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The value of intermittent ultrasound treatment in subacromial impingement syndrome

Subakromiyal sıkışma sendromunun konservatif tedavisinde kesikli ultrasonun yeri

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Amaç: Kesikli ultrasonun subakromiyal sıkışma sendromunun (SSS) tedavisindeki yeri şimdiye kadar yeterince incelenmemiştir. Bu çalışmada ultrasonun SSS'nin konservatif tedavisindeki etkisi araştırıldı.

Çalışma planı: Tip II SSS tanısı konan 36 hasta (29 kadın, 7 erkek; ort. yaş 51, dağılım 40-69) randomize olarak iki gruba ayrıldı. Yirmi hastaya (grup 1) kesikli ultrason, 16 hastaya (grup 2) plasebo ultrason uygulandı. İki grupta da tedavi 15 seans (3 hafta) sürdürüldü. Tüm hastalara ultrason dışında aynı standart fizik tedavi ve rehabilitasyon programı uygulandı. Değerlendirmeler, tedaviden önce ve tedaviden üç ve altı hafta sonra yapıldı. Fonksiyonel sonuç Constant skoru, ağrı görsel analog skala ile değerlendirildi; hastaların hareket açıklıkları ölçüldü.

Sonuçlar: İki grupta da tedavinin üçüncü ve altıncı haftalarındaki düzelmeler anlamlı bulundu ($p<0.05$). Grup 1 ve 2'de, tedavi öncesinde ortalama fleksiyon sırasıyla 148.8±20.4° ve 165.9±14.1° idi; altı hafta sonra bu değerler 175.6±6.0 ve 177.4±4.4 dereceye yükseldi. Tedavi öncesinde iç ve dış rotasyon grup 1'de sırasıyla 66.8±20.7° ve 61.9±22.9°, grup 2'de 75.0±17.3° ve 70.0±19.8° idi. Altıncı hafta sonunda bu değerler grup 1'de 83.2±10.9 ve 84.4±9.6 dereceye, grup 2'de 87.1±6.8 ve 84.6±8.4 dereceye yükseldi. Son değerlendirmede hareket açıklığı açısından iki grup arasında anlamlı fark yoktu ($p>0.05$). Grup 1 ve 2'de tedavi öncesinde sırasıyla 43.7±12.9 ve 43.9±16.4 olan ortalama Constant skoru altıncı hafta sonunda 65.7±7.7 ve 65.3±7.6'ya yükseldi. Grup 1'de tedaviden önce 5.5 olan ağrı skoru son kontrolde 2'ye, grup 2'de ise 5'ten 1'e düştü. Constant skoru ve ağrı skorundaki düzelmeler iki grup arasında anlamlı farklılık göstermedi ($p>0.05$).

Çıkarımlar: Bulgularımız, SSS tanısı konan hastaların konservatif tedavisinde kesikli ultrason uygulamasının ek yarar sağlamadığını göstermektedir.

Anahtar sözcükler: Fizik tedavi yöntemleri; omuz sıkışma sendromu/rehabilitasyon; ultrason tedavisi/yöntem.

Objectives: The role of intermittent ultrasound in the conservative treatment of subacromial impingement syndrome (SIS) has not been clarified. We aimed to evaluate the efficacy of ultrasound treatment in SIS.

Methods: Thirty-six patients (29 females, 7 males; mean age 51 years; range 40 to 69 years) with type II SIS were randomized to two groups to receive intermittent ultrasound (group 1, n=20) and placebo ultrasound (group 2, n=16) for three weeks (15 sessions). All the patients received the same standard physical therapy and rehabilitation modalities besides ultrasound treatment. Evaluations were made before and three and six weeks after treatment. Functional results were assessed by the Constant score, pain was assessed by a visual analog scale, and range of motion was measured.

Results: Within-group comparisons showed significant improvements in both groups three and six weeks after treatment ($p<0.05$). Comparison between pretreatment and 6-week values were as follows: the mean flexion increased from 148.8±20.4° to 175.6±6.0° in group 1, and from 165.9±14.1° to 177.4±4.4° in group 2; internal and external rotation increased from 66.8±20.7° and 61.9±22.9° to 83.2±10.9° and 84.4±9.6° in group 1, and from 75.0±17.3° and 70.0±19.8° to 87.1±6.8° and 84.6±8.4° in group 2, respectively. There were no significant differences between the two groups with respect to the range of motion at the end of six weeks ($p>0.05$). The Constant score improved from 43.7±12.9 to 65.7±7.7 in group 1, and from 43.9±16.4 to 65.3±7.6 in group 2. Pain scores decreased from 5.5 to 2 and from 5 to 1 in group 1 and 2, respectively. Improvements in Constant scores and pain scores were similar in both groups ($p>0.05$).

Conclusion: Our findings suggest that intermittent ultrasound added to conservative treatment of SIS do not provide an additional benefit to the patients.

Key words: Physical therapy modalities; shoulder impingement syndrome/rehabilitation; ultrasonic therapy/methods.

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The primary aim in the therapy for subacromial impingement syndrome (SIS) is to reduce pain and improve function of the joint. The preferred first step in the treatment of the syndrome is conservative management. In those patients in whom anti-inflammatory medications, rest and the application of ice do not ease symptoms, physiotherapy and rehabilitation are recommended. These therapies can include exercises to strengthen the rotator cuff and scapular muscles [1,2,3], manipulation and mobilisation techniques [4,5], passive, active and joint-movement enabling exercises [3,5], home exercise programmes [6,7], ultrasound, magnetic fields, TENS and infra-red therapy modalities[8,9] and immobilisation. Ultrasound is one of the most commonly used therapies in musculoskeletal injury, and it can generally be carried out in conjunction with other therapeutic procedures. The thermal properties of ultrasound have been found to improve circulation and increase elasticity of collagenous tissue and tissue temperature while decreasing muscle spasms and destroying scar tissue [11]; non-thermal properties include increased blood flow and fibroblast activity and repair of soft tissue.[10] It must be borne in mind that where oedema and inflammation occur in SIS, benefit can arise from non-thermal effects of the recommended therapy of intermittent ultrasound.[12]

Currently, ultrasound remains the only therapy whose effect on SIS has not been sufficiently proven. [8, 13] The aim of this study is to compare the effect of intermittent ultrasound or placebo ultrasound on the pain, range of joint mobility and functional capacity of patients taken from the standard physiotherapy programme for SIS.

Materials and methods

36 patients (29 female, 7 male; mean age: 51.4, range: 40-69) who on first examination after surgery met the minimum criteria for a diagnosis of Neer Type II SIS based on direct radiography and magnetic resonance findings were included in this study. The surgery was performed at our clinic by two surgeons experienced in shoulder surgens.

Inclusion criteria: 1. 40 years or older; 2. Not engaged in sporting activities; 3. Symptoms of 6 months' duration or longer; 4. Positive findings of impingement on examination (Neer impingement test, Hawkins sign, Jobe supraspinatus test) which showed less than 30% restriction on passive movement when compared to the other side; 5. Absence of deformities such as mesoacromion or degenerative arthritis on radiographic examination; 6. Absence of pathological findings on investigation of MRI scans with the exception of subacromial oedema; 7. Patients gave fully informed consent before being included in the study.

Exlusion criteria: 1. Symptoms of less than 6 months' duration; 2. Greater than 30% restriction of passive movement when compared to the opposite side; 3. Patients who had undergone previous shoulder surgery, subacromial injections or entered a physiotherapy and rehabilitation program; 4. Evidence of rotator cuff tears on MRI scans or pathological findings on radiography; 5. Patients undergoing psychiatric therapy were not included.

The nature of the study was explained to the patients and signed consent forms were obtained. The cohort was split randomly into two groups. All the patients underwent the same standard physiotherapy and rehabilitation program that our clinic provides with the exception of the ultrasound therapy. This program includes: wand exercises, posterior and inferior capsule stretching exercises and exercises to strengthen the rotator cuff. Manual joint movement-enabling exercises were carried out individually with a physiotherapist. Both groups were treated at the same time with 20 minutes' transcutaneous electric nerve stimulation (TENS) and 15 minutes' ice. The exercises were repeated 20 times once a day for 3 weeks under the supervision of a physiotherapist, and

Figure 1. Position for ultrasound application.

patients were required to repeat the exercise twice another 20 times each at home on the same day, after each time applying another 15 minutes of ice. The exercise program was supported by the use of non-steroidal anti-inflammatory drugs. Patients were divided randomly into two groups according to the type of ultrasound to be used. The first group consisted of 20 patients, the second of 16. The first group received 1 mHz, 4 minutes, 1 watt/cm2 intermittent 1:2 (50%) ultrasound, applied to an area 12cm^2 along the supraspinatus (Fig. 14) while the affected arm was in a position of adduction, 90 degrees' internal rotation and 30 degrees' hyperextension. The second group received placebo ultrasound with the arm placed in the same position.

Therapy continued for 15 sessions (3 weeks). Before treatments, at the end of the third and sixth weeks, a medical practitioner blind to the treatments used in the study assessed the results using: functional level; Constant score; pain; visual analogue scale (VAS) and goniometer–measured range of motion (anterior flexion, internal and external rotation). To establish differences between the groups, a student's t-test was used, and VAS score was assessed using a Mann-Whitney U test.

Results

Range of motion

In the first group: Mean forward elevation increased from 148.75°±20.36° to 170.20°±9.87° after 3 weeks and 175.55°±6.00° after 6 weeks. Internal rotation increased from 66.75°±20.68° to 75.20°±14.93° after 3 weeks and 83.15° ±10.9° after 6 weeks. External rotation increased from 61.85°± 22.89° to 77.15°±13.36° (20) after 3 weeks and 84.35°±9.61° after 6 weeks.

In the second group: Mean forward elevation increased from 165.88°±14.06° to 174.38°±8.94° after 3 weeks and 177.38°±4.43° after 6 weeks. Internal rotation increased from 75.00°±17.29° to 84.19°±7.57° after 3 weeks and 87.06° ± 6.77° after 6 weeks. External rotation increased from 70.00°±19.81° to 79.75°±14.60° after 3 weeks and 84.63°±8.36° after 6 weeks.

Functional results

These were determined using the Constant score. The mean Constant score in the first group was 43.65°±12.89° which increased to 58.30°±9.07° immediately after therapy, and to 65.65°±7.65° at 6 weeks. In the second group the Constant score was 43.88°±16.44° which increased to 61.06°±8.06° immediately after therapy, and to 65.25°±7.61 after 6 weeks.

Pain results

The pain score (VAS) in the first group decreased from 5.5 to 3 after therapy, and to 2 at 6 weeks. In the second group, the pain score decreased from 5 to 2 after therapy, and to 1 at 6 weeks.

Statistical analysis

The increase within both groups after 3 and 6 weeks of therapy was found to be statistically significant ($p<0.05$).

At the start of therapy, no significant difference was found between the groups with the exception of foward elevation. The elevation results from the second group before therapy were found to be significantly greater than those of the first group ($p<0.05$) but after 6 weeks this was no longer the case. At the end of 3 weeks, the mean internal rotation results were greater in the second group as compared to the first, but by 6 weeks this was no longer apparent. No significance was found between the groups' pain scores ($p>0.05$).

Discussion

The role of ultrasound use in soft tissue lesions – specifically of the tendon and ligament – is disputed. Ultrasound therapy has had its use tested in abdominal soft tissue trauma, carpal tunnel syndrome, Achilles tendonitis, back pain, gonarthrosis, plantar fasciitis and several other injuries of this type, and differing opinions have surfaced. In fact, only carpal tunnel syndrome [15] and Achilles tendonitis [16] have provided positive results both histologically and in the clinic. In plantar fasciitis, intermittent ultrasound has been shown to have no extra effect when compared to placebo ultrasound.[17]

In SIS, several methods of conservative treatment have been described.[1,2,3,4,5,7,8,18,19] Only range of motion and capsule-strengthening exercises have since been included in the method of standard therapy. In our study, we too used a previously approved exercise program [20] as our foundation.

Conditions needing physiotherapy in the region of the shoulder use of ultrasound is widespread. However, it has not been possible to fully demonstrate its effect

according to both diagnosis and mode of use. A study comparing those with shoulder pain in whom a diagnosis could not be reached observed no significant difference in application of intermittent or placebo ultrasound between the groups.[21] The effects of rehabilitation programs have been studied in back, knee, shoulder and neck pain, and only in calcifying tendonitis has therapeutic ultrasound been found to have any effect. [22] Another study that researched the effect of intermittent versus placebo ultrasound in calcifying tendonitis found statistically significant improvement in the intermittent ultrasound group.[23] In a study of patients with shoulder soft tissue injury in whom a definitive diagnosis could not be reached, the effects of placebo and continuous ultrasound were compared and found to be ineffective.[24] Ultrasound use has been studied in subacromial bursitis as an addition to ROM exercises and NSAID use; a difference was observed in placebo versus continuous ultrasound.[25] A review investigating the therapeutic effects of ultrasound found that active ultrasound was more effective than placebo ultrasound in diseases of the musculoskeletal system and soft tissue, and that it had a greater effect than ROM.[9]. In other reviews of the effect of ultrasound on diseases of the musculoskeletal system, clinical use of ultrasound was not found to be statistically significant [26], or the conclusion was reached that intermittent ultrasound had a greater effect.[9] In our study, the standard dose for intermittent ultrasound applied densely over the shoulder area was used. Problems with previous studies include: insufficient placebo or control groups, insufficient blind studies, insufficient definition of treatment types, inappropriate dosage, length, type of device cap, treatment area, delivery rate and frequency of the apparatus. [27] We planned the study with the aim of addressing points such as these. In our study, both groups were put on the same exercise program, TENS and ice. Intermittent ultrasound and placebo ultrasound were both targeted at the same area of the supraspinatus. As a result, the standard exercise program used in the conservative therapy of SIS was found to have an effect independent of the intermittent ultrasound. No difference was detected between the intermittent ultrasound and placebo ultrasound groups in freedom of movement, functional outcomes or pain immediately after therapy and six weeks later. The conclusion was reached that there is no need to add intermittent ultrasound to the standard treatment of patients with a diagnosis of SIS.

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