A Controlled Clinical, Electromyographic, and Kinesiographic Assessment of Craniomandibular Disorders in Women

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Clinical, electromyographic, and kinesiographic methods were used to evaluate 35 female patients presenting with craniomandibular disorders. Twenty-six similarly aged, symptom-free women served as controls. Clinical assessments showed that the patients demonstrated a higher prevalence of bruxism than did the controls. Electromyographic results suggested that the rest activity of patients' elevators was significantly greater than that of the controls. Kinesiographic measurements showed that the patient group demonstrated greater vertical and anterior posterior movements from rest to centric occlusion than did the control group, and both the average and maximum opening velocities were smaller in patients than in controls.
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Craniomandibular disturbances are not life threatening, but they do affect the quality of life. Eating, sleeping, speech, sexual activity, nonverbal communication, and body image may be influenced.[1] Women suffer from these disturbances more frequently than do men, with the ratio ranging from 3:1 to 5:1.[2] The target group for therapy therefore appears to be women between the ages of 15 to 40 years.[1,2]

Carlsson's review of 18 epidemiologic studies world wide showed significant variations.[3] The proportions of the populations with symptoms and signs ranged from 16% to 59% and from 33% to 86%, respectively.[3] The most common symptoms are stiffness or fatigue in the jaws, sounds from the temporomandibular joint (TMJ), impaired movements of the mandible, and pain in the TMJ region during mandibular movements. Other symptoms frequently reported are facial pain, headache, earache, vertigo, tinnitus, globulus, and back and neck pain.[4]

The ADA guidelines of 1983 for the evaluation and diagnosis of these disorders call for a comprehensive history, a clinical examination, and TMJ imaging when appropriate.[5,6] Some investigators believe that new technology has increased the capacity for making objective measurements of mandibular functions together with associated muscle activity,[7,8] but other studies[9–12] criticize jaw tracking and electromyography as being of no greater diagnostic value than standard clinical examination and not well supported by scientific evidence.

The aim of the present study was to evaluate, by means of a controlled study, the signs and symptoms of craniomandibular disorders (CMD) in women, using specific clinical observations, electromyographic (EMG), and kinesiographic (MKG) recordings.

Materials and Methods

Subjects were divided into two groups. The experimental group, known as the patient group, consisted of 35 women with CMD aged from 20 to 42 years (mean 28.8 years). These patients had been referred to the Department of Prosthetic Dentistry and the Department of Oral and Maxillo-Facial Surgery.

Criteria for the selection were:

1. Women, aged between 20 and 45 years, not pregnant
2. No clinical or radiographic evidence of organic TMJ pathologic conditions
3. No clinical evidence of trismus or "closed lock" (locking without reduction)
4. Patients with mild and severe symptoms from the stomatognathic system and headache (Helkimo's anamnestic dysfunction index: I, II[13])
5. A virtually intact natural dentition or one restored with fixed prosthodontics to provide posterior occlusal support
6. No psychotropic medication
7. A clear medical history

The control group consisted of 26 women, free of CMD, aged from 21 to 42 years (mean 26.7 years). These subjects were dental students and dental staff (dentists and dental technicians).

Criteria for the selection were:

1. Women, aged between 20 and 45 years, not pregnant
2. No past history or present symptoms of CMD, including headache
3. No clinical evidence of any signs of CMD
4. Natural dentition or fixed prosthodontics with posterior occlusal support
5. No psychotropic medication
6. A clear medical history

Both groups were investigated by the same examiner, who employed standardized clinical, electromyographic, and kinesiographic protocols.

Clinical Examination Protocol

Both groups completed a special anamnestic questionnaire and a psychological test. The anamnestic questionnaire included questions about the sounds of the TMJ, luxation and locking of the TMJ, oral habits, pain in the face and jaw, and headache. To assess the intensity of the pain, a scale from 0 to 5 was used in which 0 indicated no pain at all and 5 was the severest pain imaginable. To assess the severity of click, one cross was used for mild sound and two crosses were used for the worst. The Anamnestic Dysfunction Index by Helkimo[13] was completed according to the answers to these questions.

The psychological test was a stress inventory (SOS), which is a modification of the Cornell Medical Index (used with permission from the Department of Psychological Nursing, University of Washington, Seattle). The SOS consists of 94 items grouped into 10 subscales and a 5-point frequency scale instead of a dichotomous response (yes/no).

The 10 subscales are:

1. Peripheral manifestations
2. Cardiopulmonary
   (a) Symptoms of arousal
   (b) Upper respiratory
3. Central-neurological
4. Gastrointestinal
5. Muscle tension
6. Habitual patterns
7. Depression
8. Anxiety/fear
9. Emotional irritability
10. Cognitive disorganization

The examiner performed a full clinical examination of the craniomandibular system of both groups, including examination of the TMJ (observation and manual palpation), the masticatory and neck muscles (manual palpation), and mandibular mobility (measurement of the vertical and horizontal overlap as well as the border movements of the mandible). The results constitute the Clinical Dysfunction Index of Helkimo.[13,14] This examination also included occlusion analysis by assessment of the dental status, premature contacts in centric relation (CR), occlusal contacts during lateral and protrusive movements of the jaw, and notation of any nonworking side interferences. Centric relation was located with bimanual guidance (Dawson method),[15] and premature contacts were recorded as unilateral (right or left side) and bilateral according to the subject's tactile sensibility and articulation paper. During lateral movements, the occlusal scheme was registered from centric occlusion (CO) as canine protection or group function. Any nonworking side interferences were recorded. In addition the presence of anterior guidance and posterior contacts was recorded during protrusion.

EMG and MKG Protocols

The EMG recordings were made with a four-chan-

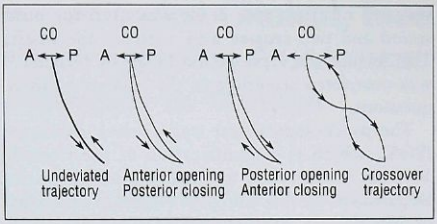

Fig 1 Patterns of opening and closing in the sagittal plane (A = anterior, P = posterior).

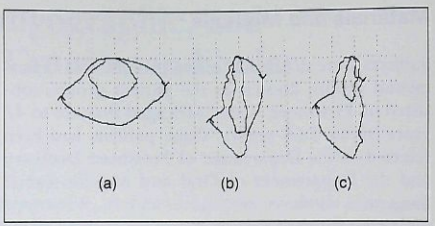

Fig 2 Velocity traces: the first cycle represents the normal opening and closing movements and the second cycle shows the very fast and wide opening and closing movements. Arrows indicate the opening and closing phase; *(a)* smooth movement, *(b)* dyskinesia, *(c)* click coinciding with the opening-phase arrow.

nel surface electromyograph intended primarily for use as a stand-alone system for clinical monitoring of up to eight different muscles (Model EM2 Biolectric Processor, Myo-Tronics, Seattle, WA).[16] The EM2 System can interface with the K6 Diagnostic System (version 4.1, Myo-Tronics) to allow simultaneous display and storage of the EMG and MKG data. The EM2 was used alone to monitor, for 40 seconds, the rest activity of the elevator, the anterior temporalis, and masseter muscles of both sides. This system averages and records the muscle activity every 5 seconds and then prints the final average at the end of the 40-second interval. With the EM2 interfaced with the K6 System, the maximum and average activities of the same muscles during clench were recorded for 1 second.

Procedure. Each patient sat erect in a straight-back dental chair with both feet on a foot rest, hands resting on the lap, and eyes open. Activity from the anterior temporalis and masseter muscles was recorded bilaterally. Electrodes were positioned over the belly of the muscle lying parallel to its long axis so that the outer edge of electrode tape corresponded with the outer edge of the muscle. Specific guides were used to reposition the electrodes at the same position for each subsequent recording session. The patient was asked to relax, keep the teeth apart, and sit quietly and try to refrain from swallowing. The EM2 records were made continuously for 40 seconds. Resting values ranged from 0 to 25.5 μV. Next, the amount of activity generated when the muscles contracted was recorded. The patient was asked to relax the jaw, clench the teeth as hard as possible, and relax again. These data were recorded as 1 second of instantaneous EMG activity with the K6 System only. The peak and the average values during the 1-second burst were monitored.

The MKG recordings were made with the model K6 Diagnostic System. On the basis of previous experience,[17,18] it was felt a skilled operator could employ the K6 for the measurement of craniomandibular relations provided that the distortions and shortcomings of the instrument were well understood. A description together with the procedures followed during the recordings have been described in previous articles.[17,18] Three preset K6 programs (scans) were chosen to record the jaw movements.

Scan 1: Recordings of maximum opening and closing movements. Values from the analyzing program of the computer were maximum vertical opening from CO (MVO); maximum anteroposterior movement (sagittal plane) from CO (MAP); and maximum lateral deviation from the right and left (frontal plane) (MDR, MDL). In addition, four types of patterns of opening and closing in the sagittal plane were observed (Fig 1).

Scan 2: Recordings of the velocity of the jaw during normal and fast opening and closing movements. This test yielded the maximum and average velocities during normal or fast opening and closing as well as the maximum velocity at terminal tooth contact (terminal velocity). This velocity is the mandibular velocity at the last instant before initial tooth contact. From the tracings (according to manufacturer's instructions), movements of the jaw were determined to be smooth or erratic and irregular (dyskinesia), and the presence of clicking was noted (Fig 2).

Scan 3: This program provides information

Table 1 Clinical Measurements of the Border Movements of the Jaw for Patient and Control Groups

Clinical measurements	CMD Patients Mean in mm (range)	Controls Mean in mm (range)
Maximum opening	44.7 (27–60)	46.3 (37–55)
Maximum vertical overlap	3.9 (0.5–7)	3.9 ((–2)–6.5)
Maximum lateral left shift	9.1 (5–11)	9.6 (6–15)
Maximum lateral right shift	8.9 (5–11)	9.4 (7–13)
Maximum protrusion	5.4 (2–9)	5.8 (3–9)
Maximum horizontal overlap*	3.3 (0.5–6)	1.73 ((–0.5)–5)

*= Significant differences between the two groups ($P < .01$).

about the vertical movement (freeway space) together with the anteroposterior and lateral movements of the jaw from rest position to CO. In addition, according to the company's instructions,[16] the ratio of anterior to vertical movement is determined as:

1. Normal A/V ratio is the average of 1:2; the mandible, as it closed, moved anteriorly 1 mm for each 2 mm it moved vertically. However, an A/V ratio of as much as 1:1 is seen in some individuals.
2. Neutral A/V ratio of 0:1. The trajectory is straight up without any anterior movement.
3. Negative A/V Ratio of –1:1 or –2:1; the mandible moves posteriorly 1 mm or 2 mm as the mandible moves vertically.

From this test, values were found for the interocclusal space during rest position (freeway space; FS), the anteroposterior movement of the jaw from rest position to CO, and the lateral movements (right or left) of the jaw from rest to CO.

The order of the EMG and MKG recordings applied for both groups was as follows:

1. Monitor the rest activity of the muscles with EM2.
2. Monitor the "clench" activity of the muscles with the EM2 and K6 System.
3. Monitor the maximum opening/closing movements only with K6.
4. Monitor the velocity of the normal and fast opening/closing movements only with the MKG-K6.
5. Monitor the movement of the jaw in three dimensions from rest position to centric occlusion only with the MKG-K6 .

Statistical Analysis. The Mann-Whitney U test was used to compare the clinical, EMG, and MKG recordings between the two groups. For the EMG recordings, a two-way analysis of variance was carried out to compare the groups while allowing for the difference in age distribution. For comparing the occlusion grades, each variable was reduced to two categories. Then, for each of the three age bands, 2×2 tables were formed of the variable against the group. The Mantel Haenszel χ^2 test for combining 2×2 tables was then applied.

Results

Clinical Assessment

Of the patient group, 26 individuals suffered pain in the jaw, 11 complained of pain in the face, 30 had tension headache, 28 had clicking, and 10 had locking of their jaw. Furthermore, 24 (68.5%) clenched their teeth and 18 (51.4%) ground them. Of the controls, only 7 (26.9%) clenched their teeth. According to the Helkimo index,[13] 3 patients were A.I, 32 were A.II, 6 were D.I, 22 were D.II, and 7 were D.III.

The mean values of the border movements of the jaw, for both groups, are shown in Table 1. The only significant difference between groups was noticed in the protrusive movement (maximum protrusion plus the maximum horizontal overlap). The mean number of present teeth for the patient and control group was 27 and 28, respectively. The location of the premature contacts in CR, the protection scheme during lateral movements, the existence of nonworking side interferences, and the location of the contacts during protrusion in both groups are shown in (Table 2).

The statistical comparisons of the occlusal variables did not show any significant differences between the two groups. Three subjects of each group did not demonstrate anterior guidance during protrusive excursion; they only had posterior contacts.

No significant differences existed in the frequen-

Table 2 Occlusion Analysis Records

	Centric relation premature contacts			Working side occlusal scheme: Canine protection		w/o canine protection	Group function		Nonworking side interferences		w/o nonworking side interferences		Protrusive contacts		
	R	L	Both	R	L		R	L	R	L	R	L	A	P	Combined
No. patients(%)	9(25.7)	23(65.7)	3(8.6)	25(71.4)	27(77.1)	1(2.8)	9(25.8)	8(22.9)	28(80)	21(60)	7(20)	14(40)	17(48.6)	3(8.6)	15(42.8)
No. controls(%)	9(34.6)	17(65.4)	0	15(57.6)	16(61.5)	0	11(42.4)	10(38.5)	16(61.5)	12(46.1)	10(38.5)	14(53.9)	17(65.4)	3(11.5)	6(23.1)

No significant differences in the occlusion variables were noticed between the two groups; R - right, L = left, A = anterior, P = posterior.

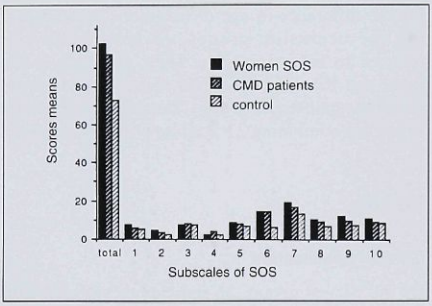

Fig 3 Comparisons between the scores recorded from controls and patients with female subjects of the SOS.

cy and type of stress responses reported from both groups. Comparisons of the scores collected from our subjects and from the female individuals who participated in the stress management program for the SOS development are shown in Fig 3. When the subjects of our control group were questioned as to the kind of symptoms of anxiety or restlessness they noticed during their daytime activities, 15 answered that they often chewed their lips and 11 bit their nails. Of the patient group, 21 answered that they chewed their lips and 15 often bit their nails. In this SOS test some particular questions are presented in relation to how often women experienced anxiety or depression during their periods. Of the control group, 4 women often felt tense or jumpy during their period and 2 felt mildly depressed. Twenty-three women never experienced severe depressive feelings during their periods and 13 never felt tense or jumpy. Of the patient group, 10 women often felt tense or jumpy during their period, 6 felt mildly depressed, and 5 felt moderately depressed. Twenty-nine never felt severely depressed, and 5 never felt tense or jumpy.

EMG Results

Test 1: Rest (Postural) Activity. The EMG examination showed that patients' rest activity of both masseter muscles and the left side anterior temporalis muscles was significantly greater than the controls. The rest activity of patients' right side anterior temporalis muscle was slightly greater but not significantly so (Table 3).

Test 2. Elevator Muscle Activity During Clenching (Maximum Biting). No significant differences existed between the two groups in the maximum or average values of the elevator muscle's activities during clenching. The controls presented higher maximum (peak) activities of the elevator muscles than the patients (Table 3).

A regression analysis of variance applied for both EMG tests showed that the differences existing between the groups were not due to age.

Kinesiographic Results

Scan 1. Maximum Opening and Closing. No significant differences existed between the two groups with maximum vertical opening, maximum anteroposterior movements in the sagittal plane, and maximum deviation to left or right in the frontal plane (Table 4). The asymptomatic group showed a deviation ranging from 0 to 8.2 mm, and the patients' deviations ranged from 0 to 13.2 mm. The trajectory patterns in the sagittal plane during the maximum opening and closing movements were, for the patient group: 6 (17.1%) presented an undeviated trajectory, 6 (17.1%) presented an anterior opening and posterior closing, 14 (40%) presented a posterior opening and anterior closing, and 9 (25.8%) presented a crossover pattern. For the control group, 11 (42.3%) presented an undeviated trajectory, 2 (7.7%) presented an anterior opening and posterior closing, 4 (15.4%) pre-

Table 3 Electromyographic Assessment Records

EMG results	CMD patients	Controls
Test 1: Rest activity of the elevator muscles*		
Left anterior temporalis†	8.5	3.5
Left masseter†	6.7	1.9
Right masseter§	6.7	2.8
Right anterior temporalis	4.8	3.5
Test 2: Elevator muscle activity during clenching**		
Left anterior temporalis	109.9 (174.9)	123.0 (202.1)
Left masseter	90.1 (146.8)	93.0 (163.3)
Right masseter	100.1 (163.3)	103.1 (177.1)
Right anterior temporalis	132.3 (205.4)	122.6 (198.4)

*Mean values (μV) of average rest activity for 40 s.
**Mean values of maximum and average activity (maximum means).
†Significant difference at $P < .001$.
§Significant difference at $P < .5$.

Table 4 Kinesiographic Records of Maximum Opening and Closing Movements (Scan 1)

	CMD patients	Controls
Maximum vertical opening (mm)	33.13	33.92
Maximum anteroposterior movements (mm)	10.87	10.58
Maximum deviation to left (mm)	4.22	3.65
Maximum deviation to right (mm)	3.03	2.12

No significant differences between groups.

Table 5 Mean Values of the Velocities (mm/s) of Normal and Fast Opening and Closing Movements (Scan 2)

	CMD patients	Controls
Maximum velocity of normal opening	110.6	110.2
Average velocity of normal opening	55.3	58.6
Maximum velocity of fast opening*	230.1	288.1
Average velocity of fast opening*	112.05	133.7
Maximum velocity of normal closing	112.8	118.7
Average velocity of normal closing	59.5	63.9
Terminal velocity of normal closing	21.2	27.5
Maximum velocity of fast closing	284.3	314.0
Average velocity of fast closing	141.8	161.9
Terminal velocity of fast closing	60.9	85.6

* = Significant differences between the two groups, $P < .005$.

sented a posterior opening and anterior closing, and 9 (34.6%) presented a crossover pattern.

Scan 2. Velocities of the Jaw During Normal and Fast Opening and Closing Movements. The mean values for the maximum and average velocities of the jaw during normal and very fast open and closing movements together with the terminal velocities for both groups are shown in Table 5. Only the maximum and average velocities during fast opening were significantly different. The women in the control group presented slight greater average and terminal velocities during normal and very fast opening and closing movements. The data shown in Table 6 emerged using the criteria recommended in the K6 manual.

Scan 3. Vertical, Anteroposterior, and Lateral Movements of the Jaw From Rest Position to CO (Table 7). Significant differences were noticed in the vertical (FS) and anteroposterior movements between the two groups. The FS in the control was smaller than that in the patient group. Eight patients had negative A:V ratios, one patient had a neutral A:V ratio, and the rest had normal A:V ratios. From the control group, only two subjects had negative A:V ratios, and those of the rest were normal. Three of the patients and four of the controls did not record any anteroposterior movement when closing their jaw into CO from rest position, and seven subjects from each group did not record any lateral movement.

Discussion

Few would dispute that diagnosis of CMD requires a comprehensive history, physical examination, and appropriate TMJ imaging if indicated; the value of EMG and jaw tracking devices is far

Table 6 Velocity Traces

	Fast opening		Fast closing		Normal opening		Normal closing	
	CMD patients	Controls	CMD patients	Controls	CMD patients	Controls	CMD patients	Controls
Clicking	11	0	11	0	16	2	18	1
Dyskinesia	21	3	16	7	19	7	12	13
Smooth movements	3	23	8	19	0	17	4	12

Numbers represent the number of patients or controls.

Table 7 Kinesiographic Records for the Movements of the Jaw From Rest to CO

	CMD patients		Controls	
	Mean value (mm)	Range	Mean value (mm)	Range
Freeway space (vertical movement)*	2.7	0.6–12	1.49	0.2–6.7
Anteroposterior movement*	0.53	(–0.8)–2	0.31	(–0.2)–1.1
Left lateral movement	0.21	0.0–1.2	0.11	0.0–0.7
Right lateral movement	0.07	0.0–0.9	0.09	0.0–0.6

* = Significant differences between the two groups, $P < .05$.

more controversial, and the need for controlled clinical studies is apparent.[6,19]

Despite the best of efforts, it proved surprisingly difficult to match the ages of control and patient groups. Women aged between 25 and 45 years and free from craniomandibular disturbances were somewhat rare. No significant differences existed in the frequency and type of stress responses reported in the two groups, although the patient group demonstrated a tendency for higher scores than the control group. Others have made similar findings.[20]

The clinical assessment of the mandibular border movements showed a higher value for the control group. Other studies have found similar results.[21,22] The horizontal overlap (overjet) was significantly larger in our patient group. However, Seligman and Pullinger,[23] in their comprehensive literature review, have already mentioned that large overjet lacks specificity in defining a patient group, since it is also common in nonpatient populations.

No significant differences were noticed in the occlusal variables between the patient and the control groups. This is contrasted with the studies of Geering[24] and Mohlin and Copp,[25] who found a considerably higher prevalence of nonworking side interferences in patient groups than in controls. In the present study, only one examiner was used for the clinical occlusal analysis assessment. Vallon et al[26] showed that intraobserver agreement in determining balancing side interferences was relatively high compared with other nonparametric clinical variables. The interobserver agreement was lower than intraobserver agreement, and more interferences were detected when the lateral movements originated from CR compared with CO. In addition, the intraobserver and interobserver variability of working side interferences was slightly lower when the movement started from CR compared with CO.

The EMG results of the present study showed that patients demonstrated a significantly greater rest activity than the asymptomatic controls, and these differences between the groups could be not be attributed to age or different psychological responses to stress. These results agree with other studies.[27]

Before accepting the hypothesis that the CMD patients present higher resting activity, some observers believe it is important to consider two other factors: the thickness of the subcutaneous tissues and the prevalence of bruxism.[12] In present study, the majority of patients clenched their teeth. The mean rest activity levels for masseter and anterior temporalis muscles of the control group were slightly higher than the relaxed normal range values stated in the device's manual.[28]

No significant differences existed between the two groups in the maximum or average values of the elevator muscles' activities during clenching. The control group demonstrated higher maximum (peak) activities of the elevator muscles than the

patients. The authors cannot agree with Cooper and Rabuzzi[29] that healthy muscles' clenching ability should be able to raise output more than 160 μV.

The kinesiographic assessment demonstrated no significant differences between the two groups in maximum vertical opening, maximum anteroposterior movements in the sagittal plane, and maximum deviation to left or right in the frontal plane during maximum opening and closing. The maximum vertical opening measurement given from the K6 analysis program (Scan 1) is not the clinical maximum opening, so comparisons cannot be done. Nielsen et al[30] showed that the mean values of the maximum vertical opening of 10 normal subjects tracked with the Kinesiograph-K5 were 31.5 ± 7.4 mm. The deviation of the jaw in the frontal plane was only slightly larger in our female patients. The deviation of the jaw during opening and closing has been proposed as a pathognomonic sign of the dysfunction of the craniomandibular system.[6,31] The clinical dysfunction index of Helkimo,[13,14] based on evaluation of five clinical signs, proposed a deviation of ≥ 2 mm as an indication of a slight disturbance of the craniomandibular system. The present K6 data do not support such a concept.

No subject in our study demonstrated an "ideal" pattern of opening/closing trajectory, which can be defined as an undeviated pattern in both frontal and sagittal planes. All showed a deviated pattern in the frontal plane to either the right or left. In the sagittal plane, 42% of the asymptomatic women demonstrated an undeviated trajectory compared with the 17% of the patient group. According to the manual of the K6,[16] an undeviated trajectory in the sagittal plane represents a more relaxed muscular system and more coordinated opening and closing movements. A crossover pattern was demonstrated in both groups; 34.6% of the controls and 25.8% of the patients showed this pattern. These percentages are less than those of Feine et al,[9] who evaluated the diagnostic criteria of the Mandibular Kinesiograph (Myo-Tronics) and reported that 60% of their controls and 57% of their patients demonstrated this pattern. Nevertheless, the present results agree with their statement that the pattern is unlikely to be linked to muscle disorder. The limited number of subjects together with the lack of reproducibility or consistency of the mandibular movements did not allow establishment of positive diagnostic criteria in the present study. Such criteria are presented in the manufacturer's manual but without supportive evidence.

Compared with the patients, the control group showed slightly greater maximum and terminal velocities during normal movements, together with very fast and wide opening and closing movements. Only the maximum and average velocities during fast and wide opening were significantly different. Feine et al[9] also showed that in TMD patients, the maximum velocities of opening and closing tended to be less than that of normal persons, but the detected differences were not statistically significant.

Myo-Tronics' manual states that "If there is no dysfunction, the trace will be smooth and reach a speed of between 250 mm/sec and 450 mm/sec on opening and closing without irregularity and rough spot." The present study's mean maximum velocities of the asymptomatic women during the fast opening/closing movements ranged from 288.1 to 314.0 mm/s, whereas those of the patient group ranged from 230.1 to 284.3 mm/s. In the study of Feine et al,[9] the mean maximum fast opening/closing velocities ranged from 95 to 286 mm/s for normal persons and 89 to 191 mm/s for patients. While et al[29] stated that 76% of their asymptomatic subjects showed bradykinesia, indicating velocity of less than 300 mm/s.

The irregularities noticed in the velocity tracings were evaluated according to the company's instructions. Three of the asymptomatic subjects demonstrated a click whereas most of them had smooth movements. Twenty-one patients traced a click, while 28 revealed a click under clinical examination.

Significant differences were noticed between the two groups in the vertical (FS) and anteroposterior movements from rest to CO. The mean value of the FS in the control group (range 0.2 to 6.7 mm, mean 1.49 mm) was smaller than that in the patient group (range 0.6 to 12 mm, mean 2.7 mm). Feine et al[9] found the FS ranged from 0.5 to 3.8 mm for the patient group and from 0.5 to 6.9 mm for normal individuals. Cooper and Rabuzzi[29] considered from 0.75 to 2.0 mm as "healthy" FS and less than 0.75 mm or greater than 2.0 mm as "unhealthy." In 16 out of 26 of their asymptomatic subjects, the vertical FS was within the normal range. Cooper et al[32] reported the recordings of 476 patients that showed that 24% had healthy FS (average vertical 1.8 mm) and 76% had unhealthy (average vertical 4.1 mm) FS. The clinical rest position (FS), measured with various methods and devices, has been reported to be in the range of 0.9 to 3.8 mm.[33–35]

In drawing conclusions from this work, the limitations of the experiment should be appreciated. This was a controlled study; it was not blind.

Furthermore, even the selection of the control group posed problems, as it appeared more practical to use staff who were on the premises. Although there was no shortage of females in the age group 25 to 45 years, it proved surprisingly difficult to find subjects who were symptom-free. The results of this study indicate that patients with craniomandibular disorders demonstrated a higher prevalence of bruxism and, as expected, a greater rest activity of the elevator muscles. In addition kinesiographic measurements showed that the patient group demonstrated greater vertical and anteroposterior movements from rest to centric occlusion, while both average and maximum mandibular opening velocities were smaller.

Conclusion

The clinical assessment showed that female CMD patients demonstrated higher prevalence of bruxism compared with the asymptomatic female group, but showed no significant differences in the occlusal variables. No significant differences existed in the frequency and type of stress responses between females suffering craniomandibular disturbances and asymptomatic females.

The EMG assessment showed that patients' rest activity of elevator muscles was significantly greater than that of the controls, and no significant differences existed between the two groups in the maximum or average values of the elevator muscles activities during clenching.

The kinesiographic assessment showed that both groups recorded nearly similar deviations of the jaw in the frontal plane during opening and closing. No valuable diagnostic criteria can be established from the evaluation of the pattern of opening and closing trajectory in the sagittal plane. Only the maximum and average velocities during fast and wide opening were significantly different between the two groups. The vertical and anteroposterior movements of the jaw from rest position to centric occlusion significantly differed between the two groups.

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Resumen

Evaluación clínica, electromiográfica y cinesiográfica controlada de los desórdenes craneomandibulares en mujeres.

Se utilizaron métodos clínicos cinesiográficos y electromiográficos para evaluar 35 mujeres que presentaban deórdenes craneomandibulares. Los controles fueron otras 26 mujeres asintomáticas, cuyas edades eran similares a las del grupo experimental. Las evaluaciones clínicas demostraron que las pacientes del grupo experimental tenían una prevalencia más marcada hacia el bruxismo que las del grupo de control. Los resultados de los exámenes electromiográficos indicaron que la actividad de reposo de los músculos elevadores de las pacientes del grupo experimental fue significativamente mayor que las del grupo de control. Las medidas cinesiográficas indicaron que el grupo experimental tenía mayores movimientos verticales y antero-posteriores desde la posición de reposo a la de oclusión céntrica en comparación al grupo de control. Además tanto la velocidad de apertura promedio como la de máxima apertura fueron menores en el grupo experimental que en el de control.

Zusammenfassung

Eine kontrollierte klinische, elektromyographische und kinesiographische Untersuchung von Myoarthropathien des Kausystems (MAP) bei Frauen.

35 Patientinnen mit MAP wurden elektromyographisch und kinesiographisch untersucht. 26 Frauen gleichen Alters dienten als Kontrollgruppe. Die klinische Untersuchung zeigte eine höhere Prävalenz für Bruxismus in der Patientengruppe als in der Kontrollgruppe. Die elektromyographische Ruheaktivität der Elevatoren in der Patientengruppe war signifikant höher als in der Kontrollgruppe. Die vertikalen und anterio-posterioren Bewegungen von der Ruheposition in die maximale Interkuspidation waren grösser in der Patientengruppe. Mittlere und maximale Oeffnungsgeschwindigkeit waren in der Patientengruppe geringer als in der Kontrollgruppe.