



Effects of Multi-Modal Approach on Vibration Perception Threshold (VPT) in Trigeminal Neuralgia Using Neurothesiometer

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Abstract:

This case study describes a 50 years old woman diagnosed as a case of trigeminal neuralgia with no remarkable findings on CT scan. She presented with clinical signs and symptoms of trigeminal neuralgia and depression. The objective of this study was to determine the effect of multi-modal approach on pain, vibration perception threshold and depression. She was assessed for pain on numerical pain rating, vibration perception threshold from ophthalmic, maxillary and mandibular branches of trigeminal nerve on neurothesiometer and depression on beck's inventory of depression. Study was conducted from June to September, 2022 at Zubaida Khanum Medical Center Gujar Khan, THQ Gujar Khan, THQ Sohawa, Pakistan. Detailed history was taken using an 18-item questionnaire, designed by the Pain Panel of the European Academy of Neurology (EAN). Patient had 15 sessions based on a multi-modal approach which included Medications, Physical therapy and Cognitive behavioral therapy. Data was collected before and after the intervention. Vibration Perception Threshold not also improved on the affected side (p-value 0.033) but also on the unaffected side (0.038). Pain decreased significantly ($\geq 30\%$) as well as symptoms of burning sensation, numbness, muscular pain, difficulty in chewing and tinnitus were also relieved. Depression was decreased from a score of 29 to 12 on Beck's Inventory of depression.

Keywords: Trigeminal Neuralgia, Neurothesiometer, Vibration Perception Threshold (VPT)

INTRODUCTION

Trigeminal neuralgia also known as tic douloureux, is a sudden in onset and manifest as severe, stabbing and recurrent pain in the domain of one or more branches of trigeminal nerve lasting for short duration from seconds to few minutes.¹ Primary trigeminal neuralgia is supposed to be caused by the compression of trigeminal nerve in the region of head where the brain connects the spinal cord.² Primary trigeminal neuralgia is diagnosed on the basis of symptoms of the patient and the description of the pain. There are no specific tests for the diagnosis of trigeminal neuralgia.³ The symptoms of this condition in the cheek and jaw region includes; numbness or tingling sensation, burning sensation or electric shock like pain on the affected side of the face, regular aches, difficulty opening mouth, difficulty in chewing and short burst of intense pain.⁴ Multi-modal approach for TN management must be individualized comprising of all available treatment options based on bio-psycho-social model.⁵ Quantitative sensory testing is a diagnostic

tool for the determination of somatic sensory system which depicts precise sensory disorders that may not be identified in regular clinical examination.⁶ Samaira Younis et al (jul,2016) reviewed patients of trigeminal neuralgia without having any sensory disorder in neurological examination, possessed sensory disorders at Quantitative Sensory Testing.⁷ That is why we have also utilized neurothesiometer to assess vibration perception threshold (quantitative sensory testing) before and after multimodal approach for management of trigeminal neuralgia.

Although neurothesiometer has been used in assessing improvement in peripheral neuropathies⁸; to the best of our knowledge this study is the first one to assess the effect of multi-modal approach on vibration perception threshold using neurothesiometer. In our case study, we used a multi-modal (comprising of medication, cognitive behavioral therapy and physical therapy) approach as the treatment protocol for trigeminal neuralgia that gave synergistic effects.

CASE DESCRIPTION

This case study describes a 50 years old woman, already a diagnosed case of trigeminal neuralgia with no remarkable findings on CT scan. She presented with the chief complaints of sudden electric shock like pain, burning sensation on left side of the face, difficulty in opening jaw, stretching of upper eyelid, numbness of lips, altered taste sensations and left side facial weakness that was impacting her functional status. She also had the history of depression which has been aggravating as per assessment using Beck’s Inventory of Depression. The case was notably peculiar because she presented with pain in all the three branches of the trigeminal nerve over the complete left side of the face which made her symptoms more excruciating. The patient rates her pain during neural attacks as 9-10/10 on the Numerical Pain Rating Scale (NPRS). Multi-modal approach was suitable to reduce her symptoms, depression and to improve her functional status and quality of life. She was treated under the supervision of a doctor, physiotherapist and psychiatrist at Zubaida Khanum Medical Center. Her detailed management is described in (Table-1).

Table-1: Treatment Protocol for TN

Medications	Physiotherapy	Cognitive Behavioral Therapy
<p>Prescribed medications:</p> <ul style="list-style-type: none"> ➤ Tablet Deltacortil 1x TDS for 5 days ➤ Capsule Pregabalin 75 mg 1x H.S ➤ Tablet Surbex Z 1x OD ➤ Syrup Ginkgo Biloba 2tsp x OD for 1 month. ➤ Tablet Carbamazepine* 100mg 1x BD was also advised with the above regimen. <p>*The carbamazepine is a first line, gold standard treatment for the management of trigeminal neuralgia but the patient did not bother to take carbamazepine without informing the doctor because she believed that she might develop addiction to it.</p>	<p>Short-term goals: reducing pain and number of neural attacks</p> <p>Long-term goals: reducing the symptoms and improving the functional status of the patient.</p> <p>The physiotherapy management included the following:</p> <ul style="list-style-type: none"> ➤ Manual therapy techniques: 20-25 mins/session to reduce tenderness and relax muscles. ➤ TENS: 5 days/week for pain relief. 	<p>Short-term goals: reducing depression and frequency of panic attacks</p> <p>Long-term goals: to improve patient’s quality of life by decreasing. The cognitive behavioral therapy included the following:</p> <p>CBT sessions were done with a therapist twice a week. Total 10 sessions were done with each session lasting for 30 to 45 minutes.</p> <ul style="list-style-type: none"> ➤ Patient’s counseling and Education: psychotherapeutic intervention using neurodevelopmental techniques and education regarding taping technique, nerve desensitization using cotton, fork and other

	<ul style="list-style-type: none"> ➤ Therapeutic ultrasound: 5 days/week over trigger points. ➤ Superficial moist: 20minutes/session to reduce muscular tension in the cervical region and shoulder muscles especially trapezius. ➤ Isometric neck exercises and PNF technique: 3 sessions/day with 10 rep/set and 2 set/session. ➤ Acupressure: Using magnets on alternate days. ➤ Facial gun: nerve desensitization to promote the reduction of nervous system to constant afferent input. ➤ Cardiovascular exercise: Walking to improve overall health status and fitness level. ➤ Self-massage therapy was also educated to the patient. 	<p>materials to reduce hypersensitivity.</p> <ul style="list-style-type: none"> ➤ Deep breathing exercises and distraction techniques: provide relaxation and to divert the attention of the patient from her pain respectively.
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Figure1: Physical Therapy Treatment Protocol

DISCUSSION & RESULTS

Neurothesiometry was done before and after the intervention. Vibration perception threshold improves statistically in all branches of trigeminal nerve bilaterally i.e., congruent effect on the other side.⁹ So it was very surprising that the treatment protocol given on the affected side also enhanced Vibration perception threshold on the contralateral side which opens a new platform for the researchers.¹⁰ Pain neuroscience education adjunct with TENS improves pain, sensory abnormalities, jaw function and psychosocial factors.¹¹

Not only frequency of episodes but also symptoms of headache, neuralgic pain (MCID: reduction of 30% / 2 points)¹², altered sensations, tinnitus, nasal congestion and depression (MCID: reduction of 29.64%)¹³ also reduced remarkably. TN is associated with increased risk of depression but no study has evaluated the effect of cognitive behavioral therapy (CBT) in trigeminal neuralgia.¹⁴ X. Moisset proposed in the study that psychotherapy and other complementary therapies which includes use of neurostimulators i.e., TENS proved to be beneficial for the management of trigeminal neuralgia.¹⁵

Our results are supported by Alfio Spina et.al proposed notion of personalized multimodal approach for Trigeminal neuralgia in improving chronic pain.⁵

Table-2: Comparison of Bilateral VPTs

Variable	Mean±SD(Hz)	P Value
Pre-Right Ophthalmic	15.6±0.7	0.038
Post Right Ophthalmic	13.1±1.0	
Pre-Right Maxillary	15.6±1.5	0.048
Post Right Maxillary	12.0±0.5	
Pre-Right Mandibular	17.1±1.2	0.007
Post Right Mandibular	12.0±0.5	
Pre-Left Ophthalmic	18.0±1.0	0.006
Post Left Ophthalmic	11.5±0.5	
Pre-Left Maxillary	25.3±1.0	0.005
Post Left Maxillary	12.5±0.5	
Pre-Left Mandibular	20.8±0.7	0.007
Post Left Mandibular	10.8±0.7	
Pre-Total Mean of Right Side	16.1±0.8	0.038
Post Total Mean of Right Side	12.3±0.6	
Pre-Total Mean of Left Side	21.3±3.6	0.033
Post Total Mean of Left Side	11.6±0.8	

Table-3: Comparison of Symptoms

Symptoms in Patient	Before Intervention	After Intervention
Facial burning sensation	Present	Absent
Facial numbness	Present	Absent
Pain in SCM	NRPS: 8/10	NRPS: 2/10
Pain in upper trapezius	NRPS: 7/10	NRPS: 1/10
Difficulty in chewing/drinking	Present	Absent
Stretching of eyelid	Present	Absent
Tinnitus	Present	Absent
Nasal decongestion	Present	Absent

Headache	Present	Rarely
Depression	Scoring: 29 (Beck's Depression Inventory)	Scoring: 12 (Beck's Depression Inventory)
Frequency of neural attacks	7-10times/week	1-2times/week

TN is associated with increased risk of depression but no study has evaluated the effect of cognitive behavioral therapy (CBT) in trigeminal neuralgia.¹⁴ This study showed remarkable decrease (29.64%) in depression after multimodal approach comprising of CBT.

Mauro Barone stated in the study that pain neuroscience education adjunct with TENS improves pain, sensory abnormalities, jaw function and psychosocial factors.¹¹

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