

“The Effect of Scapular Taping on Compound Muscle Action Potential of Scapular Muscles & Upper Limb Function in Chronic Hemiplegic Patients”



Medical Science

KEYWORDS : Taping, scapula muscles weakness, chronic hemiplegia, CMAP, Fugl Meyer Physical Performance Assessment Scale.

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ABSTRACT

Introduction: Stroke is the 3rd leading cause of the death and an important cause of hospital admission and long term disability among Indian population^{1,2}. Stroke results from a disturbance of blood supply to a section of the brain & should not be considered as an isolated event but as a clinical consequence of a progressive underlying vascular disorder, which is having two major risk factors for stroke are high B.P. & age³. The World Health Organization Defines stroke as “Rapidly developing clinical signs of focal [or global] disturbance of cerebral function, with symptoms lasting 24 hours or leading to death, with no apparent cause other than vascular origin”³. Men have been reported to be at greater risk than women in two studies. Stroke accounts for 10-20% of all deaths in industrialized countries & about 88% of stroke deaths are among people over 65 years³. Most common deficit is motor impairment but not all strokes cause physical disabilities, about 16-25% of strokes have been reported to be non hemiplegic³. The most common of impairment of stroke is weakness or paralysis which is to be found in over 80% of CVA [Cerebral Vascular Accident] survivors at 3 months after stroke & even after one year hemiplegia or hemiparesis is to be found in 46% of patients³. Hemiplegia is the commonest form of paralysis, involving arm, leg and sometimes the face on one side of the body.

Shoulder girdle in chronic hemiplegic suffers from two sorts of problems a) the spasticity of elevators and retractors which pull the scapula into a fixed elevated and retracted position⁴⁻⁸. b) the weakness of the opposite group of scapular muscles i.e. depressors and protractors⁴⁻⁸. This leads to instability of the scapulothoracic joint resulting in impaired functional use of the upper limb⁹. Evidence from different authors and different book saying that proximal Control of, e.g. scapula, trunk, and pelvis helps to regain early development of movements at the distal joint. In order to get the purposeful and coordinated movements at the distal extremity, we need support from proximal musculatures of the scapula^{10,11}.

Taping is method of maintaining orientation of the scapula by means of proprioceptive biofeedback to the patient¹². Scapular taping has its effects in to improve alignment which promotes improved movement patterns, to alter length-tension properties by stretching tissues that are too short and reducing tension placed on tissues that are too long, to provide support and reduce stress to myofascial tissues under chronic tension¹³ to provide kinesthetic awareness of scapular position during rest and movement. Even taping also having effect on inhibition and facilitation of muscular structures^{1,14,15,16}. Taping to scapula has used to inhibit hyperactive Upper Trapezius muscle to depress the scapula in its normal resting position^{14,16}. So that it will prevent associated movements of shoulder elevation during arm raising activities. Taping also has used to facilitate the Serratus Anterior muscle which helps in elevating, laterally rotating and protracting the scapula which is restricted or absent in spastic hemiplegic patient due to disuse or weakness of the Serratus Anterior muscle^{15,16,17}.

Nerve conduction velocity (NCV) studies are usually carried out to (i) evaluate the integrity of, and (ii) diagnose diseases of, the peripheral nervous system. These studies specifically measure the conduction velocity, latency, amplitude, as well as shape of the response following electrical stimulation of a peripheral nerve through the skin and underlying tissue. Results of NCV studies can reveal the degree of demyelination and axonal loss in the segment of the nerve examined. Demyelination results in prolongation of conduction time, while axonal loss generally leads to loss of nerve or muscle potential amplitude. CMAP (Compound Muscle Action Potential): The CMAP idealizes the summation of a group of almost simultaneous action potentials from several muscle fibers in the same area. These are usually evoked by stimulation of the motor nerve^{18,19}.

There is lack of conclusive evidence to prove that taping by stabilizing scapula improves the functional performance of affected Upper Extremity.

Hence the aim of this study is to check the effect of taping on scapular stability & upper limb function in recovering hemiplegics and also on CMAP of Trapezius and Serratus Anterior muscles.

Material & Method:

SUBJECTS:

100 chronic hemiplegic patients with scapular weakness were taken and divided into two groups: Group A (Experimental group) and Group B (Control group).

SOURCE OF DATA COLLECTION:

1. Government Physiotherapy College, Surat.
2. New Civil Hospital, Surat.

INCLUSION CRITERIA:

1. Patients diagnosed as stroke leading to hemiplegia by neurologists.

2. Chronic stroke patient more than 9 months.
3. Hemiplegic patients demonstrating weakness of scapular muscles i.e. less than grade 3 on manual muscle testing Scale.

EXCLUSION CRITERIA

1. Unconscious Patients
2. Hemiplegic Patient with unstable vital parameters
3. Hemiplegic Patient in flaccid stage
4. Hemiplegic Patient having spasticity greater than grade 2 according to Modified Ashworth Scale.
5. Hemiplegic Patient having contractures & deformity of the upper limb.

6. Hemiplegic Patient with cognitive & perceptual disorders.
7. Hemiplegic Patient having sensory, behavioural dysfunction & emotional liability.
8. Hemiplegic Patient who is having any associated history of trauma & other medical disorders of hemiplegic Upper Extremity.

SAMPLING:

Convenience sampling

METHOD:

Study Design: Experimental Study

100 chronic hemiplegic patients with scapular weakness were taken and divided into two groups: Group A (Experimental group) and Group B (Control group).

All the 100 chronic hemiplegic patients were evaluated by Fugl Meyer Physical Performance Assessment Scale for hemiplegic Upper Extremity before starting the treatment. Group A patients received scapular taping to Upper Trapezius & Serratus Anterior muscle combined with physiotherapeutic exercises and Group B patients received only physiotherapeutic exercises for the period of four weeks.

After the 4 weeks both Group A & Group B patients were reevaluated on Fugl Meyer Physical Performance Assessment Scale for hemiplegic Upper Extremity.

Pre and Post treatment Nerve Conduction Studies have been done on all the patients of both the groups where CMAP was measured and compared for both the Cranial Nerve XI (Spinal Accessory Nerve) and Long Thoracic Nerve, i.e. Trapezius & Serratus Anterior muscle respectively, on affected side.

RESULTS:

This study was done among 100 hemiplegic patients, 50 in Experimental and 50 in Control group. Mean age of study population was 50.98 years ±10.04 years which is similarly distributed among both Experimental and Control groups.

Table 1 Testing Significance of Difference in Mean score of Fugl Meyer Physical Performance Assessment Scale in Total (Upper Extremity) for pre to post intervention in both groups

Independent Samples Test					
		t-test for Equality of Means			
		t	df	Sig. (2-tailed)	Mean Difference
Total_pre	Equal variances assumed	-.617	98	.539	-1.200
	Equal variances not assumed	-.617	95.357	.539	-1.200
Total_post	Equal variances assumed	1.335	98	.185	2.620
	Equal variances not assumed	1.335	95.287	.185	2.620

Mean score of Fugl Meyer Physical Performance Assessment Scale in Total Upper Extremity in the Control group and that in the Experimental group before treatment is 43.14±8.8 and 41.94±10.5 respectively. Mean score of Fugl Meyer Physical Performance Assessment Scale in Total Upper Extremity in the Control group and that in the Experimental group after treatment is 46.66±8.95 and 49.28±10.61 respectively.

Levene's test for equality of variances before treatment comes to be statistically insignificant (p= 0.425), on applying the independent t test, value comes to be -0.62 which is statistically insignificant (p=0.539). Levene's test for equality of variances after treatment comes to be statistically insignificant (p= 0.204), On applying the independent t test, value comes to be 1.33 which is statistically insignificant (p=0.18). (Table 1)

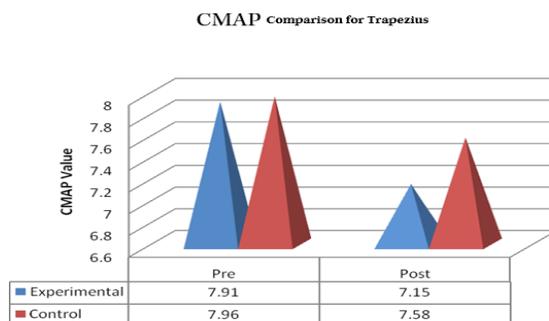
Table 2 Testing Significance of Difference in CMAP value of Trapezius muscle for pre to post intervention in both groups

Independent Samples Test				
		t-test for Equality of Means		
		t	df	Sig. (2-tailed)
CMAP_pre_Trap	Equal variances assumed	-.656	98	.513
	Equal variances not assumed	-.656	97.639	.513
CMAP_post_Trap	Equal variances assumed	-4.429	98	.000
	Equal variances not assumed	-4.429	95.204	.000

Mean score of Compound muscle action potential value in Trapezius muscle in the Control group and that in the Experimental group before treatment is 7.96±0.39 and 7.91±0.42 respectively. Mean score of Compound muscle action potential value in Trapezius muscle in the Control group and that in the Experimental group after treatment is 7.58±0.44 and 7.15±0.52 respectively.

Levene's test for equality of variances before treatment comes to be statistically insignificant (p= 0.53), on applying the independent t test, value comes to be -.656 which is statistically insignificant (p=0.513). Levene's test for equality of variances after treatment comes to be statistically insignificant (p= 0.51), On applying the independent t test, value comes to be -4.429 which is statistically significant (p=0.00). (Table 2)

CMAP Comparison for Trapezius



Graph 5: CMAP Comparison for Trapezius muscle Descriptive data for both groups

Table 3 Testing Significance of Difference in CMAP value of Serratus Anterior muscle for pre to post intervention in both groups

Independent Samples Test					
		t-test for Equality of Means			
		t	df	Sig. (2-tailed)	Mean Difference
CMAP_pre_Serr	Equal variances assumed	1.176	98	.243	.136
	Equal variances not assumed	1.176	60.190	.244	.136
CMAP_post_Serr	Equal variances assumed	1.969	98	.052	.226
	Equal variances not assumed	1.969	71.385	.053	.226

Mean score of Compound muscle action potential value in Serratus Anterior muscle in the Control group and that in the Experimental group before treatment is 2.92 ± 0.26 and 3.06 ± 0.77 respectively. Mean score of Compound muscle action potential value in Serratus Anterior muscle in the Control group and that in the Experimental group after treatment is 3.46 ± 0.73 and 3.69 ± 0.36 respectively.

Levene's test for equality of variances comes to be statistically insignificant ($p = 0.51$), on applying the independent t test, value comes to be 1.176 which is statistically insignificant ($p = .243$). Levene's test for equality of variances comes to be statistically insignificant ($p = .48$). On applying the independent t test, value comes to be 1.969 which is statistically insignificant ($p = .052$). (Table 3)

SUMMARY & CONCLUSION:

100 hemiplegic patients fulfilling the inclusion criteria were taken randomly. We have divided patients into two groups. Group A (Experimental group) and Group B (Control group). Pretreatment Scale of both group's patients on Fugl Meyer Physical Performance Assessment Scale and CMAP for Serratus Anterior and Trapezius muscle for hemiplegic Upper Extremity were taken. After that, scapular taping was given to the Group A patients in order to orient the scapula in normal position along with traditional physiotherapeutic exercises for the period of 4 weeks.

Group B patients were given only traditional physiotherapeutic exercises for the period of 4 weeks. After 4 weeks we have taken post treatment Scale on Fugl Meyer Physical Performance Assessment Scale and CMAP for Serratus Anterior and Trapezius muscle for hemiplegic Upper Extremity for both the groups of patients.

We conclude that Mean scores of Fugl Meyer Physical Performance Assessment Scale in both Control and Experimental groups comes out to be statistically insignificant. We can say that scapular taping is not effective in improving stability of the scapula and also in functional motor performance in hemiplegic Upper Extremity in recovering hemiplegic patients along with traditional physiotherapeutic exercises where almost all parameters remain insignificant except CMAP of Trapezius muscle showed significant change in statistical parameters. So, we can conclude that by using scapular taping technique there can be inhibition of hypertonic muscle. In other parameters also there is clinical improvement though it is not statistically significant.

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