ORIGINAL ARTICLE

Safety and Efficacy of Radiofrequency Ablation of Gasserian Ganglion in Trigeminal Neuralgia

Chandra Shekhar Karmakar[1], Mohammad Abdul Hannan[1], Rajat Shuvra Das[1], Saiful Mahmud Tuser[1], Kazi Mahzabin Arin[1], Ayesha Sultana[1], AKM Akhtaruzzaman[2]

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Abstract

Background: Trigeminal neuralgia (TN) is characterized by intractable pain in one or more division of trigeminal nerve. Pharmacologic management is first line treatment for TN, when it fails interventional treatment options are considered like percutaneous procedures or micro vascular decompression. Radio frequency thermoscoagulation is an effective option for medically refractory cases to control pain.

Objective: To evaluate the safety and efficacy of Radiofrequency thermocoagulation of the gasserian ganglion for the treatment of trigeminal neuralgia.

Methods: Total 44 patients were included in this prospective obsarvational study who were already diagnosed with trigeminal neuralgia and refractory to medical management. All patients were treated by radiofrequency thermocoagulation after confirming the position of needle tip by sensory and motor stimuli. Three lesions were created at 60-70°C for 90 second each. Patients were assessed for pain relief, corneal reflex, numbness and masticatory muscle weakness at immediate post procedural stage, 1 week, 1 month and at 6 months.

Results: Twenty eight patients had pain over both mandibular (V3) and maxillary (V2) division, 12 patients had mandibular (V3) and 4 patients had only maxillary (V2) division involvement. Excellent pain relief was archived in 38 (86.36%) patients, 4 patients (9.09%) have good pain control and 2 (4.54%) patient developed poor pain control with development of Anesthesia dolorosa in 1 patient. None of them develop complete facial numbness, 41 patients developed tolerable numbness and 2 patients develop somewhat bothersome, Facial numbness. Three patients developed unilateral masseter muscle weakness however no patients developed corneal ulcers, blindness or other complications.

Conclusion: Temperature controlled thermocoagulation is a safe and effective treatment options for trigeminal neuralgia.

Keywords: Trigeminal Ganglion, Trigeminal Neuralgia, Thermocoagulation, Radiofrequency Ablation.

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1. Assistant Professor, Department of Anaesthesia, Analgesia & Intensive Care Medicine, BSMMU, Shahbag, Dhaka, Bangladesh

2. Professor, Department of Anaesthesia, Analgesia & Intensive Care Medicine, BSMMU, Shahbag, Dhaka, Bangladesh

Correspondence
Dr .Chandra Shekhar Karmakar
cndra42@gmail.com

Introduction

Trigeminal neuralgia (TN) is one of the common debilitating neuropathic facial pain disorders that usually affect people often over 50s. Pain is usually unilateral, transient, electric shock like sudden severe pain that occur usually in one or more division of trigeminal nerve. Those who suffer for long time often experience background constant pain along with transient severe attack. Most of them also suffer from anxiety depression and emotional changes[1]. Study shows elderly women have higher incidence than men, and annual prevalence is 12.6-28.9 cases per 10 million people[2-3]. Carbamazepine is the first line of management other commonly used drugs are oxcarbazepine, lamotrigine, Gabapentine and baclofen. Patients who cannot tolerate oral medications or pain control is poor can be benefitted from invasive surgery or minimally interventions. Some commonly used percutaneous interventions are radiofrequency thermocoagulation, percutaneous balloon compression, decompression (MVD)[4], gamma knife radiosurgery, intradermal and/or subcutaneous injections of Botox, intragasserian glycerine and peripheral alcohol[5].

Each of these modality of treatment has some complications, reported in previous study such as unilateral fascial numbness, masseter muscle weakness, corneal reflex lost to blindness. Conventional radiofrequency thermocoagulation is widely used for the clinical treatment of TN with a pain relief rate of 90–100% of the patient group[6]. In this study we observed postprocedural therapeutic efficacy of radiofrequency thermocoagulation of gasserian ganglion and its common complications.

Methods

In this observational study, total 44 patients (32 females and 12 males, aged 31 to 73 years) were included after proper counselling and written informed consents were taken from patients. Patients were randomly scheduled to receive radiofrequency thermocoagulation of selected part of gasserian ganglion between January, 2020 to December 2021. The time of disease onset and time of intervention range from 0.5 to 17 years, with a mean range of 5.3 ± 3.5 years. Among all 38 patients was on carbamazepine, 4 patients were on oxcarbazepine, 2 patients were on carbamazepine and baclofen. Patient with bleeding tendencies, unstable stage of cardiovascular disease, trigeminal neuralgia secondary to intracranial tumors were excluded from this study.

All patients received standard monitoring with presence of an anaesthesiologist. Heart rate, respiratory rate, and fingertip digital oximetry and noninvasive blood pressure monitoring were applied throughout the procedures. A 50 μg dose of fentanyl was injected intravenously 5 minutes prior to insertion of the needle to provide analgesia. Skin microbial burden was reduced with povidone iodine and a sterile drape was spread over the face. Nasal prong was attached in nostril to provide supplemental oxygen during sedation. Total procedures were performed under fluoroscopic guidance, with the patient in the supine position and head extended by putting a soft pad under the neck. The intensifier of the C-Arm was adjusted 15-25° ipsilaterally and 30-35° caudally to reveal the X-ray image of desired foramen ovale in upper one third of the ramus of mandible and inside of the condyle. Before putting the needle 2ml of 1% lidocaine was infilered locally and radiofrequency trocar with 5mm active tip was inserted in tunnel view through foramen ovale. Needle tip was adjusted with appropriate motor and sensory stimulation. After eliciting pain in same area of face with sensory stimulation radio frequency thermocoagulation was done by Morgan Automation NeuroTherm JK3 Radiofrequency RF Lesion Generator.

During RF thermocoagulation 1.0 mg/kg injection propofol was administered to mitigate pain and discomfort. Two leisions created at 70°C for 90 minutes. After RF lessoning injection, 0.5 cc xylocaine 1% + 0.5 cc dexamethasone 2.5 mg injected at the level of foramen ovalae just before withdrawal of needle. Then skin sensation and corneal reflexes were checked and recorded. Patients were discharged 4 hours after the procedures on the same day.

Preprocedural and post procedural VAS score, corneal reflexes, facial numbness, masticatory muscle weakness, corneal sensations and reflexes were assessed and recorded. Then oral medications were tapered slowly where applicable. All data were collected at at preprocedural state, at immediate postprocedural

state, at 1st day, at 6 month and at 12 month. The data were tabulated and analyzed using Statistical Package of Social Sciences program (SPSS version 20.0) software.

Results

A total 44 patients were recruited into the study. Females outnumbered males (32 female patients, 72.72%, 12 male patients, 27.27 %). Most of our studied population (38 patients, 86.36%) had right-sided facial pain. (Table I)

Table I: Demographic and clinical characteristics

Variable	Value (n = 44)
Age (years)	60.2 ± 4.54
Gender (F/M)	32/12
Site of pain Rt/ Lt	38/6
Duration of pain (years)	5.3± 3.5
Preoperative VAS	8.40 ± 0.54
Branches affected:	
Mandibular + maxillary	16 (36.36%)
Mandibular	20 (45.45%)
Maxillary	8 (18.18%)
Ophthalmic	0
Masseter muscle weakness	6 (9.09%)
Corneal reflex intact	44 (100%)

Data expressed as mean ±SD number (%)

There was 100% improvement in VAS score (44 patients, 100%) on day 1 and 95.45% (21 patient) patients having excellent pain control at 6 month (VAS score 0-2), ($p< 0.05$). Age was the only statistically significant factor among patients. We found that older patients showed a better improvement regarding VAS score ($p< 0.05$) (Table II). On the contrary, sex, the side of the trigeminal pain, and the trigeminal nerve branch and/or number affected revealed no statistical significance ($p> 0.05$). Regarding complications, only one patient (2.5%) developed mild facial edema that subsided spontaneously within a few days, yet none of the studied patients developed any major adverse events (Table III).

The incidence of mild facial numbness was 38 (86.36%) patients in the first day reduced to 30 (68.18%) at 6th month and reduced significantly to 2 (4.54%) at 12 month. Masseter muscle weakness was managed using physiotherapy.

Table II: Pain relief after RFA by VAS

VAS	Pre-procedural	Immediate Post procedural	On 1st day	At 6 month	At 12 month
0-2	0	44	44	42	42
≥3	44	0	0	2	2

Value expressed as number

Table III: Facial numbness and hypoesthesia of the sutdied patients.

BNI facial hypoesthesia scale	Immediate Post procedural	At 1st day	At 6 month	At 12 month
No facial numbness	3 (6.81%)	10 (22.72%)	12 (27.27%)	41 (93.18%)
Mild facial numbness	38 (86.36%)	30 (68.18%)	30 (68.18%)	2 (4.54%)
Facial numbness, somewhat bothersome	2 (4.54%)	2 (4.54%)	0	0
Facial numbness, very bothersome	1 (2.27%)	1 (2.27%)	1 (2.27%)	1 (2.27%)

Data expressed as number and percentage

Discussion

Trigeminal neuralgia is a clinically common craniofacial painful disease, for which a variety of drugs or surgical procedures are available for its management. In our study, trigeminal neuralgia was diagnosed according to the criteria of the International Classification of Headache Disorders-II (2004)[7]. For the initial management medications such as carbamazepine, oxcarbazepine are used as first line therapy. When failed or patient can't tolerate other drugs such as baclofen, lamotrigine, phenytoin or topiramate could be used. Sometimes in very severe cases intravenous infusion of a combination of magnesium and lidocaine could be an effective modality for some patients. For decades radiofrequency thermocoagulation has been used all over the globe as a proven, safe and effective modes in treating different chronic pain disorders. Managing re-fractory Trigeminal neuralgia pain relief can be attained in almost 98% of diagnosed case of Trigeminal Neurlgia[8]. Among the total cases gender plays an important role in the incidence of Trigeminal Neuralgia as female are more prone to develop the symptoms [9, 10].

Conventional RF is being used as a minimally invasive and very effective treatment modalities of TN. During radiofrequency ablation controlled heat produced at the bare tip of the radiofrequency needle is thought to selectively destroy the Aδ and C types of pain fibers by thermocoagulation at temperatures >65°C[11]. Some study showed that the safety and

efficacy along with postoperative complications profile is very favorable in Pulsed radiofrequency but the recurrence time was shorter compared with CRF[12]. PRF achieves an analgesic purpose by stimulating the nerve only instead of damaging it and temperature remains less than 42°C; therefore, the effect duration of pain free time turns to be shorter.

In our study population we found the right side was more affected than the left (38 patients, 86.36% versus 6 patients,[13].63%, respectively). The anatomical variations of the patient population among foramen rotundum and foramen ovale may have the impact on it[13,14]. The mandibular and/or maxillary branches were almost equally affected. This disease predilection pattern is comparable with that of other studies[16,17]. Conventional RF is the most common percutaneous procedure used to treat typical TN and offers the highest rate of efficiency (90–100%) and complete pain relief[15–17] for longer time compared with chemical ablation, percutaneous ballon decompression or Gamma knife surgery. Moreover, conventional RF can easily be done under light sedation even in cardiac compromised patient safely as a day case procedure. Current study shows, high efficiency (95.45%), ($p<0.05$) in pain relief up to one year and only 1 patient (2.27 %) did not improve much in her VAS score and 1 (2.27%) patient develop anaesthesia dolorosa persisted up to 12-month follow-up that was managed poorly with anticonvulsant and capsaicin. In a large-scale, long-term follow-up of 1600 patients treated with RF rhizotomy of the trigeminal ganglion, complications reported as follows; 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%). Some other complications like cranial nerve VI palsy, CSF leakage, carotid-cavernous fistula in and aseptic meningitis[18]. Considering all these things most studies recommend conventional RF as the first line of treatment for medication refractory TN or patient having severe adverse effect with oral medications[19,20] our study also match with their recommendations. Short comings of our study was the number of patients population and would be more reliable in a larger population size.

Conclusion

CRF is a safe and reliable modes of treatment if it can be done in efficient hand in moderate high temperatures (65-70°C). Our study shows excellent pain relief in most of the cases with few manageable side effects.

Declaration

Ethics approval

The study was approved by the Institutional Review Board of Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh.

Author Contributions

Conception and development of the idea *CSK, RSD*
Writing *CSK, SMT*
Data analysis *MAH, AS, KMA*
Data collection *KMA, RSD, CSK*
Review and Editing *AKMA*

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Conflict of interest None

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