Comparison of the Neuropathic Pain Symptoms and Psychosocial Impacts of Trigeminal Neuralgia and Painful Posttraumatic Trigeminal Neuropathy

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Submitted February 1, 2018;
accepted April 30, 2018

Aims: To compare the impacts of trigeminal neuralgia (TN) and painful posttraumatic trigeminal neuropathy (PPTTN) on psychologic function and health-related quality of life (HRQoL) using a comprehensive quantitative assessment. **Methods:** This was a comparative cross-sectional study. A total of 97 patients diagnosed with PPTTN and 40 patients diagnosed with TN who sought treatment at an orofacial pain clinic completed standardized self-report measures of pain intensity, neuropathic symptoms, pain self-efficacy, mood, and indicators of general and oral HRQoL. Differences between the PPTTN and TN groups were tested, and associations of each condition with pain severity, psychologic function, and HRQoL were examined. **Results:** The majority of PPTTN (66%) and TN patients (80%) were affected by orofacial pain. Pain attacks were more frequent in TN (71%) than PPTTN (28%) patients, while numbness was more common in PPTTN (51%) than TN (12%) patients. Pain intensity was higher in TN for intermittent and affective pain dimensions. Both PPTTN and TN had a significant, but comparable, impact on patients' oral HRQoL. The burden of condition on overall health was significantly more pronounced in patients with TN than PPTTN, with evident differences in the mobility and self-care domains. There was a trend showing that more TN (54%) than PPTTN (36%) patients reported signs of depression, but clinically significant anxiety was comparably high in both groups (34% to 39%). Anxiety and pain-self efficacy were closely related to oral and general health statuses in both groups. **Conclusions:** Both TN and PPTTN are associated with significant psychosocial burden and reduced HRQoL, indicating a need to develop effective treatments for neuropathic orofacial pain that target functional restoration. *J Oral Facial Pain Headache 2019;33:77–88. doi: 10.11607/ofph.2157*

Keywords: *orofacial pain, posttraumatic trigeminal neuropathy, psychosocial, trigeminal nerve injuries, trigeminal neuralgia*

Chronic orofacial pain is multidimensional in nature and commonly involves a neuropathic pain (NP) component. The International Association for the Study of Pain (IASP) defines NP as "pain arising as a direct consequence of a lesion or disease affecting the somatosensory system."[1] Neuropathic pain of the orofacial region may be episodic, such as trigeminal neuralgia (TN), or continuous, such as painful posttraumatic trigeminal neuropathy (PPTTN). Long-standing neuropathic orofacial pain may lead to significant changes in an individual's psychologic status, level of daily functioning, and social interactions.[2] Accordingly, the relationships between NP conditions such as TN or PPTTN and psychologic morbidities have increasingly become of interest to researchers.[3]

Although rare, TN is a well-known cause of severe orofacial pain. TN is defined by the IASP as "a sudden, usually unilateral, severe, brief, stabbing recurrent pain in the distribution of one or more branches of the fifth cranial nerve."[4] Data from general practices based in the United Kingdom drew an incidence of 8 per 10,000 people per year.[5]

According to the International Classification of Headache Disorders (ICHD),[6] two types of classical TN are identified. The first type is purely paroxysmal without persistent background facial pain (classical TN,

purely paroxysmal). It is usually responsive, at least initially, to pharmacotherapy (especially carbamazepine or oxcarbazepine). The second type (classical TN with concomitant continuous pain) is characterized by persistent background facial pain of moderate intensity in the affected area that is less likely to be triggered by innocuous stimuli.[6] Central sensitization may account for the persistent facial pain. Additionally, symptomatic TN may occur secondary to the presence of an intracranial lesion compressing the trigeminal nerve at its root entry zone or secondary to multiple sclerosis.[7,8]

The neuropathic pain in TN patients is often excruciating, leading to severe distress that often causes anxiety, depression, and reduced quality of life (QoL).[9–12] In some cases, it may even lead to suicide.[13] TN patients usually seek health care from many providers with different specialties until proper diagnosis and management can be achieved. Dentists and physicians tend to first consider more common conditions likely to occur in the facial region, such as toothache or temporomandibular disorders (TMD), over TN, which is a relatively rare condition.[14] Initial misdiagnosis may lead to unnecessary interventions in many patients, especially unneeded dental restorative and/or surgical procedures, which may add further to their suffering.[15]

Another prominent cause of orofacial NP is iatrogenic trigeminal nerve injuries (TNIs), which may occur in relation to dental or oral surgical procedures and often lead to PPTTN. This damage may happen during implant placement, root canal treatment, orthognathic surgery, local anesthetic injections, or surgical removal of mandibular third molars.[16] The incidence of painful neuropathy following TNI is around 3% to 5%,[17] and a key feature of PPTTN is the presence of continuous burning and/or shooting pain in an area of the trigeminal nerve distribution with a clear history of trauma. Clinically, there may be positive and/or negative changes in the neurologic profile, which are the marking characteristics of PPTTN.[18]

Renton and Yilmaz[19] have demonstrated the functional disability from which patients with trigeminal nerve injuries may suffer. This can include problems with speaking, eating, drinking, make-up application, and shaving, all of which lead to dramatic effects on personal and social lives. A study of patients with TNI by Smith et al[3] indicated an increased risk of psychologic dysfunction in patients with PPTTN, as well as poor oral health–related quality of life (OHRQoL) and overall QoL.

As chronic orofacial pain extends over time, the psychosocial consequences of pain may themselves become etiologic factors in the maintenance and enhancement of associated symptoms. Psychosocial factors are now believed to play an important role in the maintenance and amplification of the pain experience and can affect the coping capabilities of the patient and the impairment of daily life activities.[20,21] Consequently, it is recognized that psychologic factors associated with chronic orofacial pain need to be urgently addressed during diagnosis and treatment planning to achieve proper pain management.[22]

Distinguishing between TN and trigeminal neuropathy arising from (dental) trauma is important from both a diagnostic and management perspective.[18] Different orofacial pain conditions are often associated with varying degrees of psychologic distress and impaired QoL, as well as differences in disease perception and ways of coping with the painful disorder.[9] Previous studies focusing on the psychosocial burden of patients with different types of orofacial pain have tended to compare neuropathic to non-neuropathic conditions,[9] and where both TNI and TN patients are considered, they tend to be grouped together[2] or be in very small samples.[23] Comparisons of TN to other neuropathic disorders are rare. One recent study reported more severe pain intensity in TN patients than in patients with burning mouth syndrome (BMS), although the psychosocial impacts of these conditions were comparable.[24] The aims of this study were to evaluate the psychosocial impacts of TN and TNI using a comprehensive quantitative assessment and to explore the relationships between neuropathic pain symptomatology, psychologic function, and QoL in TN and PPTTN patients.

Materials and Methods

Design

This was a comparative cross-sectional study that evaluated the symptomatology and psychosocial impacts of TN and PPTTN in patients who consecutively attended an orofacial pain clinic in South London (Dental Institute, King's College Hospital, London) during the period from January 2016 to August 2017. Data collection was done at the point of referral to the specialist center. Written informed consent was obtained from all patients providing permission for their anonymized data to be used for research purposes. Ethical approval for the study was provided by the London-Dulwich Research Ethics Committee (REC reference 15/LO/1108).

Participants

Patients with a diagnosis of TN or PPTTN who attended the clinic during the study periods under consideration for each condition (January 2016 to August 2017 for TN patients; January 2016 to February 2017 for PPTTN patients) were included. All patients were examined thoroughly by specialized

pain consultants and referred to a neurologist for validation of the diagnosis when appropriate. When indicated, magnetic resonance imaging (MRI) was used for exclusion of underlying causative lesions and detection of potential neurovascular compression of the trigeminal nerve. Patients were diagnosed according to the criteria of the ICHD-3.[6] The assessment protocol for trigeminal neuropathy used in the clinic has been published previously.[25] No patient was included in the study if they were affected by other potentially confounding facial pain conditions (besides headache or migraine) or severe mental illness. Demographic and clinical information were extracted from patient records, including data concerning trigeminal nerve divisions involved in the orofacial NP condition, side of the face affected, sensory deficits identified in clinical assessment (PPTTN patients), presence of migraines/headaches, and whether patients had other bodily chronic pain or any comorbid medical conditions.

Measures and Instruments

Participants of both groups were asked to complete a number of self-report standardized questionnaires commonly used to measure pain experience, general and oral HRQoL, and psychologic function in patients with chronic pain.[3] Questionnaires were administered at the patient's first clinic appointment either manually (hard copies) or electronically using IMPARTS (an initiative funded by King's Health Partners to "integrate mental and physical healthcare in research, training and clinical services").

Affective and Health Function Questionnaires. Depression was assessed using the 9-item Patient Health Questionnaire (PHQ-9),[26] a measure that assesses core diagnostic areas underlying clinical depression on a 9-item scale. Each item is rated on a 4-point frequency scale ranging from 0 (not at all) to 3 (nearly every day), with an overall score ranging from 0 to 27. Mild, moderate, moderately severe, and severe depression are indicated by scores of 5, 10, 15, and 20, respectively. The PHQ-9 has been validated in patients with a broad range of physical health problems, including chronic pain.[27]

Anxious mood and behavior was assessed with the 7-item Generalized Anxiety Disorder (GAD-7).[28] Response options for each item range from 0 (not at all) to 3 (nearly every day), with a total score ranging from 0 to 21. Higher scores indicate more severe anxiety (ie, disorder); a score of 8 or more indicates clinically significant levels of anxiety.[28] The GAD-7 has been recommended for the assessment of anxiety in patients with orofacial pain.[29]

OHRQoL was assessed with the Oral Health Impact Profile (OHIP-14), a widely used questionnaire assessing the oral health domains of functional limitation, physical pain, psychologic discomfort, physical disability, psychologic disability, social disability, and handicap.[30] This measure consists of 14 items, each scored on an ordinal frequency scale as follows: 0 = never; 1 = hardly ever; 2 = occasionally; 3 = fairly often; 4 = very often. Summary variables computed for the OHIP-14 were an overall severity score of OHRQoL impairment, calculated as the sum of all ordinal responses (range = 0 to 56), and an extent score, determined by the number of items with responses of fairly often or very often. The psychometric properties of the OHIP-14 are generally good.[22,31]

HRQOL was measured using the EQ-5D-5L, a generic health status questionnaire that consists of five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Using a 5-point ordinal scale (0 = no problems; 1 = slight problems; 2 = moderate problems; 3 = severe problems; and 4 = extreme problems), respondents were asked to select the level that best matched their health for each domain. For each patient, an overall health state valuation (EQ-Health) ranging from −0.285 for extreme problems in all domains to 1.000 for no problems in any domain was calculated according to a value set recently developed for England populations.[32] Patients also indicated their self-rated health on a 20-cm vertical visual analog scale (EQ-VAS) with worst (0) and best (100) health they could imagine as scale anchors.[33] The EQ-5D-5L has shown sufficient convergent validity to be used in patients with persistent orofacial pain.[34]

Pain and Pain-Related Function Questionnaires. Patients who reported experiencing orofacial pain at the time of consultation were asked to complete measures gauging pain experience and pain-related function.

The sensory, affective, and evaluative qualities of pain were measured using the Short-Form McGill Pain Questionnaire-2 (SF-MPQ-2), a 22-item revised version of the SF-MPQ that uses an 11-point numeric rating scale (NRS) on all items and includes symptoms relevant to neuropathic pain.[35] The overall score is the mean of all 22 items, and higher scores are indicative of more severe symptoms. Four subscales have been established based on pain descriptors: continuous, intermittent, neuropathic, and affective. Subscales are scored by calculating the means of the relevant items. There is support for the construct validity, convergent validity, and reliability of the SF-MPQ-2 across many chronic pain conditions.[35,36]

Patients' current pain level and their average and strongest pain over the last month were measured using the painDETECT 11-point NRS.[37] The quality and intensity of specific neuropathic symptoms—specifically burning, prickling, allodynia, attacks, thermal sensitivity, numbness, and pressure—were

gauged from the sensory descriptors of the painDETECT questionnaire (PD-Q). For each symptom, patients rated the perceived severity on a 6-point scale (0 = never; 1 = hardly noticed; 2 = slightly; 3 = moderately; 4 = strongly; 5 = very strongly).

The 10-item Pain Self-Efficacy Questionnaire (PSEQ) was used to assess the confidence that TN and PPTTN patients currently had in performing activities across different areas (eg, work, leisure, household chores) while experiencing pain.[38] Each item response is scored on a 7-point ordinal scale ranging from 0 (not at all confident) to 6 (completely confident). Total scores are determined by the sum of all item responses and can range from 0 to 60. Lower scores reflect a patient's strong focus on their pain, whereas higher scores suggest strong self-efficacy beliefs. The PSEQ has good test-retest reliability and internal consistency[39] and has been used in previous research with TNI patients.[3]

Across standardized measures, in cases where 10% or less of the items were missing, scores for missing items were imputed from the mean of the other scale items (if 10% or more was missing, the entire scale was considered missing). The only exception to this was for the SF-MPQ-2, where if there was one missing item within a subscale, SF-MPQ-2 subscale scores were computed as the mean of the answered items. A total score was only calculated in cases where not more than one item was missing on any subscale.

Statistical Analyses

Comparisons between PPTTN and TN patient subgroups for sociodemographic and clinical characteristics and pain-related, psychosocial, and HRQoL indicators were measured using *t* test, analysis of covariance (ANCOVA), and χ^2. In instances where continuous data distributions were clearly nonnormal, bootstrapping (bias-corrected and accelerated, based on 2,000 bootstrap samples) was employed to calculate 95% confidence intervals (CI) of mean differences and associated *P* values. For group comparisons of categorical variables that controlled for another variable, binary logistic regression was employed. To evaluate the association between HRQoL indicators and relevant variables, such as measures relating to pain, mood, and sociodemographic and clinical characteristics, Pearson correlation coefficients and Spearman rho were calculated according to the distributional properties of the data. Statistical significance was set at $P < .05$ with no adjustments for multiple comparisons given the descriptive nature of the study. All statistical analyses were completed with the Statistical Package for the Social Sciences, version 24.0 (SPSS, IBM).

Results

Overall, 200 patients with a diagnosis of TN or PPTTN attended the clinic during the study periods: 141 patients with PPTTN, 58 with TN, and 1 patient with both PPTTN and TN diagnoses. The latter was excluded from comparative analyses. Three more patients were excluded: 2 with TN secondary to other causes with known psychiatric morbidity (specifically, patients who had multiple sclerosis before the onset of their TN) and 1 patient with PPTTN linked to bruxism (bruxism is a parafunctional habit likely to induce painful TMJ dysfunction, but not identified as a possible etiology for PPTTN; so, to avoid any symptom overlap which could affect the final results, it was decided to exclude this case).

A total of 137/196 (69.9%) patients completed one or more questionnaires and were included in the analyses; 97/140 (69.3%) PPTTN patients and 40/56 (71.4%; $P = .768$) TN patients. There was a trend suggesting questionnaires were more likely to be completed by older patients (completers, mean ± standard deviation [SD] = 52.92 ± 14.57; noncompleters = 48.54 ± 14.61; $P = .056$), but questionnaire completion was not related to gender or clinical features of the condition, such as duration, trigeminal nerve division affected, number of divisions affected, side of face affected, or presence of headaches/migraines (for all comparisons between completers and noncompleters, $P > .14$).

The sociodemographic and clinical characteristics of the PPTTN and TN patients who completed the questionnaires are provided in Table 1. The majority (70% overall) were female. On average, the TN patients were more than 10 years older than patients with PPTTN. Chronicity of condition (time since onset > 6 months) was high in both patient groups, but duration was significantly longer for TN patients. PPTTN was most common in the mandibular division, while TN affected the maxillary and mandibular divisions with comparable frequency. PPTTN was predominantly localized in one division. In contrast, almost half of the TN patients had more than one division affected. Symptoms were lateralized approximately equally in both patient groups, although a small number of PPTTN patients were affected bilaterally. Almost a quarter of TN patients also suffered from headaches or migraines; this was marginally significantly higher than the rate in patients with PPTTN. TN patients were also more likely than PPTTN patients to have one or more comorbid medical conditions.

TN without persistent pain was diagnosed in 21 (52.5%) of the 40 patients; TN with persistent pain was diagnosed in 19 (47.5%) patients. No precipitant factor was reported in 32 (80%) TN cases. In the remaining cases, a range of events were recalled

Table 1 Demographic and Clinical Characteristics of PPTTN and TN Patients

Variable	PPTTN (n = 97)	TN (n = 40)	*P* value
Sociodemographic			
Gender, female	70 (72.2)	26 (65.0)	.405
Age, mean (SD)	49.4 (13.8)	61.3 (13.1)	**< .001**
Clinical characteristics			
Duration (mo), median (IQR)	13.0 (5.0–36.0)	34.0 (12.0–78.0)	**.039**
> 6 mo	61 (67.8)	31 (93.9)	**.002**
Division affected			
Ophthalmic (V1)	0 (0.0)	2 (5.0)	
Maxillary (V2)	23 (24.2)	9 (22.5)	
Mandibular (V3)	64 (67.4)	11 (27.5)	
Ophthalmic and maxillary (V1, V2)	1 (1.1)	4 (10.0)	
Maxillary and mandibular (V2, V3)	3 (3.2)	12 (30.0)	
Ophthalmic, maxillary, and mandibular (V1, V2, V3)	3 (3.2)	2 (5.0)	**< .001**
More than one division affected	8 (8.4)	18 (45.0)	**< .001**
Side affected			
Left	45 (46.9)	17 (42.5)	
Right	41 (42.7)	23 (57.5)	
Both	10 (10.4)	0 (0.0)	.061
Headaches or migraines	11 (11.3)	9 (23.1)	.080
Other bodily chronic pain	13 (13.4)	10 (25.0)	.099
Comorbid medical condition(s)a	25 (25.8)	18 (45.0)	**.027**

Data are reported as n (%) unless otherwise stated. Due to missing data on some variables, stated percentages and means refer to participants with data available for the variable in question. Significant differences between groups are highlighted in bold.
SD = standard deviation; IQR = interquartile range.
[a]Comorbid conditions included (but were not limited to) hypertension, diabetes, hypothyroidism, multiple sclerosis, epilepsy, hiatus hernia, cardiovascular disease, and/or malignancy.

by the patients as an initiator (eg, dental extraction, endodontic treatment, car accident); however, the symptoms, examination, and course of the disorder pointed clearly to TN rather than to PPTTN or any other orofacial condition. The etiology of PPTTN varied widely. PPTTN was sustained during third molar surgery for just under 30% of patients (29 [29.9%]), while in 4 patients, PPTTN was precipitated by extraction of another tooth. PPTTN emerged after repeated extractions or interventions in 16 (16.5%) patients, following implant placement in 11 (11.3%), and as a result of local anesthesia in 8 (8.2%). A variety of other causes were identified in 16 (28.6%) patients, including endodontic treatment (2), accidental injury (3), ear/nasal surgery (2), infection (1), and osteotomy (1). The cause was unknown or not recorded in 13 (13.4%) patients (Table 1).

Data from clinical assessment (qualitative testing) of sensory symptoms in PPTTN were available for 88 patients. Twenty-three (26.1%) presented with hypoesthesia alone; hypoesthesia was accompanied by paresthesia in two patients, by dysesthesia in one, by allodynia in two, and by a combination of one or more of these symptoms in six. Paresthesia alone was observed in 24 patients (27.3%), dysesthesia alone in 4 (4.5%), hyperalgesia alone in 3, and allodynia alone in 11 (12.5%). Paresthesia and dysesthesia were observed in two patients, paresthesia and allodynia in two, dysesthesia and hyperalgesia in one, dysesthesia and allodynia in two, and hyperalgesia and allodynia in two. Two patients had paresthesia, hyperalgesia, and allodynia, while another had paresthesia, dysesthesia, and allodynia.

Affective and Health Function

HRQoL and mood data for the PPTTN and TN samples are shown in Table 2. TN patients tended to score higher on the PHQ-9 than PPTTN patients, but these differences were not significant. More than half (15 [53.6%]) of patients with TN showed some signs of depression (PHQ-9 ≥ 5) compared to approximately one-third of PPTTN patients (33 [35.9%]; $P = .094$), while moderately severe/severe depression (PHQ-9 ≥ 15) was evident in one-fifth of TN patients (5 [17.9%]) and one-tenth of PPTTN patients (10 [10.9%]; $P = .328$). Anxiety levels were highly comparable between participant groups; GAD-7 scores indicated that almost 40% (15 [38.5%]) of TN patients and over one-third (33 [34.4%]; $P = .653$) of PPTTN patients experienced clinically significant levels of anxiety (GAD-7 ≥ 8) (Table 2).

PPTTN and TN had a marked but comparable effect on patients' OHRQoL. Mean severity scores on the OHIP-14 were higher than the 90th percentile value for the UK dentate population, which ranges from 10 to 17 across age groups and genders,[40] and significantly greater than those observed in a study of patients assessed 1 week after undergoing third molar surgery[41] (mean ± SD = 8.6 ± 7.2, $P < .001$).

Table 2 Affective Function and HRQoL in PPTTN and TN Patients

	PPTTN		TN		PPTTN vs TN	
Questionnaire	n	Mean (SD)	n	Mean (SD)	Mean difference (95% CI)	*P*
Mood						
PHQ-9 (0–27)	92	4.74 (6.54)	28	6.89 (6.76)	–2.15 (–5.17, 0.64)	.145
GAD-7 (0–21)	96	6.09 (5.95)	39	5.97 (5.65)	0.12 (–2.08, 2.32)	.915
HRQoL measures						
OHIP Severity (0–56)	97	28.57 (15.02)	38	27.61 (15.21)	0.96 (–4.82, 6.56)	.739
OHIP Extent (0–14)	97	5.92 (4.33)	38	5.87 (4.36)	0.49 (–1.49, 1.59)	.863
EQ-Health (–0.285 to 1.00)	97	0.6969 (0.2630)	39	0.5786 (0.2964)	0.1182 (0.0111, 0.2192)	.031
EQ-VAS (0–100)	97	69.78 (22.94)	39	64.00 (23.41)	5.78 (–2.53, 14.48)	.211

n values for questionnaires are variable due to a small number of patients not completing all measures.
P values were calculated using independent group t tests; signficant differences are highlighted in bold. SD = standard deviation; CI = confidence interval; PHQ-9 = Patient Health Questionnaire-9; GAD-7 = Generalized Anxiety Disorder-7; HRQoL = health-related quality of life; OHIP = Oral Health Impact Profile; EQ-Health = EQ-5D-5L health state evaluation; EQ-VAS = current overall health rating.

Table 3 Pain and Pain-Self Efficacy in PPTTN and TN Patients

	PPTTN		TN		PPTTN vs TN	
Questionnaire	n	Mean (SD)	n	Mean (SD)	Mean difference (95% CI)	*P*
PD-Q (0–10)						
Current pain	59	5.19 (2.71)	26	4.31 (3.16)	0.88 (–0.46, 2.31)	.222
Strongest pain	**59**	**7.22 (2.67)**	**26**	**8.50 (1.86)**	**–1.28 (–2.23, –0.25)**	**.016**
Average pain	59	6.03 (2.73)	26	7.04 (2.34)	–1.01 (–2.23, 0.22)	.107
SF-MPQ-2 (0–10)	59	3.18 (2.25)	19	3.89 (2.05)	–0.71 (–1.87, 0.45)	.228
PSEQ (0–60)	60	34.55 (15.28)	27	35.56 (15.76)	–1.01 (–8.12, 6.10)	.779

n values for questionnaires are variable due to a small number of patients not completing all measures. *P* values were calculated using independent group *t* tests; significant differences are highlighted in bold. SD = standard deviation; CI = confidence interval; PDQ = painDETECT Questionnaire; SF-MPQ-2 = Short Form McGill Pain Questionnaire-2; PSEQ = Pain Self-Efficacy Questionnaire.

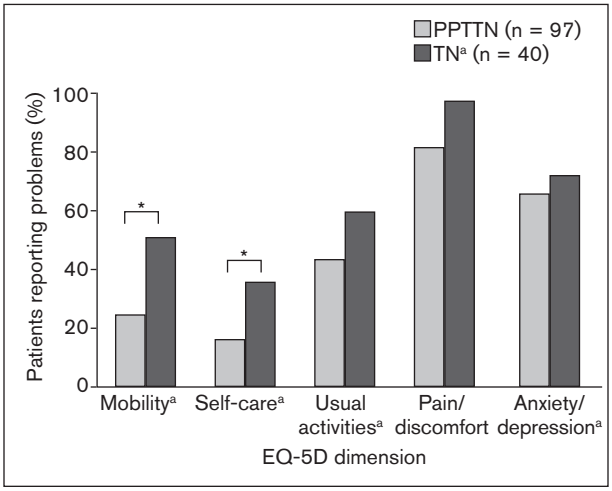

Fig 1 Percentage of PPTTN and TN patients reporting problems on dimensions of the EQ-5D-5L. [a]TN = 39 patients. *Indicates significant differences between groups after controlling for age (*P* < .05).

While the mean EQ-5D-5L health state valuation scores of both groups were less than EQ-5D-3L norms observed in age-matched healthy UK populations (which across 10-year cohorts from 25 to 75 years of age range from 0.93 to 0.78),[42] overall health was significantly poorer in patients with TN than PPTTN. However, the difference was only marginally significant after accounting for age and presence of comorbid medical conditions (*P* = .086), suggesting worse HRQoL in TN patients was partly attributable to their older age and greater likelihood of comorbid illness. Nevertheless, post hoc group comparisons focused on patients' EQ-5D-5L profiles (Fig 1) showed that after controlling for age and comorbid medical conditions, mobility (*P* = .032) and self-care (*P* = .027) were significantly worse in TN patients compared to PPTTN patients. Pain/discomfort and mood disturbances were the domains most affected in both groups (Fig 1).

Severity of Pain and Sensory Symptoms

The majority of PPTTN (64 [66.0%]) and TN patients (32 [80.0%]; *P* = .103) indicated they were affected by pain at the time of their consultation and completed pain-specific measures (Table 3). Unsurprisingly, overall, these patients reported worse HRQoL, as evidenced by elevated OHIP-14 scores (mean ± SD = 31.81 ± 14.57 for patients with pain vs 19.64 ± 12.52 for patients without pain, *P* < .001) and lower EQ-Health values (mean ± SD = 0.5806 ± 0.2629 for patients with pain vs 0.8537 ± 0.2081 for patients without pain, *P* < .001).

For those patients completing pain-specific measures, pain severity varied widely. There was a marked difference between diagnostic groups in

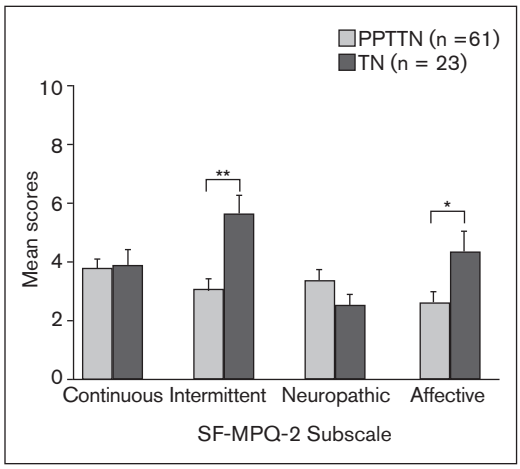

Fig 2 Mean scores on Short Form McGill Pain Questionnaire-2 (SF-MPQ-2) subscales. Error bars represent the standard error of the mean; n values for subscales are variable due to missing responses on some SF-MPQ-2 items. *P < .05; **P < .001.

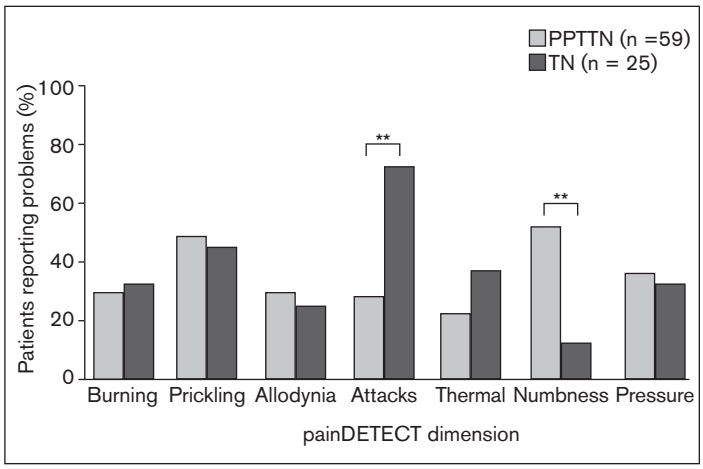

Fig 3 Percentage of PPTTN and TN patients indicating clinically relevant problems (ie, score > 3) on dimensions of neuropathic pain in the painDETECT Questionnaire; n values for dimensions are variable due to missing responses on some painDETECT items. **P < .001.

Table 4 Associations Between Health-Related Quality of Life (HRQoL), Pain Characteristics, and Affective Function in PPTTN and Trigeminal TN Patients

	PPTTN (n = 97)		TN (n = 40)	
Questionnaire	OHIP severity	EQ Health	OHIP severity	EQ Health
SF-MPQ-2				
Continuous	0.48**	−0.49**	0.03	0.05
Intermittent	0.52**	−0.47**	0.34	−0.61*
Neuropathic	0.67**	−0.20	0.39	0.03
Affective	0.44**	−0.43**	0.24	−0.09
PHQ-9	0.30**	−0.39**	0.22	−0.18
GAD-7	0.42**	−0.57**	0.45*	−0.33*
PSEQ	−0.45**	0.56**	−0.61**	0.44*

Values presented are Pearson r or Spearman ρ (according to distribution of correlated variables); n values for SF-MPQ-2 subscales are maximum of 61 for PPTTN and 23 for TN. SF-MPQ-2 = Short Form McGill Pain Questionnaire-2; PHQ-9 = Patient Health Questionnaire-9; GAD-7 = Generalized Anxiety Disorder-7; PSEQ = Pain Self-Efficacy Questionnaire; OHIP = Oral Health Impact Profile; EQ-Health = EQ-5D-5L health state evaluation. *P < .05. **P < .001.

4-week strongest pain intensity, with TN patients reporting pain at almost ceiling levels. Notably, almost three-quarters of TN patients (19 [73.1%]) reported pain that was, on average, severe (ie, ≥ 7[43]) compared to a little more than half of patients with PPTTN (33 [55.9%]; P = .135). Overall, severity of pain as measured by the SF-MPQ-2 was numerically (but not significantly) greater in TN than PPTTN patients; however, examination of the subscales revealed a marked, highly significant elevation in TN patients' intermittent and affective pain in contrast to the continuous and neuropathic pain domains, which were approximately equivalent between TN and PPTTN groups (Fig 2). Self-efficacy for coping with pain was moderate, with no difference according to orofacial condition (Table 3, Fig 2).

The frequencies of neuropathic sensory disturbances that were regarded as clinically relevant (ie, strongly or very strongly) for PPTTN and TN participants, gauged from the PD-Q, are shown in Fig 3. More than half of the patients with PPTTN reported clinically relevant numbness, a proportion that was significantly greater than that reported by TN patients. In contrast, electric shock attacks were a defining feature of TN patients' pain, with just under three-quarters of patients indicating clinically relevant levels compared to approximately 30% of PPTTN patients. Clinically relevant cold/hot pain was also more frequent in TN patients, but differences compared to PPTTN patients were not significant (P = .183) (Fig 3).

Relationships Between Pain Characteristics, Affective Function, and HRQoL in PPTTN and TN Groups

Table 4 shows correlations between generic and oral health–specific QoL indicators and between SF-MPQ-2 subscales and mood and pain

self-efficacy measures for each patient group. In the PPTTN group, across all pain measures (save neuropathic pain for EQ-Health) there were significant moderate associations with HRQoL. Both anxiety and self-efficacy were also moderately related to HRQoL. PHQ-9 scores were significantly correlated with HRQoL, but the magnitude of the association was smaller. In contrast, no pain measure was significantly correlated with TN patients' oral health, although neuropathic pain was marginally significant (P = .065), and only intermittent pain showed a strong relationship with TN patients' EQ-Health scores. However, both self-efficacy and anxiety were linked to TN patients' HRQoL. Notably, for both groups, age, gender, duration of condition, and presence of headaches/migraines or comorbid medical condition were not significantly related to either HRQoL score (for all associations, P > .10). Patients with bodily chronic pain (PPTTN mean ± SD = 0.5409 ± 0.2982; TN = 0.4441 ± 0.3522) showed worse EQ-Health scores than those without (PPTTN mean ± SD = 0.7210 ± 0.2504; TN = 0.6250 ± 0.2657), although the difference was only significant in the PPTTN group (P = .021) and not the TN group, in which small numbers likely precluded a significant effect (P = .145). TN patients with persistent pain had significantly poorer EQ-Health Scores (mean ± SD = 0.4692 ± 0.2751) than TN patients without persistent pain (mean ± SD = 0.6827 ± 0.2839; P = .028), but there was no difference in OHIP-14 totals (P = .279) (Table 4).

Discussion

To the present authors' knowledge, this is the first study directly comparing the neuropathic symptomatology and psychosocial impacts of TN and PPTTN using a comprehensive quantitative psychosocial assessment. While OHRQoL and psychologic function were comparable between the groups, the results showed more severe intermittent and affective pain and poorer general health in TN patients, which was partly attributable to the older age and higher prevalence of comorbid medical conditions. All aspects of pain were significantly associated with HRQoL in PPTTN patients only, while anxiety and pain-self efficacy were related to oral and general health in both groups.

Demographics and Clinical Characteristics

Women were overrepresented in both PPTTN and TN samples, concurring with several clinical studies and a recent review of population-based studies (in TN) that showed greater prevalence of women for both conditions.[11,18,19,44–46] The reason for the elevated risk of PPTTN and TN in women remains unclear, although it may be related to gender—ie, the differential manner in which the brains of women respond to the affective dimensions of pain,[47] which was elevated in TN patients in this study. Also, women are more likely to seek medical care in general and, more specifically, to seek advice regarding pain.[48] TN patients were significantly older than patients with PPTTN, consistent with the findings of previous comparative studies[18,23] and those across individual studies of these conditions.[11,19,45,46] While the incidence of TN is known to increase with age, peaking between 50 and 60 years,[11,44] the onset age for PPTTN varies more widely according to the cause of injury.[19]

The etiology of PPTTN in the present study varied widely, with the greatest percentage attributed to third molar surgery (30%). However, this represents a lower value than the percentage of PPTTN related to third molar surgery in previous studies.[3,19,48] When trigeminal nerve injuries do occur as a complication of dental/oral surgical procedures, they usually affect the lingual and/or inferior alveolar branches of the mandibular division and affect the left or right sides at equal rates.[46] In line with this, in the present study, PPTTN was most common in the mandibular division of the trigeminal nerve with approximately equal lateralization, although a small percentage had symptoms on both sides. In contrast and consistent with the somatologic relationships of sensory fibers in the trigeminal nerve and previous investigations of TN populations, TN affected both the maxillary and mandibular divisions with a predominance of right-sided symptoms.[11,45,46] Bilateral symptoms were not observed in any TN patients in the present study; bilateral TN appears to be rare except for cases in which TN is caused by multiple sclerosis.[18,49]

Almost half of the patients in the present TN sample had concomitant pain, a similar proportion to the Maarbjerg et al[45] cohort (49%) but considerably more than in the recent Zakrzewska et al[11] study. It is possible that the high rate of TN with concomitant persistent pain in this cohort relates to the referral process, as the clinic has specialist headache neurology input for the assessment and management of patients. Almost a quarter of TN patients also suffered from headaches or migraines; this was significantly higher than in patients with PPTTN, where it was uncommon. Headache disorders are frequently observed in TN; one recent study identified headache in a quarter of patients and migraines or migraines with tension-type headache in one-fifth.[11] Interestingly, Lin et al recently proposed migraine as a previously unidentified risk factor for TN, suggesting the presence of a linked underlying mechanism.[50] Comorbid medical conditions were also more frequent in TN patients, a likely consequence of their older age and

the association of TN with various systemic diseases, such as multiple sclerosis, hypertension, and cardiovascular disease.[51,52]

Pain Severity and Sensory Symptoms

Most TN and PPTTN patients experienced substantial pain. A minority of patients did not report (problematic) pain at the time of consultation, consistent with previous studies indicating that, at least for some patients presenting in specialist care clinics, TNI may be clinically reflected by a loss of function (anesthesia, hypoesthesia) without pain[3,19] and that frequently in TN, there are changes in sensory quality over the course of the disease.[11,53]

There was a tendency for TN patients to report higher levels of pain than patients with PPTTN, most obviously when considering strongest pain, which was at ceiling levels. A previous study comparing these patient groups also observed higher typical pain levels in TN.[18] TN is considered one of the most painful pain experiences that a patient can report, and still no universal treatment is available that can definitely and completely relieve this excruciating, unpredictable pain.[54] However, examination of patients' pain experiences using the SF-MPQ-2 revealed significantly elevated scores for TN patients (relative to PPTTN patients) on the intermittent and affective pain subscales only. Intermittent pain attacks are a cardinal sign of TN[4,15] and less common after TNI,[19] so the observed difference is not surprising, but the data also indicate that patients with TN may have greater pain-related affective distress than patients with PPTTN. Zakrzewska et al[11] observed that more than half of TN patients attending their clinic chose a word such as fearful, frightful, or terrifying to describe their pain, attributing high pain catastrophizing in this group to the unpredictability of the pain attacks. Interestingly, continuous pain scores were comparable between patient groups, reflecting inclusion in the study of a significant number of TN patients with concomitant persistent pain.

Clinically significant levels of neuropathic symptoms in TN and PPTTN patients were highly similar for burning, prickling, allodynia, and pressure (ranging from a quarter to half of patients across symptoms), reflecting the overlap in symptomatology of the two conditions. More than 50% of patients with PPTTN reported clinically relevant numbness—however, in contrast to just 11% of TN patients. This is consistent with the nature of TNIs, where patients predominantly suffer from neurosensory loss of function in the area supplied by the severed nerve in the form of hypoesthesia or anesthesia.[46,55,56] In contrast, electric shock attacks were the defining prominent feature of TN patients' neuropathic symptomatology, affecting almost three-quarters of patients, consistent with the known characteristics of TN.[6,18,23]

Affective and Health Function

In both TN and PPTTN, patients face limitations in their daily life activities in addition to the overwhelming chronic pain experience. This often leads to psychosocial distress and reduced QoL.[11,48,57] The present results provide further evidence of the close associations of chronic neuropathic orofacial pain with mood disturbance and poor oral and general health.

The burden of the orofacial pain condition on overall health was significantly more pronounced in patients with TN compared to PPTTN patients. These scores are consistent with those indicating poor quality of life in previous (separate) studies of PPTTN and TN populations using EQ-5D.[3,10] There are two likely explanations for the observed differences. First, the TN patients were older and as a group more likely to have a comorbid medical illness and experience bodily chronic pain, both of which can impair health—especially in the mobility and self-care domains, for which between-group differences were the most marked. Second, differences may be attributable to higher intermittent pain levels in the TN group. Intermittent pain was moderately associated with poor HRQoL in both groups and was the only pain dimension linked to HRQoL in the TN group. In a qualitative study, Allsop et al[15] found TN patients' QoL was specifically related to fear of pain recurring suddenly and the lack of psychologic support in addition to other management-related factors, such as delay in diagnosis and side effects of medications. Zakrzewska et al[11] have also emphasized the debilitating effects of fear associated with the unpredictability of intermittent pain in TN and the lack of confidence in dealing with these attacks and how it results in high pain-catastrophizing levels.

Despite more severe intermittent and affective pain in TN patients, PPTTN and TN patient groups evidenced comparably impaired OHRQoL. It is well established that altered sensation in the orofacial region as a result of TNI can interfere with a number of functions, including eating, drinking, kissing, make-up application, shaving, and tooth brushing, all of which affect patients' QoL.[19,46] One recent study found that enjoying social contact with other people, the ability to eat and enjoy food, and maintaining an emotional state without irritability were the most affected aspects of health function affected in a group of TNI patients.[58] Similar functional problems are also experienced by TN patients.[6,59] But, interestingly, whereas (in line with previous studies of patients with PPTTN) neuropathic pain severity showed a moderate-to-strong relationship with oral health,[3] no aspect of pain was reliably linked to OHRQoL in TN patients, suggesting that the extent of functional impairment for activities that involve the face are not necessarily related to the frequency or intensity of TN pain attacks.

The disability experienced by PPTTN and TN patients is consistent with the high levels of anxiety and depression evidenced by both groups. Observed levels of anxiety and depression were in line with those shown in other (separate) studies of patients with PPTTN and TN,[3,11,60] indicating mood disturbances, particularly anxiety disorders, are prevalent in these conditions. TN patients may be at greater risk of depression than patients with PPTTN, which is broadly consistent with the elevated levels of affective pain distress observed in this group as well as with studies showing a close relationship between pain severity and depression in patients with neuropathic orofacial pain.[3,12]

The findings of affective and psychologic dysfunction in both patient groups, which were severe in 15% to 20% of cases, call for the routine use of holistic, multidisciplinary approaches for pain management in PPTTN and TN patients.[11,61] Significantly, anxiety and pain self-efficacy were reliably associated with oral and general health in both groups. In TN patients, psychologic function was more closely related to oral health status than any measure of pain and only intermittent pain was better correlated with general health, indicating that mental health status of these patients is closely linked to pain-related disability. Galli et al[62] found that after controlling for pain severity, beliefs about illness—particularly that pain could have serious consequences on one's life and low personal control—negatively impacted treatment outcomes in a group of patients with orofacial pain that included individuals with TN. In patients with temporomandibular muscle and joint disorders, worries about both pain and depression have been shown to contribute to the progression of chronic pain disability.[21] More generally, neural markers for fear and anxiety, which exacerbate chronic pain, have been identified.[63] As such, psychologic-based interventions (eg, cognitive behavioral therapy) that target psychosocial components in patients with TN and PPTTN, such as pain-related anxiety, illness beliefs, and affective dimensions of orofacial pain, may usefully complement aspects of treatment concerning medication management and rehabilitation.[11,61]

Study Limitations

This study was cross-sectional and, as such, pain severity and psychosocial constructs were assessed at a single time point, which does not allow specification of the nature of identified relationships between pain, psychosocial factors, and QoL. Further, the psychologic and health status of patients prior to nerve injury or onset of TN is unclear. A recent retrospective study of patients with orofacial neuropathic pain found a history of chronic stress and psychologic/psychiatric illness in 37% of cases,[64] suggesting a high rate of psychologic dysfunction prior to onset of orofacial pain. Additionally, the study involved a population of patients who attended a specialist national clinic and that may not be representative of the wider population of patients with PPTTN and TN (who may not be as severely affected). Also, not all patients attending the clinic completed measures. However, this was not related to orofacial condition or clinical profile, suggesting the samples were representative of referred patients. The sample size of TN patients was relatively small compared to the PPTTN sample and heterogenous, which may have contributed to the inability to detect statistically significant effects on some outcomes, precluded multivariate analysis of factors associated with oral and general HRQoL (identified from bivariate analyses), and did not readily allow comparisons of important subgroups. Additionally, as previously noted, TN patients were older and more often had a comorbid medical illness than patients with PPTTN, complicating comparisons of affective and health function. Finally, there was no correction for multiple group comparisons, raising the risk of Type I errors.

Conclusions

Both TN and PPTTN were associated with a significant psychosocial burden and reduced QoL. Oral health was affected equally in TN and PPTTN, reflecting the loss of function for activities that involve the face associated with both conditions, but TN had a more marked impact on overall health in comparison to PPTTN. Neuropathic pain intensity was higher in TN than PPTTN, notably for aspects closely related to the pain attacks that characterize the former, such as strongest pain endured and intermittent and affective pain dimensions. TN patients also appear to be at greater risk of depression, although clinically significant anxiety was comparably high in both groups. The substantial burden of illness observed here in addition to the close associations of anxiety and pain self-efficacy with oral and general HRQoL in both groups suggest a need for psychologic support to be integrated into the management programs of both conditions to help patients cope better with their chronic disorder and improve efficacy of treatment.

Acknowledgments

The first author would like to thank the British council and the Egyptian Science and Technology Development Fund (STDF) for financially supporting her with a 6-month postdoctoral research fellowship in orofacial pain at King's College London, Dental Institute through the "Newton - Mosharafa" joint programme (Grant number 26226 [EGY/UK]). The authors state no conflicts of interest.

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