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Orofacial pain caused by trigeminal neuralgia and/or temporomandibular joint disorder

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Abstract

Background and Purpose: *The purpose was to evaluate an accurate method of differentiating between temporomandibular joint (TMJ) disorder and trigeminal neuralgia (TN) in the sample of patients from a subspecialist dental practice.*

Patients and Methods: *Patients (n=239, mean age 39.3 years, 83.3% female) were examined for clinical symptoms and signs of orofacial pain of non-dental origin. The study included 12 female patients (group G-1; mean age 60.3 years) with determined co-morbidity of TMJ disorder and TN, and 17 patients (group G-2; mean age 53.8 years, 64.7% female) with only TN confirmed and the TMJ disorder ruled out. The TMJ diagnosis by means of magnetic resonance imaging (MRI) was confirmed. Pain intensity was rated on a visual-analogue scale (VAS with range 0–10) and maximal mouth opening capacity (mm) measured by gauge.*

Results: *TMJ pain on the VAS scale for G-1 patients amounted to 6.91. TN related pain symptoms on the VAS scale for G-1 patients amounted to 9.0±1.6 and for G-2 patients 8.1±2.7. There was a statistically significant difference in the intensity of TMJ and TN related pain ($p=0.0074$) within the G-1 patients group. Pain in the TMJ area ($p=0.0012$), noise in the TMJs ($p=0.0345$) as well as ear pain ($p<0.001$) were more frequent in G-1 patients with TMJ disorder. Maximal mouth opening was statistically significant ($p=0.0037$) between G-1 (38.9±9.2 mm) and G-2 patients (48.9±5.2 mm).*

Conclusion: *A thorough clinical evaluation of symptoms as well as MRI as the gold standard for TMJ diagnostics also includes a neurological examination in cases of uncommon orofacial pain conditions.*

INTRODUCTION

Differential diagnostics of orofacial pain is important because odontogenic pain, which is most common in dental practice, should be clinically differentiated from pains of other origins. Temporomandibular disorders are the most common non-odontogenic pains of

Abbreviations:
MRI magnetic resonance imaging
TMD temporomandibular disorder
TMJ temporomandibular joint
TN trigeminal neuralgia
VAS visual-analogue scale

musculoskeletal origin. Temporomandibular disorders (TMDs) consist of a disorder of masticatory muscles and/or a disorder of temporomandibular joint (TMJ). Arthrogenic disorder is divided in two separate subgroups: osteoarthritis and variations of anterior disc displacement (*1, 2*).

Furthermore, neurological diseases involve the orofacial region, headaches being most commonly in co-morbidity with TMDs (*3, 4, 5*). Trigeminal neuralgia (TN), which is considered to be among the most common neurological pains involving the orofacial region and one of the most intensive pains in general, is of great importance to dentists (*6, 7, 8, 9, 10*).

There are a great number of studies in which clinical diagnostics and magnetic resonance imaging (MRI) are used as the gold standard in investigating the TMJ disorder (*11, 12, 13*). Recognizing of conditions such as the TMJ disorder and TN is important for managing non-dental orofacial pain (*14, 15*). The aim of this study was to evaluate an accurate method of differentiating between TMJ disorders and TN in the sample of patients from a subspecialist dental practice for orofacial pain conditions.

MATERIAL AND METHODS

A prospective study of patients with orofacial pain was carried out at the Department of Removable Prosthodontics, where 239 (83.3% female) patients were examined from 2001 to 2011 for clinical symptoms and signs of orofacial pain of non-dental origin. The study included 12 female patients (group G-1) with determined co-morbidity of TMJ disorder and TN, and 17 patients (group G-2; 64.7% female) with only TN confirmed and the TMJ disorder ruled out (Table 1). All the patients were familiar with the purpose and method of study and at the request of the Ethics Committee, School of Dental Medicine, University of Zagreb, all subjects signed an Informed Consent confirming their voluntary participation in this research.

Research Diagnostic Criteria for TMD were used in diagnostics of TMJ disorder as well as Axis I (*16*) and manual functional analysis (*17*). The patients presented the following clinical signs: pain in the TMJ region, limited mouth opening and noises (clicking, crepitation) in TMJ during opening of the mouth. The main outcome measuring criteria were: pain duration (in months) and intensity rated on a visual-analogue scale (VAS with range 0–10) and maximal mouth opening capacity (in mm) measured by gauge. Clinical characteristics were noted, which also included the following clinical symptoms: ear pain, toothache, burning sensation in the mouth, as well as diagnosed bruxism.

As a part of an interdisciplinary collaboration, suspect patients also underwent neurological diagnostics within the Outpatient clinic at the Department of Neurology, Clinical Hospital Centre "Sisters of Charity". Patients with orofacial pain were diagnosed with idiopathic TN with or without co-morbidity with the TMJ disorder. The specialist examination also recorded headaches (tension, migraine, occipital, etc.) The etiology of orofacial pains caused by intracranial tumors, mircovascular compressions on trigeminal nerve and other neurological diseases, evident lesions such as multiple sclerosis, or trauma-related TN were excluded by means of MRI and multislice computed tomography. In group 1, pain related to TMJs at mouth opening was measured, and in groups 1 and 2, pain related to TN was measured. Based on clinical diagnosis and clinical signs of TMJ disorder, a definitive diagnosis was confirmed by MRI scanning of the joints. As a result, diagnoses of anterior disc displacement with or without reduction, and osteoarthritis of the TMJ were made.

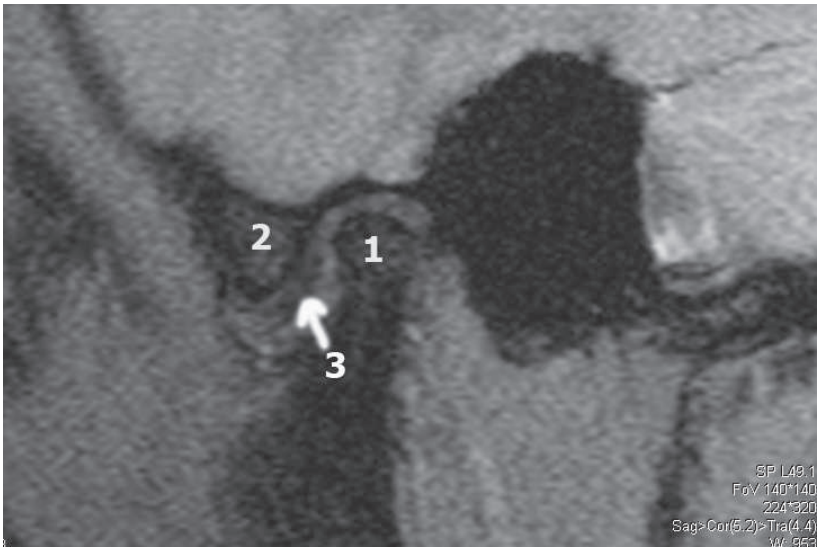

Figure 1. *Magnetic resonance image of the temporomandibular joint of a 22-year-old female with marked low signal area extending into the articular eminence (a). This corresponds to the finding seen on panoramic radiograph (arrow) (b).*

TABLE 1

Age of all patients with orofacial pain and chosen subgroups of patients according to diagnosed trigeminal neuralgia.

Age of patients' groups	mean	SD	minimum	maximum
All patients (n=239)	39.3	17.8	12	84
Group G-1 (n=12)	60.3	15.2	27	78
Group G-2 (n=17)	53.8	11.9	25	78

n, number of patients, SD, standard deviation

MRI of TMJs imaging was performed by the following scanners: Harmony 1T (T1 weighted images with TR 450/TE 12; matrix 256 x 192; 160 x 160 field of view; T2 weighted images with TR 3000/TE 66; matrix 389 x 512; 190 x 190 field of view), and Avanto 1.5T (T1 weighted images with TR 600/TE 15; 410 x 512; 180 x 180 field of view; T2 weighted images with TR 770/TE 13; matrix 128 x 256 field of view; PD weighted images (Figure 1) with TR 3030/TE 50; 320 x 320; 160 x 160 field of view) with section thickness 3 mm (both devices manufactured by Siemens, Erlangen, Germany).

The level of anxiety was evaluated by Spielberger's psychological measuring instrument State-Trait Anxiety Inventory (*18*) (STAI 1 – concerning anxiety as subjective state, feeling in a period of last week, including today, and STAI 2 – concerning anxiety as a relatively stable individual characteristic in general throughout life).

The statistical data analysis was performed by STATISTICA (StatSoft Inc., Tulsa, Oklahoma, USA) program. Differences in distribution were analyzed by t-test and Fisher's exact test). All MR images were analyzed independently of the patient's clinical signs by a specialist neuroradiologist (D. Z) a dentist subspecialized in TMD (T. B.), who have been collaborating for years. The Kappa index of reliability was between 0.8 and 1.0 for all variables.

RESULTS

The groups G-1 and G-2 of patients did not differ according to age (t-test=1.30 (df27) with p=0.203). Regarding the patients' gender according to groups (G-1 group consisted of females only), men were only included in Group 2 (35.3%), which was statistically significant (Fisher's exact test p=0.028).

Previous pain duration (that is, pain chronicity), prior to examination and related to the reason for recently seeking medical/dental help, did not show to be significant either for subgroups of patients or characteristics of pain upon their presentation (Table 2). Individual frequency of involvement of certain branches or their combinations is low and there are no differences between subgroups of patients (Table 3).

Orofacial pain duration prior to the first examination was 11.5±14.2 months for G-1 patients, and 30±36 months for G-2 patients (t-test=–1.92 (df22.27) with p=0.0683). TMJ pain on the VAS amounted to 6.91, and TN related pain amounted to 9.0 with a statistically significant difference (t-test=3.27 (df11) with p=0.0074) within the G-1 patients group. G-2 patients presented only TN related pain intensity on the VAS (mean value 8.1), compared with TN pain in patients of Group 1 which was insignificant (t-test=1.09 (df27) with p= 0.2843. However, there was no difference in the intensity of TMJ pain for G1 patients and TN related pain for G2 patients (t-test=1.26 (df27) with p=0.22).

Although TMJ sounds were diagnosed in both subgroups of patients, this was still a significant clinical finding typical of patients who, apart from TN, also suffer from TMJ disorder (Table 4). On the other hand, all G-1 patients suffered from TMJ pain as well as 41.2% of G-2 patients, in whom TMJ disorder was excluded (Fisher's exact test with p=0.0012). yet, it is significant that as much as 91.7% of G-1 patients and only one G-2 patient (5.88%) had ear pain (Fisher's exact test with p=3.950E -06). Maximal mouth opening was statistically significant between G-1 group and G-2 patients (Table 5).

TABLE 2

Patients classified according to previous pain duration and occurrence of pain from both groups almost equally suffering previous pain.

variables	previous pain duration		occurrence of pain	
subgroups of patients	<6 month	= 6 month	occasional pain	constant pain
Group 1 (n)	7 (58.3%)	5 (41.7%)	4 (33.3%)	8 (66.7%)
Group 2 (n)	6 (35.3%)	11 (64.7%)	9 (52.9%)	8 (47.06%)
Fisher's exact test	p=0.2742		p=0.4515	

n, number of patients

TABLE 3

Distribution of trigeminal nerve branches involvement.

Trigeminal branches	Group G-1 (n)	Group G-2 (n)	total (n, %)
	Fisher's exact test p=0.2217		
I		2	2 (6.9%)
II	7	5	12 (41.4%)
III	3	3	6 (20.6%)
I+II		2	2 (6.9%)
I+III	1		1 (3.5%)
II+III	1	5	6 (20.7%)

n, number of branches, % percent of combination of total affected branches; I, ophthalmic branch; II, maxillary

TABLE 4

Frequencies of noise diagnosed in TMJs of both patients' subgroups.

noise in TMJ	no	clicking	crepitation
Group 1 (n=12)	1 (8.33%)	6 (50%)	5 (41.7%)
Group 2 (n=17)	9 (52.9%)	6 (35.3%)	2 (22.8%)
Fisher's exact test p=0.0345			

TMJ, temporomandibular joint; n, number of patients

TABLE 5

Measuring of active mouth opening in both patients' subgroups.

Mouth opening measurements (mm)	mean± SD	minimum	maximum
Group G-1 (n=12)	38.88±9.24	26	52
Group G-2 (n=17)	48.91±5.20	39	61
t-test=–3.74 (df27) with p=0.0037			

n, number of patients; mm, millimeters; SD, standard deviation

There were no differences between the patients' groups (G-1/G-2) regarding the frequency of burning sensation in the mouth (50%/17.7%; Fisher's exact test with p=0.1059), as well as previous toothache (58.3%/64.7%; Fisher's exact test with p=1.0). Bruxism was diagnosed in 50% of G-1 patients and in 23.5% of G-2 patients (Fisher's exact test with p=0.2359).

There were no differences between both groups of patients regarding diagnosed headache: 66.7% for G-1, and 47.1%/ for G-2 patients (Fisher's exact test p=0.4515). In both groups of patients (G-1/G-2), similar elevated anxiety scores were found: STAI 1-44.67/44.24, and STAI 2-48.92/43.71 respectively (p=0.9228).

DISCUSSION

Pains related to TMJ disorder and to TN have different etiologies and are present in the orofacial region (*6, 19*). TMJ disorder is a musculoskeletal disorder which has an unclear origin, mostly caused by a multifactorial etiopathogenesis (*20, 21*). Besides, TN is the most frequent neuropathic orofacial pain. According to the leading theory of pathogenesis, idiopathic TN is related to demyelization of trigeminal sensory fibers within the proximal nerve root. TN attacks the distribution of some or multiple divisions of the trigeminal nerve. However, pain is in most cases of unclear etiology (*10*).

TMJ disorder is most prevalent in females (up to 90% of patients) aged between 20–45 years, but the first symptoms and signs could appear in adolescent age. Generally, the incidence does not increase with age of patients (*2*). On the contrary, TN is a rare condition with incidence of approximately 4.5 cases per 100,000. Peak incidence has moved, compared with TMJ disorder, to an elderly population between 50–60 years and increases with age. It affects women slightly more often than men (*9, 10*). In this study, the age of patients was not different depending on the presence TMJ disorders, but they were female patients only. Our patients with co-morbidity (G-1) were of characteristic age for TN patients. Also, females were more affected than male patients with TN only.

As it was previously confirmed, all the patients in our study had unilateral TN pain. The distribution of TN localization also matches the data from literature: the highest frequency is when the maxillary and mandibular branch are involved (up to 42%) and the lowest if only the ophthalmic branch of the nerve is involved (about 2%) (*22*). Although TN pain is one of the strongest and most unpleasant paroxysmal pains, mostly provoked by innocuous sensory stimulation of the nerve, there was neither significance in the previous pain duration nor in characteristics of its occurrence with respect to the patients with co-morbidity of TMJ disorder (G-1 patients). On the other hand, TMJ disorder does not need to be exclusively related to the mandibular movements since chronic musculoskeletal pain can occur spontaneously (*23*).

According to pain intensity, it is expected that TN related pain is not only qualitatively different but also of greater intensity than TMJ related pain in patients with co-morbidity of both diseases (G-1). However, comparison of musculoskeletal and neuropathic pain in different individuals (that is, TMJ pain in G-1 and TN pain in G-2 group) did not reveal any significance in different natures of pains. This complicates the differential diagnostics and therefore, MRI is relevant in differential diagnostics of orofacial pains as well as the gold standard in TMJ disorder (*11, 12*). Pain in mandibular movements is an important complaint related to limited mouth opening in TMJ patients whereas in TN patients, limited mouth opening is not to be expected only (*24*).

TMJ disorder is very widespread in general, non-patient population because they (non-patients) show at least one clinical sign or symptom in TMJ region or it is related to mandibular motion during function (25). However, clicking or crepitations in the painless TMJs are indications for active treatment whereas the painful TMJ disorder can be found in only 5% of those who need treatment (*20, 24*). On the other hand, radiological signs of TMJ disorders do not need to correlate with pain occurrence – disc displacement of TMJ was found in 25–33% of asymptomatic individuals by MRI (*26*). In this study, noise in the TMJ was clinically confirmed also in patients with only TN. Insufficient validity of clinical diagnostics in differential diagnostics of orofacial pains has already been known (*27, 28*).

Apart from clinically confirmed pain in the TMJ region, which is primarily related to clinical diagnostics, ear pain has proved to be a significant symptom for TMJ patients although it is not the main diagnostic sign in TMJ disorder diagnostics (*29*). TN may mimic dental

pain and it is therefore often misdiagnosed (*6*), which has often occurred in both groups of patients in our study. Burning sensation in the mouth was also recorded in our patients. It also proved to be a common complaint of patients with orofacial, prevalently neuropathic, pain (up to 29.3%) (*15*).

The causal relation between bruxism and TMJ disorder has not been proved. However, in this study, the co-morbidity was found in both groups of patients. Bruxism is also of multifactorial etiology and is more related to psychological and pathophysiological conditions and diseases (*30, 31*). Chronic pain and anxiety are generally in co-morbidity. An elevated level of anxiety was recorded in both groups of patients, which is related to pains which are suffered by patients with chronic pain disorders (*32, 33, 34*).

In conclusion, correct diagnosis is the key to managing facial pain of non-dental origin, which includes participation of several experts from the fields of dentistry, neurology and radiology. A thorough clinical evaluation of symptoms as well as MRI as the gold standard for TMJ diagnostics also includes neurological examination in cases of uncommon orofacial pain conditions. Co-morbidity of TMJ disorder and TN, as well as only TN, were found in 12.1% of all the examined patients in this study. Patients with musculoskeletal and/or neuropathic orofacial pain had higher levels of anxiety.

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