

Title: Comparison of the Efficacy of Acupuncture and Conventional Physiotherapy in the Management of Sacroiliac Joint Dysfunction- A Randomised Controlled Trial

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Abstract

Background: The question of what form of non-invasive treatment is most effective for sacroiliac joint (SIJ) dysfunction has not been sufficiently addressed. The quality of evidence regarding the efficacy of a conservative treatment approach is low, and there is no evidence for sustained benefits.

Objectives: To compare the efficacy of acupuncture and conventional physiotherapy in the management of pain and functional disability in patients with SIJ dysfunction.

Methods: Forty women with SIJ dysfunction with a mean age of 29.3 ± 4.3 years participated in the study. Ten participants were randomised into each of three intervention groups (acupuncture (ACT); conventional physiotherapy (CPT); and acupuncture combined with conventional physiotherapy (ACPT)) and a control group (CG) (education and advice). Treatment interventions were provided three times a week for five weeks. The main outcome measures were pain intensity measured with visual analogue scale (VAS) and functional disability measured with Roland Morris Disability Questionnaire (RMDQ). Assessments were carried out by an independent examiner before and after the intervention and at 3 months follow-up.

Results: Baseline VAS and RMDQ scores did not show significant differences among the groups. After treatment, the participants in all the intervention groups had reduced pain scores on the VAS scale (ACT= 3.5 ± 0.06 , CPT = 3.0 ± 0.08 and ACPT= 1.2 ± 0.98) and improved function on RMDQ scores (ACT = 7.0 ± 1.53 , CPT = $6.0 \pm .01$, ACPT = 3.0 ± 0.08) compared to those in the control group, who recorded 7.4 ± 0.08 and 17.5 ± 4.32 for pain intensity and functional disability, respectively. However, pain reduction and improvement in function was greatest in the ACPT at the end of the 5-week treatment and at 3-month follow-up (VAS= 1.0 ± 0.04 , RMDQ = 2.0 ± 0.07) compared with the other intervention groups (VAS: ACT= 4.0 ± 0.97 , CPT = 3.5 ± 1.00 and RMDQ: ACT= 7.0 ± 1.6 , CPT= 5.0 ± 0.87). There was a

significant difference in the pain scores on VAS ($F = 67.171, P = 0.000$) and functional disability on RMDQ scores ($F = 62.467, P = 0.000$) among the groups after 5 weeks of treatment and at 3-month post-treatment follow-up assessment VAS ($F = 79.903, P = 0.000$) and RMDQ ($F = 75.301, P = 0.000$), which was not present at the baseline.

Conclusion: Findings from this study showed that acupuncture or conventional physiotherapy alone or in combination is more effective than advice and education. The combination of acupuncture and conventional therapy is more effective than both treatments alone.

Key words: Acupuncture, manipulation, stabilisation exercises, sacroiliac joint dysfunction

Introduction

The sacroiliac joint (SIJ) is estimated to cause between 15% and 30% of cases of low back pain (Slipman, et al., 2000), making it likely underappreciated as a source of low back pain. Since the majority of prevalence studies have used intra-articular anaesthetic blocks to establish the diagnosis of SIJ pain, the true prevalence may well be higher than the above estimates since extra-articular causes of SIJ pain such as ligamentous strain and enthesopathy would not be expected to result in a positive intra-articular anaesthetic block. A retrospective evaluation of the cause of SIJ pain in injection-confirmed cases revealed that 44% of cases were related to a traumatic event (motor vehicle accident, fall onto buttocks), 21% were related to cumulative trauma such as repetitive lifting or altered gait mechanics, and 35% were idiopathic (Chou, et al., 2004).

There are many non-invasive treatment options for SIJ-mediated pain, and these are generally similar to treatment options for nonspecific low back pain (Richardson, et al., 2002; Hungerford, Gilleard, and Hodges, 2003; Prather and Hunt, 2004). Although some patients who receive a diagnosis of nonspecific low back pain may have SIJ-mediated pain, the two entities are not the same; therefore, only limited conclusions about the management of SIJ pain can be made from these studies. Nonsteroidal anti-inflammatory drugs (NSAIDs) and cryotherapy have been shown to be helpful in cases of acute SIJ irritation (Desphnade, et al., 2007). However, individual risk-benefit ratio to NSAIDs has to be considered, and pre-existing gastrointestinal and cardiac comorbidities may limit the use of NSAIDs in some patients with SIJ dysfunction. The conventional physiotherapy management approach in the form of modalities such as transcutaneous electrical nerve stimulation, ultrasound, heat and cryotherapy are often used as part of an initial physiotherapy program. Although modalities may help some patients with SIJ pain, there is insufficient literature on this topic to comment definitively on their use in the subset of low back pain patient with SIJ dysfunction

(Desphnade, et al., 2007). Therapeutic exercise can be used to correct muscular imbalances in strength and flexibility, improve force transfer and decrease stress on the pelvis, SIJ and lumbar spine (Richardson, et al., 2002). Delayed firing of the multifidus and gluteus maximus muscles has been observed on the symptomatic side of patients with SIJ pain and contraction of the transversus abdominis has been shown to decrease the laxity of the SIJ (Richardson, et al., 2002; Hungerford, Gilleard, and Hodges, 2003), thus making core stability exercises incorporating co-activation of multifidus and transversus abdominis muscles an integral part of conventional physiotherapy treatment for SIJ dysfunction (Richardson, et al., 2002). Although there is a theoretical basic exercise treatment for SIJ dysfunction, there is limited high-level evidence for the utility of exercises in the treatment of SIJ pain (Desphande, et al., 2007). Shearar, Colloca, and White (2005) and Kamali and Shokri (2012) found that two different manipulative therapy techniques significantly improved pain and functional disability in patients diagnosed with SIJ pain at the end of a one-month intervention. However, both of these studies had a small sample size, no control group and no long-term follow-up. Therefore, it could be concluded that although spinal manipulation may help decrease pain and disability in patients with SIJ pain in the short term, the quality of evidence is low, and there is no evidence for sustained benefits. Thus, it appears that the question of what form of non-invasive treatment is most effective to SIJ dysfunctions has not been sufficiently addressed.

Acupuncture has been suggested as the treatment of choice for patients with one-sided SIJ pain, one-sided SIJ pain combined with symphysis pubis pain, and double-sided SIJ pain (Stux and Pomeranz, 1998). However, it appears that few controlled clinical trials have been published on the effects of acupuncture on a well-defined isolated SIJ dysfunction.

Acupuncture is one of the oldest forms of therapy, with roots in ancient Chinese philosophy. It is based on the concept that vital energy de qi courses through the body along distinct

pathways or meridians, that, when imbalanced, results in disease manifestation (Furlan, et al., 2005). Inserting needles into specific points along these meridians permits restoration of harmony to the system, rebalancing the flow of de qi and restoring normalcy to the body system (Furlan, et al., 2005). In the Western medical model, acupuncture is thought to relieve pain through the gate-control mechanism or through the release of neurochemicals (Tukmachi, et al., 2004). Stux and Pomeranz (1998) described the possible neural mechanisms of acupuncture analgesia as follows: small diameter muscle afferents are stimulated, sending impulses to the spinal cord, which then activate three centres (spinal cord, midbrain, and pituitary) to release neurochemicals (endorphins and monoamines) that block pain messages. Despite lacking a clear understanding of its physiologic mechanism of action, acupuncture is utilised in the treatment of a wide range of neuromusculoskeletal conditions (Guerreiro et al., 2004; Kvorning, et al., 2004; Sokunbi, Kachalla, and Maduagwu. 2014; Sokunbi and Kachalla, 2015).

Thus, it could be that acupuncture, if used alone or in combination with conventional physiotherapy, will facilitate recovery from pain and functional limitation in patients with SIJ dysfunction. The present study was designed to compare the efficacy of acupuncture treatment, conventional physiotherapy treatment and conventional physiotherapy treatment combined with acupuncture in the management of SIJ dysfunction.

Methods

This study was a randomised controlled trial aimed at investigating whether using acupuncture alone or a combination of acupuncture and conventional physiotherapy will be effective in the management of SIJ dysfunction. Approval to carry out this study was obtained from the Research and Ethics Committee of the University of Maiduguri Teaching Hospital (UMTH), Maiduguri, Nigeria. Detailed information about the procedure of the study was provided in a participant's information sheet given to each participant. Participants were

given 4 weeks to decide whether they would take part in this study. Participants were required to sign the written informed consent document prior to their participation in the study.

Participants

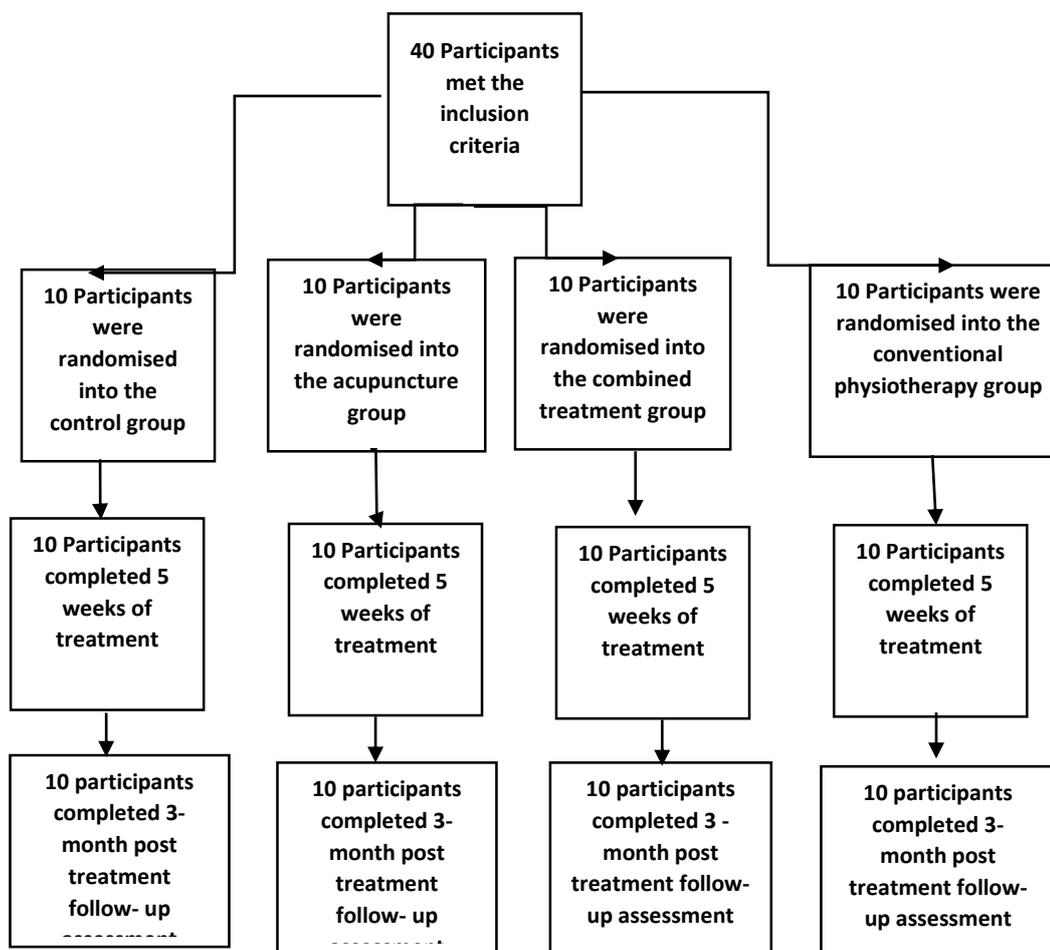
Sample size estimation was based on the assumption that acupuncture could reduce lower back pain intensity by at least 1.5 on the VAS scale (this was based on the previous work by Sokunbi, Muhwhati, and Robinson (2014)). Thus, to yield a power of 80% with a significant level of 0.05, a sample size of at least 9 subjects in each group was required (sample size estimation was determined by power analysis sample size software).

Participants were recruited from among patients with chronic low back pain attending the orthopaedic and medical outpatient clinics of the University of Maiduguri Teaching Hospital and the State Specialist Hospital in Maiduguri. Prior to this, printed recruitment posters and handbills were distributed to prospective participants in the outpatient clinics of these hospitals. Recruitment posters consisted of pictorial illustration of SIJ dysfunction and possible areas of its signs and symptoms in the human body along with a summary of information on what the study will involve. Posters were displayed on notice boards at strategic areas within these hospitals. Individuals were invited to participate if they were 18 years of age and above and had experienced lower back pain of at least 3-months duration. Prospective participants were also advised that they may consult with their medical doctors to discuss if they would be suitable to participate in the study. The study took place between January 2014 and September 2014.

Consecutive samples of 40 women with SIJ dysfunction, with or without nonspecific low back pain (NSLBP) of mechanical origin, of at least 3-months duration and aged 18 to 65 years participated in this study. To ensure the presence of SIJ dysfunction, an independent physiotherapist with over 15 years of experience of physiotherapy assessment and

management of SIJ dysfunction assessed patients who were eligible and who consented to participate in the study. This assessor was blinded to the participants' group allocation. The assessments included a detailed standardised physical examination and collection of baseline data. SIJ provocation tests were carried out as described by Ostgaard, Zetherstrom, and Roos-Hansson (1994); these tests consist of SIJ distraction and compression, Patrick's fabere test, a modified Trendelenburg's test, Lasegue test and lumbosacral compression test. The main inclusion criteria were patients with NSLBP of mechanical origin of at least 3-months duration and aged 18 to 65 years with 3 or more positive SIJ provocation tests. Three or more positive provocation SIJ tests have been reported to have a modest predictive power in relation to controlled comparative SIJ blocks in confirming the presence of SIJ dysfunction (Laslett, 2008). Patients on medication (drug treatment) were included if the medication has not made any significant impact on the pain and there had been no change in medicine and its dosage for one month or longer. We excluded patients with other pain conditions and systemic disorders such as cancer, tuberculosis, tumour and other serious spinal pathological conditions.

A computer generated random table was used to determine the allocation sequence before the study. Groups were coded, and the allocation was transferred to a series of pre-sealed opaque envelopes. The randomisation of the patients into groups i.e. Control group (CG) acupuncture treatment (ACT), conventional physiotherapy treatment (CPT), combined treatment [acupuncture and conventional physiotherapy treatment] (ACPT) was carried out after doing the baseline assessment. Ten patients each were randomised into the four groups (Figure 1). The randomisation was carried out by a researcher who was not involved in any other aspect of this study.

Figure 1. Participants' flowchart***Interventions***

Participants were allowed to continue to treat their SIJ pain with the same dosage of oral non-steroidal anti-inflammatory drugs (NSAIDs) they had been taking prior to the commencement of the study. The use of other pain treatments, such as drugs acting through the central nervous system or corticosteroids, was not allowed as it could potentially have an effect on acupuncture and acupuncture-like TENS (Acu-TENS) induced analgesia. (Sokunbi and Usman 2014). Other than NSAIDs, participants were asked not to undergo additional treatments for SIJ dysfunction during the intervention period. An experienced physiotherapist carried out the conventional physiotherapy treatment, and an experienced acupuncturist (Certified by Chattered Society of Acupuncture Physiotherapists, UK and having 10 years of

experience of management of musculoskeletal conditions with acupuncture) carried out the acupuncture treatment.

Control group (CG): Participants in this group received education and advice on activities of daily living. The patient education protocol used in this study was similar to the one used in a previous study (Sokunbi, Watt, and Moore 2012). It began with audio-visual information related to the spine and how the spine and local stability muscles work together to protect the spine, and was then followed with advice on ideal posture for standing, sitting and lying, back care and lifting techniques. Patients were also advised about a positive coping strategy, i.e., not to resort to total bed rest on a ‘bad’ day (when there seems to be more pain) and not to overdo activities of daily living on a ‘good’ day (when there seems to be not much pain). Audio-visual information was used in this study to prevent and/or minimise the problem of progressive escalation of the advice and education and to aid with mental imagery of correct posture, back care, and lifting techniques. It lasted for 10 minutes. Patient education and advice were carried out three times a week for 5 weeks. A review of 24 trials by Engers, et al., (2011), testing different types of patient education for people with low-back pain showed that people with low-back pain who received an in-person patient education session in addition to their usual care had better outcomes than people who only received usual care. In addition to continuing to take NSAIDS if they so desired, participants in the control group were also informed that they would receive physiotherapy treatment, if they so desired, at the end of the data collection stage of this study.

Acupuncture treatment (ACT): The patients were properly instructed on what to expect in terms of the acupuncture treatment, the possible side effects, and contra indications to acupuncture treatment. Each patient was positioned in a prone position, lying with proper pillow support under the abdomen, ankle joints, head and neck and behind the knee joints for comfort. Acupuncture was given at selected acupuncture points for 20 minutes on the SIJ

area. The selected acupuncture points used in the present study are widely accepted for treating SIJ dysfunction (Elden et al., 2005), namely, Bladder 40 (BL40), Bladder 60 (BL60), Bladder 67 (BL 67) and Liver 4 (LI4) (Figure1). Standard infection control procedures for carrying out acupuncture requires that when gloves are not worn, hand hygiene is of the utmost importance (Acupuncture Code of Practice, 2000). Thus, at each point, the skin was wiped with alcohol, and the therapist hands were cleaned with alcohol gel prior to needle insertion. Disposable stainless steel needles (0.2mmx40mm, Seirin Co Ltd, UK) were inserted into a muscle to a depth of 10mm, using the sparrow pecking acupuncture technique (alternate pushing and pulling of the needle). The needle manipulation was stopped when the subject felt dull pain or acupuncture sensation (de qi: numbness, soreness and/or radiating sensation), and the needle was left in position for another 20 minutes. This treatment was carried out thrice weekly for 5 weeks. Patients in this group also received the same advice and education as those in the control group.

Conventional physiotherapy treatment (CPT): The techniques of CPT used in this study were chosen using the framework of European Guidelines for the Treatment of Pelvic Girdle Pain (2008). It recommends adequate information and reassuring the patient as part of a multifactorial treatment, prescription of medication (if necessary, for pain relief, preferably to be taken at regular intervals; first choice paracetamol, second choice NSAIDs), an individualized treatment program focusing specifically on stabilizing exercises for control and stability as part of a multifactorial treatment program, and intra-articular SIJ injections under imaging guidance (Vleeming, et al., 2008). The guidelines also specified that there are indications that acupuncture may reduce pain, but that high-quality studies are needed. Thus, for the purpose of this study, CPT consisted of core stability exercises, SIJ manipulation and advice. A random method was used to determine the order of treatment to minimize systematic error.

Core-stability exercises: The researcher demonstrated to the patient the locations of the core-stability muscles in the body and how to activate those muscles. The techniques of core-stability muscle activation used in this study were as described by Sokunbi and Kachalla, 2015. Core-stability exercises were carried out for 20 minutes three times per week for 5 weeks.

SIJ manipulation: Manipulation techniques were performed as described by Sokunbi, Kachalla and Maduagwu (2014), with the patient lying on the right side. The therapist's right hand was placed at the centre of the line joining the posterior inferior iliac spines, and with the left hand, the therapist pulled the patient's lower arm (left arm) gently until movement was felt in the SIJ area. The patient's left leg was flexed at the hip and the knee to bring the left foot resting on the back of the right knee. The patient's left leg was then moved forward slightly to induce further trunk flexion until movement was felt in the SIJ area. The patient's upper left shoulder was tractioned (pushed to create tension) backward with the therapist's left arm, and the patient's left knee was tractioned towards the floor with the therapist's right arm (Figure 2).

Figure 2. Positioning for Sacroiliac Joint Manipulative Thrust



Acupuncture plus conventional physiotherapy treatment group (ACPT): Patients in this group received treatment consisting of acupuncture, stability exercises, SIJ manipulation and advice and education as described above 3 times a week for 5 weeks. A random method was used to determine the order of treatment to minimize systematic error.

Outcome measures

Visual Analogue Scale (VAS, 0-100mm) was used to measure pain intensity (Von Korff, Jensen, and Karoly 2000). Rolland and Morris Disability questionnaire (RMDQ) was used to measure disability due to pain. A correlation coefficient of 0.72 with interclass correlation coefficient ranging from 0.42-0.53 has been reported for the use of RMDQ (Smith and Grimmer-Somers, 2010). The VAS and RMDQ scores were measured immediately before the first treatment, at the end of the 5 weeks of treatment, and at 3 months follow-up.

Data Analysis

Data were analysed with SPSS 10.0 for Windows. Participants' age, weight, height, body mass indexes (BMI), duration of onset of low-back pain, and VAS and RMDQ scores were presented as mean and standard deviation (\bar{X} (SD)). A multivariate analysis, Multiple Analysis of Variance (MANOVA), was used to analyse the difference in pain VAS scores and functional disability RMDQ scores among the four groups. Post-hoc analysis was carried out using Bonferroni correction. Changes among and within groups were considered significant at a level of $p < 0.05$.

Results

Out of 58 women who indicated interest in the study and presented for the first assessment, 18 did not meet the inclusion criteria; 40 women were included in the trial and participated from the start to follow-up assessments (Figure 1).

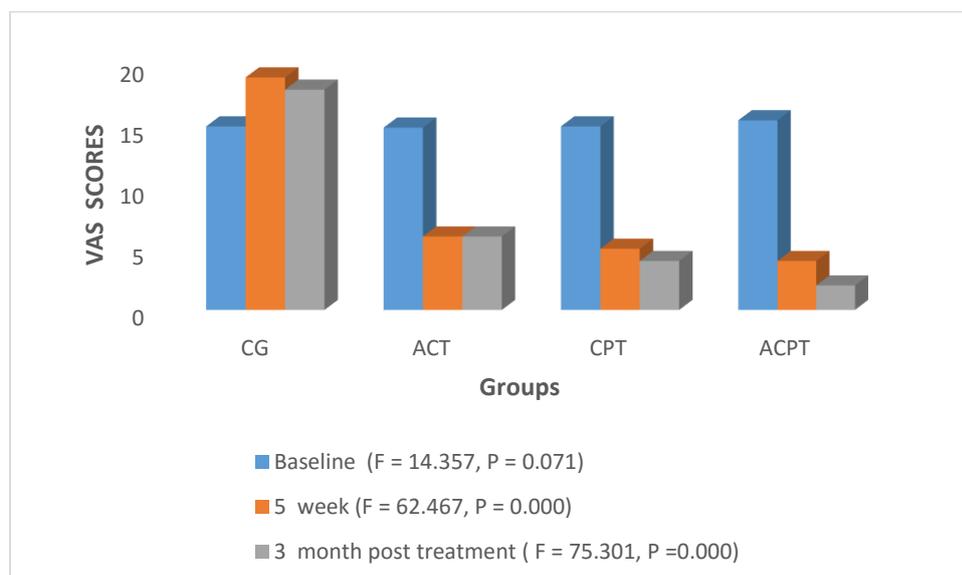
Baseline demographic variables were similar in the four groups (Table 1).

Table 1: Baseline characteristics of the participants

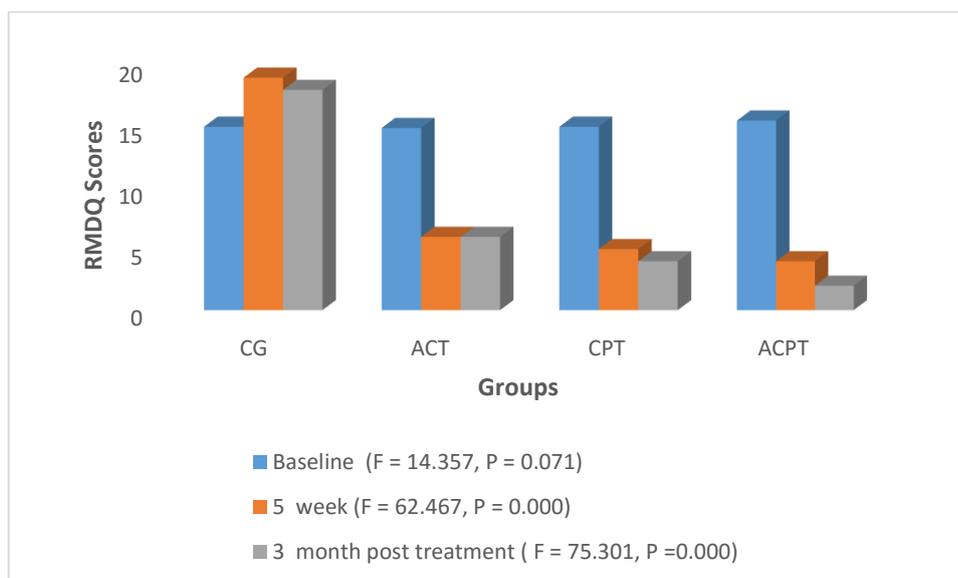
Demographic variables (X (SD))	CG	ACT	CPT	ACPT	F-value	P-value
Age (years)	28.5(7.2)	29.2(9.6)	28.9 (9.5)	30.6(8.7)	2.340	0.563
Weight (Kg)	64.1(11.7)	69.1(6.9)	66.9(2.7)	68.5(9.8)	0.921	0.402
Height (m)	1.6(0.9)	1.7(0.8)	1.7(0.6)	1.6(0.8)	4.782	0.202
BMI (Kg/m ²)	22.5(2.4)	24.7(2.5)	23.3(4.9)	24.6(7.5)	16.377	0.502
Onset of LBP /SIJD (years)	5.4(0.9)	4.8(0.6)	5.2(1.0)	4.9(0.7)	0.890	0.980

Key: CG = Control group; ACT = Acupuncture treatment group; CPT = Conventional physiotherapy group; ACPT = Combined acupuncture and conventional physiotherapy treatment group

Figures 3 and 4 shows participants' mean pain intensity (VAS) and functional disability (RMDQ) scores, respectively.

Figure 3. Pain Intensity (VAS) Scores

Key: CG = Control group; ACT = Acupuncture treatment group; CPT = Conventional physiotherapy group; ACPT = Combined acupuncture and conventional physiotherapy treatment group

Figure 4. Functional Disability (RMDQ) Scores

Key: CG = Control group; ACT = Acupuncture treatment group; CPT = Conventional physiotherapy group; ACPT = Combined acupuncture and conventional physiotherapy treatment group

A reduction in pain intensity and functional disability scores was detected for all the treatment groups. However, pain reduction (Figure 3) and improvement in function (Figure 4) were most pronounced in the acupuncture plus conventional physiotherapy group at the end of the 5-week treatment and at 3-month follow-up after the end of treatment, compared with the other treatment groups. MANOVA showed significant difference in the pain intensity and functional disability scores among the groups after 5 weeks of treatment and at follow-up, which was not present at the baseline ($P > 0.005$).

Post hoc analysis showed significant difference between the pain intensity and functional disability scores of the ACPT and each of the CG, ACT and CPT groups after 5-week ($P < 0.005$) treatment and at 3-month follow-up ($P < 0.005$) (Table 3). Pain intensity and functional disability did not differ significantly after 5-week treatment and at 3-month follow-up between the ACT and ACPT groups ($P = 1.000$) (Table 3). With acupuncture treatment, participants reported an initial slight increase in pain that eased off 5 minutes after needle insertion, but no

adverse skin reaction, dizziness, fainting and/or life-threatening side effects were reported during and after the acupuncture needle stimulation.

Table 3: Post-hoc analysis of -week treatment and 3-month follow-up VAS and RMDQ scores

Variables	Group XI	Group XJ	$\Delta X(I-J)$	<i>P</i> -values	95% CI for difference	
					Lower Bound	Upper Bound
5 week pain intensity (VAS) scores	ACT	CPT	0.50	1.000	-0.75	1.75
		ACPT	2.18	0.000*	0.92	3.43
		CG	-3.96	0.000*	-5.21	-2.70
	CPT	ACPT	1.68	0.003*	0.42	2.93
		CG	-4.46	0.000*	-5.71	-3.20
	ACPT	CG	-6.14	0.000*	-7.39	-4.88
3 month follow-up pain intensity (VAS) scores	ACT	CPT	0.13	1.000	-1.06	1.32
		ACPT	2.53	0.000*	1.33	3.72
		CG	-3.95	0.000*	-5.14	-2.75
	CPT	ACPT	-0.13	0.000*	-1.32	1.06
		CG	-4.08	0.000*	-5.27	-2.88
	ACPT	CG	-6.48	0.000*	-7.67	-5.28
5-week functional disability (RMDQ) scores	ACT	CPT	1.04	1.000	0.07	2.00
		ACPT	4.04	0.000*	3.07	5.00
		CG	-10.01	0.000*	-10.97	-9.04
	CPT	ACPT	3.00	0.000*	2.03	3.96
		CG	-11.05	0.000*	-12.01	-10.08
	ACPT	CG	-6.48	0.000*	-7.67	-5.28
3-month follow-up RMDQ functional disability (RMDQ) scores	ACT	CPT	1.98	1.000	1.11	2.84
		ACPT	4.90	0.000*	4.03	5.76
		CG	-9.07	0.000*	-9.93	-8.20
	CPT	ACT	2.92	0.000*	2.05	3.78
		CG	-11.05	0.000*	-11.91	-10.18
	ACPT	CG	-13.97	0.000*	-14.83	-13.10

Key: ΔX = Mean Difference (XI -XJ); *= Bonferroni's post hoc analysis significant at $p < 0.05$; **CG** = Control group; **ACT** = Acupuncture treatment group; **CPT** = Conventional physiotherapy group; **ACPT** = Combined acupuncture and conventional physiotherapy treatment group

Discussion

The purpose of this study was to compare the efficacy of acupuncture and conventional physiotherapy in the management of pain and functional disability in patients with SIJ dysfunction. Fifty-eight participants comprising 10 males and 48 females showed interest in participating in this study. However, 18 participants (10 males and 8 females) did not meet

the inclusion criteria and were excluded. Thus, 40 female participants were randomised, assessed and treated in this study. Surprisingly, all the participants who were enrolled into this study completed the treatment and assessments at all the stages of data collection (Figure 1). This could be partly due to the fact that many of these participants were patients who had been on medication (drug treatment) prior to this study and perhaps other forms of conservative treatment without any significant impact on their pain. Thus, full participation in the present study could have been perceived by many of them as being necessary in order to get optimal benefits in terms of pain relief and functional restoration. Direct estimation of adherence to every appointment and treatment session was not carried out in this study. However, a zero dropout rate observed in all the groups. This could have also been influenced by the positive impact of the study intervention. Also, participants in the control group could have been motivated to stay until the end of the study because they were told that they could receive full physiotherapy treatment sessions at the end of data collection stage, although they were free to withdraw from the study at any point without giving any reason. In terms of response to the acupuncture intervention, some of the participants reported an initial increase in pain that lasted for 5 minutes and then eased off. However, no cases of adverse skin reaction, dizziness and/or fainting were reported. Still, it is beneficial for the therapist to inform patients of these possible side effects prior to acupuncture intervention so that if they experience them, they will know that they are normal and there is nothing to be too concerned about, since they typically dissipate within 24 hours (Stux and Pomeranz, 1984). The main finding of this study was that acupuncture combined with conventional physiotherapy treatment (stabilising exercises and manipulation and advice) offer clear clinical advantages over either acupuncture or conventional physiotherapy alone for reduction of pain and functional disability in patients with SIJ dysfunction. There are studies that have investigated the effect of each treatment modality, i.e., exercises, acupuncture and

manipulation, on SIJ dysfunction. However, there appear to be fewer reports on the effects of the combination of acupuncture, stability exercises and manipulation on SIJ dysfunction.

Thus, there is limited comparison of the findings of this study with others. However, a study by Elden, et al (2004) showed that acupuncture together with stabilising exercises constituted an efficient complement to standard treatment for pelvic girdle pain. The results show a significant effect of acupuncture on pain; however, an effect on function was not measured in their study. There is no strong evidence concerning the effect of physiotherapy interventions on the prevention and treatment of SIJ dysfunction. Evidence was often related to multifactor programs, which include a variety of modalities, such as information, specific exercises, ergonomic advice and mobilisation (Vleeming, et al, 2008). However, the effectiveness of the various components of these programs remains unclear.

There are mixed reports from previous studies on the effects of exercise on SIJ dysfunction (Mens., Snijders, and Stam, 2000; Stuge, et al, 2004; Elden et al, 2005). Mens, Snijders, and Stam (2000) compared video-instructed exercises for the diagonal trunk muscle system with placebo exercises and no exercise. Their findings showed no significant differences between the groups after 8 weeks of intervention. The exercises were not individualized and not supervised. In the study of Stuge, et al, (2004), a treatment program focusing on specific stabilising exercises was compared with physiotherapy without specific stabilizing exercises. They reported that specific stabilising exercises has both statistically and clinically a significantly better effect on pain, functional status, and health-related quality of life than physiotherapy without specific stabilizing exercises, measured after 20 weeks of intervention. Elden et al, (2005) demonstrated the efficiency of acupuncture and stabilising exercises in complement to standard treatment for the management of pelvic girdle pain (PGP) during pregnancy. They also reported that acupuncture was superior to stabilising exercises. However, their report did not specify whether or not the participants underwent other

treatment interventions outside the trial, the effects of which could undermine the findings from the study in terms of changes in pain intensity level. Specific stabilising spinal exercise is meant to dynamically control the lumbar segments and pelvic joints by activating the local muscles in coordination with the global muscles. These exercises are effective when the pelvic girdle is adequately compressed at the moment of loading, as a result of forces acting across the joint, to ensure stability (Vleeming, et al, 2008). Besides the positive effects of stability exercises leading to an increase in static and dynamic control of movements and overall enhancement of joint stability, Sokunbi, Watt, and Moore (2002) recorded a 17% increase in plasma level of serotonin following spinal segmental stability exercises in patients with chronic back pain and concluded that serotonin may have a significant role to play in the analgesic effects of this exercises.

Concerning the possible clinical effects of manipulation on SIJ dysfunction, there is a scarcity of recent studies in the form of randomised controlled trials on the effect of manipulation or joint mobilization on SIJ dysfunction. However, studies have examined manipulation (Daly, Frame, and Rapoza, 1991) or mobilisation for PGP and SIJ dysfunction (McIntyre and Broadhurst. 1996). The results of the studies indicate that manipulation and mobilisation might be a possible treatment for PGP. The studies had, however, few participants and no control group. Tullberg, et al, (1998) used stereophotogrammetric analysis to investigate whether SIJ manipulation would result in changes in the position and alignment of the SIJ. They reported no alteration in the position of the SIJ following manipulation of the SIJ joint, thus making it uncertain whether possible beneficial clinical effects could be achieved by manipulation of the SIJ in cases of SIJ dysfunction. It is also possible that in cases where a non-mechanical mechanism is responsible for the patients' SIJ pain, manipulation might be an ineffective treatment of choice.

Despite the moderate to low quality of some of the studies on the effect of acupuncture on SIJ dysfunction, there is evidence that acupuncture seems to alleviate low-back pain, SIJ pain and PGP (Vleeming et al, 2008). One study of moderate to low methodological quality compared acupuncture with physiotherapy (Wedenberg, Moen, and Norlin 2000). A significant effect on pain and functional status, in favour of acupuncture, was found but the results may be biased by high drop-out rates and because the groups differed with regard to pain location. Kvorning, et al (2004) compared acupuncture with no treatment and reported that acupuncture patients had significantly less pain than the control group. However, their study was of moderate to low methodological quality because of a high drop-out and no intention-to-treat analysis. Guerreiro, et al. (2004) showed significant decrease in SIJ pain intensity in the group receiving acupuncture compared to the control group. Also, the capacity to perform general activities improved significantly in the acupuncture group. Acupuncture analgesia improves the noxious descending inhibitory controls and pain gate mechanism and, therefore, helps reduce the patient's pain level. The overall result is that of reduced pain, increased mobility, and improved general health (Sokunbi and Kachalla, 2015).

The findings of this study has shown that perhaps positive reinforcement occurs when acupuncture, core-stability exercises, and manual therapy are combined, leading to better pain reduction and improvement in function. Studies have shown that, in the short term, acupuncture has a positive effect on relief from pain, but when compared to conventional or alternative therapies, it was found not to be any more effective in reducing pain (Elden, et al., 2005; Furlan, et al, 2005; Mckee et al, 2013). However, when acupuncture is applied in conjunction with conventional therapies, greater improvement might be seen.

The findings of this study may not be generalizable due to the small sample size. However, the results of this study might be useful for a power size calculation to determine the minimum number of participants that will be required for a future large randomised

controlled trial. Due to the nature of the study, the therapists who carried out the acupuncture and conventional physiotherapy treatment procedures could not be blinded to the participants' group assignment. However, an independent assessor who carried out outcome measure assessment and the assessor who carried out data analysis were blinded to the group assignment. Using only a few acupuncture points for stimulation could be another limitation of the study. Most clinicians in acupuncture practice perhaps use more needles, with some needles positioned in the local area of SIJ dysfunction and some at distal locations from the SIJ for stronger analgesic effects. However we decided to exercise caution by minimising the number of stimulation points in case of any side effects and/or adverse reactions.

The outcome of this study will contribute to knowledge in the area of management of SIJ dysfunction and might influence the choice of combined acupuncture and conventional physiotherapy intervention in the management of SIJ dysfunction in this environment.

Currently, it appears that data are limited on public interest, patterns of use, effects and side effects of acupuncture treatment in this environment. However, available reports from Western countries, to a large extent, portray acupuncture intervention as a cost-effective and safe procedure with no serious side and/or life-threatening effects. It could be that acupuncture treatment might serve as a useful complementary treatment to physiotherapy and other non-invasive treatment approaches in the management of numerous neuromusculoskeletal conditions if there are training opportunities to increase the local availability of acupuncture practitioners in this environment.

Conclusion

We concluded that acupuncture as well as conventional physiotherapy treatment (stabilising exercises, manipulation and advice) constitute effective treatment for SIJ dysfunction. Also, acupuncture plus conventional physiotherapy treatment was more effective than acupuncture or conventional physiotherapy alone.

Conflict of interest: None declared

References

- Acupuncture Code of practice (2015) by *barnet.gov.uk* viewed at https://www.barnet.gov.uk/dam/jcr:6f2c62bf.../COP_Acupuncture.pdf (dated accessed: May 15, 2014)
- Chou, L.H., Slipman C.W., Bhagia, S.M., Tsaour, L., Bhat, A.L., and Isaac, Z. (2004). Inciting events initiating injection-proven sacroiliac joint syndrome. *Pain Medicine Journal* 5(1), pp 26-32
- Deshpande, A., Furlan, A., Mailis-Gagnon, A., Atlas, S., and Turk, D. (2007) Opioids for chronic low-back pain. *Cochrane Database Systematic Review* (3): CD004959
- Dreyfuss, P., Dreyer, S.J., Cole A., Mayo K. (2004) Sacroiliac Joint Pain, *Journal of American Academy of Orthopedic Surgeon* 12, pp 255-265.
- Elden, H., Lars-Ladfors, L., Fagevik-Olsen, M., and Ostgaard, H., and Hagberg H. (2005). Effects of Acupuncture and exercises as adjunct to standard treatment in pregnant women with pelvic girdle pain: randomised single blind controlled trial. *British Medical Journal*; pp 330:761
- Engers, A., J., Jellema, P., Wensing, M., van der Windt, D., Grol, R., and van Tulder, M.,W., (2011) Individual patient education for low back pain (Review). The Cochrane Collaboration viewed at www.update-software.com/pdf/CD004057.pdf (Date Accessed: March 15, 2015)
- Frotin, J., D., Kissling R., O., O'Connor B., L., and Vilensky J.A. (1999) Sacroiliac Joint Innervation and Pain, *America Journal of Orthopedics*; 28: pp 687-690.
- Furlan, A., D., van Tulder, M., Cherkin, D., Tsukayama, H., Lao, L., and Koes B. (2005). Acupuncture and dry-needling for low back pain: an updated systematic review within the framework of the cochrane collaboration. *Spine*; (8), pp 944-963
- Guerreiro, S., Nakamura, M., Cordeiro, J., and Kulay L (2004). Acupuncture for low back pain in pregnancy—a prospective, quasi-randomised, controlled study. *Acupuncture in Medicine*. 22, pp 60–67
- Hungerford, B., Gilleard, W., and Hodges P. (2003). Evidence of altered lumbopelvic muscle recruitment in the presence of sacroiliac joint pain. *Spine*; 28(14), pp 1593-600.
- Kamali, F., and Shokri, E. (2012). The effect of two manipulative therapy techniques and their outcome in patients with sacroiliac joint syndrome. *Journal of Bodywork and Movement Therapy*; 16(1), pp 29-35
- Kvorning, N., Holmberg, C., Grennert, L., Aberg, A., and Akeson, J. (2004) Acupuncture relieves pelvic and low-back pain in late pregnancy. *Acta Obstetrica et Gynecologica Scandinavica*.83, pp 246–250
- Laslett, M. (2008). Evidence-Based Diagnosis and Treatment of the Painful Sacroiliac Joint. *Journal of manual and manipulative therapy*; 16(3), pp 142-145
- Maigne, J., Y., Aivaliklis A., and Pfefer, F. (1996). Results of Sacroiliac Joint Double Block And Value of Sacroiliac Joint Pain Provocation Tests in 54 Patients with Low Back Pain, *Spine*, 21, pp1889-1892
- McKee, M., D., Kligler B., Fletcher, J., Biryukov, F., and Casalaina, W. (2013) Anderson B. Outcomes of acupuncture for chronic pain in urban primary care. *Journal of American Board of Family Medicine*.26: pp 692-695

- Mens, J. M., Snijders C., J., and Stam, H., J. (2000). Diagonal trunk muscle exercises in peripartum pelvic pain: a randomized clinical trial. *Physical Therapy*; 80, pp 1164–1173
- Ostgaard, H., C., Zetherstrom, G., and Roos-Hansson E. (1998). The posterior pelvic pain provocation test in pregnant women. *European Spine Journal*; 3: pp 258–260
- Prather, H., and Hunt, D., (2004), Conservative management of low back pain. Part I. Sacroiliac joint pain. *Disease- a- Month*: 50 (12), pp 670-683.
- Richardson, C.A., Snijders, C.J., Hides, J.A., Damen, L., Pas, M.S, and Storm J. (2002). The relation between the transversus abdominis muscles, sacroiliac joint mechanics, and low back pain. *Spine*; 27 (4):399-405
- Shearar, K., A., Colloca, C.J., and White, H., L. (2005). A randomized clinical trial of manual versus mechanical force manipulation in the treatment of sacroiliac joint syndrome. *Journal of Manipulative Physiological Therapeutics*; (7), pp 493-501.
- Slipman, C., W., Jackson, H.B., Lipetz, J.S., Chan, K.T., Lenrow, D., and Vresilovic, E., H. (2000). Sacroiliac joint pain referral zones. *Archives of Physical Medicine and Rehabilitation*; 81(3), pp 334-348
- Smith C, and Grimmer-Somers K (2010). “The treatment effect of exercise programmes for chronic low back pain”. *Journal of Evaluation in Clinical Practice*; 16 pp 484–491
- Sokunbi, O., G., and Kachalla F., G. (2015) Effects of Acupuncture, Core-stability Exercises, and Treadmill Walking Exercises in Treating a Patient with Postsurgical Lumbar Disc Herniation: A Clinical Case Report, *Journal of Acupuncture and Meridian Studies* 8(1), pp 48-52
- Sokunbi, O.,G., Kachalla, F.,G., and Maduagwu S., M. (2014) The use of Alternate Side lying Manipulation, Acupuncture and Core stability exercises in the treatment of multiple level disc prolapse. *IOSR Journal of Dental and Medical Sciences* 13(10), pp 90-96.
- Sokunbi, O., G., and Usman, M., B. (2014). Effects of Conventional and Acupuncture like Transcutaneous Electrical Nerve Stimulation [TENS] on Osteoarthritis of the Knee. *Nigerian Journal of Experimental and Clinical Biosciences*. 2(2), pp 69-74
- Sokunbi O., Watt P., Moore A. (2002) Changes in plasma concentration of serotonin in response to spinal stabilisation exercise in chronic low back pain patient. *Nigerian Quarterly Journal of Hospital Medicine*; 17, pp 108-111.
- Stuge, B., Veierod M., B., Laerum, E., and Vollestad, N. (2004). The efficacy of a treatment program focusing on specific stabilizing exercises for pelvic girdle pain after pregnancy: a two-year follow-up of a randomized clinical trial. *Spine* 29: pp E197–203
- Stux, G., and Pomeranz, B. (1998) *Basics of Acupuncture*. New York, NY: Springer: pp 280-284.
- Tukmachi, E., Jubb, R., Dempsey, E, and Jones P. (2004). The effect of acupuncture on the Symptoms of knee Osteoarthritis — An open randomised controlled study. *Acupuncture in Medicine*; 22, pp 14-22
- Tullberg, T., Blomberg S., Branth, B., and Johnsson R. (1998). Manipulation does not alter the position of the sacroiliac joint. A roentgen stereophotogrammetric analysis. *Spine*; 10, pp 1124-1128.

Van der Wurff, P., Buijs, E., J., and Groen, G., J. (2006) A multitest regimen of pain provocation tests as an aid to reduce unnecessary minimally invasive sacroiliac joint procedures *Archives of Physical Medicine and Rehabilitation*; 87(1), pp10-14.

Vleeming, A., Albert, H., B., Ostgaard, C., H., Sturesson, B., and Stuge, B (2008); European guidelines for the diagnosis and treatment of pelvic girdle pain. *European Spine Journal*; 17(6), pp 794–819

Von Korff, M., Jensen, M., P., and Karoly, P. (2000). Assessing global pain severity by self-report in clinical health service research *Spine* 25, pp 3140-3151

Wedenberg, K., Moen B., Norling, A. (2000). A prospective randomized study comparing acupuncture with physiotherapy for low-back and pelvic pain in pregnancy. *Acta Obstetrica et Gynecologica Scandinavica*; 79, pp 331–335