

Comparison Between Kinesio Taping and Extracorporeal Shockwave Therapy in Treatment of Subacromial Impingement Syndrome

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Keywords: Extracorporeal shock wave therapy; kinesio taping; subacromial impingement syndrome.

ABSTRACT

Objective: The aim of the study was to compare the effects of kinesio taping (KT) and extracorporeal shock wave therapy (ESWT) methods in the treatment of subacromial impingement syndrome.

Methods: In the present study, 105 patients with subacromial impingement syndrome were randomly divided into three groups: active kinesio taping (group 1), sham kinesiology taping (group 2), and extracorporeal shock wave therapy (group 3). VAS was used to measure patients' pain, and DASH was used to evaluate the degree of functional disorders.

Results: No statistically significant difference was determined between groups with regard to age, sex, marital status, BMI and acromion types. Post-treatment VAS scores of group 1 and 3 decreased when compared to baseline VAS scores.

Conclusion: In conclusion, our study reveals the clinical benefit of KT and ESWT usage in the treatment of non-calcific tendinitis. It may be suggested as an alternative treatment to conservative treatments according to short term results.

INTRODUCTION

Subacromial impingement syndrome (SIS) is the most common cause of shoulder pain. Supraspinatus tendinitis develops due to impingement of bicipital tendon between humerus and coracoacromial arch as a result of the pressure on subacromial bursa.^[1]

Neer divided SIS to 3 pathological stages;^[2] Edema and Hemorrhage, Fibrosis and Tendinitis, Bone Degeneration and Tendon Ruptures.

First treatment for SIS is conservative one. As conservative treatment, rest, cold application, hot application, electrotherapy modalities, transcutaneous electrical nerve stimulation, ultrasound, phonophoresis, high voltage galvanic stimulation, laser, iontophoresis, cryotherapy, use of nonsteroidal anti-inflammatory drugs, local steroid injection, joint range of motion exercises, joint mobilization

techniques, proprioceptive neuromuscular facilitation techniques, exercises for shoulder and scapular muscles, functional training, transverse friction massage could be applied.

Some recent studies proposed kinesio taping (KT) applications and extracorporeal shockwave therapy (ESWT) as alternative conservative treatment options for SIS.^[3,4]

The purpose of the prospective study was to compare short term clinical outcomes of KT and ESWT applications in patients who applied to our clinic with SIS in 2016.

MATERIAL AND METHODS

Study design

This study was a prospective randomized controlled study and carried out after the approval of Ethics Committee

(71306642-050.01.04). Patients were informed. This study was performed with 105 patients (Fig. 1). Supraspinatus Outlet Graphy, antero-posterior shoulder graphy. Routine blood tests, complete blood count and biochemistry tests were noted before the study. AP Shoulder Graphy and Supraspinatus Outlet Graphy were repeated after 4 weeks.

Patients

105 patients, who applied to Physical Medicine and Rehabilitation Clinic and Orthopedic Clinic with a diagnosis of SIS, were randomly divided into three groups with a simple randomization method by using online randomization software (GraphPad Software QuickCalcs).

3 groups were conducted as active KT group (Group 1), sham KT group (Group 2) and ESWT group (Group 3). Each group was received a 4-week therapy program.

Group 1: Active KT group patients were asked to come to the clinic with a total of 6 times with 5 days intervals for 4 weeks. Each time they came to the clinic, active KT was performed by applying muscle technique (inhibition) and area correction techniques with the same color “Kinesio Tex Gold” branded tape. Muscles that were found to be injured on MRI were evaluated and requiring treatment muscles injuries were identified, the KT muscle inhibition technique for these rotator cuff muscles was applied with 10% tension. Additionally, kinesio taping mechanical anterior correction techniques were performed on glenohumeral joint with 50%-75% tension, and kinesio taping space correction techniques were performed with 10%-20% tension to the points where decreasing of the pressure was intended.^[3] An exercise program was recommended to all patients. While the size varied from patient to patient, three Y tapes were cut at an average length of 20 cm. The application was started by attaching the thick end of the Y tape without applying any tension on the first 3-4 centimeters, then the arms of the Y tape were attached with a slight tension and the ends were attached without any tension. The last Y tape was attached to a painful area with area correction technique, with a maximum tension in the middle and no tension at the ends (Fig. 2).

Group 2: Sham Kinesio Taping Group patients were asked to come to the clinic with a total of 6 times with 5 days intervals for 4 weeks. Each time they came to the clinic, sham KT was performed by applying muscle technique

(inhibition) and area correction techniques with the same color “Kinesio Tex Gold” branded tape. Tape was attached as an I-tape, without tension and not corresponding to origin and insertion of trapezius muscle (Fig. 2).

Group 3: Extracorporeal shockwave therapy group patient’s received shock wave therapy with one week intervals for a total of three treatments. Each patient received ESWT at a frequency of 15 Hz, density of 2.0 Barr and the pulse/session of 2000. ‘EMS Swiss DolorClast Master’ branded ESWT device was used (Fig. 3), and hot package was used as superficial heat agent. After one month from their first visit, patients were asked to come to the clinic for evaluation.

In ESWT application, medium energy current was delivered with 1200 shocks per session, 2 Hz frequency and 120 shocks/minute rate.^[5,6] The first treatment was started with 0.03 mJ/mm² in low energy density and it was



Figure 2. Active kinesio taping–Sham Kinesio taping.

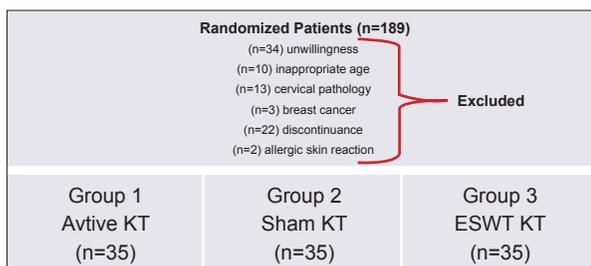


Figure 1. Study flow chart.



Figure 3. ESWT device.

increased up to 0,28 mj/mm² density according to the patient's tolerance.

Exercises were recommended for 3 days per week, in 8-12 repeats.

Exclusion criteria

Patients were excluded if they had systemic co-morbidities; space occupying lesion; recovered or present shoulder instability; a history of surgical operations or injections on shoulder, neck and thoracic region; scoliosis over 5 degrees; determined kyphosis or other postural disorders; identified herniated disc; a history of major trauma; known allergy against polyacrylate or other substances with similar structure; past malignancies; active cellulitis, skin irritation, open wounds, deep vein thrombosis or varicosity in administration area; severe cardiac and psychiatric problems; BMI levels over 30; acute inflammation and neurologic deficit; complaints in both shoulders; and anatomic variations in shoulders were excluded from the study.

Assessment

All patient's VAS scores, special shoulder tests, DASH-T scores were noted and standardized treatment protocols were questioned for a total of three times, at their first arrival, in the week 2 and in the week 4. Shoulder AP, lateral and supraspinatus graphies were requested in the first arrival and in the week 4. During this one-month monitoring, no changes were performed in the medical treatment of patients.^[7]

DASH score is a disability/symptom scale.^[8] It can be performed with shoulder anteroposterior and/or supraspinatus graphy.

It is performed with 1.5-Tesla MRI device (Siemens Magnetom Avanto) and standard extremity coil.^[8]

Statistical analysis

IBM-SPSS 22 system is used for the statistical evaluations of the data. Obtained numerical data are represented as median (minimum-maximum) with descriptive statistics. Confidence interval is assumed as 95% ($\alpha=0.05$). Kruskal Wallis test was used for the inter-group analysis of qualitative data; Exact Willcoxon two-sample test was used to analyze intra-group pre-treatment and post-treatment differences; and Freidmann test was used for intra-group comparison including more than two time follow-ups. Frequency tables (number, percentage) were used for descriptive statistics of data. For more than two matched exact measurements, Cochran Q test was calculated. In all tests, Dunn and other multiple comparisons were performed. For quantitative data, Chi-square test was applied in order to see inter-group distribution. Although all assessment methods were performed bilaterally, only the measurement values of affected shoulder were included in statistical analysis. Statistical significance level was assumed as $p<0.05$.

RESULTS

Average age was 52 (22-65) in the first group, 51 (25-65) in second group, and 51 (29-65) in the third group. No difference was determined between groups with regard to age. No difference was determined between groups with regard to sex ($p=0.815$). Average BMI score was 24.44. No statistically significant difference was determined between groups with regard to BMI.

In the first group, 10 patients (28.6%) were single, 21 patients (60%) were married, and 4 patients (11.4%) were widowed. In the second group, 9 patients (25.7%) were single, 25 patients (71.4%) were married, and 1 patient (2.9%) was widowed. In the third group, 27 patients (25.7%) were single, 68 patients (64.8%) were married, and 10 patients (9.5%) were widowed. There is no difference among the groups in terms of marital status ($p=0.524$).

In the first group, 23 patients (65%) were determined to have type 1 acromion, 9 patients (25%) type 2 acromion, and 3 patients (8%) type 3 acromion; in the second group, 26 patients (74%) were determined to have type 1 acromion, 8 patients (22%) type 2 acromion and 1 patient (2%) type 3 acromion; in the third group 27 patients (77%) were determined to have type 1 acromion, 7 patients (22%) type 2 acromion and 1 patient (2%) type 3 acromion according to Biglani classification.^[9] There is no difference with regard to acromion types ($p=0.7$) (Fig. 4).

Examinations of all groups were performed according to resting VAS (RVAS), movement VAS (MVAS) and night VAS (NVAS) (median (minimum-maximum)). p^* represents p value in intra-group comparisons A significance value of $p<0.001$ was assumed. Significant values between assessments were indicated in the last column. Significant p value is <0.05 in pairwise comparisons (Table 1-3).

Dash performance

No statistically significant difference was determined among intra-group assessments of first arrival, week 2 and week 4 dash performance assessment for the group 1, 2, and 3 (respectively $p=0.265$, $p=0.074$ and $p=0.346$).

Dash disability

When the first arrival, week 2 and week 4 disability score measurements were compared for the group 1, a statistically significant difference was determined between the first arrival and week 4 dash disability scores. Also, a statistically significant difference was determined be-

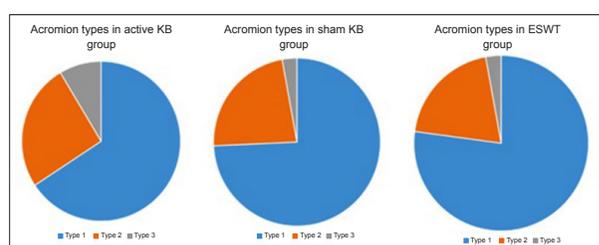


Figure 4. Acromion types distributions of the groups.

Table 1. Examination of Group 1 with regard to VAS

Variable	Group 1 (median (follow-up))			p*	Pairwise (p<0.05)
RVAS (med [min-max])	5 (2–8)	3 (1–7)	3 (1–6)	<0.001	Arrival (0) vs week 2; Arrival (0) vs week 4
MVAS (med [min-max])	5 (3–9)	4 (0–7)	3 (0–6)	<0.001	Arrival (0) vs week 2; Arrival (0) vs week 4
NVAS (med [min-max])	2 (0–9)	1 (0–6)	1 (0–3)	<0.001	Arrival (0) vs week 2; Arrival (0) vs week 4

VAS: Visual Analogue Scale; RVAS: Resting Visual Analogue Scale; MVAS: Movement Visual Analogue Scale; NVAS: Night Visual Analogue Scale.

Table 2. Examination of Group 2 with regard to VAS

Variable	Group 2 (median (follow-up))			p*	Pairwise (p<0.05)
RVAS (med [min-max])	5 (3–8)	3 (1–7)	3 (1–6)	<0.001	Arrival (0) vs week 2; Arrival (0) vs week 4
MVAS (med [min-max])	5 (3–9)	5 (2–8)	4 (2–8)	<0.001	Arrival (0) vs week 2; Arrival (0) vs week 4
NVAS (med [min-max])	2 (0–4)	2 (0–4)	2 (0–4)	0.026	Arrival (0) vs week 2; Arrival (0) vs week 4

VAS: Visual Analogue Scale; RVAS: Resting Visual Analogue Scale; MVAS: Movement Visual Analogue Scale; NVAS: Night Visual Analogue Scale.

Table 3. Examination of Group 3 with regard to VAS

Variable	Group 3 (median (follow-up))			p*	Pairwise (p<0.05)
RVAS (med [min-max])	4 (1–9)	3 (1–7)	2 (1–6)	<0.001	Arrival (0) vs week 2; Arrival (0) vs week 4
MVAS (med [min-max])	5 (2–9)	4 (0–6)	3 (0–6)	<0.001	Arrival (0) vs week 2; Arrival (0) vs week 4
NVAS (med [min-max])	3 (0–6)	2 (0–5)	1 (0–3)	<0.001	Arrival (0) vs week 2; Arrival (0) vs week 4

VAS: Visual Analogue Scale; RVAS: Resting Visual Analogue Scale; MVAS: Movement Visual Analogue Scale; NVAS: Night Visual Analogue Scale.

tween the first arrival and week 4 dash disability scores ($p<0.001$).

When the first arrival, week 2 and week 4 disability score measurements were compared for the group 3, a statistically significant difference was determined between the first arrival and week 4 dash disabilities. Also, there was a prominent improvement between first arrival dash scores and week 2 dash scores ($p<0.001$).

There was functionally improvement between the first arrival dash scores and week 4 in the group 1 and 3.

DISCUSSION

KT application for SIS treatment was reported to provide improvement in early stage VAS scores and increases the joint range of motion.^[3,4] In our study, we have found that active KT for SIS treatment provided decreasing in resting VAS scores, movement VAS scores and night VAS scores in the 4-week therapy period. However, there are no long-term results due to the fact that our study includes a 4-week follow-up.

Although there are studies in the literature that show the efficacy of ESWT in the treatment of pain, there are also studies showing that it is ineffective.^[10,11] We have found that ESWT had a positive effect in pain treatment. Our results showed that ESWT provided decreasing in resting

VAS, movement VAS and night VAS scores besides it increased joint range of motion and functionality.

Morrison and Bigliani's study that was carried out in patients with shoulder problems showed that hooked acromion in 80% and curved acromion in 20% of the patients with rotator cuff tears.^[12] Supraspinatus muscle causes hooked acromion by the narrowing in coracoacromial arch, and if there are acromial protrusions it causes tendon impingement at the anterior of the acromion.^[13–15] There was no difference among the groups with regard to acromion types; therefore, we concluded that the presence of different acromion types did not effect the safety of our study.

KT could be used in rehabilitation programs for SIS and rotator cuff tendinitis. Both decreasing in edema and pain and increasing in joint range of motion and muscle activity are targeted. KT has shown that it reduces pain in early stages of SIS and increases joint range of motion.^[16] Decreasing in the pain with KT is explained with reduced edema, activating gate control mechanism, and regulating fascia functions.^[17] In the long-term studies, it was shown that positive effects of KT in pain were not permanent.^[18,19] Although there is strong evidence in the literature about positive effects of ESWT usage in SIS, ESWT usage in non-calcific tendinitis is still controversial. Meta analyses have shown that ESWT administration in calcific tendinitis provides decreasing in VAS scores.^[20] In our study, a clinical

improvement similar to the calcific tendinitis was demonstrated with ESWT application in non-calcific tendinitis.

Haake et al. have applied ESWT with 2 sessions, 2000 pulses and 0,35 mj/mm² to a group of 60 cases with chronic supraspinatus tendinitis; and 3 sessions, 2000 pulses, 0,08-0,14 mj/mm² to the other group. They have obtained improvement functions in both groups.^[21,22] There is no generally accepted session and frequency for tendinitis; however, the numbers are close to each other and the effects are similar.

Another study that was performed by Santamato et al., higher improvement in functionality, much more decreasing in pain and increasing in muscle endurance were determined with a combination of ESWT and isokinetic exercises in patients with SIS when compared to ESWT alone.^[23]

With all these data, our study reveals the clinical benefit of KT and ESWT usage in the treatment of non-calcific tendinitis.

This study will shed light on future studies which will examine long term results of KT and ESWT usage in SIS treatment.

Long-term, controlled, well-designed studies are required in order to lead the use of ESWT and KT methods, alone or in combination with other conservative methods, on solid evidence for SIS and non-calcific tendinitis.

In the future, this study should be repeated with long-term follow-up results on larger sample groups, which is important in terms of generability of the results of this study.

Ethics Committee Approval

Approved by the local ethics committee.

Informed Consent

Prospective study.

Peer-review

Internally peer-reviewed.

Conflict of Interest

None declared.

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Subakromiyal Sıkışma Sendromu Tedavisinde Kinezyo Bantlama ve Ekstrakorporeal Şok Dalgası Tedavisinin Karşılaştırılması

Amaç: Bu çalışmanın amacı, subakromiyal sıkışma sendromunun tedavisinde kinesio taping (KT) ve ekstrakorporeal şok dalga tedavisi (ESWT) yöntemlerinin etkilerini incelemek ve karşılaştırmaktır.

Gereç ve Yöntem: Bu çalışmada subakromiyal sıkışma sendromu olan 105 hasta randomize olarak üç gruba ayrıldı: aktif kinesio bantlama (grup 1), sham kinesiyoloji bantlama (grup 2) ve ekstrakorporeal şok dalga tedavisi (grup 3). Hastaların ağrısını ölçmek için VAS skoru ve fonksiyonel bozuklukların derecesini değerlendirmek için DASH skoru kullanıldı.

Bulgular: Yaş, cinsiyet, medeni hal, BMI ve akromiyon tipleri açısından gruplar arasında istatistiksel olarak anlamlı bir fark saptanmadı. Grup 1 ve 3'ün tedavi sonrası VAS skorları başlangıç VAS skorlarına göre düşük saptandı.

Sonuç: Sonuç olarak çalışmamız, kalsifik olmayan tendinit tedavisinde KT ve ESWT kullanımının klinik yararını ortaya koymaktadır. Kısa süreli sonuçlara göre her iki yöntem de konservatif tedavilere alternatif olarak önerilebilir.

Anahtar Sözcükler: Ekstrakorporeal şok dalgası tedavisi; kinezyo bantlama; subakromiyal sıkışma sendromu.