

## THERMOCOAGULATION OF TRIGEMINAL NEURALGIA BY RADIOFREQUENCY

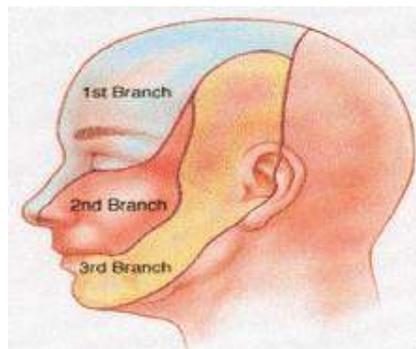
### - Effectiveness and Results -

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### Introduction

Trigeminal Neuralgia (TN) is defined by the International Association of the Study of Pain (IASP) as “a sudden, usually unilateral, severe, brief, stabbing, recurrent pain in the distribution of one or more branches of the 5<sup>th</sup> cranial nerve”<sup>1</sup> (Fig. 1). The incidence rate is about three to five cases per 100,000 population and increases with age<sup>2</sup>. The pain is characterized by recurrent paroxysms of sharp pain radiating into the territory of one or more trigeminal sensory divisions and lasting seconds to minutes. It mostly affects the mandibular division, less often the maxillary division, and least often the ophthalmic division<sup>3</sup>. Symptoms are typically present in patients who are in their 40s and 50s or older, more often on the right side.

*Fig. 1*  
*Branches of Trigeminal Nerve*



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The etiology of the classical (TN) is not completely known. There is compelling evidence of local vascular compression as a predominant feature of the pathophysiological process<sup>4</sup> although cardiovascular studies show that vascular compression of the Trigeminal Nerve is present in many patients without symptoms, additionally some patients with TN are found to have no vascular compression during nerve exploration<sup>5</sup>. Another cause of TN includes Multiple Sclerosis (MS), rarely trigeminal pain results from compression by a posterior fossa mass, such as tumour or vascular malformation; therefore an MRI of the brain is usually required to rule out the later causes.

We present 17 cases of (TN) who were treated by Thermocoagulation by radiofrequency after medical treatment failed or was intolerable.

### **Methods and Materials**

For the last eight years, 17 patients with Trigeminal Neuralgia were referred by neurologists (6 males and 11 females, 32 – 72 years of age). Thirteen of them had the right side affected while only 4 had the left side affected. All patients had reached maximum medical treatment without much benefit, and continued to suffer from severe trigeminal pain and from the side effects of the medications.

The medications mainly included anti-convulsants, tricyclic and anti-depressants. In addition, many patients were receiving sedation, hypnotics, muscle relaxants and tranquillizers.

Patients were referred for Thermocoagulation by radiofrequency of the Trigeminal Nerve. All patients were subjected to brain MRI to ensure that there is no pathology in the neighbourhood of the Trigeminal Nerve or Gasserian Ganglia which could be problematic. Blood was also tested for coagulopathy, and made certain that patients are not on any medications which affect clotting mechanism.

### **Thermocoagulation Technique**

Patients were informed that they may need to be hospitalized for postoperative observation, and intravenous antibiotic administration.

Also, patients should be thoroughly informed about the procedure as they may suffer from some parasthesia and numbness on one side of the face, that may last for a prolonged period, and that it will certainly diminish over time.

### *Technique*

Radiofrequency Thermocoagulation Rhizotomy (RTR) is a procedure on the Trigeminal (Gasserian) Ganglion, performed by a percutaneous approach with local anesthesia, intravenous sedation and intermittent general anesthesia. The approach utilizes specific anatomical landmarks and radiological guidance.

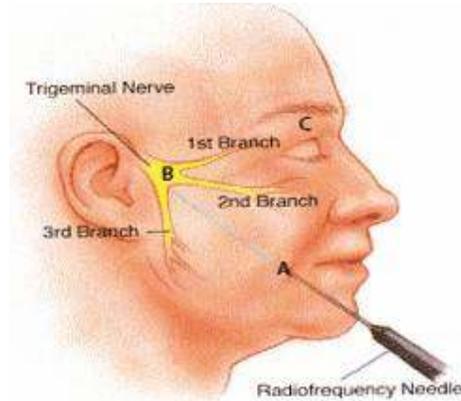
The patient is positioned supine on a mobile X-ray table, with the head and shoulders placed on a headboard which extends the head over the end of the X-Ray table. The head may then be extended over a foam sponge so that the view of the foramen ovale is obtained, with an extension of up to 20° and rotation of 15-20° away from the side of the pain for optimal visualization of the foramen ovale. The foramen ovale is seen through the pterygomandibular and infratemporal space as an oval structure at the top of the petrous bone.

Following satisfactory imaging of the foramen ovale, the face is surgically prepared and local anesthesia is infiltrated into the skin and subcutaneous tissues of the ipsilateral cheek. A 10cm insulation electrode needle with 0.5cm naked front is used, point A is 2.5-3cm away from the Angulus Oris (angle of the mouth) of the affected side, point B is marked about 2.5cm away from the auricle or one third of the distance from the external Auditory Meatus to the Lateral Canthus of the eye, and point C was defined as the Homolateral pupil (Fig. 2).

Taking A as the point of entry, the needle point was aimed at foramen oval, and kept perpendicular to both AB and AC lines. Foramen oval could be entered at around 7cm length, operator fingers of the other hand could be inside the mouth of the patient to make sure that oral cavity is not punctured, then the cannula and the stilette are advanced a little more about 1cm. The stilette is now removed and in most of the cases

there is free-flow cerebrospinal fluid which confirm the position of the needle well inside the foramen ovale (Fig. 3). At that point, one can pull back the needle very slowly (for few millimetres) until the flow of the cerebrospinal fluid stops.

*Fig. 2*  
*Approach of the needle to*  
*foramen ovale*



*Fig. 3*  
*Position of the needle in the*  
*foramen ovale*



Once satisfactory position has been obtained and confirmed, the stillete is removed and replaced with a straight or curved “Tew Electrode”. The patient is now fully awake, ready for testing stimulation, sensation with or without pain should be felt with pulsed stimulation of 50 cycles per second for 1 millisecond and 0.1-0.28 volts. If feeling requires more than this current, then the position of the electrode should be readjusted, stimulation of specific branch of the Trigeminal Nerve will need to readjust the electrode as well.

When satisfactory position has been achieved, application of Thermocoagulation is done by applying temperature of 60C° to start with under intermittent general anesthesia for 60 second and then gradually increases temperature application until 80C°, asking and questioning the patient about sensation of the side of the face and checking corneal reflexes.

The patient is usually kept in hospital for one day, to make sure that no complications occur, antibiotics are administered for seventy two hours, anti-convulsants and other medications are tapered and completely ceased within the next postoperative days.

## **Results**

All patients had no major problems Minor complications were noticed in few patients such as: swelling of the side of the face due to hematoma and headache which disappeared few days later.

Some degree of parasthesia occurred in most of the patients, which gradually decreased over time. However, two of the patients had numbness and parasthesia for an extended longer time, yet, they still prefer them over the trigeminal pain which they had prior to the procedure.

All patients had significant relief of pain and discontinued all the medications within few days of the procedure. The pain recurred gradually in two patients, 4 and 6 months postoperatively, and had to repeat the procedure after which they had significant long time relief like all the others. One of the patients had to return after 3 years and had the procedure repeated.

Most of the patients were followed-up either by telephone or the clinics and were doing excellent and free of medications.

## **Discussion**

Medical treatment still remains the first line of approach, mainly by Carbamazepine followed by combined therapy with more than one

anti-convulsant and other medications like tricyclic, anti-depressants and muscle relaxants. However, the effectiveness of medical therapy may decline gradually and its side effects remain a major problem and could be intolerable. Patients who eventually become refractory to medication are candidates for one of several surgical options<sup>6</sup>. Surgical and interventional procedures include glycerol injections, balloon, rhizotomy, thermocoagulation with radiofrequency, microvascular decompression (MVD) and even gamma knife radio surgery, all of which may be necessary when other treatments fail, but all have different surgical risks<sup>7-12</sup>.

Percutaneous Trigeminal Ganglion Radiofrequency therapy was performed by Kirchner in 1931 and ameliorated by Sweet in 1965<sup>13</sup> and it has been considered a safe and simple technique for the treatment of TN. Its mean effective rate is about 96%<sup>14</sup>. Taha<sup>5</sup> revealed results of patients from several medical centers and concluded that radiofrequency rhizotomy and MVD have the highest rate of initial pain relief and the lowest rate of pain recurrence, and that Radiofrequency Thermocoagulation should be the procedure of choice for most patients undergoing first surgical treatment. However, it may carry some risks<sup>16-17</sup>. Although the incidence rates of serious complications are very low, it should be performed with great care.

In our practice, all patients had excellent relief of pain, all pain medications were gradually tapered and discontinued within few days, and had no significant complications or side effects. Few of them had some hematomas at the site of the puncture and most of the patients had some degree of numbness and parasthesia on the side of the face which improved by time.

In conclusion, we think (RTR) is an excellent procedure, safe and effective, and could be repeated when necessary and should be used as the first choice intervention procedure compared to other surgical procedures when medical treatment fails.

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