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Association of depressiveness with chronic facial pain: A longitudinal study

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Abstract

Objective. Depression and pain are often co-morbid. Temporomandibular disorders (TMD) include facial pain as one main symptom. Reports are lacking on the association between chronic facial pain and earlier depressiveness. The aim of the study was to investigate whether depressiveness increases the risk for chronic facial pain in a longitudinal population-based study. ***Materials and methods.*** Subjects included in the Northern Finland Birth Cohort 1966 ($n = 5696$) answered a questionnaire on facial pain and depressiveness using the Symptom Checklist-25 depression sub-scale at the age of 31 years. In addition, reported depression diagnosed by a doctor was enquired about. Three years later a sub-sample of the cohort, including 63 cases with chronic facial pain and 85 pain-free controls, was formed based on the question concerning facial pain. ***Results.*** Of the chronic facial pain cases 17.5% and of the pain-free controls 7.1% were depressive 3 years earlier at baseline ($p = 0.050$, χ^2 test, crude OR = 2.8, 95% CI = 1.0–8.0). Of the chronic facial pain cases 6.3% and of the pain-free controls 1.2% reported having had diagnosed depression ($p = 0.085$, crude OR = 5.7, 95% CI = 0.6–52.2). After adjusting the gender, the association between depressiveness reported at the baseline and chronic facial pain was significant (OR = 4.2, 95% CI = 1.1–16.2). When widespread pain was included in the analysis, the association was not significant. ***Conclusions.*** Depressiveness increases the risk for chronic facial pain in a 3-year follow-up. This association seems to be mediated through widespread pain.

Key Words: *depression, facial pain, temporomandibular disorders, TMD, widespread pain*

Introduction

Facial pain is one of the main symptoms of temporomandibular disorders (TMD) that are characterized as an heterogeneous set of clinical problems involving the masticatory musculature and/or the temporomandibular joint (TMJ). They are considered to be a subclass of musculoskeletal disorders and typically run a recurrent or chronic course [1]. Besides facial pain, other symptoms such as TMJ sounds and restricted mandibular movements are common symptoms and signs of TMD [1].

The etiology and pathology of TMD varies and is partly controversial. General factors such as impaired health, general joint and muscle diseases and local factors such as occlusal disturbances and traumas can exist in the background of TMD [1]. Additionally, the role of psychological and psychosocial factors in TMD has been emphasized [2]. TMD are often associated with present psychological complaints including fatigue, sleep disturbances, anxiety, stress and depression [3,4,5].

Depression is one of the leading causes of morbidity worldwide, affecting ~ 6.7% of the general population annually and 16% over the lifetime [6,7]. Depression and pain are often co-morbid [8], with especially chronic pain and depression co-occurring frequently [9]. Depression and pain share biological pathways

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and neurotransmitters, which in turn has implications for the treatment outcome [10].

As TMD have been considered as one of the chronic musculoskeletal pain conditions, it is understandable that depression has been noted to associate with TMD. High rates of depression have been shown in patients with TMD [4,11–14], especially those of myogenous origin [14,15]. Depression has been shown to associate with TMD according to epidemiological studies as well [16–19]. The co-morbidity between TMD and depressiveness has been noted especially in multiple pain conditions [19]. It has been stated that psychological symptoms and disturbances may be a consequence of pain in TMD patients [20]. On the other hand, psychological factors are thought to have a role in the cause or maintenance of TMD and they may pre-dispose the condition to chronicity in patients with TMD [21]. Despite the association found between psychosocial factors and TMD, there is less evidence that these factors are etiologic [2]. To our knowledge, there exist no population-based studies concerning the role of depressiveness on chronic facial pain in a prospective setting.

Earlier, in an epidemiological study of a Northern Finland Birth Cohort consisting of 5696 31-year-old adults, we found that 12% of men and 18% of women reported experiencing facial pain in the past year [22] and that it was associated with depressiveness [17]. Further, co-morbidity between facial pain, widespread pain and depressiveness was found [19]. In the case-control study [23] of a sub-sample of the cohort we found a significant association between self-reported facial pain and clinically-assessed TMD.

According to the literature, it can be hypothesized that depressiveness can pre-dispose to the development of chronic facial pain, especially in the case of multiple pain. The aim of the present study was to investigate the association of earlier depressiveness with development of chronic facial pain in a 3-year follow-up and to evaluate the role of widespread pain in this association in a population-based sample.

Materials and methods

The study forms part of the Northern Finland Birth Cohort of 1966. The original sample was collected from a geographically defined area of the two northernmost provinces of Finland. It consisted of an unselected, general population-based birth cohort of 12,058 live births, whose expected date of delivery fell in 1966, representing 96.3% of all such births [24]. Permission to gather data was obtained from the Ministry of Social and Health Affairs, and the study has been approved by the Ethics Committee of the Northern Ostrobothnia Hospital District. Written informed consent was obtained from all participants.

Basic survey

In 1997, at the age of 31 years, 8463 of those cohort members who were living in northern Finland or in the capital area were sent an invitation to a clinical examination (Figure 1). Of them, 5696 subjects (68%) answered a computer-aided questionnaire where, among other aspects concerning the health and well-being of the subjects, data on facial pain were reported. Facial pain was inquired with the following question: (1) Have you had pain or ache in the face during the last year? The answers were dichotomized as no/yes (now and then/fairly often/often or continuously coded as 'yes').

Information about depressiveness was obtained from a postal questionnaire included in the 31-year follow-up. Depressiveness was measured with the Symptom Checklist-25 (SCL-25) depression subscale [25,26], which is a 13-item shortened version of an originally 90-item questionnaire designed by Derogatis et al. [27]. Subjects recorded their own estimates of symptom severity by values ranging from 1 (not at all) to 4 (very much). Responses were summed and divided by the number of answers. A score over 1.75 indicated depressiveness, while scores of 1.75 or under indicated non-depressiveness [28,29]. In addition, the postal questionnaire included the following question about diagnosed depression: Have you ever had depression, diagnosed by a doctor? The answers were dichotomized as no/yes.

Follow-up survey

In 2000, at the age of 34 years, a sub-sample of the cohort was formed based on the question concerning facial pain in the basic survey (Figure 1). A new questionnaire was sent to the following subjects living in Oulu, which is a city of 120 000 inhabitants in northern Finland:

(1) all subjects who had reported facial pain in the previous questionnaire (n = 162 cases) and
(2) randomly selected controls (n = 200), a group matched for gender, who had reported no facial pain in the previous questionnaire. The number of controls was calculated so as to obtain an equal number of cases and controls, providing for a drop-out of 20%. The new inquiry included the same following question about facial pain as in the basic survey: 'Have you had pain or ache in the face during the last year?' The answers were dichotomized as no/yes (now and then/fairly often/often/continuously coded all as 'yes'). Of the cases, 124 (76.5%) and 145 of the controls (72.5%) responded. Those who gave the same answer concerning facial pain as in the earlier questionnaire formed the study sample (63 chronic facial pain cases, 85 pain-free controls).

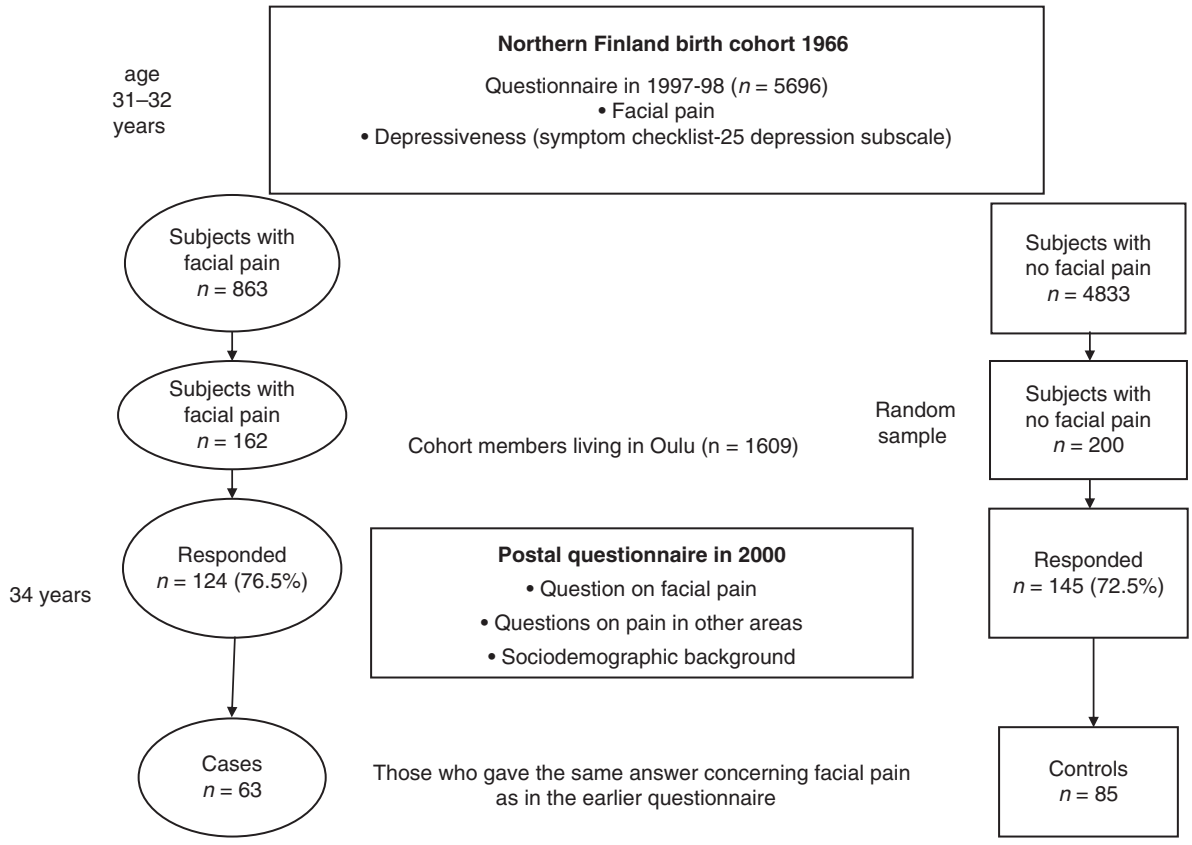

Figure 1. Selection of study subjects from the Northern Finland Birth Cohort 1966 [24]. Case and control groups were formed on the basis of the question concerning facial pain in the computer-aided questionnaire in 1997 and a new inquiry in 2000 from subjects living in Oulu.

The questionnaire constituted of the following questions about pain in other areas of the body: 'Have you had troubles (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/feet?' The answers were dichotomized as no/yes. A pain drawing from the body outline (back view) was used in order to identify the areas. For the analyses, widespread pain was defined according to the set of screening criteria established by White et al. [30] with some modifications. Subjects that reported pain involving at least one upper extremity (wrists/hands), one lower extremity (knees/feet), neck and back (upper/lower back) were assessed to be suffering from widespread pain.

Data on sociodemographic and health background were collected using a questionnaire in the follow-up study at the age of 34 years old. The variables used were education level (indicating socio-economic status), marital status and self-reported general health. Education was categorized into basic education and matricular examination. Marital status was dichotomized, with married or co-habiting subjects comprising one group and the rest (divorced, widowed or single subjects) the other group. Subjects were asked to rate their health with the response options 'very good', 'good', 'moderate', 'poor' or 'very poor' and health was further categorized as good (good/very good) or poor (moderate/poor/very poor).

Statistical analyses

The associations between depressiveness (as measured with the SCL-25 depression sub-scale and diagnosed depression) at the baseline and chronic facial pain in the follow-up survey were evaluated using chi-square tests. The crude and adjusted (including gender, poor general health status and widespread pain) odds ratios (OR) and 95% confidence intervals (95% CI) were calculated in the model. SPSS version 16.0 was used for the analyses.

Results

Almost one fifth of the chronic facial pain cases and 7% of the pain-free controls were depressive at the baseline (p = 0.050, crude OR = 2.8, 95% CI = 1.0–8.0). Chronic facial pain cases reported having depression diagnosed by a doctor at baseline almost 6-fold as compared with the pain-free controls (p = 0.085, crude OR = 5.7, 95% CI = 0.6–52.2). More than half of the chronic facial pain cases and more than one fifth of the

Table I. Percentage (%) of depressiveness (measured with the Symptom-Checklist-25 depression sub-scale), reported depression diagnosed by a doctor, sociodemographic and health background factors in chronic facial pain cases and pain-free controls in the Northern Finland Birth 1966 cohort.

At the age of 31 years[a]	*n*	Facial pain cases at the age of 34 years[a] (*n* = 63)	Controls without pain (*n* = 85)	*P*[b]	Crude OR (95% CI)
Depressiveness	17	17.5	7.1	0.050	2.8 (1.0–8.0)
Diagnosed depression	5	6.3	1.2	0.085	5.7 (0.6–52.2)
Female gender	111	81.3	68.6	0.081	2.0 (0.9–4.3)
Married/co-habiting	98	61.9	38.1	0.382	0.7 (0.4–1.4)
Education level[c]	82	54.0	56.5	0.762	0.9 (0.5–1.7)
Poor general health	58	57.1	27.2	< 0.001	3.6 (1.8–7.2)
Widespread pain	42	57.1	22.9	< 0.001	4.0 (1.9–8.6)

[a]Data were based on questionnaires in 1997 (depressiveness and sociodemographic factors) and in 2000 (chronic facial pain) at the ages of 31 and 34 years old, respectively.
[b]*p*-value (chi square test).
[c]matricular examination.

pain-free controls had widespread pain at the baseline ($p < 0.001$, crude OR = 4.0, 95% CI = 1.9–8.6). Of the background factors, poor general health at baseline associated significantly with chronic facial pain ($p < 0.001$, crude OR = 3.6, 95% CI = 1.8–7.2) (Table I). After adjusting the gender and general health status, the association between depressiveness reported at the baseline and chronic facial pain was significant (OR = 4.1, 95% CI = 1.1–16.1). After adding widespread pain in the model, the association between depressiveness and chronic facial pain was not significant (adjusted OR = 2.1, 95% CI = 0.5–9.3) (Table II).

Discussion

The results of the present study show that depressiveness increases the risk for chronic facial pain almost 3-fold in an adult population. This association is mediated through poor general health and presence of multiple pain. Depression can provoke chronic pain through several ways. One of them may be the altered care-seeking behavior. Depressiveness may lower an individual's ability to take care of themselves, which may decrease care-seeking behavior [31]. On the other hand, common neurophysiological mechanisms may exist in the background. The neurotransmittors serotonin and norepinephrine are involved in both nociception and depression and their imbalance has been shown to be involved in both conditions [32].

The present results support the previous epidemiological studies that have found an association between depression, facial pain and TMD [16–19]. Our longitudinal study indicates that depressiveness, as associated with poor general health and other pain conditions, can pre-dispose also to chronicity of facial pain condition. The results are supported by other population-based follow-up studies concerning depression and various chronic pain conditions [33–36]. A recent follow-up study by Gupta et al. [33] from 3171 adults aged 25–65 years found that psychosocial distress increases the risk for development of chronic widespread pain during a 15-month period, but they did not study TMD or facial pain. Depression has also been identified as a predictor for first onset of specific pain conditions such as TMD, chest pain and headache [34,35]. In a 3-year

Table II. Factors related to chronic facial pain with adjusted odds ratios (OR) and 95% confidence intervals (CI) in a sub-sample of the Northern Finland Birth Cohort 1966[a]

	Adjusted OR[c]	95% CI	Adjusted OR[d]	95% CI
Female gender	1.0	0.4–2.8	1.0	0.4–3.1
Poor general health	2.4	0.8–7.1	2.3	0.7–7.4
Presence of widespread pain	—	—	4.4	1.7–11.1
Depressiveness[b]	4.1	1.1–16.1	2.1	0.5–9.3

[a]Data were based on questionnaires in 1997 (depressiveness and sociodemographic factors) and in 2000 (chronic facial pain) at the ages of 31 and 34 years old, respectively.
[b]Measured with the Symptom-Checklist-25 depression sub-scale.
[c]Adjustment with depressiveness, gender and poor general health.
[d]Additional adjustment included also widespread pain. The multivariate model was adjusted for variables presented in the table.

follow-up study (from 1016 subjects), von Korff et al. [34] found that depressiveness, as measured with the Symptom Checklist 90-Revised, increased the risk for development of headache and chest pain. They did not, however, report on the association between depressiveness and chronic facial pain. In a recent prospective cohort study by Slade et al. [35], 171 healthy females (aged 18–34 years) were followed up for 3 years and 8.8% of them were diagnosed with first-onset TMD. Depression (as measured with the Brief Symptoms Inventory depression sub-scale), perceived stress and mood were predictive of 2–3-fold increases in the risk of TMD. They also investigated the possible genetic influence on this association and found that psychological factors influence on TMD risk independently of the effects of the COMT (catechol-O-methyltransferase) haplotype on TMD risk. In contrast to our study, they used the RDC/TMD criteria as an outcome variable, whereas we used chronic facial pain based on self-reported data as a main outcome variable.

TMD have been shown to have high co-morbidity with depression and a generalized pain condition, fibromyalgia, both of which are associated with dysregulation of cortisol secretion in the hypothalamic–pituitary–adrenal (HPA) axis [36]. High levels of cortisol have been noted to occur both in depression [37] and facial pain [36] as well as in fibromyalgia [38,39]. We found a strong connection between depressiveness and widespread pain (Table I). After controlling for widespread pain in the analysis, this association disappeared. Based on this result we can assume that the connection between facial pain and depressiveness is mediated through widespread pain, thus indicating that the co-morbidity may be linked with more complicated pain problemacy. This finding supports the previous results that have found the co-morbidity between facial pain and depression, especially in multiple pain conditions [19].

This study had some strengths. The aim was rather novel. As far as we know no earlier reports on the association between earlier depressiveness and chronic facial pain in a prospective setting exist. Our study consisted of an homogeneous sample concerning age and place of residence. The potential confounders (gender, general health status and presence of multiple pain) were controlled for in the multivariate analysis. Further, the selection bias was decreased by the inclusion criteria that were based on the same condition, i.e. the presence of facial pain in 1997 and in 2000. Thus, the pain reported by the cases can be regarded as chronic, whereas controls had a highly constant pain-free period. In the present study the 13-item SCL-25 depression sub-scale was used as an indicator for depressiveness. This method has been used in all Nordic countries in a large population study [40]. Besides the SCL-25 depression sub-scale, diagnosed depression was also enquired into. Although based from self-reporting, using this variable as another indicator of depression on its behalf confirms the results. As a limitation, depressiveness was based on self-reported questions and not assessed clinically. Additionally, the size of the sample was quite low and the associations are expected to strengthen when using larger samples.

It can be concluded that depressiveness predisposes to chronic facial pain. This association is mediated through widespread pain. Depressiveness may predict the transition from acute to chronic facial pain. The findings emphasize the role of early treatment of depression in preventing chronic pain conditions. Psychological components in the background of facial pain should be explored in the diagnosis and treatment of TMD. As dentists usually work in primary healthcare and treat patients with facial pain, they are in a key position in screening patients in need of psychological interventions. A multi-professional approach is necessary, especially in chronic, complex facial pain conditions.

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