Efficacy of Muscle Energy Technique Versus Strain Counter Strain on Low Back Dysfunction

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ABSTRACT

Background: *A recent focus in the manual therapy management of patients with back pain has been the specific training of muscles surrounding the spine, considered to provide dynamic stability and fine control to the lumbar spine. Manual therapy is beneficial for patients with sub acute and chronic non-specific low back pain, both reducing the symptoms and improving function.* ***Purpose:*** *to evaluate the effectiveness of muscle energy technique versus strain counter strain technique on outcome measures in patients with chronic low back pain.* ***Methods:*** *Thirty patients (male and female) their age range 30-50 years, with chronic low back pain (more than tree months) were assigned randomly to two equal treatment groups. The first group (n=15) underwent a four weeks program of muscle energy treatment. The second group (n=15) underwent a four weeks program of strain counter strain treatment. Outcome measures include pain intensity, lumber movements and functional disability index were measured.* ***Results:*** *After intervention. The present study revealed that although there was no statistical significance (P> 0.05) difference in pain intensity level, lumber range of motion and function disability level between both groups, patients in both groups showed statistical significance (P< 0.05) differences in all outcome measures between pre group (A) pain level from (6.66±0.89) to (2.4±1.05), function disability from (38.73±2.6) to (31.6±3.52) and lumber movement from (20.5±1.1) to (21.5±1.06) and group (B) pain level from (7.13±1.06) to (3.33±1.44), function disability from (38.26±3.43) to (32.6±3.83) and lumber movement from (19.76±1.42) to (21±1.86).* ***Conclusion:*** *The current results proved that both MET and SCS techniques are effective in reducing pain and functional disability in patients with chronic low back pain.*

Key words: *Muscle energy, Strain counter strain, chronic low back pain, outcome measures.*

INTRODUCTION

Chronic low back dysfunction (CLBD) is one of the most common reasons for patients to consult physical therapy clinics. A clear diagnosis leading to a specific therapy in conventional medicine can rarely be stated and most patients are diagnosed with mechanical or unspecific low back pain where an exact pathoanatomical diagnosis is not possible. This leads to a huge number of new therapy forms and minimal invasive techniques of which most are not proved to be efficient[21]. Lumbar dysfunction is a serious health problem affecting 80% of people at some time in their life. It affects the mobility of the lumbar region and adjacent joints leading to functional disability[12].

Muscle energy technique (MET) and propioceptive neuoro-muscular facilitation (PNF) stretching methods have been clearly shown to bring about greater improvements in joint range of motion (ROM) and muscle extensibility than passive, static stretching, both in the short and long term[18]. MET is a manual technique that is being widely adopted because it appears safe and gentle and is believed to be effective in patients with a variety of symptoms[10].

Strain counter strain technique (SCS): is an indirect manipulative osteopathic technique which is considered highly effective technique to relieve pain and restore function to muscles, bones, and joints. It is a powerful therapy for back pain. The application of positional release technique for somatic dysfunction requires a practitioner to first palpate a tender point in the soft tissues, the patient's limb is then moved in such a way that the pain associated with pressure on the tender points is relieved by at least 70 percent to find position of ease[43], suggested a minimum period required to hold a position of ease as 90 seconds. It is theorized that the shortening or "folding-over" of aberrant tissue in positional release achieves its therapeutic modifications via both propioceptive and nociceptive mechanisms. Thus; both of the two techniques were compared to investigate their efficacy in chronic low back dysfunction patients.

SUBJECTS, MATERIALS AND METHODS

Subjects

Criteria for inclusion in the study were restricted to 30 patients of either gender between the ages of 30 and 50 years and had persisted low back pain longer than 3 months[7].

Instrumentations

A- For evaluation:

1. Pain measures: The short form McGill pain questionnaire was used to assess each patient's average symptoms[31].
2. Lumbar spine range of movement in standing: This was measured using a Modified schober's test to assess lumbar flexion, extension[30].
3. Functional measures: The Oswestry disability questionnaire was used[17].

B- For intervention:

1. Infrared Radiation (IRR): model is 2004/2 N, a power of 400 w, voltage 203 v and frequency of 50/60 Hz.
2. Ultrasonic Device: Phyaction U 190, 230 V, 300 mA/50-60 Hz, Plus: 8 w.

Treatment Procedure: both treatment groups are received the following intervention protocols:

1. Infrared Radiation[37].
2. Ultrasonic.
3. Therapeutic Exercise program: includes finger to Toes, Bridging Exercise, Back Extension from Prone, Sit-Up Exercise, Knee to Chest Exercise and Stretching Lower Back Muscles. At this point each group is received different osteopathic manipulated technique; first group is received MET to the local spinal stabilizers and spinal mechanoreceptors including (multifidus, interspinalis and rotator muscles) as posterior stabilizers for the spine, (Iliopsoas muscle) anterior stabilizers of the spine anteriorly and control lumbar pelvic rhythm and consequent backache, and to (quadratus lumborum muscle) as lateral stabilizer of the spine[15]. It was done 3 times per session for 12 sessions with time of hold for each position 5 sec[39]. While second group is received SCS for the same muscles. Posterior lumber tender points are located on the Spinous processes, in the paraspinal area, or the tips of the transverse processes in attachment of the quadrates' lamborum and hold 90 seconds for each one and repeat three times[13].

RESULTS

MET group revealed a statistical significant difference between pre and post treatment pain intensity level as the pain level pre treatment was (6.66± 0.89) and for post treatment was (2.4±1.05) where the T-value was (20.69) and P-value was (0.000), there was a significant difference between pre and post treatment lumbar flexion ROM as the lumbar flexion ROM pre treatment was (20.5± 1.1) and for post treatment was (21.5±1.06) where the T-value was (3.66) and P-value was (0.002), there was a significant difference between pre and post treatment lumbar extension ROM as the lumbar extension ROM pre treatment was (12.1± 0.76) and for post treatment was (10.23±1.74) where the T-value was (4.26) and P-value was (0.001), and finally, there was a significant difference between pre and post treatment functional disability as the functional disability pre treatment was (38.73± 2.6) and for post treatment was (31.6±3.52) where the T-value was (9.73) and P-value was (0.000) as shown in table (1).

SCS group showed a statistical significant difference between pre and post treatment pain level as the pain level pre treatment was (7.13± 1.06) and for post treatment was (3.33±1.44) where the T-value was (11.64) and P-value was (0.000), there was a significant difference between pre and post treatment lumbar flexion ROM as the lumbar flexion ROM pre treatment was (19.76± 1.42) and for post treatment was (21.0±1.86) where the T-value was (3.58) and P-value was (0.003), there was a significant difference between pre and post treatment lumbar extension ROM as the lumbar extension ROM pre treatment was (12.2± 0.99) and for post treatment was (11.23±1.08) where the T-value was (4.09) and P-value was (0.001), and finally, there was a significant difference between pre and post treatment functional disability as the functional disability pre treatment was (38.26± 3.43) and for post treatment was (32.6±3.83) where the T-value was (9.34) and P-value was (0.000) as shown in table (1).

Table (1): Paired t- test of the dependant variables in each group.

Group	Variable	Pre treatment	Post treatment	Paired t-test		
		Mean ±SD	Mean ±SD	t-value	P-value	Significance
Group (A) (MET	Pain level	6.66± 0.89	2.4±1.05	20.69	0.000	S
	Lumbar flexion ROM	20.5± 1.1	21.5±1.06	3.68	0.002	S
	Lumbar extension ROM	12.1± 0.76	10.23±1.74	4.26	0.001	S
	Functional disability	38.73± 2.6	31.6±3.52	9.37	0.000	S
Group (B) (SCS)	Pain level	7.13± 1.06	3.33±1.44	11.64	0.0001	S
	Lumbar flexion ROM	19.76± 1.42	21.0±1.86	3.58	0.003	S
	Lumbar extension ROM	12.2± 0.99	11.23±1.08	4.09	0.001	S
	Functional disability	38.26± 3.43	32.6±3.83	9.34	0.000	S

P-value = Probability S = Significance

Statistical analysis revealed no statistically significant differences between both groups (A) and (B) in the combined dependant variables both pre and post treatment.

Pre treatment there was no significant differences between group (A) and (B) in: (I) pain intensity level where the t-value was (1.7) and P-value was (0.11), (II) lumbar flexion & extension ROM where the t-values were (1.52, 0.36) and P-values were (0.151, 0.727), and finally, (III) functional disability where the t-value was (0.04) and P-value was (0.696) as shown in table (2).

Post treatment there was no significant differences between group (A) and (B) in: (I) pain intensity level where the t-value was (2.11) and P-value was (0.053), (II) lumbar flexion &extension ROM where the t-values were (0.92, 1.89) and P-values were (0.375, 0.079), and finally, (III) functional disability where the t-value was (0.72) and P-value was (0.486) as shown in table (2).

Table (2): Paired-T- test of the dependant variables in both group.

Time of measurements	Variable	Group (A) (MET)	Group (B) (SCS)	Paired t-test		
		Mean ±SD	Mean ±SD	t-value	P-value	Significance
Pre treatment	Pain level	6.66± 0.89	7.13± 1.06	1.7	0.11	NS
	Lumbar flexion ROM	20.5± 1.1	19.76± 1.42	1.52	0.151	NS
	Lumbar extension ROM	12.1± 0.76	12.2± 0.99	0.36	0.727	NS
	Functional disability	38.73± 2.6	38.26± 3.43	0.4	0.696	NS
Post treatment	Pain level	2.4±1.05	3.33±1.44	2.11	0.053	NS
	Lumbar flexion ROM	21.5±1.06	21.0±1.86	0.92	0.375	NS
	Lumbar extension ROM	10.23±1.74	11.23±1.08	1.89	0.079	NS
	Functional disability	31.6±3.52	32.6±3.83	0.72	0.486	NS

P-value = Probability NS = Non significance

DISCUSSION

I. Pain intensity level: both MET and SCS groups revealed a statistical significant reduction in pain intensity level after the intervention period in patient with CLBP. The analgesic effect of MET could be explained by both spinal and supraspinal mechanisms; Activation of both muscle and joint mechanoreceptors occurs during an isometric contraction. This leads to sympatho-excitation evoked by somatic efferents and localized activation of the periaqueductal grey that plays a role in descending modulation of pain. Nociceptive inhibition then occurs at the dorsal horn of the spinal cord, as simultaneous gating takes place of nociceptive impulses in the dorsal horn, due to mechanoreceptor stimulation[20]. MET stimulates joint proprioceptors, via the production of joint movement, or the stretching of a joint capsule, may be capable of reducing pain by inhibiting the smaller diameter nociceptive neuronal input at the spinal cord level[22]. This is supported by the study of Degenhard et al. (2007)[14] who reported that concentrations of several circulatory pain biomarkers (including endocannabinoids and endorphins) were altered following osteopathic manipulative treatment incorporating muscle energy. The degree and duration of these changes were greater in subjects with C LBP than in control subjects. Moreover myofascial trigger point deactivation was shown to be enhanced by use of different forms of MET[19]. Consistent with these findings, Selkow et al. (2009)[36] who described the effectiveness of MET for hamstring muscle. Also the analgesic effect of MET is confirmed by work Strunk, (2008)[40], Buchmann et al. (2005)[6], and Wilson et al. (2003)[42]. On the other hand, Ballentyne et al. (2003)[4], still argue and hesitate about the efficacy of MET in form of post-isometric relaxation PIR. They suggested that the PIR theory and its consequent hypoalgesic effects are poorly supported by research.

The analgesic effect of SCS technique could be attributed to Bailey and Dick (1992)[3] who proposed a nociceptive hypothesis that tissue damage in dysfunctional muscle can be reduced by the positional release mechanism utilized by SCS. The result of the current study is supported by Carlos et al. (2011)[9], who proved reduction in pain and muscle tension in upper trapezius, which confirm the assumptions that the application of SCS seems to relieve muscle spasm and restore appropriate painless movement and tissue flexibility. Hutchinson (2008)[25] reported that there is significant improvement in VAS for pain intensity following SCS intervention for tennis elbow. These finding was in agreement with Marc (2003)[32], who confirmed the analgesic effect of SCS intervention for CLBP. This result also was supported by Meseguer et al. (2006)[33], who claimed that the application of SCS may be effective in producing hypoalgesia and decreased reactivity of TePs in the upper trapezius in subjects with neck pain. Moreover, Pedowitz (2005)[34] carried out a trial on the use of positional release on iliotibial band friction syndrome and found that the use of SCS as a treatment modality for the athlete can experience reductions in pain and be capable of returning to full activity in less than three weeks from initiation of treatment, compared to an average of 4-6 weeks of conventional therapy. This result also was supported by work of Cleland et al. (2005)[11] and Wong et al. (2004)[44], who confirmed the significant pain reduction in their studies.

II. Lumbar spine flexion and extension (ROM): Both MET and SCS groups showed a statistical significant improvement in lumbar spine ROM after the intervention period in patient with CLBP.

The improvement in ROM can be explained by reduction of pain and a proposed hypothesis by Hong (1999)[23]; The current findings of MET group are supported by the work of Blanco et al. (2006)[5] and Rajadurai (2011)[35], who proved significant improvement in active mouth opening following MET in participants with temporomandibular joint (TMJ) dysfunction. Allen (2011)[2] studied the effectiveness of MET in improving hamstring extensibility and considered MET a statistically significant intervention in improving hamstring extensibility in patients with hamstring injuries. Moreover, other studies confirmed the current findings as Willson et al. (2003)[42], AL-Khayer and Gervitt, 2007[1] and Jisha, 2007[26] that MET has been shown to improve joint range of motion, including spinal joints[27,28], other studies have showed that MET is effective in increasing range of motion in the cervical spine[38].

While the current finding of SCS group is supported by Howell et al. (2006)[24], who provided evidence in support of Korr's (1975) hypothesis of somatic dysfunction. This was supported also by Eisenhart, 2003[16], who evaluated the efficacy of osteopathic manual therapy (OMT) for patients with acute ankle sprain, showing a statistically significant improvement in edema, pain and a trend toward increased ROM immediately following intervention with OMT. Furthermore[8], provided a study about effect of osteopathic manipulative therapy OMT in case of Temporomandibular disorders (TMD) in randomized controlled trial, The result of the study was a significant improvement of pain which assessed by VAS and increase range of maximal mouth opening and lateral movement of the head around its axis.

In contrast[41], provided study to investigate the effect of SCS on increasing hamstring flexibility and concluded that SCS technique is not effective in increasing knee extension in healthy subjects who have decreased hamstring flexibility.

III. Functional Disability: both MET and SCS groups revealed a statistical significant reduction in Function disability level after the intervention period in patient with CLBP. This improvement is the resultant of combined findings of pain reduction and increasing of lumbar spine mobility. MET group is supported by a study of Wilson (2003)[42] concluded that using MET may benefit a patient to reduce low back pain and improve low back functional disabilities. While SCS group finding was in agreement with Lewis and Flynn (2001)[29], who reported improvements in the outcomes measured for disability levels.

Conclusion

The current results proved that both MET and SCS techniques are effective in reducing pain and functional disability in patients with chronic low back pain.

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الملخص العربي

تأثير تقنيات الطاقة العضلية والإجهاد مقابل الإجهاد على الاعتلال الوظيفي لمنطقة أسفل الظهر

مقدمة : يعرف ألم أسفل الظهر بأنه الأكثر كلفة من الناحية الاقتصادية على مستوى العالم . تتراوح نسبة الإصابة به بين٥٠ % - ٨٠% بين البالغين . كما تبلغ نسبة عودة الألم بعد الشفاء منه ما بين ٥٠ % - ٨٨% . تتعدد وسائل العلاج الطبيعي المستخدمة في علاج ألم أسفل الظهر إلا أنه بدأ التركيز في الأونة الأخيرة على استخدام العلاج اليدوي الإستيوباثي في صورة كل من تقنية طاقة الانقباض العضلي وكذلك الإجهاد مقابل الإجهاد للتحكم والسيطرة على هذا النوع من الألم. **الهدف :** تهدف هذه الدراسة إلى تقييم فاعلية كل من طاقة الإنقباض العضلي وكذلك الإجهاد مقابل الإجهاد على المخرجات الوظيفية لمرضى آلام أسفل الظهر المزمن. **الطريقة :** تم إجراء هذا البحث على ثلاثين مريضا (رجال – نساء) تتراوح أعمارهم بين ٣٠ – ٥٠عام ويعانون من آلام أسفل الظهر لمدة تزيد عن ثلاثة أشهر. تم تقسيم المرضى عشوئيا إلى مجموعتين متساويتين في العدد حيث تم علاج المجموعة الأولى بواسطة تقنية طاقة الانقباض العضلي والثانية بطريقة الاجهاد مقابل الاجهاد و برنامج علاج طبيعي يتكون من أشعة تحت الحمراء ، موجات فوق الصوتية ، تمرينات علاجية لكلتا المجموعتين ٣ مرات لمدة ٤ أسابيع لمدة ١٢ جلسة. **النتائج :** أظهرت النتائج فروق ذات دلالة معنوية إحصائية في كلتا المجموعتين بين المتغيرات موضع الدراسة وهي شدة الألم ، المدى الحركي (الثني والفرد) للفقرات القطنية وكذلك مقياس أوسوستري للعجز الوظيفي قبل وبعد العلاج إلا أنها أوضحت أيضا أنه ليس هناك فروق ذات دلالة معنوية إحصائية بين كل من تقنية الطاقة العضلية والاجهاد مقابل الاجهاد على هذه المتغيرات الثلاثة.**الخلاصة :** التقنيات العلاجية اليدوية الأستيوباثية لها تأثير في التحكم والسيطرة على آلام أسفل الظهر المزمن .

الكلمات الدالة : تقنية الطاقة العضلية – تقنية الاجهاد مقابل الاجهاد – آلام أسفل الظهر المزمن .