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ORIGINAL ARTICLE

Similar treatment outcome in myofascial TMD patients with localized and widespread pain

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ABSTRACT

Objective: To study the outcome of oral appliance treatment in myofascial Temporomandibular disorder (TMD) patients with and without comorbid pain using pain site drawings.

Material and methods: This randomized, controlled multicentre study comprised 65 myofascial TMD patients diagnosed according to the Research Diagnostic Criteria for Temporomandibular Disorders. Pain-site drawings were filled in at the baseline examination. The patients were treated with oral appliances. Treatment outcome was followed up for 1 year and analysed according to the recommendations by the Initiative on Methods, Measurement and Pain assessment in Clinical Trials (IMMPACT) on an intent-to-treat basis. The data were analysed for two pain profiles, localized pain (face and head, $n = 26$) versus widespread pain group (pain sites outside the face and head, $n = 39$).

Results: Statistically significant improvement was registered within both groups for all outcome variables (characteristic pain intensity, 30% pain reduction of worst reported pain, graded chronic pain, depression, and somatization scores) during the follow-up with only small differences between the groups.

Conclusions: Oral appliance treatment had a positive effect on all outcome measures during the 1-year follow-up in patients suffering from myofascial TMD pain, regardless of whether the pain was localized or widespread. Multiple pain sites seemed to have surprisingly little influence on the outcome variables. However, some indications of more challenges when treating patients with widespread pain compared to local pain could be observed. Pain-site drawings seem to be useful in the clinical situation and could support the clinicians in decision-making regarding treatment planning.

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Introduction

Temporomandibular disorders (TMDs) are characterized by pain in the temporomandibular joint (TMJ) area, masticatory muscles and associated musculoskeletal structures such as teeth, ears, cheeks, forehead and neck. Patients with these conditions typically experience pain, functional limitations of the jaw and TMJ sounds [1]. TMD signs and symptoms are common in the general population, affecting women more often than men [2]. Treatment need estimations vary between 10%-16% [3,4]. Although the prognosis of TMD is usually favourable, some subjects with TMD pain will progress to persistent TMD pain with a significant disability and impact on their life [5].

Many studies show that patients with TMD pain often report pain in other body regions [5,6]. Musculoskeletal pain in both the craniomandibular and cervical spinal regions and widespread body pain were shown to associate with an increased impairment of health status, as well as with sleep disorders [7] and other common pains [8,9]. A high proportion of headache patients show significant disability because of ongoing TMD pain [10]. Recently, Suvinen et al. [11,12] showed that the most compromised TMD patients had the poorest general health, the most elevated depression and somatization scores, sleep dysfunction, poor coping ability and widespread pain problems. A recent study showed that up to 27% of primary care TMD pain patients reported clinically significant pain 1 year after initial consultation [13]. Comorbid pains formed one predictor associated with the outcome. Consequently, comorbid pain conditions should be recognized in the patient assessment as an important factor for both the onset and persistence of TMD pain, as well as in the treatment planning [13].

Pain-site drawings have often been used in studies on chronic musculoskeletal pain like low back pain [14], but only rarely for the assessment of facial pain [15,16]. Türp et al. [15] showed that among a great percentage of persistent facial pain patients the pain distribution is more widespread than commonly assumed. However, the patients with TMD are not likely to verbally report pain located outside the head and face. Therefore, other painful sites than the face and head are easily missed [16]. To reduce the likelihood of underestimating the patient's pain involvement, the use of pain drawings was recommended. Recently, Suvinen et al. [12] reported on pain-site drawings and comorbid pains in screening and as a part of the biopsychosocial profiling of TMD pain patients. Pain-site drawings were found to be a

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valid assessment tool in screening and treatment planning for TMD pain patients.

Oral appliances are commonly used in the treatment of patients suffering from TMD [17]. The most often used 'golden standard' appliance is the stabilization appliance. Despite somewhat diverging conclusions in some reviews [18,19], it is generally agreed that most patients with masticatory muscle pain will benefit from the use of a properly adjusted stabilization appliance [17,20,21]. Also prefabricated appliances have been used because of an easier adjustment procedure. In a multicentre randomized, clinical trial, RCT study, the effectiveness of a newly developed prefabricated appliance was evaluated [22]. The effectiveness of this prefabricated appliance was found to be similar to that of the stabilization appliance in alleviating myofascial TMD pain both in the short (10 weeks), as well as the long term (12 months) [22,23]. Overall improvement, 'better', 'much better or symptom-free', was 81% and 64% for the prefabricated and stabilization appliance, respectively. However, in a study on oral appliance treatment, patients with widespread pain, for example, fibromyalgia pain, did not experience improvement compared to the patients with localized pain [24]. Self-report, questionnaire and palpation were used to diagnose the patients in the group with widespread pain.

To the best of our knowledge, pain-site drawings have not been used when evaluating oral appliance treatment outcome. Our aim was therefore to study the influence of pain localizations on the outcome of appliance treatment in myofascial TMD using pain-site drawings. The hypothesis was that multiple pain sites will influence the treatment outcome.

Patients and methods

This study is part of the above-cited multicentre RCT on effectiveness of two different oral appliances for the treatment of myofascial TMD pain [22]. The patients were selected from altogether 203 eligible patients referred for treatment of TMD. On the basis of a power analysis [22], 65 patients aged 18-71 participated in the trial, which was performed during the years 2005-2007 at Malmö University, Sweden and the University of Turku, Finland. The history-taking and examination were performed at baseline and at all follow-ups according to Research Diagnostic Criteria for TMD, RDC/TMD [25]. The patients were randomized into two groups, a prefabricated appliance group, Relax ($n = 32$), and a stabilization appliance group ($n = 33$).

The prefabricated appliance, made of polymethylmethacrylate, included a front plateau covering the edges of the incisors and canines with a palatal extension of about 1 cm. The frontal plateau allows both occlusal and articulation contacts. The appliance is individually fitted with a self-curing silicon material, polyvinylsiloxane. The adjustment of the appliance aims at achieving contacts in the centric relation. In lateral excursion, contacts on the canines or frontal group contacts, as well as symmetrical contacts at protrusion, were achieved. The stabilization appliance had a smooth, flat surface with supporting teeth in contact and was adjusted in centric relation. The appliance had a canine-protected articulation or group contacts of frontal teeth. At protrusion, the appliance had bilateral or group contacts of frontal teeth. Both appliances were made for the maxilla and recommended to be used every night for 10 weeks, and after that, when needed. Amount of use was registered at all follow-ups.

The study was approved by the ethical committee of Lund and Turku universities. A thorough description has been presented previously by Nilner et al. [22]. Among the inclusion criteria were 1) pain of muscular origin with or without limited opening, according to RDC/TMD [25] and 2) duration of pain of at least 3 months. Among the exclusion criteria were (1) TMJ pain, (2) diagnosis of whip-lash, (3) history of psychiatric disorders and (4) diagnosed systemic muscular or joint disease. The included patients had had no previous splint therapy.

At baseline the patients completed a comprehensive history questionnaire (RDC/TMD) and health declaration including pain drawings. Patient characteristics and duration of myofascial TMD pain were registered and analysed. Intensity of myofascial TMD pain was recorded on a numeric rating scale, NRS, with the endpoints 'no pain' (0), and 'worst possible pain imaginable' (10). Frequency of myofascial pain was recorded as one time, recurrent, persistent. The occurrence and frequency of headache were recorded as no headache, rarely, recurrent and continuous. Questions on self-reported neck and shoulder pain during the last 6 months were answered as yes/no. Questions regarding general health were answered using a 5-point rating scale (0 = bad, 1 = mediocre, 2 = good, 3 = very good, 4 = excellent). Stress in general was reported using a 4-point scale (1 = not at all, 2 = very little, 3 = some, 4 = a lot).

Grouping of patients

Pain drawings and pain profile subgroups

Because of the similar treatment outcome of both appliances with no statistically significant differences between the groups [22] the two appliance groups were pooled ($n = 65$) for the present study. When filling out the history questionnaire and health declaration at baseline the patients were asked to draw all the pain sites in the face, head and whole body where they experienced pain. On the basis of the drawings the patients were then grouped into two pain profile subgroups (1) pain in face and head (local), and (2) multiple pain sites outside the face and head area (widespread pain). The drawings were analysed by one of the authors (MD) using a transparent template according to Suvinen et al. [12], to improve correct allocation of the patients into one of the two subgroups (Figure 1). In case of doubt, consensus was reached through discussion (YLB, MD).

Treatment outcome was followed up for the short (6 and 10 weeks) and the long term (6 and 12 months) on an intent-to-treat basis.

Treatment outcome measures

The effectiveness of the treatment was estimated in four outcome domains: pain intensity, overall improvement, physical

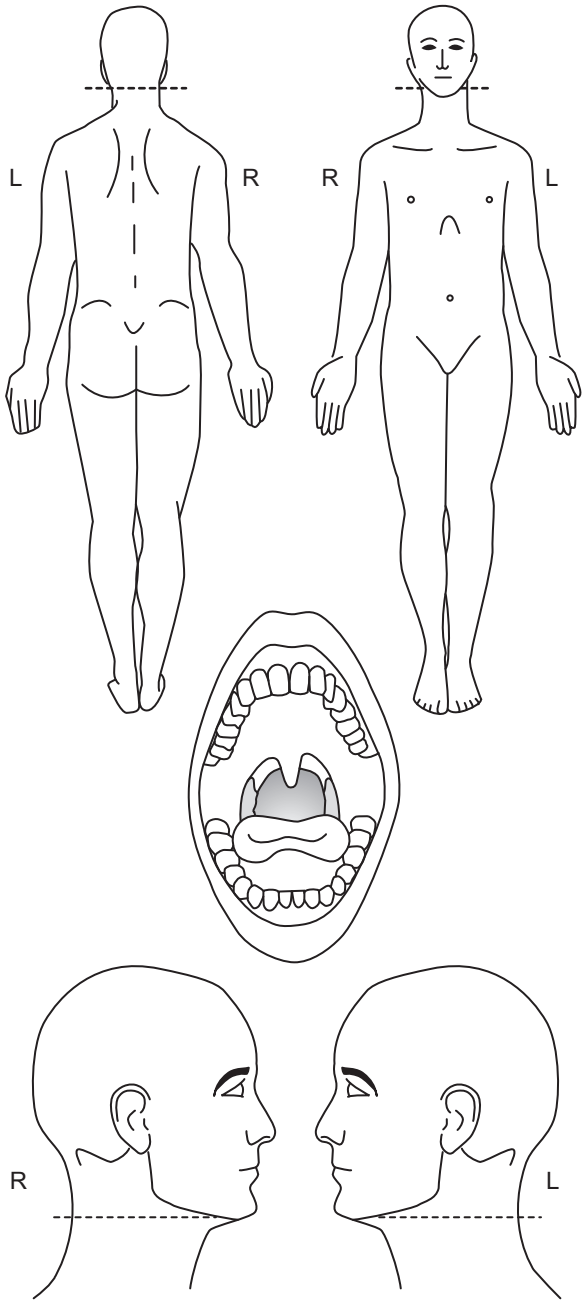

Figure 1. Assessment template for the pain drawings of localized and widespread pain.

functioning, and emotional functioning, according to the recommendations for evaluating the treatment outcome of chronic TMD pain, set by the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials, IMMPACT, [26]. The changes in the measures of the domains during the follow-up were calculated against baseline data functioning as internal controls.

Pain intensity

A 30% reduction in pain was calculated from a visual analogue scale (VAS) with the endpoints 'no reduction' and 'total reduction'. For this study, also characteristic pain intensity (CPI) derived from the RDC/TMD was analysed.

Overall improvement

Improvement in overall subjective symptoms was measured using a questionnaire with a 6-point rating scale: 0 = symptom-free, 1 = much better, 2 = better, 3 = unchanged, 4 = worse, 5 = much worse.

Physical functioning

On the basis of the history questionnaire of RDC/TMD, the patients were classified for graded chronic pain (GCP) severity as follows: Grade 0 = no TMD pain in the previous 6 months; Grade 1 = low disability – low intensity of pain; Grade II = low disability – high intensity pain; Grade III = high disability – moderately limiting; Grade IV = high disability – severely limiting.

Emotional functioning

The patients were classified for psychological status, depression and somatization scores, using the modified SCL-90-R instrument in RDC/TMD Axis II [25], including 20 questions indicating depression and 12 indicating somatization with the classifications normal, moderate and severe.

Statistics

The Chi-square test was used for comparison of differences between the groups for variables on a nominal scale, and the Mann-Whitney *U* test for the variables measured on an ordinal and continuous scale.

For comparison within the groups during the follow-up period, the Wilcoxon's signed ranks test was used for analysing changes between baseline data and follow-up measurements for the variables measured on an ordinal scale and a continuous scale.

For analysing the difference in changes between the groups, the Mann-Whitney *U* test for variables measured on an ordinal and on a continuous scale was used.

Differences at the 5% level of probability were considered statistically significant. Statistical analyses were done using SPSS Statistics for Windows, version 23.0 (IBM Corp. Armonk. NY).

Results

Baseline data

Pain profile subgroups

Out of altogether 65 patients a total of 26 (40%) patients presented drawings with pain sites limited to the face and head (local pain profile group), and 39 patients (60%) presented pain sites extending outside the face and head (widespread pain group). For the analysis, the data of the local pain profile group ($n = 26$) were compared to those of the widespread pain profile group ($n = 39$).

Demographic data

The demographic data are shown in Table 1. There were no statistically significant differences found in age, gender, or other demographic data between the two groups. According to the socioeconomic background, the majority had received higher education ($n = 40$) and were married ($n = 57$).

Distribution of subjective symptoms

Symptoms are presented in Table 2. Ninety-eight per cent of all patients reported myofascial pain with a duration of >6 months. The median NRS value for worst myofascial pain was 7,5 for the local and 8,0 for the widespread pain group. Persistent pain was reported by 42% of all patients. There were no statistically significant differences between the groups regarding duration of pain, pain intensity (NRS), frequency of myofascial pain, reported general health condition, or reported general stress. The widespread pain group reported more night-time clenching and grinding. Ninety-five per cent of all patients reported headache and 92% neck and shoulder pain with no differences between the groups.

Short- and long-term treatment results

Up to 10 weeks of appliance therapy none of the patients had expressed a need for additional treatment or another oral appliance. There was no statistically significant difference in the use of appliances between groups throughout the follow-up. A total of 64 patients attended the 10-week follow-up, 52 patients the 6-month follow-up, and 49 the 12-month follow-up. The number of drop-outs was 8 in both pain groups. Altogether, the share of drop-outs was 24.6%. When comparing the drop-outs with those completing the study, no differences could be found at baseline regarding either myofascial pain or demographic data.

Pain intensity within and between the groups

CPI. Within both groups a statistically significant pain reduction (CPI) was observed at all follow-ups compared to baseline (Table 3). The magnitude of the changes was similar in both groups. No differences between the groups were observed at baseline, 10 weeks, 6 and 12 months. At 6 weeks' follow-up, a significant difference between the pain groups was observed (Table 3), with higher values in the widespread pain group.

30% reduction of worst reported pain. At 6 weeks' follow-up, 70% of all patients experienced a 30% reduction of worst reported pain. The pain level remained similar during the follow-up (Table 4). There was a significant difference between the groups at 12 months, the widespread pain group showing better results. This was not seen at the other examination points (Table 4).

Overall improvement within and between the groups

Overall improvement 'better', 'much better' or 'symptom-free' was observed in 85% in the local and 82% in the widespread pain group at the 6 weeks' follow-up. The level remained similar during the follow-up with no differences between the groups (Table 4).

Table 1. Demographic data of 65 myofascial TMD pain patients grouped into local and widespread pain profile groups at baseline.

	Local ($n = 26$) *n*	Widespread ($n = 39$) *n*
Gender		
Female	25	33
Male	1	6
Age (y)		
Mean	38	37
SD	15	12
Min-max	19–71	18–63
Marital status		
Married	18	22
Divorced	3	5
Never married	5	12
Highest level of education		
Elementary school	3	5
High school	15	21
College	8	13

No statistical differences between the groups.

Table 2. Distribution of reported myofascial TMD pain and headache, pain from neck and shoulders, awareness of parafunctions, reported general health and stress at baseline in the local ($n = 26$) and widespread ($n = 39$) pain groups. NRS: numeric rating scale.

Duration of pain (months)	local ($n = 26$)	widespread ($n = 39$)
Median	24	36
Min-max	3–480	6–360
NRS at the examination		
Mean	4.6	4.9
SD	2.6	2.8
Median	4.0	5.0
IQR	3.00–7.00	3.00–7.00
NRS worst		
Mean	7.5	7.9
SD	1.9	1.4
Median	7.50	8.0
IQR	6.00–8.00	7.00–9.00
NRS average		
Mean	5.8	5.4
SD	1.9	1.7
Median	5.0	6.0
IQR	4.00–7.00	4.00–7.00
Frequency of myofascial pain		
One time	2	1
Recurrent	14	21
Persistent	10	17
Frequency of headache		
No headache	2	1
Rarely	7	8
Recurrent	16	24
Continuous	1	6
Reported neck/shoulder pain		
Yes	22	38
Awareness of grinding and clenching		
- Night-time	15	33
	$p = .016$	
- Day-time	17	27
Reported general health		
Bad	0	2
Mediocre	3	8
Good	12	21
Very good	7	5
Excellent	4	2
Reported stress in general		
No	0	1
Very little	9	9
To some extent	14	21
Very much	3	7

Physical functioning within and between the groups

Statistically, significant changes of GCP scores to a lower grade were observed within both groups throughout the follow-up compared to baseline. The magnitude of the changes was similar in both groups. For the local pain group the change in GCP was significant at 6 weeks, 10 weeks, 6 months and 12 months compared to baseline ($p = .005$, $p = .034$, $p = .020$ and $p = .007$). For the widespread pain group the change in GCP was significant at every follow-up compared to baseline (all $p < .001$). There were no differences between the groups at any examination point.

Emotional functioning within and between the groups

Within both groups the depression score showed a significant decrease at several examinations compared with baseline (Table 5). Both groups ended up with normal scores at 12 months (Table 5). The magnitude of the changes was similar in both groups. Between the groups, a statistically significant difference was observed at 12 months, the local pain group presenting a lower score compared to the widespread pain group (Table 5).

The somatization score decreased statistically significantly during the follow-up compared to baseline within both groups at most examinations (Table 6). The magnitude of the changes was similar in both groups. In the local pain group but not in the widespread group, the score reached normal values (Table 6). When comparing the groups with each other there was a statistically significant difference with a higher somatization score in the widespread pain profile group at baseline, 10 weeks and 6 months. No difference between the groups was observed at 6 weeks and 12 months (Table 6).

Discussion

The main result of this TMD treatment study using pain-site drawings for grouping the patients was a similar improvement model for both local and widespread pain groups starting already at 6 weeks' examination, with only minor differences in the outcome between the two groups during the 1-year follow-up. Regarding the reduction of pain intensity (CPI), there was a difference between the two groups at 6 weeks, the widespread pain group being less successful, which may suggest a faster improvement in the group with fewer pain sites. At 10 weeks this could no longer be observed, as the widespread group with multiple pain sites managed in the same way as the local pain group in the long run. Regarding 30% worst pain reduction the widespread pain group showed even better results than the local pain group at 12 months. Our results are in line with a newly published report by Häggman-Henriksson et al. [27] showing that the benefit from supervised exercise was similar in both local and general TMD pain groups. On the other hand, the results were surprising and unexpected since many recent studies emphasize that widespread pain constitutes a major risk factor with regard to onset, treatment, persistence and prognosis of TMD [15,28], as well as for the risk of chronicity of TMD [6]. In addition, an earlier study by Marbach and Raphael [24] on oral appliances showed that patients with TMD associated with widespread pain have a poorer outcome when treated with oral appliances compared to local TMD pain patients. One explanation for the different

Table 3. Changes in characteristic pain intensity (CPI) during the follow-up within the local ($n = 26$) and widespread ($n = 39$) pain profile groups. The changes at 6 and 10 weeks, 6 and 12 months compared to baseline are shown for both groups. The difference between the groups at every examination is shown as well.

	Baseline	6 weeks***	10 weeks***	6 months***	12 month***
Local pain group					
Median	50.00	36.00	40.00	33.00	25.00
IQR	42.25–77.0	28.25–53.75	27.00–54.00	13.00–53.00	9.25–40.75
Widespread Pain group		***	***	***	***
Median	63.00	50.00	45.00	37.00	23.00
IQR	47.00–77.00	40.00–60.00	33.00–63.00	18.50–45.00	17.00–43.00
Significance level between the groups	NS	*	NS	NS	NS

Wilcoxon signed rank test for testing the change in CPI within the groups. *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$; NS = not significant.
Mann-Whitney *U*-test for testing the difference in CPI between the groups *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$; NS = not significant.

Table 4. Number of patients in the local and widespread pain groups reporting reduction of pain and overall changes in symptoms during follow-up. a) Reduction of worst reported myofascial pain. b) Overall changes in subjective symptoms, according to a 6-point rating scale, compared to baseline values. VAS = visual analogue scale.

	6 Weeks		10 Weeks		6 Months		12 Months		
TMD pain	Local	Widespread	Local	Widespread	Local	Widespread	Local	Widespread	Significance level
a) Reduction of worst reported pain (VAS)	($n = 26$)	($n = 39$)	($n = 26$)	($n = 39$)	($n = 26$)	($n = 39$)	($n = 26$)	($n = 39$)	
30% Pain reduction	16	29	17	28	18	27	14(1)	31	$p = .028$
b) Overall changes in subjective symptoms	($n = 26$)	($n = 39$)	($n = 25$)	($n = 38$)	($n = 18$)	($n = 33$)	($n = 16$)	($n = 31$)	
'No change', 'much worse'	4	6	6	4	0	3	2	0	
'Better', 'much better', 'symptom free'	22	33	19	34	18	30	14	31	NS

Chi-square test, Fisher's exact test.
Figures depict number of subjects.
NS: no statistically significant differences between the groups at 12 months.
(1) a statistically significant difference between the groups at 12 months, the widespread pain group showing better results.

Table 5. Changes in the depression score within the local ($n = 26$) and widespread ($n = 39$) pain groups during follow-up. The changes at 6 and 10 weeks, 6 and 12 months compared to baseline are shown for both groups. The difference between the groups at every examination is shown as well.

	Baseline	6 Weeks	10 Weeks	6 Months	12 Month
Local pain group		6 Weeks	10 Weeks	6 Months	12 Month
Median	0.775	NS 0.475	* 0.400	NS 0.200	*** 0.200
IQR	0.238–1.012	0.200-0.875	0.100–0.700	0.050–0.700	0.038–0.623
Widespread pain group		NS	*	*	*
Median	0.800	0.500	0.475	0.300	0.500
IQR	0.300–1.425	0.200-1.500	0.100–1.388	0.125–1.050	0.200–0.900
Significance level between the groups	NS	NS	NS	NS	NS

Wilcoxon signed rank test for testing the change in depression score within the groups, *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$; NS: not significant.
Mann-Whitney *U*-test for testing the difference in depression score between the groups, *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$; NS: not significant.
Depression score (according to RDC/TMD), normal values: < 0.535, moderate: 0.535-<1.105, severe: >1.105.

Table 6. Changes in the somatization score within the local ($n = 26$) and widespread ($n = 39$) pain groups during follow-up. The changes at 6 and 10 weeks, 6 and 12 months compared to baseline are shown for both groups. The difference between the groups at every examination is shown as well.

	Baseline	6 Weeks	10 Weeks	6 Months	12 Month
Local pain group		NS	*	*	*
Median	0.625	0.550	0.400	0.300	0.330
IQR	0.330–1.020	0.225–1.127	0.200–0.950	0.170–0.750	0.133–0.710
Widespread pain group		*	NS	***	**
Median	0.917	0.800	0.815	0.500	0.500
IQR	0.600–1.750	0.300–1.400	0.383–1.405	0.300–0.875	0.250–1.170
Significance level between the groups	*	NS	*	*	NS

Wilcoxon signed rank test for testing the change in somatization score within the groups, *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$; NS: not significant.
Mann-Whitney *U*-test for testing the difference in somatization score between the groups, *$p \leq .05$; **$p \leq .01$; ***$p \leq .001$; NS: not significant.
Somatization score (according to RDC/TMD), normal values: < 0.428, moderate: 0.428-<0.857, severe: >0.857.

outcome compared to our study may be first, the study design. Patients with other diagnoses, for example, fibromyalgia were excluded from our study. In addition, the grouping was based solely on pain site drawings. In the study by Marbach and Raphael, the evidence of widespread pain was gathered from self-report of fibromyalgia, a questionnaire and extracranial palpation by the clinician and the grouping was made accordingly. No pain site drawings were used. On the other hand, in the study group by Häggman-Henriksson et al. [27] several fibromyalgia patients were included in the general pain group and still there was no difference between the local and widespread pain groups with regard to treatment outcome.

The positive treatment effect in our study may also partly be explained by the encouragement and support that a follow-up study may provide. Still, our finding of a similar positive treatment effect in both groups indicates that patients with TMD associated with widespread pain may also benefit from appliance therapy.

Psychological factors and depression [29,30], as well as social and general health factors [31], have been regarded as risk or contributing factors for TMD. On the other hand, pain as such causes discomfort, stress, and stress reactions. There is no clear evidence of whether the reported increased stress level in patients with TMD pain is the cause or the effect of TMD and TMD-related pain [30,32]. The result of our study suggests that a successful treatment with oral appliances may reflect positively also in the depression score, regardless of the pain being localized or widespread.

There is much evidence that widespread pain and somatization are highly associated [33,34]. A recent report [13] suggests that primary care patients with high somatization at baseline are more likely to report clinically significant pain 1 year later. Our results also showed higher scores in the widespread group compared to the local pain group at baseline. However, after oral appliance treatment at the 1-year follow-up, a clear improvement had occurred in both groups. The scores in the local pain group had reached normal values but the scores in the widespread pain group were still elevated.

Taking the results for the depression and somatization scores together, the widespread pain group in our study did not manage quite as well as the local pain group regarding these variables, which may suggest that patients with multiple pain sites are more challenging as pointed out above and may need additional treatment options.

Widespread pain was observed in 39 patients out of 65 (60%) in our patient material. In a recent report by Suvinen et al. [12] and Türp et al. [16], the majority of the patients, 59% and 65% respectively, suffered from widespread pain. In these studies, patients with widespread pain also reported longer pain duration compared to those with localized pain; this could not be seen in our patient material. However, those patients were divided into three groups, local (face and head), regional (neck and shoulder) and widespread (pain sites outside face, head, neck and shoulder regions), while we used only two subgroups, and our widespread pain group also included the patients with neck and shoulder pain sites. Therefore, the materials cannot be wholly compared with each other. In addition, in the study by Suvinen et al. [12], the patients were tertiary care referrals which may, at least partly, explain the high percentage of widespread

pain patients in their material, while our patients were referred from primary care.

Patient-produced pain-site drawings have commonly been used in the assessment of other musculoskeletal and chronic pain conditions [14,35,36], but rarely for facial pain patients. Türp et al. [16] showed that painful sites other than the face and head are easily missed in TMD patients if pain drawings are not used. The importance of pain-site drawings has lately been acknowledged and, for example, included as an assessment tool in the newly published Diagnostic Criteria of Temporomandibular Disorders [1].

Of our patients, 93% reported headaches, and this finding is in line with many recent studies reporting on the prevalence of comorbid pains in TMD patients [7,8]. Several studies report on the association between TMD and headaches [10,37], and according to the latest update of the International Classification of Headache Disorders [38], headache attributed to TMD should be regarded as a distinct entity. Both groups in our study reported neck and shoulder pain as well, which is in line with previous reports [12,16]. These findings also support the suggestion that the trigeminal and cervical regions are closely connected [39,40].

Some limitations of this study need to be addressed. Drop-outs are common in clinical long-term follow-up studies. However, to compensate for possible drop-outs we included more patients in the study than the original power calculation implied [22]. In addition, analyses showed no difference at base-line regarding severity of myofascial pain assessed on a NRS before start of the treatment between the drop-outs and those who completed the study. Further, some incongruences were noted when the pain drawings were compared to the data reported in the questionnaire. This should be taken into account in the clinical situation because it indicates that the drawings need to be complemented with other assessment methods.

To conclude, oral appliance treatment had a positive effect on all outcome measures during the 1-year follow-up in patients suffering from myofascial TMD pain regardless of whether the pain was localized or widespread. Multiple pain sites seemed to have surprisingly little influence on the outcome variables. However, some indications of more challenges when treating patients with widespread pain compared to local pain were registered. Pain-site drawings seem to be useful in the clinical situation and may support the clinician in making decisions about treatment planning.

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Disclosure statement

The authors report no conflicts of interest

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