ACTA ODONTOLOGICA SCANDINAVICA
2023, VOL. 81, NO. 5, 402–407
https://doi.org/10.1080/00016357.2022.2162575

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

The role of pain-related disability on treatment outcome and psychosocial symptoms in patients with temporomandibular disorders – a pilot study

Maria Hietaharju[a,b], Ritva Näpänkangas[a,b], Pinja Ahtonen[c], Ritva Kuoppala[a,b] and Kirsi Sipilä[a,b]

[a]Research Unit of Oral Health Sciences Faculty of Medicine, University of Oulu, Oulu, Finland; [b]Medical Research Center, Oulu University Hospital and University of Oulu, Oulu, Finland; [c]Research Unit of Oral Health Sciences Faculty of Medicine, University of Eastern Finland, Kuopio, Finland

ABSTRACT

Objective: The aim of the pilot study was to investigate the association of pain-related disability with the outcome of conservative treatment of temporomandibular disorders (TMD) and with depressive and non-specific physical symptoms among TMD pain patients utilizing Graded Chronic Pain Scale 1.0 (GCPS1.0) as a screening instrument.

Material and methods: The study included 80 adult patients who were referred to the Oral and Maxillofacial Department, Oulu University Hospital, Finland, due to TMD pain. At baseline, pain-related disability was assessed by using the GCPS1.0 according to the Research Diagnostic Criteria for TMD (RDC/TMD), and the patients were categorized into three TMD subtypes, 1–3. Patients were given conservative TMD treatment. At follow-up visits (1, 3, 6, and 12 months), patients evaluated the pain intensity on an NRS and described the treatment outcome and the severity of the TMD symptoms on a numerical scale.

Results and conclusions: Patients with TMD subtype 3 (moderate/severe disability) had the highest NRS scores and described their symptoms as most severe at each time point, statistically significantly so at 1-month and 6-month follow-up ($p < .05$). The highest proportion of depressive symptoms was found in TMD subtype 3 ($p < .05$). The current pilot study showed that moderate/severe TMD-related disability, based on the GCPS 1.0 as a screening tool, may be linked with poor treatment outcome and depressive symptoms. Studies with larger samples are needed to confirm the results.

ARTICLE HISTORY
Received 12 April 2022
Revised 20 October 2022
Accepted 13 December 2022

KEYWORDS
TMD; RDC/TMD; psychosocial; treatment; pain-related disability

Introduction

Temporomandibular disorders (TMD) comprise pain and various forms of dysfunction in the masticatory muscles, temporomandibular joints (TMJs) and associated anatomical structures [1]. Typical symptoms of TMD are pain located in the face, TMJ and/or masticatory muscles. Other symptoms and clinical findings include TMJ sounds such as clicking and crepitus, and restriction and pain during jaw movements.

TMD is a multifactorial disorder [1] which may be linked with biomechanical, neuromuscular, psychosocial and biological factors, such as stress, depression, or a rise in estrogen level in women [2–4]. In previous studies, disability linked with TMD pain has been associated with chronic pain, depression, non-specific physical symptoms, catastrophizing thoughts and pain duration [5–10].

In most cases, TMD related pain can be treated successfully with conservative therapy methods, such as occlusal splint, muscle exercises and information counselling [11]. According to a previous review [12], patients experiencing mild TMD symptoms benefitted equally from counselling and self-care as well as from conventional TMD treatment, often including splint treatment. On the other hand, patients who rated their TMD symptoms as severe benefitted from conservative treatment (including physiotherapy, patient education, medication and occlusal splint) combined with psychological pain intervention [12,13].

High pain intensity and disability have shown to be associated with poor prognosis in the treatment of TMD-related pain [14]. On the other hand, it has also been reported that conservative therapy shows positive results even in patients with high pain-related disability [13]. Psychosocial factors related both to catastrophizing and coping have also shown significant impact on treatment outcome [15]. Furthermore, a recent 1-year follow-up study suggested that regardless of the treatment method used, depressive and non-specific physical symptoms may have a negative effect on TMD treatment response [16]. Hence, to enable the best possible treatment outcome, early recognition and assessment of psychological factors in TMD pain patients is essential [17].

Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) published in 1992 [18] are validated, international and widely used criteria for TMD diagnostics. The criteria consist of a dual-axis system with Axis I, which assesses patient's physical and clinical findings, and Axis II, which indicates psychosocial and behavioural factors. Graded Chronic Pain Scale 1.0 (GCPS 1.0), one of the instruments included in Axis II, is used in assessing pain intensity and

CONTACT Maria Hietaharju maria.hietaharju@oulu.fi Research Unit of Oral Health Sciences Faculty of Medicine, University of Oulu, Oulu, Finland

pain-related disability. Previous studies have shown that RDC/TMD are valid criteria to evaluate pain grade and pain-related psychosocial dysfunction [6,7,12,18–22] According to Dworkin et al. [20], Axis II instruments are suitable for comprehensive assessment and planning of management of TMD patients. GCPS 1.0 (RDC/TMD) is especially helpful in classifying TMD patients into clinically relevant biopsychosocial subtypes [7,8,10] and it can therefore be utilized as a screening instrument to identify TMD patients with different degrees of health burdens in order to plan individually tailored treatment [23]. Despite its applicability, GCPS-based treatment planning has been infrequently utilized in clinical studies on TMD, and previous data on the association between TMD disability and the treatment outcome is scarce. Therefore, further studies are needed to evaluate the role of pain-related disability on the treatment outcome of TMD.

The aims of the study were, firstly, to investigate the effect of TMD-related pain disability on the outcome of conservative treatment of TMD, and secondly, to evaluate the association of TMD-related pain disability and depressive symptoms and non-specific physical symptoms (with pain items excluded or included), by utilizing GCPS1.0 as a screening tool. The study hypothesis was that severe pain-related disability associates with poor treatment outcome as well as with depressive and non-specific physical symptoms.

Materials and methods

Study design

The study was performed at the Oral and Maxillofacial Department, Oulu University Hospital, Finland. A total of 80 consecutive patients (18 men and 62 women, mean age 43.6, SD 13.1, age range 20.5–72.6 years) with TMD-related pain were recruited, as previously described by Qvintus et al. [25]. The clinical examinations were performed between March 2008 and August 2010 by the same dentist specialized in stomatognathic physiology (KS). Participants fulfilling the following inclusion criteria were eligible for the study: (i) clinically diagnosed TMD according to the RDC/TMD, (ii) age $\geq$20 years and (iii) lack of any chronic diseases, such as rheumatoid arthritis, that may affect the TMJ or the masticatory muscles.

The patients were randomly assigned to two groups: splint group and control group; those in the splint group received instructions for masticatory muscle exercises and also stabilization splint treatment, and the controls received only instructions for masticatory muscle exercises [24].

The stabilization splints were made of heat-cured acrylic by the same dental technician and the splints were fabricated in central relation using Astynax-wax. The patients were advised for using the splint every night during the course of the study. The stabilization splint treatments were performed by two other dentists who were instructed in the treatment method.

Additionally, all the patients were given instructions on performing masticatory muscle exercises. The exercises included active mouth openings, laterotrusive movements and protrusive movements in which the mandible was held in the maximal positions for a few seconds on each movement, also utilizing the resistance of patient's own fingers. The exercises were repeated 7–10 times per training session, and the sessions were performed 2–3 times per day.

The exercises were demonstrated by the same dentist (KS) before treatment, and repeated if necessary. The instructions were also given in written form. At every examination, the patients were reminded to use the splint and/or to perform the exercises regularly.

Data collection

The patients' TMD pain-related disability was assessed by using the Finnish version of the Graded Chronic Pain Scale 1.0 (GCPS1.0) questionnaire included in the RDC/TMD criteria [25].

The RDC/TMD-FIN GCPS 1.0-questionnaire assessed patient-based reports of TMD pain intensity and pain-related disability in three domains during the past 6 months as follows:

a. CPI (characteristic pain intensity) (current, worst, average) (range 0–10, 0 = no pain, 10 = worst pain) (scaled as mean value*10, maximum 100);
b. disability days (range 0–180 days; 0–3 points), categorized as 0–6 days = 0 disability days points; 7–14 days = 1 disability days point; 15–30 days = 2 disability days points; 31+ days = 3 disability days points), and
c. disability/interference score (range 0–100; 0–3 points) by pain interference with daily, social and work-related activities (range 0–10, 0 = no interference, 10 = unable to carry on any activities) (scaled as mean value*10, maximum 100) (Score of 0–29 = 0 Disability Points; Score of 30–49 = 1 pain-related activity interference point; Score of 50–69 = 2 points, score of 70+ = 3 points).

The total count of pain interference/disability points (range 0–6 points) towards GCPS 1.0 grading (including CPI) is based on the sum of points for disability days + points for disability score.

Based on their scores, patients were then classified into 5 grades according to the guidelines presented by Dworkin and LeResche and Ohrbach and Knibbe [26,27]: grade 0: no pain or disability; grade I: low intensity (CPI <50) and no or low disability (0-2 disability points); grade II: no or low disability (grade II-low [CPI $\geq$50, 0 disability points]); and high intensity (grade II-high [CPI $\geq$50, 1–2 disability points]); grade III: moderately limiting disability (3–4 disability points regardless of CPI value); and grade IV: severely limiting disability (5–6 disability points regardless of CPI value). The patients were further categorised into three TMD subtypes as follows: TMD subtype 1 (GCPS I&II-low), TMD subtype 2 (GCPS II-high) and TMD subtype 3 (GCPS III&IV). [7,13]. Depressive and non-specific physical symptoms (with pain items excluded or included) were evaluated at baseline using SCL-90-R-questionnaire [25] found in the Finnish version of the RDC/TMD Axis II questionnaire [25,26]; the patients reported

how much they had suffered during the last month from (range 0–4, 0 = not at all, 4 = very much) symptoms of depression (20 questions), non-specific physical symptoms including pain items (12 questions) or without pain items (7 questions) [26]. The patients were further classified, as follows:

1. symptoms of depression: normal <0.535/moderate <0.535 to <1.105/severe 1.105 +,
2. non-specific physical symptoms (including pain items): normal <0.500/moderate <0.500 to <1.000/severe 1.000 +
3. non-specific physical symptoms (without pain items): normal <0.482/moderate <0.428 to <0.857/severe 0.857 +

Pain duration was inquired with the following question: 'How many months ago did your facial pain begin for the first time?', and pain constancy with the question: 'Is your facial pain constant, intermittent or transiently occurring?'

The intensity of facial pain was assessed using a numeric rating scale (NRS) on a 0 (no pain) to 10 (pain as bad as could be) rating scale at baseline and at all the 4 follow-up visits (1 month, 3 months, 6 months and 12 months after baseline). At each follow-up visit the patients evaluated the treatment outcome and the severity of TMD symptoms. The treatment outcome was assessed using a scale from 1 to 4 (1 = 'very good effect', 2 = 'treatment has helped to some extent', 3 = 'no difference/cannot tell' and 4 = 'symptoms worsened') [24]. The severity of TMD symptoms after treatment was assessed by means of a scale from 1 to 5 (1= 'no symptoms'/'symptoms not significant', 2 = 'mild symptoms', 3 = 'moderate symptoms', 4 = 'severe symptoms', 5 = 'intolerable symptoms') [24].

Attrition

The flow chart of the study is shown in Figure 1. The number of dropouts was five patients at 1-month follow-up, three patients after 3-month follow-up, and three patients after 6-month follow-up. Altogether 47 patients participated in all follow-up visits while the rest participated only in some of the follow-up visits. Two patients left the GCPS1.0 questionnaire unfilled.

Statistical analyses

The mean age and pain duration (years) at baseline were compared between different TMD subtypes using analysis of variance (ANOVA). The association of pain constancy with TMD subtypes was assessed by Chi-square tests. The mean NRS scores at baseline and at each follow-up were compared between different TMD subtypes using ANOVA. The mean ratings of subjective assessment of the severity of TMD symptoms were compared between different TMD subtypes using ANOVA. For those associations showing statistical significance, pairwise comparisons, using Independent Samples Kruskal Wallis test, were performed. The subjective assessment of the severity of TMD symptoms was further dichotomized as no symptoms/symptoms not significant/mild symptoms vs. moderate/severe/intolerable symptoms, and the subjective assessment of the treatment outcome was dichotomized as very good effect/treatment has helped to some extent vs. no difference/symptoms worsened. The associations of treatment outcome and severity of TMD symptoms with TMD subtypes were assessed by Chi-square tests. The associations of subclasses of depressive and non-specific physical symptoms (with pain items excluded or included) with TMD subtypes were assessed by Chi-square tests. All statistical analyses were performed using SPSS software, version 25.

Ethical considerations

All patients gave their written informed consent. The study was approved by the ethical committee of Oulu University Hospital (#29/2007)

Results

Baseline

Baseline data by TMD subtype is presented in Table 1. Of the patients, 74.4% ($n = 58$) belonged to TMD subtype 1, 15.4% ($n = 12$) to TMD subtype 2, and 10.3% ($n = 8$) to TMD subtype 3. No significant differences were noted in age, pain duration or pain constancy between TMD subtypes. Depressive symptoms (moderate/severe) differed between TMD subtypes ($p < .05$), whereas there were no significant differences in non-specific physical symptoms.

Treatment outcome

The mean NRS value differed statistically significantly between TMD subtypes at baseline, 1 month and 6-month follow-up visits, the highest value being in TMD subtype 3 (Table 2). In the pairwise comparisons NRS differed significantly between TMD subtypes 1 and 3 at baseline and at 1 month follow-up (Table 2). Patients with TMD subtype 3 subjectively assessed their symptoms more severe as compared to the other subgroups (Tables 3 and 4). The differences in mean rating scale were significant at 1 month and 6-month follow-up visits (Table 3). The symptoms were reported most severe in TMD subtype 3 at 1-month follow-up visit ($p < .05$) In the pairwise comparisons the symptom severity differed significantly between TMD subtypes 1 and 3 at 1 month follow-up (Table 3). The proportion of those reporting moderate/severe/intolerable symptoms was highest in TMD subtype 3 at 1 month, 6 month and 12 month follow-up visits, with significant differences at 1 month follow-up (Table 4). Patients with TMD subtype 3 showed the highest proportion of those who reported poor treatment outcome, except at 12-month follow-up, although no statistically significant differences between TMD subtypes were shown (Table 5).

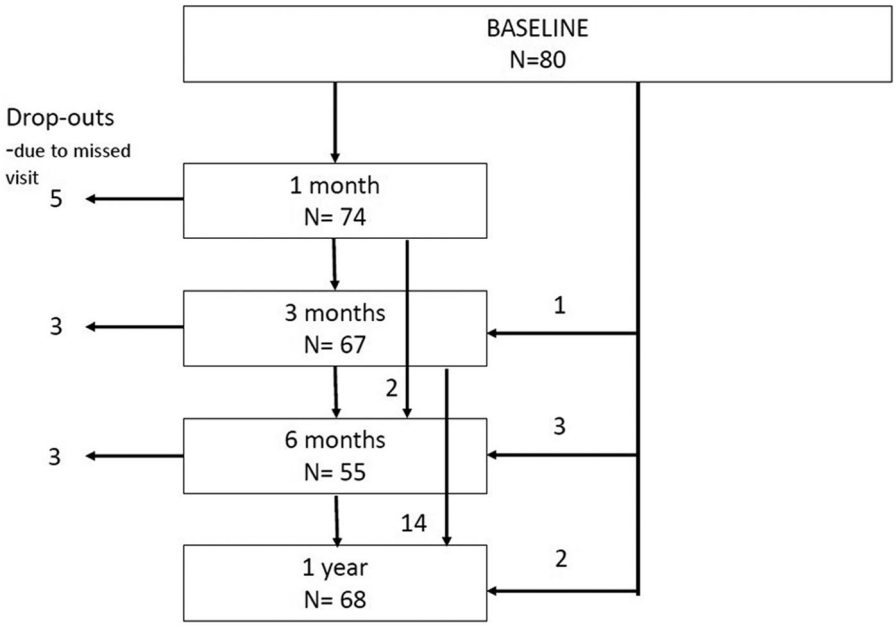

Figure 1. Flow chart of the study population.

Table 1. Distribution of gender and psychosocial symptoms (based on RDC/TMD Axis II criteria) by TMD subtypes 1–3 (based on Graded Chronic Pain Scale 1.0) in patients with temporomandibular disorders ($n = 78$).

		TMD subtype				
		1 *N* (%)	2 *N* (%)	3 *N* (%)	Total *N* (%)	*p*-Value*
Gender	Men	12 (20.7)	3 (25.0)	1 (12.5)	16 (20.5)	.793
	Women	46 (79.3)	9 (75.0)	7 (87.5)	62 (79.5)	
	Total	58 (74.4)	12 (15.4)	8 (10.3)	78 (100)	
Age mean (SD)		43.8 (12.6)	45.2 (50.0)	42.6 (16.7)		.911
Pain duration/y mean (SD)		6.5 (9.3)	4.3 (4.2)	3.1 (1.5)		.507
Pain constancy	Constant	14 (24.6)	4 (33.3)	4 (50.0)		.384
	Intermittent	35 (61.4)	8 (66.7)	3 (37.5)		
	Transient	8 (14.0)	0 (0.0)	1 (37.5)		
SCL-90-R	Non-specific physical symptoms (moderate/severe)					
	Without pain items	33 (57.9)	6 (50.0)	5 (62.5)		.837
	With pain items	40 (69.0)	7 (58.3)	6 (75.0)		.698
	Depressive symptoms (moderate/severe)	22 (37.9)	6 (50.0)	7 (87.5)		.028

*Chi-square test.

Table 2. Facial pain intensity (on NRS) at different time points by TMD subtype (based on Graded Chronic Pain Scale 1.0) in patients with TMD.

	TMD subtype 1		TMD subtype 2		TMD subtype 3			Pairwise comparisons *p* Value**		
	N	Mean (SD)	*N*	Mean (SD)	*N*	Mean (SD)	*p*-Value*	1 vs. 2	1 vs. 3	2 vs. 3
Baseline	58	4.24 (2.46)	12	6.17 (2.37)	8	7.63 (2.07)	<.001	.124	.001	.581
1 Month	54	3.13 (2.78)	11	4.91 (2.51)	8	5.63 (2.62)	.018	.140	.035	.422
3 Months	47	2.91 (2.33)	9	4.00 (2.12)	5	4.20 (3.56)	.293			
6 Months	39	2.51 (2.28)	10	3.40 (2.88)	4	6.00 (4.24)	.035			
12 Months	48	2.85 (2.69)	11	3.55 (2.81)	7	4.14 (3.29)	0.442			

*ANOVA test.
**Independent Samples Kruskal Wallis test, *p* values after Bonferroni correction.

Table 3. Patients' subjective assessment of TMD symptom severity (on a scale 1= 'no symptoms'/'symptoms not significant'; 2 = 'mild symptoms', 3 = 'moderate symptoms', 4 = 'severe symptoms', 5 = 'intolerable symptoms') at different follow-up visits in patients with temporomandibular disorders by TMD subtype (based on Graded Chronic Pain Scale 1.0).

	TMD subtype 1		TMD subtype 2		TMD subtype 3			Pairwise comparisons *p* value**		
	N	Mean (SD)	*N*	Mean (SD)	*N*	Mean (SD)	*p*-Value*	1 vs. 2	1 vs. 3	2 vs. 3
1 Month	54	2.43 (0.96)	10	2.90 (0.88)	6	3.38 (0.74)	0.019	.404	.029	.974
3 Months	50	2.22 (0.82)	9	2.56 (0.89)	5	2.67 (1.21)	0.323	.	.	.
6 Months	39	2.23 (0.78)	10	2.40 (1.27)	5	3.40 (0.89)	0.028	.	.	
12 Months	48	2.25 (0.96)	12	2.42 (1.24)	7	2.71 (1.26)	0.520	.	.	

*ANOVA test.
**Independent Samples Kruskal Wallis test, *p* values after Bonferroni correction.

Table 4. Patients' subjective assessment of TMD symptom intensity (those reporting moderate/severe/intolerable symptoms) by TMD subtype (based on Graded Chronic Pain Scale 1.0) at different time points.

	TMD subtype 1 *N* (%)	TMD subtype 2 *N* (%)	TMD subtype 3 *N* (%)	*p*-Value*
1 Month	25 (46.3)	8 (80.0)	7 (87.5)	.022
3 Months	15 (30.0)	5 (55.6)	3 (50.0)	.247
6 Months	13 (33.3)	6 (40.0)	4 (80.0)	.131
12 Months	16 (33.3)	6 (50.0)	5 (71.4)	.443

*Chi-square test.

Table 5. Patients' subjective assessment of the treatment outcome (those reporting no difference/symptoms worsened) by TMD subtype (based on Graded Chronic Pain Scale 1.0) at different time points.

	N	TMD subtype 1 *N* (%)	TMD subtype 2 *N* (%)	TMD subtype 3 *N* (%)	*p*-Value*
1 Month	27	18 (33.3)	4 (40.0)	5 (62.5)	.278
3 Months	15	11 (22.0)	2 (22.2)	2 (33.3)	.822
6 Months	14	10 (25.6)	2 (20.0)	2 (40.0)	.705
12 Months	23	15 (31.9)	6 (50.0)	2 (28.6)	.469

*Chi-square test.

Discussion

The study results indicated that patients with moderate/severe pain-related disability reported higher pain intensity and severe TMD symptoms and poor treatment outcome more often than those with lower disability. Also, the presence of depressive symptoms increased from TMD subtype 1 to TMD subtype 3. This partly supports the study hypotheses and concurs with previous studies in which depressive symptoms showed an association with high TMD disability [7,8,10].

According to the present study results, patients with TMD subtype 3 had the weakest response to conservative treatment. These results are partly supported by the findings of Dworkin et al. [13], who assessed the impact of conservative treatment on patients in three TMD subtypes and the utilization of cognitive behavioural therapy in TMD subtypes 2 and 3. These studies found that self-care program had the most beneficial effect on patients with TMD subtype 1, whereas patients with TMD subtypes 2 and 3 benefitted from more comprehensive treatment.

The study results indicate that the patients with TMD subtype 2 formed an intermediate group concerning the severity of the symptoms at almost every follow-up visit as shown in Tables 3 and 4. It is noteworthy that in all TMD subtypes the intensity of the symptoms was at its highest at baseline. A statistical difference was shown at 1-month and 6-month follow-up visits. The results showed that unlike in other TMD subtypes, in TMD subtype 3 patients the symptoms (both pain intensity and overall symptom severity) worsened at 6-month follow-up visit and showed more fluctuation, although the study sample was relatively small in size at this time point.

The role of psychosocial factors on treatment outcome has only been investigated in few studies. In a study by Litt et al. [15], TMD patients ($n = 101$) were randomly assigned to two groups of which the first one received standard conservative care and the other one conservative care in addition to cognitive-behavioural therapy. They concluded that psychosocial load affected on the treatment response; a total of 16% did not benefit from the given treatment, and treatment responders and non-responders differed from each other mainly on psychological factors such as coping with pain and catastrophizing. Furthermore, in the study of Huttunen et al. [16], which used the present study sample, those who suffered from depressive and non-specific physical symptoms with pain items showed a tendency towards poor conservative TMD treatment outcome. However, the associations of these psychosocial variables with the intensity of facial pain were not significant. The only significant association was shown between moderate or severe non-specific physical symptoms (with pain items included) at baseline and severe symptoms after treatment. Based on their results and the present study, it can be supposed that GCPS 1.0 predicts poor prognosis of treatment better than the other instruments of the RDC/TMD Axis II. This emphasizes the relevance of GCPS in predicting the treatment outcome in TMD patients with different psychological and psychosocial burden.

It is noteworthy that in the present study the treatments were not planned based on tailoring, as the study design was originally a randomized controlled trial, where the groups received randomly either splint or control treatment. However, due to the non-significant differences between the groups in the symptom severity or treatment outcome [24] the group status was not considered in the present analyses. Furthermore, the study used GCPS 1.0 since the revised GCPS 2.0 included in the DC/TMD Axis II criteria was not available at the time of the study. Compared to GCPS 2.0, GCPS 1.0 uses a 6-month timeframe to evaluate pain-related intensity and interference, whereas GCPS 2.0 uses a 30-day timeframe. As to the applicability of GCPS, Visscher et al. [28] conducted a literature review aiming to find helpful tools for oral healthcare practitioners for Axis II assessment in relation to the DC/TMD. The authors recommended GCPS as one of the three domains of assessment for dentists in the primary care setting along with Patient Health Questionnaire-4 (PHQ-4) and Pain Drawing. GCPS is considered a helpful tool especially in tailored treatment planning and in predicting healthcare costs of patients with persistent orofacial pain [29]. The present study showed that GCPS not only distributes patients to biopsychosocial TMD subtypes and thus corroborates earlier studies [7,8,10], but also predicts the prognosis and treatment response of TMD pain patients. Therefore, it should be considered as one of the main instruments used in planning individualized treatment for TMD patients.

As in the present study, GCPS1.0 has been used to distribute patients to three TMD subtypes in an earlier Finnish study by Suvinen et al. [7] with TMD pain patients in tertiary care. Of the study population of 135 consecutive referral patients suffering from TMD pain, 44% belonged to TMD subtype 1, 33% to TMD subtype 2, and 23% to TMD subtype 3

Overall, the distribution to TMD subcategories differed from the current study in which the patients were distributed to TMD subtypes as follows: 74% (TMD subtype 1), 15%

(TMD subtype 2), and 10% (TMD subtype 3). In the present study, the proportion of those belonging to the TMD subtype 3 was smaller, leading to the relatively small subsample in this group.

The strength of this study was that the internationally validated instruments of RDC/TMD were used and the clinical examinations were performed by the same dentist. The limitation of the study was a relatively small study sample, which also affected the TMD subtype sample sizes and thus impaired the power of the data, which is why the results can only be regarded as preliminary pilot study.

Future research with larger study samples and using the newest GCPS2.0 instrument is needed to verify the relevance of these observations. From a clinical point of view, in future studies it would also be beneficial to investigate the efficacy of tailored treatment based on TMD subtyping.

Conclusion

The current pilot study showed that moderate/severe TMD-related disability, utilizing the GCPS1.0 as a screening tool, may be linked with poor treatment outcome and depressive symptoms. Studies with larger samples are needed to confirm the results.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Maria Hietaharju http://orcid.org/0000-0002-6911-2153
Kirsi Sipilä http://orcid.org/0000-0001-9734-320X

References

[1] Okeson J. Management of temporomandibular disorders and occlusion. 8th ed. St Louis (MI): Elsevier; 2020. p. 132.
[2] Landi N, Manfredini D, Lombardi I, et al. 17-beta-estradiol and progesterone serum levels in temporomandibular disorder patients. Minerva Stomatol. 2004;53(11–12):651–660.
[3] Slade GD, Diatchenko L, Bhalang K, et al. Influence of psychological factors on risk of temporomandibular disorders. J Dent Res. 2007;86(11):1120–1125.
[4] Fillingim R, Ohrbach R, Greenspan J, et al. Psychological factors associated with development of TMD: the OPPERA prospective cohort study. J Pain. 2013;14(12 Suppl):T75–90.
[5] Turner JA, Brister H, Huggins K, et al. Catastrophizing is associated with clinical examination findings, activity interference, and health care use among patients with temporomandibular disorders. J Orofac Pain. 2005;19(4):291–300.
[6] Manfredini D, Winocur E, Ahlberg J, et al. Psychosocial impairment in temporomandibular disorders patients. RDC/TMD axis II findings from a multicentre study. J Dent. 2010;38(10):765–772.
[7] Suvinen TI, Kemppainen P, Le Bell Y, et al. Research diagnostic criteria axis II in screening and as a part of biopsychosocial subtyping of Finnish patients with temporomandibular disorder pain. J Orofac Pain. 2013;27(4):314–324.
[8] Kotiranta U, Suvinen T, Kauko T, et al. Subtyping patients with temporomandibular disorders in a primary health care setting on the basis of the research diagnostic criteria for temporomandibular disorders axis II pain-related disability: a step toward tailored treatment planning? J Oral Facial Pain Headache. 2015;29(2):126–134.
[9] Reiter S, Eli I, Mahameed M, et al. Pain catastrophizing and pain persistence in temporomandibular disorder patients. J Oral Facial Pain Headache. 2018;32(3):309–320–320.
[10] Hietaharju M, Näpänkangas R, Sipilä K, et al. Importance of the graded chronic pain scale as a biopsychosocial screening instrument in TMD pain patient subtyping. J Oral Facial Pain Headache. 2021;35(4):303–316.
[11] Roldán-Barraza C, Janko S, Villanueva J, et al. A systematic review and meta-analysis of usual treatment versus psychosocial interventions in the treatment of myofascial temporomandibular disorder pain. J Oral Facial Pain Headache. 2014;28(3):205–222.
[12] Kotiranta U, Suvinen T, Forssell H. Tailored treatments in temporomandibular disorders: where are we now? A systematic qualitative literature review. J Oral Facial Pain Headache. 2014;28(1):28–37.
[13] Dworkin SF, Turner JA, Mancl L, et al. A randomized clinical trial of a tailored comprehensive care treatment program for temporomandibular disorders. J Orofac Pain. 2002;16(4):259–276.
[14] Forssell H, Kauko T, Kotiranta U, et al. Predictors for future clinically significant pain in patients with temporomandibular disorder: a prospective cohort study. Eur J Pain. 2017;21(1):188–197.
[15] Litt MD, Porto FB. Determinants of pain treatment response and nonresponse: identification of TMD patient subgroups. J Pain. 2013;14(11):1502–1513.
[16] Huttunen J, Qvintus V, Suominen AL, et al. Role of psychosocial factors on treatment outcome of temporomandibular disorders. Acta Odontol Scand. 2019;77(2):119–125.
[17] Gatchel RJ, Stowell AW, Wildenstein L, et al. Efficacy of an early intervention for patients with acute temporomandibular disorder-related pain: a one-year outcome study. J Am Dent Assoc. 2006;137(3):339–347.
[18] Von Korff M, Dworkin SF, Le Resche L. Graded chronic pain status: an epidemiologic evaluation. Pain. 1990;40(3):279–291.
[19] Von Korff M, Ormel J, Keefe FJ, et al. Grading the severity of chronic pain. Pain. 1992;50(2):133–149.
[20] Dworkin SF, Sherman J, Mancl L, et al. Reliability, validity, and clinical utility of the research diagnostic criteria for temporomandibular disorders axis II scales: depression, non-specific physical symptoms, and graded chronic pain. J Orofac Pain. 2002;16(3):207–220.
[21] Manfredini D, Favero L, Gregorini G, et al. Natural course of temporomandibular disorders with low pain-related impairment: a 2-to-3-year follow-up study. J Oral Rehabil. 2013;40(6):436–442.
[22] Ozdemir-Karatas M, Peker K, Balik A, et al. Identifying potential predictors of pain–related disability in turkish patients with chronic temporomandibular disorder pain. J Headache Pain. 2013;14(1):17.
[23] Kotiranta U, Forssell H, Kauppila T. Painful temporomandibular disorders (TMD) and comorbidities in primary care: associations with pain-related disability. Acta Odontol Scand. 2019;77(1):22–27.
[24] Qvintus V, Suominen AL, Huttunen J, et al. Efficacy of stabilization splint treatment on facial pain – 1-year follow-up. J Oral Rehabil. 2015;42(6):439–446.
[25] Suvinen T, Rantala M, Ahlberg J, et al. Purentaelimistön kivut ja toimintahäiriöt (TMD). Tieteelliset diagnostiset kriteerit. RDC/TMD_FIN. Version: 2010. Finnish; 2020 [cited 2020 Dec 15] Available from: https://ubwp.buffalo.edu/rdc-tmdinternational/wp-content/uploads/sites/58/2017/01/RDC-Finnish.pdf
[26] Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord. 1992;6(4):301–355.
[27] Ohrbach R, Knibbe W. Diagnostic criteria for temporomandibular disorders (DC/TMD) scoring manual for self-report instruments. NY, US and ACTA, Amsterdam, The Netherlands: University at Buffalo; 2018.
[28] Visscher CM, Baad-Hansen L, Durham J, et al. Benefits of implementing pain-related disability and psychological assessment in dental practice for patients with temporomandibular pain and other oral health conditions. J Am Dent Assoc. 2018;149(6):422–431.
[29] Durham J, Shen J, Breckons M, et al. Healthcare cost and impact of persistent orofacial pain: the DEEP study cohort. J Dent Res. 2016;95(10):1147–1154.