The Clinical and Sonographic Effects of Kinesiotaping and Exercise in Comparison With Manual Therapy and Exercise for Patients With Subacromial Impingement Syndrome: A Preliminary Trial

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Abstract

Objective: The purpose of this study was to compare the effects of manual therapy with exercise to kinesiotaping with exercise for patients with subacromial impingement syndrome.

Methods: Randomized clinical before and after trial was used. Fifty-four patients diagnosed as having subacromial impingement syndrome who were referred for outpatient treatment were included. Eligible patients (between 30 and 60 years old, with unilateral shoulder pain) were randomly allocated to 2 study groups: kinesiotaping with exercise (n = 28) or manual therapy with exercise (n = 26). In addition, patients were advised to use cold packs 5 times per day to control for pain. Visual analog scale for pain, Disability of Arm and Shoulder Questionnaire for function, and diagnostic ultrasound assessment for supraspinatus tendon thickness were used as main outcome measures. Assessments were applied at the baseline and after completing 6 weeks of related interventions.

Results: At the baseline, there was no difference between the 2 group characteristics ($P > .05$). There were significant differences in both groups before and after treatment in terms of pain decrease and improvement of Disability of Arm and Shoulder Questionnaire scores ($P < .05$). No difference was observed on ultrasound for tendon thickness after treatment in both groups ($P > .05$). The only difference between the groups was at night pain, resulting in favor of the kinesiotaping with exercise group ($P < .05$).

Conclusion: For the group of subjects studied, no differences were found between kinesiotaping with exercise and manual therapy with exercise. Both treatments may have similar results in reducing pain and disability in subacromial impingement in 6 weeks. (J Manipulative Physiol Ther 2014;37:422-432)

Key Indexing Terms: *Subacromial Impingement Syndrome; Ultrasonography; Manipulative Therapy; Athletic Tape*

Subacromial impingement syndrome (SIS) was first proposed by Neer[1] as the compression and abrasion of the bursal side of the rotator cuff beneath the anterior acromion and was characterized by pain (44%-65%) and functional restrictions. It is now considered as a much broader category than that first described by Neer, including the following: subacromial impingement or external impingement; internal impingement, which may be further divided into anterior or posterior[2]; and coracoid impingement.[3] Subacromial impingement syndrome is a common condition believed to lead to the development or progression of rotator cuff disease and is considered to be one of the most common shoulder complaints.[4,5]

The diagnosis of shoulder pain is too broad to provide sufficient information to develop specific treatment protocols in daily practice.[6,7] In primary care, general practitioners and

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physiotherapists often rely on clinical signs and symptoms to establish a diagnosis and to determine the focus of treatment.[8–10] Imaging methods such as roentgenography, ultrasonography, and magnetic resonance imaging (MRI) are helpful for differentiation of potential additional pathologies, if there is suspected red or yellow flags in the patient presentation, or if conservative care fails.[11] Lately, ultrasonography was shown as effective and reliable as MRI in showing changes in the soft tissue.[12–14] Kelly et al[15] examined the diagnostic accuracy of commonly used physical tests for SIS. Using ultrasound as the reference standard, they concluded that the emphasis on the management of dysfunction may be more appropriate rather than a simple reliance on clinical tests with inconclusive sensitivity and specificity if ultrasound scanning is not available. In addition to the diagnosis of rotator cuff tears, sonography could demonstrate abnormalities within the intact rotator cuff tendon including the changes in echogenicity and the tendon thickness. In rotator cuff abnormalities, tendon thickness could occur in comparison with the other side. Thus, the measurement of supraspinatus tendon thickness was found reliable.[16–18] The ultrasonographic diagnosis has the potential for becoming a valuable aid to the clinician in allowing confident diagnosis, and it enables to follow up treatment efficiency.[19–22]

Rehabilitation of the patients with SIS is a complex process that requires a comprehensive evaluation and multifactorial treatment program. Lately, it was shown in an evidence-based systematic review that there was an equal effectiveness of physiotherapist-led exercises when compared with surgery in the long term.[23,24] The restoration of parascapular muscles for scapular control was recommended as one strategy to restore shoulder function with exercise for various muscles along the scapulohumeral joint.[24–26] In the rehabilitation process, some additional techniques may also be used to restore function and decrease pain. One useful method might be manual therapy to restore range of motion and function to the soft tissue and joints. This may influence the overall neuromusculoskeletal system by influencing physical and mechanical properties of tissues and changes in tissue fluid dynamics (blood, lymph, extracellular and synovial fluids).[27–31] Low level to fair evidence was shown for the treatment of shoulder pain by manipulative therapy in the literature, and a need for new trials was focused.[32,33]

Another approach is the use of taping techniques with different materials and methods. Although the underlying mechanisms of the taping effects are still unclear, many believe that taping works by offering constant proprioceptive feedback or by providing alignment during dynamic movements.[34,35] The kinesiotaping method is a relatively new technique used in rehabilitation programs to treat upper arm or hand pain. It has been used as an adjunct in the treatment of some impairments.[36,37] Kase et al[38] claimed that applying kinesiotape would have physiological effects including decreasing pain or abnormal sensation, supporting the movement of muscles, removing congestion of lymphatic fluid or hemorrhages under the skin, and correcting misalignment of joints. Theories report that it provides a constant pulling force to the skin and improvement of blood and lymph circulation, and it decreases pain through the restoration of superficial and deep fascia function.[38] When the tape is applied properly, patients often report symptom relief, comfort, or stability of the involved joint.[37–40] This would be a beneficial choice for treating patients with SIS. Thelen et al[39] declared the assistance of the tape in improving pain-free active range of motion immediately after the application, but they could not support the use of taping for decreasing pain intensity or disability for SIS. Both taping and manual therapy can be an effective and fast method to enhance the healing in a similar fashion by means of local changes in tissue fluid dynamics, repositioning of soft tissue and joints, changes in the physical and mechanical properties of tissues, and somatosensory input. To our knowledge, no study exists that compare the effects of kinesiotaping and manual therapy as an adjunct to exercise therapy with functional and sonographic aspects. Therefore, the aim of this study was to investigate the effectiveness of 2 different shoulder rehabilitation interventions on pain, function, and sonographic findings of supraspinatus tendon.

Methods

Participants

Participants between 30 and 60 years old who were diagnosed as having SIS by an orthopedic surgeon were considered for inclusion. The assessment form, designed by the physiotherapists and the orthopedic surgeon, was used to diagnose and differentiate the participants. The form included the pain severity assessment, shoulder range of motion, shoulder muscle strength, and special tests including Neer painful arc, Hawkins-Kennedy, sulcus sign, and apprehension tests for instability. The combination of the Hawkins-Kennedy impingement sign, the painful arc sign, and the infraspinatus muscle test was used to diagnose SIS and showed that the tests could yield the best posttest probability (95%) for any degree of impingement syndrome, as claimed by Park et al.[41] Eighty-nine participants were referred to the outpatient physiotherapy clinic for the study.

Potential participants (n = 26) were excluded if there is a cervical spine involvement; the presence of a glenohumeral joint adhesive capsulitis, or instability; a history of previous shoulder surgery; having another physiotherapy treatment of this disorder in the past 6 weeks; or steroid injection into or around the shoulder in the past 2 months. The patients with recurrent complaints or long history of complain over a year were also excluded. Furthermore, MRI scans were

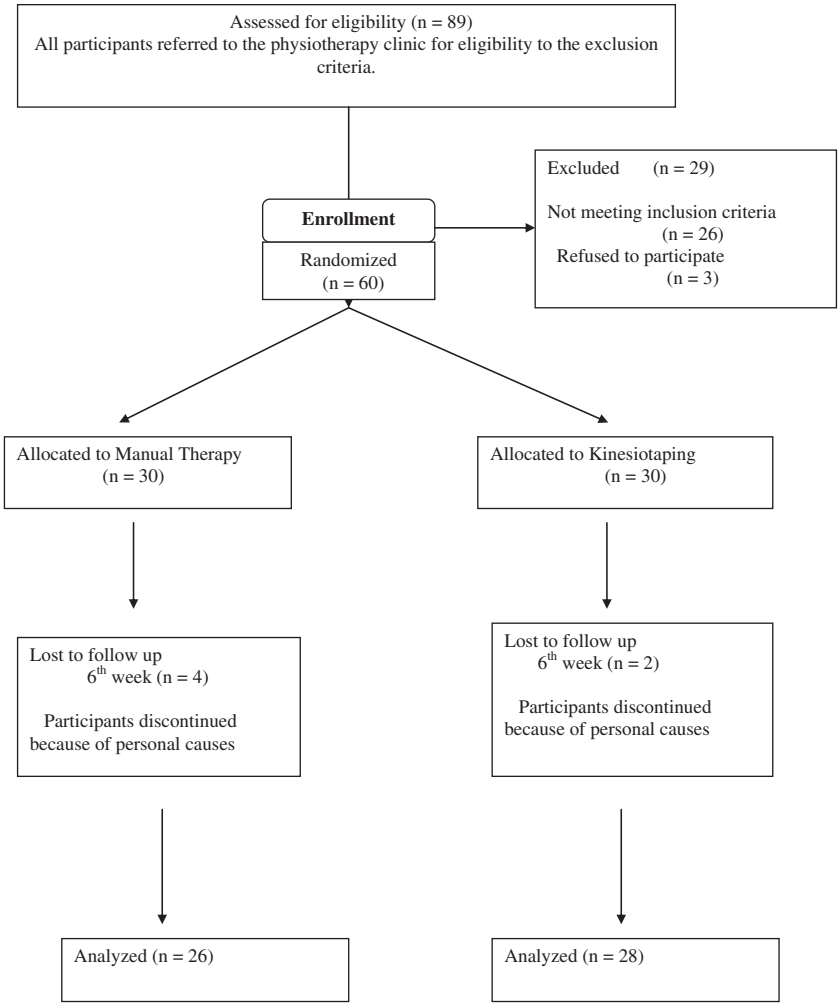

Fig 1. *Consort flowchart of the participants.*

assessed to confirm if there are any massive rotator cuff or labral tears to exclude from the study.

The written informed consent was obtained from all participants before the involvement in the trial. Volunteers were treated as participants. Three of the potential participants rejected to join the study. Four participants of 30 from the manual therapy group (MT group) discontinued the study because of personal reasons. Two participants of 30 from the kinesiotaping group (KT group) left the study; 1 of them had severe skin irritation. The other did not like to use the tape throughout the study. The details of included and excluded subject numbers into the study through final data analysis were provided in Figure 1 as a flowchart. The study was approved by the University Research Ethics Committee (FON 05/15-40).

Design

A randomized, clinical trial with a quasi-experimental design with premeasure and postmeasure was used. Sixty eligible participants of 89 were allocated to taping or manual treatment groups. Randomization was designed according to the random case sample in SPSS program (SPSS, Chicago, IL). The SPSS software randomly assigned participants to one of the groups. All participants were assessed by the same physiotherapist (D.O.K.) at the baseline and at the sixth week after completing the interventions by means of pain and function with visual analog scale (VAS) and Disabilities of the Arm, Shoulder, and Hand Questionnaire (DASH).[42] Furthermore, the treatment procedure was conducted by 2 physiotherapists (D.O.K. and G.B.), but the specific applications were applied by G.B. to avoid bias. For supraspinatus tendon thickness measurements, the participants were sent to a radiologist (U.T.) who was blinded to the group allocation.

Power analyses demonstrated a need for at least 26 participants per group given an SD of 25-mm VAS, a difference in pain intensity between groups of 20 mm on the VAS, an α level of .05, and a power set at 80%.

Fig 2. *The manual therapy application for scapular region.*

Intervention

Before the application of the interventions, all participants were informed of their pathology. They were made aware of the association of posture and SIS. The overall postural awareness was taught with chin tuck and scapular retraction to promote an erect posture.[43–45] Cold pack gel application on the shoulder was recommended to control pain 5 times a day, especially before and after exercises.[46,47] They were treated in the outpatient physical therapy unit once a week for 6 weeks. Each session took almost 1½ hours. Exercises were taught and applied with the supervision of a physiotherapist (D.O.K.). The compliance of exercises and cold pack application at home were questioned.

Exercise Therapy

The exercise therapy included 3 phases, and each phase consisted of strengthening/muscle reeducation exercises for the scapula stabilizers and the rotator cuff in addition to flexibility exercises.[48] Flexibility exercises were composed of posterior capsule with "cross-body stretch,"[49] upper thoracic extension stretch, and active range of motion stretching for glenohumeral joint for flexion and abduction. They had 3 repetitions held for 30 seconds each. Codman's pendulum exercises were also added into the program for improvement of range of motion in pain-free range. After flexibility exercises, strengthening exercises were conducted according to the phase of exercise. Strengthening exercises had 3 sets of 10 repetitions, using a 150-cm-long precut section of Thera-Band (Hygenic Corporation, Akron, OH). The participants began exercising using the no-latex yellow band at mild tension, and when able to perform 3 sets of 15 repetitions without significant pain or fatigue, they were progressed to the next color-resistive band in the sequence: red, green, and blue. Phase 1 emphasized the strengthening of the rotator cuff with avoidance of excessive upper trapezius activity and serratus strengthening. Shoulder elevation exercises were added in phase 2, and in phase 3, the subject was instructed to continue the exercises from phase 2 in addition to the new exercises such as push-up on wall and push-up plus with Thera-Band. The exercise prescription and loading continued every week during the treatment session. To move onto another phase, the subject was required to perform the exercises in the previous phase for 2 weeks without an increase in symptoms. An exercise booklet designed for the study regarding to literature recommendations was given to each participant in order to standardize the exercise regimen and to facilitate the task of the participant.[24,48,50–53] They were also encouraged to do their exercises at home regularly and were checked for the continuity. After a detailed control and teaching period in each session for the exercises, participants got the related intervention.

Manual Therapy

The MT group received a combination of manual therapies by the therapist. General mobilization, including superoinferior gliding, rotations, and distractions to the scapula, were applied 3 to 5 times (Fig 2).[27,31] Also, neuromuscular facilitation techniques for scapula motions at anterior elevation–posterior depression and posterior elevation–anterior depression planes were performed up to 5 to 6 repetitions.[54] Glenohumeral joint mobilization with long-axis traction and posterior or inferior glide techniques to improve shoulder internal rotation limitations were applied according to the individual requirements of the participants.[27] Soft tissue massage and joint mobilization of the neck, thoracic region, and elbow areas, according to the involvement, and deep friction massage with specific ischemic compression technique were applied to supraspinatus muscle by the physical therapist (G.B.) who is experienced on manual therapy.[29,55–57] Although the patients did not report any cervical problems, the upper trapezius hyperactivity, postural impairments, and long-lasting working postures that may cause pain in the neighboring segments were taken into account for the treatment.

Kinesiotaping

The KT group received the application of the tape according to the special assessment and the general

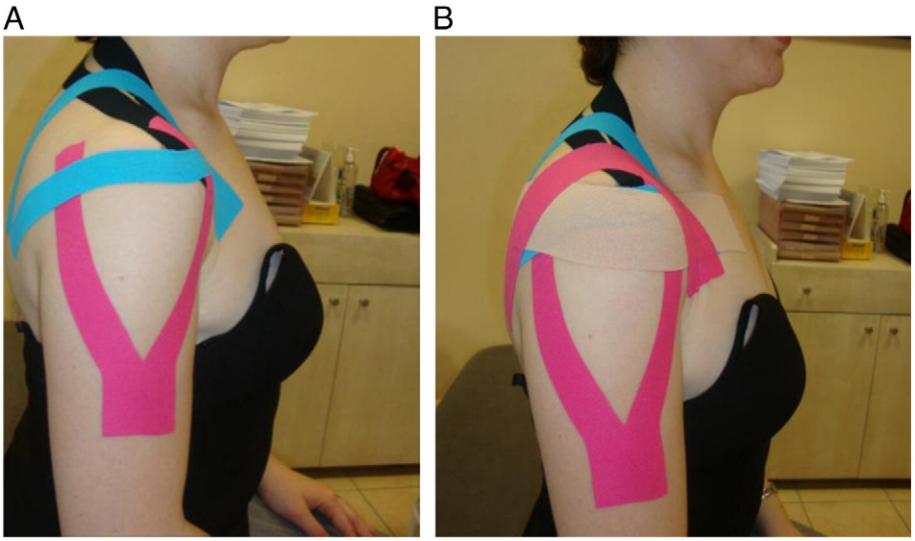

Fig 3. *A, The general application guidelines for rotator cuff tendonitis/impingement including the application of kinesiotaping to supraspinatus (black tape) and deltoid muscles (pink tape) and mechanical correction technique (blue tape) B, Glenohumeral (beige tape) and acromiclavicular joint (pink tape) correction techniques.*

application guidelines for rotator cuff tendonitis/impingement protocol, as suggested by Kase et al[38] In order to find out a specific taping method to a specific muscle. Wright Test and muscle strength tests were applied as special assessment. For the Wright Test, which was described as a screening test for shoulder girdle, the arm was elevated up to 90° abduction and external rotation as much as available. Any restriction was observed, and the test continued with specific muscle strength testing for muscles, bilaterally. According to the test results, the affected weak muscle groups including supraspinatus, upper and lower trapezius, deltoideus, teres minor, and levator scapulae were identified. First, the muscle technique was applied to the specifically affected muscle with no tension on band with a Y shape. Then, a correction technique for the protracted shoulder and a ligament technique for the overall shoulder were applied (Fig 3A and B). All techniques were identified according to the tissue that was in need of help. Taping technique and the assessment protocol were standardized through the education of 2 physiotherapists involved in the study by Kinesiotaping Institute. Thus, as all the other testing parameters, the primary author (D.O.K.) did the assessment and the secondary author (G.B.) applied the taping. Standard 2-in (5-cm) Kinesio Tex tape was applied once per week. Each taping was removed after 4 to 5 days in situ.

Outcome Measures

Measurement occurred at baseline and then after 6 weeks after the introduction of the treatment. The main outcome measures were the pain intensity scores at rest, during activity, and at night; the DASH scores; and tendon thickness of the supraspinatus muscle tendon on sonographic assessment.

The VAS was used for pain assessment. This scale involves a horizontal line, 10 cm long, such that 0 defines no pain and 10 defines unbearable pain. The patient is asked to mark the strength of his/her pain at rest, during activity and at night, on the horizontal line. The reliability of this measure was determined by Clark et al,[58] who found that $r = 0.79$ and retest = 0.97.

The DASH is a 30-item self-report questionnaire. The DASH is designed to measure physical disability and symptoms in people who have upper limb disorders. It has physical function items—6 symptom items and 3 social/role function items. [42,59]

The current ultrasound technology is now increasingly able to provide good accuracy in the assessment of shoulder. Furthermore, the higher-resolution technology allows for the assessment of the stages of rotator cuff disease and the classification of rotator cuff tears based on the extent of tendon involvement, size, and location of the tear. [60,61] Thus, the sonographic data were used in this study, and they were collected by an assessor blinded to the group allocation. The radiologist examined anatomical structures and measured maximal supraspinatus tendon thickness with a longitudinal angle in 1 cm proximal of the lateral aspect of humerus head with GE Logiq 9 scanner (General Electric Medical Systems, Milwaukee, WI) and linear 12-MHz (10-14 MHz) probe while the participant was sitting with the hand on his/her back at the gluteal region.[18,19,62,63] In compound imaging, a 60-dB gain parameter was used. Supraspinatus tendon thickness in centimeters and any structural changes were recorded (Fig 4). Tendon bursa differentiation was done in

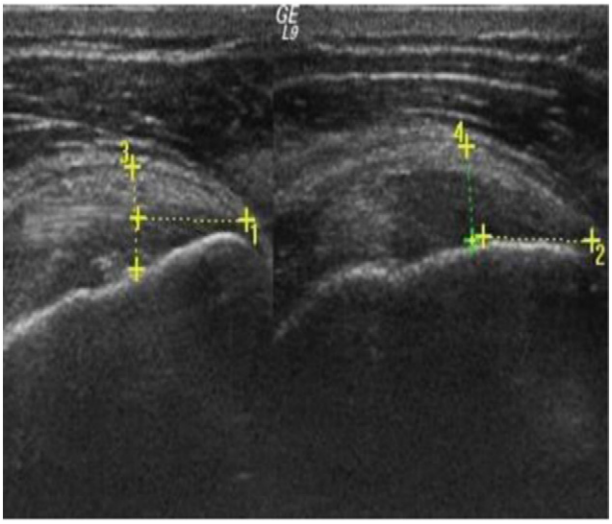

Fig 4. *Ultrasound tendon thickness assessment and tendon measurement.*

dynamic assessment more than once because it was declared that in many instances, a cleavage plane was lacking between these 2 structures, and therefore, it might be difficult to exclude the contribution of the bursa when measuring the tendon thickness.[64]

Statistical Analysis

For statistical analysis, "SPSS 15 for Windows" was used. For data analysis, we used the independent-samples *t* test to compare the results between groups from baseline to postintervention (after 6 weeks) and paired *t* test for the assessments of groups.

The subset of per-protocol analysis is an "as-treated" analysis in which only participants adherent to the intervention were included from all randomized participants by using baseline-postintervention analysis. Probability levels less than .05 (2-tailed) were accepted as significant.

Results

The results from the following were included: VAS scores at rest, during activity, and at night; DASH scores; and supraspinatus muscle thickness before and after completing 6 weeks of the interventions. The characteristics of the participants are given in Table 1. There were no significant differences between groups in terms of age and symptom durations ($P > .05$).

At the baseline, there were no differences in VAS, DASH scores, and tendon thickness between the 2 groups ($P > .05$; Table 1).

There were significant differences between pre and post, VAS, and DASH scores in both groups, in that they both improved ($P < .05$). There was no significant difference in the tendon thicknesses on both sides in both groups before and after the treatment ($P > .05$; Table 2).

The only difference between groups was shown for night pain in that the KT group had better results in comparison with the MT group ($P < .05$; Table 2).

Discussion

This randomized trial assessed the efficiency of 6-week MT and KT group applications in addition to exercise therapy for the treatment of SIS. It was shown that both groups' pain and function improved significantly. The improvement at night pain was greater in the KT group. However, no change for the supraspinatus tendon thickness was identified.

For the physiotherapeutic management of shoulder problems, it was emphasized that treatment should firstly aim to eliminate pain, then to restore shoulder joint mobility by instructing the participant on how to properly center the humeral head, and, subsequently, to restore normal movement patterns and the scapulohumeral rhythm, and finally to gradually increase the range of active mobility.[65] Exercises assisted by physiotherapist were declared as an essential issue in the treatment.[23] However, in general, the effectiveness of new adjunct techniques has been investigating.

In this study, 2 different interventions were chosen for the management within the context of these principles. With the use of both interventions, quick control of pain and neuromuscular remodeling were aimed so that exercises were able to be applied at the very beginning of the treatment. The first intervention was manual therapy. In the literature, manual therapy was shown to be more effective in reducing pain than exercise alone, and it was also emphasized that strength in the MT group improved significantly, whereas in the exercise group, it did not.[28,29] A neuromodulatory role for manual therapy was declared. According to the model of Bialosky et al,[66] mechanical force from manual therapy initiates a cascade of neurophysiologic responses from the peripheral and central nervous system, which are then responsible for the clinical outcomes. Bergman et al[67] declared that using manual therapy in addition to usual care for patients with shoulder complaints might diminish severity of shoulder and neck pain and increase mobility. Conversely, some researchers reported that joint mobilizations in addition to exercise and modalities were not more effective than exercise alone.[30,68,69] In this study, manual therapy was used as an adjunct treatment to exercise in order to get neuromodulatory effects and to persuade a participant to exercise and overcome the dysfunction. Beside this, hands-on assessment and treatment have great impact in terms of the patient's satisfaction in addition to physiologic effects. Application of the techniques once per week for 6 weeks was chosen similarly to the study of Kachingwe et al[70] because of the methodology of the study, the consistency between groups, and the cost-effectiveness. The studies mostly mentioned about the pain and function as outcome

Table 1. *Demographic Data of the Groups*

Parameter	Group 1 (exercise + manual therapy; n = 26)	Group 2 (exercise + kinesiotaping; n = 28)	*P* *
Age (y)	47.15 (9.44)	50.85 (5.17)	.07
Sex			
Male	10	11	
Female	16	17	
Handedness			
Left	3	5	
Right	23	23	
Side of symptoms			
Left	14 (53.8%)	15 (53.6%)	
Right	12 (46.2%)	13 (46.4%)	
Duration of symptoms (wk)	6-28	6-26	

wk, week.
* $P < .05$.

Table 2. *Results of the Functional Assessments of the Participants*

	Group 1 (exercise + manual therapy; n = 26)			Group 2 (exercise + kinesiotaping; n = 28)			*P* Values * Between Groups	
Parameters	Pre, mean ± SD	Post, mean ± SD	Within groups, *P*	Pre, mean ± SD	Post, mean ± SD	Within groups, *P*	Pre	Post
Pain (VAS)								
Pain at rest (cm)	3.11 ± 3.03	1.50 ± 2.28	<.001 *	2.89 ± 3.10	1.82 ± 2.05	.04 *	.79	.58
Pain during activity (cm)	7.84 ± 1.97	5.11 ± 2.68	<.001 *	7.21 ± 1.52	3.92 ± 1.71	<.001 *	.19	.57
Pain at night (cm)	5.15 ± 3.77	3.19 ± 3.28	<.001 *	4.92 ± 2.94	1.28 ± 1.88	<.001 *	.80	.01 *
Function								
DASH score	64.97 ± 18.39	35.61 ± 15.66	<.001 *	65.01 ± 16.38	38.71 ± 15.41	<.001 *	.99	.46
Tendon tickness								
Affected side (cm)	5.97 ± 1.07	5.74 ± 1.05	.08	6.19 ± .98	6.17 ± 1.18	.84	.43	.17
Nonaffected side (cm)	5.44 ± .93	5.48 ± .85	.46	5.91 ± 1.02	6.00 ± 1.15	.35	.08	.07

DASH, Disabilities of the Arm, Shoulder, and Hand Questionnaire; *Pre*, before treatment; *Post*, after treatment; *VAS*, visual analog scale.
* $P < .05$.

measurements. In addition to pain and function, our study also focused on changes on tendon structure. The supraspinatus tendon was chosen because the tendon is the most commonly damaged structure. The tendon changes were classified as normal, tendinosis, and partial or complete tears.[71] The changes in muscle and fiber diameter would be important in the shoulder in that they would affect the passive mechanical properties, length-tension behavior, and force-velocity behavior of the muscle. Also, architectural parameters such as physiological cross-sectional area and normalized muscle fiber length (serial sarcomere number) can predict muscle maximal force, excursion, and velocity, which is particularly important for physical therapists.[72] Thus, as an evidence-based outcome measure, the sonographic assessment of cross-sectional supraspinatus tendon thickness was used because significant functional improvement may be related to structural changes of the tendon.[18,63,73] The finding of this study pointed out that not only the manual therapy intervention but also the kinesiotape intervention with exercise had no effect on tendon structure within 6 weeks. Furthermore, although the affected side, supraspinatus tendon, was a little bit thicker than the nonaffected side, no statistically differences were observed before and after the intervention or in the affected and nonaffected sides within and between groups. From an evaluation perspective, morphology measurements include variables such as muscle length, thickness, width, cross-sectional area, and pennation angles.[74,75] We used the thickness for this study as a new way of looking inside the tendon formation, but no change was observed. It might be related to the standardization and selection of the groups. Abate et al[17] assessed the supraspinaus tendon thickness to evaluate the prevalence of shoulder lesions in a population of asymptomatic elderly subjects, healthy and with non–insulin–dependent diabetes mellitus, and showed that tendons thickness was greater in diabetic subjects than in controls. They also mentioned that the age of individuals may correlate with changes in the tendon. Further research on different age and pathology groups is needed to observe the changes.

The second intervention was kinesiotaping. Kinesiotaping differs from other athletic tapes in that the material is elastic, which can be stretched to 140% of its original length. It may stay on the skin for 4 to 5 days and may show resistance to water. With the techniques that were used for this study, the superficial fascia might have been supported, and

glenohumeral joint correction and ligament support might have been provided. Thus, this kind of support of shoulder probably enabled pain decrease for the participants. Previous studies had demonstrated the effects of kinesiotape for shoulder pain[39,40] and meralgia paresthetica.[76]

The improvement of pain was observed for both groups and was shown to be statistically significant. However, because we used VAS scale for the assessment, it could be considered "clinically meaningful" if the change is at least 2 or greater. In this case, although the pain score change at rest would not be considered clinically meaningful, it was very impressive for activity, especially for the KT group. The only superiority of KT to MT was shown on reducing night pain. It might be related to the restoration of superficial and deep fascia function with long-lasting effects of kinesiotape, in that it can stay on the skin up to 5 days. Because it was declared that the typical symptom of shoulder problems is the pain that worsens at night and with overhead activity,[77–79] the use of kinesiotape may have additional relief for the participants who had severe night pain. Beside this, in practice, there might be an advantage to choose taping in that applying a tape does not take a lot of time.

The functional recovery of the groups, which was assessed by DASH, was similar. The implication of this finding might be that the reduction in pain, especially during an activity, may be permitted to the more effective delivery of exercise and the function recovery for both groups. It may be highlighted that exercise may have a dominant effect.

Limitations

This study was a quasi-experimental design with premeasure and postmeasure, but no control group was included. Subject selection was a challenge in the clinical setting. Ethical reasons and the health insurance system did not let us to have a control group in this study. However, the nonaffected extremity was used as a control for the tendon thickness assessments. Furthermore, a short-term follow-up design was used because the sixth week was a cornerstone in order to see soft tissue healing. Besides this, the availability of the health insurance to pay the treatment and the cost-effectiveness issue had to be taken into account. Further studies with a control group and maybe with a combination of 2 interventions with long-term follow-up are needed.

The subset of per-protocol analysis in this study was an as-treated analysis in which only participants who were adherent to the intervention are included. These analyses seem reasonable for this study because participants can only be affected by an intervention they actually receive. The major disadvantage of intention-to-treat approach is that participants who choose not to take the assigned intervention will, nevertheless, be included in the estimate of the effects of that intervention. Therefore, substantial discontinuation or crossover between treatments will cause intention-to-treat analysis to underestimate the magnitude of the effect of the treatment. Besides this, when we compared the number of dropouts, one group doubled the other. It may also cause a conflict if intention-to-treat analysis was applied.

Another weakness of the study is related to the history duration of complaints in that it was long for some cases. This might be a prognostic factor for the syndrome, but because the detailed assessments were conducted, the group standardization was provided. This issue should be considered for further studies.

Taking only supraspinatus tendon thickness into consideration for the sonographic assessment might be another potential limitation for SIS. The other rotator cuff muscles may be considered for further studies.

The method of therapeutic kinesiotape application used in this study was chosen to correct for tendonitis/impingement. However, it was applied according to the specific requirements of the patient. Besides the general standardized approach of the manual therapy, applications were also arranged according to patients' needs. Those may cause a limitation. However, patients' specific requirements should be taken into account for the treatment.

Conclusion

This study showed that kinesiotaping with exercise and manual therapy with exercise reduced pain and disability in subacromial impingement in 6 weeks. Kinesiotaping may have an adjunct effect of reducing night pain. Neither treatment had an effect on supraspinatus tendon structure as visualized on ultrasound.

Practical Applications

- Sonographic and functional assessments may provide evidence-based data to show the effects of treatment interventions.
- Kinesiotaping and manual therapy may have similar impacts in reducing pain and disability in subacromial impingement in 6 weeks.
- Kinesiotaping may have adjunct effect to reduce night pain in some subjects.
- Either treatment interventions did not cause any structural changes in supraspinatus tendon thickness.

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Contributorship Information

Concept development (provided idea for the research): D.O.K., G.B.
Design (planned the methods to generate the results): D.O.K., G.B.
Supervision (provided oversight, responsible for organization and implementation, writing of the manuscript): D.O.K., G.B.
Data collection/processing (responsible for experiments, patient management, organization, or reporting data): D.O.K., G.B., U.T., A.O.A.
Analysis/interpretation (responsible for statistical analysis, evaluation, and presentation of the results): D.O.K., U.T.
Literature search (performed the literature search): D.O.K., U.T., G.B.
Writing (responsible for writing a substantive part of the manuscript): D.O.K., G.B.
Critical review (revised manuscript for intellectual content, this does not relate to spelling and grammar checking): D.O.K., G.B., U.T., A.O.A.

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