





# Questionnaire for Dental Practitioners to Screen for Trigeminal Neuralgia

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Asian J Neurosurg 2023;18:528–532.

## Abstract

**Objective** Trigeminal neuralgia (TN) is a neurological disorder that often presents as severe toothache. The majority of TN patients visit dental clinics first, so TN represents a potential pitfall for dental practitioners. This report describes the development of a trigeminal neuralgia questionnaire (TNQ), assessing 10 characteristics of TN, to assist dentists in screening for TN in dental clinics, and evaluates the effectiveness of TNQ.

**Materials and Methods** Fifty-three patients who visited the TN outpatient department in our institute and completed the TNQ were included in this study. All patients were examined by two neurosurgeons and neuroimaging was performed.

**Statistical Analysis** Patients were classified into a TN group and a non-TN group. TNQ score was retrospectively compared between groups. Furthermore, history and characteristics of TN were investigated in the TN group to clarify the status of the reference situation.

**Results** Thirty-seven cases were assigned to the TN group, and 16 cases to the non-TN group. Mean TNQ score was 8.3 in the TN group and 6.6 in the non-TN group. Setting a TNQ cutoff score of 7 offered 91% sensitivity and 56% specificity for TN. Investigation of the history of the present illness indicated that 39.2% of TN cases were improperly triaged and referred from initial dental clinics, and interdisciplinary practice was insufficient.

**Conclusion** TNQ offers a reliable, convenient method to triage TN patients, and may assist dentists in screening for TN. Multidisciplinary practice is necessary for total management of TN and the TNQ is expected to connect dentists and TN specialists.

## Keywords

- ▶ dentist
- ▶ endoscopy
- ▶ microvascular decompression
- ▶ screening test
- ▶ trigeminal neuralgia

## Introduction

Trigeminal neuralgia (TN) is a neurological disorder often appearing as unilateral sharp and severe orofacial pain.

Attacks can be triggered by any kind of movement or touch, and the severe pain causes serious health problems and deterioration of quality of life.<sup>1</sup> Classical TN is attributed to vascular compression of the trigeminal nerve. Treatment

article published online  
September 22, 2023

DOI <https://doi.org/10.1055/s-0043-1771368>.  
ISSN 2248-9614.

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options include pharmacotherapy, trigeminal nerve blocks, stereotactic radiosurgery, and surgical intervention (mainly by microvascular decompression), and microvascular decompression appears to provide the longest pain-free intervals.<sup>2</sup> Moreover, endoscopic microvascular decompression is reported as a state-of-the-art minimally invasive surgery, offering superior surgical results compared with classical microscopic microvascular decompression.<sup>3-5</sup>

TN patients often visit dental practitioners first complaining of tooth pain and are subsequently treated for issues relating to teeth or surrounding tissue,<sup>1</sup> so TN represents a potential pitfall in the daily practice of dentists. Although unnecessary dental treatments relating to TN have been reported,<sup>6-8</sup> concrete methods to reduce such problems have not been advocated.

The Trigeminal Neuralgia Questionnaire (TNQ) was developed to assist dentists achieve early detection of TN. Because no single symptom or test can lead to the diagnosis of TN, clarifying the nature of the pain is key to screening and diagnosis. The TNQ is designed to contain the characteristics of TN and to triage possible cases of TN. In this study, the screening ability of TNQ is evaluated and potential methods to achieve early detection of TN in dental clinics are discussed from a neurosurgical perspective.

## Materials and Methods

### The TNQ

The TNQ comprises 10 question items related to the characteristics of TN, as shown in ►Table 1. The total number of “yes” responses is then counted as the TNQ score, ranging from 0 to 10.

### Subjects

Sixty-one patients visited our TN outpatient department complaining of orofacial pain and requiring diagnosis and/or treatment from June 2021 to November 2021. Of these, 53 cases completed the TNQ at the first visit to our

neurosurgical department and a TNQ score was obtained. These 53 responders were included in this study. All cases were examined by two neurosurgeons, and magnetic resonance imaging (MRI) of the head, contrast-enhanced computed tomography (CT) of the head, and CT angiography of the head, face and neck were performed. Furthermore, three-dimensional fusion imaging was created from Digital Imaging and Communication in Medicine (DICOM)-formatted data using image analysis software (Ziostation 2; ZIOSOFT, Tokyo, Japan) to assess whether vascular compression of the trigeminal nerve was present. Finally, the cause of orofacial pain was diagnosed. Depending on the diagnosis, cases were classified into a TN group and a non-TN group. All procedures performed in this study involving human participants were in conducted accordance with the latest version of the Declaration of Helsinki. Informed consent was obtained from all individual participants included in the study.

### Data Analysis of TN

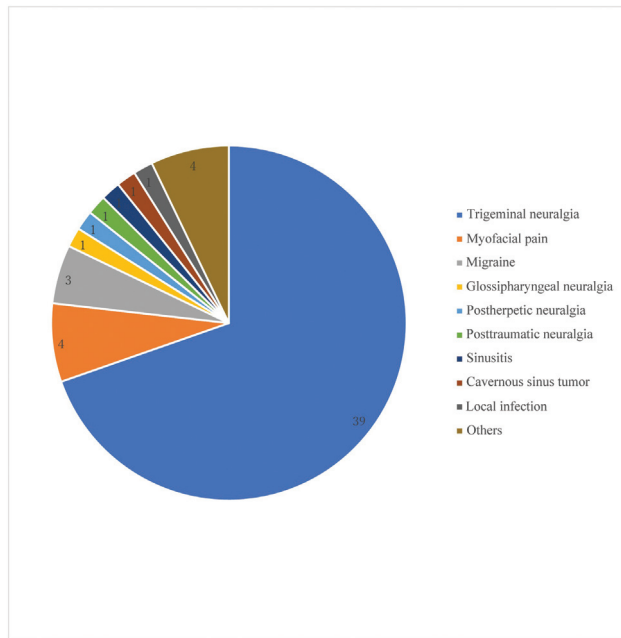
TNQ scores in the two groups were analyzed to assess the screening ability of the questionnaire for TN. Furthermore, in the TN group, whether the patient had visited a dentist as the first medical facility, process to reach the diagnosis of TN, and requirement of surgical treatment were investigated. Endoscopic microvascular decompression was performed as surgical treatment, and Barrow Neurological Institute (BNI) pain intensity criteria were used to evaluate pain intensity before and after the operation. Satisfactory pain relief was defined as BNI I–III.

## Results

Mean age for the 53 cases was 58.3 years (range: 9–88 years) and male/female ratio was 1:1.7. Diagnoses for the 53 cases are listed in ►Fig. 1. Of the cases, 69.8% (37/53) were categorized to the TN group and 30.2% (16/53) were assigned to the non-TN group. Mean affected period in the TN group was 5.1 years (range: 3 months to 25 years). Diagnoses in the

**Table 1** The trigeminal neuralgia questionnaire (TNQ)

[Q1] Are you 40 years old or more? (Yes / No)
[Q2] Are you female? (Yes / No)
[Q3] Have you had the pain for 1 month or more? (Yes / No)
[Q4] Is the pain unilateral? (Yes / No)
[Q5] Is the pain severe (electric shock-like or stabbing)? (Yes / No)
[Q6] Is the pain brief (from a few seconds to minutes) and recurrent? (Yes / No)
[Q7] Is the pain absent during sleep? (Yes / No)
[Q8] Is the pain triggered by specific motions? (e.g., washing your face, applying make-up, shaving, eating, conversation, brushing teeth)? (Yes / No)
[Q9] Is the pain triggered by touching your face? (Yes / No)
[Q10] Is the pain unresponsiveness to medication? (Yes / No)
The total number of “yes” responses is counted as the TNQ score
<b>TNQ score</b>



**Fig. 1** Diagnoses for 53 cases in our trigeminal neuralgia (TN) outpatient department.

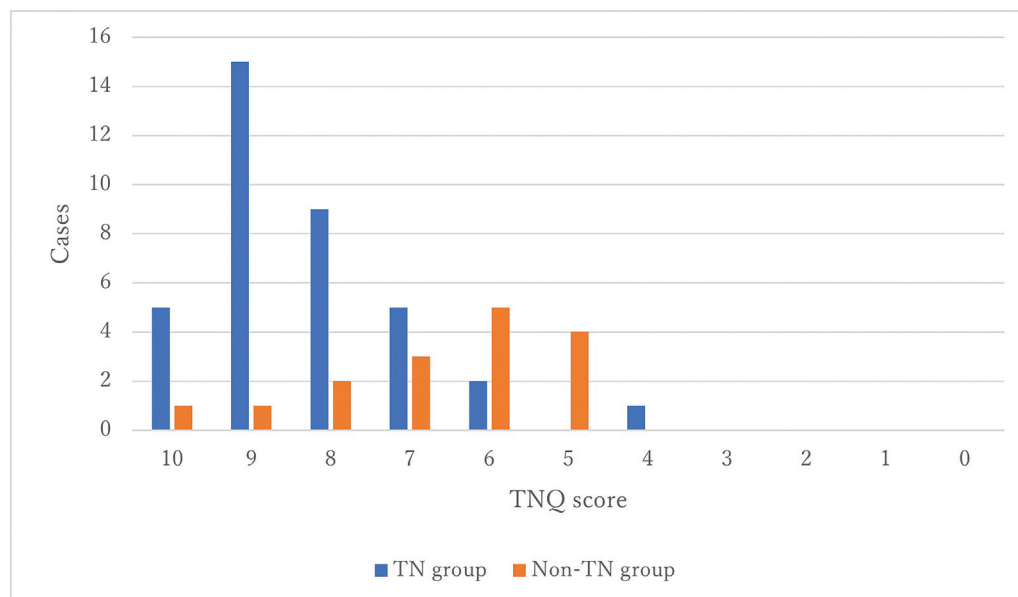
non-TN group included myofascial pain in four cases, migraine in three cases, glossopharyngeal neuralgia in one case, postherpetic neuralgia in one case, posttraumatic neuralgia in one case, sinusitis in one case, cavernous sinus tumor in one case, local infection in one case, and others in four cases.

In the TN group, 75.7% of patients (28/37) visited dental clinics first. Six of the nine patients who did not visit a dentist first reported pain in the territory involving the first division of the trigeminal nerve. Most patients (28/31, 90.3%) who only experienced pain in the territory of the second and/or third division of the trigeminal nerve had visited dental clinics first.

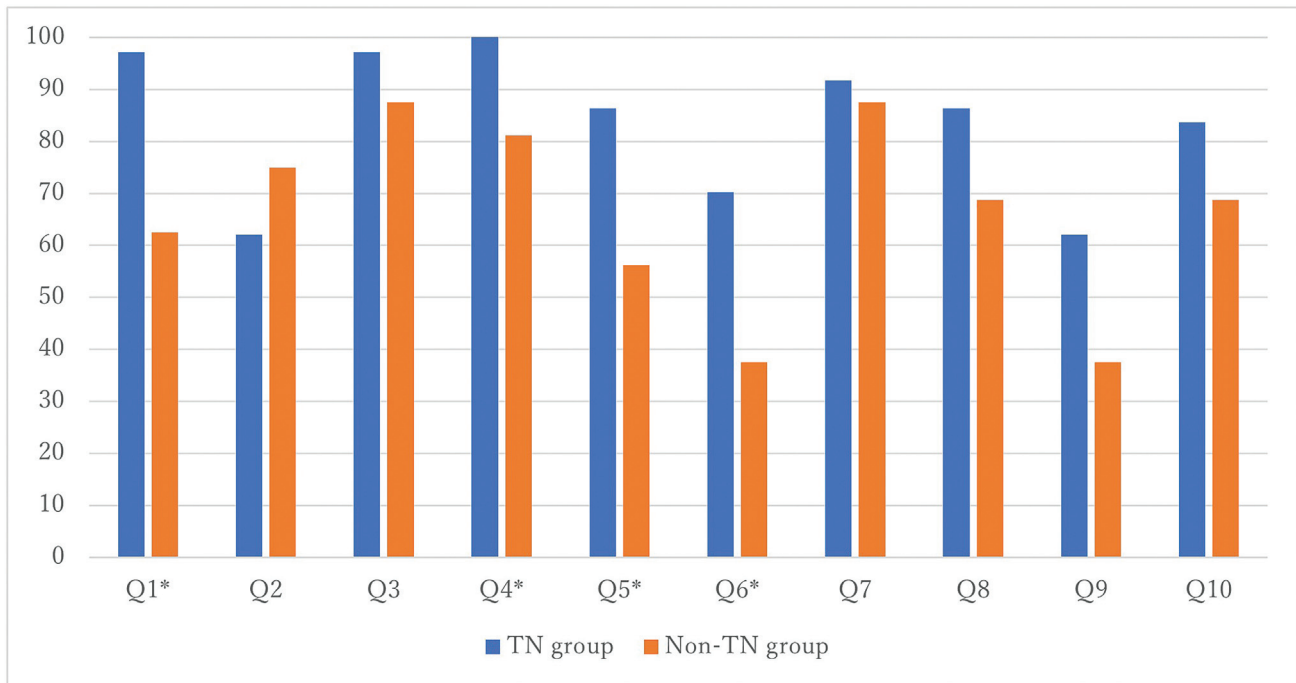
In the 28 patients who had visited dental clinics first, TN was suspected in 11 cases by the primary dentist, but whether any dental procedures had been performed before suspicion of TN in this series was not investigated. Also, in the 28 patients who had visited a dental clinic first, six cases were referred to key specialists such as oral surgeons, neurologists, or neurosurgeons for further investigation and diagnosis. Those 17 cases (60.7%) were properly triaged to reach diagnosis of TN. On the other hand, 6 of 28 patients visited other dentists by themselves without reference from a primary dentist. Five of the 28 patients visited neurologists or neurosurgeons by themselves without reference from primary dentists. Those 11 cases (39.2%) were not properly managed regarding the reference system by primary dentists.

The distribution of TNQ scores in the two groups is shown in ►Fig. 2. The highest TNQ score in the TN group was 9, while the highest TNQ score in the non-TN group was 6. Mean TNQ score was 8.3 in the TN group and 6.6 in the non-TN group. To detect TN cases, a cutoff score for the TNQ was set at 7, and sensitivity and specificity for detecting TN were calculated. The TNQ offered 91% sensitivity and 56% specificity. In the two group, 81% of patients showing a TNQ score of 7 or more were diagnosed with TN. Three cases in the TN group who scored less than 7 had already achieved good control of TN by medication in the early stage. Conversely, postherpetic neuralgia, glossopharyngeal neuralgia, and some migraine cases scored 7 or more in the non-TN group. While those cases did not have TN, the underlying pathologies were neurologically associated.

The applicability rates of each question item in the two groups are compared in ►Fig. 3. Q1 (40 years old or more), Q4 (unilateral pain), Q5 (severe, electric shock-like, or stabbing pain), and Q6 (brief [a few seconds to minutes] and recurrent pain) showed statistical differences between the TN and non-TN groups using unpaired *t*-tests ( $p < 0.05$ ). Endoscopic



**Fig. 2** Distribution of trigeminal neuralgia questionnaire (TNQ) score in trigeminal neuralgia (TN) and non-TN groups.



**Fig. 3** Applicability rate of trigeminal neuralgia questionnaire (TNQ) items in trigeminal neuralgia (TN) and non-TN groups. Q1, 40 years old or more; Q2, female; Q3, pain present for 1 month or more; Q4, unilateral pain; Q5, severe pain (electric shock-like or stabbing); Q6 brief (a few seconds to minutes), recurrent pain; Q7, no pain during sleep; Q8, triggered by specific motions (washing face, applying make-up, shaving, eating, conversation, brushing teeth, etc.); Q9, triggered by touching face; and Q10, unresponsiveness to medication. *p*-Values were calculated using unpaired *t*-tests for each item. Asterisks indicate statistical significance ( $p < 0.05$ ).

microvascular decompression was performed for 26 of the 37 cases as surgical treatment. Of these, 24 cases (92.3%) achieved satisfactory pain relief (BNI I–III) without complications.

## Discussion

We believe that three main reasons make early diagnosis of TN difficult for dentists. The first reason is the low incidence of TN. According to previous reports, the incidence of TN is 4.0 to 8.0 per 100,000 population per year.<sup>9–11</sup> Aichi prefecture in Japan, where our institute is located, has a population of approximately 7,500,000, and around 3,900 dentists are working in this area.<sup>12,13</sup> Based on such statistics, the approximate incidence of TN for dentists is that 1 in 10 dentists see one TN patient per year. In other words, one dentist sees one TN patient once in 10 years. This extremely low incidence makes it difficult for dentists to keep TN in mind.

The second reason is the stages of TN. Typical symptoms of TN are well known, but patients usually express typical TN symptoms in the middle or late stages. In contrast, the early stage of TN tends to present with less severity and lower frequency of pain in the teeth. TN patients visit dentists in this early stage. Because patients have a strong tendency to visit dentists first, primary-care dentists must see TN patients in this early stage.

Furthermore, the third reason is pre-TN. In the early stages of TN, 20% complain of dull, continuous pain that lasts up to several hours, but some characteristics triggered by specific

motions are preserved.<sup>14,15</sup> This condition differs from typical symptoms of TN and is reported as pre-TN. Pre-TN persists for days to years before progressing to typical symptoms of TN. In the pre-TN period, screening for typical characteristics of TN such as severe, brief recurrent pain would not identify potential TN cases, and meticulous interviewing regarding characteristics of TN is required.

Given those reasons, early detection of TN by primary dentists may be difficult. This study suggested that the TNQ shows high sensitivity for TN and has a potential role to play as a screening test for TN. The advantages of the TNQ are its ease of use, noninvasive nature, rapid application, and low cost. The characteristics of TN are widely contained, so that difficult cases of early-stage TN (including pre-TN) can be detected using the total TNQ score. For the detection of pre-TN, the question item for age was set as “40 years old or more,” younger than the predominant age for TN. Similarly, the history was set as “1 month or more,” which is relatively short for a history of TN. These questions were designed to detect even early-stage TN or pre-TN.

In contrast, a few disadvantages of the TNQ must be considered. Reproducibility is sometimes unstable, because the TNQ depends on subjective answers from patients and conditions of pain differ even within the same patient over time. This is often seen for the trigger of touching the face. Another question item on “unresponsiveness to medication” is ambiguous for some patients. For example, some patients have not taken any medication for the pain before visiting the initial medical facility. In addition, TN presenting as atypical symptoms such as persistent dull ache or burning sensation

is difficult to screen for in the TNQ. However, if the pain has specific triggers and worsens over time, TN should be suspected. Consulting with key specialists in TN and MRI evaluations to assess neurovascular conflict may be needed to diagnose TN in such atypical cases.

A key limitation to this study was that the TNQ was completed only in the neurosurgical department, not in dental clinics. TNQ scores for common diseases in dental clinics are unclear and some conditions may lead to suspicion of TN even in patients with odontogenic diseases.

Our data also revealed that 39.2% of cases were not properly triaged and did not reach appropriate multidisciplinary consultation. This means that the local referral system is not working properly for TN patients, and there is a large amount of room for improvement. Multidisciplinary practice is essential for the management of TN, especially for the early diagnosis of TN, and this is an important factor for the proper management of TN. To achieve better multidisciplinary consultation, TN specialists who are engaged in TN treatment must provide continuous education and awareness campaigns to local dental practitioners. Conversely, TN specialists must also learn about orofacial pain from a dental perspective, and a mutual and reliable relationship is absolutely necessary. If TN is suspected from the TNQ, this questionnaire will play an important role in connect dentists and TN specialists. An environment in which dentists can consult appropriate local TN specialists without hesitation is necessary.

Finally, we suggest the possible effectiveness of the TNQ for early detection of TN by dentists. If the symptoms and clinical findings do not appear consistent with typical oral disease, or if standard treatments do not alleviate the pain, dental practitioners must consider TN in complex orofacial pain diagnoses. The TNQ may provide a screening test for TN, and thus may facilitate the implementation of ideal interdisciplinary TN management.

## Conclusion

In conclusion, the role of primary dental practitioners in total TN management is crucial. Interviews regarding pain and ready consultation with key specialists are important for early diagnosis of TN. We suggest the possible utility of the TNQ for early detection of TN by dentists. The TNQ is a reliable and convenient method to interview patients regarding TN, and may assist dentists with early detection of TN. Having local networks between dentists and TN specialists and multidisciplinary practice is necessary for total management of TN.

### Author's Contributions

Fuminari Komatsu provided the idea, designed the study, wrote the manuscript, performed statistical evaluation, and contributed substantially to discussion. Kento Sasaki, Kyosuke Miyatani, Riki Tanak, and Yasuhiro Yamada helped in data collection. Yoko Kato and Yuichi Hirose proofread the manuscript and contributed substantially to discussion.

### Ethical Approval

The institutional ethics committee approved this study (No. HM18-447). The study was conducted in accordance with the guidelines of the Declaration of Helsinki.

### Conflict of Interest

None declared.

### Acknowledgment

We greatly appreciate the advice to this study from the Aichi Dental Association, Nagoya Dental Association, and Alumni Association School of Dentistry Aichi-Gakuin University.

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