Trigeminal Neuralgia: A Comparison of Surgical, Medical, Conservative, and Chiropractic Treatments

A Literature Review

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Abstract:

Objective: The purpose of this article is to review current treatments for trigeminal neuralgia, along with efficacies of those treatments. This will serve as an informative reference for patients with and practitioners who treat trigeminal neuralgia.

Data Collection: A review of literature, including refereed journal articles, textbooks and reference books; on the treatment options available for patients afflicted with trigeminal neuralgia. This review includes medical, surgical, conservative and chiropractic treatments and efficacies of the treatments for trigeminal neuralgia.

Results: There is a multitude of treatment options available for sufferers of TN. The patients do not understand all of the options or the risks that they pose. This review provides the patients with a quick reference to understand the options. It also provides success rates and recurrence rates for patients and practitioners to be more educated on the treatment and its outcomes.

Conclusion: There needs to be a collaborative approach between all practitioners, and an active involvement by TN sufferers to provide an evidence rich research base to enhance the treatment of TN.
Introduction:

Treatments for trigeminal neuralgia (TN) vary widely and the efficacies have been disputed in the past and even today. This leaves practitioners and researchers with few direct ways to measure the effects of their treatments in patients with TN. There are many treatment options available to patients, but few understand them or the side effects of choosing a particular treatment.

A concern of practitioners and researchers is the subjectivity of this disorder. There is no accurate way to measure results of treatment objectively, and this is one of the major reasons that there are a multitude of treatment options available (24). This in turn leads to few randomized clinical studies to evaluate the efficacy of the varying treatments, especially when looking at long-term relapse. There have only been a handful of randomized controlled trials and longitudinal cohort studies on the management of TN. Therefore, high-quality, evidence-based guidelines on management have been difficult to produce (23).

For many years practitioners have been performing procedures and prescribing medications that have not been proven effective in controlled studies. Many of these drugs are used today after the standard treatment protocol has failed. What many of the patients do not know is that side effects of these drugs are often many and rarely reduce the pain or frequency of TN to a satisfactory level.

The discussion will look at a variety of treatment options available to patients with TN. The current surgical procedures, pharmaceuticals, conservative treatment, and chiropractic care will all be included. With each item success rates, relapse statistics, and side effects will be listed as appropriate. These are to provide the patient with TN and
practitioners a source to evaluate and understand the consequences of the treatment options in the future.

Trigeminal Neuralgia (TN) is defined as “a disease of the trigeminal nerve marked by brief lightning-like along the distribution of one or more of its branches, but usually along the maxillary nerve. The attacks last from a few seconds to 2 minutes, and may be triggered by touch, cold, chewing, brushing teeth, smiling or talking (18).” There are many clinical features familiar to patients and practitioners familiar with the disorder. First, the pain is a sharp, shooting pain within the distribution of the trigeminal nerve. Most commonly it is unilateral, but shows up bilaterally in 3% of all cases. With bilateral cases needing special attention due to complexity (19), the following information is aimed at treatment options for unilateral TN. The attacks are paroxysmal and the patient may have a remission for many years or even permanently. The most common provoking factor is light touch, chewing, and facial movements, however there is some evidence to increased blood pressure playing a role.

There are a multitude of treatment options available to patients with TN. The following will provide useful information to patients and practitioners alike on the treatment options still available today.

**Medications**

Medications or pharmaceuticals are usually the first line of defense when someone has been diagnosed with TN. The most commonly used medications are carbamazepine (Tegretol), oxcarbazepine, and related anticonvulsant drugs. These drugs work as Na+ channel blockers and relieve pain in TN by suppressing membrane resonance and firing in injured afferents (6). Other drugs used if carbamazepine fails to
relieve symptoms are oxcarbazepine, phenytoin, clonazepam, sodium valproate, and gabapentin. (17).

Carbamazepine is the most studied and considered the most effective drug for treating TN. It has been shown in controlled clinical trials to both reduce pain severity, number of spontaneous paroxysms, and number of triggers (4). In other studies carbamazepine has been shown to be effective in long-term treatment (months to years) in approximately 75% of patients in whom the drug was initially effective (2 and 21). Although effective, all of the drugs used to treat TN do have contraindications and side effects. Contraindications for treatment with carbamazepine should include major cardiac problems and blood disorders. In the United States the mean number of side effects listed by TN patients on any of the medications was 5.1 (23). The most common side effects associated with carbamazepine are sedation, confusion, dizziness, double vision, ataxia, rash, blurred vision, fluid retention, and thrombocytopenia (see Table 1).

Closely related to carbamazepine is oxcarbazepine and it has a similar mechanism of action and contraindications. Although not used as often to treat TN, oxcarbazepine appears to be better tolerated by the patients (17). Although it requires a higher dose for the same efficacy, the side effects have been reported as fewer and less frequent than those of patients on carbamazepine. The most common side effects are headache, sedation, dizziness, ataxia, rash, and fluid retention.

The remainder of the drugs used in treating TN has not been the subject of many controlled clinical trials and need to be closely watched. However, when carbamazepine and oxcarbazepine cannot be used, these should be tried as they do show some promise.
Phenytoin has been shown to reduce TN pain in limited trials (9). However it too has a multitude of side effects that can be seen in Table 1. The contraindications for use are the same as for carbamazepine.

Sodium valproate and gabapentin may affect liver and kidney function respectively and also show many side effects. Clonazepam and baclofen have no contraindications known and their respective side effects can be seen in Table 1. They both show effects on TN pain in small trials (7).

<table>
<thead>
<tr>
<th>Drug</th>
<th>Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbamazepine</td>
<td>Sedation, confusion, dizziness, ataxia, rash,</td>
</tr>
<tr>
<td></td>
<td>Double vision, fluid retention, leukopenia,</td>
</tr>
<tr>
<td></td>
<td>Blurred vision, agranulocytosis, Thrombocytopenia,</td>
</tr>
<tr>
<td>Oxcarbazepine</td>
<td>Headache, sedation, rash, ataxia, fluid retention,</td>
</tr>
<tr>
<td></td>
<td>Dizziness, double vision</td>
</tr>
<tr>
<td>Phenytoin</td>
<td>Sedation, dizziness, ataxia, rash, hirsutism,</td>
</tr>
<tr>
<td></td>
<td>Impaired memory and attention, Double vision, gingival hypertrophy,</td>
</tr>
<tr>
<td></td>
<td>peripheral Neuropathy, behavioral changes</td>
</tr>
<tr>
<td>Gabapentin</td>
<td>Sedation, dizziness, ataxia, nausea, vomiting, Headache</td>
</tr>
<tr>
<td>Sodium Valproate</td>
<td>Increased appetite and weight gain, sedation,</td>
</tr>
<tr>
<td></td>
<td>Abdominal pain, nausea, vomiting, hand tremor, Alopecia (rare), toxic hepatitis (rare)</td>
</tr>
<tr>
<td>Clonazepam</td>
<td>Depression, paradox agitation, irritability, Sedation, rash</td>
</tr>
<tr>
<td>Baclofen</td>
<td>Sedation, confusion, dizziness, vomiting</td>
</tr>
</tbody>
</table>

Table 1 adapted from (17 and 24).
Surgical options

Surgical treatment is another option for patients whom suffer from TN. There is a long history of surgical attempts to reduce the symptoms of TN. The following will be based on the surgical techniques still in use today. Information about specific studies and surgeries, relapse rates, mortality, and morbidity will all be included with each type of surgery. The first group of surgeries falls under the peripheral surgery heading and they include, neurectomy and radiofrequency thermocoagulation of the peripheral branches.

A neurectomy is to remove or excise a section or a whole peripheral nerve. The procedure is aimed at removing the section or sections of the trigeminal nerve and its branches that are causing the pain. When there is only one branch affecting the patient it is a safe surgical method. There are three steps to a neurectomy (24):

1. Removal of an adequate length of nerve and leaving no small fibers.
2. Avulsion of the nerve, leaving no small fibers.
3. Blockage of the bony canal through which the nerve passes.

Neurectomy can be performed under general anesthesia or under local analgesia. Both require a short hospital stay. The skin is first opened to expose the nerve. Once the nerve is exposed as far back as possible the nerve is removed. This exposure is usually to the point where the nerve exits a bony canal. This canal is then filled with surgical cement or titanium screws (11) to prevent the nerve from regenerating.

There are few controlled studies evaluating the recurrence of trigeminal pain after neurectomy. However, most patients within a few days have a decrease in pain severity or no pain at all. There is also a failure rate of 3% who do not get any decrease in pain. Patients who have successful surgeries often need secondary or tertiary surgeries on different trigeminal nerve branches due to migration of pain. The complication of main
concern is the loss of sensory in the area, but is rarely seen as a problem if the corneal reflex is kept intact.

Radiofrequency thermocoagulation is the other common peripheral surgery. This surgery is designed to heat a nerve causing a lesion. This lesion due to specific heat and amperage will selectively destroy more of the pain fibers while leaving light touch intact. Intravenous sedation and local anesthesia are used. Although this procedure is still used the recurrence rate for TN pain is 68% due to the peripheral nerves ability to regenerate. Hematoma is the commonest complication.

There are three more invasive surgeries that are currently used and show good success. Percutaneous retrogasserian glycerol rhizotomy (PRGR), percutaneous microcompression (PMC), radiofrequency thermocoagulation (RFTC), and gamma knife radiosurgery (GKS) will all be explained. Practitioners decided that since the peripheral nerve surgeries are not extremely successful, the next step would be to aim procedures at affecting the gasserian or trigeminal ganglion.

PRGR is performed using a needle for injection of glycerol at the level of the gasserian ganglion. Glycerol, being neurotoxic, destroys the sensory or pain fibers. Most patients report immediate pain relief following this procedure. Currently 85% will achieve a pain free level for a short time, weeks to months. Roughly 50% of patients who receive this treatment will have the TN return in three to four years. Repeat procedures show a decrease in the efficacy of treatment when looking at pain free periods following the procedure.

RFTC again uses heat to destroy a section of tissue. This time it is directed at the gasserian ganglion instead of peripheral nerves. There are contraindications to the
procedure that include, patients with clotting disorders, patients who do not want any sensory deficits, and those with ophthalmic pain. The procedure consists of the patient being on a short-acting anesthesia so that the patient can be cooperative during the procedure. The surgeon inserts a probe up through the foramen ovale to heat the ganglion. Neurons that transmit pain are more vulnerable to heat destruction, thus with controlled heating the pain fibers are destroyed. The aim of this procedure is to destroy unmyelinated and small myelinated pain conducting fibers while sparing the thick myelinated touch conducting fibers, thus preserving touch sensation. The amount of destruction is dependent on the amount and duration of the applied heat.

The procedure is safe, outpatient surgery requiring little recovery time after the procedure. There has been increasing safety measures added to the RFTC procedure with the use of computerized tomography (CT) fluoroscopy. Using the CT in combination with RFTC provides the surgeon with real-time pictures of the location of the probe during the procedure. This results in less complications and shorter recovery times due to no aberrant punctures (8).

Yoon (22) and colleagues have reported long-term outcomes of RFTC. They concluded that 87% were initially pain free. They followed up at 1,2 and 11 years post-surgery and found that 65, 49, and 26% remained pain-free, respectively. His studies showed no mortalities and the commonest side effects to be dysesthesia, corneal numbness, and masseter weakness.

Pollock and colleagues reported on the effects of RFTC with tumor-related trigeminal pain. He found that between 1 and 6% of patients with facial pain have tumors that involve the trigeminal nerve. The tumor was the target of the surgery and the
results showed that it was effective in eliminating the tumor-related facial pain in the majority of patients with either benign or malignant cranial base tumors (15).

GKS is an advancement on RFTC, utilizing gamma radiation aimed directly at a specific region in or near the brain. The heat produced destroys the ganglion. The radiation is focused at the ganglion by a specially designed gamma knife composed of 201 Cobalt sources. Underneath the patient has had an aluminum frame. After the frame is fitted the patient undergoes CT or MRI to locate the ganglion within the head. The gamma knife hemisphere is then applied and the radiation can be focuses by using overlapping beam summation and collimators. Over weeks 60 to 80% of TN sufferers achieve good to excellent pain relief (5). Results tend to be better in individuals who have not had other surgical remedies (3). However, repeated GKS procedures can be associated with a high rate of pain relief in patients who experienced a significant reduction in their pain after the first GKS procedure (14).

GKS rarely results in any sensory loss and does not interfere with additional treatment. It is a suitable alternate to all surgical treatment modalities. In view of its ease of treatment, low complication rate, and non-invasive nature it is a safe alternate to carbamazepine (13).

PMC or microvascular decompression is based on the concept that compression on the trigeminal nerve at or near the brainstem, most commonly from blood vessels results in the TN (24). This surgery is a major procedure and patients need to be carefully assessed prior to operation. Some contraindications are bleeding disorders, uncontrolled hypertension, patients over 70 year of age, and coronary artery disease. Age may be more of a concern due to other disorders and not due to the procedures.
effectiveness in elderly patients (10, 12). Hearing may also be affected on the surgery side and thus audiometry may want to be used to assess contralateral hearing in the event that hearing may be lost ipsilaterally.

The procedure requires full anesthesia due to the partial craniectomy and exposure of the brainstem. The dura is opened and the cerebellum gently lifted to expose the brainstem. All small vessels, especially veins, near the trigeminal nerve are coagulated (24). The structures are then returned to their anatomical position and the skin sutured.

The complications associated with PMC include loss of touch sensation, loss of the corneal reflex, ipsilateral hearing loss, and severe neurological morbidity in up to 1%. Also, there is a 1% mortality rate in patients undergoing this procedure. The advantages of PMC over other procedures are longer lasting results, no loss of sensation, and often times, preservation of all the trigeminal nerve functions. Long-term studies have shown at 5 years 66% of patients still had good or excellent results according to (24).

**Chiropractic:**

Currently, there is a limited quantity of chiropractic treatment options for TN in the literature. However, the following will give the chiropractic practitioner options and ways to help any patients they might see with TN.

In a case reported by Thorsen and Lumsden (20), a trial of self-applied TENS was recommended for pain control in a patient with a 5 month history of TN. Initial application to patient tolerance provided transient pain relief until an accidental, intense discharge resulted in immediate remission of symptoms, lasting three years, the time of
the article. This shows that initially, TENS can be a safe and effective therapy for trigeminal neuralgia. Although firm conclusions are difficult to draw from one incident, this case suggests the need for further investigation of TENS in the treatment of trigeminal neuralgia and related pain syndromes.

Cryotherapy is another effective procedure chiropractors can use to treat patients with TN. It is a safe alternative to medications and surgery due to the fact that it has no side effects if used properly. Most patients report a decrease in pain immediately however, it is usually transient. A small percentage remains pain free for months and in some cases up to 2.5 years. This provides a safe and cost effective treatment for chiropractors to treat TN. One concern associated with cryotherapy is the risk of exacerbating the pain syndrome. Since many patients have mechanically stimulated pain, the contact on the face may initiate a flair-up, thus not allowing the patient to be treated with this method.

Acupuncture has also been explored as treatment option for TN. Using meridian acupuncture as described by Shuhan (16), TN symptoms can be reduced effectively. Over 99% of 539 of the 1500 patients followed for up to 6 years had no pain. A total of 237 patients had a recurrence but it was less severe. Beppu (1) had a 50% success rate in overall absence of pain and another 40% showed a decrease in pain with a similar acupuncture treatment.
Alternative:

The alternative options are recommended for the patient that wants to do as much as possible to live a pain-free life. It also gives practitioners on outside co-management for a TN case that the doctor may have over looked.

First, chronic and severe pain leads to psychological and behavioral disturbances. For this reason co-managing or referring a case with a psychologist or psychiatrist may provide useful assessment and analysis of causes or provocations of the pain. It also provides an outlet for the patient to help to treat the psychological disturbances brought about by the TN. Second, there are a multitude of support and self-help groups for people suffering from TN. It has been shown that patients who attend these types of groups have a higher compliance with treatment. Also, many of these groups receive input from professionals and thus this gives the practitioner a way, although indirect, to help others suffering from TN.

Finally, for the practitioner, providing information leaflets to patients about particular disorders helps with the psychological distress related to the disease. By providing pamphlets in the office, a practitioner can relieve the stress of the patient and educate the patient on the best approach to treat the disorder.

Discussion:

There are many factors to be evaluated when looking at treatment options and outcomes for patients with TN. The first of which is side effects and surgical complications. All of the medications mentioned for the treatment of TN have numerous side effects from rashes, to sedation, and even toxicity to the liver and blood disorders.
Patients need to be aware of the dangers of these drugs and weigh the disadvantages of the side effects against the benefits, if any, from the medications. The same can be said about the surgeries and their complications. Mortality is a consideration. There is up to a 1% mortality rate in patients undergoing microvascular decompression, and there are isolated deaths associated with procedures at the level of the gasserian ganglion. Patients need to consider if undergoing a potentially lethal surgery is worth eliminating a disorder that has a 0% direct mortality rate. Although the peripheral surgeries may not have a mortality rate there are complications associated like sensory loss and infection.

Cryotherapy and TENS units may exacerbate the pain and be unusable and thus not effective. The same can be said for acupuncture. If the patient’s pain is exacerbated by the procedure, the patient will not likely follow the treatment plan and render the treatment ineffective.

Patients and practitioners also need to look at recurrence rates and acclimation to drugs or therapies. Many of the surgeries have a high recurrence rate and often are only successful initially 40-60% of the time. Are the expenses and complications worth the possible benefits? Also, patients may become unresponsive to medications and other treatments. Patients and practitioners need to be prepared and have a plan ready for care.

**Conclusion:**

Currently, the medical model has provided patients who suffer from TN a variety of treatment options. They have improved greatly over the decades and show promising signs of success in some instances. The concern is if the patients are being educated about their treatment and the options that they have. There is a significant difference in the risks, expenses, and quality of life with all of the treatment options. The patient needs
to be educated so that they are making informed decisions on their health. The patient also needs to be informed of alternative treatment options like those mentioned in the chiropractic and alternative headings above. The goal of all practitioners should be to treat TN sufferers in the most effective way with the least side effects.

For this to happen, there needs to be an increasing number of controlled randomized collaborative studies to investigate current and future treatment options for TN. This research would need active involvement of sufferers to improve the evidence base and treatment (23). Medical doctors, chiropractors, dentists and all other practitioners need to make a concerted effort to find ways to treat TN and to let it be known by publishing their findings. This is the only way for TN sufferers to receive the highest standard of care.
References


