Case Report

Noninvasive pulsed radiofrequency for trigeminal neuralgia: Off the beaten path – Case series

ABSTRACT

Trigeminal neuralgia (TN) is a debilitating condition characterized by excruciating facial pain resulting from dysfunction in the trigeminal nerve. Treatment options are limited. Noninvasive pulsed radiofrequency (PRF) therapy is an emerging promising approach to managing TN. This therapy provides pain control without tissue damage or unpleasant side effects compared to invasive procedures. Here, we present five cases of trigeminal neuralgia successfully managed with noninvasive PRF therapy. Our case series contributes to the existing literature and supports the potential efficacy of noninvasive PRF therapy for TN.

Key words: Ablation, noninvasive, radiofrequency, trigeminal neuralgia

Introduction

Trigeminal neuralgia (TN) is a distressing condition characterized by severe facial pain originating from trigeminal nerve dysfunction.[1] The pain, triggered by inoffensive stimuli, hinders routine activities and significantly reduces quality of life.[2] Individuals with TN are also at a higher risk of experiencing anxiety, depression, and even suicide.[3] Therefore, early diagnosis and appropriate interventions are of utmost importance. The primary treatment typically involves anticonvulsant medications that target sodium channels (carbamazepine).[4-6] Secondary pharmacotherapy with lamotrigine, gabapentin, pregabalin, botulinum toxin type A, and baclofen can be utilized alone or in combination. However, if these are ineffective or cause intolerable side effects, invasive options like microvascular decompression (MVD) or neuroablation are considered.[3,5,6] Approximately one-third of patients require combination therapy, emphasizing the need for improved treatment approaches.[7]

While nerve stimulation through electrodes holds promise as a treatment modality, it is associated with complications like lead migration, lead allodynia, and infection.[8] An emerging and versatile approach in pain management is noninvasive pulsed radiofrequency (PRF) therapy, which offers pain relief without causing tissue damage or adverse effects. In this case series, we present the outcomes of administering cycles of noninvasive pulsed radiofrequency therapy to a group of five patients diagnosed with trigeminal neuralgia who were referred to our pain clinic.

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Case Description

Case 1

A 57-year-old male patient was referred to the pain clinic due to a 2-month history of trigeminal neuralgia, experiencing intense localized pain on the left cheek near the ear. The pain was described as sharp, burning, and pruritic, and it worsened with eating, brushing, and exposure to cold. Initial treatment with baclofen, amitriptyline, and carbamazepine provided moderate pain relief. However, after 3 months, the patient reported increased pain scores (Visual Analogue Score (VAS) 6/10) and was prescribed additional methylcobalamin and pregabalin, along with an increased baclofen dose. Despite these adjustments, pain control remained suboptimal (VAS 5/10), leading to the decision to proceed with noninvasive PRF therapy. The patient experienced pain recurrence after 3 months and underwent additional PRF sessions. After 3 weeks, his VAS score plummeted to 1/10, allowing for a reduction in pain medication dosage.

Case 2

A 77-year-old female was referred to the pain clinic for the management of trigeminal neuralgia affecting the mandibular division. Despite receiving treatment with carbamazepine, amitriptyline, and baclofen, the patient experienced insufficient pain control with pain scores ranging from 6 to 7 out of 10 on the VAS. Subsequently, the patient underwent PRF therapy over several weeks, resulting in a notable reduction in pain scores to 2/10, without the necessity of increasing medication dosages.

Case 3

A 90-year-old male suffering from trigeminal neuralgia affecting the ophthalmic and maxillary divisions was referred to the pain clinic. Given his cardiac condition and use of oral anticoagulants, a cautious approach to management was necessary. The patient was receiving a combination of baclofen, carbamazepine, methylcobalamin, pregabalin, and amitriptyline. Subsequent follow-ups indicated a moderate reduction in pain (VAS 4/10), prompting the decision to proceed with PRF therapy. After 3 weeks, pain levels decreased significantly to a VAS of 1/10.

Case 4

A 70-year-old male diagnosed with trigeminal neuralgia affecting the maxillary and mandibular divisions was referred to the pain clinic, presenting with intense pain rated at 8/10 on the VAS. Initially, the patient's management involved oral ketorolac, pregabalin, and amitriptyline. Subsequently, noninvasive PRF therapy was introduced. The patient underwent three cycles of PRF therapy and upon completion experienced a significant reduction in pain scores with a VAS score of 1/10.

Case 5

A 40-year-old female diagnosed with trigeminal neuralgia affecting the mandibular division presented with severe pain, rating it at 8/10 on the VAS. The initial treatment plan included daily doses of baclofen, carbamazepine, methylcobalamin, pregabalin, and amitriptyline. Concurrently, PRF therapy was scheduled. Two cycles of PRF therapy were administered, spaced 1 week apart, adhering to specific parameters. Regrettably, due to the COVID-19 pandemic, the patient was lost to follow-up. However, during a teleconsultation, the patient reported that her pain was manageable and she perceived no need for further clinic visits.

We adhered to guidelines from the existing literature for the management of chronic pain using noninvasive PRF therapy.[9] We followed specific treatment parameters including varying treatment durations (5, 10, 20, or 30 minutes), treatment intensities ranging from medium to strong (15 to 30 mA), and a flexible number of sessions (3, 6, or 12). In our study, each patient underwent three cycles of noninvasive PRF therapy, with one cycle administered weekly over 3 weeks. We employed specific parameters, including a frequency of 2 Hz, a pulse width of 0.2 milliseconds, and a current of 20 mA. Individual adjustments in current intensity (ranging from 15 to 20 mA) were made based on patient tolerability, and for those with insufficient response, the duration of treatment in the final weeks was extended as necessary. Following the completion of this therapy regimen, patients reported a significant reduction in pain scores and were able to decrease their oral analgesic medication doses. Subsequent follow-up assessments at 6 months and 1 year demonstrated a continued reduction in medication usage and doses.

Initially, the recommended treatment schedule involved daily sessions for 1 month, followed by a gradual reduction in frequency to three times, twice or once a week over an extended period. If the pain subsided and then returned, it is advisable to resume treatment, although fewer sessions may suffice. It is notable that adjustments to treatment intensity should be made to ensure patient comfort.

Discussion

Noninvasive PRF therapy has emerged as a novel approach to pain management, offering pain relief without tissue damage. It holds the potential for addressing complex pain conditions

like TN. Noninvasive modalities, including supraorbital stimulation with the Cefaly device, vagus stimulation with the gammaCore device and transcranial magnetic stimulation with the SpringTMS device have demonstrated efficacy as alternatives or adjunctive therapies alongside pharmacotherapy.[10,11] Among these, transcutaneous supraorbital nerve stimulation (tSNS) using the Cefaly device has undergone rigorous evaluation with trial-based evidence supporting its effectiveness and safety.[10]

In these cases, we administered cycles of noninvasive PRF using the Stimpod NMS460 device (Xavant Technology, Pretoria, South Africa) to a cohort of five patients diagnosed with trigeminal neuralgia who were referred to our pain clinic. The Stimpod NMS460 device applies PRF waves to induce percutaneous peripheral nerve stimulation.[12] It has received approval from the United States Food and Drug Administration (US-FDA) as an adjunct therapy for acute and chronic pain conditions.[12] The treatment involves the external application of the device, delivering PRF through a small probe to the targeted nerve as shown in Figure 1. This device uniquely targets superficial nerves along the entire axon, influencing the dorsal root ganglion and achieving percutaneous peripheral nerve stimulation.[12]

PRF signals typically consist of pulse durations ranging from 5 to 50 milliseconds and pulse frequencies ranging from 1 to 10 Hz, commonly using a frequency of 2 Hz.[9] The Stimpod NMS460 device utilizes a handheld device connected to a probe as the active electrode delivering the treatment current. An indifferent electrode can be placed at an appropriate distance from the active electrode for optimal current penetration. The current intensity ranges from 0 to 30 mA, with higher intensities recruiting both sensory and motor nerve fibers.[9] The probe is applied firmly to the skin surface to facilitate current penetration into deeper tissues. During the procedure, the intensity is gradually increased based on individual tolerance, starting at a low intensity and adjusting as necessary to ensure patient comfort.[9]

Figure 1: External application of the noninvasive PRF device (Stimpod NMS460) through a small probe to the targeted nerve or affected region

In our practice, the patients with trigeminal neuralgia reported significant pain reduction, with VAS scores decreasing from 6 to 9 out of 10 to 1–2 out of 10, indicating effective pain control. A study by Tauheed *et al*.[13] evaluated the efficacy of noninvasive stimulation of the supraorbital nerve (SON) and occipital nerve (ON) using the Stimpod NMS460 device in patients with chronic daily headache (CDH). The intervention group, receiving Stimpod NMS460 PRF therapy, showed significant improvements in pain relief, quality of life, and numerical rating scale (NRS) scores compared to the sham treatment group.[13] The Stimpod NMS460 device, with its dual noninvasive neurostimulation, offers better coverage for hemicranial headache compared to the Cefaly device targeting only the supraorbital nerve.[14]

PRF therapy can also be applied to different regions, such as the cervical, thoracic, and lumbar-sacral regions, targeting local and referred pain. For trigeminal neuralgia, treatment targets areas posterior, superior, and inferior to the temporomandibular joint.

In summary, noninvasive PRF therapy holds promise as a safe and effective adjunctive therapy for trigeminal neuralgia and other neurogenic pain conditions. Further research, including larger randomized trials, is needed to establish its efficacy, safety, and long-term outcomes.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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