DOI: 10.5152/eurasianjmed.2018.17421

Manuscript Type: Original Article

Title: Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome

Authors: Ayhan Kul[1], Mahir Ugur[2]

Institutions: [1]Department of Physical Therapy and Rehabilitation, Ministry of Health Regional Training and Research Hospital, Erzurum, Turkey

[2]Department of Physical Therapy and Rehabilitation, Atatürk University School of Medicine, Erzurum, Turkey

Correspondence to: Ayhan Kul, drayhankul@gmail.com

You may cite this article as: Kul A, Ugur M. Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome. Eurasian J Med 2018; DOI: 10.5152/eurasianjmed.2018.17421

Objective: The aim of the present study was to compare the effectiveness of kinesio taping (KT) treatments and conventional physical therapy (PT) modalities that are applied to reduce pain and improve physical movements and functions of patients with subacromial impingement syndrome (SIS).

Materials and methods: Forty patients were randomly divided into two equal groups. The first group was assigned KT plus home exercise program (HEP) for 15 days. The second group was given 15 sessions of PT and HEP. Patients were assessed using active joint range of motion (ROM), Visual Analogue Scale (VAS; rest, movement, and night pain), the Society of the American Shoulder and Elbow Surgeons Evaluation (ASESS-100), Constant–Murley (C–M) scale, and Western Ontario Rotator Cuff (WORC) index at before and after treatment and at the end of the study (first month control visit).

Results: PT was found to be more effective than KT when these two treatment modalities were assessed based on ASESS-100, WORC index values, night pain, and movement pain. PT and KT treatments have similar effects in active ROM, rest pain, and C–M scale. At the end of the study, they were found to have similar effects except the night pain value. PT was found to be more effective for night pain than KT.

Conclusion: PT was concluded to be more effective after treatment. The application of KT does not appear to be an alternative treatment method for SIS, but it can provide a potential supportive care for SIS. However, the outcomes suggest that KT can provide a remarkable benefit.

Keywords: Impingement syndrome, kinesio taping, physical therapy

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as: Kul A, Ugur M. Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome. Eurasian J Med 2018; DOI: 10.5152/eurasianjmed.2018.17421

Introduction

Subacromial impingement syndrome (SIS) is the most common disorder of the shoulder, accounting for 44%–65% of all complaints of shoulder pain during a physician's office visit [1]. It is the most common cause of shoulder pain [2]. It encompasses a spectrum of subacromial space pathologies including partial thickness rotator cuff tears, rotator cuff tendinitis (RCT), calcific tendinitis, and subacromial bursitis [3]. Workers who continuously hold their arms in a horizontal position or higher, carpenters, and individuals who are involved with sports, such as swimming and throwing, comprise the risk group. Since it can cause a limitation in movement, as well as pain during rest, moving, and sleeping, SIS can pose serious problems in daily and working life [4]. The main consequences of SIS are functional loss and disability [3].

Conservative and surgical treatments are used to stop the inflammatory process, relieve pain, maintain joint mobility, and prevent the development of progressive degenerative changes in SIS. Conservative treatment methods include prevention, rest, medical treatment, steroid injections to the subacromial space, and various conventional methods of physical therapy (PT) and exercises, as well as kinesio taping (KT) application as a relatively novel method [4–5]. KT is used in SIS and RCT to reduce edema, relieve pain, and increase joint range of motion (ROM) and muscle activity [5]. These provide cost-effective outcomes and require less treatment time for both patient and physician. Previous studies showed conflicting results about the efficacy of KT, and it is not clear whether it is an alternative treatment or a supportive treatment when compared with conventional PT modalities (PT) [6–15].

In the present study, we aimed to compare the short-term efficacy between PT modalities plus home exercise program (HEP) and KT plus HEP in patients diagnosed with SIS stage 2 (supraspinatus tendinitis) or stage 3 (with partial rupture and without total rupture of the supraspinatus) according to Neer [16].

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as: Kul A, Ugur M. Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome. Eurasian J Med 2018; DOI: 10.5152/eurasianjmed.2018.17421

Materials and method

The study was prospectively designed and was conducted in a single center between June 2014 and June 2015. Patients were numbered according to their order of admission and were randomly assigned into one of the two groups until the number of the group is equal. The ethics committee of the Faculty of Medicine approved the study (approval no. 24.04.2014/5;4). All subjects were provided detailed information about the objective of the study and the procedures to be performed in accordance with the Declaration of Helsinki. Informed consents were obtained from all subjects before participating in the study. No analgesics were permitted (except paracetamol when needed) during the study. Paracetamol intake was also not allowed just before measurements.

Forty patients who were clinically (Neer, Hawkins, painful arc, drop arm, Yergason, supraspinatus, and active ROM tests were performed for clinical diagnosis) and radiologically (diagnosed by a radiologist on magnetic resonance imaging) diagnosed with SIS (who had supraspinatus tendinitis or partial supraspinatus rupture) were included in the study. Patients with cervical pathologies who were diagnosed with cervical and neurological examinations were excluded from the study. The first group (n=20), KT group (KTG), followed the HEP together with KT. The second group (n=20), PT modalities group (PTG), followed PT modalities together with the HEP treatment program. Patients were followed up by phone (two calls in 5 days interval, 6 times in total) to track their keeping to the exercises recommended. Thus, they were motivated to maintain the exercises, providing the required information.

Inclusion criteria were patients diagnosed with shoulder impingement syndrome (who had supraspinatus tendinitis or partial supraspinatus rupture), aged between 18 and 70 years, and able to comply with the treatment protocol.

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as: Kul A, Ugur M. Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome. Eurasian J Med 2018; DOI: 10.5152/eurasianjmed.2018.17421

Exclusion criteria were patients with a history of conservative PT in the shoulder area within the last 6 months, local steroid injection to the shoulder area within the last 3 months, and chronic steroid use; adhesive capsulitis, presence of bicipital tendinitis, total rupture in the supraspinatus or other rotator cuff muscles, and rotator cuff tendinitis; and with a history of shoulder joint surgery, systemic inflammatory disease that can affect the shoulder area, cervical radiculopathy, metabolic bone disease, and diabetes mellitus.

KT method

We applied taping to two muscles (deltoideus and supraspinatus). A "Y' tape was placed over the deltoid muscle using the muscle stimulation (KT strip arms were located by stretching slightly by 15%–25%) and mechanical correction techniques (KT strip arms were located with maximal stretching). Another "Y" tape was placed over the supraspinatus muscle using the muscle inhibition technique (the starting point of the tape was attached to the subacromial-greater tubercle with submaximal (75%) stretching and without stretching on strip arms). KT treatment was applied 3 times at 5-day intervals. Thus, KT strip remained on the shoulder for 15 days [5, 17]. In all applications, the last 3–5 cm of the arms of the tapes was attached without stretching. An additional HEP was given to all patients who underwent KT treatment (Fig. 1).

Patient and treatment groups

The space and lymphatic correction techniques that were described by Kase were used [5]. The increased space is believed to reduce pressure by lifting the skin. By lymphatic correction technique, KT decreases the pressure under the KT strip that acts as channels to direct the exudates to the nearest lymph duct. This technique also helps to maintain the scapula-thoracic stability by mechanical correction [5]. Superficial warming (Hot-Pack; H-P) on the shoulder region first regulates circulation, provides local feeding, and frequently helps recovery [4]. Ultrasound (US), used as a deep warmer, stops pain and soft tissue inflammations particularly muscle spasm and has an anti-inflammatory effect [18]. Transcutaneous electrical nerve stimulation (TENS) is suggested for reduce pain from the early periods

[19]. In addition, it has been shown that exercise has an effect on RCT and has a long-term effect on it [20].

In our study, an “HEP” was given to the KTG that consists of ROM, Codman, and stretching (posterior capsule) and strengthening (isometric) exercises. Patients, in addition to the 15-day standard of care recommended by Kase et al. [5], were asked to follow the exercise routine 3 times a day and to repeat each exercise 10 times. On the other hand, PTG patients were asked to follow a daily program that consists of applying H-P for 20 min, TENS for 30 min, and US with settings of 1 MHz and 1 W/cm^2 for 10 min in a continuous mode on the painful shoulder and in a circular style, as well as HEP similar to the one assigned to the other group.

Assessment

In SIS, restrictions occur in active shoulder ROM measurements, especially during abduction and internal rotation. Since shoulder movements in this direction will increase compression and pain, patients avoid moving their arms [21]. Therefore, we examined the ROM values during active flexion, abduction, and internal rotation. Pain levels of patients were evaluated during resting, activity, and night through the Visual Analogue Scale (0–10 score).

The Society of the American Shoulder and Elbow Surgeons Evaluation (ASESS-100) form is used for the evaluation of shoulder functions and includes two parts: shoulder pain scaled using VAS and 10 parameters that evaluate shoulder functions, each parameter ranged from 0 to 4 points. These parameters include back pocket, perineal care, combing hair, carrying 5–7.5 kg while the arms are on the sides, putting on, sleeping on the side of the affected arm, using hand above head, throwing, doing daily duties, and doing familiar sports. In each parameter, scores are categorized as 0 point for incapability, 1 point for doing with help, 2 points for doing with difficulty, 3 points for slightly affected, and 4 points doing normal. The accumulated results multiplied by 1.25 and function score are calculated [22].

The Constant Score was developed as a scoring system to evaluate the overall functionality of patients with shoulder disorders. This 100-point scoring system consists of four variables: (1) pain, (2) daily activities, (3) ROM, and (4) strength. It evaluates pain and daily activities subjectively, whereas ROM and strength are assessed objectively. Higher scores indicate better shoulder function [23].

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as: Kul A, Ugur M. Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome. Eurasian J Med 2018; DOI: 10.5152/eurasianjmed.2018.17421

Western Ontario Rotator Cuff (WORC) index is a functional test that is used for rotator cuff disease. It is an evaluation system that measures life quality and includes 5 parts and 21 questions. Each question is scored with the scale of 0–100 mm. Patients' total score ranges from 0 to 2100. Zero is the best score, and 2100 is the worst score. Turkish validity and reliability of WORC index and C–M scale were proven, which were used as functional assessment scales in previous studies [24–25]. Holtby et al. [26] used the C–M scale, ASESS-100, and WORC index form values to assess patients with shoulder pain functionally and reported a good correlation between them [26].

In our study, patients were assessed based on the pre-treatment (T1), post-treatment (T2), and end-of-study (T3: post-treatment 1 month follow-up) active ROM (flexion, abduction, and internal rotation), pain (rest, activity, and nocturnal), and function scores. A goniometer was used to measure ROM; VAS was used for rest, activity, and nocturnal pain; ASESS-100, C–M scale, and WORC index values were used for functional measurements. KT and assessments were performed by the same person.

Statistical analysis

The SPSS software v21 was used to analyze data. Data were expressed as number, percentage, median, mean, and standard deviation. Conformance of the groups to a normal distribution was analyzed by using the Kolmogorov–Smirnov test. Categorical variables were analyzed using the chi-square and Fisher's exact tests, and differences between the two measurements in both groups and quantitative variables were analyzed using the Mann–Whitney U test.

In cases when there was a difference between the first, second, and third measurements of the groups, the Friedman test was used. In the analysis using the Friedman test, Bonferroni correction was applied to determine the group from which the difference had originated, and Wilcoxon signed-rank test was used for pairwise comparisons. In this test, the significance level (p/the number of pairwise comparisons=p/3) was accepted as $p<0.017$. For the analyses other than this test, the significance level was considered as $p<0.05$.

Results

A total of 40 patients were included in our study. The demographic, clinical, and radiological characteristics of the patients were shown in Table 1, and the T1 results were shown in Table 2. There was no significant difference between the demographic, clinical, and radiological characteristics shown in Table 1. All values except for T1 VAS—nocturnal pain ($p<0.05$) were homogeneous between the two groups, with no significant difference in between (Table 2). No side effects were observed neither during the treatment periods nor in the following periods. All patients complied with the treatment protocol.

A significant improvement was observed in all variables in the PT group ($p<0.001$) at T2. Significant improvements were also observed in shoulder abduction ROM ($p<0.05$), nocturnal pain ($p<0.05$), C–M scale ($p<0.01$), and WORC index ($p<0.001$) at T3 (Table 3).

A significant improvement was observed in all values in the KT group ($p<0.001$) at T2. Significant improvements continued in rest pain ($p<0.01$), activity pain ($p<0.05$), nocturnal pain ($p<0.01$), ASESS-100 ($p<0.01$), C–M scale ($p<0.05$), and WORC index ($p<0.05$) at T3 (Table 3).

For both treatment methods, improvements were observed at T3 compared with T1 in the shoulder active ROM ($p<0.001$), VAS—rest pain, activity pain, and nocturnal pain severity ($p<0.001$), ASESS-100, C–M scale, and WORC index values used to assess shoulder functions ($p<0.001$) (Table 3).

When the groups were compared, it was found that PT was more effective than KT regarding the end-of-treatment VAS activity pain ($p<0.05$), nocturnal pain ($p<0.01$), ASESS-100 ($p<0.01$), and WORC index ($p<0.01$) values compared with the T1 values. Moreover, it was observed that significant improvements in favor of PT continued in the rest pain ($p<0.05$) and ASESS-100 ($p<0.05$) values from the end of the treatment until T3. In conclusion, it was found that PT was effective only in the nocturnal pain values ($p<0.05$) at T3 compared with T1 ($p<0.05$) (Table 4). In other parameters, no significant differences were found between the groups at the end of the treatment and T3 (Table 4).

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as: Kul A, Ugur M. Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome. Eurasian J Med 2018; DOI: 10.5152/eurasianjmed.2018.17421

Discussion

KT is a relatively new technique used in rehabilitation programs. Although it has been commonly used in orthopedic and sports settings, it is increasingly becoming an adjunct treatment option for other musculoskeletal impairments. It can strengthen weakened muscles, control joint instability, assist postural alignment, and relax overused muscles. Various authors have previously reported improvements in ROM, pain, and function by KT [6–12]. Some studies have shown that KT in SIS relieves pain and increases ROM, especially during the early period. This was considered to be an important advantage since the exercise performance will also improve [5, 6, 11]. Dong et al. [11] conducted a review and network meta-analysis study on SIS treatments. The results of the study demonstrated that exercise and exercise-based treatments including KT are ideal treatments for patients at the early stage of SIS. In addition, Frazier et al. [6] observed positive results with KT in the parameters of shoulder pain, function, and disability in all patients diagnosed with shoulder pain, SIS, rotator cuff tear, or acromioplasty and found that KT may be an adjunct to an extensive PT program.

The physiological mechanisms of decreasing pain and disability by KT can be explained as pain modulation via gate control or guidance of the shoulder through an arc of improved glenohumeral motion, reducing mechanical irritation of the involved soft tissue structures. These effects can be derived from supporting periarticular structures as well as reducing soft tissue inflammation and pain by KT [27–29]. Through its effect on the sensorimotor and proprioceptive systems, KT can assist in postural trunk and scapula alignment and support weak rotator cuff muscles [30].

Our results showed a significant recovery in both groups with all variations at T2. Our results also showed that KT application has similar effects to PT for the variations of active ROM, resting pain, and C–M scale values in the T2 evaluation. In the T3 evaluation, KT showed similar effects to PT for all variations except night pain.

Kaya et al. [12] applied KT every 3 days (3 times in total), performed a 2-week treatment program consisting of PT modalities (H-P, US, and TENS), and compared disability and pain in shoulder SIS. Kaya et al. found that kinesiology taping shows a significant effect on pain at the end of the first week; however, similar improvements are observed regarding pain and disability in both groups at the end of the second week. When compared with the PT program, this early pain relief effect observed with KT has been found to be an important advantage since it would also increase exercise performance. In conclusion, it was stated that kinesiology taping may be an alternative treatment option in shoulder SIS and suitable for use, especially when an immediate effect is expected. On the other hand, we think that KT can be a supplementary therapy, not an alternative therapy, especially when fast effect is demanded since we found that KT values are not superior to FT, and KT values of night pain, activity pain, ASESS-100, and WORC index are less efficient than FT values at T2.

On the other hand, findings of some studies are contrary to our findings. Saracoglu et al. [13] conducted a systematic review study to assess the application of any kind of KT in patients with SIS together with PT in comparison with physical treatment alone. The study concluded that the efficacy of taping as an alternative therapy is inconsistent and weak in improving pain, disability, ROM, and muscle strength. The results of the study also showed that clinical taping can be used as an optional method, especially at the early stage of treatment in addition to PT interventions (e.g., exercise, electrotherapy, and manual therapy), and that more effective, placebo-controlled and consistent studies are needed to prove whether it is more effective than physiotherapy interventions without taping. Thelen et al. [14] also investigated the efficacy of kinesiology taping in terms of pain, disability, and painless active ROM in patients with SIS or RCT of the shoulder. It has been reported that KT in young and active patients who were diagnosed with shoulder SIS may have contributed to an improvement in painless active abduction movement; however, it was not found to be more effective than placebo tape in terms of shoulder pain and disability parameters in the long term. Kocyigit et al. [15] suggested that KT and sham taping produce similar results in pain and C–M scores.

The difference of our results between the aforementioned studies might be due to the exclusion of patients with total rupture, the obedience of the patients to regular exercises, and changing daily routine activities as well as placebo effect or self-healing. These factors might play a role in the decrease of shoulder pain, causing recovery in ROM values and functional indexes.

One important difference of KT from PT modalities is the frequency and duration of application. As we preferred to use in our study, local modalities have been applied daily for 3 weeks, whereas KT has been applied 3 times during the same period and has been demonstrated to provide a significant benefit in the treatment. Less frequent visits and potential improvements of economic outcome should also be considered. The limitation of the present study is the absence of groups in which KT is used alone, with PT, or sham taping is performed.

Based on our study, the results revealed that conventional PT modalities are effective methods in the treatment of SIS, PT modalities being more effective during the early period. KT application, which is a new method, is not an alternative treatment but may be a good supportive treatment especially during the early period. However, their similar end-of-the-study efficacies demonstrated that KT application provides a considerable benefit in the treatment.

References

1. Van der Windt DA, Koes BW, de Jong BA, Bouter LM. Shoulder disorders in general practice: incidence, patient characteristics and management. Ann Rheum Dis 1995; 54:959–64.

2. Pribicevic M, Pollard H. Rotator cuff impingement. J Manipulative Physiol Ther 2004; 27 (9):580-90.

3. Koester MC, George MS, Kuhn JE. Shoulder impingement syndrome. Am J Med 2005; 118:452–55.

4. Hawkins RJ, Abrams JS. Impingement syndrome in the absence of rotator cuff tear (stages 1 and 2). Orthop Clin North Am 1987; 18 (3):373-82.

5. Kase K, Wallis J, Kase T. Clinical therapeutic applications of the kinesio taping method. Ken Ikai Co. Ltd. KIC, Tokyo, Japan; 2003.

6. Frazier S, Whitman J, Smith M Utilization of kinesio tex tape in patients with shoulder pain or dysfunction: a case series. Advanced Healing 2006; Summer: 18–20.

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as: Kul A, Ugur M. Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome. Eurasian J Med 2018; DOI: 10.5152/eurasianjmed.2018.17421

7. Şimşek HH, Balki S, Keklik SS, Öztürk H, Elden H. Does Kinesio taping in addition to exercise therapy improve the outcomes in subacromial impingement syndrome? A randomized, double-blind, controlled clinical trial. Acta Orthop Traumatol Turc 2013; 47 (2): 104-10.

8. Göksu H, Tuncay F, Borman P The comparative efficacy of kinesio taping and local injection therapy in patients with subacromial impingement syndrome. Acta Orthop Traumatol Turc 2016; Oct 50 (5):483-88.

9. Hsu YH, Chen WY, Lin HC, Wang WT, Shih YF. The effects of taping on scapular kinematics and muscle performance in baseball players with shoulder impingement syndrome. J Electromyogr Kinesiol 2009; 19(6): 1092-99.

10. Harput G, Guney H, Toprak U, Colakoglu F, Baltaci G. Acute effects of scapular Kinesio Taping® on shoulder rotator strength, ROM and acromiohumeral distance in asymptomatic overhead athletes. J Sports Med Phys Fitness 2017; Nov 57 (11): 1479-85.

11. Dong W, Goost H, Lin XB, et al. Treatments for shoulder impingement syndrome: a PRISMA systematic review and network meta-analysis. Medicine (Baltimore) 2015; Mar 94(10): e510.

12. Kaya E, Zinnuroglu M, Tugcu I. Kinesio taping compared to physical therapy modalities for the treatment of shoulder impingement syndrome. Clin Rheumatol 2011; 30(2): 201-07.

13. Saracoglu I, Emuk Y, Taspinar F. Does taping in addition to physiotherapy improve the outcomes in subacromial impingement syndrome? A systematic review. Physiother Theory Pract 2017; Nov 7:1-13.

14. Thelen MD, Dauber JA, Stoneman PD. The clinical efficacy of kinesio tape for shoulder pain: a randomized, double-blinded, clinical trial. J Orthop Sports Phys Ther 2008; 38 (7): 389-95.

15. Kocyigit F, Acar M, Turkmen MB, Kose T, Guldane N, Kuyucu E. Kinesio taping or just taping in shoulder subacromial impingement syndrome? A randomized, double-blind, placebo-controlled trial. Physiother Theory Pract 2016; Oct 32(7): 501-08.

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as: Kul A, Ugur M. Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome. Eurasian J Med 2018; DOI: 10.5152/eurasianjmed.2018.17421

16. Neer CS. İmpingement lesions. Clinical Orthopaedics and Related Research 1983; 173: 70-77.

17. Pekyavas NO, Baltaci G. Short-term effects of high-intensity laser therapy, manual therapy, and Kinesio taping in patients with subacromial impingement syndrome. Lasers Med Sci 2016; Aug 31(6):1133-41.

18. Lehmann FJ, de Lateur BJ. Therapeutic Heat. In: Lehmann JF (Ed.), Therapeutic heat and cold. Williams ana Wilkins; Baltimore: 1990. pp. 417-581.

19. Walsh DM, Howe TE, Johnson MI, Sluka KA. Transcutaneous electrical nerve stimulation for acute pain. Cochrane Database Syst Rev 2009.

20. Kuhn JE. Exercise in the treatment of rotator cuff impingement: a systematic review and a synthesized evidence based rehabilitation protocol. J Shoulder Elbow Surg 2009; 18: 138-60.

21. Neviaser RJ. Lesions of the biceps and tendinitis of the shoulder. Orthop Clin North Am 1980; 11(2):343-48.

22. Richards RR, An KN, Bigliani LU et al. A standardized method for the assessment of shoulder function: J Shoulder Elbow Surg; 347-52.

23. Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. Clin Orthop 1987; 214: 160-164.

24. El Ö, Bircan C, Gulbahar S et al. The reliability and validity of the Turkish version of the Western Ontario Rotator Cuff Index. Rheumatol Int 2006; 26: 1101–1108.

25. Çelik D, Turkish version of the modified Constant-Murley score and standardized test protocol: reliability and validity Correspondence: Acta Orthop Traumatol Turc 2016; 50 (1): 69–75.

26. Holtby R, Razmjou H. Measurement properties of the Western Ontario rotator cuff outcome measure: a preliminary report. J Shoulder Elbow Surg 2005; 14 (5):506-10.

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as: Kul A, Ugur M. Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome. Eurasian J Med 2018; DOI: 10.5152/eurasianjmed.2018.17421

27. Camargo PR, Haik MN, Ludewig PM, Filho RB, Mattiello-Rosa SM, Salvini TF. Effects of strengthening and stretching exercises applied during working hours on pain and physical impairment in workers with subacromial impingement syndrome. Physiother Theory Pract. 2009; 25: 463e475.

28. Khan Y, Nagy MT, Mala J, Waseem M. The painful shoulder: shoulder impingement syndrome. Open Orthop J 2013; 6e7:347e351.

29. Canaghan PG. Steroid injection and regular shoulder specific exercises reduce the need for surgery in subacromial impingement syndrome. Evid Based Med 2013; 18:e3.

30. Djordevic OC, Vukicevic D, Katunac L, Jovic S. Mobilization with movement and kinesiotaping compared with a supervised exercise program for painful shoulder: results of a clinical trial. J Manipulative Physiol Ther 2012; 35: 454e463.

Fig. 1. The final appearance of the attached kinesio tapes (side view of the shoulder).

Table 1. Demographic, clinical, and radiological characteristics of the groups and their comparisons.

	PTG	KTG	p
Age (years)–mean (SD)	54.8 (8.2)	49.6 (10.1)	ns
BMI (kg/m^2)–mean (SD)	31.7 (4.5)	31.2 (5.3)	ns
Duration of pain (months)–mean (SD)	12.6 (11)	18.5 (19.4)	ns
Gender (male/female)	7/13	3/17	ns
Dominant side (right/left)	18/2	17/3	ns
Patient side (right/left)	15/5	11/9	ns

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as: Kul A, Ugur M. Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome. Eurasian J Med 2018; DOI: 10.5152/eurasianjmed.2018.17421

Acromion type (Type 1/Type 2/Type 3)	7/10/3	7/13/0	ns
Pathological types (tendinitis/partial rupture)	8/12	7/13	ns

PTG: physical therapy modalities group, KTG: kinesio taping group, BMI: body mass index, SD: standard deviation, $p<0.05$: statistically significant difference between the groups, ns: not significant.

95% confidence interval, α=0.05.

Table 2. Comparison of T1 results between the groups.

	PTG Mean (SD)	KTG Mean (SD)
Active ROM		
Flexion	137 (20.6)	143 (23.6)
Abduction	124 (29.5)	132 (29.1)
Internal rotation	47.5 (9.6)	50 (10.9)
VAS		
Rest pain	3.65 (1.8)	4 (0)
Movement pain	7.95 (1.7)	7.45 (1.3)
Night pain	7.55 (2.1)	6.45 (1.9)*
ASESS-100	40.4 (20.9)	49.3 (17)
C–M scale	65.3 (18.9)	59.2 (21)
WORC index	1246.5 (253.5)	1288.5 (293)

T1: pre-treatment, ROM: range of motion, PTG: physical therapy modalities group, KTG: kinesio taping group, SD: standard deviation, VAS: Visual Analogue Scale, ASESS-100: Society of the American Shoulder and Elbow Surgeons Evaluation, C–M: Constant–Murley, WORC index: Western Ontario Rotator Cuff index.

*p<0.05: Statistically significant difference between the groups.

95% confidence interval, α=0.05.

Table 3. Intra-group comparisons of T1, T2, and T3 mean values for both groups.

		T1 Mean (SD)	T2 Mean (SD)	T3 Mean (SD)
Active ROM				
Flexion	PTG	137 (20)	164 (23)$^{\alpha(***)}$	166 (19)$^{\gamma(***)}$
	KTG	143 (23)	165 (17)$^{\alpha(***)}$	168 (19)$^{\gamma(***)}$
Abduction	PTG	124 (29)	154 (29)$^{\alpha(***)}$	160 (21)$^{\beta(*)\ \gamma(***)}$
	KTG	132 (29)	161 (20)$^{\alpha(***)}$	164 (23)$^{\gamma(***)}$
Internal rotation	PTG	47 (9)	61 (9)$^{\alpha(***)}$	64 (6)$^{\gamma(***)}$
	KTG	50 (10)	64 (6)$^{\alpha(***)}$	66 (6)$^{\gamma(***)}$
VAS				
Rest pain	PTG	3.65 (1.78)	0.25 (0.63)$^{\alpha(***)}$	0.25 (0.63)$^{\gamma(***)}$
	KTG	4.00 (0.00)	0.85 (0.81)$^{\alpha(***)}$	0.20 (0.52)$^{\beta(**)\gamma(***)}$
Movement pain	PTG	7.95 (1.66)	1.95 (2.03)$^{\alpha(***)}$	1.40 (1.72)$^{\gamma(***)}$
	KTG	7.45 (1.27)	3 (1.89)$^{\alpha(***)}$	1.80 (2.30)$^{\beta(*)\gamma(***)}$
Night pain	PTG	7.55 (2.08)	1.4 (1.63)$^{\alpha(***)}$	0.85 (1.30)$^{\beta(*)\gamma(***)}$
	KTG	6.45 (1.93)	2.85 (2.25)$^{\alpha(***)}$	1.50 (1.93)$^{\beta(**)\gamma(***)}$

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as: Kul A, Ugur M. Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome. Eurasian J Med 2018; DOI: 10.5152/eurasianjmed.2018.17421

ASESS-100	PTG	40.4 (20.9)	85.9 (15.5)$^{\alpha(***)}$	89.0 (15.0)$^{\gamma(***)}$
	KTG	49.3 (17.0)	74.0 (18.6)$^{\alpha(***)}$	86.5 (14.2)$^{\beta(**)\gamma(***)}$
C–M scale	PTG	65.2 (18.8)	84.1 (17.4)$^{\alpha(***)}$	88.7 (14.4)$^{\beta(**)\gamma(***)}$
	KTG	59.1 (21.0)	82.9 (18.2)$^{\alpha(***)}$	88.4 (15.5)$^{\beta(*)\gamma(***)}$
WORC index	PTG	1246 (253)	392 (334)$^{\alpha(***)}$	255 (302)$^{\beta(***)\gamma(***)}$
	KTG	1288 (292)	618 (315)$^{\alpha(***)}$	463 (346)$^{\beta(*)\gamma(***)}$

ROM: range of motion, PTG: physical therapy modalities group, KTG: kinesio taping group, T1: pre-treatment, T2: post-treatment, T3: post-treatment 1 month follow-up, SD: standard deviation, VAS: Visual Analogue Scale, ASESS-100: Society of the American Shoulder and Elbow Surgeons Evaluation, C–M: Constant–Murley, WORC index: Western Ontario Rotator Cuff index.

95% confidence interval, α=0.05.

*p<0.05, **p<0.01, ***p<0.001. α: comparison of T1–T2, β: comparison of T2–T3, γ: comparison of T1–T3.

Table 4. Comparisons of the parameters of both groups at T1, T2, and T3.

	PTG Mean (SD)			KTG Mean (SD)		
	T1–T2	T2–T3	T1–T3	T1–T2	T2–T3	T1–T3
Active ROM						
Flexion	26 (9.6)	2.2 (14)	29 (11)	22 (13)	2.2 (6.9)	24 (13)
Abduction	30.7 (15.5)	5.7 (10.1)	36.5 (16.9)	29.7 (18.1)	3.0 (11.8)	32.7 (20.4)

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as: Kul A, Ugur M. Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome. Eurasian J Med 2018; DOI: 10.5152/eurasianjmed.2018.17421

Internal rotation	13.7 (8.5)	2.7 (7.8)	16.5 (8.7)	14.0 (11.1)	1.7 (6.3)	15.7 (11.7)
VAS pain gap						
Rest	3.40 (1.56)	0.00 (0.72)*	3.40 (1.78)	3.15 (0.81)	0.65 (0.87)	3.80 (0.52)
Movement	6.00 (1.97)*	0.55 (1.31)	6.55 (1.90)	4.45 (1.82)	1.20 (1.9)	5.65 (2.25)
Night	6.15 (2.00)**	0.55 (1.09)	6.70 (2.00)*	3.6 (2.03)	1.35 (1.87)	4.95 (2.3)
ASESS-100 value gap	45.5 (16.8)**	3.10 (10.9)*	48.6 (19.8)	24.6 (20.3)	12.5 (16.9)	37.2 (17.4)
C–M scale value gap	18.8 (9.27)	4.65 (7.40)	23.5 (11.3)	23.8 (15.8)	5.50 (9.12)	29.3 (16.5)
WORC index value gap	854 (265)*	137 (152)	991 (244)	670 (254)	154 (292)	825 (323)

ROM: range of motion, PTG: physical therapy modalities group, KTG: kinesio taping group, VAS: Visual Analogue Scale, ASESS-100: Society of the American Shoulder and Elbow Surgeons Evaluation, C–M: Constant–Murley, WORC index: Western Ontario Rotator Cuff index, SD: standard deviation.

*p<0.05, **p<0.01, ***p<0.001. 95% confidence interval, α=0.05.

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as: Kul A, Ugur M. Comparison of the Efficacy of Conventional Physical Therapy Modalities and Kinesio Taping Treatments in Shoulder Impingement Syndrome. Eurasian J Med 2018; DOI: 10.5152/eurasianjmed.2018.17421