Review Article

Trigeminal Neuralgia: Etiopathogenesis, Diagnostic criteria and Treatment Modalities-A Review

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Received: 02-07-2013

Revised: 16-09-2013

Accepted: 28-09-2013

Abstract:
Trigeminal neuralgia (TN), the most common and the most serious of the facial neuralgias, is characterized by an extremely severe electric shock like or lancinating pain limited to one or more branches of the trigeminal nerve. Among the very many diagnostic and treatment options in the management of TN only very few have proven their efficacy to modern evidence-based medicine standards. For thorough and accurate management, a stepwise diagnostic and treatment approach is recommended. Surgical management should be recommended if sufficient and compliant medical therapy failed. The aim of this review article is to discuss the etiopathogenesis, diagnostic criteria, and treatment strategies for trigeminal neuralgia.

Key words: Carbamazepine, Cranial Nerve, Pain, Trigeminal neuralgia.

This article may be cited as: Garg P, Ashutosh, Pahuja M, Nagarth H, Singh S, Kaur RK, Aggarwal K. Trigeminal Neuralgia: Etiopathogenesis, Diagnostic criteria and Treatment Modalities-A Review. J Adv Med Dent Scie 2013;1(2):106-111.

Introduction

Trigeminal neuralgia (TN), the most common and the most serious of the facial neuralgias, is characterized by an extremely severe electric shocklike or lancinating pain limited to one or more branches of the trigeminal nerve. In the majority of cases the pain is located in the maxillary or mandibular distribution of the nerve.[1] Trigeminal neuralgia is diagnosed in 6 of every 1, 00,000 persons every year.[1] The onset is usually in middle or old age but young adults and children can also be affected.[2] The etiopathogenesis of this lesion is becoming clearer. A wide range of medical and surgical treatments has been developed and introduced, usually without

randomised clinical trials. As a result, uncertainty remains about how best to use the available treatments.[3] The purpose of this review article is to discuss the etiopathogenesis, diagnostic criteria, and treatment strategies for trigeminal neuralgia.

Etiopathogenesis

Currently, there are three most popular TN aetiologic theories. The basis of first theory is diseases-related, second is based on direct trauma to the nerve and the basis of third theory relates to polyetiologic origin of the disease. However, for most patients with TN, there is no identifiable cause.[4,5] Because patients suffering from TN often have vascular diseases some authors suggested vascular theory of TN aetiology. However, there is no evidence that supports direct relation of blood vessels pathology to TN.[4,6,7,8]

Some authors have suggested the importance of multiple sclerosis in TN aetiology.[4] However, others have disputed this link because TN is reported to occur only in 0.9% to 4.5% of patients that had multiple sclerosisis.[4,9,10,11] Chronic inflammation of maxillary sinuses and other

ear, nose and throat (ENT) inflammatory disorders may be implicated as a direct cause of TN development.[12,13,14] Some authors suggest that the cause of the TN can be related to the compression syndrome, and the most popular is Neurovascular compression hypothesis. Arteriovenous malformation may evoke neurovascular compression at the root entry zone. Although the vascular compression theory is popular, it cannot justify the varied phenomena associated with the TN.[4]

Pathogenesis of TN is one of the most complicated, mysterious and controversial topics. Many theories and hypotheses concerning peripheral and central pathogenetic mechanisms have been proposed. Earlier TN was characterized as a functional disease because there was no evidence of morphologic changes in the trigeminal nerve.[4] However, Kerr[15] examined histologically the rhizotomy specimens from the TN patients and found that morphological nerve changes existed typically for interstitial neuritis, neural fibers demyelization, and perineural and endoneural sclerosis. Later published data addressing morphological changes occurred not only in peripheral branches but also in central structures of trigeminal nerve.[4] Central mechanisms theory assumes that TN starts due to thalamus[16], nuclei of trigeminal nerve[17], encephalic trunk or cerebral cortex injury.[18,19] However, there is a lack of objective evidence supporting the theories of central and peripheral TN pathogenic mechanism.

The peripheral pathogenetic mechanism of trigeminal neuralgia is induced by progressive dystrophy in the peripheral branches of the trigeminal nerve which can be evoked by the compression syndrome (neurovascular compression due to neoplasms, narrowed bone canals and others) or allergic-immune reaction (mast cell degranulation and histamine release). This predetermines long-lasting afferent impulsation and the formation of a central pathogenetic mechanism (a stable pathologic paroxysmal type irritation focus in the central nerve system). Patients with susceptive trigeminal neuralgia should be examined carefully by specialists who have expertise in assessing and diagnosing of possible pathological processes and be able to eliminate the contributing factors so the trigeminal neuralgia can be properly managed.[4]

TN attack was described as multineuronal reflex for the first time by Williams[20], which involves the following structures: trigeminal and facial nerves systems, formation reticularis, diencephalon nucleus and cortex of the brain. Others[18,21] have indicated that

afferent physiologic stimulation of trigeminal nerve receptors can induce paroxysmal excitation focus on central structures that generates efferent impulses to the peripheries.

Diagnostic Criteria[1]

- The onset of a pain: attack is abrupt, often initiated by a light touch to a specific and constant trigger point.
- The pain is extreme, paroxysmal, and lancinating.
- The duration of a single pain spasm is less than2 minutes, although the overall attack may consist of numerous repeating spasms of short duration.
- For several minutes after an attack (‘the refractory period”), touching the trigger point usually cannot induce additional attacks.
- The pain must be limited to the known distribution of one or more branches of the trigeminal nerve with no motor deficit in the affected area.
- The pain is dramatically diminished, at least initially, with the use of carbamazepine.
- Spontaneous remissions occur, often lasting more than 6 months, especially during the early phase of the disease.

Treatmnent Modalities

There is a huge variety of pharmacological and surgical treatment options for TN that are effective and widely used. It is generally recommended to start with medical therapy and consider surgical procedures in patients who are refractory to medical treatment.[22]

Medical treatment

Medical treatment for trigeminal neuralgia has been the subject of several Cochrane systematic reviews.[3,23,24,25] Carbamazepine is the drug of choice as per the available evidence.[3,25,26] The mechanism of action of carbamazepine may relate to the blockade of voltage-sensitive sodium channels resulting in the stabilization of hyperexcited neural membranes, inhibition of repetitive firing or reduction of propagation of synaptic impulses.[22] Many patients develop adverse effects, however, though most can continue taking the drug.

If carbamazepine has adverse effects Oxcarbazepine is a prodrug of carbamazepine that is often better tolerated; it provides a logical,[27] if largely unproved,[26] alternative when carbamazepine has provided pain relief but has had unacceptable adverse effects. The risk of allergic crossreactivity between carbamazepine and oxcarbazepine is about 25%, so oxcarbazepine is best avoided in carbamazepine allergy.[3]

Gabapentin is effective and widely used for neuropathic pain, though it lacks evidence in trigeminal neuralgia.[24] 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.[3]

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.[26]

Surgical treatment

Surgical treatments are generally reserved for patients with debilitating pain refractory to an adequate trial of at least three drugs including CBZ in sufficient dosage.[22] Surgical approaches are performed when medication cannot control pain or patients cannot tolerate the adverse effects of the medication, or in medically complex patients with polypharmacy for other conditions.[28]

Percutaneous procedures on the Gasserian ganglion, gamma knife and microvascular decompression (MVD) are recommended, efficacy-proven surgical treatment options for medical refractory TN. Surgery for TN is either destructive (ablative), where the trigeminal nerve sensory function is intentionally destroyed, or non-destructive, where the trigeminal nerve is decompressed preserving its normal function. Gasserian ganglion percutaneous techniques are all destructive and include radiofrequency thermocoagulation, balloon compression and percutaneous glycerol rhizolysis. In gamma knife surgery, a focused beam of radiation is aimed at the trigeminal root in the posterior fossa.[22] Gamma knife radiosurgery (GKS) uses gamma rays produced by cobalt-60 sources and 201 beams of radiation focus on a target. Surrounding normal tissue is minimally affected, resulting in few adverse effects. Proximal root entry zone, the retrogasserian part of the trigeminal nerve, and brainstem are the targets for irradiation.[28,29,30,31,32]

Partial Sensory Rhizotomy is performed in addition to or in place of MVD, in whom posterior fossa exploration fails to reveal significant compression of the trigeminal sensory root, in whom MVD is technically infeasible, or in whom MVD results in poor results and no significant vascular contact was present at the time of reoperation.[28,33,34,35,36]

Cyberknife Radiosurgery uses x-ray produced by linear accelerator radiation. CyberKnife uses a single high-energy photon beam fixed to a robotic arm. Unlike the Gamma Knife, a head frame is not required. A patient is fixed to the treatment table with a firm plastic mask and the robotic arm is guided by a series of x-ray images of the skull taken during irradiation.[28,37]

Other procedures that have been used include peripheral alcohol block, peripheral neurectomy, peripheral glycerol injection, curettage of the jawbone cavities, injection of 10% phenol in glycerol, peripheral radiofrequency thermocoagulation, and helium-neon laser therapy.[28,38,39,40]

Conclusion

Among the very many diagnostic and treatment options in the management of TN only very few have proven their efficacy to modern evidence-based medicine standards. For thorough and accurate management, a stepwise diagnostic and treatment approach is recommended. Surgical management should be recommended if sufficient and compliant medical therapy failed.

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Source of support: Nil

Conflict of interest: None declared