation for measuring lateral flexion; and in 0 degrees of flexion, extension, and lateral flexion for measuring rotation. Stabilization to prevent flexion of the thoracic and lumbar spine is possible with the cooperation of patient and support from the back of the chair.

Four movements described below are tested (see Figs 2 and 3), and for each movement the patient is guided through the range of motion (ROM) before measurements are recorded.

Flexion. The goniometer body is centered over the patient's external ear canal, the proximal goniometer arm is positioned so that it is perpendicular to the floor, and the distal arm is aligned with the base of the nares of the nose. Keeping the mouth closed, the patient is asked to move the head towards the chest (Fig 2a). At the end of the ROM, the examiner's left hand aligns the proximal goniometer arm (Fig 2b), while the right hand maintains alignment of distal arms with the base of the nares.

Extension. The goniometer alignment for measuring cervical extension is the same as for flexion. At the end of cervical extension, the perpendicular alignment of the proximal goniometer arm is maintained, whereas the distal arm is aligned with the base of the nares (Figs 2c and 2d).

Lateral Flexion. The fulcrum of the goniometer is centered over the vertebrae at the level of the spinous process of C7. The base of the goniometer is made parallel to the floor and the moving arm aligned with the dorsal midline of the head using the occipital protuberance for reference (Fig 3a). At the end of lateral flexion ROM, the base of the goniometer is made parallel with the floor, and the moveable arm indicates the degree of flexion from the perpendicular (Fig 3b). This is repeated on the other side.

Rotation. The fulcrum of the goniometer is centered over the center of the cranial aspect of the head, and the moveable arm is aligned with the tip of the nose (Fig 3c). At the end of the ROM, the moveable arm is realigned to the tip of the nose, and the base of the goniometer is made parallel to the subject's acromion processes.

Cervical Joint Sounds. Joint sounds are noted during assessment of cervical mobility. Clicking and popping sounds most commonly occur with flexion-extension and rotation; crepitus (grating) occurs more frequently with lateral flexion and rotation. Optimal function is associated with smooth gliding and rotation of intervertebral joints without sounds accompanying movement. Occasional clicking and popping sounds are of muscular origin and associated with overactivity (eg, sport, carrying heavy loads, etc). Regular clicking suggests intervertebral disc dysfunction,

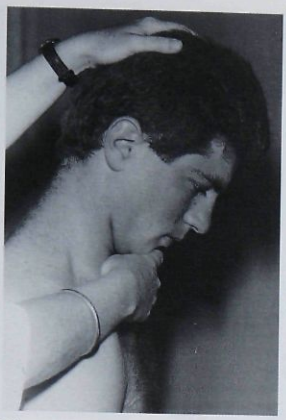

Fig 2a Clinical indication of full head flexion in a male patient.

Fig 2b Measurement of the degree of head flexion using a goniometer; a rod between the teeth is used as a guide to indicate the end point of head flexion.

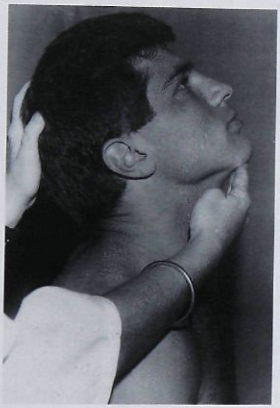

Fig 2c Clinical indication of full head extension in a male patient.

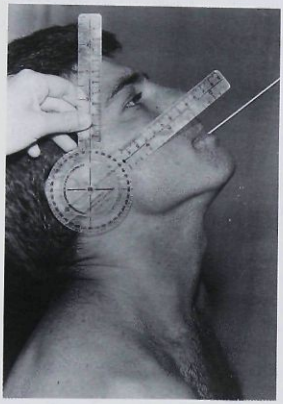

Fig 2d Measurement of the degree of head extension using a goniometer; a rod between the teeth is used as a guide to indicate the end point of head extension.

and regular crepitus is indicative of degenerate changes. Lack of joint sounds associated with reduced mobility may indicate the inability of the vertebral bodies to glide over one another.

This study and clinical protocol has been designed to correlated cervical and TMJ signs and symptoms and to emphasize the functional and dysfunctional interrelationships.

Fig 3a Clinical indication of lateral flexion to the right in a male patient.

Fig 3b Measurement of the degree of lateral flexion to the right in the same patient.

Fig 3c Clinical measurement of head rotation using a goniometer; a rod between the teeth is used as a guide to indicate the end point of head rotation.

Bony Process Palpation. Palpation of the cervical processes may sometimes indicate an abnormal structural relationship of cervical vertebrae.[27] The lateral processes of the first cervical vertebrae should be symmetrically positioned and may be palpated behind the posterior border of the mandible, slightly anteroinferior to the mastoid process. The spinous processes of the seventh vertebrae can usually be palpated and evaluated for symmetry, paravertebral muscle tenderness, and cervical lordosis. The aim of palpation is to determine the anatomic level, the nature of the problem, and the associated degree of mobility.[28]

Neurosensory Abnormalities. The patient is questioned about altered sensations, such as hyperalgesia (pain on light touch) or numbness, localized sensory loss, reduced muscular power, or hyperflexion, and, if present, examination for nerve root lesions is indicated.[28] The anatomic distribution of a neurosensory abnormality will give a clue to the origin of the problem.

Craniocervical Posture. In addition to the general evaluation of posture, the head and neck relationship is particularly important as a possible contributor to TMJ problems.[29,30] An anterior head position[31,32] is common in those suffering from head and neck dysfunction.[23] When the head-neck relationship remains constant, the line of sight is downward, and as the patient corrects for visual needs, the head becomes hyperextended and affects both the TMJs and the cervical spine. It is important to acknowledge that the correction made by the spinal column is three-dimensional and involves flexion, rotation, and side-bending of vertebral segments. This creates abnormal stretching of soft tissue structure, in an attempt to correct the curvature.[33]

Visual assessment of craniocervical posture is made of the side view of the patient while standing: A line extending from the greatest point of curvature of the cranium to the shoulder blades is established with a T-square placed across the patient's shoulder blades and the shaft against the occipital region of the head. From this, the perpendicular distance to the greatest concavity of the neck is measured with a ruler (Fig 4). The distance of greatest concavity averages 6 cm in optimum head posture. Shoulder height is also evaluated (Fig 5), and the patient is questioned to assess the presence of sleeping or working postures that may be associated with presenting symptoms.

Kenna and Murtagh[28] recommended use of provocation tests in cervical examination. Palpation does not always evoke the pain, but a provocation test may do so. The tests are compression and quadrant tests and are directed towards the painful side. The quadrant test is especially useful if there is any doubt that the pain originates

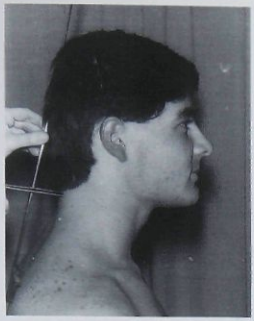

Fig 4 *(Left)* Clinical assessment of craniocervical posture. Measurement of degree of curvature of cervical spine using a T-square (vertical) and ruler (horizontal) to measure distance of the arc of curvature from the vertical marker.

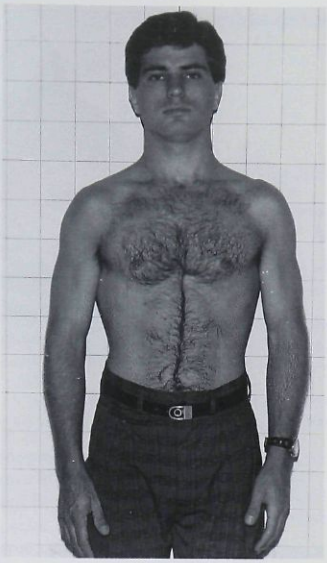

Fig 5 *(Right)* Clinical assessment of body posture from a frontal view; particular note is taken of shoulder height and symmetry.

from the neck, since it tests the mid and lower cervical spine areas.

Corrigan and Maitland[26] also recommended palpation and auscultation of the extracranial arteries in addition to clinical test of the vertebral arteries during examination. In all patients with neck pain, but especially those with giddiness, an attempt should be made to assess the relationship between neck movements and giddiness. This is done by both direct questioning and testing neck movement. Sustaining the positions of extension and rotation to each side in turn may evoke dizziness while the position is sustained or on its release. Dizziness evoked in this way is likely to be of cervical origin.[34,35]

Shoulder Movements. The "Mouth Wrap-around" Test requires full abduction and external rotation of the arm at the shoulder. The patient carries out this test by bringing the hand and forearm behind the head, rather than above, as far forward as possible, and trying to cover the mouth (Fig 6a). The head should be turned no more than 45 degrees and not tilted. Normally, the fingertips then cover the mouth nearly to the midline, to the corner of the mouth if the patient has short upper arms, and over the entire mouth if the patient has hypermobile joints.

The "Hand-to-Shoulder Blade" Test requires full adduction and internal rotation of the arm at the shoulder. The patient does this test by placing the hand behind the back and reaching as far up the spinal column as possible (Fig 6b). Normally, the fingertips should reach at least to the spine of the scapula.

Radiographic Assessment

A knowledge of the radiologic anatomy of the cervical spine is an important prerequisite for interpretation of radiographs of this area. Referral to a diagnostic radiologist is important when assessing patients with craniocervical dysfunction. To provide a comprehensive management plan, radiologic examination is mandatory in conjunction with a clinical examination. Radiographic assessment of spinal curvature may be made using the following views recommended by Corrigan and Maitland[31] and Matthews and Pemberton[36]:

1. An open-mouth view shows the relationship of the atlas and axis. Trauma to the neck may result in tearing or stretching of the atlantoaxial ligaments with resulting subluxation of the head and atlas on the axis. Fracture, in absence of any displacement of the odontoid process,

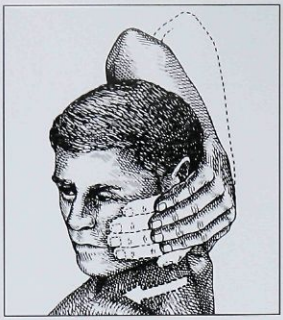

Fig 6a Diagrammatic view of shoulder abduction.

Fig 6b Diagrammatic view of shoulder adduction.

may also be viewed on this projection as an irregular line of decreased density at the base of the odontoid process. Fractures through the lateral mass of the axis or atlas, compression fractures, or fractures of the transverse process of the atlas may also be visualized.

2. An anteroposterior view of the lower cervical vertebrae gives valuable information concerning the lateral interbody joints, the disc spaces, the vertebral bodies, the pedicles, cervical ribs, T1 (a site for neoplastic disease), and in some instances the posterior facets. Osteophytic changes at the margins of the lateral interbody joints are well demonstrated in this view. Fractures of vertebral bodies may be suspected, although the extent of such fractures cannot be determined. Congenital abnormalities such as hemivertebra and cervicodorsal scoliosis can be excluded with this projection.
3. A Caudad-angled view reveals the condition of the interarticular isthmus of the sixth, fifth, and fourth vertebrae, and, if teeth are absent, the isthmus of the third, second, and first vertebrae. Compression and avulsion fractures of the articular processes may also be noted.
4. A loss of the forward curve that can be noted in the straight lateral view may be indicative of some disorder of the cervical spine. This projection is important in assessing alignment, the relationship of the odontoid process to the foramen magnum, disc space integrity, and vertebral height. Backward subluxation may also be noted in this view, as can forward displacement of one vertebral body on the vertebral body beneath it. Forward displacement indicates rupture of the posterior ligamentous and capsular structures, a fracture of one or both vertebral arches, or of one or both posterior facets.
5. On clinical examination, the neck may appear to have a full range of motion in flexion. However, the lateral view made with the neck placed in maximum forward flexion may reveal that what appeared to be a normal or average range of flexion was actually taking place between the atlantoaxial and the atlantooccipital joints and at the cervicothoracic joints, with little or no motion occurring in the other joints.
6. The range and the location of backward motion can be demonstrated in the lateral view made with the neck in hyperextension. In a "normal" cervical spine, the spinous processes of the vertebrae approach each other with the same degree at each segmental level. The persistence of a reversed forward curve or the persistence of backward angulation indicates some disorder of the cervical spine, and this may be the result of protective contraction of the muscles or permanent ligamentous and/or joint damage. It may also be the result of skeletal injury or disorder. Subluxations; fractures of the vertebral arch, spinous processes, and laminae; or tears of the longitudinal ligaments may also be visible in this projection. Destructive lesions of the vertebral bodies resulting from metabolic disorders, infections, metastatic lesions, and primary bone tumors are seen best in these lateral views.

7,8. The right and left oblique views illustrate the patency of the intervertebral foramina

through which the nerve roots and their accompanying structures pass. These canals are ovoid in shape, decrease in size from above downward, and may show alterations in contour. Changes in size and shape of the canals may be the result of ligamentous and capsular instability, or the presence of osteophytic spurs at the margins of lateral interbody joints or the posterior joints (which may cause neural entrapment). Fractures of the posterior facets of the vertebral arches with some displacement, fractures of the upward lateral projections of the vertebral bodies, splayed fractures of the vertebral bodies, or dislocations may also result in change of foramina size or shape.

Emotions

Stress may precipitate physical as well as emotional illness. Patient examination would include a careful evaluation of symptoms and the manner in which they are presented. Does the patient report discrete, well-localized complaints, or are they vague, nonspecific symptoms? Are the symptoms chronic or acute? Have past treatment(s) been successful? Lefer[37] suggested that the dentist need only ask the patient one question: "What does this problem stop you from doing?" It may then become apparent that the patient has been avoiding social contact, interpersonal relationships, or a variety of other responsibilities. Thus, the behavior of the patient in the face of the symptoms becomes an important aspect of the psychological history.[33]

Diagnosis may be further clarified by an evaluation of the patient's general lifestyle. The clinician is interested in emotional disturbances caused by the problem and by emotional irritation resulting from suppression of the "fight or flight" response. The patient must have the opportunity to describe these problems, since their expression and bringing them to consciousness, where they may be discussed, may be the first step in their resolution.[17]

Conclusion

This paper presents an overview of a recommended approach for the assessment of patients with craniocervical dysfunction. A systematic approach is advised, and, with practice, each clinician will find the method that allows each individual to gather all clinical data quickly and efficiently. This information will aid the clinician in reaching a diagnosis and help to determine the need for interdisciplinary referral.

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Resumen

Manejo de los desórdenes craneomandibulares. Parte II: Evaluación clínica de pacientes que sufren de disfunción craneocervical.

La evaluación comprensiva de la function mandibular requiere de una evaluación más extensa de la cabeza, cuello y ambos maxilares, en comparación a la que normalmente se realiza. Al examinar sólo los dientes y el periodonto se van a dejar de evaluar los problemas relacionados a los músculos y a las articulaciones, los cuales deben ser considerados en el plan de manejo. El reconocimiento de los síntomas relacionados a la función es importante en el pronóstico de los resultados del tratamiento. La tensión muscular inducida por stress y los hábitos orales traumáticos pueden estar vinculados a síntomas reportados tales como cefaleas, dolores de oído y problemas en la articulación temporomandibular. El significado de estos síntomas debe ser evaluado a través de exámenes clínicos detallados.

Zusammenfassung

Management von Myoarthropathien des Kausystems. Teil II: Klinische Beurteilung von Patienten mit craniocervicalen Funktionsstörungen

Genaueres Verständnis der Funktion des Kausystems erfordert eine genauere Untersuchung von Kopf, Hals und Kiefer als sie üblicherweise erfolgt. Nur Zähne und Parodontien zu untersuchen, birgt die Gefahr in sich, Probleme der Muskeln und Gelenke ausseracht zu lassen, die unbedingt in die Therapieplanung einbezogen werden müssen. Erkennen von funktionsbezogenen Symptomen ist von grosser prognostischer Bedeutung. Stressbedingte Muskelverspannung und traumatische orale Gewohnheiten können vergesellschaftet sein mit Symptomen wie Kopf- und Ohrschmerzen, sowie Symptomen des Kiefergelenkes. Die Signifikanz dieser Symptome sollte in einer detaillierten klinischen Untersuchung erhoben werden.