Clin Oral Invest (2010) 14:593–597
DOI 10.1007/s00784-009-0330-0

ORIGINAL ARTICLE

Chronic stress in myofascial pain patients

Marc Schmitter · Livia Keller · Nikolaos Giannakopoulos · Peter Rammelsberg

Received: 27 May 2009 / Accepted: 29 July 2009 / Published online: 25 August 2009

Abstract Although myofascial pain has often been described as being associated with psychosocial stress, detailed evidence in support of this assumption, either from standardized clinical examination or from validated chronic stress questionnaires, is absent. The hypothesis of the present study was that some stressors lead to higher scores in patients suffering from chronic myofascial pain than in pain-free controls and in patients suffering from chronic facial pain. One hundred and fifty subjects were included in the study, and depending on clinical findings, divided into three groups: exclusively chronic myofascial pain group, controls with chronic facial pain but without temporomandibular disorders (TMD), and controls without pain or TMD. Chronic stress was assessed on nine subscales by use of a validated questionnaire. Myofascial pain patients have a significantly higher stress score for "social isolation" than pain-free controls (*t*-test, $p=0.003$). However, they do not have higher scores than patients suffering from facial pain (*t* test, $p=0.169$). Thus, the hypothesis of this study could not be completely rejected.

Keywords Psychosocial distress · Myofascial pain · Chronic

M. Schmitter · N. Giannakopoulos · P. Rammelsberg
Department of Prosthodontics, University of Heidelberg, Heidelberg, Germany

L. Keller
Department of Psychology, University of Koblenz-Landau, Koblenz-Landau, Germany

M. Schmitter (✉)
Poliklinik für zahnärztliche Prothetik der Universität Heidelberg, Im Neuenheimer Feld 400,
69120 Heidelberg, Germany
e-mail: Marc_Schmitter@med.uni-heidelberg.de

Introduction

For a long time, it has been clearly recognized that the onset of disease is a result of several characteristics of the interaction of an individual with numerous interdependent factors in the individual's social context [1]. This applies to temporomandibular disorders (TMD) also. TMD, however, are a heterogeneous set of clinical conditions and/or diagnoses (muscle and/or joint, etc.) which complicates assessment of the effects of different factors on the etiology of TMD subgroups.

In addition to physical aspects (e.g., traumata), it is accepted that psychological factors play a role in the etiology and maintenance of TMD [2–4]. This is particularly applicable for muscle-related TMD (myofascial pain), which might be associated with stress in addition to other psychosocial factors [5]. In this context, it must be remembered that there is a difference between acute and chronic stress.

Most studies evaluating the correlation between stress and TMD have used questionnaires to assess acute stress [6, 7], and did not distinguish between TMD subgroups and/or did not include a control group (with and without pain). This procedure might be biased in two ways. First, disregard of TMD subgroups and/or control groups in the assessment of stress might overlook important findings. Second, although most questionnaires assessing acute stress use specific stressors (e.g., unemployment, moderate income), the correlation between subjective decisions about single loads (e.g., work overtime, divorce, etc.) and objective indicators of health has been shown to be poor [8]. Consequently, a questionnaire using stress experiences (e.g., the experience of being overloaded with work) instead of specific stressors would be helpful for assessing chronic stress.

Table 1 Criteria for classifying subjects in a specific subgroup

Subgroup	TMD status	Intensity of pain	Duration of pain
MP: myofascial pain	diagnosis of myofascial pain	pain>0	at least 6 months
FP: controls with pain	no TMD, but facial pain	pain>0	at least 6 months
C: pain/TMD-free controls	no TMD	pain=0	not applicable

The Trierer Inventory for Chronic Stress (TICS) was developed to fulfill this criterion. The underlying interactional stress concept defines stress as a result of interaction between person and environment. This interaction is characterized by the use and/or consumption of personal or environmental resources.

The objective of this study was to evaluate chronic stress levels, on nine subscales, for patients suffering from chronic myofascial pain, and for controls both with and without pain, by using a standardized clinical examination procedure (research diagnostic criteria for temporomandibular disorders, RDC/TMD). The hypothesis was that some stressors (work overload, social isolation, etc.) would result in higher scores for patients suffering from myofascial pain.

Methods

Study population

The sample was recruited from among the patients of the university hospital in Heidelberg, and consisted of 150 subjects. To recruit these 150 subjects, 234 subjects had to be screened. The study was approved by the local ethics committee. Only subjects between the ages of 18 and 70 were included in the study. On the basis of clinical examination, subjects were classified in one of three groups:

MP: exclusively chronic **m**yofascial-**p**ain group according to the RDC/TMD;
FP: controls with chronic **f**acial **p**ain but without signs or symptoms of TMD (e.g., chronic pain after surgery, after traumata, neuropathic pain, etc.); or
PC: **p**ain-free **c**ontrols without TMD or other pain conditions, visiting the department of prosthodontics for a dental check.

All subjects were recruited in the Department of Prosthodontics. The subjects of the myofascial pain group and the facial pain group visited the department to obtain relief from pain. The pain-free controls came to the department for dental treatment (e.g., new fixed partial denture) and did not suffer from pain and/or TMD.

Two criteria were used to classify the subjects unequivocally (Table 1)—the intensity of the pain at the time of assessment and the duration of the pain. For groups MP (myofascial pain) and FP (facial pain), only subjects who indicated they were suffering from pain were included, whereas group PC (pain-free control) consisted of subjects without pain (indication of 0 for the relevant questionnaire item). It was ensured that subjects of the pain groups suffered from chronic pain and had endured it for at least 6 months. Participants were not included if TMD diagnosis or duration of pain were not known, duration of pain was <6 months.

Age and gender characteristics of the subgroups are listed in Table 2. Analysis of variance (ANOVA) revealed that the mean age of the subgroups did not differ, either within gender groups or between subgroups. Because the percentage of women in the subgroups varied, gender was included as a factor in the subsequent analysis.

Clinical examination

The clinical examination was performed, by calibrated examiners, in accordance with the RDC/TMD. This examination procedure includes measurement of mandibular motion, assessment of muscle and joint pain, and the detection of joint sounds. The examination procedure is described in detail elsewhere [9].

Questionnaires

The TICS, which has been used in recent studies [10, 11], is a 57-item questionnaire which assesses different kinds of

Table 2 Age and gender of subgroups

	Men			Women		
Subgroup	Number	Age: mean	Age: standard deviation	Number	Age: mean	Age: standard deviation
MP: myofascial pain	19	40.0	14.1	55	42.0	14.1
FP: controls with pain	8	39.6	11.4	22	44.3	14.7
C: pain/TMD-free controls	19	46.2	15.3	27	38.4	16.7

chronic stress on the basis of an interactive concept. The TICS consists of nine subscales (Table 4) reflecting different aspects of chronic stress, predominantly pertaining to work (e.g., excessive work demands, overwork) or social (e.g., social tensions, social overload) issues. Items describe specific subjective experiences of stress, for example "I can fulfill my tasks only insufficiently although I try my very best".

Analysis of the TICS is quite simple—the numerical values for each item are added together. These values are then transformed into t values (according to the subject's age). Using these t values, the stress profile can be constructed on the nine subscales and on the screening scale. The reliability of the TICS scales ranges from 0.776 to 0.887 [12]. The reliability of the TICS profile is ${}_{\text{prof}}r_{\text{tt}}=0.72$ [12].

For groups MP and FP, characteristics of their pain were also assessed using the Graded Chronic Pain Status [13]. Seven questions were asked about the intensity of the pain, the extent to which it had impaired their work and social life, and the number of working days during the last 6 months which were impaired by the pain.

Statistical analysis

Prior to the start of the study, a sample size calculation was performed. The following parameters were used: ά=0.05, clinically relevant differences which should be detected: 9 to 10 TICS points, estimated variance of means≈20, estimated standard deviation≈10, estimated effect size≈ 0.2 (small to medium effect size), power≈80%. Based on these estimations, a sample size of≈27 subjects per group would be necessary to detect differences≥9 TICS points reliably.

Analysis of variance was used to assess differences between the groups with regard to stress. Gender was used as a control variable. To assess differences in pain intensity, duration, etc., a *t*-test was used.

Results

Graded chronic pain scale and duration of pain

Because only patients in the myofascial and the facial group suffered from chronic pain, their levels of pain were compared using *t*-tests, with separate analysis for men and women. Among women, significant differences between the intensity of pain were found ($p=0.023$) (Table 3).

Chronic stress (TICS): comparison of subgroups

Raw scores of the TICS questionnaire were transformed into t-scores, according to the manual. The stress levels ranged between 39.85 and 51.71 (Table 4). The greatest difference in stress levels within the TICS subgroups was observed for "social isolation" in women (50.13 in the myofascial group versus 41.74 in the pain-free group). Analysis of variance was conducted to test differences in all TICS subgroups statistically, using "gender" as a control variable. Only for the item "social isolation" did ANOVA show a significant difference ($p=0.020$). This variable was therefore analyzed further using a *t*-test. Comparison of groups MP and PC revealed a significant difference ($p=0.003$) with regard to "social isolation". In contrast, there was no significant difference between groups MP and FP (*t* test, $p=0.169$) with respect to this variable.

Discussion

Myofascial pain patients do not usually have significantly higher TICS scores than other patients suffering from facial pain. With regard to "social isolation", however, pain-free controls had significantly lower scores than patients suffering from myofascial pain.

In addition to somatic and other psychosocial factors, stress might play a role in the etiology and maintenance of

Table 3 Pain characteristics within subgroups I and II

Subgroup	Men		Women	
	Group MP: myofascial pain	Group FP: controls with pain	Group MP: myofascial pain	Group FP: controls with pain
Duration of pain (months)	47.4 (72.2)	26.4 (26.5)	66.0 (75.4)	64.8 (73.4)
General level of impairment	28.2 (22.7)	20.2 (12.2)	33.3 (29.3)	19.0 (25.0)
Intensity of pain	49.1 (20.5)	36.2 (15.1)	56.1 (22.0)*	42.5 (21.7)*
How many days did pain hinder daily activities/work?	20.2 (48.0)	2.5 (6.1)	18.1 (48.3)	5.1 (9.5)

Note. Means (standard deviations)

*$p<0.05$, *t* test

Table 4 Subgroups' means and standard deviations on TICS scales

		Men		Women	
		Mean	SD	Mean	SD
Work overload	myofascial pain	46.1	10.4	49.9	12.6
	controls with pain	44.8	8.7	48.1	10.5
	pain/TMD-free controls	44.3	13.5	43.7	12.8
Social overload	myofascial pain	43.4	10.5	47.4	8.1
	controls with pain	42.9	12.6	43.2	9.1
	pain/TMD-free controls	44.7	15.5	42.0	14.6
Overextended at work	myofascial pain	49.0	11.6	45.2	11.8
	controls with pain	46.3	8.1	42.1	10.1
	pain/TMD-free controls	45.8	11.7	39.9	12.7
Work discontent	myofascial pain	46.4	11.1	46.8	10.6
	controls with pain	46.5	13.3	44.5	11.4
	pain/TMD-free controls	43.8	13.0	41.6	13.4
Performance pressure at work	myofascial pain	45.5	7.6	51.7	12.6
	controls with pain	48.0	12.3	47.5	11.5
	pain/TMD-free controls	47.7	11.9	46.1	9.5
Lack of social acknowledgement	myofascial pain	45.5	8.1	47.0	11.1
	controls with pain	45.8	6.0	43.9	10.7
	pain/TMD-free controls	49.0	11.6	44.7	12.0
Social tensions	myofascial pain	46.1	9.1	49.0	10.6
	controls with pain	47.6	11.0	49.0	11.0
	pain/TMD-free controls	49.4	11.8	44.3	9.9
Social isolation	myofascial pain	48.0	9.5	50.1	11.1
	controls with pain	44.0	16.6	46.7	14.5
	pain/TMD-free controls	45.8	10.6	41.7	9.9
Worry propensity	myofascial pain	44.5	10.4	51.0	11.9
	controls with pain	46.6	12.6	47.5	12.7
	pain/TMD-free	45.6	11.7	43.9	12.4
Screening scale	myofascial pain	44.8	11.5	50.5	12.1
	controls with pain	43.4	15.1	43.9	14.5
	pain/TMD-free	45.8	14.6	46.4	12.5

TMD [2]. Detailed analysis of chronic stress in myofascial pain patients has not yet been conducted, however. In addition, it might be necessary to include patients suffering from chronic facial pain, but not from myofascial pain (musculoskeletal pain) to cope with the fact that pain itself might affect stress.

Although several studies have assessed the relationship between TMD and stress, these studies have had shortcomings, e.g., assessment of acute stress, limited sample size, nonstandardized examination, no controls, etc.

Stein et al. [14] used the Social Readjustment Rating Scale [15] to assess life-change events which increase life stress. The results revealed that scores were higher for patients with TMD than for controls. However, the sizes of both the study population and the control group were limited, the clinical examination was not standardized, and there were no subcategories of stress. Another study [16] assessed self-reported symptoms of stress and found significant differences between symptoms of stress self-reported by controls and TMD patients. In addition to other differences in that study, acute stress (1 week) was assessed using an instrument which evaluates symptoms of stress (SOS) [17]. Consequently, comparison with the results of this study is of dubious value. Kuttila et al. [7] assessed the need for treatment of TMD in relation to different aspects, including stress, again using the SOS. They concluded that the total stress score added significantly to the explanatory power of the model. Another study [6] assessed the role of recent experience of stressful life events in the onset of TMD. They found that TMD patients experienced twice as many stressful life events as controls in the 6 months before onset. No distinction between different TMD subgroups was established, however, and no standardized clinical examination procedure was used.

In 2001, a study on psychosocial functioning and dental factors in adolescents with TMD was performed using the RDC/TMD to assess TMD [4]. The results revealed that adolescents with TMD reported significantly higher levels of stress than controls. The population in that study consisted of boys and girls from 12 to 18 years old, so the results should be compared with those from our study with reservation. One study is available in which the TICS was used in TMD patients and controls [18]. The results of that study showed that patients suffering from myofascial pain had higher TICS scores in the "social overload" and "overextended at work" categories. This result is comparable with the results of the current study when pain-free controls and patients suffering from myofascial pain are analyzed (higher score for "social isolation"). However, when the stress score of patients suffering from myofascial pain and from facial pain is compared, this finding cannot be confirmed.

To summarize, a relationship between myofascial pain and (acute) stress is described in the literature. Unfortunately, there is a lack of studies of this relationship for subcategories of chronic stress (e.g., social isolation, work overload, etc.) in a defined TMD-subgroup (myofascial pain patients) and both pain-free controls and controls suffering from pain. In a recent study, however, predictors of the onset of facial pain and temporomandibular disorders were investigated. The results showed that TMD pain in adolescents may reflect underlying vulnerability to musculoskeletal pain that is not unique to the orofacial region [19]. Several studies have investigated this issue and have found, for patients with musculoskeletal pain, that psychosocial aspects, including stress, play an important role. Another study demonstrated that women with pain seem to be especially vulnerable to the effects of social stress [20]. The results of the current study could confirm this finding: chronic social stress seems to be important especially in patients with pain, whereas females are more affected than men (Table 4).

Some limitation have to be considered when discussing the results of the present study: the subjects were recruited in a university hospital and might not represent "the general" patient. Additionally, the sample size of the present study (n=30 in the smallest group) allows detecting differences between the groups of $\Delta \geq 9$ TICS points, only. However, values of $\Delta < 9$ might have less clinical impact and are therefore not essential in the analysis. Thus, this limitation is acceptable.

Conclusion

Patients suffering from myofascial pain display a higher chronic social stress level than pain-free controls.

Conflict of interest The authors declare that they have no conflict of interest.

References

1. Rabkin JG, Struening EL (1976) Live events, stress, and illness. Science 194:1013–1020
2. Suvinen TI, Reade PC, Kemppainen P, Kononen M, Dworkin SF (2005) Review of aetiological concepts of temporomandibular pain disorders: towards a biopsychosocial model for integration of physical disorder factors with psychological and psychosocial illness impact factors. Eur J Pain 9:613–633
3. Lindroth J, Schmidt J, Carlson C (2002) A comparison between masticatory muscle pain patients and intracapsular pain patients on behavioral and psychosocial domains. J Orofac Pain 16:277–283
4. List T, Wahlund K, Larsson B (2001) Psychosocial functioning and dental factors in adolescents with temporomandibular disorders: a case-control study. J Orofac Pain 15:218–227
5. Schuz B, Kanzlivius B, Peroz I (2006) Stress, coping, and craniomandibular disorders. Schmerz 20:490–497
6. Speculand B, Hughes AO, Goss AN (1984) Role of recent stressful life events experience in the onset of TMJ dysfunction pain. Community Dent Oral Epidemiol 12:197–202
7. Kuttila M, Niemi PM, Kuttila S, Alanen P, Le Bell Y (1998) TMD treatment need in relation to age, gender, stress, and diagnostic subgroup. J Orofac Pain 12:67–74
8. Lepore SJ (1995) Measurement of chronic stressors. In: Cohen S, Kessler RC, Gordon LU (eds) Measuring stress. A guide for health and social scientists. Oxford University Press, New York, pp 102–120
9. Dworkin S, LeResche L (1992) Research diagnostic criteria for temporomandibular disorders. J Craniomandib Disord 6:301–355
10. Nickel C, Tanca S, Kolowos S et al (2006) Men with chronic occupational stress benefit from behavioural/psycho-educational group training: a randomized, prospective, controlled trial. Psychol Med 37:1–9
11. Pruessner M, Hellhammer DH, Pruessner JC, Lupien SJ (2003) Self-reported depressive symptoms and stress levels in healthy young men: associations with the cortisol response to awakening. Psychosom Med 65:92–99
12. Schulz P, Schlotz W, Becker P (2004) Trierer inventar zum chronischen stress. Hogrefe, Göttingen
13. Von Korff M, Dworkin S, LeResche L (1990) Graded chronic pain status: an epidemiologic evaluation. Pain 40:279–291
14. Stein S, Hart DL, Loft G, Davis H (1982) Symptoms of TMJ dysfunction as related to stress measured by the social readjustment rating scale. J Prosthet Dent 47:545–548
15. Holmes TH, Rahe RH (1967) The social readjustment rating scale. J Psychosom Res 11:213–218
16. Beaton RD, Egan KJ, Nakagawa-Kogan H, Morrison KN (1991) Self-reported symptoms of stress with temporomandibular disorders: comparisons to healthy men and women. J Prosthet Dent 65:289–293
17. Kogan HN, Betrus PA (1984) Self-management: a nursing mode of therapeutic influence. ANS Adv Nurs Sci 6:55–73
18. Chen CY, Palla S, Erni S, Sieber M, Gallo LM (2007) Nonfunctional tooth contact in healthy controls and patients with myogenous facial pain. J Orofac Pain 21:185–193
19. LeResche L, Mancl LA, Drangsholt MT, Huang G, Von Korff M (2007) Predictors of onset of facial pain and temporomandibular disorders in early adolescence. Pain 129:269–278
20. Davis MC, Zautra AJ, Reich JW (2001) Vulnerability to stress among women in chronic pain from fibromyalgia and osteoarthritis. Ann Behav Med 23:215–226