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Evaluation of effectiveness of Kinesio taping on trigger points in masseter in patient with Myofascial Pain Syndrome-A Systematic Review

Dr. Lavanya MK, Dr. Santhosh Kumar, Dr. Arun M

Department of Oral and Maxillofacial Surgery, Saveetha Dental College and Hospital, Saveetha Institute of Medical and Technical Sciences, India

BACKGROUND: Myofascial pain syndrome is presented with multiple trigger or hyper irritable points , taut bands, localized or referred pain , muscle stiffness, reduced range of motion muscle weakness without atrophy and autonomic symptoms is a musculoskeletal disorder. Masticatory myofascial pain syndrome has multifactorial etiology which affects the quality of life of the patient. Both Invasive or non-invasive treatment modalities have been used for treating MPDS . Kinesio taping is one non-invasive treatment modality available.Kinesio tape (KT), an elastotherapetic tape was invented by Dr Kase in the 1970s which can stretch up to 140% of its original length used for treating myofascial trigger points. AIM: To gather evidence on effectiveness of Kinesio taping On trigger points in masseter in patient with Myofascial Pain Syndrome. MATERIALS AND METHODS: Pubmed/ Medline, Cochrane , web of science , scopus and Google scholar were comprehensively searched to identify relevant articles. Based on the inclusion criteria articles were included . The full text of the articles were read and data related to the research question was extracted. Risk of bias and quality assessment was carried using Rob 2 tool. RESULT: This systematic review includes 4 RCT's , comprehensively summarizing the effectiveness of kinesio taping in masseter for treatment of myofascial pain syndrome. Pre operative pain ranged from 6.50- 2.29 which shows statistically significant reduction in pain after 1 week of kinesio tape application to 3.10 -1.4 and after 6 weeks pain ranges from 1.6-1.04. Preoperative mouth opening ranged from 44.58 - 34.0 . Statistically significant improvement in mouth opening is observed , after. 1 week mouth opening ranged from 41-35.8 and after six weeks mouth opening ranged from 41.74 -37.3. CONCLUSION: This systematic review provides the latest evidence to statistically support the use of kinesio taping over other non-invasive treatment modalities for pain management , improving mouth opening and range of motion in myofascial pain syndrome.

Keywords: kinesio tape, myofascial pain syndrome, masticatory muscle, masseter, pain.

1. Introduction

Myofascial pain syndrome (MPDS) is a common musculoskeletal pain and dysfunction, characterized by chronic pain originating from muscle and surrounding fascia , presented

with multiple trigger or hyper irritable points , taut bands, localized or referred pain, low pressure pain threshold , muscle stiffness, reduced range of motion muscle weakness without atrophy and autonomic symptoms which affects quality of life of the patient and disturbs day to day activity.

Although the exact etiology for Myofascial pain syndrome is not known it is associated with common risk factors like traumatic factors, ergonomic factor (overuse of muscle , abnormal posture) structural factors (spondylosis, scoliosis, osteoarthritis) , systemic factors (hypothyroidism, vitamin D deficiency, iron deficiency) and psychological stress .

Main goal in treating MPDS is to gain muscle strength , flexibility and give symptomatic relief by decreasing pain , increasing mouth opening etc.., MPDS treatments are broadly divided into invasive and noninvasive techniques. Each patient needs multisector and specific care .

Kinesio tape (KT) introduced by Dr.Kase in the 1970s is an elastic-therapeutic bandage which can stretch up to 30–40% of their original length and allows greater mobility and skin traction , as well their properties like thickness, specific weight, and flexibility of the tapes are similar to epidermis which do not disturb day to day activities and also quality of life is improved [4, 5].

It is used in maxillofacial surgery for management of postoperative edema . Recently, KT has become popular for treating musculoskeletal conditions. It is effective in decreasing pain and muscular spasm, increasing the range of motion (ROM), improving local blood and lymph circulations, reducing edema, strengthening weakened muscles, controlling joint instability and postural alignment.

Traction produced by KT realigns joints , Pain is reduced by gate control mechanism, pressure on the mechanoreceptors which are located below the dermis by elevating epidermis reduces the nociceptive stimuli , it also improves blood and lymphatic flow .

KT aids in repairing damaged or weak muscle , accelerating recovery from musculoskeletal injuries , facilitates or inhibits activity of overused muscle , soft tissue support, improving joint alignment, increasing pain-free range of motion (ROM) , enhancing proprioception . It also gives symptomatic relief from headaches and sinus pain,reducing swelling and edema and manages lymphedema .

The aim of this Meta analysis is to evaluate effectiveness of Kinesio taping On trigger points in masseter in patients with Myofascial Pain Syndrome. 4 RCTs with low and moderate risk of bias were included in this study .

RESEARCH QUESTION:

Is kinesio taping in masseter muscle effective in giving symptomatic relief in patients with Myofascial Pain Syndrome compared to conventional treatment modalities ?

PICO ANALYSIS:

POPULATION: Patient diagnosed with myofascial pain syndrome

INTERVENTION: kinesio tape in masseter muscle

COMPARISON: Conventional treatment

OUTCOME: Pain intensity, Mouth opening, Range of motion

2. MATERIALS AND METHOD :

This systematic review and meta-analysis was conducted in accordance with the preferred reporting items for systematic reviews (PRISMA).

SEARCH STRATEGY :

The Databases of Pubmed, Cochrane, scopus , web of science and Google scholar searched using the search strategy . Potential eligible articles were screened to find additional relevant articles. Two reviewers assessed independently the full text of the included articles and data were extracted based on research questions.

Mesh term used were Myofascial pain or Temporomandibular disorder AND kinesio tape

Eligibility criteria

The randomized controlled trials and clinical trials studies in which patients with myofascial pain syndrome are treated by Kineso tape application in masseter and compared with conventional treatments to assess Pain intensity, Mouth opening, Range of motion .

Case reports / case series , Review articles , Animal studies ,In Vitro studies , Retrospective studies or Studies in which kinesio tape is not the main intervention or if Kinesio taping was not done in masseter muscles were excluded from this study.

STUDY SCREENING AND SELECTION:

Two authors independently scanned the titles and abstracts. Records were screened and duplicate record were removed, After reading title and Abstract in eligible records were removed, records which can't be fully retrieved authors were contacted and requested for text , After which the included records were fully assessed and final record were selected based on study design.

RISK OF BIAS:

Two reviewers independently assessed the validity of the included studies using the Cochrane Collaboration's risk-of-bias tool Rob-2 for randomized clinical trials. Studies were assessed and categorized to either , 'HIGH RISK', 'MODERATE RISK' or 'LOW RISK ' Domain.

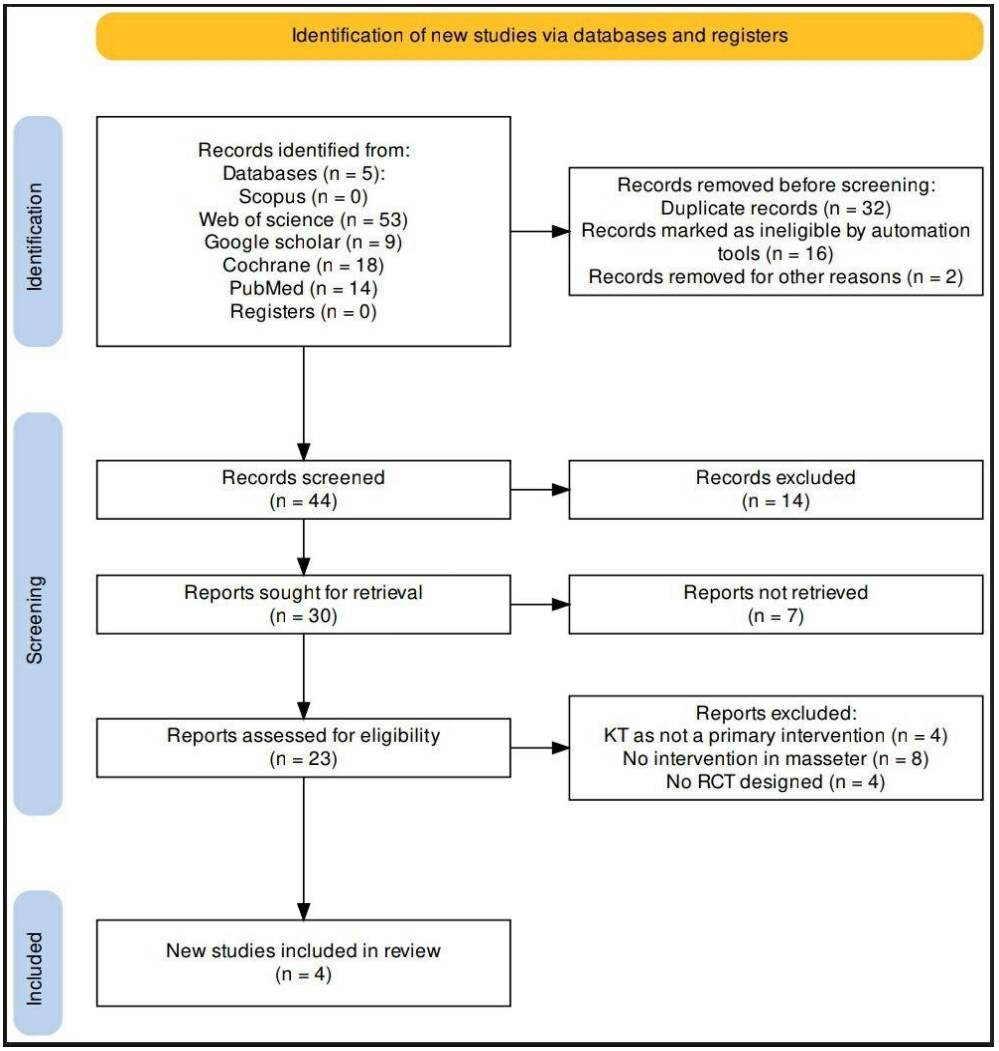
Data Extraction

The following data were collected from the selected articles in a protocol developed for the research: author, year of publication,study type, sample characteristics (sex, age, clinical condition, and treatment received), method, duration , technique and number of tape application, pain , moth opening and range of motion). The data were independently extracted by two reviewers , who met afterward to check the results. Random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessments, incomplete outcome data, selective reporting and other biases were also assessed to evaluate quality of extracted data.

3. META ANALYSIS:

RESULT :

PRISMA



SUMMARY SYNTHESIS:

Consequently, we provided a narrative synthesis of the findings, summarizing the key results of each study and identifying any patterns or trends that emerged. Meta-analysis were performed , our narrative synthesis provided a qualitative summary of the available evidence, allowing us to draw meaningful conclusions and inform clinical practice.

Characteristic table

OUTCOME:

PAIN: Pain was assessed by visual Analog scale.

STUDY		baseline	1 week	4 week	6 week	6 months
Elif Esra Öz et al	STUDY (n=16) Right	2.62+/-0.50			0.37+/-0.61	0.83+/-1.02
	left	2.62+/- 0.61			0.62+/-0.71	1.25+/-1.05
	CONTROL(n= 17) Right	2.29+/-0.58			1.76+/-0.66	1.62+/-0.61
	left	2.29+/-0.58			1.76+-0.66	1.62+/-0.61
Danuta Lietz-Kija et al	STUDY (n=30)	6.50+/-1.74	3.10+/-1.35			
	CONTROL (n= 30)	6.27+/-1.41	4.17+/-1.36			
Coskun Benlidayia et al	STUDY (n=16)	3.4+/-3.4	1.4+/-1.7		0.4+/-0.9	
	CONTROL (n=17)	2.5+/-3.2	1.8+/-2.5		1.6+/-2.7	
Aydin Keskinruzgar et al	STUDY (n=32)	7.23+/-2.37	3.87+/-2.7	2.87+/-2.51		
	CONTROL (n=36)	5.94+/-2.96	4.64+/-2.59	2.93+/-2.46		

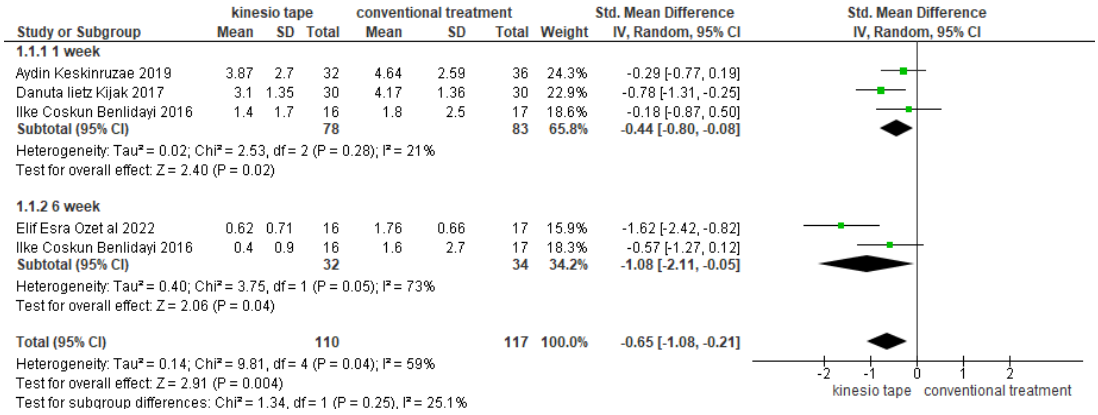
MOUTH OPENING: Mouth opening was assessed by Interincisal distance in mm

STUDY		BASELINE	1 st week	4 th week	6 th week	6 month
Elif Esra Öz et al	STUDY (n=16)	31.97+/-8.99			43.05+/-6.24	41.74+/-8.73
	CONTROL(n= 17)	44.58+/-7.02			43.22+/-6.44	54.73+/-6.73
Coskun Benlidayia et al	STUDY (n=16)	30.6+/-9.4	35.0+/-6.8		38.6+/-8.1	
	CONTROL(n=17)	34.6+/-9.4	35.8+/-6.9		37.3+/-7.1	
Aydin Keskinruzgar et al	STUDY (n= 32)	38.93+/-7.25	41+/-6.87	42.25+/-7.28		
	CONTROL (n= 36)	338.93+/-8.1	41.93+/-7.63	43.13+/-6.74		

RANGE OF MOTION: Range of motion was assessed by Elif et al by using an electronic calliper (Gfb 200-mm digital caliper) to measure protusive and lateral movements.

STUDY		BASE LINE	1 st week	6 th week	6 th month
Elif Esra Öz et al	STUDY (n=16) Right	18.36+/-2.99		21.48+/-1.95	20.43+/-2.73
	left	18.78+/-2.63		21.91+/-2.59	20.78+/-2.67
	CONTROL(n= 17) Right	22.45+/-3.55		21.52+/-2.92	21.93+/-3.03
	left	23.21+/-3.51		22.82+/-1.78	22.70+/-2.69
Coskun Benlidayia et al	STUDY (n=16) Right	4.9+/-1.1	6.4+/-1.4	7.1+/-1.3	
	left	4.7+/-1.1	6.0+/-1.1	6.6+/-0.9	
	CONTROL(n=17) Right	4.4+/-1.5	5.1+/-1.6	5.3+/-1.8	
	left	4.4+/-1.3	5.1+/-1.2	5.6+/-	

PAIN:

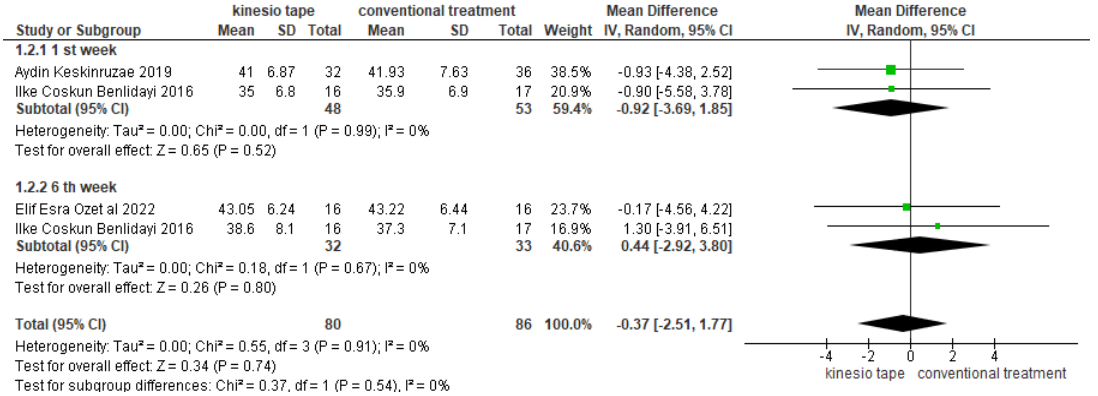


Three studies compared pain in MPDS in involving 124 patients , the pooled effect suggested that kinesio taping was significant in reducing the pain compared to conventional treatment modalities.There was moderate heterogeneity (I2= 59)

Three studies evaluated pain in 1 st week and two studies evaluated pain in 6 th week.

Further kinesio taping was found be statistically significant at 1 st (SDM ,0.44 [_CI 95%,0.80,-0.88] p = 0.02) and 6 th week (SDM , - 1.08[CI 95%, -2.11,-0.05] p = 0.04)

MOUTH OPENING :



Three studies compared mouth opening in MPDS in involving 124 patients , the pooled effect suggested that kinesio taping was significant in improving mouth open compared to conventional treatment modalities.There was no heterogeneity.

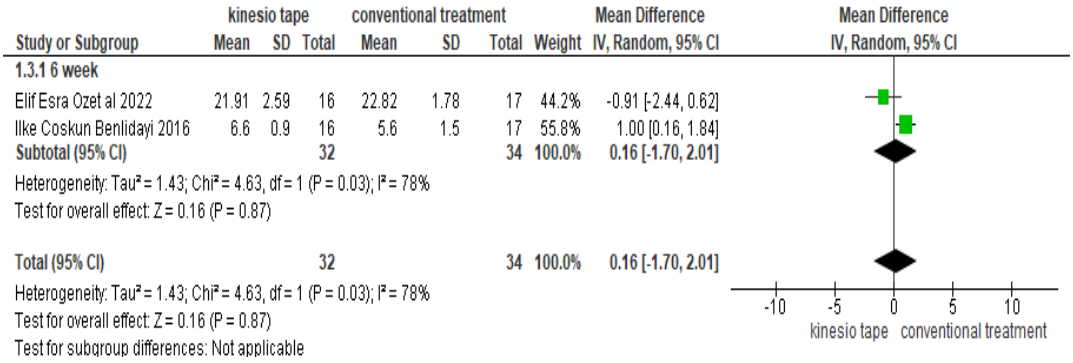
Two studies evaluated pain in 1 st week and two studies evaluated pain in 6 th week.

Further kinesio taping was found be statistically significant

at 1 st (SDM ,0.44 [_CI 95% ,0.80,-0.88] p = 0.02)

and 6 th week (SDM , - 1.08[CI 95%, -2.11,-0.05] p = 0.04)

RANGE OF MOTION :



Two studies compared range of motion in MPDS involving 124 patients, the pooled effect suggested that kinesio taping was significant in improving range of motion compared to conventional treatment modalities. There was high heterogeneity.

At 6 th week significant improvement in range of motion (SDM ,0.19 [CI 95%,-0.97,1.35] p = 0.02)

CHARACTERISTIC TABLE:

STUDY	MATERIALS AND METHOD	INTERVENTION	OUTCOME
Mid- and Long-Term Effect of Kinesio Taping on Temporomandibular Joint Dysfunction: A Randomised-Controlled Trial Elif Esra Öz et al	N=33 Study group (n=16) Control group (n=17) Nonsteroidal anti-inflammatory drugs, myorelaxants, nocturnal splint therapy and exercise therapy were applied to both groups for 6 weeks, while KT was further applied to the study group. In both groups, participants were instructed to perform home exercises during the follow-up period.	KT was applied in a Y shape on the masseter muscle for 4 day In both groups, participants were instructed to perform home exercises during the follow-up period.	Increased mouth opening, reduced pain,increased exercise tolerance
Assessment of the Short-Term Effectiveness of Kinesiotaping and Trigger Points Release Used in Functional Disorders of the Masticatory Muscles Danuta Lietz-Kija et al	n=60 STUDY GROUP(n=30) : 15 female and 15 male)were subjected to active kinesio taping application (K-Active Tape Classic, 50 mm × 17 mm CONTROL GROUP(n=30): Subjected to physiotherapy with the release of trigger points by the ischemic compression method	Applied over the region of masseter with a tape (5 cm wide) cut into 2 parts, called tails, which covered the treatment sites without tension. The base was located in the region of the temporomandibular joint. The upper tail ran across the buccal surface of the face towards the nose, while the lower tail was directed towards the chin and thus included the masseter for 5 day	Increased the analgesic effect and mouth opening in study group
Kinesio Taping for temporomandibular disorders: Single-blind, randomized, controlled trial of effectiveness Ilke Coskun Benlidayia	N=33 Study group (n=16) Control group (n=17) Both groups received lifestyle counseling along with instruc(tions for jaw exercises. Additionally,	The base of the “Y” strip was placed slightly posterior to the TMJ with no tension. The su-perior tail of the strip was applied with very light ten- sion (0–15% of available) after pulling the skin	Reduced pain, increased mouth and range of motion in study group .

et al	Kinesio Taping was applied to the partic- ipants of the study group	from temporomandibular joint to the nose. Later on, infe- rior tail of the "Y" strip was applied by using the same technique	
Comparison of kinesio taping and occlusal splint in the management of myofascial pain in patients with sleep bruxism Aydin Keskinruzgar et al	N=34 Study group (n=16) Control group (n=18) Study group received a kinesio tape application. Control group received occlusal splints	5 cm wide tapes were cut in the Y-shape. The skin around the Fig. 1. Application of kinesio taping. masseter muscle was cleaned and the wider sections of the tapes were then passively placed bilaterally on the surface of the skin, corresponding to the origin of the masseter muscles. The ends of the Y-shaped band were attached to the region corresponding to the masseter muscle's insertion with a tension of about 40 percent	Reduced pain , increased mouth opening.

CHARACTERISTIC RESULT :

A total of 53 articles were identified from five databases, after applying inclusion and exclusion criteria 4 RCTs that involved 155 patients were included in this systematic review.

Out of 155 patients for 76 patient kinesio taping was done in masseter .

Study group had a higher female sample(56 out of 76 were female); this can be attributed to the fact that myofascial have a higher prevalence rate in females[7].Mean age range for study group is 25.87 - 31.6.

3 RCTs assessed pain as primary outcome . Visual Analog scales were all three studies for pain measured . Pre operative pain ranged from 6.50- 2.29 which shows statistically significant reduction in pain after 1 week of kinesio tape application to 3.10 -1.4 and after 6 weeks pain ranges from 1.6-1.04.

3 RCT assessed mouth opening . Elif et al assessed mouth opening by an electronic calliper (Gfb 200-mm digital caliper). Aydin et al and Benlidayia et al mannualy measured mouth opening . All three studies used interincisal distances in millimeters to measure Mouth opening.preoperative mouth opening ranged from 44.58 - 34.0 . Statistically significant improvement in mouth opening is observed , after. 1 week mouth opening ranged from 41-35.8 and after six weeks mouth opening ranged from 41.74 -37.3.

Elif et al assessed range of motion by an electronic calli-per (Gfb 200-mm digital caliper) . Protrusive movements were improved from 2.82 to 3.61 , left lateral from 18.78 to 20.78 and right lateral from 18.36 to 20.43.

RISK OF BIAS:

The study was assessed to have a "High risk" of bias if it did not record a "Yes" in three or more of the four main categories, " Moderate Risk " if two out of four categories did not record a "Yes", and "Low Risk" if all the four categories recorded if randomization assessor, Blinding and Completeness of follow up were considered adequate. Risk of bias and Quality assessment

was assessed using Review Manager Software.

FIGURE 8 : Risk of bias summary

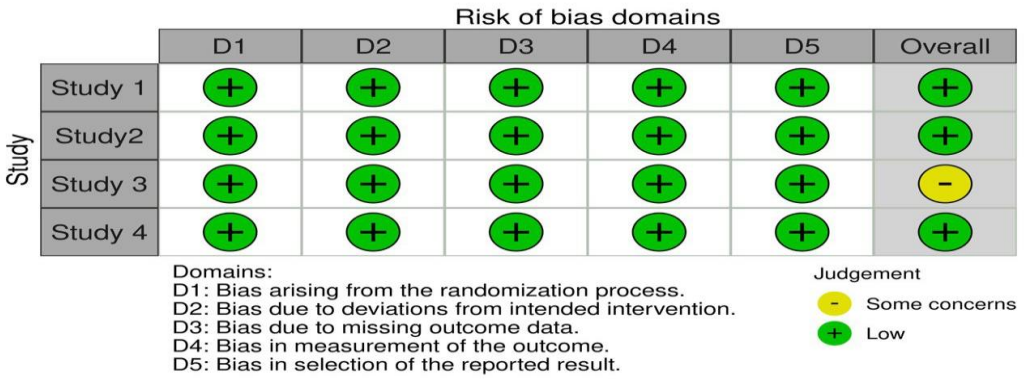
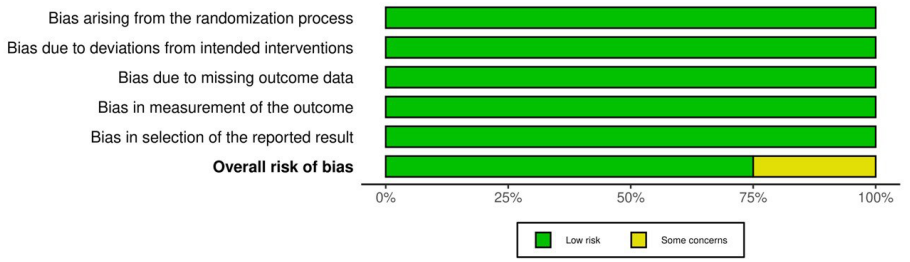


FIGURE 9 : RISK OF BIAS GRAPH



QUALITY ASSESSMENT:

(Higgins and Green. Cochrane reviewer's handbook 2009)

The quality assessment of included trials was undertaken independently as a part of data extraction process. Four main quality criteria were examined.

1. Method of Randomization, recorded as
   a) YES- Adequate as described in the text
   b) NO- Inadequate as described in the text
   c) Unclear in the text
2. Allocation Concealment, recorded as
   a) YES- Adequate as described in the text
   b) NO- Inadequate as described in the text
   c) Unclear in the text
3. Outcome assessors Blinded to intervention, recorded as

a) YES- Adequate as described in the text

b) NO- Inadequate as described in the text

c) Unclear in the text

4. Completeness of Follow up (was there a clear explanation for withdrawals and dropouts in each treatment group) assessed as

a) YES- Dropouts were explained

b) NO- Dropouts were not explained

c) None- No Dropouts or withdrawals.

Other methodological criteria examined included:

1. Presence or Absence of sample size calculation.

2. Comparability of Groups at the start.

3. Clear Inclusion or Exclusion criteria.

4. Presence or Absence of estimate of measurement

Quality assessment was performed by combining the proposed criteria of the Meta-Analysis of Observational Studies in Epidemiology statement (MOSES),(Stroup et al.,2001) the Strengthening the Reporting of Observational Studies in Epidemiology statement (SROSES),(von wt al.,2007) and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher et al.,2009) to verify the strength of scientific evidence in clinical decision-making.

Three of the included studies were assessed to have high quality and one study had moderate quality.

DISCUSSION:

Myofascial pain syndrome is presented with fascia tenderness and has myofascial trigger points (MTrPs) which are hyperirritable spots with a taut band of a skeletal muscle associated with local twitch response . Pain and tenderness on motion , limitated range of motion ,muscle weakness and motor dysfunction can be observed . Pain can be localized or referred . [13].

According to Travell and Simons excessive acetylcholine release in muscle contraction can shorten the muscle and develop to MTrPs . Inactivating TrPs is an effective treatment option which can be achieved by ischemic compression, spray and stretch , manual pressure release, needling technique , and physical therapy modalities.

KT improves blood and lymphatic circulation and channel fluid flow by raising skin and soft tissue and increase subcutaneous space in the target area to speed the recovery of wounded tissue. KT reduces pressure which diminishes subcutaneous pain receptor activation, allowing pain-free movement.Gate control theory may explain KT's pain-management benefits. Touch A-fiber diameter and conduction velocity are higher than pain A- and C-fibers. Mildly touching afferent skin receptors may activate glial spinal cells. The spinal cord blocks pain

conduction to the brain [15].

Manual pressure release method for MTrPs can reduce spontaneous pain and also increases the threshold for pain. KT combined with manual pressure release result in significant reduction in pain , improvement in tissue displacement and mechanomyography amplitude in upper trapezius muscle [13]. Similar results were found by Melek et al also KT combined with MT better pain reduction [14].

In our Meta analysis two articles (Elif et Al and Danuta et Al) compared KT with MT and found KT reduced pain and mouth opening was improved.

Transcutaneous Electrical Nerve and KT added exercises can decrease pain and increase threshold for pain , function and cervical range of motion in myofascial pain syndrome patients [15].

Nurdan Yılmaz et al [12] and Sami Ayetal et al [16] states that KT is an effective alternative to Dry needling in the treatment of MPDS in which common side effect associated with dry needling g like soreness can be avoided .

Hernandez et al. compared the efficacy of cervical manipulation and KT application in patients with mechanical neck pain and found results similar to those of Gonzalez-Iglesias et al. Karatas et al. researched the efficacy of KT application on mechanical neck pain and showed that patients treated with KT exhibited improvements in terms of pain[11].

The KT application techniques include facilitation, inhibition, fascia correction, field correction, functional correction, and mechanic correction techniques. The KT practitioner must decide which muscle group should be treated with which type of technique. The inhibition technique can be used for muscle dysfunction caused by microtrauma or tension

In muscle inhibition technique , tapes are applied from insertion to origin site with full degree (100%) stretch . This technique prevents excessive contraction of acute,y damaged and overused muscles.

In space correction techniques, single or multiple “I” shaped strips with medium degree (25-30%) of stretch in the middle part of the tape , tips are applied without stretching . It lift skin, fascia and soft tissue . It is suggested that by this way, the pressure, under the applied area and on the chemical receptors and nociceptors, decreases and the lymphatic drainage and blood circulation improve leading to removal of the exudates .

Fatma et Al compared muscle inhibition technique and space correction technique and found both reduces pain, improves function and quality of life but no statistically significant difference between two groups were found [17].

Rasool Bagheri stated that Inhibitory Kinesio taping (IKT) works by reducing pressure on the subcutaneous pain receptors leads to a reduced stimulation of the pain afferents, and the increase in sensory afferents in the soft tissue facilitates pain control or gait control mechanisms. IKTand Dry needling shows similar effect in reducing increased pain threshold [18]

According to Williams et al., KT increase in muscle strength by producing a concentric pull on fascia, which may stimulate increased muscle contraction, and an additional hypothesis

suggests that the facilitated muscle activity and improved muscle alignment may contribute to increases in muscle strength

On the other hand, Yolanda et al does not support the use of space correction techniques to treat myofascial trigger points in upper trapezius muscle [19] .

There is no clear data available regarding various kinesio tape application techniques ,further prospective studies are needed in this field to highlight the clinic efficiency of various techniques and their clinical application.

All 4 articles included in this meta analysis doesn't clearly explain about the type of taping technique.

Lumbroso et al said that different muscles react differently to the KT application . Therefore, the method of KT application should be designed specific to each muscle, because maximum muscle strength depends on muscle morphology and muscle activation type .

4. CONCLUSION:

This systematic review provides the latest evidence to statistically support the use of kinesio taping over other treatments for relieving the pain intensity , improving mouth opening and range of motion of patients with myofascial pain syndrome . Kinesio taping is also statistically superior to other non-invasive techniques in relieving pain intensity, improving mouth opening , lateral and protrusive movements .

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