



ORIGINAL RESEARCH PAPER

Neurology

MANAGEMENT OF TRIGEMINAL NEURALGIA: EFFICACY OF RADIOFREQUENCY ABLATION

KEY WORDS: interventional treatment, minimally invasive, pain management, radiofrequency rhizolysis, trigeminal neuralgia

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ABSTRACT

Trigeminal neuralgia (TN) is a neuropathic pain condition affecting the face. It has a significant impact on the quality of life and physical function of patients. Evidence suggests that the likely etiology is vascular compression of the trigeminal nerve leading to focal demyelination and aberrant neural discharge. Secondary causes such as multiple sclerosis or brain tumors can also produce symptomatic TN. Treatment must be individualized to each patient. Carbamazepine remains the drug of choice in the first-line treatment of TN. Minimally invasive interventional pain therapies and surgery are possible options when drug therapy fails. Younger patients may benefit from microvascular decompression. Elderly patients with poor surgical risk may be more suitable for percutaneous trigeminal nerve rhizolysis. The technique of radiofrequency rhizolysis of the trigeminal nerve is described in detail in this review.

Method 15 patients of TN patients who were on Pharmacological management selected for the study. All the 15 patients were subjected for Radiofrequency ablation (RFA) of Trigeminal Ganglion under fluoroscopic guidance. Clinical effectiveness and complications were noted. The patients were followed up to 12 months of duration.

Conclusion The RFA is an effective method for the pain relief in 14 patients (93%) with mean duration of 7.5 months. The criteria of pain relief is defined as more than 50% of pain relief from the pre procedure pain score - VAS.

Introduction

Trigeminal neuralgia (TN) is a painful condition involving the face. It is the most frequently diagnosed form of facial pain with a prevalence of 4 per 100,000 in the general population. It commonly affects patients aged over 50 years and occurs more frequently in women than men with a ratio of 1.5:1 to 2:1, respectively. It is also more common in patients with multiple sclerosis (incidence of 1%–2%) and hypertension. TN is associated with decreased quality of life and impairment of daily function. It impacts upon employment in 34% of patients, and depressive symptoms are not uncommon. The condition may be severely disabling with high morbidity, particularly in the elderly.

Pathophysiology

The pathophysiology of TN remains unclear. Evidence suggests that pain occurs because of pressure on the trigeminal nerve root at the entry zone into the pontine region of the brain stem. Compression by tumor or blood vessel may cause local pressure, leading to demyelination of the trigeminal nerve. Results from experimental studies suggest that demyelinated axons are prone to ectopic action potential generation. Demyelination has also been shown in cases of TN associated with multiple sclerosis and tumor compression of the trigeminal nerve root.

Diagnosis

TN is characterized by sharp, shooting, 'electric shock-like' pain sensation that is limited to one or more branches of the trigeminal nerve. It is almost always unilateral with the maxillary branch being most commonly affected and the ophthalmic branch the least. Pain usually lasts from a few seconds to 2 min and may recur spontaneously between pain-free intervals. Most patients report a sensitive trigger zone that reproduces an attack of neuralgia if lightly touched. Routine daily activities that contact, mobilize, stretch, or even slightly stimulate the trigger zone, such as brushing the teeth, applying facial cosmetics, encountering a breeze, talking, or eating, may trigger intolerable pain.

In classical TN, no etiology can be identified other than vascular compression. On the other hand, symptomatic TN is related to an underlying cause such as tumor compression or multiple sclerosis. It is therefore important to distinguish between the two as the focus in management of symptomatic TN is to treat the underlying cause.

Trigeminal deafferentation pain resulting from intentional injury to the nerve by peripheral nerve ablation, gangliolysis, or rhizotomy in an attempt to treat either TN or other related facial pain;

Symptomatic TN due to multiple sclerosis;

Post-herpetic TN following a cutaneous herpes zoster outbreak in the trigeminal distribution; and Atypical facial pain that refers to facial pain secondary to a somatoform pain disorder and requires psychological testing for diagnostic confirmation.

Neurological examination is usually normal in patients with idiopathic TN, although a subtle trigeminal sensory deficit may be detected occasionally. However, symptoms of TN may also be the first manifestation in patients with cerebellopontine angle tumors or multiple sclerosis. Therefore, patients should be asked about other neurologic symptoms such as tingling, numbness, loss of balance, weakness in one or more limbs, blurred or double vision, hearing loss, dizziness, headaches, and fits.

Magnetic resonance imaging (MRI) scan of the brain is useful to exclude symptomatic TN due to multiple sclerosis and tumors. MRI sequences augmented by a three-dimensional gradient echo sequence such as fast inflow with steady-state precession or intravenous gadolinium-DTPA can also improve visualization of the vascular compression around the trigeminal nerve root.

Differential diagnoses for facial pain include headache disorders, temporomandibular joint pain, dental pain, chronic sinusitis, otitis media, as well as myofascial pain. A discussion of these conditions is beyond the scope of this review. In general, the facial location, sharp or electrical quality, excruciating intensity, phasic temporal profile, and responsiveness to a specific drug can help us distinguish TN from other types of facial pain.

Treatment

The treatment of patients with idiopathic TN is often a challenge in clinical practice, and conservative management with drug therapy is always the first-line treatment. When drugs are not efficacious or produce intolerable adverse effects, interventional pain treatment or surgery is the possible option.

Pharmacological treatment

Carbamazepine has been used for many decades in the treatment of TN, and it is the drug of choice. Meta-analyses have demonstrated the efficacy of carbamazepine with a number-needed-to-treat of Carbamazepine may even have diagnostic utility because patients with classical TN will respond well to it. Patients with symptomatic TN or other causes of facial pain are less likely to respond to carbamazepine. Doses of carbamazepine range between 200 and 1200 mg daily.

Other medications with reported efficacy in TN include oxcarbazepine, baclofen, and lamotrigine. Other medications such as topiramate, gabapentin, pregabalin, and levetiracetam have

shown success in treating TN, but evidence is limited to small uncontrolled studies or case reports. Patients should receive an adequate trial of at least three drugs including carbamazepine before surgical or interventional treatment is considered.

Surgical MVD

MVD has been widely used based on the theory that vascular compression of the trigeminal nerve is responsible for TN. Craniotomy is performed to separate the blood vessels from the trigeminal nerve using an inert sponge or felt. A recent retrospective review of patients with TN who had undergone MVD showed that a high proportion of patients (71%) reported complete pain relief 10 years after surgery.

Mortality rate for MVD ranges from 0.2% to 0.5%. There is a 4% incidence of postoperative morbidity such as cerebro-spinal fluid (CSF) leak, infarct, or hematoma formation.

Ablative techniques

Gamma knife surgery GKS is a noninvasive stereotactic radiosurgical technique that utilizes a focused beam of radiation to target the root of the trigeminal nerve. It is commonly performed with the patient under sedation. Pain relief obtained from GKS is delayed and usually occurs about 2 weeks later. Initial good pain relief can be achieved in ~80% of patients. However, there is a risk of recurrence after 1 year. GKS may be preferred to MVD in elderly patients because of the lower rate of surgical complications. Complications include facial paresthesia, hypoesthesia, and sensory loss. Anesthesia dolorosa has not been reported.

Minimally invasive percutaneous techniques for treating TN include balloon compression, glycerol rhizolysis, and radiofrequency (RF) rhizotomy.

Balloon compression

In balloon compression, a small balloon is introduced percutaneously using a needle to compress the trigeminal ganglion. Pain relief was immediate in more than 80% of patients. Complications include severe bradycardia or asystole, corneal anesthesia, facial sensory loss or dysesthesia, and masseter weakness. In a 20-year follow-up review, recurrence of pain occurred in 32% of patients over the entire study period.

Glycerol rhizolysis

This procedure is performed with the patient in the sitting position with the head flexed. A needle is introduced into the trigeminal cistern and glycerol is injected. As glycerol is hyperbaric, it will sink and produce discrete neurolytic lesions of the second and third divisions of the trigeminal nerve. Pain relief has been reported to be more than 90% in one study with a recurrence rate of 23% after a mean period of 30 months.

Radiofrequency rhizotomy

It is performed by destruction of the trigeminal ganglion using RF. 15 patients of TN patients who were on Pharmacological management selected for the study. All the 15 patients were subjected for Radiofrequency ablation (RFA) of Trigeminal Ganglion under fluoroscopic guidance.

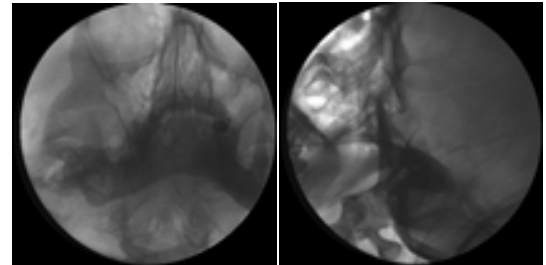
Informed consent was obtained. Pre procedure clinical ,biochemical evaluation were carried out in all cases. Pre procedure VAS were noted .Clinical effectiveness and complications were noted. The patients were followed up to 12 months of duration.

Procedure

Patients are fasted for at least 6 h before the procedure. Prophylactic antibiotic is administered 1 h before the procedure. Intravenous access is obtained, and standard monitors including electrocardiogram, blood pressure monitoring, and pulse oximetry are applied. The procedure is performed under fluoroscopic guidance with the patient in the supine position and head extended. The C-arm is rotated to obtain an oblique submental view to visualize the foramen ovale. The needle trajectory follows a straight line directed toward the pupil when seen from the front and passes 3 cm anterior to the external auditory meatus when seen from the side.

A 22-gauge, 10-cm RF cannula with a 5-mm active tip is used. After administration of local anesthesia, the cannula is advanced in a tunnel view to the X-ray beam toward the foramen ovale. When the cannula enters the foramen ovale, the depth of the cannula inside the Meckel’s cavity is ascertained on the lateral fluoroscopic view. The electrode is advanced ~2–4 mm further through the canal of the foramen ovale such that the tip of the electrode reaches the junction of the petrous ridge of the temporal bone and the clivus. The stylet is then removed from the cannula, and aspiration is performed to ensure that there is no CSF or blood.

Figure



oblique submental fluoroscopic & lateral views showing needle directed toward the foramen ovale.

Test stimulation is mandatory before RF lesioning. The mandibular nerve lies in the lateral portion of the foramen ovale. If the nerve is stimulated at 2 Hz between 0.1 and 1.5 Hz, muscle contraction of the lower jaw may be seen. This confirms that the needle has passed through the foramen ovale and the tip is lying on the trigeminal roots. Next, paresthesia in the concordant trigeminal distribution of the patient’s usual symptoms (V1, V2, or V3 divisions) at 50 Hz, 1 msec pulse duration should be reproducible at 0.1–0.5 V.28,29 If paresthesia is only obtained above 0.5 V stimulation, the needle should be redirected to get the same response at a lower voltage. After appropriate stimulation parameters have been achieved, 0.5 mL of 1% Xylocard should be injected. After waiting for at least 30 sec, RF lesioning of 3 episodes at 60°C, 65°C, 70°C is carried out for 60 sec each. The needle can be repositioned in between the repeat RF lesioning.

The patients were discharged after 12 hrs of observation.

Results

The effective pain relief (disappearance of more than 50% of pre existing pain intensity measured by VAS) were in 14 out of 15 patients (93%). The mean duration of pain relief was 7.4 months.

The common complications noted were parasthesia over the cheek in 7 (47%) out of 15 patients, numbness over the lateral border in one case (6.6%). No other complications noted during the study period.

Complications

In a large-scale studies , long-term follow-up of 1600 patients who had received percutaneous RF rhizotomy of the trigeminal ganglion, complications reported include diminished corneal reflex (5.7%), masseter weakness and paralysis (4.1%), dysesthesia (1%), anesthesia dolorosa (0.8%), keratitis (0.6%), and transient paralysis of cranial nerves III and VI (0.8%). Permanent cranial nerve VI palsy, CSF leakage, carotid-cavernous fistula, aseptic meningitis.

Conclusion

It is important to rule out secondary causes of TN, especially in young patients or patients with bilateral symptoms suggestive of multiple sclerosis. MRI scans should be obtained to help detect the presence of vascular compression of the trigeminal nerve. Medical therapy remains first line in the treatment of TN, and drugs such as carbamazepine and oxcarbazepine can be used. Surgery and interventional pain treatment can be considered in patients who have persistent pain despite drug therapy or who are unable to tolerate adverse effects of drugs.

Disclosure

The authors report no conflicts of interest in this work.

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