The Relationship Between Muscle Tenderness and Craniomandibular Disorders: A Study of 35-Year-Olds From the General Population

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Of a random sample of 345 subjects aged 35 years and drawn from the general population of Västerbotten County, Sweden, 276 (80%) participated in an epidemiologic survey on muscle tenderness of the jaw, neck, shoulder, arm, hand, and calf, and on the prevalence of signs and symptoms of craniomandibular disorders. The control group consisted of 144 subjects (52%) who had no tenderness. The remaining subjects were separated into groups: (1) *59 subjects (21%) with tenderness only in jaw muscles;* (2) *26 subjects (9%) with tenderness only in neck/shoulder muscles;* (3) *39 subjects (14%) with tenderness in muscles of the jaw and neck/shoulder; and* (4) *eight subjects (3%) with tenderness in all palpated muscles of the neck, shoulder, arm, hand, and calf. Women were found to have palpation tenderness significantly more often than men* ($P < .05$). *The main finding of this study was the presence of a significantly higher proportion of signs and symptoms of craniomandibular disorders in the group who had both jaw muscle tenderness and neck/shoulder muscle tenderness and in the group who had generalized tenderness than in the control group. The results indicate that in epidemiologic and clinical research of craniomandibular disorders, a distinction between local, regional, and general tenderness should be made since the etiology may differ.*

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The term *craniomandibular disorders* (CMD) covers signs and symptoms of functional impairment of the mandible, sounds of the temporomandibular joint (TMJ), pain on movements of the jaws, associated headaches, and facial pain.[1] One of the first to focus on these symptoms in relation to the function of the TMJ and occlusion was Costen.[2] His theory about the condyle compressing adjacent nerves as a result of overclosure of the mandible related to a loss of molars gained much attention but was later seriously questioned. The work of Schwartz[3] shifted the focus of studies on TMJ dysfunction to the muscles of mastication. Much effort has since been made to understand the etiology of disturbances in jaw function and associated pain. The concept of a multifactorial etiology is generally accepted when psychosocial factors, instability of occlusion, and diseases affecting the musculoskeletal tissues have been found to have a significant importance. In one study,[4] mandibular dysfunction was found to be related to minor illness, such as back, neck, and shoulder pain. In another study,[5] mandibular dysfunction was found

to be related to impaired general health. Thus, CMD should be seen as a result of a number of specific diseases affecting the joints, the muscles, and the peripheral and central nervous systems.

Experimental studies that tested the effect of loading the jaw muscles by bruxism for 30 minutes[6] or by protrusion of the mandible against resistance for 5 minutes[7] in asymptomatic volunteers have elicited dull pain in the regions of the ears, temples, and forehead, similar to that of symptomatic subjects. Submaximal clenching using a clenching effort of approximately 30% of maximal voluntary clenching (MVC) developed pain and discomfort within 30 seconds in patients with CMD, while asymptomatic individuals reported symptoms after 180 seconds.[8] Several studies based on population and patient samples have found significant relationships between tenderness of jaw muscles and reported jaw fatigue,[9–11] pain,[9–11] headaches,[12–14] and sick leave.[15]

In 1904, the term *fibrositis*, which was based on the assumption of an inflammation of the connective tissues, was used by Gowers[16] to suggest an underlying mechanism in patients with dull, migrating pain in muscles and joints. Since 1976,[17] the term *fibromyalgia* has often been used, sometimes preceded by the terms *secondary* or *primary*. Clinical criteria have been established for diagnosis,[18,19] but the phenomenon is also questioned.[20] Fibromyalgia is described to be far more common among women than among men. Women constitute 75% to 90% of the cases,[21] and the median onset is reported to fall within the third decade of life.[21,22] Often associated symptoms include headaches and an irritable bowel.[21–23] A recent study estimating the prevalence of fibromyalgia in the population reported that about 1% met the criteria.[24]

Muscle tenderness, the most common sign found in patients with CMD, is often found in the general population.[1,25] Although diseases involving generalized tenderness of muscles may affect the jaw muscles, no study seems to have focused on the interaction among the presence of tenderness of jaw muscles, neck/shoulder muscles, and generalized sites in relation to CMD. The aim of this study was to examine a sample drawn from the general population in regard to the pattern of muscle tenderness and the presence of CMD.

Materials and Methods

In 1990, an epidemiologic study on the oral health of the adult population in the county of Västerbotten in northern Sweden was conducted. Individuals aged 35, 50, and 65 years old were included in the study. From the cohort of 35-year-olds (3,588 individuals), a sample of 345 was selected at random: 276 people (80%) participated in a clinical examination and answered a 45-item questionnaire; 41 people (12%) provided some information (31 answered the questionnaire and 10 were interviewed by telephone); eight people had moved from the county; and 20 people (6%) did not participate in any way. The present study focuses on the 276 subjects who participated in the examination and answered the questionnaire. Six dentists, whose techniques were calibrated for the variables used, performed the examinations. Before the study, interexaminer reliability was tested for the variables included in the functional examination. The percentage of agreement was 81% to 87%, and Cohen's kappa was 0.58 to 0.67. The sample and the procedures have been presented elsewhere.[26]

The questionnaire included questions about general health, living arrangement (living alone or with someone), medication, education, employment, use of tobacco, TMJ sounds, feelings of fatigue in the jaws, difficulties in opening wide, pain in the jaws at rest or during movements, headaches, tinnitus, and days of sick leave.

The clinical examination included:

1. TMJ sounds. Auscultation and palpation for the presence of TMJ sounds and vibrations on opening and closing movements of the jaw were performed without the use of a stethoscope. The occurrence of sounds and vibrations was classified as dull clickings, sharp clickings, or crepitations.
2. TMJ locking. Locking of one or both TMJs was registered if jaw opening was less than 25 mm or a deviation of 5 mm or more occurred when opening wide.
3. TMJ tenderness. The TMJ was palpated laterally and posteriorly through the auditory meatus. To improve the reliability, tenderness was registered only if the palpation elicited a palpebral reflex in the eye or a protective reflex.
4. TMJ pain during movements. Pain on free movements (opening wide, laterotrusion, protrusion) was registered.
5. TMJ loading. Each subject was asked to bite hard for 30 seconds on a double wooden spatula (2 mm) placed at the region of the first molars of the right side, and the procedure was repeated on the left side. Elicited pain in the contralateral joint was registered as "TMJ load pain."

6. Mandibular mobility. Maximal opening capacity was measured to the nearest millimeter with the aid of a ruler in accordance with Agerberg's study.[27] In the statistical analysis, a group was formed comprised of those who had a reduced opening capacity (less than one standard deviation of the mean value).
7. Loading of jaw muscles. Each person was asked to clench his or her teeth hard in the intercuspal position for 30 seconds. Development of fatigue or of pain in the head, face, or jaws during the clenching was recorded as "clench symptoms."
8. Muscle tenderness. Tenderness to palpation of muscles was evaluated the same way that the TMJ was evaluated. The following muscle and/or tendon attachment sites were palpated: lateral pterygoid muscles, medial pterygoid muscles, anterior and posterior parts of the temporal muscles, tendons of the temporal muscles, superficial and deep parts of the masseter muscles, sternocleidomastoid muscles, trapezius muscles, underside muscles of the forearms, thumb muscles, and calf muscles.

The sample of subjects was grouped according to the result of muscle palpation. Those who had no registered tenderness comprised the control group, and the remaining subjects comprised the symptomatic group. The symptomatic group was further grouped according to patterns of tenderness: *(1)* tenderness found only in jaw muscles; *(2)* tenderness found only in neck/shoulder muscles; *(3)* tenderness found in jaw and neck/shoulder muscles; and *(4)* tenderness found in all palpated regions of neck, shoulder, arm, hand, and calf muscles (Fig 1). Subgroups of those with localized tenderness in jaw muscles were also formed, with one to three and four or more jaw muscles tender to palpation. The grade of tooth wear of the canines and incisors was recorded according to the index developed by Oilo et al.[28] In the statistical analysis, those with no or slight tooth wear formed one group (80%), and those with moderate to severe wear formed the other (20%).

Statistics

The chi-square test or Fisher's Exact test (two-sided) was used in analyses between control subjects and symptomatic subjects. A 5% level of significance was used.

Results

No one in the sample wore dentures. The mean number of teeth was 28 (range, 16 to 32). According to the index of Eichner, 93% of the subjects had contact in all four supporting zones. No statistically significant differences between control and symptomatic subjects were found in the number of teeth or supporting zones. An absence of tenderness to palpation was recorded for 144 subjects (52%); tenderness in one or more jaw muscles only, for 59 subjects (21%); tenderness in both jaw and neck/shoulder muscles, for 39 subjects (14%); tenderness in neck/shoulder muscles only, for 26 subjects (9%); and generalized tenderness, for eight subjects (3%). For all symptomatic subjects, women were found to have tenderness to palpation significantly more often than men ($.05 \geq P > .01$; $.01 \geq P > .001$; $P < .001$) (Table 1). No statistically significant differences between symptomatic subjects and control subjects were found regarding the level of education or living arrangement (Table 1).

In both control and symptomatic groups, allergy was frequently reported; however, the number of cases was not significantly different between groups (Table 2). Rheumatic diseases were significantly more often reported by those who had jaw and neck/shoulder muscle tenderness ($P = .04$) and by those with generalized tenderness ($P = .02$). Impaired general health was reported by about 5% of the control subjects and significantly more often by the group with generalized tenderness ($P = .01$). Stomach complaints were reported significantly more frequently by those in whom generalized tenderness ($P = .005$) and jaw and neck/shoulder muscle tenderness ($P < .001$) were found (Table 2).

The symptom reported most frequently was TMJ sounds, but the distribution between the different groups did not differ significantly (Table 3). Compared to control subjects, fatigue and pain in the jaws were significantly more common in those with both jaw and neck/shoulder tenderness and in those with generalized tenderness ($P < .001$) (Table 3). Headaches that were reported as occurring at least once a week were significantly more often reported by the groups with jaw muscle tenderness ($P < .001$), jaw and neck/shoulder muscle tenderness ($P = .01$), and generalized tenderness ($P = .04$). When subjects with only localized tenderness in jaw muscles were further divided according to the number of tender sites, 33% of the group with four or more tender sites reported weekly headache ($P < .001$). Tinnitus was reported by almost half of those with both jaw and neck/shoulder tenderness, which was statistically significant ($P < .001$) in

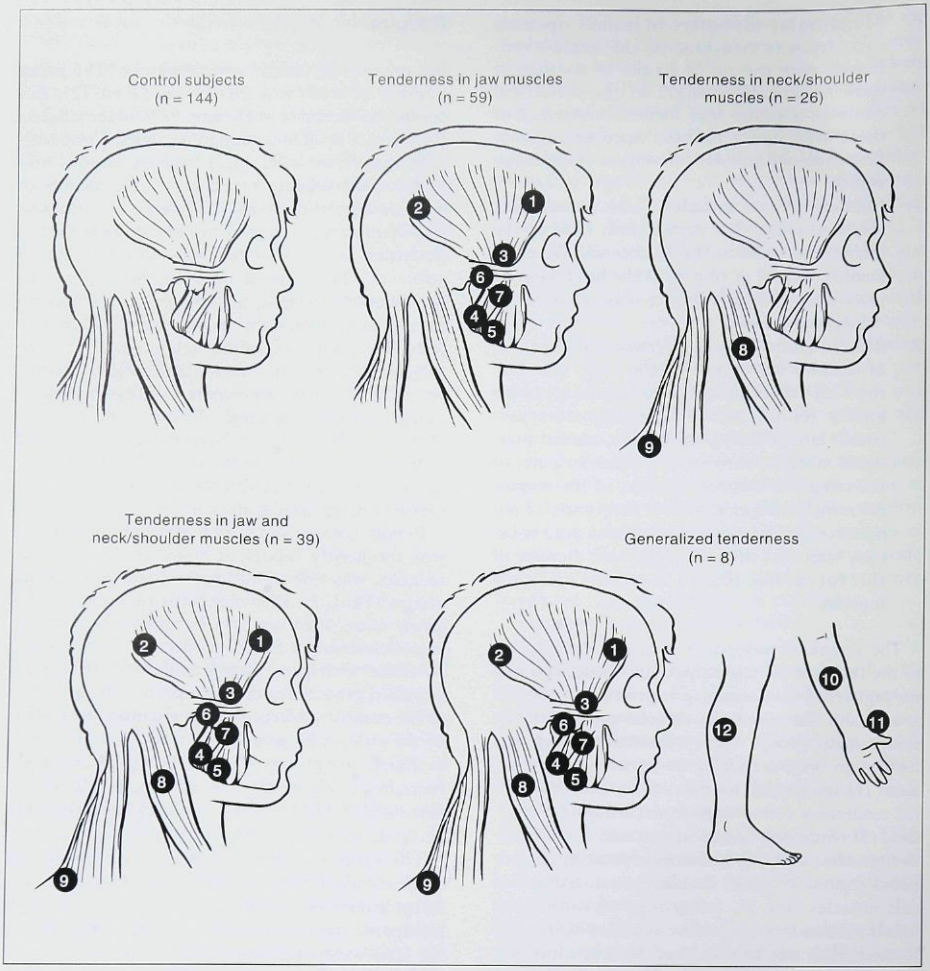

Fig 1 Localization of palpation sites and the distribution of subjects according to the results of palpation. 1 = anterior part of the temporal muscles (extraoral); 2 = posterior part of the temporal muscles (extraoral); 3 = temporal tendon (intraoral); 4 = deep part of the masseter muscles (extraoral); 5 = attachments of the medial pterygoid muscles (extraoral); 6 = area of the lateral pterygoid muscles (intraoral); 7 = superficial part of the masseter muscles (intraoral, bidigital); 8 = sternocleidomastoid muscles (bidigital); 9 = trapezius muscles (bidigital); 10 = underside muscles of the forearm (bidigital); 11 = thumb muscles (bidigital); 12 = calf muscles (bidigital). Control subjects = no tenderness at sites 1 to 12; tenderness in jaw muscles = tenderness in one or more of sites 1 to 7 and no tenderness in sites 8 to 12; tenderness in neck/shoulder muscles = tenderness in one or both of sites 8 and 9 and no tenderness in sites 1 to 7 or 10 to 12; tenderness in jaw and neck/shoulder muscles = tenderness in one or more of sites 1 to 7 and in one or both of sites 8 and 9 but not in sites 10 to 12; generalized tenderness = tenderness in all of sites 8 to 12.

Table 1 Percentage Distribution of Factors Related to Demography

	Control subjects† (n = 144)	Symptomatic subjects‡			
		Jaw (n = 59)	Jaw/neck (n = 39)	Neck (n = 26)	General (n = 8)
Gender					
Men	63.9	44.1	30.8	42.3	12.5
Women	36.1	55.9**	69.2***	57.7*	87.5**
Living arrangement					
With someone	80.6	83.1	74.4	80.8	62.5
Alone	19.4	16.9	25.6	19.2	37.5
Education					
Compulsory school	16.7	25.4	23.1	19.2	25.0
Senior high school	58.3	47.5	53.9	53.9	37.5
University degree	25.0	27.1	24.6	26.9	37.5

†No tenderness to palpation.
‡Jaw = tenderness in one or more jaw muscles only; jaw/neck = tenderness in one or more jaw muscles and in one or more neck/shoulder muscles; neck = tenderness in one or more neck/shoulder muscles; general = tenderness in neck/shoulder muscles, arm muscles, thumb muscles, and calf muscles.
*$.05 \geq P > .01$
**$.01 \geq P > .001$
***$P \leq .001$

Table 2 Percentage Distribution of Reported State of General Health

	Control subjects† (n = 144)	Symptomatic subjects‡			
		Jaw (n = 59)	Jaw/neck (n = 39)	Neck (n = 26)	General (n = 8)
Impaired general health	4.9	3.4	10.3	7.7	37.5**
High blood pressure	4.9	5.1	7.7	3.9	0
Rheumatic disease	2.1	3.4	10.3*	7.7	25.0*
Allergy	21.5	15.3	20.5	23.1	50.0
Abdominal disease	8.3	11.9	30.8***	11.5	50.0**
Smoker	27.8	32.2	41.0	23.1	50.0

†No tenderness to palpation.
‡Jaw = tenderness in one or more jaw muscles only; jaw/neck = tenderness in one or more jaw muscles and in one or more neck/shoulder muscles; neck = tenderness in one or more neck/shoulder muscles; general = tenderness in neck/shoulder muscles, arm muscles, thumb muscles, and calf muscles.
*$.05 \geq P > .01$
**$.01 \geq P > .001$
***$P \leq .001$

comparison with the control subjects. Sick leave due to head, face, or jaw pain during the year before examination was more commonly reported by all symptomatic groups than by the control group but reached a level of significance only for those with generalized tenderness ($P = .007$) (Table 3).

Sounds from TMJ clicking on jaw movements were the most frequently recorded signs of mandibular dysfunction. Compared to control subjects, the symptomatic subjects with jaw and neck/shoulder tenderness had significantly more frequent TMJ clicking ($P = .01$), tenderness of the TMJs at palpation ($P = .002$), TMJ load pain ($P = .05$), clench symptoms ($P = .002$), and moderate to severe tooth wear ($P = .004$) (Table 4). The group with generalized tenderness had tenderness of the TMJs ($P = .007$) and clench symptoms ($P = .001$) significantly more often than did control subjects. When those with only localized tenderness in jaw muscles were analyzed according to number of tender sites, 60% of those with four or more tender sites had a moderate to severe grade of tooth wear ($P < .001$).

Table 3 Percentage Distribution of Symptoms of Mandibular Dysfunction, Recurrent Headaches, Tinnitus, and Sick Leave

	Control subjects† (n = 144)	Symptomatic subjects‡			
		Jaw (n = 59)	Jaw/neck (n = 39)	Neck (n = 26)	General (n = 8)
TMJ sounds	29.2	25.4	33.3	30.8	50.0
Fatigue in jaws	10.4	15.3	48.7***	19.2	75.0***
Pain in jaws	3.5	5.1	30.8***	3.9	50.0***
Difficulties in opening wide	6.3	13.6	5.1	3.9	25.0
Headaches once a week or more often	9.7	25.4***	25.6**	7.7	25.0*
Tinnitus	19.4	23.7	46.2***	34.6	25.0
Sick leave in past year due to jaw or head pain	4.2	8.5	12.8	15.4	37.5**

†No tenderness to palpation.
‡Jaw = tenderness in one or more jaw muscles only; jaw/neck = tenderness in one or more jaw muscles and in one or more neck/shoulder muscles; neck = tenderness in one or more neck/shoulder muscles; general = tenderness in neck/shoulder muscles, arm muscles, thumb muscles, and calf muscles.
*$.05 \geq P > .01$
**$.01 \geq P > .001$
***$P \leq .001$

Table 4 Percentage Distribution of Signs of Mandibular Dysfunction

	Control subjects† (n = 144)	Symptomatic subjects‡			
		Jaw (n = 59)	Jaw/neck (n = 39)	Neck (n = 26)	General (n = 8)
TMJ clicking	23.2	22.8	43.6**	30.8	12.5
TMJ tenderness	4.2	5.1	20.5**	0	37.5**
TMJ load pain	9.2	17.0	21.6*	24.0*	25.0
Reduced maximal opening capacity	11.1	11.9	18.4	3.9	12.5
Clench symptoms	18.2	23.7	42.1***	11.5	75.0***
Moderate to severe tooth wear	15.3	23.7	35.9**	11.5	12.5

†No tenderness to palpation.
‡Jaw = tenderness in one or more jaw muscles only; jaw/neck = tenderness in one or more jaw muscles and in one or more neck/shoulder muscles; neck = tenderness in one or more neck/shoulder muscles; general = tenderness in neck/shoulder muscles, arm muscles, thumb muscles, and calf muscles.
*$.05 \geq P > .01$
**$.01 \geq P > .001$
***$P \leq .001$

Discussion

The studied group was a random sample drawn from the general population to estimate the oral health and the need for treatment among adults in the northern part of Sweden. The participation rate was good and the total number of dropouts was low. The methods of investigation are well known in this kind of research.[1] We used palpebral and protective reflexes as signs of muscle tenderness, because this has been found to increase the reliability.[29] The results of the interexaminer variability were in accordance with other studies.[30–32] The sites of palpation of the jaw muscles and neck/shoulder muscles used in the present study are commonly used in research on the function of the masticatory system.[1,12–15,33,34] The sites that were used to estimate generalized tenderness were not based on the proposed sites for fulfilling the criteria of fibromyalgia.[19] It was not the purpose of this study to estimate the prevalence of different musculoskeletal disorders in the population. In addition, a complete palpation procedure for fulfilling the criteria for fibromyalgia according to Yunus et al[19] would have required the subjects to take off their shirts, but the subjects might have found this inappropriate for an

epidemiologic study of their oral health. The term *generalized tenderness* was based on the presence of a palpebral or protective reaction to palpation of each of the four different functional and anatomic parts of the body (shoulder, arm, hand, and leg). In later analysis, all of those with generalized tenderness were found to also have tenderness to palpation in the jaw muscles.

Pain is a common reason for consulting a physician. In a Danish study, 22% of the consultations during 1 week were in response to pain, 39% of which was chronic.[35] In two recent mail surveys of random samples from the general population in the United States[33] and in Sweden,[34] a high prevalence of pain was presented. In the former study, headache was reported by 26% of the subjects and facial pain by 12%. In the latter study, head, face, and mouth pain was reported by 14.6% of the sample, and any pain or discomfort by 65.9%. In those with benign chronic pain, the conditions in myofascial tissues was the most likely factor.[34] In patients with tension and migraine headaches without aurae, tenderness to palpation in muscles related to the function of the masticatory system is commonly found.[12-14]

The presence of tenderness was more commonly found in women than in men, which also has been found in earlier studies.[1,24,36,37] The prevalence of tenderness in jaw muscles (38%) in the present study was close to the median value of 18 epidemiologic studies.[25] The prevalence of tenderness in neck/shoulder muscles (24%) was close to the results of a study that used a similar technique.[36] No comparable figures of the prevalence of generalized tenderness (3%) have been found, but in an older sample of the general population (aged 50 to 70 years), the prevalence of fibromyalgia according to the criteria of Yunus et al[19] was estimated to be 1%, and the prevalence of rheumatoid arthritis was 0.7%. Approximately 1% had psoriatic arthritis, ankylosing spondylitis, gout, or other similar disorders.[24]

The major finding in this study was the significantly higher proportion of signs and symptoms of craniomandibular disorders in the subjects who had both jaw muscle and neck/shoulder muscle tenderness and in those with generalized tenderness, even though the number of individuals in the latter group was small and inference should be done with care. A higher prevalence of CMD symptoms has been found in patients with rheumatoid arthritis,[38] psoriatic arthritis,[39] and ankylosing spondylitis[40] than in the general population. Hence, in clinical examinations as well as in epidemiologic studies of the presence of CMD, a palpation procedure involving other areas in addition to the jaw and neck is recommended. Impaired general health, rheumatic and abdominal complaints, sick leave, and headaches were more frequently reported by subjects with generalized tenderness than by the control subjects. This finding is in agreement with clinical material of patients with fibromyalgia.[21-23] In a sample of 17-years-olds, a significant relationship between recurrent headaches and stomach complaints was found.[12] The majority of those with generalized pain to palpation developed fatigue and pain in the jaws during 30 seconds of clenching. This might indicate a low or reduced capacity in the tissues to endure load and the importance of the etiology of the disorder.[41]

A relationship between the presence of CMD and the state of the neck and shoulder was noted even in the early papers of Schwartz,[3] in which he wrote that pain "was not always limited to the regions innervated by the fifth cranial nerve, but sometimes involved the neck and shoulder. . . not only the masseter, internal pterygoid, and temporalis muscle, but also the posterior cervical, trapezius, and sternomastoid muscles were frequently involved." The cause was thought to be a painful self-perpetuating spasm of the masticatory system.[3] Later studies have not supported that theory.[42] The association among headache, neckache, and TMJ dysfunction was studied in a sample of female typists and keyboard operators in Finland.[43] Signs of CMD were found to be more prevalent in a group that had sought medical advice and received treatment for neck and shoulder symptoms in comparison with those who had not sought advice and treatment.[43] Berry[4] found a higher frequency of neckache and backache in patients with mandibular dysfunction. In a group of patients referred for cervical hyperextension-hyperflexion injury, a strong relationship between the patients' subjective assessment of pain and dysfunction in the neck and the subjective report of CMD and masticatory muscle palpation was found.[44] The results in the present study are in agreement with these previous findings and indicate a relationship between signs and symptoms of CMD and neck/shoulder pain. An earlier study reported a close relationship between pain and tenderness of the chewing muscles and a protruded head posture.[37] In another study,[22] the author reported a frequent occurrence of posture anomalies of the spinal column, suggesting that static factors related to posture might be of significant importance in patients with CMD. A collaboration between physiotherapists and dentists for these patients is recommended as well as further

studies aimed at the role of head posture in the development of CMD. The results may also indicate that pain mediated with small-diameter muscle afferents from jaw muscles or cervical muscles may give a facilitation of the trigeminal spinal tract nucleus, which contributes to a spread of tenderness.[45] In a follow-up study[46] that included subjects with different pain symptoms, subjects with a pain condition at baseline were more likely to report first onset of a new pain condition over the follow-up period. The authors suggested as an explanation of this finding that the result might also have been related to a tendency among the subjects to answer affirmatively to questions about pain symptoms. The results of the present study indicate that when an effort is made to analyze the significance of determinants in the development of CMD, a distinction between local, regional, and general tenderness of muscles should be advocated.

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Resumen

La Relación entre la Sensibilidad Muscular y los Desórdenes Craneomandibulares: Estudio de Personas de 35 Años de Edad Pertenecientes a la Población General

De 345 personas de 35 años de edad seleccionadas al azar provenientes de la población general del Condado de Västerbotten en Suecia, 276 (80%) participaron en un examen epidemiológico sobre la sensibilidad muscular de la mandíbula, cuello, hombro, brazo, mano y pantorrilla y sobre la prevalencia de los signos y síntomas de los desórdenes craneomandibulares (DCM). El grupo de control consistió de 144 sujetos (52%) quienes no presentaban sensibilidad. El resto de las personas fueron separadas en grupos: *(1)* 59 personas (21%) con sensibilidad en los músculos de los mandibulares solamente; *(2)* 39 personas (14%) con sensibilidad en los músculos del cuello/hombros solamente; *(3)* 26 personas (9%) con sensibilidad en los músculos mandibulares y del cuello/hombros; y *(4)* ocho personas (3%) con sensibilidad en todos los músculos palpables del cuello, hombro, brazo, mano, y pantorrilla. Las mujeres presentaron sensibilidad a la palpación mas a menudo en comparación a los hombres, lo cual fue significativo ($P < .05$). El hallazgo principal de este estudio fue la presencia de una proporción significativamente mas alta de signos y síntomas de DCM en el grupo que tenía sensibilidad de los músculos de la mandíbula y del cuello/hombro lo mismo que en sujetos que presentaban sensibilidad generalizada, en comparación al grupo de control. Los resultados indican que en la investigación epidemiológica y clínica de los DCM, se debe hacer una diferenciación entre la sensibilidad local, regional y general, ya que la etiología puede ser diferente.

Zusammenfassung

Die Beziehung zwischen Muskelempfindlichkeit und Myoarthropathien des Kausystems: Eine Studie an 35-jährigen aus der Bevölkerung

Aus einer zufällig augewählten Gruppe von 345 Probanden—35-jährig und aus der Bevölkerung von Västerbotten, Schweden—nahmen 276 (80%) an einer epidemiologischen Studie über Muskelempfindlichkeiten an Kiefer, Hals, Schultern, Arm, Hand und Wade und über die Prävalenz von Zeichen und Symptome von Myoarthropathien des Kausystems (MAP) teil. Die Kontrollgruppe bestand aus 144 Subjekten (52%), die keine Empfindlichkeiten aufwiesen. Die übrigen Subjekte wurden in Gruppen eingeteilt: *(1)* 59 Subjekte (21%) mit Empfindlichkeit nur in den Kaumuskeln, *(2)* 26 Subjekte (9%) mit Empfindlichkeiten nur in der Hals- und Schultermuskulatur, *(3)* 39 Subjekte (14%) mit Empfindlichkeit in den Kaumuskeln und im Hals- und Schulterbereich und *(4)* acht Subjekte (3%), die Empfindlichkeiten in allen an Hals, Schulter, Arm, Hand und Wade palpierten Muskeln aufwiesen. Bei Frauen konnten signifikant mehr Palpationsempfindlichkeiten gefunden werden als bei Männern ($P < .05$). Der Hauptbefund dieser Studie ist das Vorhandensein von signifikant mehr Zeichen und Symptomen von MAP in der Gruppe mit Druckempfindlichkeiten in den Bereichen Kaumuskulatur und Hals- und Schultermuskulatur und mit generalisierter Palpationsempfindlichkeit als in der Kontrollgruppe. Das Resultat weist darauf hin, dass in der epidemiologischen und klinischen MAP-Forschung eine Unterscheidung zwischen lokaler, regionaler und generalisierter Muskel-Palapationsempfindlichkeiten gemacht werden sollte, weil deren Aetiologie verschieden sein kann.