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Trigeminal Neuralgia - Update in Our Knowledges

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Abstract

***Background:** Trigeminal neuralgia can be presented with chronic pain or acute pain depending on the cause, which varies with the patients. Chronic pain differs greatly from acute pain in terms of the pain persistence and adaptation. TN is the most successfully treated NP both medically and surgically. Trigeminal neuralgia is associated with poor activity of daily living, suicidal attempts and an overall decreased quality of life due to the unbearable pain.*

***Aim of the work:** the aim of this review was to illustrate the definitions and diagnosis of TGN and its pathology with discussion of the best methods Plasma of management.*

***Study design:** Narrative review article.*

***Conclusion:** TGN is a lifelong disease that requires expert strategies with life-long duration. RF is an effective, accurate and precise procedure that provides efficient pain relief to TGN sufferers. RF is suggested in the elderly because it is more beneficial to them in term of low morbidity and mortality.*

Keywords: *Trigeminal neuralgia – Radiofrequency – VDC-VAS score- Anticonvulsants.*

Introduction

Definition of TGN provided by the International Association for the Study of Pain (IASP) is; sudden, usually unilateral, severe brief stabbing recurrent pains in the distribution of one or more branches of the 5th cranial nerve (trigeminal nerve) while International Headache Society (HIS) define TNG as Painful unilateral affliction of the face, characterized by brief electric shock like pain limited to the distribution of one or more divisions of the trigeminal nerve. Pain is commonly evoked by trivial stimuli including washing, shaving, smoking, talking, and brushing the teeth, but may also occur spontaneously. The pain is abrupt in onset and termination and may remit for varying periods. (1-2)

Trigeminal neuralgia can be presented with chronic pain or acute pain depending on the cause, which varies with the patients. Chronic pain differs greatly from acute pain in terms of the pain persistence and adaptation. TN is the most successfully treated NP both medically and surgically. Trigeminal neuralgia is associated with poor activity of daily living, suicidal attempts and an overall decreased quality of life due to the unbearable pain. (3-5)

Trigeminal neuropathy, whether painful or non-painful, is associated with a structural lesion or systemic disease. It may be seen following direct trauma to the nerve (e.g. supra- and infra-orbital neuralgias following facial fractures); we also classify dysaesthesia and anaesthesia dolorosa following neuro-ablative procedures as trigeminal neuropathy. On occasion, it can be seen caused by severe arterial compression, usually from an ecstatic basilar artery. The pain description in this condition is different from that in TGN and more akin to that in painful peripheral neuropathy. Pain is usually constant and associated with allodynia and sensory loss. (6-8)

Clinically; two phenotypic forms of TN are usually recognized, typical and atypical TN. The hallmark of typical TN is paroxysmal pain, which is lancinating

in nature and occurs unilaterally in a trigeminal distribution. Paroxysmal pain is present in atypical TN as well, but patients often report it along with diffuse and chronic pain, which persist beyond the duration of a typical paroxysm, in the same trigeminal distribution areas. The paroxysmal pain distinguishes atypical TN from persistent idiopathic facial pain, which was previously known as atypical facial pain. (9-10)

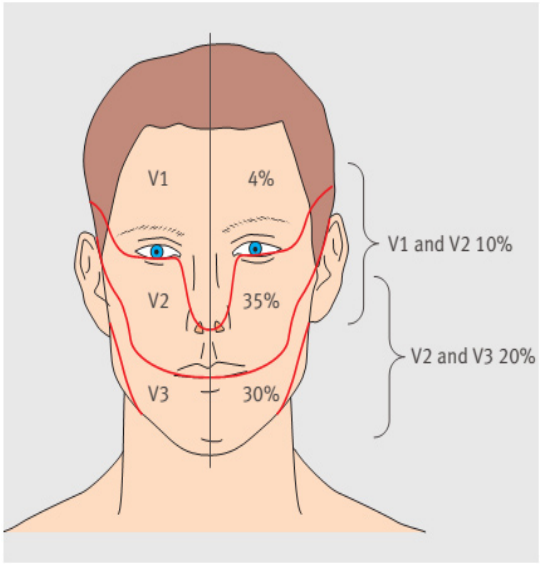

Fig 1. *Distribution of trigeminal neuralgia. (11)*

Patho-Physiology and Diagnosis

Evidence has been mounting that in a large proportion of cases, compression of the trigeminal nerve root at or near the dorsal root entry zone by a blood vessel is a major causative or contributing factor. There are several lines of evidence that support this view; (12)

First, novel imaging methods (MRI) and observations during posterior fossa surgery for TGN have consistently shown a blood vessel in contact with the nerve root. Second, elimination of the compression leads to long-term pain relief in most patients. Third, intra-operative recordings show immediate improvement in nerve conduction following decompression. Fourth, sensory functions recover as well following decompression (though this recovery is slower than that in nerve conduction). (13-15)

However, some patients present with trigeminal neuralgia and no nerve compression. Also, there are cases where the trigeminal nerve is being compressed yet the patient is not suffering from trigeminal neuralgia. A 12 year study have shown that trigeminal neuralgia has been associated with zone demyelination of the nerve root entry in multiple sclerosis (MS) patient and nerve root vascular compression patients. Another hypothesis is the TN is caused by the entrapment of the maxillary and mandibular nerves when they cross the ovale and rotundum foramen. (16)

The newest theory is bioresonance. Many neuro surgeons state that when the vibration frequency of a structure surrounding the trigeminal nerve becomes close to its normal frequency, the resonance of the trigeminal nerve occurs4. This occurrence can damage the nerves fibers preventing them from transmitting the correct impulses which can result in TN. (17)

Diagnostic Criteria for Classic Trigeminal Neuralgia

- Paroxysmal attacks of pain lasting from a fraction of a second to two minutes that affect one or more divisions of the trigeminal nerve.
- Pain has at least one of the following characteristics intense, sharp, superficial, or stabbing precipitated from trigger areas or by trigger factors.
- Attacks are similar in individual patients.
- No neurological deficit is clinically evident.
- Not attributed to another disorder. (18)

Investigations Should be Done

- Clarify the differential diagnosis; for example, by taking dental x rays

- Investigate whether there is an identifiable cause of the disease, particularly with a view to surgical cure. This is best done using magnetic resonance imaging. (19)

Meaney and colleagues developed a specific technique to optimally image the relationship of the nerve and the blood vessels in its vicinity (magnetic resonance tomographic angiography, MRTA). Essentially, by choosing specific scanning parameters to visualize blood vessels as high signal intensity structures and using thin slices, they were able to performer constructions around the nerve in any orientation. (20)

Common Conditions Should be Distinguished from Trigeminal Neuralgia: (21-22)

- Dental infection or cracked tooth
- Temporomandibular joint pain
- Persistent idiopathic facial pain (previously "atypical facial pain")
- Migraine
- Temporal arteritis

Treatment Methods for Trigeminal Neuralgia

Pharmacological Treatment

The ultimate goal of any treatment is to reduce pain and relieve symptoms. Strong evidence supports that carbamazepine should be offered to treat TNG pain (Level A), while good evidence supports that oxcarbazepine should be considered to treat TNG pain (Level B). The two drugs to consider as first-line therapy in TGN are CBZ (200-1200 mg/day) and OXC (600-1800 mg/day). (23-25)

Gabapentin is effective and widely used for neuropathic pain, though it lacks evidence in trigeminal

neuralgia. Use of gabapentin therefore relies on the similarities between trigeminal neuralgia and other neuropathic pain, rather than their obvious differences. Familiarity with use in other neuropathic pain has led many clinicians to choose this as second line for trigeminal neuralgia. (26)

Lamotrigine and baclofen have been suggested as alternative second line agents on the basis of small studies in trigeminal neuralgia. In practice, lamotrigine needs to be titrated over many weeks and has limited value in severe pain. Other drugs to consider are phenytoin, clonazepam, valproate, mexiletine, and topiramate. (27)

Surgical Techniques

Surgical techniques are; Gasserian ganglion percutaneous techniques, gamma knife, and microvascular decompression (**MVD).** There is weak evidence to support that early surgical therapy may be considered for patients with TGN refractory medical therapy (Level C). Also there is insufficient evidence to support or refute the effectiveness of the surgical management of TGN in patients with MS (Level U). (28)

Since the original theory, outlined by Dandyin 1925, of vascular compression as aprominent feature of TGN, it took almost half a century until MVD was accepted as one of the major surgical methods for treating this condition. (29)

TN does not have a surgical treatment that is 100 % efficient. All of the procedures come with risks and benefits. As of 2005, about 8000 TGN patients were undergoing surgical treatment in the United States. Surgery is proposed to patient whose TN is unresponsive to pharmacotherapy or if they are sensitive to possible side effects. Some patients can be treated with any of the surgical treatment available with the same probability on the outcome. In cases like that, personal preference and experience, attitudes toward risk on behalf of the patient and the surgeon, and clinical factors (such as the patient's age and health) generally suggest one procedure over another. (30-32)

Alcohol or Phenol Injection

Alcohol or phenol is injected within several locations of the trigeminal nerve. The goal of this procedure is to destroy selective pain fibers. This procedure is rarely use nowadays because of its low success rate and high recurrence rate within a short period of time. (33)

Radio Frequency

Radiofrequency (RF) treatment is defined as the delivery of short pulses of RF via a needle tip, thereby avoiding thermal lesions. This technique had been performed for various other conditions and has been shown to be effective and safe. There are contrasting opinions regarding the use of PRF treatment for TN, but in our opinion, one of the main reasons for this discrepancy is the insufficient PRF dose used in most studies. (34)

RF is a healing procedure with immediate effect. RF is sometimes preferred in elderly patients with limited life expectancy. This preference is cause by the fact that RF is an easy procedure with minimal side effects and provides relief for a shorter period of time than microvascular. RF is also the treatment option for any patients not responding to pharmacotherapy, patients that are in poor health condition or young patients who cannot tolerate the risk of posterior fossa surgery. (35) It is also worth mentioning that RF is used sometimes based on a bias recommendation of the physician. Most Physicians tend to be better or more knowledgeable at one particular procedure over another, so sometime unconsciously they will suggest one procedure over another. (36)

In this procedure, the patient lies comfortably in a supine position with continuous hemodynamic monitoring and the head slightly extended.. The C-arm is introduced in a postero-anterior fashion and rotated caudocranially to produce a submental view. The foramen ovale can be often already visualized with this view. The needle entry point is 2–3 cm from the corner of the mouth. An approach that worked well for us was to "bring the foramen ovale to the entry point" by manipulating the C-arm in a caudo-cranial orientation, which produced an excellent "tunnel view."

The skin over the needle entry point is anesthetized with 1% lidocaine. Using an aseptic technique, the needle is directed towards the ipsilateral pupil. Up to 0.75 mg/kg of propofol is used to sedate the patient during the initial needle penetration into the foramen ovale. Once the needle enters the foramen ovale into Meckel's cavity, the C-arm is then rotated laterally to ascertain the depth of penetration. The final position of the needle tip is just past the angle formed by the petrosal ridge of the temporal bone and the clivus.

The propofol sedation is discontinued, the patient is allowed to awaken, and sensory stimulation is carried out at 50 Hz. The definitive position of the electrode was verified by inducing paresthesia with sensory stimulation between 0.1–0.3 V in the fected painful area. PRF is then applied for 6 minutes at 45 V, with a pulse width of 10 ms and a pulse frequency of 4 Hz. The cut-off needle tip temperature was set at 42 °C and LRF applied for 2 minutes with cut-off needle tip temperature was set at 82 °C. (37)

Discussion

Ever al published series suggest a high level of initial success with MVD, most patients (87±98%) experiencing immediate pain relief. Those series that present the proportion of patients with unrelieved or recurrent pain using Kaplan knife show relatively similar results. At 2yr the incidence of complete pain relief is 75±80%. After 8±10 yr, this proportion has been reduced to 58±64%, with a further 4±12% suffering from minor recurrence only. (38)

Use of fuoroscopy, and stepwise increases of needle temperatures make this procedure relatively safe alternative. Most patients only need an overnight stay. Mortality is virtually nil and severe complications (cerebral haemorrhage, carotid-cavernous fistula, meningitis, and cranial nerve lesions) are very rare. (39)

The largest review till date, Kanpolat et al. reporrted the results for 1,600 patients who had undergone percutaneous RF trigeminal rhizotomy over a period of 25 years. The complications reported in this large study were decreased corneal reflex (5.7%), weakness and paralysis of the masseter muscle (4.1%), dysesthesia (1%), anesthesia dolorosa (0.8%), keratitis (0.6%), and temporary paralysis of the third and fourth cranial nerves (0.8%). Complications like anesthesia dolorosa, though considered rare by some, are regarded to be worse than the initial pain of TN. (40)

It was perhaps for this reason that PRF was explored as a less risky alternative. However, Erdine et al. demonstrated in a double-blinded trial that PRF was remarkably less efficacious that conventional RF. Their results demonstrate significant pain reductions in all patients treated with conventional RF, while only 2 of the 20 patients in the PRF group experienced this level of pain relief. (41)

A systematic review of ablative neurosurgical techniques for the treatment of TN evaluated 166 studies reporting RF thermocoagulation, glycerol rhizolysis, balloon compression of the trigeminal ganglion, and stereotactic radiosurgery and concluded that RF thermocoagulation offers the highest rates of complete pain relief (42).

In our opinion, RF trigeminal rhizotomy is still an invaluable technique that has provided pain relief for many patients with TN. In our opinion, PRF needs to be performed to a similar degree to be compared in the same light. (43)

RF is suggested in the elderly because it is more beneficial to them in term of low morbidity and mortality. Studies show that RFL provided a high initial pain relief, with a pain free rate of 50.4% after a 5 year follow up. After 37 years of experience in the TN field and base on the results from their most recent study, Humberto Santo Neto et al concluded that TN is a lifelong disease that requires expert strategies with life-long duration. (44)

Conclusion

TGN is a lifelong disease that requires expert strategies with life-long duration. RF is an effective, accurate and precise procedure that provides efficient pain relief to TGN sufferers. RF is suggested in the elderly because it is more beneficial to them in term of low morbidity and mortality.

References

[1] The International Classification of Headache Disorders: 2nd edition. Cephalalgia. 2004; 24 (Suppl 1):9-160.

[2] Burchiel KJ. A new classification for facial pain. Neurosurgery.

[3] Abhinav K, Love S, Kalantzis G, Coakham HB, Patel NK. Clinicopathological review of patients with and without multiple sclerosis treated by partial sensory rhizotomy for medically refractory trigeminal neuralgia: a 12-year retrospective study. [Internet]. Clin Neurol Neurosurg. 2012; 114:361–5. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22130049. [PubMed: 22130049]

[4] Azar M, Yahyavi ST, Bitaraf MA, Gazik FK, Allahverdi M, Shahbazi S, et al. Gamma knife radiosurgery in patients with trigeminal neuralgia: quality of life, outcomes, and complications. [Internet]. Clin Neurol Neurosurg. 2009; 111: 174–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/18995955. [PubMed: 18995955]

[5] Barker FG, Jannetta PJ, Bissonette DJ, Larkins MV, Jho HD. The long-term outcome of microvascular decompression for trigeminal neuralgia. [Internet]. N Engl J Med. 1996; 334:1077–83. Available from: http://www.ncbi.nlm.nih.gov/pubmed/8598865. [PubMed: 8598865]

[6] Besson JM. The neurobiology of pain. [Internet]. Lancet (London, England). 1999; 353:1610–5. [cited 2015 Aug 3] Available from: http://www.ncbi.nlm.nih.gov/pubmed/10334274.

[7] Bozkurt M, Al-Beyati ESM, Ozdemir M, Kahilogullari G, Elhan AH, Savas A, et al. Management of bilateral trigeminal neuralgia with trigeminal radiofrequency rhizotomy: a treatment strategy for the life-long disease. [Internet]. Acta Neurochir (Wien). 2012; 154: 785–91. discussion 791–2 Available from: http://www.ncbi.nlm.nih.gov/pubmed/22392016

[8] Brisman R. Trigeminal neuralgia: diagnosis and treatment. [Internet]. World Neurosurg. 2011; 76:533–4. [cited 2015 Aug 3] Available from: http://www.Worldneurosurgery.org/article/S1878875011007637/fulltext. [PubMed: 22251500]

[9] Bennetto L, Patel NK, Fuller G. Trigeminal neuralgia and its management. BMJ. 2007; 334 (7586): 201-5.

[10] PJ, McLaughlin MR, Casey KF. Technique of microvascular decompression. Technical note. Neurosurg Focus. 2005;18(5):E5.

[11] Jannetta PJ, Tew JM, Jr. Treatment of trigeminal neuralgia. Neurosurgery. 1979;4(1):93-4.

[12] Young RF, Vermulen S, Posewitz A. Gamma knife radiosurgery for the treatment of trigeminal neuralgia. Stereotact Funct Neurosurg. 1998;70 (Suppl 1):192-9.

[13] Mullan S, Lichtor T. Percutaneous micro compression of the trigeminal ganglion for trigeminal neuralgia. J Neurosurg. 1983; 59(6): 1007-12.

[14] Hakanson S. Trigeminal neuralgia treated by the injection of glycerol into the trigeminal cistern. Neurosurgery. 1981;9 (6):638-46.

[15] Sweet WH, Wepsic JG. Controlled thermo coagulation of trigeminal ganglion and rootlets for differential destruction of pain fibers. 1. Trigeminal neuralgia. J Neurosurg. 1974; 40(2): 143-56.

[16] Lopez BC, Hamlyn PJ, Zakrzewska JM. Systematic review of ablative neurosurgical techniques for the treatment of trigeminal neuralgia. Neuro surgery2004; 54:973-82.

[17] Zakrzewska JM. Facial pain: neurological and non-neurological. J Neurol Neurosurg Psychiatry 2002; 72(suppl 2): ii27-32.

[18] Zakrzewska JM. Diagnosis and differential diagnosis of trigeminal neuralgia. Clin J Pain 2002; 18:14-21.

[19] Love S, Coakham HB. Trigeminal neuralgia: pathology and pathogenesis. Brain 2001; 124: 2347-60.

[20] Cheng TM, Cascino TL, Onofrio BM. Comprehensive study of diagnosis and treatment of trigeminal neuralgia secondary to tumors. Neurology 1993; 43: 2298-302.

[21] Patel NK, Aquilina K, Clarke Y, Renowden SA, Coakham HB. How accurate is magnetic resonance angiography in predicting neuro vascular compression in patients with trigeminal neuralgia? A prospective, single-blinded comparative study. Br J Neurosurg 2003; 17: 60-4.

[22] Wiffen P, Collins S, McQuay H, Carroll D, Jadad A, Moore A. Anticonvulsant drugs for acute and chronic pain. Cochrane Database Syst Rev 2005; (3): CD001133.

[23] Kim, J.; Burchiel, M. Trigeminal Neuralgia Surgery: Overview, Preparation, Technique [Internet]. Medscape. 2014. Available from: http://emedicine.medscape.com/article/248933-overview#showall

[24] Lord SM, Bogduk N. Radiofrequency procedures in chronic pain [Internet]. Best Pract Res Clin Anaesthesiol. 2002; 16: 597–617. Available from: http://www.researchgate.net/publication/10960123_Radiofrequency_procedures_in_chronic_pain. [PubMed:12516 894]

[25] Punyani SR, Jasuja VR. Trigeminal neuralgia: An insight into the current treatment modalities. [Internet]. J oral Biol craniofacial Res. 2012; 2: 188–97. Available from: http://jobcr.org.marlin-prod.literatumonline.com/article/S221242681200053X /fulltext.

[26] Punyawudho B, Ramsay ER, Brundage RC, Macias FM, Collins JF, Birnbaum AK. Population pharmacokinetics of carbamazepine in elderly patients. [Internet]. Ther Drug Monit. 2012; 34:176 81. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3777257&tool=pmcentrez&rendertype=abstract.[PubMed: 22406657].

[27] Revuelta-Gutierrez R, Martinez-Anda JJ, Coll JB, Campos-Romo A, Perez-Peña N. Efficacy and safety of root compression of trigeminal nerve for trigeminal neuralgia without evidence of vascular compression. [Internet]. World Neurosurg. 2013; 80:385–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22889619. [PubMed: 22889619].

[28] Erdine S, Ozyalcin NS, Cimen A, Celik M, Talu GK, Disci R. Comparison of pulsed radiofrequency with conventional radiofrequency in the treatment of idiopathic trigeminal neuralgia. Eur J Pain. 2007;11(3):309-13.

[29] Tanaka N, Yamaga M, Tateyama S, Uno T, Tsuneyoshi I, Takasaki M. The effect of pulsed radiofrequency current on mechanical allodynia induced with resiniferatoxin in rats. Anesth Analg. 2010;111(3):784-90.

[30] Siccoli MM, Bassetti CL, Sandor PS. Facial pain: clinical differential diagnosis. Lancet Neurol. 2006; 5(3):257-67.

[31] Sato J, Saitoh T, Notani K, Fukuda H, Kaneyama K, Segami N. Diagnostic significance of carbamazepine and trigger zones in trigeminal neuralgia. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2004; 97:18-22.

[32] Lopez BC, Hamlyn PJ, Zakrzewska JM. Stereotactic radiosurgery for primary trigeminal neuralgia: state of the evidence and recommendations for future reports. J Neurol Neurosurg Psychiatry 2004; 75:1019-24

[33] Li ST, Pan Q, Liu N, Shen F, Liu Z, Guan Y. Trigeminal neuralgia: what are the important factors for good operative outcomes with microvascular decompression. Surg Neurol2004; 62:400-4.

[34] Kalkanis SN, Eskandar EN, Carter BS, Barker FG. Microvascular Microvascular decompression surgery in the United States, 1996 to 2000: mortality rates, morbidity rates, and the effects of hospital and surgeon volumes. Neurosurgery 2003; 52: 1251-61.

[35] Lopez BC, Hamlyn PJ, Zakrzewska JM. Systematic review of ablative neurosurgical techniques for

the treatment of trigeminal neuralgia. Neuro surgery. 2004; 54(4): 973-82. discussion 82-3.

[36] van Kleef M, van Genderen WE, Narouze S, Nurmikko TJ, van Zundert J, Geurts JW, et al. 1. Trigeminal neuralgia. Pain Pract. 2009; 9(4): 252-9.

[37] Goads by PJ, Lipton RB. Areview of paroxysmal hemicranias, SUNCT syndrome and other short-lasting headaches with autonomic feature, including new cases. Brain 1997; 120:193±203.

[38] Goto F, Ishizaki K, Yoshikawa D, Obata H, AriiH, Terada M. The long lasting effects of peripheral nerve blocks for trigeminal neuralgia using a high concentration of tetracaine dissolved in bupivacaine. Pain1999; 79: 101±3.

[39] Gregg JM, Small EW. Surgical management of trigeminal pain with radiofrequency lesions of peripheral nerve. J Oral Maxillofac Surg 1986; 44: 122±5.

[40] Ha Êkansson S. Trigeminal neuralgia treated by the injection into the trigeminal cistern. Neurosurgery 1981; 9: 638±46 47HaÊ.

[41] Ashkan K, Marsh H. Microvascular decompression for trigeminal neuralgia in the elderly: a review of the safety and efficacy. Neurosurgery2004; 55:840-8.

[42] Zakrzewska JM, Lopez BC, Kim SE, Coakham HB. Patient reports of satisfaction after microvascular decompression and partial sensory rhizotomy for trigeminal neuralgia. Neurosurgery 2005; 56: 1304-11.

[43] Nurmikko TJ, Eldridge PR. Trigeminal neuralgia—pathophysiology, diagnosis and current treatment. Br J Anaesth 2001; 87: 117-32.

[44] Zakrzewska JM, Jassim S, Bulman JS. A prospective, longitudinal study on patients with trigeminal neuralgia who underwent radiofrequency thermo coagulation of the Gasserian ganglion. Pain 1999; 79:51-8.

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