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Comparative Analysis of Impact of TENS and EMS on Treatment of Patients with Chronic Hemiplegia Caused by Stroke Using Fugl-Meyer Assessment Scale

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Abstract

Background: The aim is to compare impact of TENS and EMS on treatment of patients with chronic hemiplegia caused by stroke using Fugl-Meyer assessment scale. **Subjects and Methods:** Subjects were divided into 2 groups of 20 each. Group A were hemiplegic subjects who were given TENS and group B were hemiplegic subjects who were given EMS. FMA, NDS and BI value were compared. **Results:** Left side was involved in 8 patients in group A and 11 in group B and right side in 12 in group A and 9 in group B. Type of stroke was ischemic in 5 in group A and 8 in group B and haemorrhagic in 15 patients in group A and 12 in group B. SBP was 120.4- and 68.4-mm Hg in group A and 124.6 and 70.2 mm Hg in group B. The mean pre- treatment FMA value in group A was 26.5 and post- treatment FMA was 41.7, in group B pre- treatment FMA value was 26.8 and post- treatment FMA value was 42.2. The mean pre- treatment NDS value in group A was 25.6 and post- treatment NDS was 18.4, in group B pre- treatment NDS value was 25.8 and post- treatment NDS value was 20.7. The mean pre- treatment BI value in group A was 32.5 and post- treatment BI was 50.2, in group B pre- treatment BI value was 33.2 and post- treatment BI value was 54.7. **Conclusion:** Physiotherapy is one of effective management in retaining strength and spasticity in stroke patients. Both TENS and EMS can help them improve their ability to move their hemiplegic lower extremity.

Keywords: Hemiplegic, Physiotherapy, Spasticity.

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Introduction

The disease, hemiplegia results from any reason that results in injury to the spinal cord or damage to some part of the brain which ultimately causes paralysis of one side of the body.[1] It leads to stiffness in muscles, lack of muscle control, and weakness of muscles on the affected side of body. The severity of symptoms of hemiplegia varies according to the level of injury and its location.[2] It can occur an any age of life span. Congenital hemiplegia is defined as a hemiplegia which occurs before birth of an individual during the fetal stages of development, at the time of birth or within early two years of life. It is called as acquired hemiplegia if it occurs in later years of life.[3]

The symptoms of hemiplegia don't generally get worse after its onset. The two diseases – hemiplegia and hemiparesis produce same type of symptoms and hence these terms are frequently used interchangeably.[4] However, it should be noted that hemiparesis should be termed when a person experiences weakness or a slight paralysis of one half of the body whereas hemiplegia is termed when a person experiences up to full paralysis on one side of their body and can have difficulty in breathing or speaking. Cerebral palsy, on the other hand, is a term which is broader than hemiplegia. It constitutes of many disorders which affects muscles and their movements. It develops in the early few years of a child's life or even in the intra-uterine phase of body development.[5]

TENS (Trans Cutaneous Electrical Nerve Stimulation), EMS (electrical muscle stimulation) and exercises

decreased disability by refining recovery of volitional movement or by assisting and replacing lost volitional movements.[6] Chronic hemiplegia main management is TENS (23), stroke patients who are recovered by applying TENS to common perineal nerve has shown improvement in motor function.[7] The present study compared impact of TENS and EMS on treatment of patients with chronic hemiplegia caused by stroke using Fugl-Meyer assessment scale.

Subjects and Methods

This was experimental analytical research conducted at Singhania University Bari Pacheri, Jhunjhunu, Rajasthan, in the Department of Physiotherapy, School of Medical and Pharmaceutical Sciences.

The subjects were selected by the simple random sampling from the patients who visit the hospital for their treatment. The total number 150 participants were tested out of which 80 participants (male and female) were chosen. The research has been conducted on chronic post stroke hemiplegic patients who have spasticity, disability and loss of range of motion in lower limbs (right/left) and whose medical condition is stable and who are able to do exercises. The following research procedure was followed. The patients were informed in detail regarding- the different phases of research, exercises, treatment methods, the duration of treatment and the possible health outcomes. Written consent was taken from all patients

Vital monitoring (body temperature, heart rate, number of respirations per minute and non-invasive blood pressure was recorded after and before physiotherapy session. Height and weight were also recorded. Subjects were divided into 2 groups of 20 each. Group A were hemiplegic subjects who were given TENS and group B were hemiplegic subjects who were given EMS.

Two channels of TENS were used. On the lateral and medial quadriceps and gastrocnemius of the afflicted lower leg, 5 cm2 TENS electrodes were positioned. 200 µs of pulse width at 100 Hz were employed in this operation. Using the sub-sensory threshold, we assessed the pre-stimulation threshold at 0.01 mA and post-stimulated at 90% amplitude. The patient had no feeling during the 30-minute stimulation. TENS was used while exercising as usual.

Range of movement calculated by goniometer. Limb moving ability was evaluated with the simplified Fugl Meyer assessment (FMA), for calculating the recovery of the hemiplegic extremity of patients: severe movement disorder (<50 points), obvious movement disorder (50–84 points), moderate movement disorder (85–95 points), mild movement disorder (96–99 points), and regular function (100 points).

The betterment in the degree of disability of patients was calculated by clinical neurologic deficit scale (NDS): mild type (0–15 points), moderate type (16–30 points), and severe type (31–45 points). The improvement in ADL in patients was calculated by Barthel index (BI): excessively serious functional defect (0–20 points), severe functional defect (25–45 points), moderate functional defect (50–70 points), mild functional defect (75–95 points), and complete self-help of ADL (100 points). According to The Fourth National Conference on Cerebrovascular Diseases' (1995) pertinent criteria, the clinical effect was roughly calculated as follows: basic recovery (70-100 points), progress (41-69 points), invalidity (0-40 points), and total efficacy= (basic recovery + progress number of patients) / total number of patientsX100 percent. Software called SPSS 18.0 was used to generate and statistically analyze the data. P value under 0.05 was considered significant.

Results

Out of 80 patients, males were 44 (55%) and females were 36 (45%) [Table 1].

Group A hemiplegic patients were treated with TENS. Group B hemiplegic patients were treated with EMS. There were 12 males and 8 females in group A, group B had 10 males and 10 females, group C had 9 males and 18 females and group D had 13 males and 7 females [Table 2].

Left side was involved in 8 patients in group A and 11 in group B and right side in 12 in group A and 9 in group B. Type of stroke was ischemic in 5 in group A and 8 in group B and haemorrhagic in 15 patients in group A and 12 in group B. SBP was 120.4 and 68.4 mm Hg in group A and 124.6 and 70.2 mm Hg in group B. The difference was significant (P< 0.05) [Table 3].

The mean pre- treatment FMA value in group A was 26.5 and post- treatment FMA was 41.7, in group B pre-treatment FMA value was 26.8 and post- treatment FMA value was 42.2. Intra- group comparison revealed significant difference in all groups (P< 0.05) [Table 4].

The mean pre- treatment NDS value in group A was 25.6 and post- treatment NDS was 18.4, in group B pre-treatment NDS value was 25.8 and post- treatment NDS value was 20.7. The difference was significant (P< 0.05) [Table 5].

The mean pre- treatment BI value in group A was 32.5 and post- treatment BI was 50.2, in group B pre- treatment BI value was 33.2 and post- treatment BI value was 54.7. The difference was significant (P< 0.05) [Table 6].

Table 1: Patients distribution

Gender	Frequency	Percentage
Male	44	55%
Female	36	45%

Table 2: Distribution based on treatment given

Groups	A	B
Treatment	TENS	EMS
Male: Female	12:8	10:10

Table 3: Comparison of parameters

Parameters	Variables	Group A	Group B	P value
Side	Left	8	11	0.05
	Right	12	9	
Stroke type	Ischemic	5	8	0.04
	Haemorrhagic	15	12	
Blood pressure (mm Hg)	SBP	120.4	124.6	0.92
	DBP	68.4	70.2	0.81

Table 4: Comparison of Fugl–Meyer assessment (FMA)

FMA	A		B	
	Pre	Post	Pre	Post
Mean	26.5	41.7	26.8	42.2
P	0.04		0.03	

Table 5: Comparison of neurologic deficit scale (NDS)

NDS	A		B	
	Pre	Post	Pre	Post
Mean	25.6	18.4	25.8	20.7
P	0.03		0.05	

Table 6: Comparison of Barthel index (BI) in all groups

BI	A		B	
	Pre	Post	Pre	Post
Mean	32.5	50.2	33.2	54.7
P	0.02		0.02	

Discussion

Stroke is a neurological condition caused because of acute pivotal injury of the CNS (ie, brain, retina, or spinal cord caused by a vascular system cause.[8] Arterial occlusion causes reduced blood flow creating the stage of hypoxemia. cerebral veins or venous sinuses blockage causes Venous infarction, a rare type of ischaemic stroke. About 40% of stroke symptoms are thought to be haemorrhagic occur due to rupturing of cerebral arteries.[9] Haemorrhages those can occur here can be intracerebral or subarachnoid. ruptured aneurysm causes Subarachnoid haemorrhages as secondary. Ischaemic stroke shows presence of infarct in brain. Patients of transient ischaemic attack shows infarction in approximately 40% of cases within 24 hours and they have recurrent stroke a high-risk condition.[10] Sudden start of a focal neurological deficit is suspicious clinical feature of stroke. Timing of acute onset can be confused if the patient comes with stroke indicators or if the start is unseen and the patient is not able to connect and lack the ability to recognise the onset of a deficiency.[11] The present study compared impact of TENS and EMS on treatment of patients with chronic hemiplegia caused by stroke using Fugl-Meyer assessment scale.

Our results showed that left side was involved in 8 patients in group A and 11 in group B and right side in 12 in group A and 9 in group B. Sabut et al,[12] had 7 left side and 9 right side patients in FES group and 7 each side in control group.

We found that type of stroke was ischemic in 5 in group A and 8 in group B and haemorrhagic in 15 patients in group A and 12 in group B. SBP was 120.4 and 68.4 mm Hg in group A and 124.6 and 70.2 mm Hg in group B. We

observed that the mean pre- treatment FMA value in group A was 26.5 and post- treatment FMA was 41.7, in group B pre- treatment FMA value was 26.8 and post- treatment FMA value was 42.2. Zhang et al,[13] studied the usefulness of non-surgical interference for betterment of lower limb PROM or to recognise the procedures helping musculoskeletal disfigurement after stroke. The ankle plantar flexion PROM in post stroke patients showed a decrease of 50% and that the stiffness or resistance torque could be elevated by 1.5 times in paralysed extremities.

The mean pre- treatment NDS value in group A was 25.6 and post- treatment NDS was 18.4, in group B pre-treatment NDS value was 25.8 and post- treatment NDS value was 20.7. The mean pre- treatment BI value in group A was 32.5 and post- treatment BI was 50.2, in group B pre-treatment BI value was 33.2 and post- treatment BI value was 54.7. Chan et al,[14] in their research group had pre-treatment FMA of 26.32 and post- treatment FMA of 41.2 and control group had pre- treatment FMA of 26.8 and post-treatment FMA of 34.3. Tae sung et al,[15] studied the effects of TENS combined with taping on spasticity, muscular strength, and walking capacity in stroke survivors. Total of 46 patients with stroke with moderate level of spasticity in their plantar flexors were put in the TENS group (n=23) and TENS+ taping group (n=23). The participants were subjected to a total of 30 sessions of

30mins per session for 5 days a week for total of 6 weeks of functional training. The patients were asked to do Sit-to standing, indoor walking and stair walking for 10 mins each. All the patients were subjected to peroneal nerve TENS stimulation for 30 mins prior to the functional training. Taping was added to the feet, shin and ankles and was replaced once daily. The strength of spasticity and

muscle strength were measured by composite spasticity score and handheld dynamometer. Post TENS + taping there was improvement in the gait, spasticity score and muscle strength.

Conclusion

Physiotherapy is one of effective management in retaining strength and spasticity in stroke patients. Both TENS and EMS can help them improve their ability to move their hemiplegic lower extremity.

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