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Article

Assessment of the painDETECT questionnaire as a tool for screening and treatment evaluation in trigeminal neuralgia

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ABSTRACT:

Introduction: Although trigeminal neuralgia (TN) is diagnosed clinically and most cases can be easily identified, misdiagnoses are frequent and lead to delayed treatment. Therefore, we evaluated the painDETECT questionnaire, an established tool for detecting neuropathic pain components, as a screening tool in TN.

Methods: We conducted a retrospective chart review of all patients who had presented to our neurosurgical outpatient department complaining of craniofacial pain between January 2019 and August 2021. The patients were categorized as likely having TN (TN group) or likely having pain of a different etiology (non-TN). Patients with other neuropathic facial pain syndromes or those in whom TN could not be diagnosed nor ruled out with sufficient confidence were excluded. The painDETECT scores were compared, along with other outcome parameters.

Results: We identified 52 patients with craniofacial pain. After exclusion of 14 patients, 25 patients were included in the TN group and 13 in the non-TN group. The mean painDETECT score was 17.0±4.7 and 12.7±6.1, respectively (p=0.02). The positive predictive value for TN at a cutoff value of 19 points was 80%, the negative predictive value was 39%. In patients who underwent surgery, the correlation between the postoperative painDETECT score and the postoperative numeric rating scale score was 0.73 (p=0.01).

Discussion: The painDETECT questionnaire is of limited use as a screening tool for possible TN. It can be utilized to track treatment outcomes if data collection beyond daily clinical use is desired.

Keywords: trigeminal neuralgia; facial pain; painDETECT questionnaire; neuropathic pain

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Introduction

Trigeminal neuralgia (TN) is a neuropathic pain syndrome characterized by short, extremely painful paroxysms in the facial area (Cruccu et al., 2020). Its features are well described, and the diagnosis is established based on patient history and clinical examination. The International Classification of Headache disorders 3rd Edition (ICHD-3) specifies the purely paroxysmal pain in TN as "lasting from a fraction of a second to 2 minutes", being of "severe intensity" and of "electric shock-like, shooting, stabbing or sharp in quality"; furthermore being "precipitated by innocuous stimuli within the affected trigeminal distribution" ("Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd Edition," 2018). Although the diagnostic criteria are clearly defined and allow for a confident diagnosis of TN in most patients, misdiagnoses are frequent. In a study by Antonaci et al., only 17.6% of all TN patients received a correct diagnosis after their first consultation with a physician. By comparison, 18.6% of the patients claimed to have self-diagnosed their condition, most often after conducting internet research (Antonaci et al., 2020). It, therefore, appears as though better education of physicians about facial pain syndromes is warranted, possibly with the help of screening tools.

The painDETECT questionnaire was originally developed to help detect neuropathic pain components in patients with back pain (Freynhagen et al., 2006). It is a patient-based test in which attributes typical of neuropathic pain (burning pain, tingling sensations, pain to light touch, numbness, or pain triggered by slight pressure) are rated as Likert items (never, hardly noticed, slightly, moderately, strongly, very strongly). Furthermore, pain patterns (persistent pain with slight fluctuations, persistent pain with pain attacks, pain without pain between them, pain attacks with pain between them), as well as the presence of radiating pains are taken into account to result in a final score between 0 and 38. With a score from 0 to 12, a neuropathic pain component is regarded as unlikely, while a score of 19 or above is indicative of a neuropathic component being likely. With a score of 13-18, the result is ambiguous.

Although initially meant to be used with back pain, the painDETECT questionnaire has been used in various pain syndromes such as post-thoracotomy pain, painful diabetic neuropathy, and postherpetic neuralgia, osteoarthritis, fibromyalgia, and others (Baron et al., 2009; Freynhagen et al., 2016; Gwilym et al., 2009; Rehm et al., 2010; Steegers et al., 2008). However, little research has been conducted to evaluate the painDETECT questionnaire in patients with trigeminal neuralgia. Therefore, we posed the question of whether, in patients with TN, the mean painDETECT score is different from the score in patients with non-neuropathic facial pain syndromes. Secondarily, we evaluated whether the painDETECT questionnaire helps evaluate treatment success by comparing its results after successful therapy of TN with the baseline score and with other parameters.

Materials and Methods

From January 2019 on, all patients presenting to the pain clinic of the neurosurgical outpatient department completed several questionnaires, including the painDETECT questionnaire.

We collected data both at the first presentation and subsequent consultations. The patients filled out the questionnaire before they consulted with the physician. After the consultation, a diagnosis was established and treatment proposed. Patients not suited for neurosurgical intervention were frequently referred to the university pain center.

If within one Likert item the patient marked two levels, we counted the higher one. If an item was not marked, we tried to impute the missing values by information obtained through anamnesis. If missing information could not be substituted, the patient was excluded.

The study was approved by the institutional review board (BO-EK-316062021). All patients who had presented with craniofacial pain from 05 January 2019 to 11 August 2021 were included in a retrospective chart review. The diagnoses were verified by a neurosurgeon and pain specialist (JK) according to the ICHD-3. The patients were split into two groups: those in whom TN was deemed certain or very likely and those in whom TN was excluded or deemed very unlikely. Patients in whom TN could neither be confirmed nor excluded with sufficient confidence were excluded. This was the case if, for example, intermittent facial pain could not be triggered by innocuous stimuli or if it was associated with substantial allodynia. Likewise, we excluded patients with other neuropathic facial pain syndromes as the painDETECT questionnaire cannot distinguish between neuropathic pain due to neuralgia and neuropathic pain due to neuropathy, and the study aimed to evaluate it as a screening tool for trigeminal neuralgia, not as an instrument to make a definite diagnosis.

Patients who had received neurosurgical treatment were evaluated during follow-up consultations. Patients in whom data were missing were excluded.

Homoscedasticity was evaluated with Levene's test, normal distribution with the Shapiro-Wilk test. Continuous independent data were compared using

Student's t-test. For paired samples, the repeated measures t-test was used. Where normal distribution could not be assumed, the Mann-Whitney U test was used instead of the independent t-test and the Wilcoxon signed-rank test instead of the repeated measures t-test. Categorical data were compared with Fisher's exact test. Correlation was assessed with Spearman's rank correlation. Lastly, logistic regression analysis was performed along with a confusion matrix and receiver operating characteristic (ROC) curve. Statistical calculations were performed in JASP 0.16.3.

Results

From January 2019 to August 2021, we identified 52 patients with craniofacial pain who presented to our outpatient department. Fourteen patients were excluded: four due to insufficient baseline data, five due to other neuropathic pain syndromes (three trigeminal neuropathy, one occipital neuralgia), four because a TN could neither be confirmed nor excluded with adequate certainty, and one because they had no pain at presentation. The remaining 38 patients constituted the two study groups. Twenty-five patients were included in the TN group (19 classical TN, six TN attributed to multiple sclerosis plaque) and 13 patients in the non-TN group (seven persistent idiopathic facial pain, two otogenic pain, one nummular headache, one cluster headache, one tension-type headache, one psychogenic pain). Figure 1 provides a flowchart of patient inclusion.

Normal distribution and homoscedasticity were confirmed for all continuous variables except the numeric rating scale (NRS) scores and the duration of pain, which were not normally distributed. The mean age in the TN group was 68.4±11.4 years and in the non-TN group 51.4±16 years ($p<0.001$). The TN group consisted of 13 male and 12 female patients, while 11 of 13 patients in the non-TN group were female ($p=0.039$).

The mean painDETECT score was 17.0±4.7 in the TN group and 12.7±6.1 in the non-TN group ($p=0.02$), while the mean worst reported pain during the four weeks before the consultation was 9.0±1.2 on the NRS in the TN group and 8.1±1.6 in the non-TN group ($p=0.049$), respectively. The positive predictive value for TN at a cutoff value of 19 points was 80%, the negative predictive value was 39%. The pain was present on the right side of the face only in 17 of 25 patients in the TN group and 7 of 13 patients in the

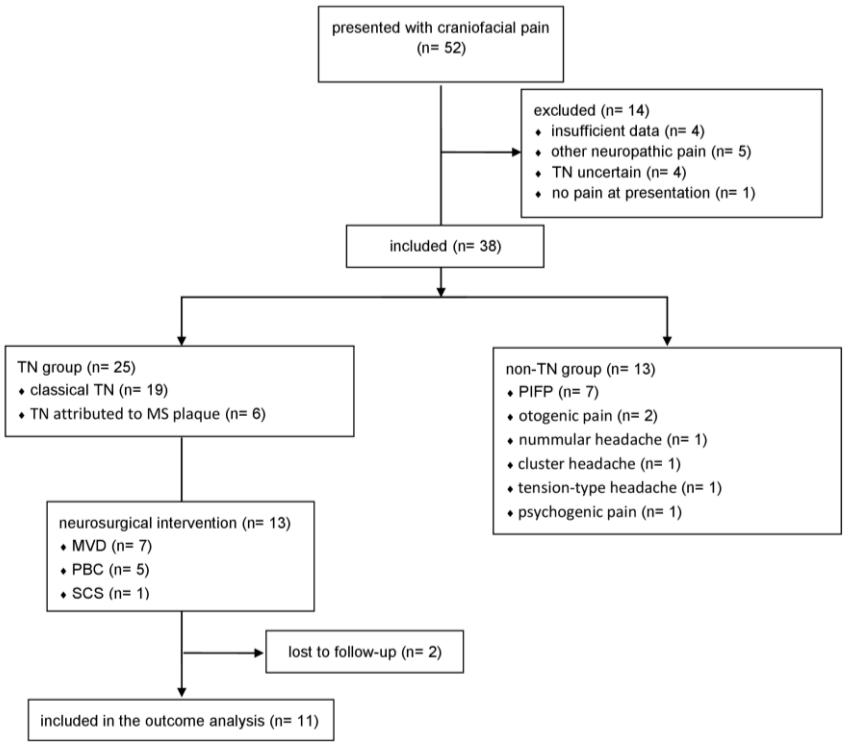

Figure 1. Flowchart of patient inclusion

non-TN group (p=0.49). For a complete account of demographic data, see Table 1.

	TN	non-TN	p
n	25	13	
age (years; mean±SD)	68.4±11.4	51.4±16.0	<0.001
male : female	13 : 12	2 : 11	0.039
lateralization of pain -right : left : bilateral	17 : 7 : 1	7 : 6 : 0	
pain duration (years, mean±SD)	7.3±6.3	7.0±6.9	0.86
painDETECT score (mean±SD)	17.0±4.7	12.7±6.1	0.02
max. NRS (mean±SD)	9.0±1.2	8.1±1.6	0.049

Table 1. Demographic data of patients included in the study. SD: standard deviation; NRS: numeric rating scale; TN: trigeminal neuralgia

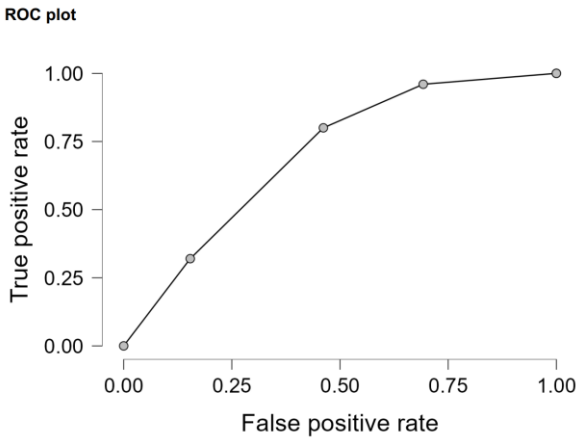

Figure 2. Receiver operating characteristic (ROC) plot. The ROC plot for the painDETECT score predicting trigeminal neuropathic pain shows a flat slope before reaching 1,1. This indicates a relatively high false positive rate, corresponding to the calculated specificity of 0.46. The resulting area under the curve is 0.71.

Logistic regression analysis with the initial painDETECT score as the sole covariate resulted in the painDETECT score being significantly associated with the TN group (p=0.02). In the performance diagnostics, the sensitivity was 0.96, and the specificity was 0.46. The area under the curve (AUC) in the ROC analysis was 0.71 at a cut-off value of 0.5. Figure 2 shows the ROC curve. The corresponding confusion matrix is shown in Table 2.

	Predicted non-TN	Predicted TN	% correct
Observed non-TN	6	7	46.15
Observed TN	1	24	96.0
Overall % correct			78.95

Table 2. The table shows the confusion matrix for the logistic regression analysis. The cut-off value was set to 0.5. TN: trigeminal neuralgia

13 patients of the TN group underwent neurosurgical intervention (seven microvascular decompressions, five percutaneous balloon compressions, one cervical spinal cord stimulation). Follow-up data were available for 11 patients at a mean follow-up time of 6.1±7.3 months. The mean worst reported pain during four weeks was 0.18±0.4 on the NRS, while the mean painDETECT score was 3.3±5.0 (p=0.003 and p<0.001 compared with the respective baseline values). The correlation between preoperative NRS and preoperative painDETECT score was 0.14 (p=0.69) in patients who underwent surgery, while the correlation between the postoperative values was 0.73 (p=0.01). Figure 3 shows heatmaps of the Likert items of the painDETECT questionnaire for both groups.

Discussion

We performed an analysis of the painDETECT score as a screening tool for trigeminal neuralgia by comparing its results between TN patients and patients with other (non-neuropathic) craniofacial pain syndromes. Furthermore, we evaluated the score as a follow-up tool by comparing its results before and after neurosurgical intervention and correlating it to the NRS scores.

While we did detect a statistically significant difference between the painDETECT scores of both groups, the difference was not big from a clinical perspective.

TN

	never	hardly noticed	slightly	moderately	strongly	very strongly
burning	12	3	3	2	3	2
tingling/prickling	8	7	2	4	4	0
light touch painful	3	3	0	9	5	5
electric shock-like	0	1	0	2	7	15
cold/heat painful	8	4	6	2	4	1
numbness	17	5	0	2	1	0
slight pressure painful	1	5	0	7	6	6

non-TN

	never	hardly noticed	slightly	moderately	strongly	very strongly
burning	5	1	3	1	3	0
tingling/prickling	5	3	1	3	1	0
light touch painful	7	2	1	1	2	0
electric shock-like	2	2	1	3	3	2
cold/heat painful	5	1	3	2	2	0
numbness	7	1	3	1	1	0
slight pressure painful	4	2	1	5	0	1

Figure 3. The heatmap shows a color coding of the number of patients in each group that marked the individual responses. The coding ranges from white (zero patients) to dark (highest number of patients). Note the high number of patients in the TN group who considered the electric shock-like quality of their pain strong or very strong, as opposed to the patients in the non-TN group.

The non-TN group averaged a score of 12.7, which borders on the uncertain region of the score interpretation since a result between 13 and 18 points signifies ambiguity with a neuropathic pain component possibly present. On the other hand, the TN group had a mean score of 17.0, which, too, falls into the same range. Only eight of 25 TN patients had a score of ≥19, which would mean a neuropathic pain component being likely. While the positive predictive value for TN at the questionnaire's cutoff value of 19 points is 80%, the negative predictive value is only 39%. But even these numbers need to be interpreted with caution as other neuropathic pain syndromes were excluded.

Likewise, upon logistic regression and the corresponding ROC analysis the sensitivity for the detection of TN was 0.96 at a cut-off value of 0.5 (corresponding to 19 points), whereas the specificity was only 0.46. This is confirmed by the ROC curve (fig. 2): the plot has a shallow slope indicating a high false positive rate. The AUC, at 0.71, is at the lower end of the acceptable range.

It does seem surprising that a score designed to detect neuropathic pain components fails to do so reliably in a purely neuropathic pain syndrome. To better understand the pattern of the patients' responses to the Likert items of the questionnaire, we calculated the individual responses and created heatmaps for both groups separately (Fig. 2). Notably, in TN patients, there was a clear dominance in the reporting of electric shock-like paroxysms, with 22 of 25 patients (88%) experiencing them strongly or very strongly, while this was the case in only 5 of 13 patients (38%) in the non-TN group. Within the painDETECT questionnaire, this is the most useful item to differentiate TN from other craniofacial pain syndromes. Then, the validity of the remaining questionnaire may be questioned for the detection of TN.

Zakrzewska et al. evaluated the painDETECT questionnaire in patients with various neuropathic orofacial pain syndromes and reported a median score of 17, while the control group with non-neuropathic pain syndromes had a median score of 11. The authors performed a ROC curve analysis to calculate the questionnaire's accuracy for detecting neuropathic pain components, which resulted in only modest sensitivities, specificities, positive and negative predictive values (Jafree et al., 2018). Elias et al. studied whether the painDETECT questionnaire is suitable as a screening tool in patients with painful post-traumatic trigeminal neuropathy, and concluded that it is not (Elias et al., 2014). Our observations are in line with these results, suggesting that the painDETECT questionnaire may not be as suited for neuropathic facial pain syndromes as it is for other conditions. Likewise, the modified self-reported Leeds Assessment of Neuropathic Symptoms and Signs (S-LANSS), which was developed to detect pain of predominantly neuropathic origin, comparable to the painDETECT questionnaire, failed to show adequate accuracy in the detection of orofacial pain with neuropathic characteristics (Herrero Babiloni et al., 2017).

We calculated the correlation between the painDETECT score and the maximum NRS the patients reported during pain attacks. While, at baseline, no significant correlation could be detected, the postoperative results suggest a strong positive correlation (ϱ=0.73). The painDETECT questionnaire, therefore, can be used to track and quantify the symptom changes induced by the treatment of TN, which may be useful for larger outcome analyses. However, for daily clinical use, it provides little additional information compared to the NRS.

Although the typical clinical characteristics allow for easy diagnosis of TN in most cases, misdiagnoses are frequent. Most patients initially consult their general practitioner or dentist when first experiencing facial pain (Antonaci et al., 2020), so these healthcare providers must be acquainted with TN symptoms. As, however, the rate of misdiagnoses upon first consultation was 42% in the study by Antonaci et al., there is room for improvement (Antonaci et al., 2020). Perhaps a well-designed screening questionnaire could raise suspicion towards TN and shorten the time to initiation of effective treatment. Such attempts have been made for atypical odontalgia and persistent dentoalveolar pain disorder (Durham et al., 2019). No validated screening tools exist for TN, whereas Panczykowski et al. defined a grading system to predict the outcome of microvascular decompression. They found that classical TN type, positive response to carbamazepine and/or oxcarbazepine, and the presence of neurovascular compression demonstrated on MRI were predictive of long-term treatment success (Ishaque et al., 2022; Panczykowski et al., 2020).

Our study has limitations. The patient cohort is relatively small; however, the power is adequate as multiple results are statistically significant and comparable to the existing literature on neuropathic facial pain syndromes. The patient population may differ from the patients that general practitioners commonly encounter because we recruited them from a neurosurgical outpatient department. Consequently, many (albeit not all) of our patients were already refractory to conservative treatment, some had had interventional or surgical treatment before, and overall, the degree of chronification may have been higher than in other cohorts. Furthermore, excluding patients with other neuropathic facial pain syndromes may constitute a bias. However, including them in the non-TN group would have led to even smaller differences from the TN group. As stated above, the study's goal was to evaluate the painDETECT questionnaire as a screening tool for possible TN, not as a means to establish a definite diagnosis.

Conclusions

The painDETECT questionnaire is of limited use as a screening tool for possible TN. It can be utilized to track treatment outcomes if data collection beyond daily clinical use is desired.

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Conflicts of Interest: The authors declare no conflict of interest.

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