

Clinical Insights in Trigeminal Neuralgia

S. K. Gupta, Ajay Gupta, Annil Mahajan, Rajinder Gupta, Vishal R. Tandon*, Neeru Gupta**

Trigeminal neuralgia (TN) is one of the most painful conditions known to medical scientists & is basically disorder of 5th cranial nerve. It is characterized by paroxysms of electric shock like shooting pain lasting from few seconds to less than two minutes. The pain is so severe that patient involuntarily winces or is often accomplished by brief muscle spasm & hence the term 'tic'. This is the reason that trigeminal neuralgia is also known as "tic douloureux" (1).

Incidence

Annual occurrence rate of TN is 3-5 per 100,000 people. It is found more often in women than men (Age adjusted ratio 1.74:1) & most common age group is 52-69 years. It is also seen in younger patient & is known as secondary TN. Attacks occur during the day or night but rarely during sleep (2).

Trigger Factors

TN is triggered by various actions that involve facial muscles particularly brushing, eating, chewing, shaving or washing the face. Even wind blowing into the nose can sometimes be the trigger.

Intensity & Frequency of Attacks

Attacks can be mild or severe, single or multiple. Some will have mild attacks to start with & later on they develop severe attack. Frequency of attack also varies, sometimes it may be once a day, once a month & in some cases it may be several attacks in a day or a week. There may be no pain for a prolonged period of time. The pain is very cruciating & making the patient unable to do his daily routine work.

Distribution of TN

Pain is usually unilateral in 97% cases, affects maxillary & mandibular branches which means the patient has severe pain around the nose or going right upto mandible.

In few cases (less than 5%), ophthalmic division is affected. When there is pain in the ophthalmic division, some of the patients have herpes & post-herpetic neuralgia needs to be excluded. In some cases, pain of TN can be bilateral (3%) & invariably same nerve divisions (V₂ and V₃) are affected. Right side of face being affected in 57% cases (2).

Aetiology

Most of the cases are idiopathic in nature. Among the patients who are symptomatic:-

1. About 67% of patients will have a large looping artery or vein at the base of brain, which may compress the trigeminal nerve responsible for TN (3).
2. About 50% of patients may have associated multiple sclerosis leading to TN.
3. 1-2% of people may have tumor lesions. 4. 5% of patients have facial trauma which later on leads to TN.
4. Other etiological aspects are bony deformities of skull, abnormalities of trigeminal nuclei, carotid trauma to gasserian ganglion & mandibular misalignment. The most important cause is root degeneration or pressure of one of the vessels over trigeminal ganglion in the brain stem, which explains the etiology of pain.

Types of Trigeminal Neuralgia

1. Typical trigeminal neuralgia (tic dolorueaux).
2. Atypical trigeminal neuralgia with associated neural injury.
3. Pathophysiology of painful trigeminal neuropathy as in peripheral neuropathy (no tic dolorueaux).

Characteristics of Idiopathic TN

- History of shooting pain, stabbing, jabbing, electric shock like pain in the 5th nerve distribution which occurs in paroxysm.

From The Postgraduate Department of General Medicine, *Pharmacology & Therapeutics and **Physiology, GMC, Jammu (J&K) .
Correspondence to: Dr. S. K. Gupta, Associate Prof. & Neurologist, P.G Deptt. of General Medicine Government Medical College, Jammu.

- Triggered by some facial activities.
- Normal neurological examination.
- Pain free intervals between the attacks.
- This occurs typically in 6th decade but rarely may occur at any other age.
- Male to female ratio is 2:3.
- Younger female patients with trigeminal neuralgia-suspect multiple sclerosis.

Pathophysiology

TN is mostly because of de-myelination of trigeminal sensory fibres within the nerve root or the root entry zone or less commonly in the brainstem. There occurs ectopic degeneration of spontaneous nerve impulses and erratic transmission of the axonal fibres. This is one mechanism that supports for the use of anticonvulsant medications in trigeminal neuralgia.

Various lesions are associated with trigeminal roots, within the few millimeter of pons as the trigeminal nerve is emerging out from the pons. There may be damage to the myelin sheath which is covering the nerve and that may be responsible for the pain. There are some causes, which results in a chronic irritation of the nerve. This irritation may be due to failure in the segmental inhibition in the trigeminal nucleus or it could be an increased activity of the trigeminal nerve due to what is known as ectopic action potential and once this reaches the threshold, the patient experiences the excruciating pain. This irritating phenomenon in the trigeminal nerve could be at its origin or during its course as it emerges out from the pons giving rise to action potentials and produce severe degree of pain (1).

Diagnosis

History is a main important feature on the basis of which one can diagnose the TN. Some specialists advocate the injection of alcohol in the distribution of 5th cranial nerve, the pain may disappear & other say if you give carbamazepine & if the patient responds to the medication then the diagnosis is TN. Laboratory investigations are not of much help in diagnosing TN. But MRI is the one, which is primarily used to rule out the other causes of TN. One important advancement of MRI is 3D volume for visualization of trigeminal nerve & the vessels, which detect the offending vessels in 80% of the cases (4).

Differential Diagnosis

Trigeminal neuralgia is to be differentiated from the following conditions.

- Local findings on face : otitis media, sinusitis, acute glaucoma, periorbital infection, dental caries, temporomandibular joint problem, herpes zoster.
- Persistent pain : cranial nerve compression, giant cell arteritis, optic neuritis, atypical facial pain.
- Episodic pain

No triggers present : cluster headache.

With triggers : TN and glossopharyngeal neuralgia.

- Neurological deficit Optical findings : multiple sclerosis, Rieder-para trigeminal neuralgia, cluster headache and Tolosa Hunt syndrome. Others : aneurysm, neurofibroma, meningioma and diabetic neuritis.

Management

There are three types of management strategies to treat TN (5)

1. Pharmacotherapy
2. Surgery
3. Combination of pharmacotherapy and surgery.

Typical Trigeminal Neuralgia

The treatment strategy is pharmacotherapy or microvascular decompression or the gangliolysis, stereotactic radiosurgery & peripheral neurodestructive procedures.

Atypical Trigeminal Neuralgia

Pharmacotherapy remains the important treatment in many cases Microvascular and neurodestructive surgery procedures can be tried but one has to be very careful because of the misdirection of the fibers.

Painful Trigeminal Neuralgia

In these cases microvascular decompression should be avoided. In patients with SLE, procedures like gangliolysis or peripheral neuro-destructive procedures are contraindicated & the only treatment is pharmacotherapy (6).

Pharmacotherapy (7)

1st line drug - Carbamazepine

2nd line drugs - Baclofen, lamotrigene, oxcarbamazepine, phenytoin, gabapentin, sodium valproate, topiramate, clonazepam

Commonly used drug is a carbamazepine whereas second line of drugs are prescribed once the patient either responds partially or becomes resistant to CBZ. There are newer drugs which are promising and could be had as a first line therapy along with carbamazepine.

1. Carbamazepine (CBZ)

The mainstay of drug treatment is with carbamazepine. It acts by blocking post tetanic potentiation, this in turn blocks the transmission of pain. Initially it is started with low dose of 100mg twice a day & gradually increasing upto 1200mg/day or till pain is relieved whichever is low. Maximum dose as approved by FDA is 1200 mg/day while EURO group use upto 1800 mg/day. Once the pain is relieved, the patient should be put on maintenance dose of 600-1200 mg/day for atleast 4-6 months before one plans to taper the medications.

2. Phenytoin

It is another wonderful drug, which is primarily used as an adjunctive to CBZ & baclofen. The dose is 300 mg /day & can be increased upto 600mg/day depending upon the response & tolerability of the patients.

3. Gabapentin

Gabapentin can be given in the dose of 900 mg/day, which can be increased upto 1800 mg/day & maximum dose can be achieved upto 2400 mg/day in 1-2 weeks time, till the pain is relieved.

4. Baclofen

Baclofen is the muscle relaxant & antispastic drug. It is very good 2nd line drug & can be used 5-10 mg t.i.d & can be increased upto 60 mg/day. Baclofen is used with other anticonvulsants & may have synergistic effect with CBZ. One warning is there that premature tapering of baclofen may lead to recurrence of pain and which may be difficult to control with medications.

Among pharmacological options, one can see that CBZ gives an initial relief of pain in about 80% cases, with phenytoin 60%, 65-74% with baclofen. Pain recurrence is seen upto 42-50% with CBZ, 75% with phenytoin, 70% with baclofen. Drugs like tizanidine, pimozone, ketamine, propocaine hydrochloride ophthalmic drops particularly with V1 type of trigeminal neuralgia & capsaicin cream locally over the face have been tried with variable effects, but no definite indications are available for these drugs (6).

Role of Surgery

There are following situations where surgery is indicated:

1. When medicines fail to produce expected results.
2. When the patient can't tolerate the medications & symptoms start worsening.
3. Demonstration of aberrant vessel on MRI.

Surgical Interventions

The goal of the surgery is to either damage or destroy the path of trigeminal nerve which is the basic cause of pain.

Currently available surgical options are:-

(A) Invasive Technique

1. Open Microvascular decompression
2. Percutaneous Radiofrequency rhizotomy
Retrogasserian glycerol rhizotomy
Ballon compression of trigeminal nerve

(B) Non-Invasive Technique

Radiosurgery Gamma knife radiosurgery for TN (GKRS) Peripheral approaches like cryotherapy & alcohol injection which were tried in the past are no longer used because they give rise to loss of sensation over the face & they are very crude methods & one would not really like to do them until & unless it is last procedure (8). The microvascular decompression (MVD) technique of Jannetta is the treatment of choice for TN (9,10) as it has advantages like- no numbness, immediate relief, effect lasts for years. However, certain drawbacks also have been noted like- craniotomy-a big procedure, 10-15% experience recurrence of pain which is managed with drugs or repeat MVD or destructive procedures.

Radiofrequency Rhizotomy (RFR)

RFR is based on the theory that at lower temperatures radiofrequency current selectively destroys the nociceptive unmyelinated C-fibers & the poorly myelinated A-delta fibers while sparing the heavily myelinated A-alpha & A-beta fibers which convey the touch, proprioceptive & motor impulses. Certain complications have been noticed with the procedure are keratitis, dysaesthesias, anaesthesia dolorosa, motor 5th nerve weakness, carotico-cavernous fistula & meningitis. The effect of procedure lasts for 1.5-2 years & pain recurrence is seen after months or years (11).

Percutaneous Ballon Compression (PBC)

It is also effective method in treating TN without creating significant numbness. The effect of PBC lasts for years. There is significant risk of masseter weakness (12,13).

Gammaknife Radiosurgery for Trigeminal Neuralgia (GKRS)

It is based on the principle of using focused radiation beam to alter axonal function in such a way to relieve pain. Radiosurgery is especially useful in the setting of TN which predominantly affects an older population with the potential for concurrent medical illness because of its minimally invasive character. The effect of GKRS takes 3 weeks to 3 months for pain relief to begin & lasts for 3-4 years (14-15).

Conclusion

Trigeminal Neuralgia is one of the most painful disorders known to mankind. It is one of the most common neurologic causes of facial pain & one has to make the correct diagnosis. The diagnosis is purely clinical, typical current like episodic pain with trigger zones at times.

In most of the cases (70%) the medical treatment is effective. Carbamazepine is the drug of choice. New drugs are quite promising & effective. As yet, there is no concrete evidence that they should be used as first line therapy. The patient with the disorder requires treatment both physically & mentally in order to get out of the pain phobia in patients with TN.

Patients demonstrating aberrant vessel on MRI need to undergo microvascular decompression. Surgery provides an effective option when pharmacotherapy fails. Surgery needs to be individualized for the needs & benefit of the patients. Drawbacks of the surgery like mastication problem & numbness of face have to be explained to the patient or attendants before going for surgery.

References

1. Adams RD, Victor M. Principles of Neurology. chapter 10. McGraw Hill, New York 2001. pp. 175-203.
2. Pascal J, Berciano J. Experience with headaches that start in elderly people. *J Neurol Neurosurg Psychiatry* 1994; 57: 1255-59.
3. Hamlegn PJ, King TT. Neurovascular compression in trigeminal neuralgia- A clinical & anatomical study. *J Neurosurg* 1992; 76: 548-54.
4. Frishberg BM. The utility of neuroimaging in evaluation of headache in patients with normal examination. *Neurology* 1994; 44: 1191-96.
5. Delzell JE, Grelle AR. Trigeminal neuralgia-New treatment options for a well known case of facial pain. *Arch Jam Med* 1999; 8: 264-68.
6. Fields HL. Treatment of trigeminal neuralgia. *N Engl J Med* 1996; 334: 1125-28.
7. Sweet WH. The treatment of trigeminal neuralgia. *N Engl J Med* 1986; 315: 174-80.
8. Kanpolat Y, Saur A, Beckar A, Berk C. Percutaneous radiofrequency trigeminal rhizotomy for treatment of idiopathic trigeminal neuralgia-25 years experience with 1800 patients. *Neurosurgery* 2001; 48(3): 524-32.
9. Barker FG. The long term outcome of microvascular decompression for trigeminal neuralgia. *N Engl J Med* 1996; 334: 1077-83.
10. Lovely TJ, Janetta PJ. Microvascular decompression for trigeminal neuralgia. *Neurosurg Clin Nor Am* 1997; 8(1): 11-29.
11. Yoon K B. Long term out come of thermocoagulation for Trigeminal neuralgia. *Anaesthesia* 1999; 54: 803-08.
12. Skirving DJ, Dan NG. A 20 year review of percutaneous ballon compression of the trigeminal ganglion. *J Neurosurg* 2001; 94(6): 913-17.
13. Bown JA, Gouda JJ. Percutaneous balloon compression of the trigeminal nerve. *Neurosurg Clin Nor Am* 1997; 8(1): 53-62.
14. Kondziolka D, Lunsford LD, Habeeq M, Flickinger JC. Gamma knife radiosurgery for trigeminal neuralgia. *Neurosurg Clin Nor Am* 1997; 8(1): 79-85.
15. Brisman R, Mooij R. Gammaknife radiosurgery for trigeminal neuralgia. Dose- volume histograms of brainstem & trigeminal nerve. *J Neurosurg* 2000; 93 (Suppl 3): 155.