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Original Research Paper

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EFFECT OF INTRINSIC AND EXTRINSIC MUSCLE TRAINING ON QUALITY OF HAND FUNCTIONS IN STROKE PATIENTS.

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ABSTRACT

Objectives: The objective is to find the effect of conventional training, specific intrinsic and extrinsic muscle training and compare the effect of both on quality of hand functions in stroke subjects.

Methods: A comparative study was conducted on 34 subjects after obtaining ethical clearance. The subjects were equally divided into Group A and Group B. Conventional treatment was given to both the groups as a baseline treatment and Group B was given intrinsic and extrinsic muscle training.

Results: Pre-training there was no statistical significant difference seen for Chedoke arm and Hand activity Inventory and Jebsen's Hand Function test. while post training the results between the two groups showed significant difference for Chedoke arm and Hand activity Inventory and extremely significant difference for Jebsen's Hand Function test.

Conclusion: Conventional training was effective in achieving gross motor skills but specific intrinsic and extrinsic muscle training significantly improved overall hand functions thus improving quality of hand functions in stroke patients.

KEYWORDS : Intrinsic and Extrinsic Muscle training, Stroke, Quality of hand function.

INTRODUCTION

Stroke is defined as the sudden loss of neurological function caused by an interruption of the blood flow to the brain. Neurological deficits must be present for at least 24 hours to be classified as stroke[1].

Depending on the areas of brain affected stroke leads to a variety of symptoms like hemiplegia, altered sensations, hand impairments, balance and co-ordination impairments etc[2].The most commonly affected artery is middle cerebral artery which mainly involves unilateral motor and sensory deficits of the upper extremity and face[3].

The hand has unique biomechanics and motor control capabilities which requires a co-ordinated interplay of the intrinsic and extrinsic hand musculature[4].Thus the hand is capable of a vast variety of functions like prehension, precision, grip, grasping, manipulation and transfers[5].

The hand has a bidirectional relationship with the brain which is necessary for execution of unique achievements of mankind[6]. Stroke leads to alterations in the muscle tone affecting the motor functions. The rate of regaining isolated movements is slow as the area responsible for controlling the hand functions in the motor cortex is large which delays recovery of hand post stroke[7].

Conventional exercises are those exercises that are traditionally practiced since ancient times and are accepted worldwide[8,9]. These exercises concentrate on the upper extremity as whole. Setting a structured protocol concentrating mainly on the hand is necessary for improvement of functional mobility and enhancing quality of life in stroke survivors.

METHODS

This was a comparative study conducted on 34 subjects who were equally divided into two groups using simple random sampling with lottery method. Conventional treatment was given to both the groups as a baseline treatment. The patients were selected according to the inclusion and exclusion criteria. Informed consent was taken from the patient and patient's caretaker. Inclusion criteria: (1)Subjects with middle cerebral artery involvement(2)Subjects with Brunnstorm recovery stage 2 and above(3)Subjects with impairment of hand function (4)Both genders. Exclusion criteria: (1)Wrist and Hand Fractures(2)Subjects with stroke secondary to traumatic brain injuries(4) Subjects with transient ischemic attack.

The treatment was given regularly for 5 days/week for 4 weeks.

- Group A was given conventional training- Passive/ Active assisted exercises for upper limb, Mat exercises, Electrical stimulation- Wrist and finger extensors, Transfer training, Therapeutic gymnasium exercises.
- Group B was given specific intrinsic and extrinsic muscle training- Active Stretching exercises, Dumbbell exercises, Pinching Clothespins, Hand ball exercises- Squeezing ball, Thumb roll, Pinching the ball, Table roll, Cutting papers, Making a bead necklace, Clay exercises, Rubber band exercises, Towel Exercises, Functional training with conventional training.

RESULTS:

Chedoke Arm and Hand Activity Inventory (CAHAI) - intragroup comparison using paired t-test.

In Group A the mean score on pre-intervention was 41.94±16.72 and 43.17±16.91 post-intervention. The p value was 0.0003, extremely significant.

In Group B the mean score on pre-intervention was 42.82±16.32 and 56.23±15.68 post-intervention. The p value was <0.0001,extremely significant.

Jebsen's Hand Function Test (JHFT) - intragroup comparison using paired t-test

In Group A the mean score on pre-intervention was 172.76±30.85, 54.52±18.15, 77.82±16.93, 111.17±23.31, 93.11±16.55, 130.58±17.96, 151.29±16.49 and post intervention was 171.11±31.21, 53±18.38, 76.52±17.08, 109.76±23.85, 91.58±17.01, 128.70±18.55, 148.94±16.79 for writing, page turning, picking small objects, simulated feeding, stacking checkers, picking large light objects, picking large heavy objects respectively. The p value was 0.0001, <0.0001, <0.0001, <0.0001, <0.0001, <0.0001, <0.0001 in the respective components which is extremely significant.

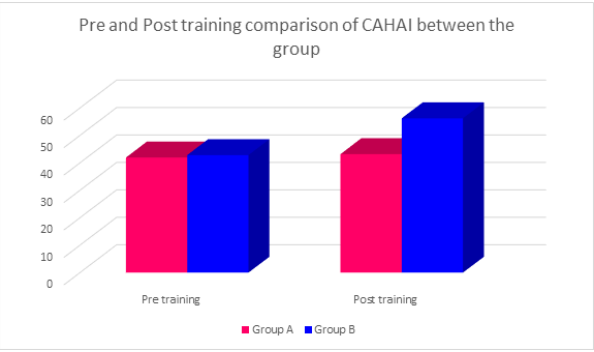
In Group B, the mean score on pre-intervention was 168.70±30.64, 52.76±18.05, 76.88±16.50, 108±22.82, 91.41±16.62, 128.64±18.02, 150.11±15.94 and post intervention was 135.70±24.84, 31.23±15.28, 52.29±15.14, 76.17±23.31, 50.29±16.69, 97.58±14.85, 117.17±15.62 for writing, page turning, picking small objects, simulated feeding, stacking checkers, picking large light objects, picking large heavy objects respectively. The p value by was <0.0001, <0.0001, <0.0001, <0.0001, <0.0001, <0.0001, <0.0001 in the respective components which is extremely significant.

CAHAI – intergroup comparison using unpaired t-test

On comparing the pre-interventional values, the results between the two groups revealed that there was no statistically significant difference seen in the p values=0.8773 while post intervention there was significant difference seen in the p values=0.0260.

Table 1- Pre and Post comparison of CAHAI score between the group

Group	Mean±SD		p value	Inference
	Group A	Group B		
Pre training	41.94±16.72	42.82±16.32	0.8773	Not Significant
Post training	43.17±16.91	56.23±15.68	0.0260	Significant

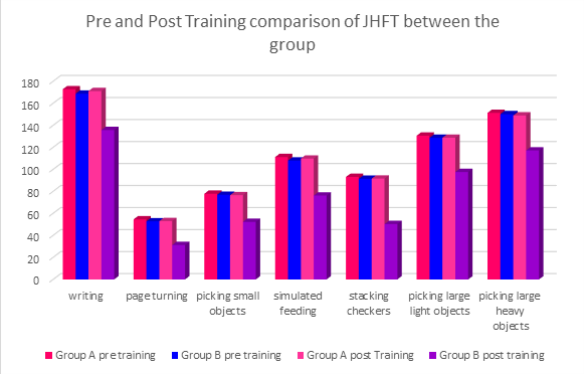


JHFT – intergroup comparison using unpaired t-test

On comparing the pre-interventional values, the results between the two groups revealed that there was no statistically significant difference seen in the p values=0.7029, 0.7781, 0.8707, 0.6908, 07663, 0.7552, 0.8339 while post intervention there was extremely significant difference seen in the p values=0.0009, 0.0007, 0.0001, 0.0002, <0.0001, <0.0001, <0.0001 for writing, page turning, picking small objects, simulated feeding, stacking checkers, picking large light objects, picking large heavy objects.

Table 2- Pre and Post comparison of JHFT score between the group

Group	Mean±SD		p value	Inference
	Group A	Group B		
Pre Training-				
a) Writing	172.76 ± 30.85	168.70±30.64	0.7029	Not Significant
b) Page turning	54.52±18.15	52.76±18.05	0.7781	Not Significant
c) Picking small objects	77.82±16.93	76.88±16.50	0.8707	Not Significant
d) Simulated feeding	111.17±23.31	108±22.82	0.6908	Not Significant
e) Stacking checkers	93.11±16.55	91.41±16.62	0.2997	Not Significant
f) Picking large light objects	130.58±17.96	128.64±18.02	0.7552	Not Significant
g) Picking large heavy objects	151.29±16.49	150.11±15.94	0.8339	Not Significant
Post Training–				
a) Writing	171.11±31.21	135.70±24.84	0.0009	Extremely Significant
b) Page turning	53±18.38	31.23±15.28	0.0007	Extremely Significant
c) Picking small objects	76.52±17.08	52.29±15.14	0.0001	Extremely Significant
d) Simulated feeding	109.76±23.85	76.17±23.31	0.0002	Extremely Significant
e) Stacking checkers	91.58±17.01	50.29±16.69	<0.0001	Extremely Significant
f) Picking large light objects	128.70±18.55	97.58±14.85	<0.0001	Extremely Significant
g) Picking large heavy objects	148.94±16.79	117.17±15.62	<0.0001	Extremely Significant



DISCUSSION

Hand impairment is a common motor impairment after stroke and is a major limiting factor increasing the dependency and reducing efficiency and social participation. When patients are unable to use their affected hand they compensate either by using the non-affected hand more or using affected hand in a possible way thus learning abnormal compensatory movements.

Till date there are many neurophysiological techniques devised for upper extremity and hand functioning such as Constraint induced movement therapy-a multifaceted intervention associated with a moderate reduction in disability with no evidence of persisting benefit[10], Functional electrical stimulation which has a positive improving effect on the upper limb motor function post stroke[5], Upper extremity task-oriented training that improves upper extremity functional use in patients with mild/moderate paresis but they have their own limitations.

This study was undertaken considering all the mentioned points and the aim was to find out the effect of intrinsic and extrinsic muscle training on quality of hand functions in stroke patients.

Post training improvement in hand function is due to plasticity following brain lesion. Repetitive exercises following stroke can help in formation of new and effective functional connections within remaining brain tissue. It can be due to specificity of the exercise programme that helped in achieving gross and fine motor control. Intrinsic and extrinsic muscle training might have helped the patients to have a better motor planning thus recruiting specific motor units. Although skilled performance was initially delayed Intrinsic and extrinsic muscle training added specificity and variability thus helping in retention of the skills. In conventional training the activities were done as a whole and not by breaking down in components which might have limited the transfer of training. While conventional training helped in early acquisition of skills, retention and specificity was achieved by specific intrinsic and extrinsic muscle training. This all can be supported by a statement of Kottke-If the practiced activity has been precise, the engram will be precise.

Our study thus shows that intrinsic and extrinsic muscle training and conventional training are both effective, but the combination of both has superior effects as compared to individual techniques.

CONCLUSION:

Conventional training was effective in achieving gross motor skills but specific intrinsic and extrinsic muscle training significantly improved overall hand functions thus improving quality of hand functions in stroke patients.

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