Generalized Pain and Pain Sensitivity in Community Subjects with Facial Pain: A Case-Control Study

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Aims: *To investigate the existence of pain outside the facial area as well as pain sensitivity in a population-based sample of 34-year-old subjects with facial pain.* ***Methods:*** *Fifty-two facial pain cases (10 men, 42 women) and 52 pain-free controls (10 men, 42 women) included in the Northern Finland Birth Cohort of 1966 underwent a clinical musculoskeletal examination. Pain outside the facial area during the week prior to the examination was defined by means of a pain drawing. Eighteen fibromyalgia points were palpated in response to digital palpation with an algometer. Pressure pain thresholds were measured from the dorsal side of the wrist and from the highest points of the temporalis muscles.* ***Results:*** *Compared to controls, pain cases reported significantly more pain in areas outside the face, with the exception of the shoulder and lower back. The number of painful fibromyalgia points was significantly higher in cases than in controls. Mean pressure pain thresholds were slightly lower in cases than in controls; the difference was significant in the left wrist.* ***Conclusion:*** *Subjects with facial pain reported more pain and had more muscular tenderness outside the facial area compared to controls. Pain symptoms outside the facial area should be assessed in patients seeking treatment for facial pain, and they should be taken into account when treatment is planned.* J OROFAC PAIN 2005;19:127–132

Key words: facial pain, generalized pain, pain sensitivity, temporomandibular disorders

Facial pain has been considered a common symptom in temporomandibular disorders (TMD).[1] Local factors, such as occlusal interferences, have been suggested to affect TMD.[2,3] On the other hand, it has been proposed that TMD may be part of a generalized pain condition. Several clinical studies have found a significant overlap between facial pain and pain in other parts of the body.[4–6] Patients with masticatory myalgia in particular have complaints and diffuse muscle tenderness beyond the masticatory muscles,[7] mostly in the head, neck, and back.[5] It has been suggested that this generalized pain condition is associated with psychological problems, especially depression and somatization.[8]

Several authors have provided data on the role of central nervous system modulation in TMD. Maixner et al[9] presented a psychophysiologic hypothesis to account for general changes in somatosensory sensitivity in patients with TMD myalgia. They proposed that myalgia patients might have impaired endogenous pain regulation. Compared to normal populations, facial pain patients have been observed to have lowered pain thresholds,[9–14] although some investigators have found no differences in pain sensitivity.[15,16]

The association of TMD with generalized pain has mostly been investigated in studies with patient samples, where care-seeking behavior may have an effect on the results. Therefore, additional population-based studies are needed to evaluate this association. Earlier, in a large population-based sample consisting of 5,696 young adults, Rauhala et al found an association between reported facial pain and reported pain in other areas of the body, such as the neck, arm, shoulders, and lower back,[17] as well as an association between reported facial pain and depression.[18] Clinical research is needed in this area. Based on the findings of Rauhala et al and earlier studies concerning pain regulation among TMD patients, the authors hypothesized that facial pain is associated with self-reported and clinically assessed muscle tenderness in other areas of the body, as well as with lowered pain sensitivity. The aim of the study was to investigate the existence of pain outside the facial area, as well as pain sensitivity, in a population-based sample of 34-year-old subjects with facial pain.

Materials and Methods

The study sample was part of the Northern Finland Birth Cohort 1966, which included subjects born in 1966 in Northern Finland.[19] In 1997, 5,696 subjects answered a computer-aided questionnaire. In addition to questions about various aspects of their health and well-being, patients were asked "Have you had pain or ache in the face during the last year?" The patient was asked to respond either "yes" or "no." If the patient responded yes, he or she was asked whether the pain occurred "now and then," "fairly often," or "often or continuously" (Fig 1). The same questionnaire was sent by mail to those in the cohort who did not attend the computer-aided questionnaire session.

In 2000, a subsample of the cohort (n = 362) was formed based on the question concerning facial pain in the computer-aided questionnaire.[20] A second inquiry was sent to all subjects who lived in Oulu (a city of 120,000 inhabitants in northern Finland) who had reported facial pain (n = 162 cases) and to 200 randomly selected Oulu residents, matched for gender, who had not reported facial pain. The number of controls was based on the number needed to obtain an equal number of cases and controls, providing for a dropout rate of 20%.

The second inquiry consisted of the following questions about facial pain and pain in other areas of the body:

1. Have you had pain or ache in the face during the last year? (Respondent answered "yes" or "no"; if yes, he or she was asked whether the pain occurred "now and then," "fairly often," or "often or continuously.")
2. How long ago did you have facial pain for the first time?
3. Have you had problems (pain, ache, discomfort) during the last year (12 months) in the following parts of the body: neck/occiput, shoulders, elbows, wrists/hands/upper back, lower back, one or both hips, one or both knees? (Respondent answered "yes" or "no." A drawing of the body outline (posterior view) was used in order to identify the areas where pain was felt (Fig 2).

Responses were obtained from 124 cases (76.5%) and 145 controls (72.5%). Those who reported their willingness to participate in the study and gave the same answer to the question concerning facial pain given in the earlier questionnaire (61 cases, 83 controls) were invited to a clinical examination. In total, 121 people (53 cases, 68 controls) participated in the clinical examination. One of the cases was excluded from the study because of lack of cooperation. Because of a different gender distribution in the final study groups, the controls were randomized by the proportional allocation method. The final number of the subjects was 104, with 52 participants (10 men, 42 women) in each group (Fig 1).

Musculoskeletal examinations of the body were performed by a physiotherapist (PS). Both the therapist and the subjects were unaware of the case-control status. According to criteria described by the American College of Rheumatology,[21] 18 fibromyalgia (FM) points were palpated in response to digital palpation, with an approximate force of 4 kg. A pressure pain algometer (Model FDV, Wagner Instruments) was used to measure pressure pain thresholds (PPTs) from the following points: *(1)* the dorsal sides of the wrists (at a point 2 cm proximally from the distal end of the ulna) and *(2)* the temporalis muscles (on the line between the upper orbital margin and the upper point of the outer ear, which was determined from palpation during voluntary contraction). The measurements were performed with a probe with a contact area of 1 cm^2; force was increased by 1 kg/s until the subject said that the pressure felt

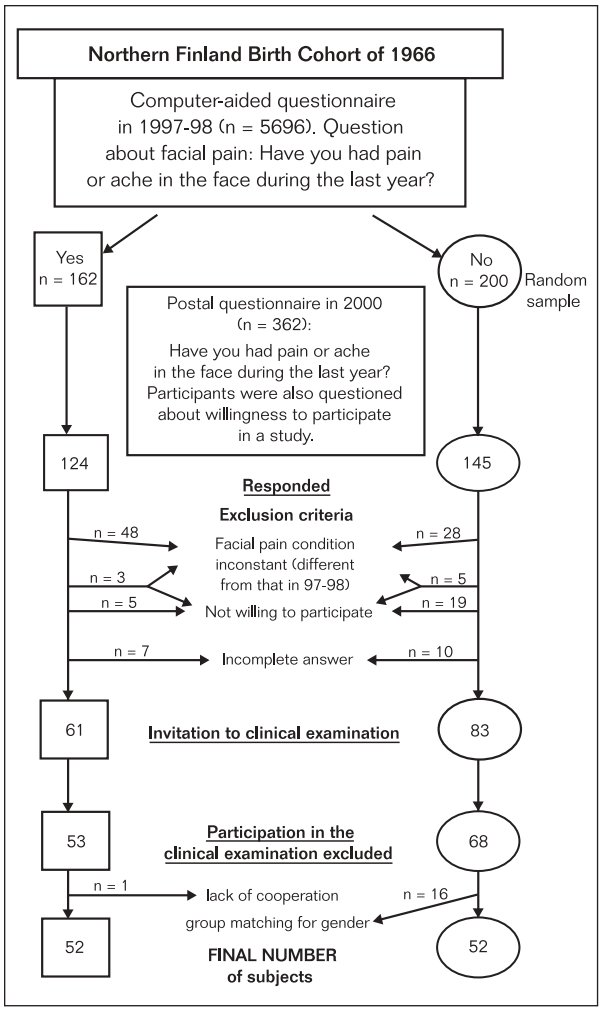

Fig 1 A flowchart of the study from selection of subjects from the Northern Finland Birth Cohort of 1966 to clinical stomatognathic and musculoskeletal examination. Case and control groups were formed on the basis of the subjects' answers to a question asked in a computer-aided questionnaire performed in 1997 and 1998 and in a second inquiry sent in 2000 to subjects living in Oulu.

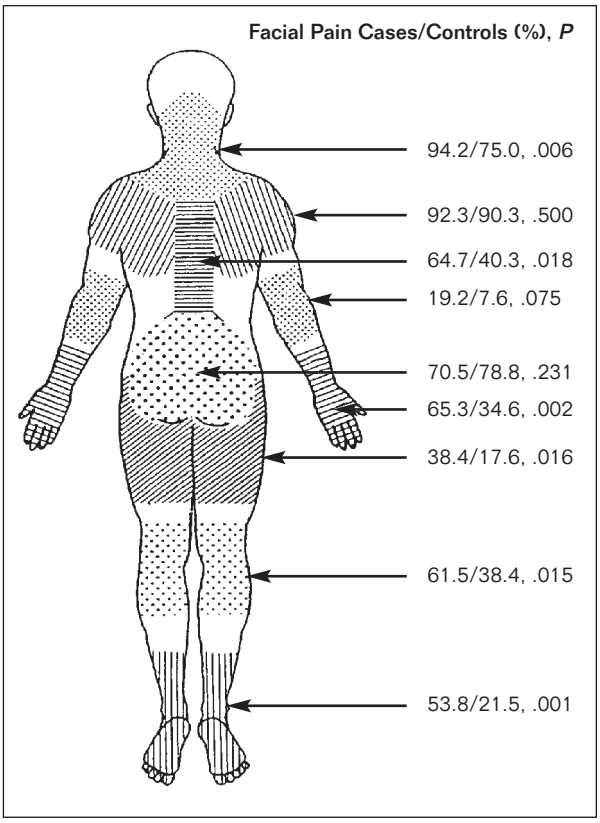

Fig 2 Percentage of subjects (52 cases and 52 controls) who reported pain in the indicated area during the previous week. The locations where pain was felt were indicated on an outline of the body (posterior view). Cases reported pain in areas outside the face significantly more often than controls ($P < .05$, Fisher exact test), except in the shoulders and lower back.

painful. The procedure was practiced 1 or 2 times on the arms in order to get the subjects accustomed to the device before measurements were recorded. After practicing, 1 measurement was made at each site in each subject. Forty-eight cases and 51 controls underwent a complete measurement.

Statistical Analyses

The Fisher exact test was used to compare the report of pain in distinct areas of the body between cases and controls. The 2 groups were compared in regard to number of tender FM points with the 1-tailed Mann-Whitney test. Independent 1-tailed *t* tests were used to compare the mean PPTs for the case group with those of the control group. A P value $< .05$ was considered to indicate statistical significance. An analysis of attrition was performed to compare differences in gender and sociodemographic characteristics between the 362 individuals initially selected, the 269 individuals who responded to the questionnaire, and the 104 subjects who participated in the clinical examination and were included in the final sample of the study (Fig 1). The differences in sociodemographic characteristics between the groups were not significant. The gender distribution of the 104 participants differed significantly ($P < 05$, chi-square test) from the original sample, which indicates that the net sample was not representative of the initially selected sample.

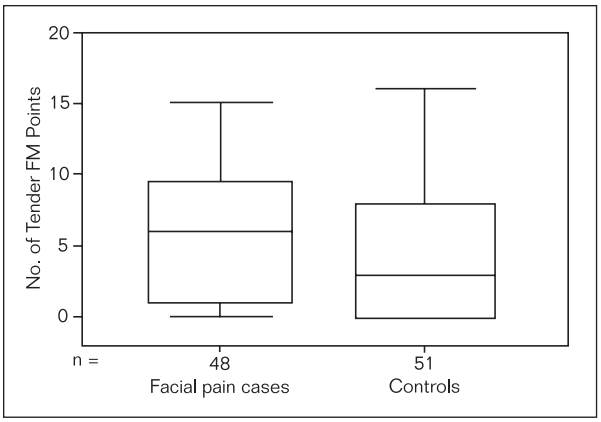

Fig 3 The number of tender FM points in 48 of 51 facial pain cases and 51 of 52 pain-free controls. The number of tender FM points was significantly higher in cases than in controls ($P < .05$, 1-tailed Mann-Whitney test).

Table 1 Mean (SD) PPTs Measured on the Dorsal Sides of the Wrists and From the Highest Points of the Temporalis Muscles in 48 Facial Pain Cases and 51 Pain-free Controls

	PPT (kg/cm^2)		
	Cases (n = 48)	Controls (n = 51)	*P**
Wrist			
Right	5.54 (1.98)	6.02 (2.14)	ns
Left	5.17 (1.89)	5.91 (2.27)	.0038
M. temporalis			
Right	2.61 (1.19)	3.08 (1.89)	ns
Left	2.61 (1.38)	2.99 (1.50)	ns

*Independent samples 1-tailed *t* test.
ns = not significant.

Results

A total of 35 facial pain cases answered the question concerning the onset of facial pain. The median duration of facial pain was 5 years (range, 0.5 to 24 years). According to the pain drawings, cases reported significantly ($P < .05$) more pain in areas outside the face, with the exception of the shoulders ($P = .500$), elbows ($P = .075$), and lower back ($P = .231$) (Fig 2). Clinically, the number of tender FM points was significantly higher among cases (median, 6; range, 0 to 15) than among controls (median, 3; range, 0 to 16) (Fig 3). Ten (19.2%) cases and 5 (9.6%) controls had at least 11 tender FM points.

The mean PPTs were lower in cases than in controls. The difference was significant in the left wrist ($P < .05$). The PPT values were lower in the temporalis muscles than in the wrists (Table 1).

Discussion

The results of the present study have shown that compared with controls, subjects with facial pain reported significantly more pain outside the facial area, except in the shoulders, elbows, and lower back region. The number of painful fibromyalgia points was significantly higher in cases than in controls. Mean pressure pain thresholds were slightly lower in cases than in controls; the difference was significant in the left wrist.

The present study had certain strengths and limitations. It consisted of a population-based sample that was homogenous in regard to age and place of residence. This community sample offered an opportunity to estimate the associations between the variables, excluding the effects of care-seeking behavior, in contrast to patient studies, which may overrepresent comorbidity between the disorders. A strength of the present study is that both the subjects and the clinicians were unaware of the case-control status. This decreased the possibility of an information bias. No reliability tests were done, which is a limitation of the study. However, the clinical examinations (ie, stomatognathic and musculoskeletal) were carried out at all registrations by the same persons.

Because the cases reported having facial pain in both 1997 and 2000, the pain reported by the cases can be regarded as chronic; a corresponding pain-free period was reported by the controls. The duration of pain reported by the cases was rather long (median of 5 years), which also demonstrates the chronicity of the cases' facial pain.

The gender distribution of the 104 participants differed from the original sample, which indicates that the net sample was not representative of the initially selected sample. Because the gender distribution differed between cases and controls in the final study groups, randomization of the controls was used to equalize the groups in relation to gender.

Based on their age (34 years), the community subjects are at risk for TMD.[22] Further, women are reportedly more likely to have multiple symptoms of TMD than men,[23] and muscular TMD is more commonly part of a generalized pain syndrome among women than men.[24] For these reasons, the groups were matched by gender in the present study.

The results suggest that facial pain subjects may be more prone to report pain in general compared

to controls. The observation that no significant differences were found between cases and controls in the shoulder, elbow, and lower back areas may be related to the proportionally high amount of pain reported in these areas. In the authors' previous study,[20] the facial pain cases of this sample were primarily classified in the myogenous subgroup of TMD. Furthermore, according to adjusted analyses reported earlier,[20] subjects having moderate or severe TMD had the strongest association with facial pain, followed by protrusion interferences in dental occlusion, reported allergies, and "other headaches." Thus, the possibility of other facial pain conditions should be taken into consideration. The lack of final diagnoses for those conditions is a limitation of the present study.

The findings of the present study are consistent with other studies indicating that patients with myogenous facial pain report high rates of widespread pain.[5,6] Turp et al[6] found persistent facial pain primarily in association with pain in the neck, shoulder, and back regions. In the present study, the associated pain areas extended even to the upper and lower extremities. Differences between the groups in regard to muscle tenderness based on the clinical examination were also found in the present study. This finding is in accord with a population-based study of a cohort of 35-year-olds (n = 276) by Wänman.[25] He found a connection between TMD and generalized muscle tenderness (tenderness found in the neck, shoulder, arm, hand, and calf muscles).

Some clinical studies also indicate an overlap between facial pain and FM.[7,8,24,26,27] Because the onset of symptoms most often occurs between 30 and 40 years of age, [21] the prevalence of FM in this age group was suspected to be low. For this reason, the FM criteria (at least 11 out of 18 tender points and self-reported pain in 4 quadrants over the prior 3 months)[21] were not used. However, according to the clinical examination, the cases had higher levels of tender FM points and so might conceivably have FM in their later years. The tendency of facial pain subjects to report a greater number of pain symptoms could be interpreted as an indication that they are likely to be more sensitive to peripheral stimulation in general. The present data support this assumption, although the differences in PPTs were not significant (except in the left wrist). There are discrepancies in previous studies of PPT values in TMD patients and control subjects. Studies by Farella et al[14] and Reid et al[12] found significantly lower PPTs in TMD patients than in control subjects, while others have found no differences between patients and controls.[16] The discrepancies may be associated with various factors, such as mode and site of pressure stimulation, as well as the composition of the sample. Curran et al[16] evaluated pressure pain tolerance in the hand, whereas Reid et al[12] and Farella et al[14] used sites in the temporal and masseter regions. Furthermore, Farella et al[14] noted that PPT values for the jaw muscles were lower on the more painful side compared to the least painful side. The finding of the present study that PPTs in the temporal area were lower than those measured in the wrists among both cases and controls indicates differences in pain sensitivity between the 2 areas.

It can be concluded that subjects with facial pain report more pain and have more muscular tenderness outside the facial area compared to controls and thus may be more prone to report pain in general. It has been noted that patients with widespread pain are more resistant to conservative treatment of TMD.[28] Although facial pain may be local, it can also be part of a generalized pain condition, possibly related to stress, which was reported to provoke facial pain by 60% of the cases in an earlier study by the authors.[20] Pain symptoms outside the facial area should also be assessed in patients seeking treatment for facial pain and should be taken into account in the treatment plan.

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