The Effect of Kinesio Taping in Reducing Myofascial Pain Syndrome on the Upper Trapezius Muscle: A Systematic Review and Meta-Analysis

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Doi: 10.19044/esj.2018.v14n6p336 URL:http://dx.doi.org/10.19044/esj.2018.v14n6p336

Abstract

Background: Myofascial Pain Syndrome is a condition causing pain at myofascial trigger points. Kinesio Taping has been widely used to decrease pain and improve range of motion. **Objective:** The purpose of this systematic review and meta-analysis was to evaluate the effectiveness of therapeutic programs that include kinesio taping on reducing myofascial pain syndrome symptoms. **Methods:** Independent research was performed for legit studies using the following electronic databases: PubMed, CINAHL, MEDLINE, SPORT Discus, EM base, and Cochrane Central Register of Controlled Trials, from February 2017 to March 2017. The keywords were "keniso tape myofascial" AND "taping myofascial" AND "myofascial pain Syndrome" AND "myofascial trigger points." The research resulted in 5,793 articles that eventually included 6 articles that had met the inclusion and exclusion criteria, and the data extracted data from the articles was about the pain severity, and was measured by Visual Analog Scale (VAS). **Results:** The collected data was pooled from the results of 256 subjects (199 females and 57 males). Using KT showed improvement but not significant statistically in three of the analyzed studies, and the remaining three studies showed a statistical significant reduction in VAS score. The overall P value that computed by the

Comprehensive Meta-Analysis 2.0 software was statistically significant (P value= 0.001) between the KT group and the control group. **Conclusion:** This systematic review and meta-analysis was performed on six studies in regarding to the efficacy of KT on the myofascial pain in the upper trapezius muscle. The meta-analysis suggests KT with other therapeutic protocols to treat myofascial pain syndrome and increase cervical range of motion as well as the functional activities.

Keywords: Myofascial Pain Syndrome, Kinesio Taping

Introduction

Myofascial pain syndrome (MPS) is a condition causing pain at myofascial trigger points (MTrPs). MPS might present independently or concomitant with other muscular conditions.[1] MTrPs are supremely sensitive spots to palpation in the skeletal muscles and appear to be the most common cause of pain in clinical practice.[2]

MPS is deemed to be an extremely painful condition of the musculoskeletal system and different from other chronic pain conditions. Chronic pain conditions are more common in females, though both males and females are susceptible to develop MPS.[1] additionally; symptoms of MTrPs include taut bands in the muscles, weakness or tenderness at the affected spot, radial or reproduced pain, limited range of motion (ROM), and/or hot and red skin.[3]

Diagnosis of MPS can be confirmed via a medical history and physical examination, and is readily identified by palpation on the suspected area. MPS is a common condition characterized by either primary or secondary pain and eventually leads to muscle spasm, restricted ROM, and functional limitations.[1, 4, 5]

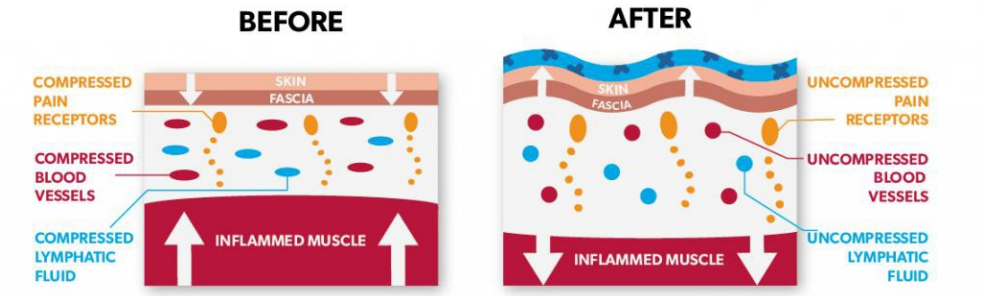
MPS may be either an acute or chronic condition. Pain in acute and chronic conditions is similarly characterized by a dull deep aching discomfort or pain that is difficult to be localized and broadly distributed. Also, sharp and stabbing pain may not be present with MTrPs.[4] In some instances; MPS symptoms mimic those of radiculopathy.[1, 4-6]

Treatment of MPS common includes pain control and ROM enhancement governed by medications, splints, and physical therapy approaches. Medication options include painkillers, anti-depressants, or anti-epileptics. Physical therapy options include ischemic compression, stretching techniques, manual therapy techniques, dry needling, electro therapy modalities, and taping.[4, 5]

In the 1970s, a Japanese chiropractor, Kenzo Kase, developed Kinesiology Tape (KT), an adhesive tape with unique stretchable characteristics rendering it easy to be worn on the skin without restricting

movement. KT is made from a thin elastic adhesive material that can be stretched from 120-140% creating a dynamic flexible tape that can simulate the human skin.[7,8]

Theoretically, KT treatment is based on the function of lifting the skin from the soft tissue beneath which increases the space between skin and muscle and therefore encourages blood flow and lymphatic drainage. Also, applying KT on the skin may alter the excitatory functions of the central nervous system. Therefore, KT can be used to control pain and manage muscular activities as well as improve ROM (Figure 1).[8-10]



Picture from: http://themassageroom.blogspot.com/2015/12/2015-courses-attended-kinesio-taping.html

Figure 1: Illustration of the lifting effect of Kinesio Taping on the skin

KT is mostly administered in sports injuries for preventive and treatment goals creating dynamic forces which can be governed by the therapist guiding the movement towards the desired direction. KT has increasingly been used by therapists after first seen used in the Seoul Olympics in 1988. KT has evolved to be used therapeutically in a myriad of practice areas including pediatrics, neurology, osteopathy, and many other fields.[9-12]

Wu, et al.[13] and his colleagues reviewed the effectiveness of KT on treating myofascial pain. In their review they discussed a plethora of options in assuaging pain and other symptoms caused by MPS including isometric exercises, deep friction massage, and KT as a new method of MPS management. Additionally, they attributed origin of KT to the traditional athletic non-elastic tape. They also introduced KT application principles based on findings of previous researches.

Mense, et al.[14] reported that continuous stimulation of sensory receptors from muscles leads to neuropathic alteration in the posterior horn of the spinal cord that had been excited by MTrPs pain and eventually blocks the nerve ends causing a decline in the pain level. Kase, et al.[15], studied the effect of taping on blood circulation, and found that blood flow increases instantly after applying KT on the skin.

Based on the theoretical principles of MTrPs and on empirical outcomes of KT, the authors of this study decided to investigate the efficacy of KT to alleviate MPS symptoms on the upper trapezius muscle by completing a systematic review and meta-analysis of randomized controlled trials.

Methods

This systematic review and meta-analysis was performed following the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) [16].

Search Strategy

Independent research was performed by the examiners from February 2017 to March 2017 for studies that matched the eligibility criteria. The research was not restricted with a specific time line. A literature search was performed using different electronic databases including PubMed, CINAHL, MEDLINE, SPORTDiscus, EMbase, and Cochrane Central Register of Controlled Trials. The keywords used for the search were "keniso tape myofascial" AND "taping myofascial" AND "myofascial pain Syndrome" AND "myofascial trigger points."

Inclusion Criteria

Randomised Controlled Trials (RCTs) of treatment protocols that included using PRP in treating chronic plantar fasciitis were eligible. RCTs were included based on the following characteristics: (1) level I of evidence, (2) sample size was higher than 20 participants, (3) English full-text articles.

Exclusion Criteria

Studies were excluded if they: (1) did not qualify as an RCT, (2) were under peer review or accepted but not published, (3) were retrospective or cohort studies, (4) were observational studies, (5) were case reports, case studies, and/or cross sectional studies, or (6) did not provide statistical analysis before and after the intervention. (7) Included other kinetic segments of MPS.

Inclusion Procedure, Data Extraction, and Meta-Analysis

Inclusion Procedure

The initial search was performed by two examiners who ran the key words into the electronic databases and dismissed the redundant results. Articles that did not meet the inclusion criteria were dismissed from the search procedure. A third examiner evaluated the results and assured the search process. Also, reference lists of the chosen studies were introduced for more potential included results.

Data Extraction

Two examiners extracted information from the marked full text articles, and all the articles were in English language. Results data extracted from the articles were pain severity, and were measured by Visual Analog Scale (VAS).

Administration

Studies were saved and analysed using MAC OS Sierra software version 10.12.3. Also, initial findings of the studies were collected and extracted via Microsoft Excel 2016 preceding logging the information into the Meta-Analysis software.

Meta-Analysis

Collected data were logged and assessed using Comprehensive Meta-Analysis 2.0 software, and the significance was considered if $P < 0.05$. In case of the articles did not showed significant comparison between the intervention group (KT) and the controls, the comparison was computed by the system using t-tests based on the statistical information extracted at the base line and the last follow up. Later, statistical analysis was conducted on each article by calculating the *p* values of the differences between groups and eventually the overall *P* value was calculated.

Risk of Bias

The Cochrane Collaboration's Tool was used to determine the publication bias. A checklist consisting of 7-items based on box form was developed in 2005.[17] The Cochrane Collaboration's Tool categorizes articles as +, low risk of bias; -, high risk of bias; and ? un clear or unknown risk of bias.

Methodological Quality Measurement of Selected Research Studies

The examiners evaluated the methodological quality of each article using the Physiotherapy Evidenced Database (PEDro) scale. The PEDro scale consists of a 10-item checklist of "Yes" or "No" questions referring to the internal validity and parametric statistical information introduced. Items were scored as either present (1) or absent (0) and a score out of 10 is figured by compuatation.[18] A study scoring ≥ 7 is considered high quality, a study scoring 5-6 is considered fair quality, and a study score ≤ 4 is considered poor quality.[19]

Myofascial Pain Syndrome Definitions:

Myofascial pain syndrome (MPS) is a condition causes pain at the Myofascial Trigger Points (MTrPs) regions. MPS might present independently or concomitant with other muscular conditions.[1] MTrPs are

supremely sensitive spots to palpation in the skeletal muscles, and are appeared to be the most common inducement of pain in clinical practice.[1, 2]

Results:

Articles Stream

The search procedure generated 5,793 articles. Following exclusion of duplicates, 68 articles were reviewed based on the title and the abstract. The remaining results after applying the inclusion criteria were 9 full-text articles. The exclusion criteria permitted 6 articles which were qualified to the current analysis. Three articles excluded; two had loss of controls and one was conducted on more than one kinetic segment. Figure 2 illustrates the schematic structure of the analysed studies using PRISMA flow charts.

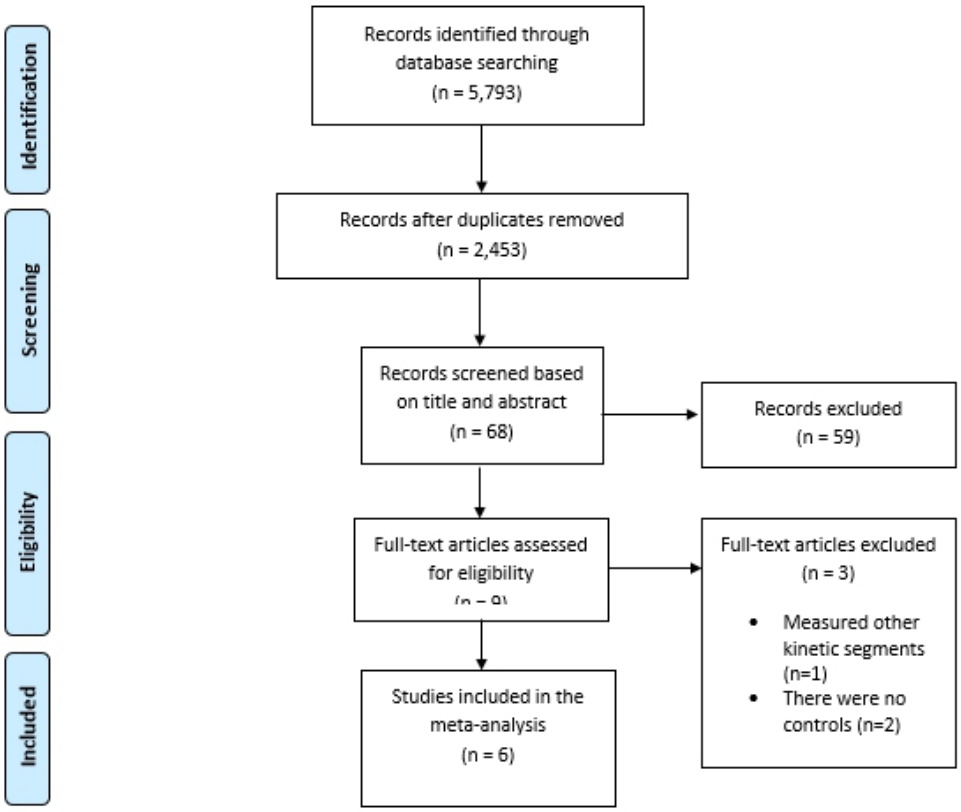


Figure 2: illustrate the schematic diagram of the articles flow and the remaining articles after applying inclusion and exclusion criteria

Baseline characteristics

All the analyzed articles were randomized controlled trials, and level I of evidence. The demographic distribution of the articles is presented based on the chronological order as the following: one study[20] was conducted in South Korea, one study[21] was conducted in Poland, one study[6] was conducted in Taiwan, and Three studies [22-24] were conducted in Turkey. All the studies included male and female subjects with total of 256 subjects who participated in the KT group and the control group without calculating the other comparative treatment participants. Besides, female to male ratio was about 3:1 (199 females and 57 males). All Studies performed in Physical therapy department either in a university[6,21,24] or in a hospital.[20,22,23] Furthermore, one study[20] used KT prior to stabilization exercise twice a week for four weeks, one study[21] used star shape KT primarily once for 3 days, one study[6] used Y-shaped KT as a primary intervention twice for 3 and four days sequentially, one study[22] used inhibition application technique using I strips KT twice for three days with 1 day rest in between, one study[23] used muscle technique with I strips KT in addition to stretching exercise consisting of 4 KT sessions during the treatment period, and one study[24] used I strips KT primarily five times by interval of three days .For the control group, there were three studies[21,22,24] used sham tape, one study[20] used stabilization exercise, one study[6] used manual pressure release, and one study[23] used trapezius stretching exercise. To assess the pain, all studies used Visual Analog Scale (VAS), and duration of treatment protocols escalated from 3 days to 3 months. Table 1 to summarize the baseline characteristics of the analyzed articles.

Table 1. Baseline characteristics of the analyzed articles.

Study	Year	Location	number of subjects n=, M/F	Duration	Intervention	Control	Quality
Lee et al	2012	South Korea	n=32, 7/25	4 weeks	Stabilization Exercise+ KT n=16	Stabilization Exercise n=16	5/10
Halski et al	2016	Poland	n=49, 4/45	3 days	KT n=25	Sham KT n=24	7/10
Chao et al	2016	Taiwan	n=31, 7/24	1 week	MPR + KT n=16	MPR + KT n=15	8/10
Ozturk et al	2016	Turkey	n=37, 9/28	1 month	KT n= 20	Sham KT n=17	7/10
Azatcam	2016	Turkey	n=46, 14/32	3 months	KT+ Exercise n=23	Exercise only n=23	7/10
Ay et al	2017	Turkey	n=61, 16/45	15 days	KT n=31	Sham KT n=30	7/10

Pain Severity Results

Pooled data of 256 subjects, the mean VAS score for the intervention group (KT group) at the base line was 6.55 and 2.83 after the last follow up compared to the score of the control groups which was 6.13 at the baseline and 3.22 after the last follow up (Table 2).

Table 2. Illustrate the VAS values and standard deviations pre-test and post-test for KT group and the control group.

	KT Group		Control Group	
Study	Pre- test	Post-test	Pre-test	Post-test
Lee. et al	7.31 ± 0.87	4.88 ± 1.36	7.06 ± 1.12	4.75 ± 1.69
Halski. et al	6.80 ± 1.80	5.20 ± 2.40	6.40 ± 1.60	4.90 ± 2.20
Chao. et al	5.96 ± 0.60	0.37 ± 0.81	5.07 ± 1.67	0.73 ± 0.88
Ozturk. et al	6.86 ± 1.87	2.64 ± 3.25	6.45 ± 1.19	2.60 ± 2.82
Azatcam. et al	7.39 ± 0.94	1.56 ± 0.94	7.21 ± 0.51	2.95 ± 0.97
Ay et. al	5.00 ± 2.00	2.35 ± 1.99	4.56 ± 2.17	3.93 ± 1.96

Meta-Analysis Results

The p values of the comparisons between KT groups and control groups illustrated in Table 3, and eventually overall p value was calculated (Fig 3&4). Studies[20-22] showed remarkable reduction in VAS score which means pain had reduced compared to the control groups; however, these scores reduction were nor statistically significant (*P* values were 0.801, 0.866, and 0.674 respectively). In contrast, the remaining three studies[6,23,24] showed significant reduction in VAS that infer a significant pain alleviation in comparison to the controls (*P* values were 0.004, 0.001, and 0.000 respectively). Overall, *P* value of all articles between the KT group and the control group was 0.001 which interprets the strong effect of KT on reducing MPS pain.

Risk of Bias

Cochrane Collaboration's Tool results revealed mild inequality, interpreting that the risk of bias might not be found in the analyzed articles. Table 3&4 illustrate the results of Cochrane Collaboration's Tool and the Pedro Scale results.

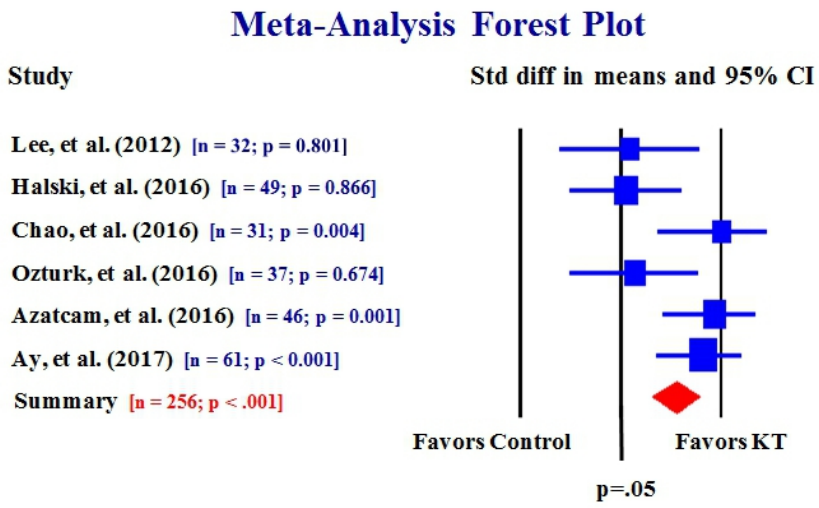


Figure 3: *P* values between intervention (KT) groups and control groups and the overall *P* value

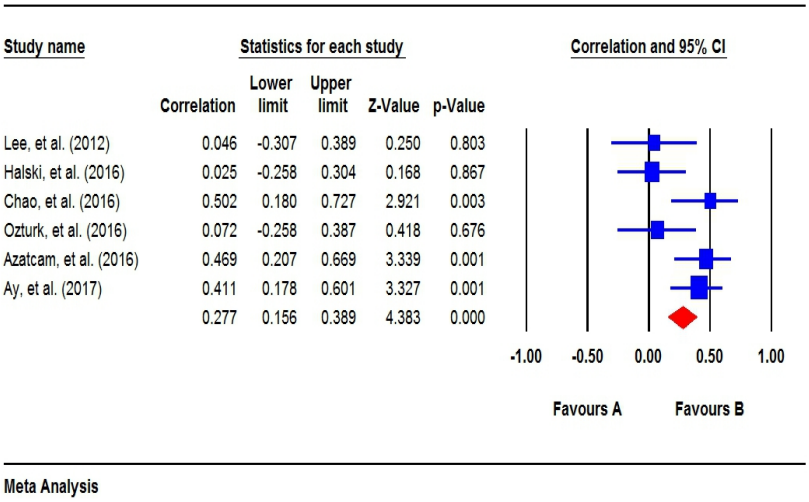


Figure 4: illustration of the statistics of the meta-analysis

Table 3: Data of Pedro Scale results:

Table 1. Pedro scoring of analyzed studies												
Study	2	3	4	5	6	7	8	9	10	11	Total score	Quality
Lee et al	Y	N	Y	N	N	N	Y	Y	N	Y	5.00/10.00	Fair
Halski et al	Y	N	Y	Y	N	N	Y	Y	Y	Y	7.00/10.00	High
Chao et al	Y	N	Y	Y	N	Y	Y	Y	Y	Y	8.00/10.00	High
Ozturk et al	Y	N	Y	Y	N	N	Y	Y	Y	Y	7.00/10.00	High
Azatcam et al	Y	N	Y	Y	N	N	Y	Y	Y	Y	7.00/10.00	High
Ay et al	Y	N	Y	Y	N	Y	N	Y	Y	Y	7.00/10.00	High
% of Y Per Criterion	100%	0%	100%	83.33%	0%	33.33%	83.33%	100%	83.33%	100%	Score Average: 6.83/10.00	

Criterion Satisfied; N= Criterion not satisfied

2. Random allocation to groups
3. Allocation was concealed
4. Similar group at base line regarding important prognostic indicators
5. Blinding of all subjects
6. Blinding of therapist who administrated the therapy
7. Blinding of all assessors who measured at least one key outcome
8. Measure of at least one outcome for more than 85% of subjects
9. All subjects received the intervention or "intention to treat" was stated
10. Between-group statistical comparison for at least one key outcome
11. Point measures and measures of variability for at least one key outcome

Table 4. Illustration of the Cochrane Collaboration's Tool results.

Study	1	2	3	4	5	6	7	8
Lee et al	+	-	-	-	-	+	+	-

Halski et al	+	-	+	-	-	+	+	-
Chao et al	+	-	+	-	+	+	+	?
Ozturk et al	+	-	+	-	-	+	+	?
Azatcam	+	-	+	-	-	+	+	?
Ay et al	+	-	+	-	-	+	+	+

(+), low risk of bias;(-), high risk of bias; (?), unknown risk of bias

1. Random sequence generation (selection bias)
2. Allocation concealment (selection bias)
3. Blinding of participant
4. Blinding of provider
5. Blinding of outcome assessment (selection bias)
6. incomplete outcome data (selection bias)
7. Selective reporting (selection bias)
8. other bias

Discussion

This is the first meta-analysis that evaluated the effect of Kinesio Tape (KT) on the myofascial pain on the upper trapezius muscle area. Our study included six Randomized controlled trials[6,20-24] implemented significant role of kinesio tape on assuaging myofascial pain in the upper trapezius region. Accordingly, using weather only KT or concomitant with other traditional exercise on the upper trapezius area decreases pain.

Latent Myofascial Trigger Point (MTrPs) is mostly concentrated in the upper trapezius region in the shoulder area[25,26]. Fischer[27] measured the muscle sensitivity to pain using pressure threshold meter on seven muscles around the shoulder joint, two muscles on the lumbar region, and on muscle in the hip joint. The results of his study confirmed that upper trapezius muscle is the most sensitive muscle to pain, and females are significantly more prone to MTrPs in the upper trapezius muscle than males.

Among the analyzed studies, there was not united application of the KT. Various taping techniques have been used to measure the effect of the KT on the MPS. The taping concept can be used for many purposes including muscular inhibition, ligament application, fascial application, lymphatic applications, and etc.[28-31] Besides, the tape characteristics are different among the available products. These factors might affect the results of using KT in decreasing pain; however, the proper technique should be performed after full examination to the affected muscle.

Moreover, three studies [20,23,24] examined the effect of KT on pain relief and the functional activity or disability level. In contrast, the remaining three studies[6,21,22] analyzed the effect of KT on reducing pain with other parameters. For instance, Chao et al[6] evaluated VAS, muscle stiffness, and

mechanomyography. However, comparing affected muscle with the sound muscle in the other side has not been done in neither analyzed study.

Wu et al[28] and his colleagues reviewed the effect of KT on myofascial pain, and refer the mechanism of KT in reducing pain to the other physical therapy interventions principles. So that, they hypothesized that KT reduces MTrPs through increasing the space between the inflamed fascial, and therefore two factors play role in alleviate pain. First, blood circulation improved to discard the heat elements from inflammation. Second, the pressure on nociceptors reduced on the inflamed area.

Aleksiev[32] used distinct technique by doing taping with post-isometric relaxation (PIR-taping) to evaluate its efficacy on treating myofascial pain. Interestingly, he highlighted the continuous effect of this technique because of the presence of taping. Also, he found that PIR-taping is more useful with children to achieve adequate muscle contraction. In some cases when voluntary contraction is necessary needed, PIR-taping is a recommended approach to avoid complications of those situations.

Strength and Limitations

This study included high standards randomized controlled studies and focused intervention on very specific illness. However, many restriction of this studies has been inferred after deep evaluation. Firstly, the articles declared the default KT wearing duration, but it is hard to detect the sustainability of the tape or if any peeling of the tape occurred. Secondly, using various taping technique had an effect on the comparative results of the studies. In other words, there was no formal technique to use in this specific diagnosis even though the goal was to increase space in the inflamed tissue, Thirdly, studies which used another intervention as a control (e.g., stretching exercise) contributed in the bias of measuring the true impact of the KT on the MPS. Using sham tape reveled more accurate values of the effect of the KT; however, the career ethics and adequate potential reasons for not doing these types of controls.

Directions for Future Studies

This study recommend conducting more RCTs on the effect of KT on the MPS pain in other kinematic regions to investigate its therapeutic efficacy. The basics of KT concept are relatively understandable and we can hypothesis from this study that KT can produce significant reduction in pain caused by MPS. However, to measure the accurate effect of KT in the future study, and since it easy to compare tape with sham tape, using sham tape as a control is strongly recommended.

Acknowledgment

This systematic review was performed under the supervision of the Rehabilitation Science Department at Concordia University Wisconsin, and with a direct supervision of the head of the department Dr. Theodor King. Additionally, the main other is a current certified taping practitioner approved by the Cure Tape©.

Conclusion

This systematic review and meta-analysis was performed on six studies in regarding to the efficacy of KT on the myofascial pain in the upper trapezius muscle. The meta-analysis confirmed the fact that using KT alone in this illness can assuage myofascial pain. In addition, Appling KT accompanied by exercises can generate greater decrease in pain and increase cervical range of motion as well as the functional activities. These results suggested that the KT is significantly efficacious in treating myofascial pain on the upper trapezius muscle with or without other therapeutic protocols.

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