IDIOPATHIC TRIGEMINAL NEURALGIA: NEUROLYSIS WITH PULSED RADIOFREQUENCY (PRF). EXPERIENCE OF 30 CASES AT ARMY PAIN CENTRE CMH RAWALPINDI

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ABSTRACT

Objective: To describe the experience of 30 patients with idiopathic trigeminal neuralgia who underwent pulsed radiofrequency neurolysis of the trigeminal ganglion.
Study Design: Prospective descriptive study.
Place and Duration of Study: Army Pain Centre, CMH Rawalpindi, from Jan 2016 to Mar 2017.
Material and Methods: Total 30 patients fulfilling the inclusion criteria were included in this study after approval of the ethical committee through non probability consecutive sampling technique. All patients received pulsed radiofrequency therapy under image guided fluoroscopy through percutaneous approach. The definitive position of the electrode was verified with sensory stimulation between 0.1–0.6V at a frequency of 50Hz and motor stimulation between 0.5-2V at 2Hz to locate the affected nerve. Pulsed radiofrequency is then delivered for 4 minutes at 45 V, with a pulse width of 10 ms and a pulse frequency of 2 Hz. The cut-off needle tip temperature was set at 42°C. BNI scoring scale used for evaluating post procedural pain relief at, 1, 3, 6 and 12 month and graded as excellent, satisfactory and poor on the basis of BNI scores. Mean ± standard deviations were calculated for quantitative variables, while qualitative variables presented in frequency and percentages. Chi-square test used for qualitative variables.
Results: The patient diagnosed with typical idiopathic trigeminal neuralgia in the present study, was ranged between 45 to 68 years of age, peak incidence of the disease was in the fifth and sixth decades of life, females to male ratio was 2.33:1. The right to left sided facial pain ratio was 1.5:1 indicating predominance of right side facial pain. The mandibular division was the most frequently involved. A considerable number of patients had excellent relief of pain at 01.03,06 and 12 months was 23/30 (76.7%), 20/30 (66.6%), 17/30 (56.66%), 18/30 (60%) respectively.
Conclusion: PRF therapy of the trigeminal ganglion may be a possible alternative to minimally invasive modalities in the management of trigeminal neuralgia with fewer complications.

Keywords: Pulsed radiofrequency, Trigeminal neuralgia.

INTRODUCTION

Trigeminal neuralgia is a neuropathic painful disorder that is brief in duration, electric shock-like in character, abrupt in onset and termination, and is restricted to the distribution of one or more division's of trigeminal nerve[1]. It is classified into four types according to etiology which are idiopathic, secondary, atypical and post herpetic[2]. Further it may be classified into two types according to clinical characteristics of pain which are classical and mixed trigeminal neuralgia[3]. The prevalence of trigeminal neuralgia in general population is between 0.01% and 0.3% as suggested by different studies, although in primary care settings, it's going to be much higher, around 12% per 100,000 persons per year[4]. The gender ratio of women to men is approximately 2:1.[5] Trigeminal neuralgia may appear at any age, but disease onset occurs after the age of 40 years in more than 90% of cases, and the peak age of onset is between 50 and 60 years[5]. In current opinion, the trigeminal neuralgia is caused by a proximal compression of the trigeminal nerve root by a tortuous blood vessel (an artery or vein), close to the brainstem resulting in twisted nerve fibers mechanically

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and lead to ultimate demyelination which is probably mediated by microvascular ischemic damages[6]. These changes lower the excitability threshold of affected fibers and promote cross-talk between adjacent fibers,thus tactile signals coming from the fast myelinated (A-beta) fibers can directly activate the slow nociceptive (A-delta) fibers, and sometimes C fibers, resulting in the high-frequency discharges characteristic of trigeminal neuralgia[7]. Symptomatic trigeminal neuralgia may result from tumors (benign or malignant), multiple sclerosis, arteriovenous malformations or PHN[7]. Magnetic resonance imaging (MRI) is the most helpful imaging modality to determine the presence of lesions, such as cysts or tumors, vascular malformations, plaques of multiple sclerosis, as well as vascular compression of the trigeminal nerve[8]. Despite recent advancement in treatment, trigeminal neuralgia remains an incapacitating condition, which is difficult to treat with sucess in every patient. At present it is a standard practice to use carbamazepine as first line treatment, sometimes the addition of oxycarbazepine, phenytoin, baclofen, lamotrigine, gabapentine or sodium velproate may relief pain[8]. The effectuality of carbamazepine or alternative medicine could decrease over time and adverse effects may impose discontinuation of the medication. About half of all patients eventually require an operation for pain relief. The management options for trigeminal neuralgia also include radiofrequency thermocoagulation (RFT) and percutaneous injections of different chemical agents into the affected nerve. The first substance used was chloroform, later, boiling water, glycerol, phenol, high concentrations of tetracaine and streptomycine were also used[9]. Patients with serious morbidity who cannot undergo invasive surgical procedures safely may benefit from percutaneous injection of alcohol and PRF into the painful peripheral trigeminal nerve branch. These techniques are associated with pain relief for 1.43 ± 0.23 5 and 2.3 ± 0.8 6 years respectively[10]. The available surgical options include surgical microvascular decompression (MVD) surgical sectioning of a portion of the sensory component of the trigeminal nerve, stereotactic radiation therapy or gamma knife treatment, percutaneous balloon micro compres-sion[11,12]. Trigeminal neuralgia which is resistant to medical treatment, may be benefited from percutaneous procedures like glycerol, phenol, alcohol and radiofrequency (RF) rhizolysis that damage the trigeminal nerve or the Gasserian ganglion so that peripheral stimuli no longer trigger an attack of trigeminal neuralgia[13,14]. These procedures have little mortality and mor-bidity and require little or no general anesthesia. They are therefore useful for the elderly patients, those who do not wish to undergo major intracranial operation. As compared to surgical choices these procedures are less time consuming and less expensive. The rationale of this study was to reduce morbidities associated with this incapacitating and debilitating illness.

MATERIAL AND METHODS

This prospective descriptive study was conducted after approval from ethical review committee of the Hospital, patient's consent and explaining the risks and benefits to the patients. This study was conducted at the department of Pain medicine Combined Military Hospital Rawalpindi. The duration of the study was, from January 2016 to March 2017. Technique used was non probability consecutive sampling. All the patients with the diagnosis of idiopathic trigeminal neuralgia, drug resistant idiopathic trigeminal neuralgia and with the history of disease duration more than 1 year were included in this study. All the patients unwilling for procedure, disease duration of less than 1 year, other types of Trigeminal neuralgia except Idiopathic trigeminal neuralgia, operated cases of trigeminal neuralgia, had undergone any interventional procedure for trigeminal neuralgia before and with the history of trauma or direct nerve injury (trigeminal neuralgia) were excluded. The age and gender of the patients was determined at the first visit. The diagnosis was based on a detailed history and clinical examination, computed tomography (CT)

scanning or magnetic resonance imaging (MRI) was be performed for every patient to exclude any local pathology or lesion at brain level. All patients received pulsed radiofrequency under image guided fluoroscopy through percutaneous approach. All the patients were given written informed consent for PRF treatment. On the first visit, the branch of the nerve involved was identified according to the site of the pain and confirmed using a diagnostic local anesthetic injection of 1% lignocaine 2-3 ml at the site. All the patients were kept NPO for 8 hours. Prophylactic antibiotic was administered 1 h before the procedure. Intravenous access was obtained, and standard monitors including electrocardiogram, blood pressure monitoring, and pulse oximetry were applied. Sedation is usually necessary to increase patient comfort and reduce anxiety. In this procedure, the patient was lying comfortably in a supine position with the head slightly extended. Electrocardiogram and pulse oximetry and blood pressure readings was obtained for continuous hemodynamic monitoring. The C-arm was introduced in a postero-anterior fashion and rotated caudo-cranially to produce a submental view. The foramen ovale was visualized with this view. A 5-10 degree tilt to the ipsilateral affected side was required to improve visualization of the foramen ovale. The needle entry point was 2-3 cm from the corner of the mouth. An approach that would worked well for us was to bring the foramen ovale to the entry point by manipulating the C-arm in a caudo-cranial orientation, which produced an excellent tunnel view. Intravenous nalbuphine up to 02 mg and 1-2 mg of dormicum used to sedate the patient during the initial needle penetration into the foramen ovale. Once the needle enters the foramen ovale into Meckel's cavity, the C-arm was then rotated laterally to ascertain the depth of penetration. The final position of the needle tip was just at the angle formed by the petrosal ridge of the temporal bone and the clivus. The sedation was discontinued, the patient allowed awakening, sensory and motor stimulation carried out at 50 Hz & 2 Hz respectively. The definitive position of the electrode was verified with sensory stimulation between 0.1-0.6V at the frequency of 50Hz and motor stimulation between 0.5-2V at 2Hz to locate the effected nerve. PRF is then applied for 4 minutes at 45 V, with a pulse width of 10 ms and a pulse frequency of 2 Hz by using 22 gauge 100mm RF needle with 5mm active tip. The cut-off needle tip temperature was set at 42°C. BNI scoring system used for evaluating post procedural pain relief at, 1, 3, 6 and 12 months in all patients.

The BNI scoring system used to label the degree of relief as follows:

Grade I: No pain and no medication required

Grade II: Occasional (mild) pain and no medication required

Grade III: Some pain (moderate) which was adequately controlled on medication

Table-I: Demographic data.

Parameter (n=30)	Mean ± SD
Age (years)	57.86 ± 5.12
Weight (Kg)	68.23 ± 6.11
Gender F/M Ratio (21/09)	2.33 / 1
(70/30%)	

Grade IV: Pain improved (severe) but not adequately controlled on medication

Grade V: No pain relief whatsoever

In this study response to therapy were classified as follows,

'Excellent' - if there was total absence of symptoms (BNI Grade I, II),

'Satisfactory'- if some improvement of the symptoms was observed (BNI Grade III)

'Poor-' 'failure' if the preoperative clinical status was unaffected or was become worse (BNI Grade IV, V)

Data was analyzed with SPSS version 20. Mean ± SD was calculated for quantitative variables like mean pain score (NRS), age and weight. Frequency and percentage was calculated for qualitative variables like gender, efficacy

(Degree of pain relief). Chi square test was used for qualitative variables.

RESULTS

The patient diagnosed with typical idiopathic trigeminal neuralgia in the present study ranged between 45 to 68 years, with a mean age of 57.86 years. The peak incidence was in the fifth and sixth decades of life (table-I). Females comprised 70 percent of the patients, representing a ratio of 2.33:1. Of the 30 cases, 18 patients (60%) suffered excruciating pain on the right side of the face and 12 patients on the left side (table-II). This gave a site ratio of 1.5:1 confirming a predominance of right side facial affiliation. The mandibular division was the most frequently involved branch (table-II).

From the review of results, the percentages of patients who showed excellence response to therapy at 01, 03, 06 and 12 months were 23/30 (76.7%), 20/30 (66.6%), 17/30 (56.66%), 18/30 (60%) respectively. The percentages of patients who showed satisfactory response to therapy at 01, 03, 06 and 12 months were 06/30 (20%), 08/30 (26.7%), 10/30 (33.3%), 07/30 (23.3%) respectively and those patients showed poor response to therapy at 01, 03, 06 and 12 months were 01/30 (3.3%), 02/30 (6.6%), 03/30 (10%) and 05/30 (16.6%) respectively. No complications were reported.

Table-II: Distibution of Nerve Involved.

Nerve Involved(n=30)	Right side	Left side	Bilateral	Total
Mandibular (V2)	08	07	-	15 (50%)
Maxillary (V3)	08	05	-	13 (43.3%)
Opthalmic (V1)	01	Nil	-	01 (3.35%)
Mix (V2+V3)	01	Nil	-	01 (3.35%)

Table-III: Response to treatment.

Response to Treatment	Frequency (n=30)	Percentage (%)
At One Month		
a) Excellent	23	76.7
b) Satisfactory	06	20
c) Poor	01	3.3
At 03 Month		
a) Excellent	20	66.6
b) Satisfactory	08	26.7
c) Poor	02	6.6
At 06 Month		
a) Excellent	17	56.66
b) Satisfactory	10	33.3
c) Poor	03	10
At 12 Month		
a) Excellent	18	60
b) Satisfactory	07	23.3
c) Poor	05	16.6

DISCUSSION

Trigeminal neurolyitc blocks stay a debatable form of trigeminal neuralgia management, and thus far no well-designed statistically based study has presented the outcome data. Different percutaneous techniques including RF neurolysis, balloon compression, glycerol or alcohol neurolysis, and MVD are presently used to manage trigeminal neuralgia, but no consensus has been reached so far concerning best possible modality.

Furthermore, few reports have addressed duration of pain relief by a radiofrequency block

of the peripheral trigeminal nerve. Van Zundert *et al*, administered PRF treatment for the trigeminal neuralgia to 5 high-risk patients. The first 4 patients experienced excellent pain relief over an average of 17.5 months, even though 1 of them required a repeat procedure[15]. In this review, RF trigeminal rhizotomy is still an invaluable technique that has provided pain relief for many patients with trigeminal neuralgia and it may be prudent to even consider performing PRF prior to RF for a sole purpose of avoiding disturbing sensory paresthesia and masseter paralysis of ablative neurosurgical techniques for the treatment of trigeminal neuralgia.[16] However, Erdine *et al*, demonstrated in a double-blinded trial that PRF was remarkably less efficacious that conventional RF[17]. Their results demonstrate significant pain reductions in all patients treated with conventional RF, while only 2 of the 20 patients in the PRF group experienced this level of pain relief[18].

In this study we tried to evaluate the analgesic efficacy of pulsed radiofrequency induced trigeminal neurolysis at different intervals. According to the results of the study, patients experienced excellent pain relief at 01 and 03, 06 and 12 months were 23/30 (76.7%), 20/30 (66.6%), 17/30 (56.66%), 18/30 (60%) respectively but this relief of pain gradually declines till 60% at 12 months. A considerable number of patients continue to experienced satisfactory relief of pain i.e. 06/30 (20%), 08/30 (26.7%), 10/30 (33.3%), 07/30 (23.3%) at 01, 03, 06 and 12 months respectively. There were an insignificant percentage of patients who showed poor response to therapy and ranged from 01/30 (3.3%), 02/30 (6.6%), 03/30 (10%) and 05/30 (16.6%) at 01, 03, 06 and 12 months intervals respectively. However no complications were reported by the patients during and after the therapy. Therefore, it is apparent from the results that the efficacy of pulsed radiofrequency therapy for trigeminal neuralgia at 12 month is 60% (excellent pain relief) and we did not follow outcome of the pulsed radiofrequency therapy beyond 12 months. Therefore, it is recommended that more studies to be carried out to assess the outcome of pulsed radiofrequency therapy for extended period i.e more than 12 months. Our results are comparable with other studies, as in a study by Van Zundert *et al*. 80% patients experienced excellent pain relief over an average of 17.5 months and in our case it is 60% for at 12 months[15].

To the author knowledge this is the largest series of trigeminal neuralgia patients treated with PRF in pakistan. This data correlated well with our records of excellent and satisfactory rates of pain relief at 6 and 12 months. This may mean that good pain relief at 6-12 months after trigeminal ganglion PRF treatment may predict for long-term efficacy of PRF treatment. Our results are comparable with other studies in respect of relief of pain and safety profile of the therapy. Our results indicate that this modality offers a high rate of adequate pain relief and may have a long lasting effect without serious complications and its comparable efficacies to conventional modalities need to be evaluated in greater detail in further studies.

CONCLUSION

PRF treatment of the trigeminal ganglion may be a possible alternative to minimally invasive modalities in the management of trigeminal neuralgia with fewer complications.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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