Effect of Tactile Stimulation and Joint Integrity Exercises on Hemineglect in Stroke Survivors

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Abstract

Background: Unilateral spatial neglect is likely to be associated with poor functional outcome in sub-acute phase. During this period, intensive rehabilitation is needed to obtain higher ADL scores. If greater efficacy of rehabilitation can be brought about by early intervention for unilateral spatial neglect, patients with unilateral neglect might achieve higher ADL goals.

Material and Method: In this pre-post intervention study 25 neglect patients were included with less than six month of stroke.Tactile stimulations and joint integrity exercise protocol was set for four weeks. After pre-post assessment, data was analysed with help of appropriate statistical methods.

Results: According to this study, there is increase in tactile stimulation ($p=0.0023$), kinaesthetic stimulation ($p<0.0001$),stereognosis ($p<0.0001$) and motor outcome ($p=0.0001$). This indicates an overall increase in sensory and motor outcome.

Conclusion: Tactile stimulation and joint integrity exercises appears to be beneficial for improving motor outcome in hemineglect patients after stroke.

Keywords: *Stroke, hemineglect, tactile stimulation, joint integrity exercises.*

Inroduction

In accordance with the definition used by the World Health Organisation (WHO), Stroke was defined as "Rapidly developing clinical symptoms and/or signs of focal, and at times global, loss of cerebral function, with symptoms lasting more than 24 hours or leading death, with no apparent cause other than that of vascular origin".[1] Stroke is one of the leading causes of death and disability in India. The estimated adjusted prevalence rate of stroke range, 84-262/100,000 in rural and 334-424/100,000 in urban areas.[3]Approximately 12% of all strokes occurs in the population less than 40 years of age.

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Hemineglect has been defined as "the failure to report, respond or orient to novel or meaningful stimuli presented to the side opposite to a brain lesion, when this failure cannot be attributed to either sensory and motor defects".[4]Anosognosia is lack of awareness of the effects of brain lesions, including hemiplegia and hemianopia.[5]Neglect is considerably more frequent among patients with right hemisphere lesions being present in 40-50% of right hemisphere patients acutely after stroke. It is common disabling disorder occurring after stroke and is found in 30% of all acute stroke patients. [7]

Women have lower age-adjusted stroke incidences than men.Women with early menopause have twice the risk of ischemic stroke as women with late menopause. Women over 85 years of age have an elevated risk compared to men.[2]Several studies indicate that neglect implies a wrong prognosis after stroke in terms of functional outcomes, length of hospital stay, and discharge to home than for stroke patients lacking this symptoms. Furthermore, patient with the neglect seem

susceptible to falls and wheelchair collisions. On the other hand, some studies shows that neglect has no influence on the functional outcomes.[5]

Ischemic stroke is the most common type, affecting about 80% of individuals with stroke, and result when a clot blocks or impairs blood flow, depriving the brain of essential oxygen and nutrients. Haemorrhagic stroke occurs when blood vessels rupture, causing leakage of blood in or around the brain. Hemi spatial neglect is a common disabling condition following unilateral brain damage, particularly of the right hemisphere. It can be caused by various different pathological conditions; it is most often observed after cerebral infarction or haemorrhage and affects up to two third of right hemisphere stroke patients acutely.[6] Patients with neglect often fail to be aware of or acknowledge items on their contralesional side (the left side for patients with right brain damage) and attained instead to items towards the same side as there brain damage.[6] Neglect in its various forms and anosognosia are serious companions of primary right sided stroke with lesions in the parieto-temporal-occipital area.[5]

Neglect is behaviourally defined as a deficit in processing or responding to sensory stimuli in the contralateral hemispace, a part of own body, the part of an imagined scene, or may include the failure to act with the contralesional limbs despite intact motor functions. Neglecting humans is frequently encountered after right parieto-temporal lesions and leads to multicomponent syndrome of sensory, motor and representation deficits.[8]

Types of neglect:

1. Sensory Neglect: Sensory neglect is characterised by an unawareness of sensory information in the body and coming from the environment. This inability to recognize sensation usually occurs on the side of the body opposite to side to which the damage to the brain has occurred.

2. Motor neglect: motor neglect or output neglect is defined as the reduced ability to initiate movement in response to stimuli even though the patient is aware of the presence of the stimuli. This inability is not attributed to weakness of the muscles or to any primary motor deficit.

3. Representational neglect: Inattention to portions of internally generated images. Such images include visualizations including memories, dream and hallucinations. The patient will ignore half of the image on the opposite to where the brain damage has occurred.

4. Personal neglect: Lack of awareness to the side of the body opposite to the damage. E.g. A patient with personal neglect may deny ownership to a limb, ignoring its presence and claiming that it belongs to another person.

5. Spatial neglect: A patient who is unable to acknowledge stimuli originating in space opposite of damage is displaying spatial neglect. There are two types: Peri personal and extra personal neglect. Peri personal neglect is characterised by a patient's inattention to items within reaching distance while extra personal neglect refers to the neglect of items that are farther away.[6]

The best form of treatment for stroke that emerged over last several decades is stroke unit.[9] Rehabilitation of a stroke patient begins as soon as any impairment is perceived and comprises traditional exercise programs and neuropsychological approaches with the primary aim of restoring mobility and function of patient.[7]Though rehabilitation is proved to be the best treatment patients also prefer other mode of treatment approaches such as Medicine, Acupuncture, Ayurveda (Panchakarma), Chiropractic, Cupping, Dry needling, Brain stem stimulation, Stem cell therapy and Miscellaneous quack practice, etc[2,9-19]

Unilateral spatial neglect is likely to be associated with poor functional outcome in subacute phase. During this period, intensive rehabilitation is needed to obtain higher ADL scores. In rehabilitating unilateral spatial neglect patients' deficits of spatial recognition and body image prevent them from learning efficient body movements and increase the risk of falls and collisions. Furthermore, they tend to be unduly limited to their activities because of fall risks. If greater efficacy of rehabilitation can be brought about by early intervention for unilateral spatial neglect, patients with unilateral neglect might achieve higher ADL goals.[16]

Materials and Methodology

Type of Study: Experimental Study

Study Design: Pre and post

Place of Study: KIMSDU

Sample Size: 25 (Considering 10% drop out)

$$n = \frac{4pq}{L^2}$$

Sampling Method: Simp le random sampling method

Sampling Duration: Approximately 3 months

Inclusion Criteria:

- Subjects with right hemisphere stroke.
- Subjects with hemineglect following stroke.
- Acute phase (3 months) following stroke.
- Both sexes.

Exclusion Criteria:

- Subjects with neurological conditions other than stroke
- Subjects with left hemisphere involvement following stroke

Equipment's and Materials required:

Sensory kit

Assessment Charts

Writing Material

Computer for online access

Outcome Measures

- The Baking Tray Task

Time required to administer: anywhere from 1-5 minutes

Purpose of the study: The purpose of this assessment is to assess for unilateral neglect

Scoring:

Normal: spreading the cubes out evenly across the tray

Rightward bias: The cubes will be spread out across board, but cubes will be closer proximity to the right side of the tray. This score indicates unilateral neglect.

- **Nottingham Sensory Assessment**

Patient position: Sitting and in suitable state of undress

Procedure: Apply the test sensation to the test area, to the left and right side in random order. Patient is asked to indicate, either verbally or by a body movement, whenever he or she feels the test sensation

1. Tactile sensation:

Procedure: If the patient has problems communicating being testing light touch, pressure and pinprick sections.

SCORING CRITERIA: 0 absent, 1 absent, 2 normal, 9 unable to test

2. Kinaesthetic Sensation:

Procedure: The limb on the affected side of the body is supported and moved by the examiner in various directions but movement is only at one joint at a time. The patient is asked to mirror the change of movement with the other limb.

Scoring: 0 absent, 1 Appreciation of movement taking place, 2 direction of movement sense, 3 joint position sense, 9 unable to test

3.Stereognosis

Procedure: Place the object in the patient's hand for a maximum 30 seconds. Identification is by naming, description or by pair matching with an identical set. Affected side of the body is tested first. The object may be moved around the affected hand by the examiner.

Scoring: 2 normal, 1 Impaired, 0 absent, 9 Unable to test

- **Motor Assessment Scale**

Findings

Out of the 25 subjects enrolled in this study, two were discharged early and did not came for follow up, while other one was not willing to participate in the treatment trails after two sessions.

Pre- and post-intervention data was analysed, tactile stimulation in sensory input considered very significant. (p=0.0023). The mean pre interventions for tactile stimulation of 1.5 (SD=0.51), changed to mean post-

intervention of tactile stimulation (SD=0.29), showing significant increase (p=0.0023).

Kinaesthetic stimulations were given to the patients to increase proprioception in neglected limb. Kinaesthetic stimulations shows extremely significant difference in pre- and post-assessments (p<0.0001) .The mean Pre-intervention of kinaesthetic stimulations 1.136 (SD=0.35), increased to mean 2.54 (SD=0.50). Stereognosis mean pre-intervention was 0.5(SD=0.51) and mean post interventions was increased to 1.72 (SD=0.45), shows extremely significant (p<0.0001). (Fig 1)

The motor assessment score are shown in Table 2 as the secondary outcome measure. The mean pre-intervention score was 9.818 (SD=3.11), which increased to mean of 24.04(SD=6.22). The changes in both pre- and post-interventions were extremely significant (p=0.0001).(Fig 2)

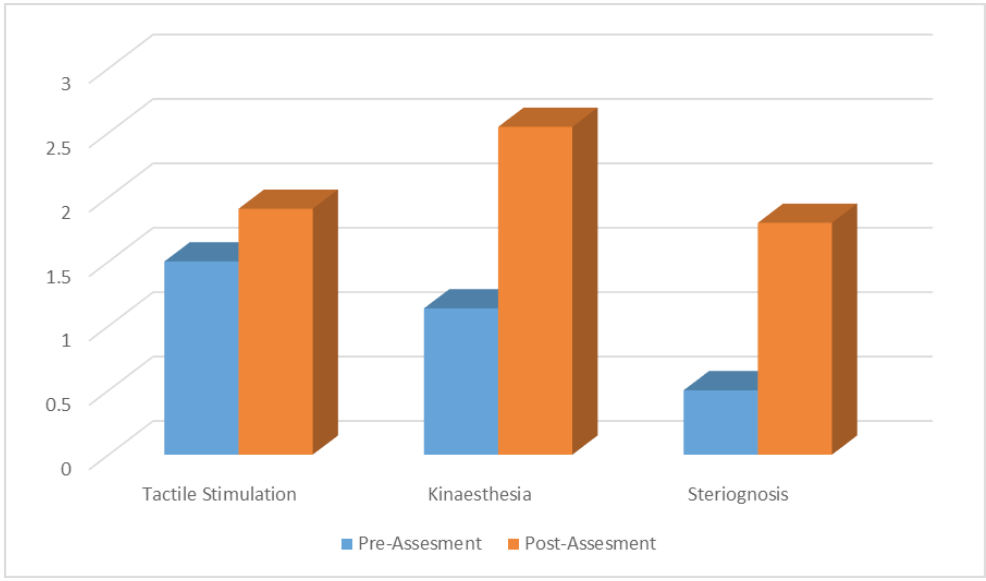

Fig 1: Nottingham sensory assessment Scale

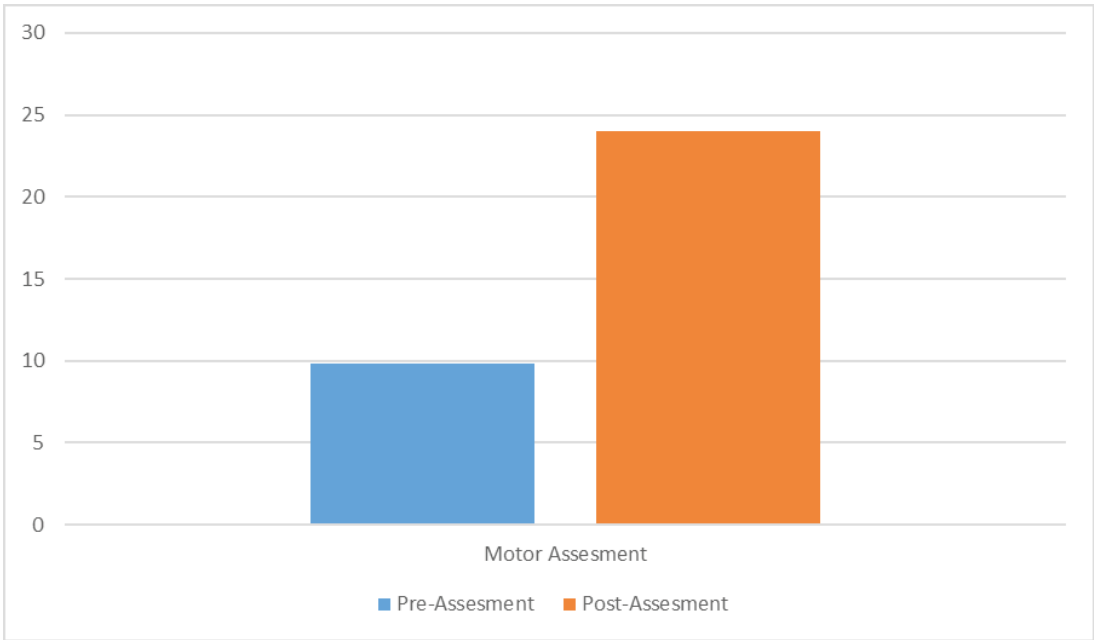

Fig 2: Motor assessment scale

Conclusion

Tactile stimulation and joint integrity exercises were appear to be beneficial for improving motor outcome in hemi neglect patients after stroke.

Discussion

In this study we wanted to determine whether tactile stimulation and joint integrity exercises is effective in rehabilitation of neglect patient. Out of the 25 subjects enrolled in this study, two were discharged early and did not came for follow up, while other one was not willing to participate in the treatment trails after two sessions. Hemineglect subjects has a good potential to recover within first three weeks after stroke. Twenty five patients treated with sensory and motor stimulation for almost 4 weeks.

Pre and Post Assessments were taken with the two scales – Nottingham sensory assessment and motor assessment scale. According to roods, sensory input is required to produce a motor output. Purposeful movement, repetition of activity, or practice, play a part in learning motor skills.[16]Tactile stimulation with the various textures applied to the patients with three strokes followed by 3 sec rest period. Pre- and post-intervention data was analysed, tactile stimulation in sensory input considered very significant. ($p=0.0023$). The mean pre interventions for tactile stimulation of 1.5 (SD=0.51), changed to mean post-intervention of tactile stimulation (SD=0.29), showing significant increase ($p=0.0023$).

Kinaesthetic stimulations were given to the patients to increase proprioception in neglected limb. Kinaesthetic stimulations shows extremely significant difference in pre- and post-assessments ($p<0.0001$) .The mean Pre-intervention of kinaesthetic stimulations 1.136 (SD=0.35), increased to mean 2.54 (SD=0.50). Stereognosis mean pre-intervention was 0.5(SD=0.51) and mean post interventions was increased to 1.72 (SD=0.45), shows extremely significant ($p<0.0001$).(Fig 1)

Proprioceptors, exteroceptors and special sense organs were targeted for motor responses. The motor assessment score are shown in Table 2 as the secondary outcome measure. The mean pre-intervention score was 9.818 (SD=3.11), which increased to mean of 24.04(SD=6.22). The changes in both pre- and post-interventions were extremely significant ($p=0.0001$). (Fig 2) It would be beneficial to offer patients with hemineglect tactile stimulation and joint integrity exercises.

Offering variety of sensory stimulation (tactile / joint integrity) might have improved sensory functioning in patients that would have initiated the motor betterment. Variety of exercises & electrotherapy modalities must have played an important role in initiating neuronal plasticity to improve motor outcome. Conventional exercises, task oriented training must have improved interneuronal integration to improve sensory awareness[17]. Structured program must have improved residual impairments to improve sensory mechanism. Electrical stimulation, hot fomentations have mechanisms to initiate sensory integration to improve motor as well as sensory response[18] .

Conflict of Interest: There were no conflicts of interest in my study.

Source of Funding: Krishna Institute Of Medical Sciences Deemed to be University, Karad

Ethical Clearance: The Institutional Ethics committee has hereby given permission to initiate the research project titled, " Effect of tactile stimulation and joint integrity exercises on hemineglect in stroke survivors"

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