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Effectiveness of Kinesio Taping in Improving the Functional Activity of Upper Limb in Hemiplegics

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Abstract

Introduction: Stroke is the leading cause of long-term disability among adults, and hemiparesis is the most common impairment after stroke. Longitudinal studies of recovery after suggest that only 50% of patients with significant arm paresis recover useful function [1]. Impaired or lack of sensation in the hemiplegic upper limb, its spasticity or flaccidity, and neglect of hemiplegic arm contribute equally to a non-functional upper extremity in the stroke victim [3]. The use of kinesio taping in conjunction with regular therapy program may assist with improving joint stability with subsequent improvement of voluntary control and coordination of the upper extremity [6]. *Need of the study:* As there is decreased functional activity of upper extremity among stroke subjects so this study being done to improve the functional activity of upper extremity and to improve the quality of life in hemiplegic subjects. *Aim of the Study:* To determine the effectiveness of kinesio taping in improving the functional activity of upper limb in hemiplegics. *Methodology:* Ten subjects were randomly divided into two groups. Five subjects in group A i.e. experimental group and five subject in group B i.e. placebo group. Group A –Kinesio taping was applied to shoulder, upper arm, elbow, forearm, wrist & hand of post stroke hemiplegic subjects. Pre and post tapping scoring was done via UEFI. *Group B:* In placebo group, one strap of shoulder, forearm tape and lumbrical taping were missed. Scoring was done in the same manner as done in group A. *Future Research:* 1. This study can be done on large sample. 2. Scapular component can also be included while taping. 3. Longer duration follow up under supervision can be done. *Limitation of Study:* 1. Some patients was drop out from the study due to three days follow up. 2. Lack of supervision for 3 days. *Conclusion:* The present study concluded that there is significant improvement in functional activity of upper extremity in hemiplegic subjects after kinesiotaping. On comparing group A and group B the results were significant in group A and there is not significant improvement was seen in group B when some components of taping were missed.

Kyewords: Cover Rolls Kinesio Tape; Scissor; Chair; Comb; Medium Size Ball; Jar & Small Suitcase.

Introduction

Stroke is the leading cause of long-term disability among adults, and hemiparesis is the most common impairment after stroke. Longitudinal studies of recovery after suggest that only 50% of patients with significant arm paresis recover useful function [1].

Analysis of community surveys from different regions of India shows a crude stroke prevalence rate of about 203 per 100,000 populations above 20 years of age, amounting to a total of about 1 million cases. The male to female ratio was estimated to be 1.7. WHO estimated that in 1990, out of a total of 9.4 million deaths in India, 619,000 were due to stroke. This gives a stroke mortality rate 73 per 100,000 (estimated total population 849 million). It is estimated that 600,000 Americans suffer a first stroke each year, and the nation's nearly 4 million stroke survivors are living with the consequences [2].

Patient diagnosed with stroke often present with a combination of muscle weakness or muscle imbalance, decreased postural control, muscle spasticity, poor voluntary control, and body mal-alignment [3].

In many patients with severe stroke, the affected upper limp (UL) never becomes useful, even after therapy. Only about 15 percent of those suffering from severe stroke recover hand function [4].

The paretic upper limb is a common and undesirable consequence of stroke that increases activity limitation. It has been reported that up to

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85% of stroke survivors experience hemiparesis and that 55% to 75% of stroke survivors have continued to have limitations in upper-extremity functioning. It has been estimated that 55% of stroke survivors have a nonfunctional upper extremity following initial therapy and 30% of stroke survivors have had some partial recovery of upper extremity function in terms of range of motion and strength, but are still unable to perform ADLs with the affected upper extremity, which negatively affects their independence and increases the burden of care [5].

Kinesio taping is a relatively new technique used in used in rehabilitation programs. It is commonly used in sports injuries; however, it is gradually becoming useful in treating other impairments [3].

Dr. Kenzo Kase designed the brand of tape kinesio Tex which is a flexible, thin, porous cotton fabric with adhesive backing. The tape is latex free and will only stretch longitudinally from 30 to 40% more than its original length. The intent of kinesio taping is to improve the dynamic stability of the weak muscle or the painful muscle by providing improved alignment and cutaneous stimulation to enhance muscle contraction. The elastic quality and proprioceptive input as well and subtle biomechanical factors may account for the functional changes observed (Kerr 1996). The principles and techniques of taping have been adapted to be used clinically in rehabilitation centers for patients who present with shoulder subluxation or shoulder pain. Taping can be used as an adjunct during the rehabilitation program for the patient to enhance functional recovery (Host 1995, Schmitt and Snyder-mackler 1996) [6].

The properties of kinesio tape do not constrict movement as 'conventional' rigid tape. kinesio taping allows immediate patient feedback regarding possible functional benefits. With the Kinesio Tape on the patient can report symptom relief, confort level or stability of the involved joint. The elastic property of kinesio tape conforms to the body, allowing for movement. The use of kinesio taping in conjunction with regular therapy program may assist with improving joint stability with subsequent improvement of voluntary control and coordination of the upper extremity [6].

The primary objective of this study is to determine the effectiveness of kinesiotaping in improving the functional activities in chronic hemiplegics.

Experimental hypothesis

kinesiotaping will show significant of functional activities of upper limp in hemiplegics.

Null hypothesis

Kinesiotaping may not show significant improvement of functional activities of upper limb in hemiplegics.

Need of the study

As there is decreased functional activity of upper extremity among stroke subjects so this study being done to improve the functional activity of upper extremity and to improve the quality of life in hemiplegic subjects

Aim of the Study

To determine the effectiveness of kinesio taping in improving the functional activity of upper limb in hemiplegics.

Review of Literation

Karatas N. et al; 2012; conduct a study on 'The effect of kinesiotape application on functional performance in surgeons who have musculoskeletal pain after performing surgey'. Concluded that kinesiotaping would be an effective method for reducing neck and back pain and improving functional performance [7].

Tulay Tarsulu et al; 2011; conduct a study on the 'Effects of kinesiotaping on sitting posture, functional independence and gross motor function in children with cerebral palsy'; concluded that kinesiotaping may be beneficial assistive treatment approach when combined with physiotherapy [8].

Chen-Yu Hang et al; 2011; conducted a study on 'Effect of kinesiotape to muscle activity and vertical jump performance in healthy inactive people'; concluded that kinesiotape implicate benefits for medical gastronemius muscle strength and push-off force [11].

Emidia Mikolajewka et al; 2011; conduct a study on 'Side effect of kinesiotaping-own observation'.; concluded that kinesiotape can cause allergies; there is need for caution s application of kinesiotape, particularly in neurological patient with possible sensory disorders and conscious disorders [12].

Marco losa et al; 2010; conducted a study on' Functional taping: a promising technique for children with cerebral palsy and concluded that functional taping seems to be a promising intervention for improving locomotor function in children with CP [13].

Spirtos M, O'Mahony, P. et al; 2010; conducted a study on 'The effect of kinesiotaping of the thumb and wrist on range of motion in children with cerebral palsy'. Stated that Kinesio tape impacts at the level of body functions and structures and significant change was greater at this level, studies which investigate kinesio taping combined with functional training would be usefu [14].

Francisco Garcia et al; 2009 September; Conduct a study on 'Treatment of myofascial pain in the shoulder with kinesio taping: a case report'. Concluded that treatment with kinesio taping contributed to the resolution of myofascial pain in shoulder producing an immediate treatment and resolving the problem in following days [16].

Hsu YH, Chen WY, et al; 2009 Dec; Conduct a study on 'Effect of taping on scapular kinematics and muscle performance in baseball players with shoulder impingement syndrome'. Found that the elastic taping resulted in positive changes in scapular motion and muscle performance [17].

Mark D. Thelen et al; 2008; Studied on 'The clinical efficacy of kinesio tape for shoulder pain: A randomized,double-blinded, clinical trial'. Concluded that KT may be some assistance to clinicians in improving pain-free active ROM immediately after tape application for patient with shoulder pain [18].

Zbigniew Sliwinski et al; 2007; conduct a study on 'Kinesiotaping application in children with scoliosis'. Conclused that kinesiotaping as a new method, using multiple forms and techniques, seems helpful in carrying out rehabilitation programme for children with scoliosis [19].

Subhash Kaul et al; 2007; conducted a study on 'Stroke in India: Are we different from world'. Concluded that India has been registering an upward trend in the last few decades, while the incidence of stroke in western countries has declined or plateaued [21].

Yasukawa A et al; 2006; conduct a study on 'Effect of kinesiotaping in an pediatric rehabilitation setting'; concluded that kinesiotaping may be a associated with improvement in upper extremity motor control and function in acute paediatric rehabilitation [6].

C. Philip Gabel et al; 2006; did a study on 'The upper limb functional Indix: Development and determination of reliability, validity and responsiveness. Concluded that ULFI demonstrated sound psychometric properties, practical characteristics and clinical utility there by making it a viable clinical outcome tool for determination of upper limb status and impairment [22].

Tapas Kumar Banerjee et al; 2006; studied on 'Epidemiology of stroke in India'. Concluded that there was higher prevalence of cerebral hemorrhage in the community compared to that in the western countries [2].

boudewijin Kollen et al; 2006; Conducted a study on 'Functional recovery after stroke: A review of current developments in stroke rehabilitation research'. Concluded that treatment strategies that incorperate compensation strategies with a strong emphasis on functional training, may hold the key to optimal stroke rehabilitation [23].

Leeanne M. Carey et al; 2005; did a study on 'Motor 4r impairment and recovery in the upper limb after stroke'. Stated that upper limb motor function and recovery are correlated with cerebral blood flow in cingulated, insula, highlighting the role of these are in the recovery process the dynamic nature of the relationship suggests ongoing adaptation within network [1].

John W. Krakauer et al; 2005; Conduct a study on 'Arm function after stroke; from physiology to Recovery'. Concluded that rehabilitation techniques enhance learning-related changes after stroke and contribute recovery [4].

Johanne higgins et al; 2005; conduct a study on' Upper limb function and recovery in the acute phase stroke'. concluded that extent of UL deficits assessed in the first week following a stroke with the use of a measure of activity limitation is a good prognostic indicator of UL function at 5 weeks post stroke and should be used for the planning of treatment strategies [5].

Kim KS, Seo HM et al; 2002; did a study on 'Effect of taping method of effect of taping method on ADL, ROM, hand function and quality of life in post-stroke patients for 5 weeks'. Stated that taping therapy was effective in improvement of physical aspects (hand function, upper extremity ROM) in post-stroke hemiplegic stroke [24].

M.C. Cirtea et al; 2000; Conduct a study on 'Compensatory strategies for reaching in stroke'. Concluded that use of compensatory strategies may be related to the degree of compensatory strategies may be related to the degree of motor impairment: severely and moderately impaired subjects recruited new degrees of freedom to compensate for motor deficit while mildly impaired subjects tended to employ healthy movement pattern [25].

Methodology

Sample

Ten subjects (10) were randomly divided into two groups. Five subjects in group A i.e. experimental group and five subject in group B i.e. placebo group. Group A –Kinesio taping was applied to shoulder, upper arm, elbow, forearm, wrist & hand of post stroke hemiplegic subjects. Pre and post tapping scoring was done via UEFI. Group B- In placebo group, one strap of shoulder, forearm tape and lumbrical taping were missed. Scoring was done in the same manner as done in group A. All the subjects participated in the study after signing the informed consent. The study was conducted in the Department of Physiotherapy, HIHT University, Jolly Grant. A sample of 10 subjects each in 2 groups were selected according to inclusion and exclusion criteria. Inclusion criteria Age 40-60 years, MMSE>23, Muscle power in upper limb > or = 2, Both gender male and female, Flexor synergy pattern in upper limb & 3 months to 6 months post stroke. Exclusion criteria subjects were excluded. Any fracture or dislocation on affected side, Tone (MAS) > or = 3, Any prior pathology to joint & Subluxated shoulder. Instrumentation for data collection includes Cover roll kinesio tape, Scissor, Chair, Comb, Medium size Ball, Jar & Small suitcase (Fig. 1).

Procedure

Ten subjects were randomly divided into two groups. Five subjects in group A i.e. experimental group and five subject in group B i.e. placebo group. Group A –Kinesio taping was applied to shoulder, upper arm, elbow, forearm, wrist & hand of post stroke hemiplegic subjects. Pre and post tapping scoring was done via UEFI.

Group B- In placebo group, one strap of shoulder, forearm tape and lumbrical taping were missed. Scoring was done in the same manner as done in group A. Taping area was prepared by removing the hair with the help of razor and cleaning the taping are with spirit. A pre taping scoring was done via upper extremity functional index (UEFI). After scoring kinesiotaping was applied over shoulder, elbow and wrist. (Fig. 2).

Subject was asked to do the following activities:

1. Opening the door
2. Grooming hair
3. Opening a jar
4. Carrying a small suitcase
5. Throwing a ball

After performing the activities we were asked the subject to score each activity himself or herself accordingly UEFI score.

0. = extreme difficulty or unable to do activity
1. = quite a bit of difficulty
2. = moderate difficulty
3. = little bit of difficulty
4. = no difficulty

Group A – In shoulder taping, arm was supported by elbow by a helper in 90 degree abducted position. 5cm wide tape was used. 1st strip of tape applied to shoulder ½ way along length of clavicle, continued across deltoid in diagonal direction, wrips around upper arm, terminates ¼ of the way along the scapula. 2nd strip applied in same direction but 2 cm below. An anchor tape was applied to secure the two ends. (Fig. 3).

In elbow and wrist taping, elbow was positioned in extended position, forearm in mid prone position and wrist in slightly extended position. 3cm wide tape was used. 1st strip of tape was applied from 5 cm above the olecranon process, spirally covering the lateral epicondyle, forearm and ending at ulnar border of wrist.

The a Y-shaped tape was applied over dorsal aspect of hand extending from midpoint of wrist to 1st and 5th metacarpals. Then tape was wrapped over lumbricals for palmer stability. An anchor tape was applied to secure the ends. Post taping score was taken to find out the immediate effect. After post taping immediate score, we ask the patient to practice these tasks at home and after 3 days one more scoring was done.(Fig. 4).

Group B- In placebo group, one strap of shoulder, forearm tape and lumbrical taping were missed. Scoring was done in the same manner as done in group A. (Fig. 5).

Results

Date of group A was analyzed by using ANOVA. The mean±standard deviation of pre taping was 8±1.41, post immediate taping was 12.2±1.48 and post 3 days was 13.8±1.09 with f value 24.92 and p value ≤ 0.05 which is significant. (Table 1).

In group B, the mean ± standard deviation of pre taping was 7.2±2.16, post immediate taping was 8.6±2.30 and post 3 days was 8.6±2.30 with f value 0.64 and p value ≥ 0.05 which shows non significant result. (Table 2).

Fig. 1: Showing instruments used in the study

Fig. 2: Showing preparation of the taping part

Fig. 3: Showing preparation of the taping part

Fig. 4: Showing Y shape taping on dorsal aspect of hand

Fig. 5: Showing Y shape taping on dorsal aspect of hand

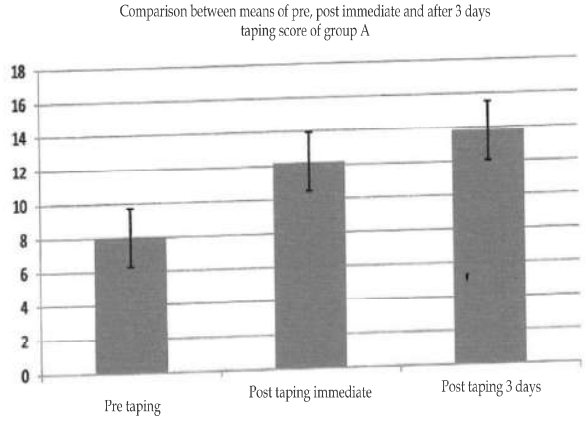
Inter group analysis i.e. between group A and group B was done by using unpaired t-test. The mean±standard deviation of pre taping of group A was 8±1.41 and group B 7.2±2.16 with t value 0.69 and p value ≥ 0.05. (Table 3).

The mean ±standard deviation of post immediate taping of group A was 12.2±1.48 and group B 8.96±2.3 with t value 2.93 and p value ≤0.05 *(Table-4)*

Which shows significant change. The mean±standard deviation of post 3 days taping of group A was 13.8±1.09 and group B was 8.6±2.3

Table 1: Comparison of mean, standard deviation, f value, p value for pre taping and post taping (immediate and 3 days) of group A.

Variable	Mean + St deviation	f value	p value
Pre taping	8±1.41		
Post taping immediate	12.2±1.48	24.92	≤0.05
Post taping 3 days	13.8±1.09		



Graph 1:

with t value 4.56 and p value ≤0.05 which shows significant result. (Table 5).

On comparison of pre taping score of mean and standard deviation 8±1.41 with post immediate score of mean and standard deviation 12.2±1.48 with post taping after 3 days of mean and standard deviation 13.8±1.09 with f value 24.92 and p value ≤ 0.05 which is significant. (Graph 1).

On comparison of pre taping score of mean and standard deviation 7.2±2.16 with post immediate score of mean and standard deviation 8.6±2.30 with post taping score after 3 days with f value 0.64 and p value ≥ 0.05 which is insignificant. (Graph 2).

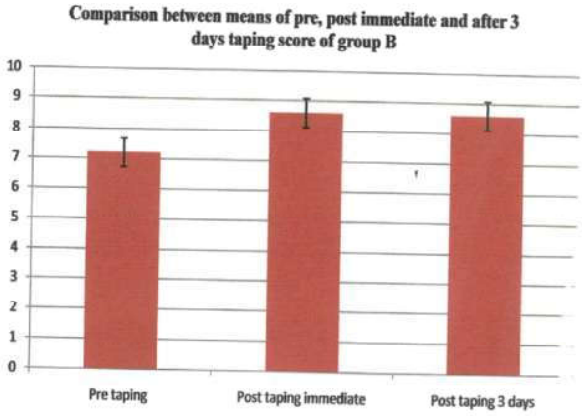
On comparison of pre taping score of group A of mean and standard deviation 8±1.41 with pre taping score of group B of mean and standard deviation 7.2±2.16 with t value 0.69 and p value ≥ 0.05 which is insignificant (Graph 3).

On comparison of post immediate taping of group A of mean and standard deviation 12.2±1.48 with post immediate taping score of group B of mean and standard deviation 8.6±2.3 with t value 2.93 and p value ≤ 0.05 which is significant. (Graph 4).

On comparison between post taping (3 days) score of group A of mean and standard deviation 13.8±1.09 with post taping (3 days) of group B of mean and standard deviation 8.6±2.3 with t value 4.56 and p value ≤ 0.05 which is significant (Graph 5).

Table 2: Comparison of mean, standard deviation, f value, p value for pre taping and post taping (immediate and 3 days) of group B

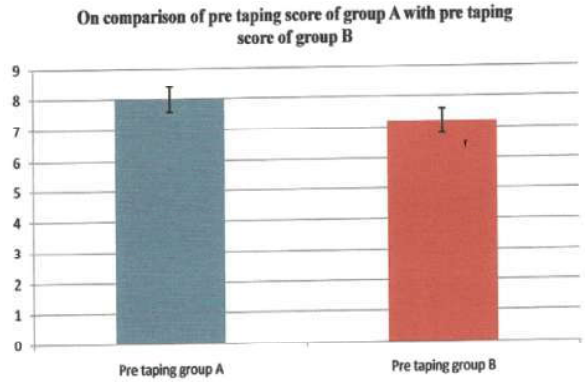
Variable	Mean + St deviation	f value	p value
Pre taping	7.2±2.16		
Post taping immediate	8.6±2.30	0.64	≥0.05
Post taping 3 days	8.6±2.30		



Graph 2:

Table 3: Comparison of mean, standard deviation, t value, p value for pre taping score of group A and group B

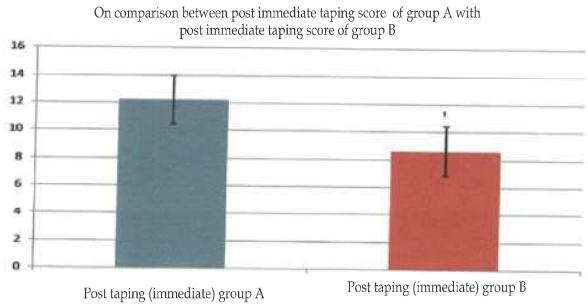
Variable	Mean + St deviation	t value	p value
Post taping group A	8±1.41	0.69	≥0.05
Post taping group B	7.2±2.16		



Graph 3:

Table 4: Comparison of mean, standard deviation, t value, p value for post taping (immediate) score of group A and group B

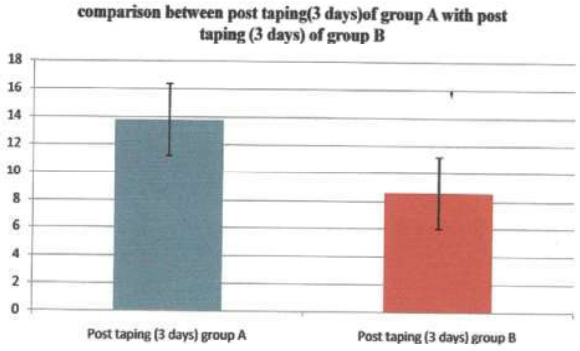
Variable	Mean ± St deviation	t value	p value
Post taping (immediate) group A	12.2±1.48	2.93	≤0.05
Post taping (immediate) group B	8.6±2.3		



Graph 4:

Table 5: Comparison of mean, standard deviation, t value, p value for post taping (3 days) of group A and group B

Variable	Mean±St deviation	t value	p value
Post taping (3 days) group A	13.8±1.09	4.56	≤0.05
Post taping (3 days) group B	8.6±2.3		



Graph 5:

Discussion

The paretic upper limb is a common and undesirable consequence of stroke that increase activity limitation. It has been reported that up to 85% of stroke survivors experience hemiparesis and that 55% to 75% of stroke survivors have limitations in upper-extremity functioning [5]. Many treatment are available to improve the upper limb function after stroke such as functional electrical stimulation, mirror therapy etc. Kinesiotaping relatively a new treatment technique. Few researches has been published regarding the effectiveness of kinesiotaping in improving the functional activity in stroke subjects.

The concept of kinesio taping was initiated in 1973 by Japanese chiropractor named Dr. Kenzo Kase. The four major functions suggested by Dr. Kase's theory on kinesio tape are: to relieve pain, remove congestion of lymphatic fluid or blood under the skin, support weak muscles and correct joint mal alignment [26].

In the present study aspect of 'supporting weak muscles' is taken as point of reference for kinesiotaping in hemiplegics with functional dependence on the basis of 'Upper extremity functional index'. UEFI is preferred upper limb regional tool due to its superior practical characteristics and clinical utility, and comparable psychometric properties [22].

The result of the study confirm that the effect of kinesiotaping has improved upper limb function as demonstrated with the UEFI. Although the sample size was small yet a statistical significant improvement was found when data was analyzed. Supported by 'Yasukawa A et al. in 2006'. This study demonstrated the clinical change in function can be measured supporting the use of kinesiotaping as an adjunct to treatment.

There is a significant change in port immediate taping score in group A $p \leq 0.05$ which approved a immediate improvement in functional activity according to UEFI. The use of kinesiotaping method appeared to have facilitated and improved movement provided needed stability and alignment to perform the task for reach, grasp, throwing etc.

The immediate change seen after the application of the tape can be attributed to the input provided by the kinesio tape. The continued improvement after 3 days was not found and need to be considered as lack of supervision for which patient has used upper extremity and quality of tape for duration of 3 days, resulting in loosening of tape or miss-placement from original attachment, which force or compel us to prefer study with larger sample size and duration with importance of features like supervision, days of application and quality of taping.

The placebo group showed non-significant result of $p \geq 0.05$. This states that beneficial effect of kinesiotaping "supporting weak muscles" does not act on these group as one of taping component was missed during taping procedure. This result also places stress on proper application and sequential procedure for kinesiotaping with proper preparation of the patient for expected outcome hence proving the experimental hypothesis.

Clinically this study demonstrated that by using kinesio tape as a treatment tool, the improvement was seen in upper extremity functional activity.

Clinical Relevance

Functional limitations of upper extremity are very common in stroke patients. Various researches have shown effect of physical therapy measures like mirror therapy, functional stimulation etc. in improving the functional activity of upper extremity in stroke subjects. Few researches have been published regarding the effectiveness of kinesiotaping in stroke subjects. Therefore this study aims at finding out the effectiveness of kinesiotaping in functional improvement of upper

extremity of stroke patients. Hence kinesiotaping should employ in upgrading rehabilitation protocol of hemiplegic subjects.

Future Research

1. This study can be done on large sample.
2. Scapular component can also be included while taping.
3. Longer duration follow up under supervision can be done.

Limitation of Study

1. Some patients was drop out from the study due to three days follow up.
2. Lack of supervision for 3 days.

Conclusion

The present study concluded that there is significant improvement in functional activity of upper extremity in hemiplegic subjects after kinesiotaping. On comparing group A and group B the results were significant in group A and there is not significant improvement was seen in group B when some components of taping were missed.

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