

Diagnosis and Management of Trigeminal Neuralgia in Dental Office -An Evidence Based Presentation

*Rajat Aggarwal, **Sanjeev Kumar ,***Rajnish Jain ,****Uday kakadia

*Lecturer, Dept. of Oral & Maxillofacial Surgery, **Prof. & Head, Dept. of Oral & Maxillofacial Surgery, ***Consultant Endodontist, ****Post Graduate, Dept. of Oral & Maxillofacial Surgery, Subharti Dental College, Meerut (U.P.)

Abstract

Trigeminal neuralgia (TN) is among the most painful afflictions known. It is characterized by sudden attacks of pain that are typically brief, lasting only seconds to two minutes. These attacks are severe and described as intense, stabbing or electrical shock-like. TN sufferers often endure years of suffering and misdirected treatments before the disease is recognized. Some of the erroneous diagnoses often encountered include various dental diseases, temporomandibular joint disorders, paranasal sinus infections, ophthalmic (eye) pain syndromes, temporal arteritis, ice pick-like migraine pain, facial migraine, myofascial pain, idiopathic facial pain and psychological disorders. Even today patients have undergone several unnecessary and useless "treatments" before the TN was accurately diagnosed. Some misdirected interventions include dental extractions, root canals, nasal sinus surgeries, biopsies, salivary gland procedures and medical treatments involving antibiotics and narcotics. The difficulty in diagnosing TN is in part due to the lack of confirmatory clinical, laboratory or radiological tests, periods of spontaneous remission that may be confused with a cure for the disorder, and the relative rarity of TN. This is an evidence based presentation aimed at managing trigeminal neuralgia in a systematic way in a dental office which reviews the common management strategies and their success.

Key Words

Trigeminal Neuralgia, Diagnosis, Carbamazepine, Phenytoin, Alcohol, Cryosurgery.

Reprint requests: Dr. Rajat Aggarwal

Lecturer, Dept. of Oral & Maxillofacial Surgery
Subharti Dental College, Meerut (U.P.)
E-mail: docrajat78@yahoo.co.in

Introduction

Trigeminal neuralgia is defined as sudden, usually unilateral, severe, brief, stabbing, lancinating, recurring pain in the distribution of one or more branches of the 5th cranial nerve. The clinical description of trigeminal neuralgia (TN), can be traced back more than 300 years. Stookey and Ransohoff accredits Aretaeus of Cappadocia, to have given the first description of this disease in the first century AD. He described a headache in which "spasms and distortions of the countenance took place." John Fothergill was the first to give a full and accurate description of TN in a paper titled "On a Painful Affliction of the Face," which he presented to the medical society of London in 1773. Nicholas Andre coined the term *tic douloureux* in 1756¹.

Etiology and Pathogenesis

- * The cause of the majority cases of TN remains controversial, but approximately 10% of cases have detectable underlying pathology such as a tumor of the cerebellar pontine angle, a demyelinating plaque of multiple sclerosis, or a vascular malformation..
- * The remainder of cases of TN are classified as idiopathic.
- * The most widely accepted theory of TN is that a majority of cases are caused by an atherosclerotic blood vessel pressing on and grooving the root of the trigeminal nerve. This pressure results in focal demyelination and hyper excitability of nerve fibers, which will then fire in response to light touch, resulting in brief episodes of intense pain.

General Characteristics

- * Incidence : it is a rare affliction, seen in about 4 in 100,000 persons.
- * Age of occurrence : Late middle age or later

in life (5th or 6th decade)

- * Affliction for sites: Predilection for the right side is noted (60%).

Clinical Features

- * The majority of the patients with TN present with characteristic clinical features, which includes episodes of intense shooting stabbing pain that lasts for a few seconds and then completely disappears.
- * The pain characteristically has an electric shock quality and is usually unilateral.
- * Pain rarely crosses the midline. The pain is of short duration and lasts for few seconds but may recur with variable frequency.
- * The maxillary branch is the branch that is most commonly affected, followed by the mandibular branch and rarely ophthalmic branch. Involvement of more than one branch occurs in some cases. Pain in TN is precipitated by light touch on a "trigger zone" present on the skin or mucosa within the distribution of the involved nerve branch.
- * Shaving, showering, eating, speaking or even exposure to wind can trigger a painful episode, and patients often protect the trigger zone with their hand or an article by suggesting a dental disorder, and TN patients often first consult dentist.
- * During the attack the patient grimaces with pain, clutches his hands on affected side of the face, stopping all the activities and hold or rubs his face, which may redden or the eyes until attack subsides.
- * In extreme cases the patient will have a motionless face - the "frozen or mask like face."
- * It is characteristic of the disorder, that attack do not occur during the sleep.

Diagnosis

- * There are few clinical features which are characteristic of trigeminal neuralgia. Presence of these symptoms help in the diagnosis
 - Unilateral electric shock kind of pain
 - Presence of trigger points
 - It is characteristic of the disorder, that attack

do not occur during the sleep.

- * Diagnosis is made from a well taken history. The classic clinical pattern will lead towards the diagnosis. Sometimes, if symptoms may be less classic and may mimic toothache, sinusitis, stomatitis or other inflammatory condition.
- * The neuralgic symptoms in younger group of patients should alert the clinician to a possible intracranial space occupying lesion or intracranial arteriovenous anomalies.
- * All patient should ideally have MRI scanning or at least a CT scan.

Diagnostic Block

- * Diagnostic injections of a local anesthetic agent into the patient's trigger zone should temporarily eliminate all pain.
- * Always begins injections at surface site of pain and then move proximally. For, example, if the pain is perceived in the lower lip, then inject lower lip, then mental nerve and then inferior alveolar nerve.
- * Inject 0.5 cc of normal saline at the test site. Wait for 5 minutes. If pain is relieved, then psychogenic pain is likely.
- * If the pain persists, then inject 0.5 ml of 2% lignocaine without adrenaline at surface site and wait for 5 minutes. If pain is relieved, then direct therapy at small nociceptor fibers.
- * If the pain persist - inject little deeper and wait for 5 minutes. If pain is relieved then consider musculoskeletal origin of pain.
- * If pain is not relieved, inject at more proximal portion of nerve - if pain is relieved, direct therapy at site, when relief occurred.

Treatment

- * First medicinal management is advocated. If the patient does not respond to it then only surgical management is opted.
- * Carbamazepine and phenytoin are the traditional anticonvulsants used primarily. This therapy consists of titration and maintenance with anticonvulsant drug.

Carbamazepine

- * Carbamazepine 100mg two times a day for 2 weeks, then three times daily increasing by

100 mg every three days to a maximum of 1000 mg/day until either remission is achieved or side effects of toxicity are unacceptable².

* SIDE EFFECTS: Visual blurring, dizziness, somnolence, skin rashes and ataxia and in rare cases hepatic dysfunction, leucopenia, thrombocytopenia. Whenever the side effects appear, a reduction of 200mg drug often eliminate them.

* Balance (disturbed - ataxia) is the feature limiting the dose of carbamazepine².

Taylor et al³, who studied 143 patients during a 16 year period found that of the 69% who initially had response to carbamazepine therapy, only 56% still had a pain control 10 year later³.

* Canavero S & Bonicalzi V⁴ and Jorns TP, Zakrzewska JM⁵ stated that Carbamazepine is the first line drug for medical management, but this should be changed to oxcarbazepine if there is poor efficacy and an unacceptable side effect profile.

Oxycarbazepine

The dosage strategy is similar to that of carbamazepine except that 300mg increments are used. All Studies to date have reported fewer side effect than with carbamazepine.

* Jorns TP, Zakrzewska JM⁵ stated that carbamazepine is still the first line drug for medical management, but this should be changed to oxcarbazepine if there is poor efficacy and an unacceptable side effect profile.

* Gomez-Arguelles JM et al⁶ conducted a study to evaluate the efficacy and tolerability of oxcarbazepine in trigeminal neuralgia (TN) unresponsive to treatment with the standard antiepileptic drug, carbamazepine. They concluded that Oxcarbazepine was effective from the first month of treatment. There was a significant reduction in pain frequency, leading to improvements in patient satisfaction. In general, oxcarbazepine was well tolerated. Oxcarbazepine appears to be an important alternative therapeutic approach for patients affected by TN.

Phenytoin

It was first successfully used in the treatment of trigeminal neuralgia in 1942. In clinical practice, a dose of 100mg three times in a day is used initially. Dosage is increased subsequently.

It can be used in combination with carbamazepine or with baclofen^{7,8}.

Baclofen

It can be effectively used in treatment of spasticity.

It was first used in the treatment of trigeminal neuralgia in 1980⁹

In a double blind study of 10 patients and an open study of 50 patients, carbamazepine and baclofen were compared. Researchers concluded that baclofen on its own was not as effective as carbamazepine.

It is effective in combination with carbamazepine but side effects are increases with combination.

Other Drugs that have been used successfully are

Lamotrigine¹⁰

Gabapentin¹¹

Sodium Valproate¹²

Minimally Invasive Procedure

Consists of

- Alcohol injections
- Glycerol injection
- Streptomycin injection
- Neurectomy and Cryotherapy of peripheral nerves

It has been known that injections of destructive substances into peripheral branches of the trigeminal nerve, produce anesthesia in the trigger zone or in the area of distribution of spontaneous pain.

Generally these peripheral procedures are easy to perform & are relatively well tolerated by the patients with fewer side effects. The limitation include a short duration of action & possibility of need for repeated procedure.

Certain contraindication to these techniques include immunocompromised pt & bleeding disorders in cases of neuroectomies & cryotherapy.

The indication of these therapies includes pt who are not suitable for more invasive management and those patients who are unable to tolerate medical treatment.

Peripheral Alcohol Injection

Injection of alcohol has been suggested in the management of TN since early 20th century. Technique involve injection of the related nerve with local anesthetic & subsequent injection of 0.5-1.0ml of absolute alcohol.

- * Mcleod & Patton¹³ stated that there was 90% success of this management with duration of relief for an average of 11 weeks. Complication included avascular necrosis, infection & local reaction. (inflammation & fibrosis)
- * Gallagher et al¹⁴ stated that there is 85% success with peripheral alcohol injection with a mean duration of action of 5 months. Transient facial paresis, trismus & soreness being the side effects for this technique.
- * Fardy et al¹⁵ reported an average duration of action of 13 months associated with peripheral alcohol injection & stated that peripheral alcohol nerve blocks are have role in elderly & medically compromised patients & those patients who are not willing for extensive surgeries.

Peripheral Glycerol Injections

This procedure can be done under local anesthesia without sedation. After the identification of involved nerve, the nerve is carefully anesthetized. Once the nerve block is checked to be effective, pure glycerol is injected in the vicinity of the nerve, around 0.5 ml, 1.0 ml and 1.5 ml for infraorbital, mental and mandibular nerve respectively as proposed by Erdal Erdam and Alper Alkan¹⁶

- * Various hypotheses of the effect of glycerol on peripheral nerves have been suggested. Stajcic¹⁷, noted axonolysis and demyelination of nerves in his study on rat infraorbital nerves. Contrary to this, AL-KHATEEB¹⁸ reported no structural changes in the structure of nerve followed by glycerol injections.
- * In a study conducted by Wilkinson HA¹⁹, the effect of glycerol on peripheral nerves lasted for an average of 9 months with around 30% patients free of pain after 2 years of treatment.

- * Stajcic Z²⁰ reported pain free duration of 6 to 26 months following peripheral injection of glycerol in his study group of thirteen patients.

Peripheral Streptomycin Injections

This procedure can be done under local anesthesia without sedation. After the identification of involved nerve, the nerve is carefully anesthetized. Once the nerve block is checked to be effective, streptomycin sulphate solution is deposited adjacent to peripheral branches of maxillary or mandibular nerves. The patients are given five injections at approximately one week intervals.

- * Sokoloviæ M et al²¹ conducted a study to evaluate Streptomycin, considering its neurolytic property, in the treatment of trigeminal neuralgia and concluded that peripheral injections of streptomycin are effective in management of trigeminal neuralgia.
- * Bittar GT et al²² conducted a study to investigate the long term effect of a peripheral sensory block using streptomycin sulphate on trigeminal neuralgia and concluded that streptomycin has no beneficial effects for idiopathic and traumatic trigeminal neuralgia.
- * Stajcic Z et al²³ conducted a study to evaluate the effect of streptomycin in the management of trigeminal neuralgia. Seventeen patients with long-lasting idiopathic trigeminal neuralgia (ITN) were treated with either five, weekly peripheral streptomycin/lidocaine (S/L) or lidocaine alone injections, in a double blind controlled study and concluded that S/L injections are initially effective in the treatment of ITN. In the long term, however, their effects are similar to the effects of lidocaine alone.

Peripheral Neurectomy (Nerve Avulsion) and Cryosurgery

- * Oldest and most affective technique.
- * Simple and reliable
- * It acts by interrupting flow of a significant numbers of afferent impulses to central trigeminal apparatus.
- * It has a disadvantage of producing full anesthesia or deep hypoesthesia related

dysfunction .

- * There is also the expected eventual return of pain with proliferation of amputated nerve stump neuromas .
- * To achieve better results, the peripheral nerve is always avulsed both from the bone as well as from the soft tissues.
- * The duration of pain remission after neurectomy may be lengthened, if the cut nerve end is cauterized or redirected sutured into viable muscle periosteum or bone tissue to prevent active neuroma formation.

Infraorbital Neurectomy

- * A U shaped Caldwell-Luc incision is made in the upper buccal vestibule in the canine fossa region. Mucoperiosteal flap is reflected superiorly to locate the infraorbital foramen. Once the nerve is exposed, all the peripheral branches are held with the hemostat and avulsed from the skin surface. Then the entire trunk is separated from the skin surface is held with hemostat and is removed by winding it around a hemostat and pulling it out. The foramen is plugged with polyethylene plug and wound is close with interrupted sutures.

Interior Alveolar Neurectomy

- * It can be performed via intraoral or extraoral approach. The intraoral approach is preferred, as it is simple and more cosmetic.
- * The extraoral approach-is through risdon's incision, where after reflection of masseter, a bony window is drilled in outer cortex and nerve is lifted with nerve hook and avulsed from its superior attachment and mental nerve is avulsed anteriorly through the same approach.
- * Intraoral approach -Via Dr Gininwala's incision-it is mainly used in dentulous cases. Incision is made along the anterior border of ascending ramus, extending lingually and buccally and ending in a fork like an inverted Y . The inferior alveolar nerve is located. Two heavy black linen threads are then looped around the nerve using nerve hook and then divided between the 2 threads. This is done as high as possible and the upper end is cauterized while dividing and lower end is held with the hemostat. Another linear

incision is made in the buccal vestibule overlying the mental foramen. A mucoperiosteal flap is reflected to expose the mental nerve. It is then tied with heavy black linen just little away from the foramen. The nerve is then caught with the hemostat distal to the knot and is divided between the two. The distal part held between the hemostat and is wound around it and the peripheral branches entering the mucosa are avulsed out. Now after the mental nerve is freed, then at the mandibular foramen, the distal part of the nerve which is held with the hemostat is pulled until the entire nerve length of the canal is avulsed out. The wound is closed with interrupted sutures.

- * Freemont AJ, Millac P²⁴ and Mason DA²⁵ conducted the study to know the role of peripheral neurectomy in the management of trigeminal neuralgia and results showed that peripheral neurectomy gives a pain free duration for 6 to 12 months.

Cryotherapy or Cryoneurolysis for Peripheral Nerves

- * In 1976 Lloyd et al described the use of cryotherapy to eliminate pain in peripheral nerves.
- * A nitrogen-perfused cryoprobe was developed to be used without tissue dissection. Special features are an outer diameter of only 2-7mm and a vacuum installed shaft. Before cryosurgery a nerve block is given to complete elimination of pain. Nerve is exposed and cryoprobe was applied in the same way as a needle for nerve block. The system is cooled down for about 40 sec and the subsequent freezing lasted for another 90 sec. after a period of thawing the freezing was repeated.
- * W. Pradel, M. Hlawitschka²⁶ et al conducted a study and showed results that all patient experienced a reduction of pain within 5 days and freedom from pain within 10-14 days. Patients were followed up for between 1 to 3 years. After 4-8 months they all had partial restoration of sensory function. The pain recurred in 13 of the 19 patients between 6 to 12 months. The cryosurgery method reliably eliminated attacks of pain. However recurrences were observed as early as 6-8 months after treatment.



Image showing exposure and cryosurgery of mental nerve for the management of Trigeminal Neuralgia

- * Zakrzewska JM²⁷ conducted a study to evaluate the cryotherapy for trigeminal neuralgia and showed result that Median duration of pain relief was 6 months after cryotherapy and 24 months after thermocoagulation. Sixty-two per cent of patients were pain-free 5 years after decompression. When pain recurred after cryotherapy it affected the same sites as previously in 80% of patients. Repeated cryotherapy of mental and long buccal nerves, but not of infra-orbital nerves, gave more prolonged pain relief than initial cryotherapy.
- * Juniper RP²⁸ conducted a study on trigeminal neuralgia – treatment of the third division by radiologically controlled cryoblockade of the inferior dental nerve at the mandibular lingual and result showed that freezing the inferior dental nerve using C-arm image-intensification control, and a nerve stimulator to guide the slim Spemby Lloyd probe, offers an additional technique for treatment of a small number of patients with trigeminal neuralgia. This paper reports the results of 31 cryoblockades of the inferior dental nerve in 11 patients.
- * De Coster D, Bossuyt M, Fossion E²⁹ conducted a study to know the value of cryosurgery in the management of trigeminal neuralgia and results showed that pain relief out-lasting return of sensation. After one year 65% of patients were pain free. In the treatment of

trigeminal neuralgia, cryotherapy is an easy method with similar results but lower complication rate in comparison with other peripheral methods.

Conclusion

Medical management is the mainstay in the management of Trigeminal Neuralgia. Carbamazepine being the drug of choice. However, if patients report with side effects or pain refractory to medical management, cryosurgery is the safest procedure to perform since it has no local reactions and it can be repeated with good patient acceptance, if need be.

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