Case Report

Pulsed radiofrequency treatment for the management of trigeminal neuropathic pain following tooth extraction: A case report

ABSTRACT

Post-traumatic trigeminal neuropathic pain is one of the rare complications that could follow orofacial procedures such as dental extraction. The incidence of this type of pain following craniofacial trauma ranges between 3% and 13% depending on the type of surgery. The inferior alveolar and lingual nerves are commonly affected following molar tooth extraction. Pain usually differs from one patient to another concerning intensity and distribution. Pulsed radiofrequency treatment is one of the most widely used techniques in chronic pain management. It focuses on generating heat using radiofrequency waves at higher voltages than conventional radiofrequency while keeping tissue temperature below the neuro-destructive range. This report aims to highlight the benefit of using trigeminal ganglion pulsed radiofrequency to manage neuropathic pain following molar extraction.

Key words: Neuropathic, pain, pulsed radiofrequency, tooth extraction, trauma, trigeminal ganglion

Introduction

Post-traumatic trigeminal neuropathic pain (PTNP) is considered a rare event happening after craniofacial trauma or dental procedures.[1,2] The incidence of its prevalence could be around 8% following implant and surgical endodontic procedures.[2-5] The inferior alveolar and lingual nerves are commonly affected following molar tooth extraction.[6] Patients usually present with a range of neuropathic symptoms such as hyperalgesia, allodynia, and hypothesia.[7,8] Pain perception usually differs from one patient to another concerning intensity and distribution. Gender difference is usually present where females are more commonly affected than males.[7,8]

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Different mechanisms have been implicated in the development of this type of pain. The release of chemical mediators such as bradykinin, serotonin, and prostaglandin activate protein kinases A and C, increasing tissue excitability.[9,10] Decreasing voltage-gated potassium channel current following trigeminal nerve injury lowers the excitability threshold and increases the frequency of spontaneous discharge within the trigeminal ganglion.[11] Peripheral sensitization following injuries also plays a crucial role in developing hyperalgesia, where there is an exaggerated response to nociceptive stimuli.[12]

Pulsed radiofrequency (PRF) treatment is one of the most widely used techniques in chronic pain management.[13] It has

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gained a lot of popularity since the first procedure, which was performed in 1996.[14] The advantages of using PRF over conventional radiofrequency ablation lie in the production of fewer complications and side effects, which could be attributed to the low temperature targeted.[14]

We are aiming through this report to describe the success of using PRF for the management of trigeminal neuropathic pain in a female patient who developed this pain after wisdom tooth extraction.

Case Report

Fifty-four-years-old female patient presented with severe neuropathic pain involving the left chin, lower jaw, and temporomandibular joint following wisdom tooth extraction two years ago. The pain intensity, as described by the patient on a numeric rating scale, is 10/10, constant throughout the day. The patient describes the difficulty in eating, moving her jaw, allodynia, and hyperalgesia. She was on high doses of Gabapentin 3600 mg per day, Naltrexone 4.5 mg per day, and Nortriptyline 40 mg per day in addition to Paracetamol and Ibuprofen, which she infrequently takes according to the severity of the pain. Previous imaging studies, including X-ray and Computerized Tomography scans for the face, and craniofacial bones, were normal. The patient has been referred to our pain department after being examined by dentists several times without finding any abnormality at the site of the previous procedure.

The patient has been informed about our management plan, which involves doing the Trigeminal ganglion PRF procedure under sedation. Consent has been taken regarding the procedure and the publication purposes. On arrival at the theater, an intravenous cannula was inserted, and routine monitoring equipment (ECG, Blood pressure, and pulse oximeter) and a nasal oxygen cannula were attached. The patient was placed supine, and the C-arm was rotated caudally to obtain a submental view and tilted to the left side to visualize the foramen ovale. A total of 2 mg of Midazolam and 50 mcq of fentanyl were given at the start of the procedure. A total of 5 mL of Lidocaine 2% was given as local infiltration 1 cm lateral to the corner of the mouth on the left-hand side. 22G, 10 cm with 2 mm active tip radiofrequency needle was inserted directed to the lateral part of foramen ovale. Once the needle passed through the foramen ovale, a lateral view was obtained to confirm the needle depth. 2HZ motor stimulation was done, and masseter twitches were observed. Sensory stimulation at 50HZ and mapping the area to ensure the desired branch was targeted was performed. After confirming with the patient that the right spot was targeted, PRF was started for 180 seconds at a temperature of 42°C. After finishing with the PRF lesion, 0.2 mL of Dexamethasone (3.3 mg per 1 mL) was injected. The patient was kept in the recovery room for 1 h after the procedure and discharged home 3 h later.

Patient follow-up was done at three and six-month intervals after the procedure. The pain intensity was reduced by 50% compared to before the procedure. The pain score was 5/10 at three and six-month intervals after the procedure. The patient reported improving her quality of life in regards to eating and drinking habits, hyperalgesia, and allodynia symptoms compared to before the procedure. No neurological complication was detected.

Discussion

PTNP could develop after iatrogenic dental procedures, and depending on its severity, the patient's quality of life is usually affected negatively.[15] Neuropathic pain development involves interaction between neuronal and non-neuronal cells within both peripheral and central nervous systems. This interaction leads to the development of both peripheral and central sensitization, which usually accompanies this type of pain.[15]

PRF is well known as one of the effective ways for the management of many chronic pain conditions.[14] Compared to conventional RF, applying a lower temperature PRF resulted in preserving nuclear membrane integrity and avoiding mitochondrial degeneration, which usually accompanies the conventional RF method.[14] In a study performed by Tun *et al*.,[16] they found that applying PRF to dorsal root ganglia (DRG) at rats' L5 and L6 spinal nerves helped improve mechanical and thermal hyperalgesia. They suggested as well that appropriate usage of PRF besides DRG could help to improve symptoms of neuropathic pain that could develop.[16] PRF not only causes these changes in the neuronal membrane but also enhances the descending noradrenaline and serotonin inhibitory fibers, resulting in alleviating neuropathic pain symptoms.[17] Another point to be considered when using the PRF technique in chronic pain management is the dose or, in other words, the interval of application of the PRF. Tanaka *et al*.[18] showed that increasing the PRF duration from 2 to 6 min helped improve the Resiniferatoxin-induced neuropathic pain symptoms in animal models. A randomized controlled trial done by Erdine *et al*.[19] showed that the usage of PRF for the management of trigeminal neuropathic pain resulted in a good response compared to the conventional RF techniques with fewer side effects and complications.

In conclusion, PRF is considered an effective, safe technique for the management of trigeminal neuropathic pain. Its

application enables both good therapeutic effects and fewer complications than conventional RF techniques.

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Conflicts of interest
There are no conflicts of interest.

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