Effect Of Kinesiotaping On The Quality Of Upper Extremity Function In Children With Hemiplegic Cerebral Palsy- An Experimental Study

Dr. Shreyashree Pandit*, Dr. Rahul Bisen **

*MPT Final Year Student, ** Associate Professor Department Of Neuro Physiotherapy,
Smt. Kashibai Navale College Of Physiotherapy, Pune 411041

Abstract: Background: Hemiplegic Cerebral palsy (CP) causes difficulty in reaching and grasping activities of the affected upper extremity. Kinesiotaping has been widely used in the last decade as an adjunct to a variety of treatment modalities including in the rehabilitation of paediatric population. Purpose of this study was to find the effect of kinesiotaping on the quality of upper extremity function in children with hemiplegic cerebral palsy. Objectives: To compare the effects of conventional treatment and conventional with kinesiotaping on the quality of upper extremity function in children with CP and to assess the effect of Kinesiotaping on fine motor and gross motor function in children with hemiplegic CP. Material And Methods: The study included 20 children who were diagnosed cases of hemiplegic CP. The experimental group was given kinesiotaping with conventional therapy and the control group received only conventional therapy. Quality of upper extremity skills test (QUEST) was used as an outcome measure. Both groups were evaluated with the QUEST before application of tape and immediately after tape application. 3 days later the tape was removed and immediately the QUEST score was recorded for both the groups. Result: The results showed no statistical difference in the final QUEST scores between the two groups as well as no difference in any domain. There was however clinical improvement between the experimental and control groups in weight bearing, dissociated movements and protective extension domains. Also there was statistically significant improvement in the gross motor scores in the experimental group as compared to control group (p= 0.44).Conclusion: Kinesiotaping can be used as an adjunct to conventional therapy to improve gross motor skills for improving upper extremity function in hemiplegic cerebral palsy.[Pandit SNatl J Integr Res Med, 2020; 11(5):06-10]

Key Words: Hemiplegic Cerebral Palsy, Kinesiotaping, QUEST, Upper Extremity.

Author for correspondence: Dr. Shreyashree Pandit, Department of Neuro Physiotherapy, Smt. Kashibai Navale College of Physiotherapy, Pune - 411041 E-Mail: shreyashripandit123@gmail.com

Introduction: Cerebral palsy (CP) is a group of non-progressive disorders which occur due to insult to the developing brain[1]. This childhood disability is a combined disorder Including postural, movement and motor function affection. There may also be associated sensory and musculoskeletal problems. According to CDC, the worldwide prevalence of CP is 1.5 to more than 4 live births in a defined age[2].

The insult to the brain tissue may be pre-natal, natal or post-natal. Cerebral Palsy is classified based on broad terms such as topography, etiology, neuroanatomic factors, etc. Spastic Hemiplegia is a type of Cerebral palsy in which one side of the body is affected. Usually the upper limb is more affected than the lower limb. According to a study 30% of CP are hemiplegics with the population prevalence being 0.6/1000 live births.

Children with hemiplegic CP show preference for using one hand, may keep hand coiled in a fist and close to the body. Hemiplegic children are not able to co-ordinate the activity between their head, arm and trunk thus leading to impairments in unimanual and bimanual tasks[3]. Kinematics of shoulder, hand and arm in hemiplegic CP differ from a normally developing child. There is difference in orientation of the shoulder and significant limitations in thoraco-humeral elevation during shoulder flexion along with abnormal abduction during hand to mouth and forward reaching tasks[4,5]. There is tendency to use wrist and elbow flexion, pronation of forearm and abnormal movements in the scapular and lateral trunk flexion to reach out and grasp.[3, 5.]

Kinesiotaping was created by a Japanese Chiropractioner in 1980's by the name of Kenso Kase (Kase, 1996). Kinesiotape is designed to mimic the qualities of human skin through its specific thickness and high elasticity. The functions of Kinesiotape (KT) are in improvement of circulation, pain reduction, muscle facilitation and support.

The use of taping has also been started in paediatrics, with Yasukawa et al. using KT in an acute paediatric setting. This was followed by a series of studies where KT was used in children with CP, idiopathic scoliosis and oromotor impairments[8,9]. Studies have been done to assess the handgrip strength and wrist range of motion

following kinesiotaping in children with CP. There is limited evidence of studies done to determine the short term effect of kinesio taping on upper limb movements, particularly in hemiplegic CP. Thus purpose of this study is to determine the effect of kinesiotaping on the quality of upper extremity Function in children with Hemiplegic CP.

Material & Methods: Institutional ethical clearance was obtained. 20 children who were diagnosed cases of hemiplegic cerebral palsy participated in the study. The parents were informed regarding the study and written consent was taken from them. The subjects were selected according to the inclusion and exclusion criteria and allocated as per convenience to Group A (experimental group) and Group B (control group). Both groups consisted of 10 children each.

Inclusion Criteria: Children from both genders, 4-8 years of age with good cognition and level III and above on Manual Abilities Classification system (MACS). Exclusion Criteria: Children with upper extremity deformities, those who had Botox in last 6 months or operative interventions of upper limb were excluded. Both groups were assessed on day 1. Group A received Kinesiotaping along with conventional therapy. Patch test was done 24 hours prior for children receiving KT. QUEST scores were taken for both groups three times - before tape application and therapy, immediately post tape application and therapy and three days later post therapy and after tape removal.

Kinesiotaping Method: Muscles antagonist to spastic muscles or those requiring facilitation were identified. For the experimental group the part to be taped was cleaned with spirit and hair removed if required. Muscle technique was used where the muscle to be taped was taken in a pre-stretched position and the tape was applied with zero stretch from insertion to origin of muscle. Conventional therapy included strengthening (3 sets of 12 repetition performed twice a week), NDT facilitation, dexterity and gripping exercises along with stretching.

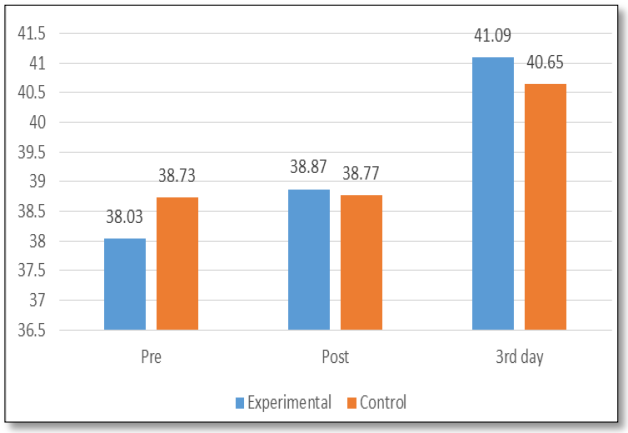
Results: The study data was analysed statistically using the SPSS 2.1 software.For the normative data, unpaired t-test was used for between group comparison and Repeated measures ANOVA was used for in group comparison. For non-normative data, Mann Whitney U test was used and for within group comparison Kruskal-Wallis test was used. Average score for each activity in experimental and control group was compared at pre, post and post 3rd day separately using unpaired t test. It was found that the QUEST score of the experimental and the control group did not differ significantly for any activity in any domain.

Table 1: Summary Of Quality Of Upper Extremity Skills Test (QUEST)

Variable	Score	Experimental	Control	t (p)
Dissociated Movement	Pre	47.34 ± 2.21	46.20 ± 2.62	1.059 (0.303)
	Post	48.12 ± 2.30	46.20 ± 2.61	1.75 (0.097)
	3rd day	49.06 ± 2.23	47.63 ± 3.30	1.135 (0.273)
	F (p)	1.45 (0.251)	0.833 (0.466)	
Grasps	Pre	40.74 ± 7.20	45.32 ± 5.10	1.643 (0.118)
	Post	42.22 ± 7.84	45.48 ± 4.97	1.111 (0.281)
	3rd day	45.55 ± 7.72	46.95 ± 4.98	0.465 (0.633)
	F (p)	1.064 (0.359)	0.320 (0.729)	
Weight Bearing	Pre	34.60 ± 3.13	33.20 ± 3.15	0.49 (0.33)
	Post	35.60 ± 3.27	33.20 ± 3.15	1.53 (0.143)
	3rd day	37.80 ± 3.93	35.60 ± 2.63	1.47 (0.162)
	F (p)	2.309 (0.119)	2.146 (0.137)	
Protective Extension	Pre	29.44 ± 2.68	30.20 ± 3.50	0.539 (0.596)
	Post	29.72 ± 2.94	30.30 ± 2.70	0.329 (0.746)
	3rd day	31.94 ± 2.70	32.42 ± 3.13	0.363 (0.721)
	F (p)	2.443 (0.106)	1.43 (0.255)	
Final	Pre	38.03 ± 2.83	38.73 ± 3.21	0.545 (0.613)
	Post	38.87 ± 3.06	38.77 ± 3.12	0.07 (0.945)
	3rd day	41.09 ± 2.77	40.65 ± 3.08	0.336 (0.741)
	F (p)	2.993 (0.067)	1.215 (0.312)	

Further analysis was done to see the difference of score before (pre), immediately after (post) and 3 days after within experimental and control group using Analysis of variance (ANOVA). The results showed no statistical significance between the experimental and control groups on the overall score of QUEST. There was however improvement in mean and SD of the experimental group (41.09 ± 2.77) than the control group (40.65 ± 3.08). All the scores for each domain of QUEST showed no statistical significance in the group or between the experimental and control group although but there was considerable difference in the mean and SD in between experimental and control groups for dissociated movements, weight bearing and protective extension. The secondary objectives were to find the effect of kinesiotaping on gross and fine motor skills. There was a statistically significant variation in the scores within the experimental group than control group for gross motor function (p= 0.44). Although there was no statistical significance between the experimental and control group scores pre post and 3 days later there was a difference in the means of both groups (111.39 ± 6.22, 113.25 ± 6.54 , 118.80 ± 5.12) for experimental and (109.59 ± 8.28, 109.59 ± 8.28, 115.64 ± 8.16) for control group respectively.

Graph 1: Final Scores of QUEST for experimental and control group



Graph 2 : Gross Motor Function Score

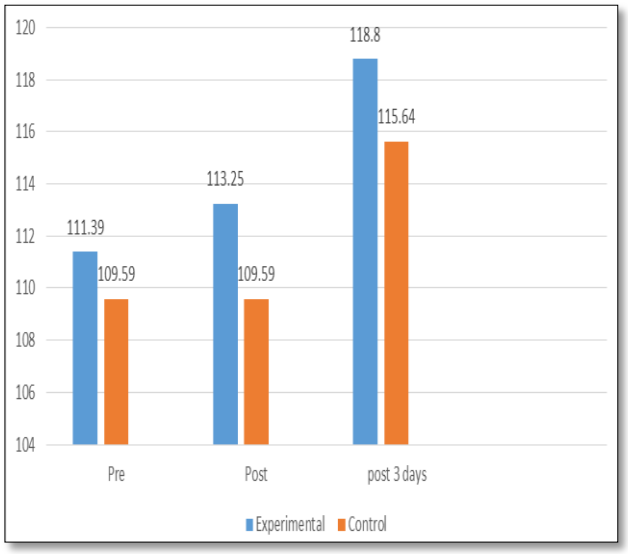


Table 2: Statistically Significant Variation In The Scores Within The Experimental Group Than Control Group For Gross Motor Function (P= 0.44).

Time	Group	Mean ± SD	P
Pre	Experimental	111.39 ± 6.22	0.472
	Control	109.59 ± 8.28	
Post	Experimental	113.25 ± 6.54	0.272
	Control	109.59 ± 8.28	
After 3 days	Experimental	118.80 ± 5.12	0.326
	Control	115.64 ± 8.16	

Discussion: Only a few studies have been done so far on the effect of kinesiotaping on gross motor functions in children with CP. Kaya Kara et al. studied the effect of Kinesiotaping on activity and body functions in children with unilateral spastic hemiplegic CP[9]. In this study gross motor function was measured using GMFM and Bruininks–Oseretsky Test of Motor Proficiency (BOTMP).

Significant changes were seen in the children receiving Kinesiotaping Dimension D and E of GMFM and gross motor function in BOTMP. Note however that both dimensions of GMFM and BOTMP relate to gross motor activities of the lower limb and trunk. The fine motor component of BOTMP however showed no effect, similar to the present study.

Yasukawa et al. investigated the effects of Kinesio Taping in acute paediatric rehabilitation settings. The study assessed the Children with the Upper Limb Assessment before and just after taping and after 3 days of wearing the tape. They showed that Kinesio Taping enabled goal-directed movement, increased stability of the shoulder and hand, and supported alignment during reaching and grasping[10]. Ibrahim M (2015) found no significant difference in the final score of QUEST in the experimental and control group, although significant difference was found in the pre and post treatment effects in the experimental group similar to the present study.

The effect seen on the protective extension, weight bearing and dissociated movements in

this study may be attributed to the fact that facilitatory taping enhances the joint position signal through tension created in the stretched tape. Furthermore, like joint receptors stretching of skin by the KT allows the cutaneous receptors to detect joint position and movement at the extremes of joint motion[11].

Clinically, the control at the elbow joint improved significantly in this study. This can be attributed to the fact that the triceps muscle has a larger area over which more sensory stimulation was provided by the KT as compared to the smaller muscles of the forearm. Thus the proprioceptive input from the triceps was more effective in improvement of upper limb movement due to the larger area of muscle covered by tape.

The overall total score of QUEST in this study however showed no significant differences statistically. This is in agreement with the study done by Simsek TT et al. The effect of KT on gross motor function and functional independence was measured during a period of 12 weeks and no significant differences were found except in the body alignment. The main problem in this study was attributed to the short time duration which was thought insufficient to see the effect of KT.

Further a systematic review by Parreira et al. showed no effect of kinesiotaping over sham taping. The authors noted clinical benefits but no statistically significant difference. This is in line with the present study where difference was seen in movement patterns in the experimental group but no statistical significance was found in the overall QUEST score.

In another systematic review by Karlon et al. the authors assessed the effect of kinesiotaping on various musculoskeletal, neurological and lymphatic conditions. Out of 3 studies that analysed the effect of KT on strength, 2 studies showed significance but these effects were not retained long-term.The current study was one of the few done on hemiplegic cerebral palsy that assessed quality of movements and where taping was done to proximal as well as distal muscles of the upper limb.

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It can be said that with regards to kinesiotaping application, there have been varied and inconsistent results. There is a dearth of studies which have good homogeneity in samples and strong scientific techniques.

Conclusion: More studies on the longer term effect of kinesiotaping must be undertaken to fully understand its effects. Thus from methodological quality and scientific evidence standpoint the effect of kinesiotaping remains inconclusive. According to current study, kinesiotaping can be used as an adjunct to conventional therapy to improve gross motor skills for improving upper extremity function in hemiplegic cerebral palsy.

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