Cervical spinal pain in chronic craniomandibular pain patients. Recognition, prevalence and risk indicators

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Chapter 7

Psychological distress in chronic craniomandibular and cervical spinal pain patients

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Submitted
In chronic craniomandibular disorders, a relationship with psychological distress has been often been investigated, yielding contradictory results. Recent studies to chronic pain have shown that especially the number of painful body areas is related to the level of psychological distress. Therefore, the first aim of this study was to analyse differences in level of psychological distress between craniomandibular pain patients with or without cervical spinal pain. In this analysis, the number of painful body areas below the cervical spine was also taken into account. The second aim was to determine differences in level of psychological distress between subgroups of craniomandibular pain patients. In this study, 103 out of 250 persons with or without craniomandibular pain were included in the final analyses. From each participant an oral history was taken and independently performed examinations of the masticatory system and of the cervical spine were performed. Patients who suffered from both craniomandibular and cervical spinal pain showed higher levels of psychological distress, as measured with the Symptom Checklist 90 (SCL-90) than patients with local craniomandibular pain and persons without pain (p=0.026-0.000). Further, a positive relationship was found between the number of painful body areas below the cervical spine, as measured on a body drawing, and the SCL-90 scores (p=0.045-0.000). No psychological differences were found between myogenous and arthrogenous craniomandibular pain patients. In conclusion: chronic craniomandibular pain patients with a coexistent cervical spinal pain show more psychological distress than patients with only a local craniomandibular pain and asymptomatic persons.
Introduction

In chronic pain, the role of psychological distress has gained much attention (e.g., Romano and Turner, 1985; Dyrehaug et al., 1998), and the majority of published reports have suggested that chronic pain patients show increased levels of distress, like depression or anxiety. Psychological distress may be a consequence of pain and the limitations it imposes on the patient’s life, but on the other hand chronic pain may also be a sign of an underlying psychological disturbance (Magni et al., 1994). Therefore, diagnostic classification systems, such as the ‘Classification of Chronic Pain’ by the International Association for the Study of Pain (Mersky and Bogduk, 1994), have included psychological factors in the assessment of chronic pain. Recent studies have indicated that in chronic pain patients, the level of psychological distress is also related to the number of painful body areas. A large-scale epidemiologic survey (Dworkin et al., 1990b) showed that patients with more than one pain site (e.g., back pain, headache, and craniomandibular pain) had higher levels of anxiety, depression, and somatization than persons with only one pain site and non-patients. Moreover, studies on patients with widespread pain, such as fibromyalgia, also suggest that these patients show increased levels of psychological distress (Boissevain and McCain, 1991).

Craniomandibular disorders (CMD) are disorders of the musculoskeletal structures of the masticatory system. The most frequent presenting symptom is pain originating from its musculoskeletal structures, which usually aggravates by chewing or other jaw function (Mersky and Bogduk, 1994; Okeson, 1996). Moreover, symptoms like limited jaw movements and joint sounds can occur. Like for other chronic musculoskeletal disorders, also for chronic CMD a relationship with psychological distress has been suggested (e.g., Rugh and Solberg, 1976; Mersky and Bogduk, 1994; Turk, 1997; Dohrenwend et al., 1999), and the Research Diagnostic Criteria for CMD have stressed that psychosocial variables should be included in the classification of CMD patients (Dworkin and LeResche, 1992). This is expressed by their dual-axis approach: the first axis describes the physical diagnosis of a CMD and provides three categories for the most common forms of muscle- and joint related craniomandibular disorders, whereas the second axis relates to the patients’ pain-related disability and psychological status.
The craniomandibular system forms a functional entity with the cervical spine (Brodie, 1950; Browne et al. 1998; Visscher et al., 2000). A coexistence of CMD with signs and/or symptoms of a cervical spine disorder (CSD) has often been suggested (e.g. Clark et al., 1987; Kirveskari et al., 1988; De Wijer et al., 1996; De Laat et al., 1998; Visscher et al., 1998). In this respect, CSD is a collective term embracing a number of clinical problems of the musculoskeletal structures of the cervical spine, with as most important symptom pain in the neck region, which usually aggravates during movements of the head or by adopting certain head positions (Grant and McKenzie, 1994). As described above, recent investigations have suggested that the number of pain sites is also related to the level of distress. Therefore, the first aim of the present study was to analyse differences in level of psychological distress between chronic craniomandibular pain patients with or without cervical spinal pain. Since patients with a painful craniomandibular disorder may have a higher risk of suffering from pain conditions in other parts of the body (Hagberg, 1991; Türp et al., 1998), the number of painful body areas below the cervical spine was also taken into account in this analysis.

Psychological differences between subgroups of CMD, i.e., patients with muscle- or joint related disorders, have also been investigated, with equivocal results. Some studies concluded that CMD patients with a myogenous disorder suffer from increased levels of psychological distress (Eversole et al., 1985; Lundeen et al., 1987; Kight et al., 1999), whereas others did not find differences between subgroups of CMD patients (Mahrbach and Lund, 1981; Michelotti et al., 1998). Therefore, the second aim was to determine differences in level of psychological distress between subgroups of chronic craniomandibular pain patients.
Materials and methods

Participants
This report is part of a larger study on the relationship between craniomandibular and cervical spinal pain. In total, 250 participants, 179 women and 71 men, with a mean age of 34 ± 13.3 years, entered the study. These participants were consecutively recruited from the CMD clinic at the Academic Centre for Dentistry Amsterdam (ACTA), were friends or relatives of the recruited persons, or were friends or relatives of co-workers from the department. Exclusion criteria were the presence of general joint disorders that might involve the head and neck region (e.g., rheumatoid arthritis), a history of jaw fractures or orthognathic surgery, or active treatment for a CMD. Inclusion criterion was a good understanding of the Dutch language.

From each participant an oral history was taken and physical examinations of the masticatory system and neck were performed. Moreover, participants were asked to complete the Symptom Checklist 90 and the body drawing of the McGill Pain Questionnaire. The scientific and ethical aspects of the protocol were reviewed and approved by the review board of the Netherlands Institute for Dental Sciences, and written informed consent was obtained from all participants.

Psychological distress
To assess the level of psychologic distress, the Dutch version of the Symptom Checklist 90 (SCL-90) was used. The SCL-90 is a self-report symptom inventory, with 90 items covering eight dimensions of psychologic distress experienced in a recent period: anxiety, depression, distrust and interpersonal sensitivity, hostility, insomnia, obsessive-compulsiveness, phobic anxiety, and somatic complaints. In addition, the Dutch SCL-90 provides a summary scale of overall psychologic and physical disorders based on all items of the questionnaire: the psychoneuroticism scale. Each item is rated on a 5-point scale, measuring distress in a range from 1 (not at all) to 5 (very much). Arrindel and Ettema (1986) have shown the Dutch SCL-90 to be reliable and valid and have presented normative data of the male and female Dutch population.
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Widespread pain
To determine the number of painful body sites, the body drawing of the McGill Pain Questionnaire, Dutch Language Version (MPQ-DLV) was used. Each participant was asked to indicate all painful body sites on the drawing. According to a protocol suggested by Türp et al. (1997), the lower part of the body drawing (below the cervical spine) was divided in 5 areas (see Figure 1), and the number of areas marked was determined.

From the initial 250 participants, 222 persons received the SCL-90 and the MPQ-DLV, and 177 participants fully completed both questionnaires; the response rate was 80%.

![Figure 1. Body drawing of the McGill Pain Questionnaire. The five body areas used in the analyses are indicated with numbers.](image)

Recognition of craniomandibular and cervical spinal pain
Current diagnostic criteria for musculoskeletal disorders, such as CMD or CSD, are usually based upon a combination of subjective patient-based information and clinical findings. In accordance to common clinical practice, in this study the recognition of a craniomandibular and cervical spinal pain was based on the results
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of a standardised oral history and a physical examination of the masticatory system and of the neck. The oral history was always performed by the same examiner, and mainly included questions on the presence of pain or tenderness in the orofacial and neck region. Carefully calibrated dentists and physiotherapists, or last year physical therapy students, performed the physical examinations of the craniomandibular system and of the neck, respectively. At the time of the examination, the examiners were blind to the presence or absence of the participant’s pain complaints.

Among others, pain was provoked by palpation, by performing active and passive movement tests, and by dynamic/static tests. During palpation, the muscular and joint structures of the masticatory system and of the neck were examined. During active movements the participant was asked to move the mandible or the head in several directions; during passive tests the examiner further prolonged these movements. For the dynamic tests, each of the movements was performed under the guidance of the examiner by applying a small manual resistance to the mandible or to the head. For the static tests, the manual resistance applied by the examiner was so high that no movement of the mandible or the neck could occur.

The pain responses provoked by the different tests were scored on a 5-point verbal scale, ranging from 0 (no pain) to 4 (unbearably painful), whereas the pain responses on the palpation tests and on the dynamic/static tests were also rated on a 100-mm visual analogue scale (VAS). In two separate analyses, one for the verbal pain scores and one for the VAS pain scores, the highest scores of each of the tests were entered into a forward stepwise logistic regression analysis to determine which (combination of) test(s) best discriminated between persons with or without a craniomandibular or cervical spinal pain complaint, as reported in the oral history. Both analyses showed that the maximum pain score experienced during the dynamic/static tests best discriminated between persons with or without pain complaints. The VAS cut-off threshold value of the dynamic/static tests was 12 mm for the masticatory system and 13 mm for the neck. The models with the verbal pain scores resulted in rather skewed ratios of sensitivity and specificity. Incorporation of the maximum scores of the other tests did not or only slightly improve the outcome of the regression models and resulted in more complicated combinations of cut-off values. Therefore, it was decided to recognise the presence of a
craniomandibular or cervical spinal pain when, in the oral history, the participant reported pain or tenderness in the orofacial region or the neck during the previous month (symptom), and when at least one of the dynamic/static tests of the masticatory system or the neck provoked a pain response which exceeded the VAS cut-off value (sign). When neither the symptom nor the sign was present, the participant was classified as not having a craniomandibular or cervical spinal pain. When either the sign or the symptom was present, it was considered uncertain whether or not the participant had the disorder and the person was assigned to a group with equivocal craniomandibular or cervical spinal pain complaints. Details of these procedures are given elsewhere (Visscher et al., Chapters 4 and 5).

From the 177 participants that completed the SCL-90 and the MPQ-DLV, 103 could unequivocally be classified into one of four mutually exclusive groups: a non-pain group, a group with craniomandibular pain, a group with cervical spinal pain, and a group with both craniomandibular and cervical spinal pain (Table 1). The data of the remaining participants were not included in the forthcoming analysis. According to the oral history, 96% of the included persons with a craniomandibular or cervical spinal pain had chronic pain complaints (>6 months), the others had subacute pain complaints (3-6 months).

| Cervical spinal system | Craniomandibular system | | | |
|------------------------|-------------------------|--|--|
|                        | No pain | Pain | Equivocal | Total |
| No pain                | 34      | 13   | 11        | 58    |
| Pain                   | 6       | 50   | 7         | 63    |
| Equivocal              | 15      | 22   | 19        | 56    |
| Total                  | 55      | 85   | 37        | 177   |

Table 1. Number of participants classified as having, or not having, craniomandibular or cervical spinal pain.

Recognition of myogenous and arthrogenous craniomandibular pain

The participants with craniomandibular pain, with or without a cervical spinal pain (n=63; see Table 1), were also classified into three subgroups: patients with mainly myogenous pain complaints, patients with mainly arthrogenous pain complaints.
and patients with both myogenous and arthergenous pain complaints. This classification was also based upon the results of the oral history and of the physical examination of the masticatory system. Indications for a myogenous craniomandibular pain were pain complaints in the area of the masseter and/or temporalis muscle, which were confirmed by pain in the same area on dynamic/static tests or active movements. Pain complaints localised in the pre-auricular area can have an arthergenous as well as a myogenous origin. In that case, the following findings were regarded as indications for an arthergenous craniomandibular pain: more pain on dynamic than on static tests, pain on lateral or posterior palpation of the temporomandibular joint area, and pain during joint play tests. Indications of a myogenous craniomandibular pain were then: more pain on static than on dynamic tests, no pain on palpation of the temporomandibular joint area, and no pain on joint play tests. When a person had substantial signs and symptoms of both a myogenous and arthergenous character, the person was assigned to the group with myogenous and arthergenous pain. Forty-four persons were assigned to the myogenous group, 10 to the arthergenous group and 9 to the group with a myogenous and arthergenous pain.

**Statistics**

Analysis of Variance (ANOVA), followed by t-tests, was used to analyse differences in the number of painful body areas between the various pain groups and the non-pain group. Analyses of Covariance (ANCOVA), with gender and age as covariates, followed by t-tests, were used to analyse the effects of the craniomandibular and cervical spinal pain classification and the number of painful body areas elsewhere, on the SCL-90 scales. To analyse the effect of the subgroups of craniomandibular pain patients on the SCL-90 scales, Analyses of Covariance (ANCOVA) were used, with gender, age, the presence or absence of cervical spinal pain, and the number of painful body areas elsewhere as covariates, and followed by t-tests. To correct for multiple testing, Holm's Bonferroni procedure was used (Holland and Copenhaver, 1988). For all statistical analyses, the SPSS 9.0 package (SPSS Inc., 1998) was used.
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Results

Figure 2 shows box-and-whisker plots of the number of painful areas (below the cervical spine) rated on the body drawing for the non-pain group, the group with craniofacial pain, the group with cervical spinal pain, and the group with both craniofacial and cervical spinal pain. The craniofacial pain patients with a cervical spinal pain had more painful body areas than the craniofacial pain patients without a cervical spinal pain and the non-pain group ($F_{3,99}=4.80$, $p=0.004$; $t=2.84$-$2.92$, $p=0.005$-$0.004$). The most frequently reported pain area was the back (35%), followed by the arms (10%), and the legs, chest, or abdomen (6%). Only three patients, all with craniofacial and cervical spinal pain, showed three or more painful body areas elsewhere.

![Box-and-whisker plots](image)

**Figure 2.** Box-and-whisker plots of the number of painful body areas for the non-pain group (A), the craniofacial pain group (B), the cervical spinal pain group (C), and the group with both craniofacial and cervical spinal pain (D). **: $p<0.01$

For each SCL-90 scale, Table 2 shows the results of the ANCOVA with the craniofacial and cervical spinal pain classification, and the number of painful body areas elsewhere as independent variables, and age and gender as covariates. In the second column, the F-values for the models including all variables are shown. The models were significant for the scales anxiety, depression, obsessive-compulsiveness, somatic complaints, and psychoneuroticism. In all cases, both the craniofacial and cervical spinal pain classification and the number of painful body areas significantly contributed to these models. The group with both craniofacial and
cervical spinal pain showed higher levels of psychological distress than the non-pain group ($r=3.27\text{-}5.39$; $p=0.002\text{-}0.000$). For the SCL-90 scales obsessive-compulsiveness, somatic complaints, and psychoneuroticism this group also scored higher than the group with only local craniomandibular pain ($t=2.26\text{-}4.02$; $p=0.026\text{-}0.000$). For the number of painful body areas there was positive relationship with the SCL-90 scores. There were no interactions between the two independent variables, nor was there an age effect on either of the SCL-90 scales. For two SCL-90 scales a gender difference was found: women rated higher than men on the dimensions depression and somatic complaints ($t=2.12\text{-}2.31$; $p=0.036\text{-}0.023$).

Table 2. Effect of the craniomandibular and cervical spinal pain classification and the number of painful body areas, on the SCL-90 scales, with age and gender as covariates (ANCOVA and t-tests).

<table>
<thead>
<tr>
<th>SCL-90 scale</th>
<th>Model</th>
<th>Craniomandibular and cervical spinal pain</th>
<th>Painful body areas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>p</td>
<td>F</td>
</tr>
<tr>
<td>Anxiety</td>
<td>3.15</td>
<td>0.007*</td>
<td>4.26</td>
</tr>
<tr>
<td>Depression</td>
<td>3.69</td>
<td>0.002*</td>
<td>3.74</td>
</tr>
<tr>
<td>Distrust and interpersonal</td>
<td>2.28</td>
<td>0.042</td>
<td>-</td>
</tr>
<tr>
<td>sensitivity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hostility</td>
<td>2.73</td>
<td>0.017</td>
<td>-</td>
</tr>
<tr>
<td>Insomnia</td>
<td>2.27</td>
<td>0.043</td>
<td>-</td>
</tr>
<tr>
<td>Obsessive-compulsiveness</td>
<td>3.55</td>
<td>0.003*</td>
<td>3.55</td>
</tr>
<tr>
<td>Phobic anxiety</td>
<td>1.47</td>
<td>0.197</td>
<td>-</td>
</tr>
<tr>
<td>Somatic complaints</td>
<td>11.96</td>
<td>0.000*</td>
<td>11.69</td>
</tr>
<tr>
<td>Psychoneuroticism</td>
<td>4.47</td>
<td>0.000*</td>
<td>5.35</td>
</tr>
</tbody>
</table>

* : significant after Holm's Bonferroni correction

A = non-pain group
B = craniomandibular pain group
C = cervical spinal pain group
D = craniomandibular and cervical spinal pain group

No difference in SCL-90 scores was found between the myogenous pain group, the arthrogenous pain group, and the group with both myogenous and arthrogenous pain (ANCOVA: $F_{2,56}=1.24\text{-}2.47$; $p=0.297\text{-}0.093$), nor was there a difference in the number of painful body sites elsewhere between these groups (ANOVA: $F_{2,60}=0.69$, $p=0.504$).
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Discussion

In studies to the relationship between psychological distress and craniomandibular disorders, a wide variety of self-report approaches to measure the level of distress has been used (for a review, see Dahlström, 1993). Examples are the CES-D (Center for Epidemiological Studies Depression Scale), the HSCL (Hopkins Symptom Checklist), and the SCL-90 (Symptom Checklist 90). These questionnaires measure several psychological symptoms, such as anxiety and depression. For this study, important advantages of the SCL-90 are that it is validated in Dutch, and that Dutch normative data are available (Arrindell and Ettema, 1986). Moreover, some of the SCL-90 scales are used by the Research Diagnostic Criteria for craniomandibular disorders (RDC) as part of their axis II classification (Dworkin and LeResche, 1992). Therefore, in the present study, the SCL-90 was used to measure the level of psychological distress in craniomandibular and cervical spinal pain patients. In accordance to the normative data of the Dutch population (Arrindell and Ettema, 1986), women rated some of the SCL-90 dimensions higher than men. Other studies, using different questionnaires, have also found that women report higher levels of psychological distress than men (e.g., Magni et al. 1994; Rajala et al., 1995). The reason for this gender difference is not clear, although it has been suggested that expression of symptoms is socially more acceptable to women than to men (Rajala et al., 1995). The results of this study showed that craniomandibular pain patients who also suffer from a cervical spinal pain have more painful body areas, rated below the cervical spine, than patients with only craniomandibular pain and persons without craniomandibular and cervical spinal pain. Although the difference was significant, only 3 patients, all with a craniomandibular and cervical spinal pain, reported pain in three or more body areas (Figure 2). Moreover, only 2 patients could be classified as having widespread pain, for which pain in the left and in the right side of the body, pain above and below the waist, and axial skeletal pain must be present (Wolfe et al., 1990). The finding that CMD patients have a higher risk of painful body areas elsewhere has also been reported by Hagberg (1991) and Türp et al. (1998).

For all but one SCL-90 scale (i.e., phobic anxiety), there was a trend that the variables included in the ANCOVA explained part of the variance of the model (Table
After Bonferroni correction, for five of the SCL-90 scales, this trend reached the level of statistical significance. T-tests showed higher levels of psychological distress in the group of patients that suffered from both craniomandibular and cervical spinal pain, as compared to the non-pain group and, in three cases, the group with local craniomandibular pain. Moreover, the group of patients with localised cervical spinal pain rated higher on the dimension for somatic complaints than the non-pain group, even though this group comprised of only six persons. This sample size was so low because it was not the aim of this study to look for patients with only localised cervical spinal pain; this group was merely the result of our study design. The number of painful body areas rated below the cervical spine further explained part of the variation in psychological distress. The finding that the presence of more pain sites (i.e., both craniomandibular and cervical spinal pain, or more painful body areas) is related to higher levels of psychological distress, corroborates the results of other studies. Dworkin et al. (1990b) showed in a population-based sample that an increasing number of pain sites (i.e., back pain, headache, abdominal pain, chest pain, and CMD pain) is related to higher levels of anxiety, depression and somatization as reported on the SCL-90, and this was later confirmed by Von Korff et al. (1992) and Ektor-Andersen et al. (1999). The cited reports were epidemiological investigations, using questionnaires or interviews to recognise the disorders. The present study focused on the masticatory system and the neck, and the combined results of an oral history and an independently performed clinical examination were used to unambiguously recognise the presence or absence of the craniomandibular and cervical spinal pain.

Among the three subgroups myogenous and arthrogenous craniomandibular pain patients, no differences in SCL-90 scores were found. This supports the results found by Mahrbach and Lund (1981) and Michelotti et al. (1998). Other studies, however, have indicated that subgroups of CMD patients differ in level of psychological distress (Eversole et al., 1985; Lundeen et al., 1987; Kight et al., 1999). At first, McCreary et al. (1991) also found psychological differences between subgroups of CMD patients. However, when pain levels were controlled, most of these differences disappeared. Thus, psychological differences found may be due to differences in pain intensity and this may also explain the positive results of the other cited studies. Specifically, in the Lundeen study (1987), the muscle pain group had more intense pain than the joint pain.
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group. In our study, the three subgroups of CMD patients showed similar pain intensities (data not shown). Our results are further supported by the study of Rudy et al. (1989). They compared the number of CMD signs among three psychosocial-behavioral subgroups of CMD patients. i.e., a ‘dysfunctional’ group, an ‘interpersonally distressed’ group, and a group of ‘adaptive copers’, and showed that, except for pain intensity, no differences in physical signs of CMD between these subgroups were present.

In conclusion: chronic craniomandibular pain patients with a coexistent cervical spinal pain show more psychological distress than patients with only a local craniomandibular pain and asymptomatic persons. No differences in level of psychological distress were found between subgroups of chronic craniomandibular pain patients.