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# EFFECTS OF DRY NEEDLING ALONG WITH TRANSCUTANEOUS ELECTRICAL MUSCLE STIMULATION ON POST-STROKE SPASTICITY AND MOTOR FUNCTION-A CASE REPORT

Physiotherapy & Rehabilitation

**Shreya Ingale** MPT 2, Dr. Abdul Kalam College of Physiotherapy, Loni (bk) Ahmednagar.
**Dr. Komal Thorat** Assistant Professor, Dr. Abdul Kalam College of Physiotherapy, Loni (bk) Ahmednagar.
**Dr. Tejas Suryanvanshi** Professor, HOD of electrotherapy and electrodiagnosis department, Dr. Abdul Kalam College of Physiotherapy, Loni (bk) Ahmednagar.

## ABSTRACT

Spasticity is muscle stiffness and impairment in neuromuscular control, which results in functional limitations. Dry needling (DN) has been introduced as treatment method for improving post-stroke stiffness and pain reduction. Transcutaneous electrical nerve stimulation (TENS) has been hypothesized to modulate spasticity by modulation of reciprocal inhibition, reducing stretch reflex excitability, and increasing presynaptic inhibition. Therefore, the aim of this study was to determine the effects of the DN along with TENS into a treatment session concept on spasticity, motor function and postural control in subject diagnosed with stroke. **Methodology:** A 59 years old female suffering from acute hemorrhagic stroke with left side hemiparesis and left upper limb (UL) and lower limb (LL) spasticity for 6 months. The patient was unable to walk independently, had history of type II diabetes mellitus for 10 years. **Result:** Modified Ashworth Scale (MAS), Range of Motion (ROM)on goniometer and the Balance Outcome Measure for Elder Rehabilitation (BOOMER). Participants were assessed before and after 2 sessions within a week which showed significant improvements in results. **Conclusion:** A combination of DN and TENS may reduce spasticity and improve balance, and functional activity in stroke thereby, implementing these combination techniques will minimize functional reliance and increase quality of life.

## KEYWORDS

spasticity, dry needling, diabetes mellitus, motor function

## INTRODUCTION

Stroke is the world's second leading cause of mortality and disability, trailing only ischemic heart disease. Stroke rates are disproportionately higher in low- and middle-income nations, according to evidence. Stroke is India's sixth largest cause of disability-adjusted life years. Stroke is a brain attack that produces sensory, motor, and cognitive deficits. Stroke survivors may require short-term or long-term care, resulting in tremendous human and economic expenses.[1]Spasticity is one of the most prevalent problems that arises after a stroke. It is distinguished by muscle stiffness and impairment in neuromuscular control, which may result in functional limitations.[2] A spastic foot can affect gait or standing by changing the weight-bearing function of the foot during the stance phase, which can limit foot clearance during the swing phase.[3]

DN is a physiotherapeutic method that may be used to reduce hypertonia and spasticity. It is not commonly used, although it may improve the viscoelastic characteristics of muscles and fascia, as well as spasticity and related consequences. DN is a semi-invasive treatment that employs acupuncture needles to treat painful spots in various muscles, known as "trigger points," and reduces muscular rigidity and shortening. The needle causes mechanical stimulation at certain muscle and fascia sites. Its goal is to establish muscle tone normalization. Pathophysiological dry needling involves mechanically disrupting (with a needle) the related defective end plate area. As a result of the initial action, the endomysium ruptures and the elongation of actin and myosin fibers changes. Posteriorly, the inflammatory response improves blood flow and oxygen saturation in the stimulated area.[4]

TENS and functional electrical stimulation have been demonstrated to improve muscle strength and mobility while decreasing spasticity. [5] Spasticity is caused by hyperexcitability of the stretch reflex mediated by Ia afferents due to a loss of inhibition from the dorsal reticulospinal tract. TENS is thought to reduce spasticity through a variety of processes, including manipulation of reciprocal inhibition, reduction of stretch reflex excitability, and increase of presynaptic inhibition. TENS may be applied over the spastic muscle or its antagonist, along the course of the nerve, or distal to the spastic muscle, such as on acupuncture sites, based on the many causes described above.[6]

Therefore, the aim of this case study was to determine the effects of the DN along with TENS into a treatment session concept on spasticity, motor function and postural control in subjects who had suffered a stroke.

### Patient Information

The subject was right-handed 59 years old female suffering from acute hemorrhagic stroke with left side hemiparesis and left upper limb (UL) and lower limb (LL) spasticity for 6 months with comorbidities like type II diabetes mellitus for 10 years. Patient came with complaint of difficulty in UL and LL movements, difficulty in independent standing and independent walking. she had received several other treatments, including physiotherapy, medications, and exercise. The patient had a good level of cognition determined by the MMSE scale. Informed consent was obtained from the patient before the study began.

### Investigation Findings

CT brain (plain) reveals Subacute infarct involving frontotemporal-parietal lobes, right insular cortex, right external capsule, posterior limb of right internal capsule and right corona radiata. There was thrombotic occlusion of intracranial segment of left internal carotid artery.

MRI brain with MR angiography of circle of Willis reveals thrombotic occlusion of intracranial segment of left internal carotid artery.

### Physiotherapeutic Intervention

The DN protocol was carried out with disposable sterile stainless-steel needles size 30-50mm, with patient in the prone position and ankles hanging from the bed, using the fast-in and fast-out technique, and each muscle was needled for 1 minute. The skin was first cleaned with alcohol and then the needle was inserted, crossing the gastrocnemius and soleus muscle. The needle was inserted until the first local twitch response (LTR) was obtained. Once the first LTR was obtained, the needle was moved up and down (4–5mm vertical motions, no rotation)

in the muscle at approximately 1Hz for 25–30s. The needle was inserted to about the distal limit of the proximal third of the line between the head of the fibula and the intermalleolar axis.[7] Then, the needle was held so that it would later become the negative electrode. A TENS device was being used, with the needle serving as a negative electrode and an adhesive electrode linked to the positive pole located one-centimeter distant120 Hz and a pulse width of 200 s. TENS was used for 15 minutes at a high frequency of 120 Hz and a pulse width of 200 s.

**Follow Up And Outcomes**

The patient was assessed by MAS, ROM and the BOOMER scale before intervention and reassessed after 2 sessions of intervention within a week.

**Table 1- Shows The Pre And Post Scores Of Outcome Measures**

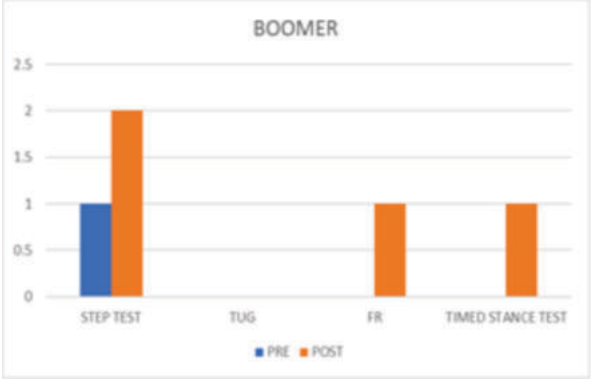
| Outcome | PRE | | POST | |
|---|---|---|---|---|
| MAS (Plantar Flexors) | 3 | | 2 | |
| BOOMER (TOTAL) | 1 | | 4 | |
| • Step test | 1 | | 2 | |
| • TUG | 0 | | 0 | |
| • FR | 0 | | 1 | |
| • Timed Static Stance | 0 | | 1 | |
| ROM (Left) | Active | Passive | Active | Passive |
| • Plantar Flexors | 30˚ | 30˚ | 30˚ | 35˚ |
| • Dorsi Flexors | 10˚ | 15˚ | 10˚ | 20˚ |

**RESULTS**

**Table 2: The Pre -post Intervention Score Of MAS**

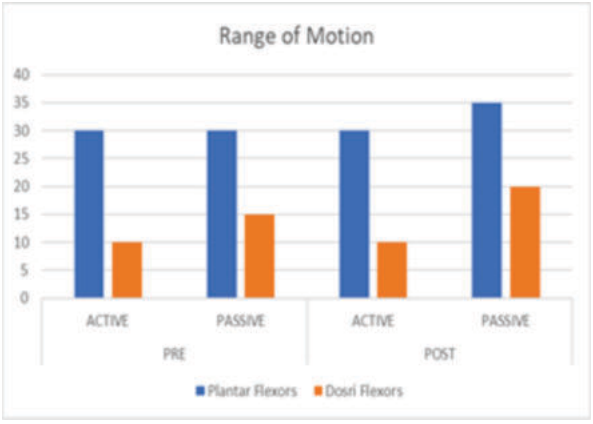

The patient was assessed Pre and Post sessions, spasticity was assessed on MAS which showed significant improvement from grade 3 to grade 2.

**Table 3: The Pre And Post Intervention Score Of MAS**




The standing balance and functional mobility were assessed on BOOMER scale which showed significant improvement in step test (Pre score 1-Post score 2), functional reach (Pre-Score 0 -Post Score1) and timed static stance (Pre-Score 0 -Post Score 1).

**Table 4: The Pre And Post Intervention Score Of Range Of Motion**




The ROM showed significant improvement in passive ROM of plantar flexors and dorsi flexors (Plantar Flexors Pre-30˚-Post 35˚and Dorsi Flexors Pre-15˚- Post 20˚)

**DISCUSSION**

The aim of this case study was to determine the effects of the DN along with TENS into a treatment session concept on spasticity, motor function and postural control in subjects who had suffered a stroke. The findings of this study will contribute to the of evidence on the combined benefits of DN and TENS on neurological outcomes of spasticity and active motor function. The evidence on the effectiveness of TENS for spasticity, on the other hand, is mixed. A few studies show a considerable reduction in spasticity following TENS application.

Pathophysiological dry needling involves mechanically disrupting (with a needle) the related defective end plate area. As a result of the initial action, the endomysium breaks and the elongation of actin and myosin fibers changes. TENS has been proposed to reduce spasticity through manipulation of reciprocal inhibition, reduction of stretch reflex excitability, and increase of presynaptic inhibition.

The same study was done by Jose Vicente Leon Hernandez et al. to compare the effectiveness of DN combined with percutaneous electrical nerve stimulation of low frequency versus high frequency, in patients with chronic myofascial neck pain. The primary outcomes were the visual analog scale and the pressure pain threshold, while Neck Disability Index and Kinesiophobia were secondary outcomes. The study concluded that Low and high frequency percutaneous electrical nerve stimulation combined with deep DN showed similar effects, since no differences between groups were observed on any of the outcome measures.

Another study conducted by Sarafraz Hadi et al. the aim of the study was to assess the short-term effects of DN on spasticity, gait, and muscle architecture of patients with chronic stroke: A case series study was designed; and six chronic stroke patients with ankle spasticity and gait impairment received a single session of DN for gastrocnemius medialis, lateralis, and soleus muscles. The main outcome measures were the MMAS, and TUG. The study concluded that, DN application seems to have short term effects in terms of reducing spasticity, improving gait, and muscle architecture of gastrocnemius medialis in patients with chronic stroke.

**CONCLUSION:**

According to the findings of the current study, two sessions of DN combined with TENS in stroke patients appear to have a positive effect on balance function. Furthermore, DN decreased the plantar flexors resistance to passive movement. The findings of this study may help to investigate structural changes in spastic muscles and improve balance in stroke patients.

**DECLARATION OF CONFLICT AND FUNDING:**

There was no potential conflict of interest observed in the study. This

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