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Effectiveness of Kinesiology Taping Application along with Therapeutic Exercise for Improving Functional Activities in Children with Erb's Palsy

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Abstract: ***Background: The erb's palsy is a partial or total paralysis of the upper extremity due to trauma of brachial plexus during normal delivery. Purpose: To investigate the effect of Kinesio taping over the deltoid and the forearm along with exercise program on the development of proper upper extremity function in children recovering from Erb's palsy. Objective of the study: This study to evaluate the effectiveness of kinesiology taping on along with exercise program to improve functional activity in children with erb's palsy. Methodology: 20 children with Erb's palsy were included in this study. There were few children were irregular attendance due to illness. So, we collect data only for the 15 patients. They received designed physical therapy program along with Kinesiotaping over the deltoid and the forearm. The duration of each session was approximately 45 minutes with adequate rest periods in between. The tape was applied for 3 days, then it removed for few hours and applied again. The exercise program along with Kinesio tape was given for 6 weeks. The study duration was 6 months. The subject was evaluated, based on pre and post test scores. Outcome measures: The outcome result was measured by using Toronto active motion scale (TAMS) BPOM- functional movement scale. Results: The study revealed that effectiveness of Kinesiotaping along with designed Physical therapy statistically significant improvement in functional activity on children with Erb's palsy. While comparing the pre and post test scores. Conclusions: It is concluded from the study that the kinesiology tape application on the arm and the forearm muscles, along with therapeutical exercise has improved the functional activity of the upper limb in children with erb's palsy.***

Keywords: Erb's palsy, functional activity, Kinesiotaping, exercise programme, Toronto active motion scale, BPOM- functional movement scale

1. Introduction

Erb's palsy is a form of brachial plexus in which there is paralysis of the upper arm and shoulder girdle muscles due to an injury to the roots of 5thand 6thcervical roots or the upper part of the brachial plexus. Erb's palsy is otherwise known as Erb – Duchenne palsy. The incidence ranges globally from 0.2% to 0.4 %of live births. According to the world Health Organization, prevalence is generally 1-2% world- wide, with the higher numbers being in underdeveloped countries. Duchenne- Erb type constitutes a major form among brachial plexus palsied children as it accounts about 80-90% of all brachial plexus palsied cases as a result of unilateral upper trunk lesion. Erb's Palsy affects the nerves of the neck that control the motions of the arm. This condition turns muscles inward toward the body, disturbing mobility. It can occur during normal delivery if a baby's neck is stretched unnaturally as the head and shoulders pass through the birth canal. Early bodily trauma in the first few months of life may also lead to the palsy. The name of erb's palsy has derived from the doctor who first documented the condition. The word palsy refers to the weakness in the muscle– not paralysis. Erb's palsy symptoms have been to improve or elseit clears up on their own. While most of the cases are mild, each child will have various reactions to their nerve damage. Therefore, each child may require different kinds of intervention.

Erb's palsy is the affecting the muscles of the Early treatment may entail physical and occupational therapy, daily passive range of motion exercise, splinting to lessen the severity of biceps/triceps co-contraction. However, many times, the deformations occur that require surgical intervention.

Kinesiology Tape

A very useful physiotherapeutic modality nowadays if applied properly isthe kinesiology tape, which is valuable adjunct to therapeutic rehabilitations. Kinesio tape is thin and elastic tape that can be extended up to 120 -140% of its original length, this elasticity result in less mechanism constraints. It allows a partial to full range of motion for the applied muscles and joints with different pulling forces to

skin, it can be used both muscles relaxation and to facilitate muscle contraction depending on its application, it associated with improvement of the proprioception, strength, and range of motion of multiple joints. The application of Kinesio tape depends on goals of treatment, include position of the affected area and amount of pre- stretch applied to the tape. Specific cut shapes of Kinesio tape are designed to allow for optimal responses. An "X" strip, "Y" strip and "I" strip all seek various results. Several studies reported the effectiveness of Kinesio tape which reducing spasticity of muscles, enhancing the dynamic activities, and also improving extremity functions and repositioning. This study was to assess the effect of Kinesio tape of improving functional activity for erb's palsy children.

Exercises Program

Physical therapist has work with children with erb's palsy to prevent or reduce joint contraction, to maintain or improve muscle strength, to improve activities to promote movement and play, and increase daily activities to encourage participation—first in the family, then in the community. Treatments may include: Gentle massage technique for affected limb, strengthening exercise, very gentle stretching for affected muscles, Active and active assist exercises, Basic hand skills (such as throwing, picking, grip) Weight bearing exercises. It consisted of moist heat in the form of hot packs for 10 min; Massage -Thumb effleurage and Spiral massage starting from the distal part (hand) to the proximal one (shoulder and periscapular area) for 5 min Range of motion exercises - 1 min for each joint. (Such as Shoulder, Elbow, Wrist –flexion, extension, abduction, adduction, internal and external rotation supination and pronation) Then facilitation of muscle contraction of the affected muscles as rhomboids, deltoid, serratus anterior, elbow flexors, radioulnar supinator and wrist and finger extensors it used in muscle testing, then the proprioceptive stimulation, and righting and equilibrium reactions. The facilitation exercise for each muscle or group of muscles, for 20 times in the form of two sets of 10 repetitions, with giving a 1 min rest in between eachset. Stretching was done for the tight muscles, - which includes subscapularis, pectoralis major, pronators, and wrist-finger flexors. Time of stretching exercise was 20 sec and 20 sec were allowed for relaxation, repeated 3–5 times. The exercise was repeated for each muscle or group of muscle for 20 times in the form of 2 set of 10 repetitions, giving a 1 min rest in between the sets. At the end of the session the stretching was done for the contracted muscles.
Time of stretch was 20 sec and 20 sec allowed for relaxation, repeated 3 to 5 times.

Outcome Measurement Tools

Toronto Active Motion Scale

To understand the reliability of the Active Movement Scale for the evaluation of infants with obstetrical brachial plexus palsy. The Active motion Scale is an VIII-grade. The ordinal scale was developed by the candidate and the head of the Brachial Plexus Clinic at The Hospital for Sick Children (HSC) for the specific purpose of analysing infants with obstetrical brachial plexus palsy. This tool is used to analyse the upper extremity strength by observing spontaneous, active movement both without and against gravity.

Functional Movement Scale

The Brachial Plexus Outcome Measure (BPOM) is a disease specific functional evaluation for children with obstetrical brachial plexus palsy. It has two constituents, which includes Activity Scale and Self-evaluation Scale. The BPOM Activity scale evaluates the key functional movement patterns that are insufficient in the affected limb of a child with obstetrical brachial plexus palsy (OBPP). The child's performance on these items is graded using a five-point ordinal scale according to the ability to accomplish the task, and the quality of movement pattern executed. The BPOM Self-evaluation scale consists of 3 (100 mm) visual Analog scales to evaluate the recognised functions of the arm and hand and the cosmetic appearance of theaffected limb. The BPOM was developed to provide guideline to the therapist with decision making regarding:

a) Secondary reconstructive procedures
b) Remedial rehabilitation interventions and,
c) Recommendations for adaptations and accommodations for activity of daily living

The BPOM was developed on the theoretical framework of the World Health Organization, International classification of function, disability and health (ICF).1 The BPOM is classified within the ICF Activity and Participation domains of functioning. The BPOM measures the function in relation to the activity limitationsof theaffected limb resulting from the physical sequela of nerve injury to the brachial plexus at birth.

2. Materials and Methodology

Study design: A quasi experimental design **Study Setting:** The study setting was conducted in Aditi child development Centre.
Study Population: Erb's palsy children were selected for this study.
Sample Size: 15 subjects were selected in this study
Sampling Method: Conventional sampling method
Study Duration: The study duration was conducted for a period of 6months
Treatment Duration: The treatment duration of this study was conducted for a period of 6 Weeks.

Inclusion Criteria:
6m-2 years old both male and female C5-C6 nerve root injury children

Exclusion Criteria: Children with deformity or stiffness Neuromuscular and musculoskeletal abnormality Children with positive skin test for Kinesio-tape Erb's palsy children. Children underwent surgery.

Outcome measurement tools:

- TORONTO ACTIVE MOTION SCALE: The active motion scale is an eight – grade. This tool is used to analyse the upper extremity strength by observing spontaneous, active movement both without and against gravity.
- BPOM- FUNCTIONAL MOVEMENT SCALE: This scale is used for analysing the functional ability of the affected upper extremity.

- MATERIALS USED: Kinesio-tape, Measuring scales, Activity tools, Pen, Paper, Computer.
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3. Procedure

15 patients of erb's palsy with age group 6m-2 years were selected. We didn't include in this study children with musculoskeletal or neuromuscular abnormalities other than erb's palsy. We have sufficiently informed their parents about the procedure. Before therapeutic tape was conducted, skin sensitivity test was done by applying a square piece of Kinesio tape on the dorsum of the forearm, and kept it for 20min then removed and the skin was observed for the reaction to the tape. The tape was applied for3 days. Repetition of tape application and removal was the period of 6 weeks. During the application of the tape the child received the physical therapy program according to his age and motor development. The exercise program was conducted every day in the centre. And home program was taught to the parents. EXCERCISE PROGRAM: The exercise programs are: Gentle massage technique for affected limb, strengthening exercise, very gentle stretching for affected muscles, Active and active assist exercises, Basic hand skills (such as throwing, picking, grip) Weight bearing exercises and moist heat in the form of hot packs for 10 min; Massage -Thumb effleurage and Spiral massage starting from the distal part (hand) to the proximal one (shoulder and periscapular area) for 5 min Range of motion exercises - 1 min for each joint. (Such as Shoulder, Elbow, Wrist–flexion, extension, abduction, adduction, internal and external rotation supination and pronation) Then facilitation of muscle contraction of the affected muscles as rhomboids, deltoid, serratus anterior, elbow flexors, radioulnar supinator and wrist-finger extensors using the means used in muscle testing, proprioceptive stimulation, and righting and equilibrium reactions. The facilitation exercise was repeated for individual muscle or group of muscles, for 20 times in the form of two sets of 10 repetitions, with giving a 1 min rest in between each set. Stretching exercise was done for the tight muscles, -which is subscapularis, pectoralis major, pronators, and wrist-finger flexors. Time of stretching was done for 20sec and 20sec were allowed for relaxation, repeated the same for 3–5 times.

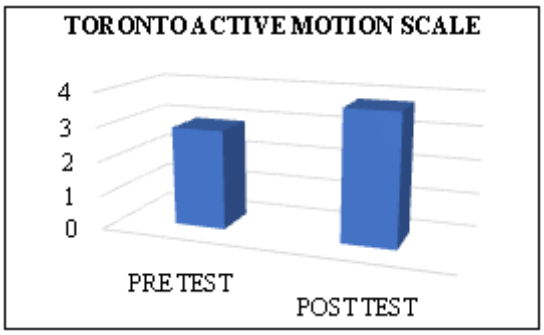
All the exercises were repeated for each muscle or group of muscle for 20 times in the form of 2 set of 10 repetitions, giving a 1 min rest in between the sets. At the end of the session stretching was done for the taut muscles. Time of stretching was done for 20 sec and 20 sec allowed for relaxation, repeated the same 3 to 5 times. The exercise program was conducted every day in the centre. And the patient has monitored the changes during the exercise. A home program was explained for the care giver to be given to the child, in the form of repetition of the exercise 2 times per day, good positioning of the affected limb and advised to dress the child's affected side first then the normal

APPLICATION OF KINESIO TAPE: - Shoulder taping was done using two Kinesio tape in the form of I shape. The tape follows the line of pull of the anterior and posterior deltoid muscle fibres applied in order to assist the deltoid muscle action. The tape was applied with the child in sitting position by assistance from his care giver, while the therapist supported the child's arm. The first tape was initiated from the origin of anterior fibres of the deltoid to the deltoid prominence on the middle of the lateral side of the body of the humerus moving backward and lateral ward while the arm was externally rotated and horizontally abducted The second tape was initiated from the origin of the posterior fibres deltoid towards the humeral deltoid prominence moving forward and lateral ward while the arm was horizontally adducted and internally rotated as if reaching to the outside of the contra lateral hip. Forearm taping was done using one Kinesio tape in the form of I shape. During the application the elbow slightly flexed and the forearm in pronation, the tape was initiated from the anterior surface of the humeral lateral epicondyle, moving in a downward helix manner passing the anterior surface of upper 1/3rdof the ulna, then continuing in the same manner passing the posterior aspect of the middle of the forearm and ending at the distal anterior border of the ulna. Mild stretch was applied to all tapes during application.

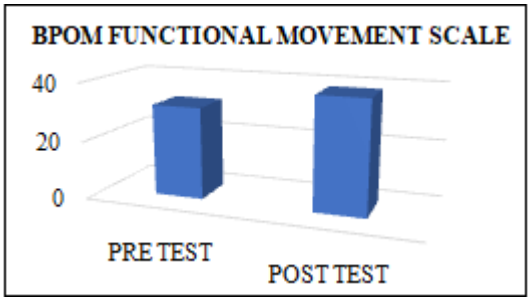
4. Data Analysis and Interpretation

Motion scale and functional movement score before and after treatment. Paired "t" test was performed to analyze the level of significance of the study. The statistical analysis used in this study was paired "t" test. The improvement in the functional activity and participation was measured using activity.

N	Pretest score		Post test score		MD	SD	't' value
	Pre test	Pretest mean	Post test	Post test mean			
15	43.64	2.9	56.8	3.78	0.87	0.28	12



N	Pretest score		Post test score		MD	SD	't' value
	Pre test	Pretest mean	Post test	Post test mean			
15	474	31.6	579	38.5	6.9	1.33	20.07



5. Results

Kinesio Taping is an effective treatment for practitioners treating the paediatric population. Kinesio tape can be used to initiate movement patterns and muscle use, increase stability, and improve alignment and function. Proper execution of technique is essential to obtain the most effective results. Early intervention may comprise physical and occupational therapy, daily passive range of motion exercise, splinting to lessen the severity of biceps/triceps co-contraction. Many times, however, deformations occur that require surgical intervention. The 20 subjects we were selected for this study at the age of 0-2 years, after that some issues of few children they were exclude from this study. Finally, we did this study with 15 subjects. The subjects are both male and female are given the treatment in the period of 6 weeks. Before the treatment the pre-test values of TAMS and BPOM- functional movement scale values were measured. The paired 't' test was used to analyse the pre-test and post-test values of Toronto active motion scale and the functional movement scale values. Based on the statistical analysis, the result of present study shows that there is a significant improvement in functional activity in affected upper extremity of erb's palsy children. The result of this study was concluded the kinesiology tape application along with therapeutic exercises has more effective in improving functional activity in children with erb's palsy.

6. Discussion

Erb's palsy incidence in globally 0.15-5 percent of 1000 live birth. It is the most common type of birth palsy and has the best prognosis for recovery. However, children with upper trunk injury often have residual weakness of shoulder external rotation, and abduction causing difficulty in activities of daily living. In our series of 30 patients with Erb's palsy, Kinesiotaping used as an adjunct to a physical therapy program evidenced a better earlier and smoother recovery to the affected arm than using a therapy program alone. It is not known if the enhanced muscular function noted shortly after application of Kinesiotape would be sustained after a prolonged period by Radwa S. Elkhatib (2012). In our 30 children with Erb's palsy, Kinesiotape was used in addition to selected physical therapy program found to be beneficial therapeutic technique to improve wrist extension range of motion and functional activities than using a therapy program alone. (Kamal-Eldeen-2016) The present study shows that, the statistical analysis of the pre and post test score were calculated in two scales, which are active motion scale and functional movement scale. The both scale data analysis that the mean values of the Toronto active motion scale was 1.2 and standard deviation was 0.41 and $p<0.005$. The mean values of brachial plexus outcome measurement functional activity scale were 6.4 and standard deviation was 1.62 and $p<0.005$. This study showed that there is a significant change in children with their functional activity level. Kinesiology taping application following by exercise program will improve the shoulder abduction and external rotation range and functional gain. Thus, still further scope of this study to analyze the effectiveness of kinesiology taping and exercise program to improve functional activity of these erb's palsy children follow this procedure.

7. Conclusion

Here we concluded in this study was to evaluate the effectiveness of Kinesio taping procedure apply in erb's palsy children along with the exercise therapy program among the age group of 6m-2 years. The effectiveness of Kinesio taping along with exercise program was assessed by pre and post test score and analysis of the data showed that "there is a significant improvement in post test score" which shows increased functional ability of children after Kinesio taping application along with exercise program in erb's palsy children

8. Limitation and Recommendation

- A large sample is required to make the study more Reliable.
- Time bound study.
- Only paediatric age group were selected.
- Only partial erb's palsy children were selected.
- This study was not included a control group.
- Different age group.
- Large size of sample.
- For the more valid result a long-term study may be carried out.

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