

*Case Report*

## Effect of Transcutaneous Electrical Nerve Stimulation on Unilateral Neglect Following Acute Stroke: A Case Report

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### ABSTRACT

A 58 year old female had a right side ganglio-capsular region ischemic stroke with presentation of left sided weakness in the upper, lower extremity and unilateral neglect since 1 week. Physiotherapy for maintenance of range of motion and prevention of respiratory and immobility related complication in the ICU was a part of the multi disciplinary treatment approach. The patient was treated with standard rehabilitation program along with 2 electrodes placed on the neck for delivering transcutaneous electrical nerve stimulation (TENS) of continuous rectangular wave form with a frequency 100 Hz, pulse width 200  $\mu$ Sec for duration of 20 minutes per day. The treatment was continued for 5 days. Results of the above treatment showed an improvement on the Line Bisection Test which decreased from 5.2 cm to 1.1 cm. Severity of the neglect was assessed using Catherine Bergego Scale, which scores reduced from 25 to 18. Functional outcome was measured using Barthel Index which improved after the treatment with TENS along with standard care for 5 days from a score of 25 to 45. These results suggests that TENS is beneficial in the treatment of unilateral neglect following acute stroke and that further more research is required to certain the results.

**Keywords:** Unilateral Neglect, Stroke, Transcutaneous Electrical Nerve Stimulation (TENS), Line Bisection Test, Catherine Bergego Scale, Barthel Index.

### INTRODUCTION

Stroke is rapidly developing clinical signs of focal or global disturbances of cerebral function, with symptoms lasting 24 hours or longer leading to death with no apparent cause other than of vascular origin. [1] Unilateral neglect is a heterogeneous perceptual disorder that often follows stroke, especially after right hemisphere lesion (parietal lobe). Unilateral neglect is one of the constraints in rehabilitating the patients with acute stroke. Thus, its management is essential for prognosis on both activities of mobility and daily living.

The most typical feature of unilateral neglect is the failure to report or respond to stimuli presented from the contralateral

space, including visual, somatosensory, auditory and kinaesthetic sources, failure to perceive their own body parts may persist. [2] The incidence of unilateral neglect in stroke patients has varied from 90% to 8% and it is more common after right hemispheric lesion (Parietal lobe). [3] However treatment of the unilateral neglect for management of overall condition following acute stroke lacks literature.

Transcutaneous electrical nerve stimulation (TENS) is the most commonly used non invasive treatment method in physical therapy, TENS is a safe and well established procedure that can be delivered over prolonged periods, via cutaneous electrode glued to the skin. Previous studies

suggested that TENS can be used to improve muscle strength, proprioception, mobility and balance. [4]

**Objective of the study:** To determine the effect of TENS on unilateral neglect following acute stroke.

## **CASE REPORT**

### **Case Discussion**

58 year old female, was diagnosed with systemic hypertension 6 years ago and received medical treatment ever since for the same. She suddenly developed left sided weakness and mild facial deviation and underwent a MRI Scan which revealed Stroke (CVA) due to massive infarct in right ganglio capsular region. Initial three days she was managed medically in the ICU along with physiotherapy. In the ICU, patient was treated with regular rehabilitation program which included chest, limb physiotherapy and positioning for three days in order to maintain chest compatibility, joint ROM, to prevent sores and further immobility related complications.

After being declared medically stable patient was shifted to neurology ward. A detailed assessment was conducted and the patient was diagnosed with unilateral neglect and weakness of left upper, lower limb.

### **Outcome Measures**

The line bisection test (LBT) is a quick measure to detect the presence of unilateral neglect. [5] Catherine Bergego Scale (CBS) is used to assess the presence and the extent of neglect on real everyday life activities [6] and the Barthel Index (BI) measures the functional independence in personal care and mobility. [7] Outcome measures were documented on the first day of intervention and on the fifth day.

### **Intervention**

Transcutaneous electrical nerve stimulation was selected based on the stimulatory effect in perceiving touch sensation in case of perceptual dysfunction like unilateral neglect. The subject consent was taken prior to the TENS intervention

after explaining the possible improvements and adverse effects to the patient and caregiver. The subject was positioned in supine with neck rotated towards the right side. Skin resistance over posterolateral part of skull and the sternocleidomastoid muscle area was decreased with the use of medicated spirit.

The TENS electrodes were placed below the occiput just lateral to the spine and posterior part of sternocleidomastoid muscle contralateral (left side neck) to the lesion. This area is the emergence of superficial cervical plexus containing a subcutaneous network with high density of sensitive fibres. [8]

TENS parameters used in the treatment included rectangular continuous waveform with a frequency of 100 Hz, pulse width of 200  $\mu$ Sec and intensity less than 30 mA. Stimulation was delivered 20 minutes per day for 5 days of continuous sessions along with standard rehabilitation program.

The standard care includes positioning, active and passive ROM exercises, bridging, rolling, PNF diagonal patterns, cueing, environmental modification and early mobilization activities.

### **Adverse effects**

TENS was given over cervical area with maximal precaution and no adverse effects were identified. Pre and Post treatment area inspection and examination was performed and no damages over the area were to be found.

## **RESULTS**

The presence of unilateral neglect is reduced from 5.2cm to 1.1cm on Line Bisection Test. Catherine Bergego Scale Score is reduced from 25 to 18 after the intervention of TENS treatment. These indicate the severity and extend of unilateral neglect changed from severe to moderate level. (Table 1)

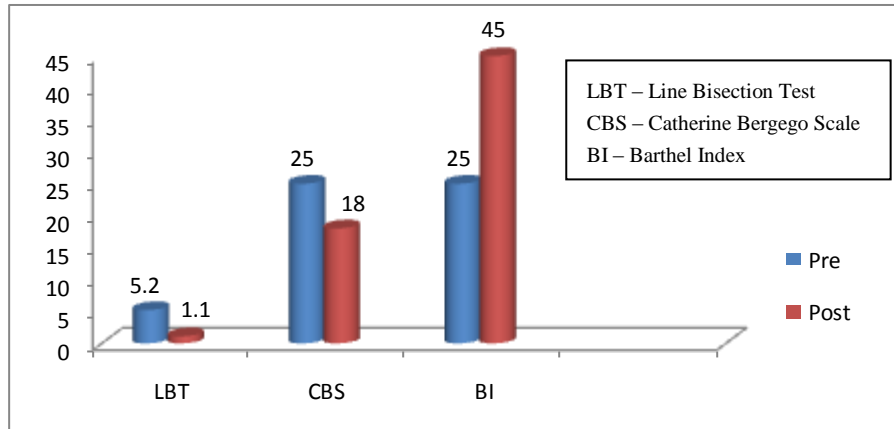
The improvement in the post intervention functional outcome was measured using Barthel Index (from 25 to 45), suggesting that the TENS was effective

in improving the functional independence on personal care and mobility. Therefore, this case study suggests that TENS is

effective on unilateral neglect following acute stroke. (Graph 1)

**Table 1: Pre and Post TENS Outcome Measure Scores**

Outcome Measures	Pre Intervention Scores	Post Intervention Score
Line Bisection Test	5.2 cm	1.1 cm
Catherine Bergego Scale (0 - 30)	25	18
Barthel Index (0 - 100)	25	45



**Graph 1: Pre and Post TENS Intervention Outcome Values**

## DISCUSSION

Pizzamiglio et al (2006) conducted a study and inferred that use of peripheral stimulation did not add any advantage as compared to improvements produced by visuo-spatial training. [9] However this case report showed considerable improvements on outcome measures with TENS and standard rehabilitation care. Previous studies with burst transcranial magnetic stimulation [10] have been undertaken however effect of continuous mode of TENS lacks literature.

Perennou et al (2001) concluded that postural instability in the neglect patients was spectacularly and systematically reduced with TENS and provides clinical evidence supporting the postural body scheme concept. [11] However in this study effects on postural stability was not assessed but improvement in the outcome measures indirectly states an improvement in the postural stability.

## CONCLUSION

TENS is safe and beneficial mode of treatment for unilateral neglect following

acute stroke. Management of unilateral neglect will aid in faster and better recovery.

**Suggestion:** Further large sample study and long term follow up is required to evaluate the effectiveness of TENS on unilateral neglect following acute stroke.

**Ethical Approval:** Ethics committee approval certificate was obtained from Central Ethics Committee [NU/CEC/P.G.-06 (NIPT)/2015], Nitte University, Medical Sciences Complex, Deralakatte, Mangalore, Karnataka, India.

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