Effect of Using Kinesio Tape Over Wrist Extensors Activation in Children with Erb's Palsy

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ABSTRACT

Back ground: Obstetric brachial plexus palsy (OBPP) is a disturbing form of cervical nerve injury that frequently leads to significant physical disability**.** It occurs or delivery as a consequence of pressure or a traction injury on any of the brachial plexus parts. **Purpose:** This study was conducted to determine the efficacy of using Kinesio tape over wrist extensors in children with unilateral Erb's palsy. **Participant and Methods:** Thirty children of both sexes (16 girl and 14 boy) having unilateral Erb's palsy, their ages ranged from one month to one year. They were selected from the out-patient clinic, Faculty of Physical Therapy, Cairo University. The children's percentage of degeneration of radial nerve was evaluated by using Electroneurography technique before and after 3 months of treatment program. The children were classified randomly into two groups of equal number. Group A (control) received a selected physical therapy program, where group B (study) received the same exercise program given to group A, in addition to Kinesio taping to activate wrist and fingers extensors. **Results:.** The results of this study revealed significant improvement in the percentage of degeneration of the radial nerve of the two groups (A and B), when comparing their pre and post-treatment mean values. Significant difference was also recorded when comparing the post-treatment results of the two groups in the favor of the study group.**Conclusion:** It could be concluded that using kinesio taping in conjunction with designed physical therapy program positively ifluence recovery of wrist extesnors activation in infants with OBPP.

key word: Kinesio taping-Erb's balsy-wrist extensors-children.

INTRODUCTION

Brachial plexus (BP) may be injured by a high-energy trauma to the upper limb and neck region particularly the head and neck are moved violently away from the ipsilateral shoulder. Injury can result in partial or complete paralysis of the upper limb, depending on whether all five roots or just the upper or lower roots are affected. The extent of the lesion determine whether the paralysis is temporary or permanent for the individual (Mooncy and Ireson, 2009).

Erb's palsy results from stretching of the fifth and sixth cervical roots. The infant's arm is held in "waiter's tip" position, where the arm is adducted, extended and internally rotated, and the wrist is flexed. When there is an absent Moro reflex in the affected arm, and the affected hand grasp is intact. (Marino et al., 2004).

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 result (Williams,2012).

Study of (Sadeghi and Moghaddam, 2012) reported the effectiveness of Kinesio tape in enhancing the dynamic activities, as well as improving extremity function and repositioning .

Electroneurography is the recording and study of the action potentials of peripheral nerve and it can be considred to be the most accurate diagnostic and prognostic test because it provides an objective qualitative measurement of neural degeneration (Daube and Rubin, 2009).

A very useful physiotherapeutic modality if applied properly is the kinesiology tape, which is a valuable adjunct to therapeutic rehabilitation (Chen et al., 2008).

Kinesiotape stimulates and strengthens the weak muscles, reduces muscle fatigue by providing support, and provides proprioceptive input to assist with awareness. Additionally, kinesiotape may encourage functional improvement by allowing the child to move in an optimally aligned position (Kase et al., 2006).

(Kamal-Eldeen et al.;2016) had studied the wrist extensors mucle strength after kinesio tapping lack objective method of evaluation thus our current study aimed to investigation the influence of kinesio taping on wrist extensors muscles strength in Erb's palsy using an objective method and so improve affected hand function

MATERIALS AND METHODS

The research design of this study was prospective assigned randomized control study design. Ethical committee approval was obtained from the institutional review board at Faculty of Physical Therapy, Cairo University before study commencement (No. P.T. REC/012/001863). Informed written consent was signed from each parent after explaining the nature and purpose of the study.

Participants:

Thirty children with Erb's Palsy participated in this study. Subjects were assigned randomly into two groups of equal number, fifteen children in each group, the control group received a selected physical therapy program; and the study group received the same selected physical therapy program plus Kinesio taping over the affected hand, wrist and fingers extensors.

Inclusive criteria Were : their ages ranged from one month to one year, and they were diagnosed as unilateral obstetric brachial plexus injury C 5-6.

Exclusive criteria: children with deformity or stiffness of shoulder,elbow,wrist or fingers joints,neuromuscular and muscloskeletal abonormalities other than Erb's Palsy as Klumpke's palsy and children with positive sensitivity for Kinesio Tape.

The sample was divided randomly into two groups of equal number (15 children each), group (A) and group (B).

Venue: Selection of patients, evaluation and treatment were conducted
at the outpatient clinic, Faculty of physical therapy, Cairo University from 7 march 2019 till 7 june 2019.

Group (A) control:

Received the designed physical therapy program for the treatment of Erb's Palsy for three months

Group (B) study:

Received the same physical therapy program designed for the control

group in addition to application of Kinesio taping over the affected hand, wrist and fingers extensors for three months.

Measurement procedure:

Percentage of degeneration was conducted for the radial nerve of both sides by using Electroneurography technique and it was calculated as the amplitude of the affected side in relation to the non-affected side.

The percentage of degenerated fibers is calculated arithmetically, as follows:

Percentage of degenerated fibers

$$= 100 - \left(\frac{\text{Amplituede of evoked response (in μV) Affected side}}{\text{Amplituede of evoked response (in μV) Normal side}} \times 100\right)$$

for both groups before andafter 3 monthes.

1- Preparation of the equipment:

The apparatus was checked for any damage to any of its parts, unattached or torn electrical wire, or any sign of dampness due to liquid spillage.

2-Preparing the child for recording :

The stimulating and the recording sites were cleaned by rubbing the skin with alcohol. The procedure was repeated until the skin becomes slightly red to ensure the removal of degenerated cells and lowering the skin resistance.

3-Position of the child during electrode placement and recording:

The child was placed comfortably in a supine position on the examination table. His head was maintained in mid position to avoid the influence of primitive reflexes, as it could alter tone distribution in the child's body.

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The software was started and reset to zero

The patient's data were entered in his /her file on the computer.

Electrodes placement:(surface electrodes)

The stimulating electrode was placed at the Erb's point.

The recording electrodes

Earth electrode (ground) was connected to the upper back of the child over the upper dorsal spine and fixed by plaster.

Active (negative) electrode was placed at the extensor indicis muscle on the normal and the affected arm Figure (1).

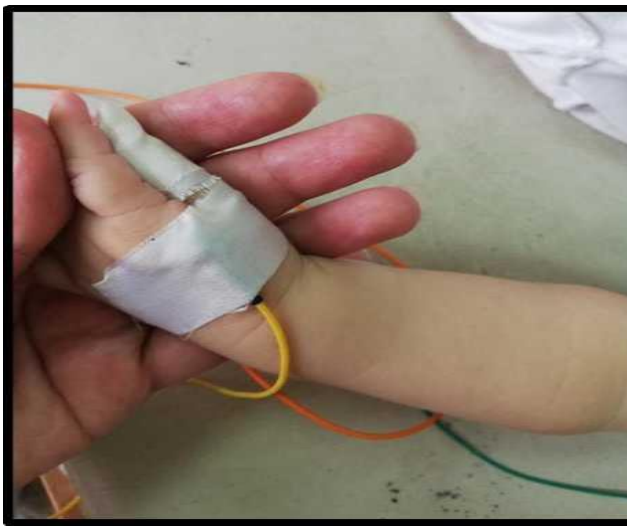

Figure (1):active electrode on extensor indicis

a) Indifferent (positive) electrode was placed at 8 cm apart distal from the negative electrode

Treatment procedures:

Physical Therapy Treatment Program according to **(Abdelhamed, 2016).**

Children in both groups received the following designed physiotherapy treatment for 45 minute applied every other day for 3 months:

- Massage (thumb effleurage and spiral massage) from the distal part (hand) to the proximal part (shoulder) for 5 minutes.

- Passive range of motion conducted for 1 minute for each joint

- Facilitation of muscle contraction of affected muscles (rhomboids, deltoid, serratus anterior, elbow flexors, radio-ulnar supinators and wrist extensors) using Exceoreceptor stimulation by brushing, brief icing, scratch and proprioceptors stimulation by taping, approximation, quick stretch used for muscle strengthening for about 20 minutes.

- Very gentle stretch for subscapularis, pronator and wrist flexor. Time of stretch 20 seconds and 20 seconds for relaxation, repeated 3-5 times.

Graduated active exercise (active assisted active free, active resisted), - Facilitation of basic hand skills (reaching, grasping, release and bilateral hand use) for 5 minutes.

- Weight bearing exercise from prone on hand, side setting for 5 minutes.

- At the end of the session, a home program was explained for the caregiver to be used with the child at home in the form of :

• Repetition of the exercises, 2 times per day **(Abdelhamed, 2016).**

• Good positioning of the affected

limb by fastening the sleeve of the affected arm to the clothes covers the same shoulder.

• Instructions to dress the child's affected side first then the normal side and undress the normal side first then the affected side **Ruchelsman DE et al., (2009)**

Kinesio Tape Application:

Test for sesnstivity : before therapeutic taping was initiated, skin sensitivity test was performed through applying a piece of kinesio tape range from 2.5 - 5 cm on the dorsum of forearm for 48 h then removed and the skin was observed for a reaction to the tape such as hyperemia or small spots, when such reactions were detected the child was excluded from the study.

Applying technique: the tap was applied for 3-5 days,then removed for 24 hours to allow skin perspiration and then was reapplied again..

Repetition of the tape application and removal was continued for the whole 3 months period.

Taping technique was in the form of:

Firstly, the skin over the area of tapping application was cleaned by organic solvent (Alcohol pads) before tape application.

We started with measuring the length from common extensor origin to radial styloid process then a piece of tape equal to this length for each child was taken.

With the forearm in pronation and wrist in slight flexion, tape was applied from the common extensor origin up to the metacarpophalangeal joints, figure (2)

Another piece of tape was applied from the common extensor origin to metacarpophalangeal of thumb to form Y shape with other tape.

Figure (2): Kinesio Tape application

RESULTS

Data Analysis

For statistical analysis; SPSS for windows, version 22 (SPSS, Inc., Chicago, IL) was used. The differences between groups mean values had been evaluated by using t test as following

-Comparing mean values of pre and post treatment within the same group was done by paired t-test.

-Comparing mean values of each variable between the two groups was done by unpaired t-test.

Patients Demographic data: As observed in table (1) the mean ± SD age of the control group was 7.33 ± 3.13 months, with maximum value of 12 months and minimum value of 1 month. The mean ± SD age of the study group was 7.26 ± 2.86 months, with maximum value of 12 months and minimum value of 1 month. There was no significant difference between both groups in the age mean values (p = 0.95). There was also no significant difference between the two groups in sex distribution (p = 0.46). table (2)

The mean ± SD percent of degeneration post treatment of the control group was 42.6 ± 5.4% and that of the study group was 25.73 ± 3.65%. The mean difference between both groups was 16.87%. There was a significant decrease in the percent of degeneration of the study group post treatment compared with that of the control group (p = 0.0001).as in table(3)

Table 1. Comparison of the age in monthes mean values between the control and study and groups.

Age (months)	Control group	Study group
$\overline{X}$ ± SD	7.33 ± 3.13	7.26 ± 2.86
Maximum	12	12
Minimum	1	1
MD	0.07	
t-value	0.06	
p-value	0.95	
Significance	NS	

$\overline{X}$: Mean MD : Mean difference p value : Probability value

SD : Standard deviation t value : Unpaired t value NS : Non significant

Table 2. The frequency distribution and for comparison sex distribution between the control and study groups.

	Control group	Study group	p-value	Sig
Girls	9 (60%)	7 (47%)	0.46	NS
Boys	6 (40%)	8 (53%)		

p value: Probability value NS: Non significant

Table 3. Comparison of post treatment mean values of percent of degeneration between the control and study group.

	Control group	Study group	MD	t- value	p-value	Sig
	$\overline{X}$ ±SD	$\overline{X}$ ±SD				
Percent of degeneration (%)	42.6 ± 5.4	25.73 ± 3.65	16.87	10	0.0001	S

$\overline{X}$: Mean MD : Mean difference p value : Probability value

SD : Standard deviation t value : Unpaired t value S : Significant

DISCUSSION

The current study included Erb's pasly type of brachial plexus injury that constitutes a major and most common birth related injury as reported by Foad et al..,(2008). Who stated that the classic Erb's palsy is an injury that involves the C5 and C6 nerve root levels and is the most common injury pattern, accounting for approximately 60% of cases.

The choice of infancy age is based on the fact that the early intervention and therapy is medically necessary to maintain joint motion , prevent the development of contractures and muscle tightness when further neurological recovery is anticipated. (Grisham and Denning, 2011)

Objective Electroneurographic help to determine the location (root and/or plexus) of injury, extent and severity of the brachial plexus injury. (Alexender and Matthews 2010)

It comes in agreement with Kamal-Eldeen et al.; (2016) who studied the effect of kinesio wrist taping in the treatment of Erb's palsy. The study was conducted on thirty children of both sexes having unilateral Erb's palsy for 2 weeks, their ages ranged from one month to 3years. From the mentionedit was concluded that using Kinesio tape in addition to selected physical therapy program is beneficial therapeutic technique to improve active wrist extension and functional activities in children with Erb's palsy.

The obtained results may be attributed to the correction of movement pattern this comes in agreement with Neumann, (2018), who stated that the kinesio taping method is felt to cause physiological effects include the circulatory, lymphatic, neural, muscular, and facial systems, as well as the joints. Kinesio taping is currently being used by therapists to change muscle tone, move lymphatic fluids, and improve posture.

The result of our study and previous literature could be attributed to the mrthod of application of kinesio tapping from origin to insertion as it assist muscle contraction , thus facilitating and improving strength. This was supported by McGee, (2010). Also Hashim, (2016) confirmed that the basic principles of therapeutic taping for weakened muscle, starting from where the muscle originates, continuing along the muscle, and finishing at muscle insertion. That result in a concentric pull on fascia during contraction. This has the effect of enhancing the muscle contraction.

The result of the study confirmed by Kase et al.,(2006) who approved that Kinesiotape used for facilitation of muscle contraction depending on application and provides proprioceptive input to assist with awareness. Additionally, Kinesiotape may encourage functional improvement by allowing the child to move in an optimally aligned position.

Also our result comes in agreement with Miller and Othmotherly, (2007) who stated that the kinesio taping Method gives the practitioner the opportunity to actually give support while maintaining full range of motion, enabling the individual to participate in physical activity with functional assistance. Kinesio taping can be used

in conjunction with other therapies, including cryotherapy, hydrotherapy, massage and electrical stimulation.

The kineso Tap application also supported by Paige, (2016) who stated that the kinesio taping method allows the individual to receive the therapeutic benefits 24 hours a day. It was designed to be the approximate thickness and elasticity of skin and can be worn three to five days at a time.

This explanation supported by Cools et al., (2019) who stated that the basic rationale for taping is to provide protection and support for a joint while permitting optimal functional movement. Most authors agree that the effect of tape can only partially be explained by increased mechanical stability , however, taping may have some proprioceptive influences. Proprioceptive influences, such as continuous stimulation due to tape application enhanced awareness of shoulder girdle and upper trunk position.

On the other hand some studies contradict the post- treatment results of kinesio taping on Erb's palsy as Katie et al., (2008) 16 who assessed muscle strength of the subjects under three conditions (1st) without taping, (2nd) immediately after taping, (3rd) 12h after taping with the tape remaining in situation. The result revealed no significant difference in muscle power among the three conditions. This could be attributed to the short duration of intervention in the above mentioned study. .

So in summary, it can be noticed that application of kinesio tape with designed physical therapy program is more beneficial than using physiotherapy program alone.

CONCLUSION

The obtained results of this study supported by the relevant literature reveal a strong argument for the introduction of kinesio taping over wrist extensors in Erb's palsy into the designed physical therapy program, to be used in conjunction with the traditional physical therapy modalities.

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