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A Review Paper of Medical Treatment on Trigeminal Neuralgia

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Abstract: *The highly incapacitating condition known as trigeminal neuralgia (TN) is characterized by recurrent bouts of facial pain that are extremely painful, brief, and electric shock-like. It is recommended to use new diagnostic criteria that subclassify trigeminal neurovascular conflict or an underlying neurological disorder as the cause of trigeminal neuralgia because they enable for a more accurate patient assessment and aid in decisions regarding medical and surgical treatments. As part of the diagnostic process, MR imaging, including high-resolution trigeminal scans, should be carried out. The medicines of preference are carbamazepine and oxcarbazepine. Baclofen, lamotrigine, gabapentin, pregabalin, type A botulinum toxin, and gabapentin can all be used alone or in conjunction with other treatments. If the pain cannot be adequately managed or the medical treatments are not well tolerated, surgery should be explored. In patients with trigeminal neurovascular conflict, trigeminal microvascular decompression is the first-line surgical procedure; however, neuroablative surgical treatments may be recommended if MR imaging does not reveal any neurovascular contact, if the patient is deemed too frail for microvascular decompression, or if the patient does not want to take the risk*

Keywords: Trigeminal neuralgia, Pain, Neuropathic, Vasculoneural conflict, Dorsal root entry zone, Superior cerebellar artery, Basilar artery, Vertebral artery, Petrosal vein, Multiple sclerosis

I. INTRODUCTION

Pain is described as "an unpleasant and negative sensory and emotional experience associated with actual or potential tissue damage" by the International Association for the Study of Pain.[1] The kind of pain is determined by its location, the type of malfunction in the specific region, and the stage of the disease.

Trigeminal neuralgia (TN) is a unilateral condition characterized by transient electric shock-like symptoms that occur abruptly and are localized to one or more divisions of the trigeminal nerve. [2] The disease is more frequent in women and more common in people aged 50-70 years. [3,4] It is the most well-known neuropathic pain of the face, and it has been proved to be extremely unpleasant to the patient's well-being. [5]. Neuralgia is a sign indicating nerve failure in the brain stem or in the nerve segment leading to the trigeminal ganglion, which is located at the base of the middle cranial fossa.

The main etiological factors responsible for neuralgia include vasculoneural conflict, which is caused by an overlaying blood vessel [6] compressing the trigeminal nerve near the dorsal root entry zone [6-10] at the site of neural connection to the brain stem, within the region of the superior cerebellar artery, the basilar artery, the vertebral artery, or the petrosal vein. Neuralgia can be caused by a head injury or an inflammation of the nerve within its myelin sheath. Other disorders, such as multiple sclerosis or tumors that compress the nerve and disrupt its function, may also be related with the condition. [11,12]

II. MATERIALS AND METHODS:

Trigeminal neuralgia research was gathered from journals with a PubMed Index. The articles gathered were based on the therapy and diagnosis of trigeminal neuralgia pain.

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III. DISCUSSION:

Anatomy:

The trigeminal nerve is part of the fifth cranial pair (CN V). It is both a sensory and motor nerve, with a big sensory root and a tiny motor root. The sensory root sends sensory information from the unilateral hemi side and is separated into three branches, each of which corresponds to a distinct skin region (dermatome): V1, V2, and V3. The unilateral masticator muscles are innervated by the motor root. In MRI, this root cannot be separated from the sensory root. Over the whole course, it shares a shared extracranial pathway with the common trunk of the nerve and root of CN V3.[13]The gasser a ganglion is found in the petrous bone's trigeminal fossa (Meckel cave) in the middle cranial fossa. It is made up of first-order general somatic sensory fibers that transmit pain, temperature, and touch. The three divisions of the trigeminal nerve (ophthalmic, maxillary, and mandibular) are formed by the peripheral processes of neurons in the ganglion. The cranium's ophthalmic division escapes through the superior orbital fissure, while the maxillary and mandibular divisions exit through the foramen rotundum and foramen ovule, respectively.

The trigeminal nerve transmits the bulk of nociceptive impulses from the orofacial area. Pseudo-unipolar neurons with cell bodies in the trigeminal (gasserian or semilunar) ganglion transmit action potentials from its peripheral branches, ophthalmic (V1), maxillary (V2), and mandibular (V3).

The central processes of these cells follow the trigeminal sensory root from the trigeminal ganglion and enter the lateral section of the pons in a location known as the trigeminal root entry zone (REZ).[14]

Causes:

The function of the trigeminal nerve is interrupted in trigeminal neuralgia, commonly known as tic douloureux. Contact between a regular blood vessel — in this example, an artery or a vein — and the trigeminal nerve at the base of your brain is usually the source of the problem. This touch exerts strain on the nerve, causing it to malfunction.

While blood vessel compression is one of the more prevalent causes of trigeminal neuralgia, there are several alternative possibilities. Some may be linked to multiple sclerosis or another illness that destroys the myelin sheath that protects certain nerves. A tumour compressing the trigeminal nerve can also cause trigeminal neuralgia.

Trigeminal neuralgia can occur in certain persons as a result of a brain lesion or other problems. In other circumstances, trigeminal neuralgia is caused by surgical damage, stroke, or facial trauma.

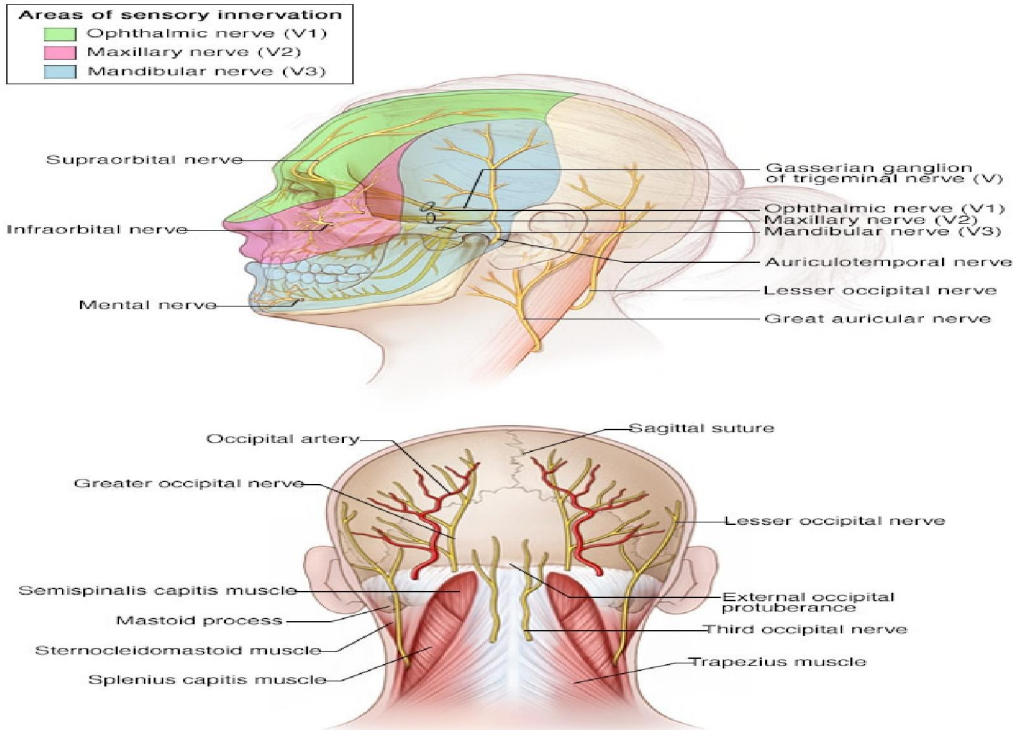

Fig. Trigeminal neuralgia.

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Diagnostic criteria and classification:

Recurrent paroxysms of unilateral facial pain restricted to the trigeminal distribution, lasting from a fraction of a second to 2 minutes, severe in intensity with an electric shock-like shooting, stabbing, or sharp quality, and precipitated by innocuous stimuli (see box 1) are required by the International Classification of Headache Disorders third edition (ICHD-3) criteria for TN.[15]

Box 1 International Classification of Headache Disorders edition 3 (ICHD-3) diagnostic criteria for trigeminal neuralgia[15]
Recurrent paroxysms of unilateral face pain in one or more divisions of the trigeminal nerve, with no radiation beyond, and meeting criteria B and C. B. Pain has the following characteristics: Ranging from a fraction of a second to two minutes. Extreme ferocity. Shooting that is electric shock-like, stabbing, or keen in character. C. Caused by insignificant stimuli within the affected trigeminal distribution. D. Is not better explained by another ICHD-3 diagnosis

IV. DIFFERENTIAL DIAGNOSIS

The clinical diagnosis of TN is based on a thorough history and examination. Though it is frequently thought to be a simple diagnosis, its differential diagnosis can be difficult because to the significant overlap with other neuropathic and neuralgiform headache and oro-facial pain diseases. Table 1 lists the most common TN differential diagnosis.

We've gone through several specific differential diagnoses in further detail below because they can be tricky in neurological clinical practice.

Table 1 Differential diagnosis of trigeminal neuralgia

Dental causes	▶ Dental caries ▶ Pulpitis ▶ Dental sensitivity ▶ Periodontal disorders ▶ Pericoronitis ▶ Cracked tooth ▶ Alveolar osteitis
Sinus causes	▶ Maxillary sinusitis
Salivary gland causes	▶ Salivary stone
Temporomandibular joint causes	▶ Temporomandibular disorders
Neuropathic pain	▶ Glossopharyngeal neuralgia ▶ Nervus intermedius neuralgia ▶ Post-herpetic neuralgia ▶ Post-traumatic trigeminal neuropathy ▶ Painful trigeminal neuropathies ▶ Atypical odontalgia ▶ Burning mouth syndrome
Trigeminal autonomic cephalalgias	▶ SUNCT/SUNA ▶ Paroxysmal hemicrania ▶ Cluster headache ▶ Hemicrania continua
Other	▶ Persistent idiopathic facial pain ▶ Primary stabbing headache

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Treatment:

Given the intensity of the pain and disability caused by TN, rapid pain treatment is critical.

Nonsteroidal anti-inflammatory drugs, opioids, or a brief course of oral steroids may be used to relieve symptoms. However, in all situations, daily preventive medication is advised.

Medication can be used to treat TN, although surgery may be required in some situations.

Medical Treatment:

Carbamazepine is used as first-line therapy and is successful in about 90% of instances [16]. Exacerbations of pain in the morning can be avoided by using an extended-release formulation at night. Gabapentin is a second-line therapy for trigeminal neuralgia, with only a small number of significant side effects [17]. Furthermore, it is neither metabolized or bound to serum protein. As a result, it can be administered safely in older individuals [17].

In a recent trial, Oxcarbamazepine demonstrated comparable effectiveness to carbamazepine while having a reduced frequency of unfavorable side effects [16]. As a result, it can be used to treat TN.

Because some individuals experience spontaneous remissions, tapering drugs might be explored when the patients are asymptomatic. If the symptoms return, the dosage should be raised to the therapeutic level. However, it is not always appropriate since some patients are concerned about the next pain attack [18].

Surgical treatment:

In individuals with persistent pain or terrible drug side effects, invasive treatments may provide relief.

Peter Jannetta was the first to conduct microvascular nerve decompression in TN patients in 1967 [19].

Barker's retrospective research of microvascular nerve decompression in TN patients found total immediate postoperative improvement in 82% of patients and partial relief in 16%. After one year, 75% of patients were symptom-free, and after ten years, 64% were pain-free [20]. Death (0.2%), brainstem infarction (0.1%), severe facial numbness (1.6%), severe ipsilateral hearing loss (1.1%), and cerebrospinal fluid leak (1.5%) were among the major consequences. Intraoperative brainstem evoked responses have been shown to lower the number of problems [20].

Radiofrequency thermal coagulation, retro-gasserian glycerol injections, and trigeminal ganglion balloon compression are less invasive percutaneous techniques for the treatment of trigeminal neuralgia, particularly in older patients and those with comorbidities [21].

All of these treatments irreversibly damage the trigeminal ganglion, causing face numbness, dysesthesia, and corneal keratitis. Observational studies imply that thermocoagulation may give more pain alleviation than glycerol rhizolysis but may produce lasting dysesthesia [22]. Glycerol rhizolysis, on the other hand, is beneficial for three or more years and must be repeated when symptoms reappear [22].

Stereotactic gamma knife radiosurgery is a non-invasive, non-destructive therapy that uses a focused beam of gamma radiation to treat the trigeminal root entrance zone. Lars Leksell developed it in 1951 to treat trigeminal neuralgia. The treatment was not employed for some years due to a lack of high-quality neuroimaging for targeting [23].However, developments in MR imaging and the limits of destructive therapies have resulted in growing interest in this technology. In one research, this method reduced pain in 94% of TN patients. Furthermore, Gamma knife radiosurgery has a very low risk of trigeminal dysfunction and is better suited for older patients or those with concomitant condition.

Finally, repeated transcranial magnetic stimulation of the contralateral motor cortex is a novel technique being investigated for the treatment of a variety of pain syndromes, including trigeminal neuralgia. The approach is currently being tested. More research is needed to determine the optimum treatment regimen and the procedure's long-term tolerability [24].

Pain Stimulator Placement is the most recent approach for relieving TN pain. The surgeon inserts microscopic electrodes beneath the skin at the trigeminal nerve location. Small impulses are employed via these electrodes to block misfiring signals, stopping the nerve from transmitting incorrect data to the brain [25].

Microvascular decompression (MVD) is a surgical operation used to reduce the symptoms (pain, muscle twitching) produced by an artery or vein compressing a nerve. MVD is performed by surgically opening the skull (craniotomy) and exposing the nerve at the base of the brainstem so that a small sponge may be inserted between the compressing vascular and the nerve. This sponge protects the nerve from the pulsating effect and blood vessel pressure[26]. The

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mortality rate for MVD is between 0.2% and 0.5%. Postoperative morbidity such as cerebrospinal fluid (CSF) leak, infarct, or hematoma development occurs at a rate of 4%.[27].

Ayurvedic Treatment

Trigeminal neuralgia is a painful disorder that affects the trigeminal nerve, which transmits feelings from the face to the brain. Ayurvedic therapy can help control the symptoms of trigeminal neuralgia and enhance the affected people' quality of life.[28]

Ayurvedic trigeminal neuralgia treatment often consists of a combination of herbal medicines, dietary adjustments, and lifestyle changes. Ayurvedic medicines that are widely utilised for this illness include:

Ashwagandha contains anti-inflammatory and analgesic effects that can assist with the pain and inflammation associated with trigeminal neuralgia.

Guggulu is a resin derived from the Commiphora mukul tree that contains anti-inflammatory characteristics that can help decrease inflammation and discomfort in afflicted regions.[29]

Turmeric includes a chemical called curcumin, which has anti-inflammatory properties.Trigeminal neuralgia is a painful disorder that affects the trigeminal nerve, which transmits feelings from the face to the brain. Ayurvedic therapy can help control the symptoms of trigeminal neuralgia and enhance the affected people' quality of life.[30]

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Turmeric includes a chemical called curcumin, which has anti-inflammatory properties.

Brahmi is an Ayurvedic herb that can aid enhance nervous system function and decrease inflammation.

Shankhapushpi: This herb can aid in the reduction of tension and anxiety, both of which are major causes for trigeminal neuralgia.[32]

Ayurvedic therapy for trigeminal neuralgia may include dietary adjustments, such as avoiding spicy and acidic foods, as well as lifestyle changes, such as practising relaxation techniques like yoga and meditation.[33]

It is crucial to note that Ayurvedic treatment for trigeminal neuralgia should only be attempted under the supervision of a skilled Ayurvedic practitioner, as the treatment strategy may differ depending on the individual's constitution and the severity of the ailment. It is also critical to maintain any traditional therapies provided by a doctor while receiving therapy.[34]

Advance Treatment

Trigeminal neuralgia can be a challenging condition to treat, and in some cases, conventional treatments may not provide sufficient relief. In such cases, advanced treatments may be recommended.

Some of the advanced treatments for trigeminal neuralgia include:

Microvascular decompression: This is a surgical procedure that involves decompressing the trigeminal nerve by moving blood vessels that may be compressing it. This procedure can provide long-lasting relief and is considered the gold standard for treating trigeminal neuralgia.[35]

Stereotactic radiosurgery: This is a non-invasive procedure that uses radiation to damage the trigeminal nerve, reducing its ability to transmit pain signals. This treatment is effective in providing pain relief, but the full effects may take several weeks to months to manifest.[36]

Radiofrequency ablation: This is a minimally invasive procedure that involves applying heat to the trigeminal nerve using a radiofrequency probe. This procedure can provide immediate pain relief, but the effects may not be long-lasting.[37]

Balloon compression: This is a minimally invasive procedure that involves compressing the trigeminal nerve using a balloon catheter. This procedure can provide immediate pain relief, but the effects may not be long-lasting.[38]

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Glycerol injection: This is a minimally invasive procedure that involves injecting glycerol into the trigeminal nerve, damaging it and reducing its ability to transmit pain signals. This procedure can provide immediate pain relief, but the effects may not be long-lasting.[39]

It is important to note that these advanced treatments for trigeminal neuralgia are typically reserved for cases where conventional treatments have failed, and the decision to undergo any of these treatments should be made after careful consideration and discussion with a qualified healthcare professional.[40]

V. CONCLUSION

The highly incapacitating condition known as trigeminal neuralgia (TN) is characterized by recurrent bouts of facial pain that are extremely painful, brief, and electric shock-like. As part of the diagnostic process, MR imaging, including high-resolution trigeminal scans, should be carried out. [2] The disease is more frequent in women and more common in people aged 50-70 years.[3,4] It is the most well-known neuropathic pain of the face, and it has been proved to be extremely unpleasant to the patient's well-being. [5].Neuralgia is a sign indicating nerve failure in the brain stem or in the nerve segment leading to the trigeminal ganglion, which is located at the base of the middle cranial fossa. The main etiological factors responsible for neuralgia include vasculoneural conflict, which is caused by an overlaying blood vessel [6] compressing the trigeminal nerve near the dorsal root entry zone [6-10] at the site of neural connection to the brain stem, within the region of the superior cerebellar artery, the basilar artery, the vertebral artery, or the petrosal vein. Neuralgia can be caused by a head injury or an inflammation of the nerve within its myelin sheath

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