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ORIGINAL ARTICLE

THE EFFECT OF KINESIOTAPING IN IMPROVING PAIN, SHOULDER DISABILITY AND FORWARD HEAD POSTURE IN PATIENT'S WITH SHOULDER IMPINGEMENT SYNDROME

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ABSTRACT

Background: Shoulder impingement syndrome is the common condition of the shoulder which results in considerable morbidity and financial cost in the healthcare industry. Pain, reduced strength and disability are the main problems seen in SIS. Few studies are available for treating patients with SIS using kinesio taping in general population. Most similar studies were conducted on specific population. Hence a need arise to rule out the usefulness of addition of kinesio taping to conventional exercise for SIS patients with forward head posture. **Objectives:** To find out the effect of kinesio taping in improving pain, disability and forward head posture in patients with SIS. **Methods:** 30 subjects were recruited in this study after obtaining an informed consent and divided into two groups; Group (A) (Experimental) and Group(B) (Control). Group A underwent kinesio taping, conventional exercise and Group B underwent conventional exercises. Interventions were conducted over 1 week, KT application 2 times/week and conventional exercise 3 times daily. All subjects were assessed for pain, disability and forward head posture using VAS, DASH questionnaire and CVA using Kinovea software before and after intervention period. **Result:** There is significance difference between pain, disability and forward head posture after the application of kinesio taping in patients with SIS. Analysis was done using Wilcoxon signed rank test and Mann Whitney U test. **Conclusion:** This study concluded that kinesio taping is effective for improving pain, disability and forward head posture in patients with SIS.

Keywords: Disability, Forward head posture, Kinesio tape, Kinovea software, Subacromial impingement.

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INTRODUCTION

Shoulder impingement syndrome (SIS) is one of the important causes of shoulder pain and disability[1,2]. Previous authors stated the lifetime prevalence of shoulder impingement syndrome ranged from 7% to 36% of the population[3,4]. SIS is associated with repetitive use of shoulder and occured by compression of structures between humerus and coracoacromial arc during overhead activities or elevation of arm. This condition leads decreases in strength of the muscle and shoulder range of motion(ROM) which adversely affect the patient's quality of life[5].

Abnormal alignment of the spine leads to abnormal scapular kinematics and abnormal function of shoulder girdle[6, 7, 8 ,9]. Patients with subacromial impingement syndrome present with abnormalities in the posture including rounded posture of shoulders, increase in the kyphosis of thorax, a forward head posture[10,11,12].

Structural and functional factors reducing the subacromial space may lead to SIS[13]. Subacromial impingement occur due to various factors, such as overuse, anatomic factors, and glenohumeral joint instability and altered scapular kinematics[14,15]. Changes in the scapulothoracic kinematics also play a role in the development of SIS and are often considered in the management and rehabilitation of this condition[7,8,9]. Factors that leads to SIS are inflammation of the tendon and bursae, weak or dysfunctional rotator cuff musculature, weak or dysfunctional scapular musculature, degeneration of the tendon, posterior glenohumeral capsule tightness, postural dysfunctions of the spinal column and scapula, bony or soft tissue abnormalities of the borders of the subacromial outlet [16],change in the shape of acromion process, forward head posture, rounded shoulder, increased thoracic kyphosis, trunk inclination to the symptomatic side, abnormal scapular motions include decreased scapular posterior tipping, increased internal rotation and decreased upward rotation[17].

The symptoms in patients with subacromial impingement was a dull pain in front of the shoulder and having nocturnal pain. In most of the patients, the pain was referred to the front of the upper arm and in some patients it extended to the fore arm[18]. They also complain of pain during abduction of the arm from 70-120 degrees[19]. Pain was aggravated by forward flexion and internal rotation of the shoulder. In contrast to the common type of impingement, forward flexion was often painful between 80-130 degrees rather than doing full flexion. In addition to the dull aching pain, these patients also complained of reduced movements, especially abduction and medial rotation. Medial rotation combined with 90^0 of abduction was restricted and painful and sometimes pain radiating to upper arm and forearm[18].

Recently taping is used as a therapeutic method to control scapular movement in patients with shoulder conditions[20]. Kinesio taping is commonly used in the sports rehabilitation and also clinical rehabilitation for both treatment and prevention of disorders affecting musculoskeleton. The tape is to provide support during movement and prevent further injury[21]. Taping works by providing alignment correction during movements or by providing proprioceptive feedback[22,23]. Nowadays, there has been greatest interest in the use of kinesiological taping (KT) in order to

provide control of scapula and postural correction[24]. KT have the properties similar to that of human skin and can be applied to any muscle or joint in the body. Some investigators suggested that taping effectively improved the postural alignment, reduced pain, increased the shoulder ROM, and discomfort of the glenohumeral joint[26-30]. However, some other studies did not support the use of KT for reducing pain or disability in patients with shoulder impingement syndrome[25]. This difference in results may be due to the difference in the method, design or procedure applied. The subjects in the similar studies were those in certain specified population with SIS[27,28,30]. Most previous studies used Kinesio tape only to one muscle that involved in SIS. Most of the previous studies use KT only for analyzing its effect on muscles and did not use KT for mechanical correction of glenohumeral joint, which cause increase in subacromial space[28].

Research question: Is there any effectiveness of kinesio tape on pain, disability and forward head posture in patients with shoulder impingement syndrome.

Aim of the study: The aim of the study was to find out the effect of kinesio taping in improving pain, shoulder disability and forward head posture in patients with shoulder impingement syndrome.

Objectives: To find out the effect of the kinesio taping in improving pain, disability and forward head posture in patients with Shoulder impingement syndrome using Visual Analogue Scale, Disability of Arm, Shoulder and Hand Questionnaire and Craniovertebral angle using Kinovea software.

Null hypothesis: There will be no significant difference in pain intensity, and shoulder disability and forward head posture after the application of Kinesio tape in subacromial impingement syndrome.

Alternative hypothesis: There will be significant difference in pain intensity, shoulder disability and forward head posture after the application of Kinesio tape in subacromial impingement syndrome.

METHODOLOGY

Study design: Pre v/s post test experimental study design.

Study setting: Hospitals and physiotherapy Clinics in and around Thiruvananthapuram and Bethany Navajeevan Physiotherapy Clinic, Nalanchira, Thiruvananthapuram.

Sample size: 30 samples of the population who satisfied the inclusion and exclusion criteria were selected.

Inclusion criteria: Age between 25 - 45 yrs, Patients with forward head posture greater than 45^0, Confirmed orthopedic diagnosis of Shoulder impingement syndrome with presence of signs and symptoms, Proximal anterior or lateral shoulder pain that continued for more than 1week during last 2months, A painful arc sign during active shoulder abduction of 45 to 120 degrees, Tenderness on rotator cuff tendon, Pain with resisted isometric shoulder abduction, (Jobe's test. Neer's test. Hawkins Kennedy test) any 2 positive test.

Exclusion criteria: Shoulder dislocation, Shoulder fracture, Traumatic injuries of

shoulder, Upper limb Surgery within last 6 months, Reproduction of cervical symptoms during cervical screening examination, rupture of rotator cuff, Periarthritis of shoulder, Infectious skin disease in the shoulder and upper back region, Intra-articular steroid injection to shoulder joint within 3 months, Acromio-clavicular sprain, Neuromuscular disorders in upper extremities, Use of corticosteroids and/or NSAID therapy within 10 days before the first day of treatment, Malignancy.

Study duration: The study was conducted over a period of 9 months.

Sampling: purposive sampling method used in this study.

Outcome measures: Visual Analogue Scale, Disability of Arm, Shoulder and Hand Questionnaire, Craniovertebral angle using Kinovea software.

Statistical analysis: Wilcoxon signed rank test and Mann Whitney U test.

Procedure: Based on the inclusion and exclusion criteria 30 subjects with SIS were included in the study. They were divided equally in to two groups, group A (Kinesio taping) group B (conventional). Once the permission has been obtained from the subjects, they were explained about the study and the procedure and written concern was taken. Following this subjective assessment of the patient was done which includes name, age, gender, chief complaints, duration of the condition and history of the patient. After the patient's subjective and objective assessment was taken, he or she were assessed for pre test.

Pre–test includes 3 components: Pain, Disability, Forward head angle.

Kineio taping (experimental group):

The patients in the experimental group were treated with standardized therapeutic kinesio tape. The patient is in sitting position. The 1st strip is a Y strip. It is applied from insertion of supraspinatus muscle to its origin. This strip is applied with paper off tension to the muscle. That means applying the tape directly to the skin as it comes off the paper backing. Y-strip is a piece of tape in which a portion of it is cut down from the middle to produce 2 tails or portions. While applying the tape the patient is in a position combining the arm reaching behind the back as if reaching into the contralateral backside pocket and opposite side bending of the neck.

The next strip (2nd) is a Y strip applied to the deltoid muscle, from insertion of deltoid to its origin. The 2nd strip is applied with one tail to the deltoid with arm horizontally abducted and laterally rotated and another tail with arm horizontally adducted and medially rotated with paper off tension.

The next strip (3rd) is I strip which is applied from the coracoid process of scapula to the posterior deltoid muscle. This strip is applied with 50% to 75% stretch and an inferiorly directed pressure applied to the tape for mechanical correction. While applying the 3rd strip, the arm was laterally rotated at the side and moved to shoulder flexion and slight horizontal adduction.

The 4th strip was applied bilaterally from the 1st to the 12th thoracic vertebra while the subject is in a neutral position. Then, the subjects were asked to retract and depress the scapulae.

Another tape was applied diagonally from the middle of the scapular spine to the 12th thoracic vertebrae bilaterally.

Figure 1: patient receiving kinesio taping

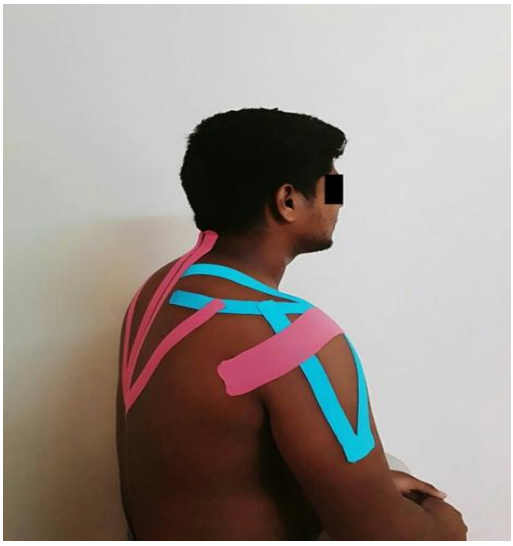

Figure 2: patient receiving kinesio taping

Participants were instructed to come to the clinic for 1 week. Kinesio tape is applied on the first day and instructed to maintain the tape as applied for 3 days. Conventional exercise was given on the remaining days. The tape can be removed at the 4th day morning, the investigator inspected the subjects' skin for any changes. Participants were then taped with the same method and instructed to wear the tape for two 2 more days. The 2nd tape application can be removed on the 7th day morning. Then the subjects must underwent the final evaluation[31,32].

Conventional exercise

Stretching exercise:

Anterior shoulder corner stretch: Patient position - standing in a door way. Procedure - place hand at shoulder level on each side of the door or in a corner of a room. Lean forward into the door and hold for 30 seconds with 10 second rest, repeat 3 times.

Posterior shoulder cross body stretch: Patient position: standing or sitting. Procedure: bring the involved arm across in front of the body. Hold the elbow with the other arm. Flex the bent arm, which pull the other arm across the chest. It must be continued until a stretch is felt in the back of the shoulder and hold for 30 seconds with 10 second rest, repeat 3 times.

Mobilization

Glenohumeral posterior glide: Patient position: supine with the arm in resting position. Therapist position: stand with therapist's back to the patient, between the patient's trunk and arm. Procedure: support the arm against therapist's trunk, grasping the distal humerus with therapist's lateral hand. Place the lateral border of your top hand just distal to the anterior margin of the joint, with therapist's finger pointing superiorly. This hand gives the mobilizing force. Glide the humeral head posteriorly by moving the entire arm as therapist bend his knees.

Glenohumeral inferior glide: Patient position: supine, with arm in the resting position. Support the forearm of the patient between

therapist's trunk and elbow. Procedure: Place therapist's one hand in the patient's axilla to provide a grade 1 distraction. The web space of therapist's other hand is placed just distal to the acromion process. With the superiorly placed hand, glide the humerus in an inferior direction.

Flexibility exercise

Codman's pendular exercise:
Procedure: Patient stand beside a table with the hand of unaffected shoulder on the table and feet slightly wider than shoulder-width apart and bend at the hips so that affected arm hang down toward the floor. Then letting the arm swing freely, side to side and front to back. Once the patient feel comfortable with these movements, move his/her body so that patient's arm swings in a circle, being careful not to use patient's shoulder muscles to create movement. Initially the circle should be small and increase the circle gradually. Continue for 30 seconds. Each day, increase the time until the patient can do 3 to 5 minutes. Repeat 5 times per day.

Rotator cuff strengthening exercise

Isometric internal rotation:
Procedure: patient stand in a doorway, facing the frame. Keep the patients elbow at the side and place the hand on the door frame. Press the hand against the door frame. Hold for 5-10 seconds, 3 sets of 10 repetitions.

Isometric external rotation: Procedure: Patient stands sideways near a wall, with the affected shoulder closest to the wall. Patient place his dorsal aspect of hand on the wall with elbow at his side and press outside. Hold for 5-10 seconds, 3 sets of 10 repetitions.

Isometric abduction: Procedure: Patient stands side on to a wall. Place the dorsal aspect of upper extremity in the wall and push the arm out to the side against the wall. Hold for 5-10 seconds, 3 sets of 10 repetitions.

Scapular stabilization exercise

Shoulder Blade Shrug: Procedure: Patient Stand keeping his/her back and neck straight. Keep the arms laterally and a slight distance away from the body with the palms facing forwards. Start lifting the shoulder blades gently towards the ear ensuring that, do not feel any pain during the exercise. Hold yourself in this position for 5-10 seconds, 3 sets of 10 repetitions. Completely squeezed and elbow should not be bent with you leaning slightly towards the wall. Gradually change position by relaxing the shoulder blades (by lengthening your arms). Hold yourself in this position for 5-10 seconds, 3 sets of 10 repetitions.

Seated press–ups: Procedure: Patient sitting in a chair with feet firmly planted on the floor, place the hands on the arm rest of the chair and press down, raising the body off the chair. Hold yourself in this position for 5-10 seconds, 3 sets of 10 repetitions[33,34].

Chin tucking exercise: Patient position: Sitting position. Procedure: Patient tuck his/ her chin and pull the head back. Hold yourself in this position for 5-10 seconds, 3 sets of 10 repetitions.

Post-test: Post-test again include 3 components: Pain, Disability and Forward head angle. These components are similar to that of pre-test.
Hence the procedure will also be the same as mentioned in pre-test. After the treatment of 1week, the final results are recorded.

RESULT

Outcome	Training group		N	Mean	Standard deviation	Z	P
VAS	Group A	Pre test	15	7.33	1.345	-3.443	0.001
		Post test	15	2.13	0.640		
	Group B	Pre test	15	7.33	1.454	-3.573	0.000
		Post test	15	3.73	1.335		
DASH	Group A	Pre test	15	41.1920	9.86469	-3.409	0.001
		Post test	15	15.4067	6.23482		
	Group B	Pre test	15	35.3053	9.33911	-3.409	0.001
		Post test	15	24.5560	8.79250		
CVA	Group A	Pre test	15	50	3.024	-3.41	0.001
		Post test	15	39.80	3.783		
	Group B	Pre test	15	49.53	2.825	-3.438	0.001
		Post test	15	44.60	2.798		

Table 1: Pre Test Vs Post test scores In Group A And Group B

0utcome	Training group	N	Mean rank	Sum of ranks	U	significance
VAS	Group A	15	10.53	158.00	38.000	0.001
	Group B	15	20.47	307.00		
DASH	Group A	15	10.73	161.00	41.000	0.003
	Group B	15	20.27	304.00		
CVA	Group A	15	10.37	155.50	35.500	0.001
	Group B	15	20.63	309.50		

Table 2 : Comparison between post test values

The pre-test and post-test mean value table (table 1) shows that both group has significant improvement. Table 2 shows comparison between posttest values of VAS, DASH and CVA. Although improvement was seen in both groups. Group A subjects demonstrate more changes in pain, disability and forward head posture than group B subjects.

DISCUSSION

The purpose of this study was to examine the usefulness of the addition of kinesio taping to conventional exercise program for SIS patients in the age group of 25-40 years with forward head posture in improving pain, disability and forward head posture.

30 subjects fulfilling the inclusion criteria were included in the study, and they were divided into 2 groups ie; Group A and Group B with 15 subjects each. Each subject were well explained about the procedure of the intervention. A written informed consent from each subject was obtained. Group A received kinesio taping and conventional exercise. Group B received only conventional exercise. All subjects were well tolerated to the interventions given and no one was dropped out of the study.

Visual Analogue Scale was used to measure the pain. Disability of Arm, Shoulder and Hand questionnaire was used to measure disability and Cranio Vertebral Angle using photographic method was used to measure forward head angle. All the 3 outcome measure datas were collected before and after the intervention protocol in Group A and Group B. In both groups Wilcoxon test was used to compare pre and post test values. The post test scores of both groups were analysed using Mann Whitney U test. The result showed that after 1

week of kinesio taping, there was improvement in pain, disability and forward head posture in Group A and Group B. But greater improvement was seen in experimental group (Group A) compare to control group (Group B) in pain, disability and forward head posture.

Reliability and concurrent validity of VAS was studied by Bjiur et al; in 2001 and the study result suggests that reliability of VAS for acute pain measurement as assessed by the ICC appears to be high. The data suggests that the VAS is sufficiently reliable to be used to assess acute pain.

Based on the statistical analysis in experimental group (Group A), the pretest mean value with standard deviation of VAS was 7.33±1.345 with minimum value of 5 and maximum value of 9 and the posttest mean value with standard deviation of VAS was 2.13±.640 with minimum value of 1 and maximum value of 3, the mean difference was 5.2, z value was -3.443 and p value was 0.001. The result of the study shows that there is statistically significance difference between pretest and posttest values of VAS in experimental group. Based on the statistical analysis in control group (Group B), the pretest mean value with standard deviation of VAS was 7.33±1.454 with minimum value of 5 and maximum value of 5 and the posttest mean value with standard deviation of VAS was 3.73±1.335 with minimum value of 2 and maximum value of 6, the mean difference was 3.6, z value was -3.573 and p value was 0.000.

The result of the study shows that there is statistically significance difference between pretest and posttest values of VAS in control. Based on the statistical analysis, the mean rank for Group A was 10.53 and for Group B were 20.47. The sum of rank for group A was158 and for group B was 307, Mann Whitney U value was 38, the P value was 0.001. The result of the study shows that there is a statistically significant difference between the post test mean rank of VAS in Group A and Group B. The post test mean rank of VAS shows that Experimental Group (Group A) shows significant improvement in functional disability than Control Group (Group B).

A study conducted by Hassan Shakeri on 'clinical effectiveness of kinesiological taping on pain and pain free shoulder range of motion in patients with shoulder impingement syndrome' found that kinesio taping produces an immediate improvement in the pain intensity at movements and nocturnal pain in patients with shoulder impingement syndrome. They used VAS (visual analogue scale) as the outcome measure.

Reliability and validity of DASH questionnaire in patients with shoulder impingement syndrome was studied by Benjamin Haldorsen et al in 2014 and the study result states that DASH is a reliable and valid outcome measure for patients with shoulder impingement syndrome.

Based on the statistical analysis in experimental group (Group A), the pretest mean value with standard deviation of DASH was 41.1920±9.86469 with minimum value of 29.16 and maximum value of 58.33 and the posttest mean value with standard deviation of DASH was 15.4067±6.23482with minimum value of 8.33 and maximum value of 26.83, the mean difference was 25.7853, z value was -3.409 and p value was 0.001. The result of the study shows that there is statistically significance difference between pretest and posttest values of DASH in experimental group. Based on the statistical analysis in control group (Group B),

the pretest mean value with standard deviation of DASH was 35. 3053±9.33911with minimum value of 21.66 and maximum value of 56.66 and the posttest mean value with standard deviation of DASH was 24.5560±8.79250 with minimum value of 13.33 and maximum value of 44.16, the mean difference was 10.7493, z value was 3.409 and p value was 0.001. The result of the study shows that there is statistically significance difference between pretest and posttest values of DASH in the control group. Based on the statistical analysis, the mean rank for Group A was 10.73 and for Group B were 20.27. The sum of rank for group A was161 and for group B was 304, Mann Whitney U value was 41, the P value was .003. The result of the study shows that there is a statistically significant difference between the post test mean rank of DASH in Group A and Group B. The post test mean rank of DASH shows that Experimental Group (Group A) shows significant improvement in functional disability than Control Group (Group B).

A study conducted by Hassan shakeri on 'A randomized clinical trial of Kinesio- taping on DASH in patients with subacromial impingement syndrome' states that 1 week usage of kinesio taping is effective in the treatment of subacromial impingement syndrome. In this study they measured the disability of the patient using DASH (Disability of Arm, Shoulder and Hand) questionnaire.

A study conducted by Shereen H Elwardany et al on 2015 on "reliability of kinovea computer program in measuring cervical range of motion in sagittal plane. The study result states that the kinovea software programe were reliable on both intra rater and inter rater reliability in measuring cervical range of motion in sagittal plane.

Based on the statistical analysis in experimental group (Group B), the pretest mean value with standard deviation of CVA was 50±3.024 with minimum value of 46 and maximum value of 56 and the posttest mean value with standard deviation of CVA was 39.80±3.783 with minimum value of 32 and maximum value of 45, the mean difference was 10.2, z value was -3.41 and p value was 0.001. The result of the study shows that there is statistically significance difference between pretest and posttest values of CVA in experimental group. Based on the statistical analysis in control group (Group B), the pretest mean value with standard deviation of CVA was 49.53±92.825with minimum value of 46 and maximum value of 55 and the posttest mean value with standard deviation of CVA was 44.60±2.798 with minimum value of 41 and maximum value of 50, the mean difference was 4.93, z value was -3,438 and p value was 0.001. The result of the study shows that there is statistically significance difference between pretest and posttest values of CVA in control group. Based on the statistical analysis, the mean rank for Group A was 10.73 and for Group B were 20.63. The sum of rank for group A was155.50 and for group B was 309.50, Mann Whitney U value was 35.50, the P value was 0.001. The result of the study shows that there is a statistically significant difference between the post test mean rank of CVA in Group A and Group B. The post test mean rank of CVA shows that Experimental Group (Group A) shows significant improvement in functional disability than Control Group (Group B).

Study conducted by Eman A Embaby et al on 'rigid tape versus kinesio tape on scapular upward rotation and forward head angle in subacromial impingement syndrome in 2016 states that both taping materials with postural

correction are beneficial in increasing scapular upward rotation and FHA in SIS patients. They used kinovea software for measuring forward head angle in sagittal plane.

Positive result were obtained in another study conducted by Mark D.Thelen on 'the clinical efficacy of kinesio taping for shoulder pain' where a 1 week program was carried out using kinesio tape in the frequency of twice application of kinesio tape weekly in 26 participants who had SIS. They postulated that kinesio tape may assist clinicians to obtain - immediate improvement in pain free range of motion and appears more efficacious than sham taping at decreasing shoulder pain intensity or disability.

The intervention used in this study is kinesio taping. Kinesio taping may promote mechanical correction of joints, proprioceptive feedback, and improvement muscle function by recruiting motor units. The taping techniques that were applied in this study were aimed to provide facilitation of the paraspinal muscles and lower trapezius, inhibition of the deltoid and supraspinatus muscles, and mechanical correction that affecting the subacromial space and forward head posture. After kinesio taping there is significant difference in intensity of pain between 2 groups and the gate control theory is one probable explanation for this difference. Kinesio taping cause enhancement in afferent feedback and this stimulus the large-diameter nerve fibers and reduce the nociception received from the small-diameter nerve fibers. Range of motion improvement may be due to an increase in the proprioceptive feedback from supraspinatus muscle in which there is increase in the number of motor units recruited to perform the activity. The effect of KT may be due to lymphatic or space correction. Kinesio taping used in this study, aimed at improving scapular stabilization during shoulder elevation motion as well as increasing the subacromial space. This increase in the space will lead to decrease in pain intensity during movements of the shoulder.

Major treatment focus of kinesio taping is the correction of positional fault and pain reduction. Kinesio taping technique is effective in reducing pain, disability and forward head posture in shoulder impingement sundrome patients. Kinesio taping is more effective when compared with conventional exercise in SIS patients.

The major limitation of the study are small sample size, both genders were included; incidence and progression may vary in different gender, blinding of therapist was not done and long term effect of kinesio tape was not considered. Further recommendations should be, the study shall conduct on a large population and gender specification should be done. Randomized controlled trial shall be done, therapist blinding shall be done and long term effects of kinesio taping shall be examined.

CONCLUSION

Based on the statistical analysis, the result of the present study shows that there is statistically significant difference in pain, disability and forward head posture between pre-test and post-test in both experimental and control group. Experimental group shows greater improvement in pain while using Visual Analogue Scale, disability using Disability of Arm, Shoulder and Hand Questionnaire and Forward Head Posture using Craniovertebral

Angle using photographic method than control group in subjects with subacromial impingement syndrome.

After analyzing this study, the following conclusions were drawn:

- kinesio taping is effective in reducing pain in patients with shoulder impingement syndrome.
- kinesio taping is effective in reducing disability in patients with shoulder impingement syndrome.
- kinesio taping is effective in reducing forward head posture in patients with shoulder impingement syndrome.

Thus,the study concludes that kinesio taping may be effective for pain, disability and forward head posture in patients with shoulder impingement syndrome.

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