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Effectiveness of Low-Level Laser Therapy Along with Conventional Physiotherapy on Pain in Subjct with Trigeminal Neuralgia

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Abstract
Trigeminal neuralgia is a condition characterized by severe facial pain. It affects the trigeminal nerve, which is responsible for transmitting sensations from the face to the brain. The pain associated with trigeminal neuralgia is often described as sharp, sudden and intense, resembling an electric shock. The study's primary objective is to evaluate the combined effect of low-level laser therapy and conventional physiotherapy on Pain using VAS scale in Trigeminal neuralgia subject. A pre-test, post-test single case study design was used. A 45year old female was diagnosed with trigeminal neuralgia. The subject had severe stabbing pain, with a brief recurrent episode and usually unilateral with the distribution of one or more branches of the Trigeminal nerve felt deep in the face. Pain occurs in a sudden attack. Duration of attack varies from a few seconds to a few minutes. The frequency of the pain attacks also differs from a few to hundreds of attacks a day. The subject received Low level laser therapy along with conventional physiotherapy for 3 alternative days in a week for 4 weeks. Pre and post-test values of pain was measured using visual analogue scale. The pre-test score of pain was 9 on VAS scale. At the end of second week, the pain reduced from 9 to 6 and at the end of the fourth week the pain was further reduced to 4 on VAS scale. Thus, the result of the study shows significant reduction in the pain in Trigeminal neuralgia subject. The study concluded that low level laser therapy along with conventional physiotherapy shows significant reduction of pain on trigeminal neuralgia subject. Low level laser therapy is found to produce significant effect when combined with conventional physiotherapy to manage trigeminal neuralgia patients.

INTRODUCTION

Trigeminal neuralgia (TN) is orificial pain that is restricted to one or more divisions of the trigeminal nerve. TN is categorized into three etiologic classes, namely idiopathic, classical and secondary TN. Idiopathic TN occurs without any underlying pathology. Traditional TN is caused by vascular pressure of the trigeminal nerve root. Secondary TN is the result of a significant neurologic malady, like a tumour of the cerebello pontine point or multiple sclerosis[1]. TN is usually presented unilaterally with intense paroxysmal pain, provocation of pain with a limited local stimulus, with pain always confined along the course of the trigeminal nerve. The pain may last for a few seconds to minutes and is episodic in nature. Patients normally do not encounter pain between paroxysms[2]. The true prevalence of TN is unknown and has not been studied extensively in the population[3]. Although TN is a prototype of neuropathic pain, it does not fit the evaluating framework for the grading of neuropathic pain. Absent objective signs and tests are known features of classical TN and hence confirmatory diagnosis is done clinically[1].Trigeminal neuralgia (TN) is a disease characterized by severe stabbing pain, with a brief recurrent episode and usually unilateral with the distribution of one or more branches of the Trigeminal nerve felt deep in the face. Pain occurs in a sudden attack (paroxysm)., duration of attack varies from a few seconds to a few minutes. The frequency of the pain attacks also differs from a few to hundreds of attacks a day. It may take months to years for remission, but each attack tends to shorten in the next remission period[4].

Recent estimates suggest the prevalence is approximately 4.5 cases per 100,000 population, with an incidence of approximately 15,000 cases per year[5]. The worldwide prevalence ranges between 10 and 300/100 000[6]. In 90% of patients, the disease begins after age 40 years. Women are more affected than men[7]. In some cases, TN may be caused by an identified structural abnormality including multiple sclerosis, tumours and abnormalities of the skull base (symptomatic TN). However, in some patient's symptoms are generated from morphologic change in the trigeminal nerve root due to vascular compression without an established aetiology (classic TN)[8]. Only, routine imaging may be helpful in identifying the symptomatic TN. However, the diagnosis of classic TN is based on the history of patient and characteristic features of pain[9].

Trigeminal nerve is the fifth and largest cranial nerve. It comprises three branches, two of which are purely sensory and third, largest branch is mixed nerve which are ophthalmic, maxillary and mandibular branches[10]. The trigeminal nerve is the largest cranial nerve and is responsible for transmitting sensory information from the face to the brain. In trigeminal neuralgia, there is a malfunction or irritation of the trigeminal nerve, leading to episodes of intense, stabbing, or electric shock like pain in the areas of the face innervated by the nerve. The condition typically affects one side of the face, although in some cases, it can affect both sides. The pain is often triggered by simple, everyday activities such as eating, speaking, brushing teeth, or even touching the face. These triggers are known as trigger points and vary from person to person.

The pain episodes in trigeminal neuralgia can be excruciatingly intense and brief, lasting for a few seconds to a couple of minutes. The pain attacks can occur in clusters over a period of time, followed by periods of remission when the person is relatively pain-free.

Trigeminal neuralgia can significantly impact a person's quality of life, as the pain can be debilitating and can interfere with daily activities. It is more common in individuals over the age of 50 and women are slightly more affected than men. The exact cause of trigeminal neuralgia is not always clear, but it is thought to involve compression or irritation of the trigeminal nerve by nearby blood vessels or the formation of a benign tumour called an acoustic neuroma. Classic trigeminal neuralgia is associated with neurovascular compression in the trigeminal root entry zone, which can lead to demyelination and a dysregulation of voltage gated sodium channel expression in the membrane. These alterations may be responsible for pain attacks in trigeminal neuralgia patients[11]. There is no specific test for trigeminal neuralgia, so a diagnosis is usually based on your symptoms and description of the pain and other investigations include neurological examination and magnetic resonance imaging [MRI]. The first step of treatment of TN is medical therapy. Carbamazepine is offered as effective drug aimed to suppress the pain, Oxcarbazepine, baclofen, lamotrigine and pimozide may also be prescribed[13,14].

In some cases, where symptoms are not controlled by medication, surgical procedures are necessary, it includes microvascular decompression, brain stereo tactic radio surgery, rhizotomy like glycerol injection, balloon compression, radio-frequency thermal lesioning etc[15,16].

Physiotherapy promotes, maintains and restores the physical, psychological, and social well-being of an individual by the use of different techniques[17]. The physiotherapy treatment of TN focusses on the patient's goals and needs. It includes TENS, interferential therapy, ultrasound, laser etc

Other treatment includes peripheral nerve treatments such as cryotherapy, alcohol injection, phenol injection, peripheral acupuncture, radio-frequency,

thermocoagulation and Laser therapy are effective in relieving symptoms of TN[8].

MATERIALS AND METHODS

Study Design: A pre-test, post-test single case study design was used. A 45year old female was diagnosed with trigeminal neuralgia.

Subjects: A pre-test, post-test single case study design was used. A 45year old female was diagnosed with trigeminal neuralgia. The subject had severe stabbing pain, with a brief recurrent episode and usually unilateral with the distribution of one or more branches of the Trigeminal nerve felt deep in the face. Pain occurs in a sudden attack. Duration of attack varies from a few seconds to a few minutes. The frequency of the pain attacks also differs from a few to hundreds of attacks a day. Methods:

Methods: A 45-year-old female had consulted a Neurologist at Ashwin Multispecialty Hospital, Coimbatore. She was suffering from recurrent, lancinating, right-dominant facial pain. She complains of pain that ran along mandibular branch of trigeminal nerve, which was shooting from the corner of the mouth to the angle of the jaw. She reported onset of a dull persistent pain and fatigue (pre trigeminal neuralgia) almost 4 years ago without any causes. Early diagnosis was teeth grinding. The neurologist had prescribed baclofen as a muscle relaxant and night guard. Symptoms went down for a while until two years ago, which reappeared suddenly with a brief, stabbing, electric shock-like, severe pain attacks in the facial area. The frequency of neural attacks varied from 5 attacks a day to <2 attacks in a month. Duration of each attack lasted 20 seconds or less. There were no facial autonomic symptoms (including lacrimation, ptosis, and nasal congestion) during neural attacks. The patient claimed that the pain was triggered by mechanical stimuli such as brushing teeth, rubbing the face, chewing, even sometimes while smiling or talking, especially exposed to ice or cold wind. The location of the evoked pain was in the triggered site or sometimes radiated to another area. Patient's main complaint was sudden neural pain along with persistent fatigue in the face that lasted after the attacks also. Patient's neurologist had diagnosed TN, prescribed the carbamazepine and referred the patient to the physiotherapy department of PPG College of Physiotherapy to reduce pain and other complications of the disease. After that she visited OPD of PPG College Of Physiotherapy, regular Physiotherapy assessment was done. The Physiotherapy treatment goal was set and she was planned to be treated with Low-level Laser Therapy along with Conventional Physiotherapy to reduce pain and other complications.

Description of Experimental Intervention:

Low Level Laser Therapy: Low-level laser therapy (LLLT) is a treatment method that employs a mono wavelength of light. The effects of monochromatic light and laser radiation on cell and tissue function are unknown[18,19]. Many researchers have reported significant pain reduction as a result of laser therapy in various disorders, including headache, rheumatoid arthritis, fibromyalgia, nervous system diseases, post-operative pain, lumbago, chronic cervical pain, and myofascial pain syndrome[20,21,22]. Low-intensity laser therapy improves the capacity for myelin synthesis and increases nerve function in injured nerves, according to clinical trials. Moreover, it promotes axonal growth in wounded nerves in animal models[23,24].

Conventional Therapy: Conventional physiotherapy is a well-established healthcare practice with a strong evidence base supporting its effectiveness. It is typically delivered by licensed and trained physiotherapists in various settings, including hospitals, clinics, rehabilitation centres and private practices. The treatment plan is individualized to meet the specific needs and goals of each patient, aiming to restore optimal physical function and enhance overall well-being. Superficial moist heat therapy is a therapeutic technique that involves applying heat to the surface of the body to provide pain relief, relaxation, and other therapeutic benefits. It is often used in physiotherapy and rehabilitation settings to treat a variety of conditions, including muscle pain, joint stiffness, and certain types of injuries.

Massage therapy is a manual therapy technique that involves manipulating the soft tissues of the body to promote relaxation, relieve muscle tension, improve circulation and enhance overall well-being. It is a popular form of complementary and alternative medicine practiced worldwide.

RESULTS AND DISCUSSIONS

The pre-test score of pain was 9 on VAS scale. At the end of second week, the pain reduced from 9-6 and at the end of the fourth week the pain was further

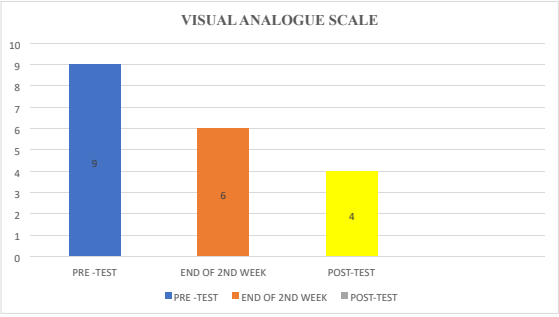

Fig. 1: Graphical representation for pre and post-test value of vas scale

reduced to 4 on VAS scale. Thus, the result of the study shows significant reduction in the pain in Trigeminal neuralgia subject.

The pre and post-test values were recorded using VAS scale. The pre-test value using VAS scale was 9. At the end of week 2, the pain reduced from 9-6 on VAS scale. The posttest value shows 4 on VAS scale. The patient had relief from the pain from the first day of treatment to the last day of treatment.This shows a significant reduction in the pain on VAS scale.

Trigeminal neuralgia is a condition that causes painful sensations similar to an electric shock on one side of the face. This chronic pain condition affects the trigeminal nerve, which carries sensation from face to brain. In Trigeminal neuralgia, even mild stimulation in face-such as from brushing teeth may trigger a jolt of excruciating pain. initially experience short, mild attacks. But trigeminal neuralgia can progress and cause longer, more-frequent bouts of searing pain. Trigeminal neuralgia affects women more often than men, and it's more likely to occur in people who are older than 50.

According to Sahar Zamani, *et al* (2018), trigeminal neuralgia is a disease characterized by severe stabbing pain, with a brief recurrent episode and usually unilateral with the distribution of one or more branches of the trigeminal nerve felt deep in the face. Pain occurs in a sudden attack; duration of attack varies from few seconds to few minutes. the frequency of the pain attack also differs from a few to hundreds of attacks a day.it may take months to years or remission, but each attack tends to shorten in the next remission period. The annual incidence of TN is 4-5 in 100000, in united states and life time prevalence of TN was estimated to be 0.3%, TN is more prevalent in women and also right-sided symptoms are more predominant. In some cases, TN may be caused by an identified structural abnormality including multiple sclerosis, tumours and abnormalities of skull base. However, in some patients, symptoms are generated from morphologic changes in the trigeminal nerve root due to vascular compression without an established aetiology only routine imaging may be helpful in identifying the symptomatic TN. However, the diagnosis of classic TN is based on the history of patient and characteristic features of pain. The first step of treatment of TN is medical therapy. Carbamazepine is offered as effective drug aimed to suppress the pain. Oxcarbazepine, baclofen, lamotrigine and pimozide may also be prescribed. In some cases, where symptoms are not controlled by medication, surgical procedure are necessary on the Gasserian ganglion, gamma knife, use of a tentorial sling and micro vascular decompression. It has also been proposed that peripheral nerve treatments such as cryotherapy, alcohol injection, phenol injection, peripheral acupuncture, radio-frequency, thermocoagulation and laser therapy are effective in relieving symptoms of TN This present study design was a single case study. Active case of trigeminal neuralgia subject was selected. The subject was treated with low level laser therapy with conventional physiotherapy., The low-level laser was performed on the anterior to the opening of ear canal. Superficial moist heat (hot pack) was used to reduce muscular tension in cervical and shoulder muscles, especially in trapezius muscle for 10 minutes. The most appropriate exercises in TN patients are stretching exercises. Stretching exercises were demonstrated in the first session and the patient was suggested to do those exercises regularly at home. The exercises were carried out three times a day with 10 repetitions in each set. The pre and post scores were measured by using VAS. The pre and post-test were obtained and analysed for results.

The statistical report states that there was significant difference seen in VAS after the application of low-level laser therapy with conventional physiotherapy subject. In this study here I discussed that the application of low-level laser therapy with conventional physiotherapy is useful to reduce pain. Hence the null hypothesis is rejected and an alternative hypothesis is accepted. The resultant of this study might be due to the following mechanism:

Low-level laser therapy (LLLT) is a treatment strategy which uses a single wavelength light source. Laser radiation and monochromatic light may alter cell and tissue function. Many authors have reported significant pain reduction in a number of conditions such as rheumatoid arthritis, fibromyalgia, post-operative pain, headache, nervous system diseases, myofascial pain syndrome, chronic neck pain, and low back pain as a result of laser application. LLLT on injured nerves have revealed an increase in nerve function and improved capacity for myelin production. Superficial moist heat therapy is a therapeutic technique that involves applying heat to the surface of the body to provide pain relief, relaxation and other therapeutic benefits. Massage therapy is a manual therapy technique that involves manipulating the soft tissues of the body to promote relaxation, relieve muscle tension, improve circulation, and enhance overall well-being.

Limitation:

- The study has been conducted as a single case study.

- The study was a short duration study.
- Follow-up was not done.

CONCLUSION

Finally, the study concluded that 4 weeks of low-level LASER therapy along with conventional physiotherapy shows statistical reduction of pain in Trigeminal Neuralgia subject.

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