



Original Article

# Please spare my teeth! Dental procedures and trigeminal neuralgia

Manjul Tripathi<sup>1</sup>, Nishanth Sadashiva<sup>2</sup>, Anand Gupta<sup>3</sup>, Parth Jani<sup>1</sup>, Sachin Jose Pulickal<sup>2</sup>, Harsh Deora<sup>2</sup>, Rupinder Kaur<sup>1</sup>, Parwinder Kaur<sup>1</sup>, Aman Batish<sup>1</sup>, Sandeep Mohindra<sup>1</sup>, Narendra Kumar<sup>4</sup>

<sup>1</sup>Department of Neurosurgery, Postgraduate Institute of Medical Education and Research, Chandigarh, <sup>2</sup>Department of Neurosurgery, National Institute of Mental Health and Neurosciences, Bengaluru, Karnataka, <sup>3</sup>Department of Dentistry, Government Medical College, <sup>4</sup>Department of Radiotherapy, Postgraduate Institute of Medical Education and Reserach, Chandigarh, India.

E-mail: \*Manjul Tripathi - drmanjultripathi@gmail.com; Nishanth Sadashiva - nishanth46@gmail.com; Anand Gupta - dranandkgmc2@gmail.com; Parth Jani - knowmoreparth@gmail.com; Sachin Jose Pulickal - sachinjosepulickal@gmail.com; Harsh Deora - demo5601@gmail.com; Rupinder Kaur - rupinder8686@yahoo.com; Parwinder Kaur - 19parwinder@gmail.com; Aman Batish - amanmamc@gmail.com; Sandeep Mohindra - sandeepneuro@gmail.com; Narendra Kumar - drnarendra@gmail.com



**\*Corresponding author:**

Manjul Tripathi,  
Department of Neurosurgery,  
Postgraduate Institute of  
Medical Education and  
Research, Chandigarh, India  
drmanjultripathi@gmail.com

Received : 15 October 2020  
Accepted : 17 November 2020  
Published : 22 December 2020

DOI  
10.25259/SNI\_729\_2020

Quick Response Code:



## ABSTRACT

**Background:** The correct diagnosis of trigeminal neuralgia (TN) is still a far cry and the patients suffer from unnecessary dental procedures before getting the definite treatment. In this study, we evaluated, if the patients have undergone dental procedures for their misdiagnosed TN before receiving definite treatment for the same.

**Methods:** A total of 187 patients received GKRS for their TN (excluding secondary TN) in two institutes from 2010 to 2019. We did a retrospective analysis of these patients' primary complaints on a standard questionnaire.

**Results:** One hundred and seventeen of the 187 patients responded. About 55.5% of patients had a toothache and 65.8% did visit a dentist for the pain. About 41.8% of patients underwent one dental procedure; 18.8% suffered from worsening of the pain while 8.5% received some partial improvement. About 19.6% also underwent root canal treatment while 6.8% had a nerve block. Mean of 1.6 teeth was extracted per person. About 71% of patients were satisfied with their Gamma Knife radiosurgery for TN at a median follow-up of 49 months.

**Conclusion:** There is a need for a better understanding of the disease among the dentists and the patients for the timely and correct treatment, without losing their teeth. The onus lies on neurosurgeons/neurologists disseminate knowledge regarding proper diagnosis and treatment modalities.

**Keywords:** Facial pain, Gamma knife radiosurgery, Microvascular decompression, Tooth extraction, Trigeminal neuralgia

## INTRODUCTION

“It is very common that patients experiencing neuralgia of the second or third branch of the trigeminal nerve, at the beginning of their suffering, will have extracted all teeth of the affected region. Generally, on a thorough examination, it will be easily recognized, whether the pain originates from the teeth or not.”

-Fedor Krause (1857–1937)

Trigeminal neuralgia (TN) is a serious health problem characterized by recurrent unilateral brief electric shock-like pains, abrupt in onset and termination, limited to the distribution of

This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

©2020 Published by Scientific Scholar on behalf of Surgical Neurology International

one or more divisions of the trigeminal nerve, and triggered by innocuous stimuli.<sup>[7]</sup> TN is the most frequent cranial neuralgia, yet is a rare entity with reported incidences of 4.5 per 100,000, more prevalent in females, and occurs more commonly in the 50- to 70-year-old age group.<sup>[2,12]</sup> The diagnosis of TN critically depends on a patient's description of pathognomonic pain attacks. Although labeled benign, it is one of the most fearful disorders among the patients. Historically, it was labeled as a suicidal disease just because of the agony, helplessness, and suffering it embarked on its owners.<sup>[1]</sup>

Usually, patients with TN have triggers that cause these painful attacks. These triggers may be laughing, chewing, shaving, brushing their teeth, or even cold breeze over the face. The pain usually involves the maxillary division of trigeminal nerve, often in combination with the mandibular division, but involvement of the supraorbital nerve is infrequent.<sup>[14]</sup> It is not infrequent that the patient with TN visits a dentist because pain often is triggered by eating and manipulation of teeth and gums.<sup>[3,5,7]</sup> Although the description of TN is typical, it is very easy for either a dentist or a physician to misdiagnose this as toothache, whenever the detailed history is not elicited. Due to its rarity and as dentists may not come across many TN patients in their practice, knowledge about this entity may be sparse.<sup>[4,5]</sup> Literature directed toward dentists and their specialties have mentioned some difficulties in diagnosing atypical odontalgia and one of the differential diagnoses being TN.<sup>[8,9]</sup> Even then, misdiagnosis of TN as a dental disease is prevalent since many decades.<sup>[5]</sup> The treatment may range from anesthetic blocks, root canal treatment, or even dental extraction, but in vain. Neurologists and neurosurgeons evaluate these patients only when referred or the patient gets unsatisfactory relief. Over that, facial pain syndromes can follow a dental procedure as an iatrogenic insult.<sup>[10-14]</sup> In this study, we intended to find out the prevalence of dental visits and procedures in cases of TN who underwent Gamma Knife radiosurgery (GKRS) to assess the prevalence of unnecessary interventions.

## MATERIALS AND METHODS

All patients, who have undergone primary GKRS at two institutes for TN from 2010 to 2019, were retrospectively reviewed for the history of toothache and previous visits to the dentist. All patients who had secondary TN were excluded from the study. The available information from the chart reviews was recorded and later they were contacted on the phone. Consent was taken for their telephonic interview. Details of their initial pain pattern, any visit to the dentist, treatment received, postprocedural pain relief, the need for medications, and time taken for them to visit specialists were recorded [Table 1]. All patients who were conclusively diagnosed to have classical and idiopathic TN through

clinical symptoms and corroborated with imaging features were included in the study. Patients were not asked to identify their dentists.

## RESULTS

During the study period, a total of 187 patients were treated with GKRS. One hundred and seventeen patients could be contacted for this study. The mean age was 57 years and 134 (71.65%) were male. Sixty-five (55.5%) patients had described that they felt like they had perceived toothache associated with the symptoms, and 77 (65.8%) of the patients had visited a dentist before visiting the neurosurgeon. Out of these patients, 49 (41.8%) had undergone some procedure during their visit to a dentist. Interestingly, 22 patients reported that their pain had actually either started or aggravated after their dental procedure and 10 of the patients reported temporary partial relief from their pain after the dental procedure. Forty-nine patients had their tooth extracted ranging from 1 to 4 in number with a mean of 1.6 teeth extracted per person. Twenty-three patients also had root canal treatments and eight patients received regional nerve blocks 1–3 times, along with tooth extraction. On asking patients, if they would undergo another dental procedure if required for pain relief only 2 patients out of 10 who had initially got partial relief replied that they would repeat a similar procedure. Eighty-three (71%) patients replied that they were satisfied with their expectations after GKRS treatment though 90 (77%) patients were still on some sort of medications for their facial pain at a median follow-up of 49 months (1–108 months).

## DISCUSSION

### The correct diagnosis: onus is on the dentist

Our study and available literature show that many patients visit dentists for their TN.<sup>[3,4,6,7]</sup> As effective management of TN starts with the correct diagnosis in the first place, it puts the onus on the primary physician or dentist. TN is

**Table 1:** Standard questions for patient's telephonic interview.

1. Was your primary complaint toothache or pain in the face?
2. Did you consult any dentist for this pain?
3. Did you undergo any dental procedure for this pain?
4. Was there any dental procedure after which you started having the pain (if there was no pain before the procedure)?
5. How many teeth were extracted?
6. Did you also receive any root canal treatment?
7. Did you receive any partial/complete and temporary/permanent pain relief after the dental procedure?
8. If you happen to get same kind of pain again, would you like to get the dental procedure repeated in any way?
9. Are you satisfied with your GKRS for pain?
10. Are you still on medication?

characterized as recurrent unilateral, brief, electric, shock-like pains, abrupt in onset and termination, limited to the distribution of one or more divisions of the trigeminal nerve, and often triggered by innocuous trigeminal tactile stimuli.<sup>[15]</sup> Differential diagnoses of TN which a dentist may consider are atypical odontalgia or neuropathic trigeminal pain (i.e., deafferentation pain) and of primary odontogenic pain syndromes, such as pulpitis and cracked tooth syndrome.<sup>[3]</sup> Other differential diagnoses include sinusitis, migraine, primary headaches, and musculoskeletal and joint pain. Depending on the predominant pain distribution, herpes zoster, orbital disease, temporal arteritis, and intracranial tumors also need to be taken into account.<sup>[5]</sup>

Essentially, the diagnosis of TN remains clinical. Dental pain is usually provoked by direct percussion to a tooth or application of cold/hot beverages.<sup>[6,16]</sup> Persistent or episodic pain radiating toward ear or eye is a characteristic sign of TN. The most characteristic differentiating feature is that dental pain aggravates at night and affects sleep, while TN is exactly opposite.<sup>[17]</sup> Many a time, a local anesthetic is given by the dentist to the periodontal area which may temporarily relieve the pain. A local anesthetic injection on mucosa causes numbness to the local area which lasts until the effect of the drug. Pains other than TN can also be relieved temporarily. Interestingly, in case of TN, there would only be numbness with no significant pain relief unless a nerve block is given. One of the most characteristic diagnostic tests of it is the response to carbamazepine and oxcarbazepine.<sup>[7]</sup> This relief is to an extent that if the patient denies any improvement with carbamazepine at any point in time, one should reconsider the diagnosis.<sup>[18]</sup> In most cases of TN, the pain relief gradually diminishes over a period of months to years eventually the medical management fails.<sup>[20]</sup>

A substantial number of patients may have concurrent dental problems due to poor oral hygiene or other reasons that may exacerbate the symptoms of TN. This is especially true considering the severe pain triggered by brushing in patients with TN. Any patient complaining of continuous pain in the tooth or periodontal structures is most commonly suffering from dental disease. Rarely, TN may also feature with pain arising from trigger areas in the mouth.<sup>[6]</sup> Elicited allodynic pain is seen in cracked tooth syndrome and reversible pulpitis in response to touch and

cold stimuli, which may mimic TN. In such a case, a patient should always be evaluated by a dentist too and should get treatment in case of any obvious pathology. However, it is not uncommon to see a patient with nonodontogenic, dental-alveolar pain, or idiopathic orofacial pain treated with several significant dental procedures such as tooth extractions or root canal procedures with often temporary or partial pain relief.<sup>[6,19-21]</sup>

In a study done by Garvan *et al.* in Zurich in 1983, 73% of patients with a history of TN had already taken a dental consultation and 48% had at least one tooth extracted.<sup>[6]</sup> In this study, 67 of 140 (48%) TN patients who were initially evaluated by dentists received surgical dental treatment with the extraction of a total of 680 teeth (median of 10 teeth). Twelve patients had got all 32 teeth removed [Table 2].<sup>[3]</sup>

In a study done by de Siqueira *et al.* in 2004, 31 (65%) of the 48 interviewed patients had undergone a total of 83 dental procedures.<sup>[3]</sup> Thirty-nine had undergone tooth extractions, 32 with single, and 7 with multiple extractions. Six patients became edentulous due to dental procedures done for TN. In their analysis, intraoral triggers for TN had no association with dental procedures compared to extraoral triggers. An interesting finding was that there was a statistically significant correlation between several patients undergoing dental procedures with the duration of TN, with 100% of patients receiving some sort of treatment if pain occurred more than 10 years.

A recent study done by von Eckardstein *et al.* in 2014, they reported that 41 patients (82%) of the 51 evaluated patients had initially consulted their dentists out of which 27 (53%) patients received invasive dental treatment including extractions, root canal treatments, and implants. The majority of the patients in that study had reported that their dentist had not recognized the exact problem. A total of 54 teeth were extracted in 13 patients with a median of 2 and a maximum of 20 teeth extractions. Of patients that reported to a dentist, 70.6 % did so within 4 weeks of the onset of symptoms, but more than 2 years elapsed before neurological or neurosurgical attention in 42.5% of patients.<sup>[29]</sup> The authors had pointed out that the sole difference in these studies done 31 years apart was that fewer teeth (median 2 vs. 10) were extracted. Several unpublished thesis dissertations also have been found with similar results.<sup>[29]</sup>

**Table 2:** Previous studies with number of patients getting their tooth extracted and the number of teeth extracted in each study.

Study	Patients with tooth extractions	Number of tooth extracted
Garvan <i>et al.</i> <sup>[6]</sup> (1983)	67 of 140 patients (48 %) had extraction	680 teeth, median 10
de Siqueira <i>et al.</i> <sup>[3]</sup> (2004)	39 of 48 patients (81%) had extractions	Total 83 dental procedures.
von Eckardstein <i>et al.</i> <sup>[29]</sup> (2014)	13 of 51 patients (25%) had extractions	77 procedures. Fifty-four teeth were extracted in 13 patients, median 2
Our study	49 of 117 patients (41.8%) had extractions	78 teeth extracted, mean of 1.6 teeth extracted per person

Our study showed similar results compared to the previous studies [Table 1]. About 65.8% of the patients had visited a dentist for their pain, 41.8% had undergone some procedure during their visit to a dentist. About 19% of patients reported that their pain was aggravated after a dental procedure. Forty-nine patients had a total of 78 teeth extracted ranging from 1 to 4 in number.

### **Postprocedure TGN: dental procedures and TGN: cause or effect**

Many times, the patient is operated for a dental procedure and the patient reports TN as a temporal event secondary to the procedure. This again raises the question if the primary diagnosis was TN or otherwise. There remain chances of some iatrogenic injury to the inferior alveolar nerve/lingual nerve, leading to sensory neuropathy. The prevalence of temporarily impaired lingual and inferior alveolar nerve function is thought to range between 0.15 and 0.54%, whereas permanent injury caused by an injection of local analgesics is less frequent at 0.0001–0.01%.<sup>[22,23]</sup> Most of these injuries are caused by injury to the third molar tooth, however, implants and local anesthetics are also contributing factors.<sup>[24]</sup> Technically, such patients should not get comparable pain relief as after MVD for a typical TN but akin to TN, they may respond to carbamazepine. These patients have a typical history of pain started after the traumatic dental/jaw procedure near the nerves such as mental, infraorbital, and inferior alveolar. This posttraumatic Causalgia is secondary to faulty myelination of the injured nerves, neuroma formation, and ephaptic transmission by adjacent unmyelinated sympathetic fibers. In many ways, this pain resembles TN, but pain triggered by manual palpation along the specific points of a neurovascular bundle along teeth is suggestive of posttraumatic neuroma formation. The resistant cases may need neuroma excision.

In a dentist analysis in the German population, only 74.5% of dentists felt competent enough to clinically diagnose TN from other orofacial pain syndromes. The majority (76.6%) felt that there is a need for further information and ongoing medical education regarding TN.<sup>[5]</sup> We lack any such survey in our study, but because of unnecessary dental procedures in our patient population, the situation does not seem too promising. Most of the patients have received unjustified dental procedures, before zeroing in the final definite diagnosis of TN by any neurologist/neurosurgeon. The patients with predominant involvement of the ophthalmic division of the trigeminal nerve have lesser chances of tooth extraction as the cause and effect analysis in conventional wisdom does not seem to correlate to the patients and dentists both.<sup>[28]</sup>

### **iTGN and oral hygiene**

Patients with TN often get reluctant to shave, brush, or floss as they may act as a triggering event hence such patients

may not brush for many days to months.<sup>[25,26]</sup> Such patients may have high chances of getting dental infections. Good oral hygiene is of paramount interest in these patients. A TN patient should make their dentist aware of the condition and any dental procedure should be done only when the patient is in a pain-free period with proper medications on. The patient may need some dose escalation and should plan the procedure in the time of the drug's maximum effectiveness duration (usually an hour after the intake).<sup>[27]</sup>

### **Limitations of the study**

We have conducted a retrospective interview of our patients who have received GKRS for TN. We relied on patients charts and interview for the assessment of the prior history, whenever details were incomplete in case records. We did not contact the dentists for their evaluation, prior investigations, and their rationale for the treatment. It cannot be outrightly denied that individual dental treatment was justified in some patients as the dental problem may have coexisted with TN. However, with this analysis, we can easily identify that the risk of missed/wrong diagnosis is very high.

### **CONCLUSION**

This is a high time to increase awareness about TN among dentists and primary caregivers. It requires a team approach to rule out dental causes before finalizing the diagnosis. Both are highly specialized specialties (neurosurgery and maxillofacial/dentistry) where each one has to complement each other for the best patient care. The onus equally lies on neurosurgeons/neurologists to differentiate typical TN from atypical TN and odontogenic pain. There are consensus guidelines for all the treatment modalities that should be regularly updated and published for the best of the treatment option. Moreover, the patient needs an early referral if the pain control is not satisfactory despite a prior dental procedure. If it is TN, even extraction of 32 teeth would not make the patient better, but only miserable.

### **Acknowledgment**

We would like to acknowledge the guidance and case management by late Professor Kanchan Kumar Mukherjee, PGIMER, Chandigarh, for his vision and effort in successfully managing patients.

### **Ethical approval**

All procedures performed in studies involving human participants were in accordance with the ethical standards of the Institutional Ethics Committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

### Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

### Financial support and sponsorship

Publication of this article was made possible by the James I. and Carolyn R. Ausman Educational Foundation.

### Conflicts of interest

There are no conflicts of interest.

### REFERENCES

- Adams H, Pendleton C, Latimer K, Cohen-Gadol AA, Carson BS, Quinones-Hinojosa A. Harvey cushing's case series of trigeminal neuralgia at the Johns Hopkins hospital: A surgeon's quest to advance the treatment of the suicide disease. *Acta Neurochir (Wien)* 2011;153:1043-50.
- Baad-Hansen L. Atypical odontalgia-pathophysiology and clinical management. *J Oral Rehabil* 2008;35:1-11.
- de Siqueira SR, Nobrega JC, Valle LB, Teixeira MJ, de Siqueira JT. Idiopathic trigeminal neuralgia: Clinical aspects and dental procedures. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004;98:311-5.
- Deora H, Tripathi M, Modi M, Mohindra S, Batish A, Gurnani J, *et al.* Letter to the editor. Microsurgical rhizotomy as treatment for trigeminal neuralgia in patients with multiple sclerosis: Turnpike or dirt road? *J Neurosurg* 2018;1:1-4.
- Devor M, Wood I, Sharav Y, Zakrzewska JM. Trigeminal neuralgia during sleep. *Pain Pract* 2008;8:263-8.
- Garvan NJ, Siegfried J. Trigeminal neuralgia-earlier referral for surgery. *Postgrad Med J* 1983;59:435-7.
- Headache Classification committee of the international headache society (IHS) the international classification of headache disorders, 3<sup>rd</sup> edition. *Cephalalgia* 2018;38:1-211.
- Hillerup S. Iatrogenic injury to the inferior alveolar nerve: Etiology, signs and symptoms, and observations on recovery. *Int J Oral Maxillofac Surg* 2008;37:704-9.
- Katusic S, Beard CM, Bergstralh E, Kurland LT. Incidence and clinical features of trigeminal neuralgia, Rochester, Minnesota, 1945-1984. *Ann Neurol* 1990;27:89-95.
- Kim JH, Yu HY, Park SY, Lee SC, Kim YC. Pulsed and conventional radiofrequency treatment: Which is effective for dental procedure-related symptomatic trigeminal neuralgia? *Pain Med* 2013;14:430-5.
- Klazen Y, van der Cruyssen F, Vranckx M, van Vlierberghe M, Politis C, Renton T, *et al.* Iatrogenic trigeminal post-traumatic neuropathy: A retrospective two-year cohort study. *Int J Oral Maxillofac Surg* 2018;47:789-93.
- Law AS, Lilly JP. Trigeminal neuralgia mimicking odontogenic pain. A report of two cases. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1995;80:96-100.
- Maarbjerg S, di Stefano G, Bendtsen L, Cruccu G. Trigeminal neuralgia-diagnosis and treatment. *Cephalalgia* 2017;37:648-57.
- Mumford JM. Role of the dentist in trigeminal neuralgia. *Pain* 1978;5:83-92.
- Obermann M. Treatment options in trigeminal neuralgia. *Ther Adv Neurol Disord* 2010;3:107-15.
- Olesen J. International classification of headache disorders. *Lancet Neurol* 2018;17:396-7.
- Ram S, Teruel A, Kumar SK, Clark G. Clinical characteristics and diagnosis of atypical odontalgia: Implications for dentists. *J Am Dent Assoc* 2009;140:223-8.
- Remick RA, Blasberg B, Barton JS, Campos PE, Miles JE. Ineffective dental and surgical treatment associated with atypical facial pain. *Oral Surg Oral Med Oral Pathol* 1983;55:355-8.
- Renton T, Adey-Viscuso D, Meechan JG, Yilmaz Z. Trigeminal nerve injuries in relation to the local anaesthesia in mandibular injections. *Br Dent J* 2010;209:E15.
- Renton T, Thexton A, Crean SJ, Hankins M. Simplifying the assessment of the recovery from surgical injury to the lingual nerve. *Br Dent J* 2006;200:569-73; discussion 565.
- Renton T. Tooth-related pain or not? *Headache* 2020;60:235-46.
- Rodriguez-Lozano FJ, Sanchez-Perez A, Moya-Villaescusa MJ, Rodriguez-Lozano A, Saez-Yuguero MR. Neuropathic orofacial pain after dental implant placement: Review of the literature and case report. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2010;109:e8-12.
- Siqueira SR, Teixeira MJ, de Siqueira JT. Severe psychosocial compromise in idiopathic trigeminal neuralgia: Case report. *Pain Med* 2010;11:453-5.
- Tinastepe N, Oral K. Neuropathic pain after dental treatment. *Agri* 2013;25:1-6.
- Tripathi M, Batish A. Letter to the editor. Cafeteria approach to management of trigeminal neuralgia: Stereotactic radiosurgery as a preferred option. *J Neurosurg* 2018; 1:1-2.
- Tripathi M. Trigeminal neuralgia: An orphan with many fathers. *Neurol India* 2019;67:414-6.
- Truelove E. Management issues of neuropathic trigeminal pain from a dental perspective. *J Orofac Pain* 2004;18:374-80.
- Viana M, Tassorelli C, Allena M, Nappi G, Sjaastad O, Antonaci F. Diagnostic and therapeutic errors in trigeminal autonomic cephalalgias and hemicrania continua: A systematic review. *J Headache Pain* 2013;14:14.
- von Eckardstein KL, Keil M, Rohde V. Unnecessary dental procedures as a consequence of trigeminal neuralgia. *Neurosurg Rev* 2015;38:355-60; discussion 360.

**How to cite this article:** Tripathi M, Sadashiva N, Gupta A, Jani P, Pulickal SJ, Deora H, *et al.* Please spare my teeth! Dental procedures and trigeminal neuralgia. *Surg Neurol Int* 2020;11:455.