DELTA UNIVERSITY
SCIENTIFIC JOURNAL
Journal home page: www.deltauniv.edu.eg/dusj

CUPPING VERSUS KINESIOTAP ON MANAGEMENT OF PATIENTS WITH SACROILIAC JOINT DYSFUNCTION: "A RANDOMIZED CONTROLLED TRIAL"

Abdel Rahman A. A. M. Anbar[1], Amir M. Saleh[2], Nabil M. Ismail[2], Usama El-Shazly[3]

[1] BSc. Misr University for Science and Technology.

[2] College of Physical therapy, Basic Science department, Cairo University.

[3] Consultant of Orthopedic Surgery. College of Medicine, Ain-Shams University

Introduction

The sacroiliac joint dysfunction (SIJD) is estimated to cause between 15% and 30% of patient with low back pain (DePalma, Ketchum et al. 2011, Cohen, Chen et al. 2013, Al-subahi, Alayat et al. 2017). The causes of the dysfunction are fractures, ligamentous injuries myofascia and enthesopathy. Commonly, unidirectional pelvic shear stress, repetitive torsional forces, and inflammation can cause pain but no specific cause has been identified. Risk factors include abnormal gait pattern, leg length discrepancy, scoliosis, heavy physical exertion, trauma, pregnancy and lumbar fusion surgery with fixation of the sacrum (Schuit, McPoil et al. 1989). Sacroiliac joint may also be the result of direct trauma or idiopathic onset (Hansen, McKenzie-Brown et al. 2007). According to (Schwarzer, Aprill et al. 1995), 'Pain from the SIJs has been proven to cause not only low-back pain, but also groin and thigh pain'. The pain distribution and tenderness on palpation under the posterior superior iliac spine (PSIS) are reliable signs that the SIJ is the source of pain (Peebles and Jonas 2017). An adequate recovery, however, decreases fatigue, accelerates the rate of physiological regeneration, may decrease the risk of injury (Shearar, Colloca et al. 2005).

There are many non-invasive treatment options for SIJ-mediated pain, and most patients with sacroiliac joint pain are managed conservatively with a combination of oral medications, physical therapy and manual therapy. Sacroiliac joint belts and other lower extremity orthoses are often used to stabilize the joint, treat underlying biomechanical abnormalities and to facilitate the rehabilitation program, and these are generally similar to treatment options for nonspecific low back pain (Richardson, Snijders et al. 2002, Hungerford, Gilleard et al. 2003, Greis, Berk et al. 2013).

A review done by (Neha, Arunmozhi et al. 2016), to document the available treatment approaches on the management of

sacroiliac joint dysfunction. Based on this systematic review they found that most of randomized control trials (RCT's) trying to propose intra articular injections and exercise in the management of sacroiliac joint dysfunction. They also found that very few studies which emphasize on manual therapy including muscle energy technique, LASER therapy, mulligan, mobilization and manipulative therapy. All the interventions are tried to manage only pain and quality of life in patients with sacroiliac joint dysfunction and the result demonstrate that none of the intervention are superior to others.

Cupping therapy (CT) is a physical traditional Chinese medicine (TCM) practiced by ancient Chinese, Egyptians, and Greeks and currently used by therapists and acupuncturists in the treatment of a broad range of medical conditions and played an important role in human health (Cohen, Chen et al. 2013). Cupping therapy may be a solution for suffering faced in many diseases manifested by pain. Reviewing the literature for cupping therapy revealed that it can relieve pain of lumbar disc herniation, herpes zoster, cervical spondylosis (Cao, Liu et al. 2012), rheumatoid arthritis (RA) (Ahmed, Madbouly et al. 2005), brachialgia paraesthetica nocturna (Ludtke et al., 2006), carpal tunnel syndrome, acute gouty arthritis, fibrositis , fibromyalgia, persistent nonspecific low back pain, chronic non-specific neck pain, chronic osteoarthritis, acute trigeminal neuralgia, headache and migraine (Ahmadi et al., 2008). (Farhadi, Schwebel et al. 2009), applied wet-cupping for treating persistent nonspecific low back pain with 98 patients aged 17–68 years. They concluded that traditional wet-cupping care was safe and acceptable to patients with nonspecific low back pain. Another randomized study assessed the treatment effect of moving cupping therapy and dexibuprofen (one kind of nonsteroidal anti-inflammatory drugs, NSAIDs) on 70 out patients with nonspecific low back pain. Results showed that the two groups were significantly improved ($P<0.01$), which indicated both moving cupping therapy and dexibuprofen alleviated nonspecific low back pain, and improve their total state of heath.

. Kinesio Taping (KT) is a therapeutic method used by physical therapists and athletic trainers in combination with other treatment techniques for various musculoskeletal and neuromuscular problems. Kinesio Taping is considered a safe technique for populations ranging from pediatric to geriatric, and successfully treats a variety of orthopedic, neuromuscular, neurological and other medical conditions. Kinesio Taping has minimal side effects,' which may facilitate musculoskeletal rehabilitation by reducing discomfort. When KT is applied to the skin, it can lift the fascia and soft tissue to produce additional space below the area of application (Neha, Arunmozhi et al. 2016).

(Lee, Yoo et al. 2014), conducted a study on 60 women with sacroiliac joint who habitually wore high-heeled shoes to assess whether a 1-day application of posterior pelvic tilt taping (PPTT) using a kinesiology tape would decrease anterior pelvic tilt and active straight leg raising test scores. Anterior pelvic tilt was measured using a palpation

meter before PPTT application, immediately after PPTT application, 1 day after PPTT application, and immediately after PPTT removal after 1 day of application. The results suggest that PPTT may temporarily decrease anterior pelvic tilt and active straight leg raising score in women with sacroiliac joint pain who habitually wear high-heeled shoes.

(Castro-Sánchez, Lara-Palomo et al. 2012), carried out a randomized control trail to examine the effect of kinesiotape (KT) in reducing pain and disability associated with sacroiliac joint dysfunction (SIJD) and other non-specific low back pain (LPB). They found that pain and disability decreased significantly after four weeks of treatment. However, these improvements were equal to the placebo tape, suggesting that KT is no more beneficial than placebo.

Investigation study on 109 patients with low back pain were randomized into intervention group (n = 54) treated with information and reassurance plus Kinesio taping applied to the most painful area for 12 days, while the control group (n = 55) received merely information and reassurance. All participants were allowed to use as-needed doses of paracetamol. After 12 days they found that there is statistically significant improvement in both groups in pain intensity and the Oswestry Disability Index with superiority to the Kinesio taping group (Kelle, Güzel et al. 2016).

The standard physical therapy (PT) interventions include repetitive exercises, manual joint mobilization, manipulation, bracing, massage, patient education, aerobic conditioning, general therapeutic exercise and electrotherapeutic modalities such as heat, ultrasound and TENS. Manual manipulation provides reflexive relaxation and pain inhibition at the segmental level through the firing of afferent mechanoreceptors when stress is applied to the periarticular structures

(Al-subahi, Alayat et al. 2017), conducted a review of literature to investigate the effectiveness of physical therapy interventions in the treatment of sacroiliac joint dysfunction (SIJD). Their review included 9 studies that matched the inclusion criterion, four of which used manipulation as their intervention, three used exercise and three used Kinesio tape. Two of the manipulation studies were a repeated measures design (pre-post design), one RCT and one randomized trial. The results showed that physiotherapy interventions are effective in reducing pain and disability associated with SIJD, with manipulation being the most effective approach and most commonly used within physical therapy clinics.

There is very limited evidence has been found on the effect of cupping therapy, versus kinesio-tap and conventional therapy in the management of pain, ROM and functional disability in subjects with SIJ dysfunction. The present study hypothesized that there are no statistically significant differences between the effects of cupping therapy, kinesio-tap and conventional therapy in the management of SIJ dysfunction.

Material and methods

Design

This was pre-post randomized controlled clinical trial (Experimental research design). The research project was approved by research ethical committee of faculty of physical therapy.

Subjects

Forty-five patients were randomly selected from an outpatient orthopedic clinic in hospitals of Egyptian Ministry of Health (Ain Al-Seera Medical Center). Participants chosen from both sexes, age from 30- 55 years. All participants have clinical diagnosis with SIJ dysfunction by the medical consultant and divided equally into three groups. Group A (cupping intervention and conventional therapy), (Castro-Sánchez, Lara-Palomo et al. 2012), Group B, (Kinesio-tap intervention and conventional therapy), and Group C, (conventional therapy). Subjects were excluded if they have, infection, injury, bleeding or allergy of the skin, neuropathic pain, whiplash, lumber intervertebral disc, congenital deformity and spinal stenosis, spinal surgery or fracture (Chi, et al., 2016).

A consent form was signed from every patient after a detailed explanation of the aim and procedure of the study. All patients will be tested by Compression test (approximation test): The patient lies on his or her healthy side with the affected side upward; the patient's hips are flexed 45°, and the knees are flexed 90°. The examiner stands behind the patient and places both hands on the front side of the iliac crest and then exerts downward, medial pressure. The test will be positive when they reproduce a patient's typical pain (Laslett, Aprill et al. 2005, Van Zundert, Hartrick et al. 2011, Moscote-Salazar, Alvis-Miranda et al. 2017).

All patients evaluated before treatment program and at the end of three consecutive weeks of treatment. The primary outcome is pain intensity (1–10 cm) on VAS, the second outcomes is functional disability using Arabic version of Oswestry Disability Index (Ar-ODI) and the third outcomes is lumber flexion and extension range of motion by modified-modified Schober test.

Treatment procedure

The participant in group (A) took one session of dry cupping therapy per week for 3 weeks by using disposable manual cupping set (Kangzhu 24-Cup Set, ISO9001 quality certified), figure 6, including a hand suction pump and a plastic cups of different size (Farhadi, Schwebel et al. 2009, Cao, Han et al. 2010, AlBedah, Khalil et al. 2015). Participants will be asked to lay prone on a treatment table with their lower back exposed.

The cupping procedure was conducted as follows

1- Practitioner hands washed with alcohol
2- Practitioner wear disposable latex gloves and mask.
3- Remove hair from treated area to avoid any pain.
4- An alcohol wipe is used to prepare and clean the treatment area of the skin.
5- A hand−operated mechanical suction device is attached to the cup prior to the cup's placement on the treatment area.
6- Disinfection of the patients' bed or using disposable plastic bed covers after

treating each patient (Aboushanab, AlSanad et al. 2018).

7- The cups are placed over the points GB 30, Huantiao, BL-28 Pangguangshu, BL-54 ZHIBIAN and EM-Yaoyan (Chirali 2007).

8- Ask participants to remain without movement as possible. the cups removed after 10 minutes of application. The entire treatment time totaled 10 minutes for each side of the body.

The suction created by the negative pressure exerted on the dermis produces hyperemia around the treatment area. and a conventional therapy applied three sessions/week, (back strengthening exercise and stretching with straight leg raising, TENS for 10 minutes, 50-100 Hz.

The participant in group (B) took 6 sessions (2 session/week) of kinesio tape therapy over a period of three weeks. The tape will be used in this study is waterproof, porous, and adhesive, with a width of 5 cm and thickness of 0.5 mm.

For optimal tape adherence, the skin should be dry (without lotion or oil present) and hair should be shaved. KT anchors should be applied at both margins of the targeted treatment area, with I-inch to 2-inch tape width. The anchors should be applied to the skin without tension, because it has been found to cause skin irritation. The desired level of tape tension should be generated after the base anchor is secured to the skin (Al-Shareef, Omar et al. 2016).

With the patient in a forward flexed position, tape is applied in a distal to proximal direction without tape tension Communication with the patient during tape application is essential, so that adjustments can be made on the basis of the patient's feedback. Figure 8,9,10,11,and 12). Application of the KT over 1) the external oblique muscle, 2) I-strip from ASIS to PSIS in side-lying position, and 3) rectus abdominis muscle. (Lee and Yoo 2012). The conventional therapy applied three sessions/week, (back strengthening exercise and stretching with straight leg raising, TENS for 10 minutes, 50-100 Hz.

The participant in group (C) took 9 sessions (3 sessions/week) over a period of three weeks of conventional therapy (back strengthening exercise and stretching with straight leg raising, TENS for 10 minutes, 50-100 Hz, the intensity monitored by the sensation feel by patient. (Bindra, Kumar et al. 2012).

Sample Size Determination:

The sample size and power calculations were performed using PASS 11 (power analysis and sample size software, this revealed a sample size of 13 subjects per group.

Statistical analysis

Statistical analysis was conducted to determine the normality of data distribution by using Shapiro-Wilk's test. Normally distributed data will be described as mean and standard deviation; otherwise the data will be presented as frequency, median, and range and analyzed nonparametrically. two-way MANOVA test to compare between the pre and post means of the three groups. The level of significance for all statistical tests will set at $P<0.05$. The data collected in this study were statistically processed using IBM

SPSS Statistics (IBM SPSS Statistics for Windows, version 21.0; IBM Corp, Armonk, NY).

Results

General characteristics (Demographic data):

Kolmogorov-Smirnov test was applied to the three groups and revealed that all groups are normally distributed (table 1).

Shapiro-Wilk					
Group		Age	Weight	Height	BMI
	df	sig	sig	sig	sig
A	15	.754	.103	.902	.578
B	15	.481	.546	.883	.070
C	15	.374	.788	.342	.800

Table. 1. Shapiro-Wilk test of normality for the demographic data of the three groups.

Descriptive statistics to compare all data which were collected from the three groups before and after treatment, the mean (X) and standard deviation (SD) table 2,3.

The mean and standard deviation (X±SD) of age, weight, height, and BMI for group A, were 42.60±7.09, 77.67±9.13, 166.47±7.11, and 28.06±3.17 respectively. The (X±SD) of age, weight, height, and BMI for group B, were 41.53±7.06, 72.13±8.45, 163.33±6.78, and 26.07±2.57 respectively. In group C, the (X±SD) of age, weight, height, and BMI were 41.93±7.16, 76.47±10.38, 165.13±7.64, and 27.67±4.32 respectively. The ANOVA test revealed no significant difference between groups in age (f=.666 &p>.719), weight (f= .651 & p>.733), height (f= .635 & p>.746), and BMI (f= .815& p> .523),

Table 2. Descriptive Statistics and ANOVA test for the age, weight, height and BMI of the three groups

Variables	Group A	Group B	Group c	f-value	p	Sig.
	$\bar{X}$ ±SD	$\bar{X}$ ±SD	$\bar{X}$ ±SD			
Age (year)	42.60±7.06	41.53±7.06	41.93±7.80	.666	.719	NS
Weight (Kg)	77.61±9.13	74.13±8.33	78.65±10.87	.651	.733	NS
Height (cm)	166.47±7.11	163.33±6.77	165.13±7.64	.635	.746	NS
BMI	28.06±3.17	26.16±2.57	27.67±4.32	.815	.523	NS

$\bar{X}$: mean SD: standard deviation
p: probability value

NS: non-significant Kg: kilogram cm: centimeter

Table 3. Descriptive Statistics and ANOVA test for the VAS, ROM flex, ROM ext., and ODI of the three groups

Variables		**Group A** $\bar{X}$±SD	**Group B** $\bar{X}$±SD	**Group C** $\bar{X}$±SD	**f**	**sig**
VAS	**pre**	7.52±.934	7.77±.763	7.71±.666	.415	.663
	post	1.85±.530	1.95±.453	3.26±.557	34.122	.000
ROM Flex	**pre**	17.96±.917	18.12±.867	18.14±.737	.205	.816
	post	22.39±.967	22.46±1.769	19.753±.857	22.343	.000
ROM Ext	**pre**	12.95±.711	13.47±.544	13.32±.508	3.052	.058
	post	7.980±.1.138	9.81±1.194	11.18±.759	35.168	.000
ODI	**pre**	39.66±2.610	38.67±3.811	38.20±3.529	.748	.480
	post	13.73±2.251	15.267±1.438	20.53±2.232	47.256	.000

$\bar{X}$: mean SD: standard deviation
sig: significant

The interaction effect of cupping therapy, kinesiotape, and conventional therapy

Mixed MANOVA test was conducted to investigate the hypothesis that there would be no one or more mean differences between the effect of treatment (cupping therapy, kinesiotape, and conventional therapy) on participants with SIJD. The results revealed that there was statistical significant interaction effect between the three groups and the dependent variables (VAS, ROM flex., ROM ext., and ODI) as the Wilk's Lambada multivariate test (Λ) was .053, F(16, 70) = 14.625, p< .000, this significant F indicates that there is significant difference among the three groups (table 4).

Table 4. Mixed MANOVA for pre and post intervention treatment for the three groups.

Interaction effect (intervention*time)	
F (8,162) = 14.191	P <.000
Effect of treatment (group effect)	
F (8,162) = 17.127	P <.000
Effect of time	
F (4,81) = 1017.187	P <.000

The test of between subjects' effects for the three groups showed that there was significant difference between subjects. The interaction effect of treatment and time between groups, effect of treatment and effect of time for the VAS were all significant (F=7.683, P<.001 – F= 10.632, P<.000 and F= 1405.430, P<.000) respectively. For the flexion ROM and extension (ROM flex. and ROM ext.), the results revealed that there was significant difference between subjects (F= 16.951, P<.000, F=19.518, P<.000, F=306.201,P<.000 and F=18.092, P<.000, F=30.937, P<.000, F=1466.841, P<.000) respectively. The between subject effect for the ODI reported a significant difference for the interaction effect of treatment and time, effect of treatment and effect of time as (F=17.584, P<.000, F=8.458, P<.000, and F=1466.841, P<.000) respectively (table 5).

Table 5. Test of between subjects' effects for the three groups.

Dependent Variable		VAS	ROM flexion	ROM extension	ODI
Inter action effect (treatment*time)	F	7.683	16.951	18.092	17.584
	P	.001	.000	.000	.000
Effect of treatment (group effect)	F	10.632	19.518	30.937	8.458
	P	.000	.000	.000	.000
Effect of time	F	1405.430	306.201	417.818	1466.841
	P	.000	.000	.000	.000

F: Fischer test P: probability

The multiple pairwise comparisons (LSD) Post Hoc test for VAS, ROM flex., ROM ext. and ODI showed no significant difference in the measurements post treatment between group A and B, (P< 0.194, 0.990, 0.052, 0.710) respectively. The multiple comparisons between group B (kinesiotape with conventional therapy) and group C (conventional therapy) for VAS, ROM flex., ROM ext. and ODI recorded that there is a statistically significant difference (P< .002.000, .014, .001) respectively. The results between group A (cupping with conventional therapy) and group C (conventional therapy) showed statistically significant difference (P< .000. .000, .000, .000) respectively table 6.

Table.6. Multiple comparisons (LSD) Post Hoc between groups.

Dependent Variable	GROUPS	Mean Difference (I-J)	Std. Error	P	Sig.
VAS	group A vs B	-.2267	.17322	.194	NS
	group B vs C	-.5500*	.17322	.002	S
	group C vs A	.7767*	.17322	.000	S
ROMFLX	group A vs B	.0033	.26768	.990	NS.
	group B vs C	1.4467*	.26768	.000	S
	group C vs A	-1.4500*	.26768	.000	S
ROMEXT	group A vs B	-1.1467*	.22010	.052	NS.
	group B vs C	-.5500*	.22010	.014	S
	group C vs A	1.6967*	.22010	.000	S
ODI	group A vs B	-.2667	.71418	.710	NS
	group B vs C	-2.4000*	.71418	.001	S
	group C vs A	2.6667*	.71418	.000	S

S.significant
NS. Not significant

Discussion

This study was to compare the effect of cupping therapy, kinesio-tap and conventional therapy in the management of pain, range of motion and functional disability in subjects with SIJ dysfunction.

The finding of this study revealed that there is a good improvement in group A explained based on the TCM theory, as cupping therapy is aimed at regulating the flow of qi and blood in the channels. TCM considers pain is usually caused by stagnation of qi and blood, thus removing stagnated qi and blood relieves pain. Therefore, when cupping is applied to specific areas on the channels, usually tender spots, pain is potentially alleviated.

The findings of the current study were similar to those of (Farhadi, Schwebel et al. 2009) who found that cupping was significantly superior than usual care including exercise and analgesics p<.00001). (Cao, Han et al. 2010) concluded that the majority of the 550 included studies in their systematic review showed that cupping is of potential benefit for pain conditions, herpes zoster, and cough and dyspnea. The results of current study are agree with a randomized controlled clinical trial done by (AlBedah, Khalil et al. 2015), found that the six wet cupping sessions within 2 weeks are potentially effective in reducing the all outcome measures for patients with nonspecific low back pain. (Lauche, Cramer et al. 2011) investigated the effects of A series of five dry cupping treatment, for treating pain syndromes, on patients with chronic non-specific neck pain. The dry cupping treatments appeared to be effective in relieving neck pain. Not only subjective measures improved, but also mechanical pain sensitivity differed significantly.

The results of the current study was reported that improvement of group B may be due to the role of KT in increasing blood supply and lymphatic fluid flow as a result of lifting effect that creates a wider space between the skin and the muscle (Gomez-Soriano, Abián-Vicén et al. 2014), which may affect muscle functions. Moreover, KT provides a positional stimulus to the skin, muscle and fascial structures and providing a proper afferent input to the central nervous system which in turn leads to a reduction of pain (Gusella, Bettuolo et al. 2014).

(Trobec and Peršolja 2017) were in agreement with the current study as they concluded that the effect of kinesiotape therapy in reducing low back pain is positive, but was not statistically significant in analyzed studies. (Castro-Sánchez, Lara-Palomo et al. 2012) who studied the short-term effect of kinesio taping versus placebo tape for one week on patient with chronic non-specific low back pain of mechanical etiology. They concluded that there is statistically significant effect immediately after the application of Kinesio Taping in disability, pain, isometric endurance of the trunk muscles, and perhaps trunk flexion range of motion.

(Al-subahi, Alayat et al. 2017), conducted a systematic review to investigate the effectiveness of physical therapy interventions in the treatment of sacroiliac joint dysfunction (SIJD). They concluded that physiotherapy interventions can be effective in reducing pain, disability and restoring pelvic position in SIJD.

Furthermore, manipulation appears to be more effective than therapeutic exercise, kinesio tape or non-interventional rest.

The results of the current study verify that cupping therapy combined with conventional physical therapy and kinesio tape in addition to conventional physical therapy showed statistically significant reduction of pain, increase flexion and extension lumber range of motion and improvement in Oswestry disability index scale. The cupping therapy with conventional physical therapy sowed a superior improvement than kinesio tape with conventional therapy.

Conclusion

The cupping therapy and kinesio tape combined with conventional therapy, such as TENS, back strengthening exercise and stretching with straight leg raising showed significant benefit than conventional therapy alone in effecting a cure for SIJD. We can consider that CT and KT applications in addition to conventional physical therapy applications enhance their efficacy and can be used as a supportive and positive curing effects in the treatment of SIJD.

Limitations

The study was limited by the psycho-physiological factor which may have interfered with the patient's performance and response**,** No follow up, Study is short term study**,** No matching between male and female.

References

1- Aboushanab, T. S., et al. (2018). "Cupping therapy: an overview from a modern medicine perspective."
2- Ahmed, S. M., et al. (2005). "Immunomodulatory effects of blood letting cupping therapy in patients with rheumatoid arthritis." 12(2): 39-51.
3- Al-Shareef, A. T., et al. (2016). "Effect of Kinesio Taping on Pain and Functional Disability in Chronic Nonspecific Low Back Pain." 41(14): E821-E828.
4- Al-subahi, M., et al. (2017). "The effectiveness of physiotherapy interventions for sacroiliac joint dysfunction: a systematic review." 29(9): 1689-1694.
5- AlBedah, A., et al. (2015). "The use of wet cupping for persistent nonspecific low back pain: randomized controlled clinical trial." 21(8): 504-508.
6- Bindra, S., et al. (2012). "A Study on the Efficacy of Muscle Energy Technique as Compared to Conventional Therapsy in Chronic Low Back Pain Due to Sacroiliac Joint Dysfunction." 6(1).
7- Cao, H., et al. (2010). "Clinical research evidence of cupping therapy in China: a systematic literature review." 10(1): 70.
8- Cao, H., et al. (2012). "P04.46. Cupping therapy for facial paralysis: a systematic review of randomized controlled trials." 12(1): P316.
9- Castro-Sánchez, A. M., et al. (2012). "Kinesio Taping reduces disability

and pain slightly in chronic non-specific low back pain: a randomised trial." 58(2): 89-95.

10- Cohen, S. P., et al. (2013). "Sacroiliac joint pain: a comprehensive review of epidemiology, diagnosis and treatment." 13(1): 99-116.

11- DePalma, M. J., et al. (2011). "What is the source of chronic low back pain and does age play a role?" 12(2): 224-233.

12- Farhadi, K., et al. (2009). "The effectiveness of wet-cupping for nonspecific low back pain in Iran: a randomized controlled trial." 17(1): 9-15.

13- Gomez-Soriano, J., et al. (2014). "The effects of Kinesio taping on muscle tone in healthy subjects: a double-blind, placebo-controlled crossover trial." 19(2): 131-136.

14- Greis, A., et al. (2013). "Non-interventional treatment options for sacroiliac joint mediated pain: a review." 1(1): 10.

15- Gusella, A., et al. (2014). "Kinesiologic taping and muscular activity: a myofascial hypothesis and a randomised, blinded trial on healthy individuals." 18(3): 405-411.

16- Hansen, H. C., et al. (2007). "Sacroiliac joint interventions: a systematic review." 10(1): 165-184.

17- Hungerford, B., et al. (2003). "Evidence of altered lumbopelvic muscle recruitment in the presence of sacroiliac joint pain." 28(14): 1593-1600.

18- Kelle, B., et al. (2016). "The effect of Kinesio taping application for acute non-specific low back pain: a randomized controlled clinical trial." 30(10): 997-1003.

19- Laslett, M., et al. (2005). "Diagnosis of sacroiliac joint pain: validity of individual provocation tests and composites of tests." 10(3): 207-218.

20- Lauche, R., et al. (2011). "The influence of a series of five dry cupping treatments on pain and mechanical thresholds in patients with chronic non-specific neck pain-a randomised controlled pilot study." 11(1): 63.

21- Lee, J.-h., et al. (2014). "Effect of posterior pelvic tilt taping in women with sacroiliac joint pain during active straight leg raising who habitually wore high-heeled shoes: a preliminary study." 37(4): 260-268.

22- Lee, J.-h. and W.-g. J. P. T. i. S. Yoo (2012). "Application of posterior pelvic tilt taping for the treatment of chronic low back pain with sacroiliac joint dysfunction and increased sacral horizontal angle." 13(4): 279-285.

23- Moscote-Salazar, L. R., et al. (2017). "Sacroiliac pain: A clinical approach for the neurosurgeon." 8(4): 622.

24- Neha, B., et al. (2016). "Effectiveness of therapeutic intervention in sacroiliac joint dysfunction: a systematic review." 4: 1484-1488.

25- Peebles, R. and C. E. J. C. s. m. r. Jonas (2017). "Sacroiliac joint dysfunction in the athlete: diagnosis and management." 16(5): 336-342.

26- Richardson, C. A., et al. (2002). "The relation between the transversus abdominis muscles, sacroiliac joint mechanics, and low back pain." 27(4): 399-405.
27- Schuit, D., et al. (1989). "Incidence of sacroiliac joint malalignment in leg length discrepancies." 79(8): 380-383.
28- Schwarzer, A. C., et al. (1995). "The sacroiliac joint in chronic low back pain." 20(1): 31-37.
29- Shearar, K. A., et al. (2005). "A randomized clinical trial of manual versus mechanical force manipulation in the treatment of sacroiliac joint syndrome." 28(7): 493-501.
30- Trobec, K. and M. J. J. o. H. S. Peršolja (2017). "Efficacy of kinesio taping in reducing low back pain." 7(1): 1.
31- Van Zundert, J., et al. (2011). "Evidence-based interventional pain medicine according to clinical diagnoses." 11(5): 423-429.