EFFICACY OF PASSIVE PELVIC FIXATION ON LUMBOPELVIC PAIN

EFICIENȚA FIXĂRII PASIVE A PELVISULUI ÎN REDUCEREA DURERII LOMBOPELVINE

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Key words: Active Straight Leg Raise; Lumbopelvic pain; Passive Pelvic Fixation

Objective The purpose of this study was to evaluate the efficacy of passive pelvic fixation (PPF) in the relief of lumbopelvic pain, restoration of spinal mobility and improving related disability.
Design Randomized Controlled Trial.
Setting Department of Musculoskeletal, Physiotherapy, Pravara Rural Hospital (Tertiary Hospital), Loni, Tal- Rahata, Dist- Ahmednagar, Maharashtra State, India- 413 736.
Participants Fifty-nine participants between 20-45 years of age having clinical diagnosis of acute nonspecific lumbopelvic pain.
Interventions Control group received the conventional physiotherapy and PPF group received passive pelvic fixation along with conventional physiotherapy. In PPF, pelvis was stabilized manually and patient performed the painful active lumbar movement 10 times. Total three sets of the above were given for seven consecutive days.
Main outcome measures The outcome was assessed in terms of visual analogue scale, lumbar spine mobility, Active Straight Leg Raise (ASLR) and Modified Oswestry Disability Questionnaire (MODQ) score.
Results PPF group had statistically significant difference in VAS score ($p<0.01$), flexion ($p=0.01$) and extension range ($p<0.05$) of lumbar motion, ASLR ($p<0.01$) and in MODQ score ($p=0.01$) after 7 days of treatment.
Conclusion Passive pelvic fixation may be used as an adjunct to conventional physiotherapy in acute non-specific lumbopelvic pain.
Clinical Trial Registration Number PMT/PIMS/RC/2011/06

Cuvinte cheie: Active Straight Leg Raise; durere lombo/pelvină, fixare pelvină pasivă

Obiective. Scopul acestui studio este de a evalua eficiența fixării passive a pelvisului (PPF) în reducerea durerii lombo-pelvine, restabilirea mobilității coloanei şi ameliorarea afecțiunilor asociate.
Design studiu controlat randomizat.
Setting Departamentul de recuperare musculoscheletală, Pravara Rural Hospital (Tertiary Hospital), Loni, Tal- Rahata, Dist- Ahmednagar, Maharashtra State, India- 413 736.
Participanți 59 de participanți între 20-45 ani, cu diagnostic de durere lombopelvină nespecifică.
Intervenții Grupul de control a urmat kinetoterapie convențională iar grupul de studiu a beneficiat şi de fixare pasivă a pelvisului, pe lângă kinetoterapie. LA grupul experimental, pelvisul a fost stabilizat manual iar pacientul a efectuat de 10 ori mişcarea lombară dureroasă. Totalul de trei seturi a cele descries anterior s-au efectuat timp de 7 zile consecutiv.
Evaluarea. Rezultatele au fost evaluate cu ajutorul scalei analoage vizuale (VAS), mobiliattea coloanei lombare, Active Straight Leg Raise (ASLR) şi scorul Modified Oswestry Disability Questionnaire (MODQ).
Rezultate Grupul experimental a înregistrat diferențe semnificative la scorul VAS ($p<0.01$), flexia ($p=0.01$) şi extensia ($p<0.05$) coloanei lombare, ASLR ($p<0.01$) şi la scorul MODQ ($p=0.01$) după 7 zile de tratament.
Concluzii Fixarea pasivă a pelvisului poate fi folosită ca adjuvant în kinetoterapia convențională a durerii lombo-pelvine acute nespecifice.
Număr de înregistrare PMT/PIMS/RC/2011/06

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Introduction

Low back pain (LBP) is neither a disease nor a diagnostic entity of any sort. Whether it's a dull, nagging ache or sharp shooting pain, low back pain is a condition that plagues millions of lives all over [1] and is a substantial health problem. Low back pain is defined as "pain, ache or discomfort, localized below the costal margin and above the inferior gluteal folds, with or without referred leg pain."[2] The incidence of low back pain in India is quite alarming affecting 60 per cent of the population at some time or the other in their lives [3]. It is the most frequent cause of limitation of activity (work, housekeeping, or school) in individuals younger than 45 years [4]. Low back pain may manifest in the form of lumbago, low back pain with buttock pain, low back pain with sciatica and lumbopelvic pain. Lumbopelvic pain is one of the major components of low back pain. Lumbopelvic pain is the pain around lower lumbar segment, sacrum with coccyx and posterior aspect of pelvis or the pain experienced between the upper level of the iliac crests and the gluteal folds.

The exact cause of pain for the majority of LBP patients remains unknown. Etiologic factors of LBP are not fully understood, but the pain seems to involve physical factors, psychological factors, and social factors, and there is strong evidence that LBP is related to work [5,6]. One of the leading factors for non specific lumbopelvic pain is lumbopelvic malalignment. These may be due to the abnormal positioning of the pelvis [7]. Ligaments and muscles surrounding lumbar and pelvis area help in maintaining position and stability of this area. Any dysfunction of these anatomical structures will result in lumbopelvic pain [8]. It is hypothesized that lumbopelvic pain can be due to overloading of the ligaments of the pelvic ring and/or lumbopelvic junction during activities in which loads have to be transferred between legs and trunk [9,10,11]. It has been shown that insufficiency can arise due to poor function of stabilization musculature [12].

Lumbopelvic stability depends on specific properties of joint articular surfaces (form closure) as well as muscle action and ligamentous force (force closure) which is known as self-locking or self-bracing mechanism [13]. This implies that several factors can lead to insufficient self locking due to decreased force closure. Load transfer with insufficient self locking can produce excessive loads on surrounding tissues and hence pain in local structures. In order to maintain the stability of this area, external forces other than muscles and ligaments may be helpful. Orthopedic manual therapy options and therapeutic exercises are fascinating treatment options for physiotherapist while treating patients with low back pain. Numerous studies have been reported about the effectiveness of therapeutic exercises in the treatment of low back pain. Interestingly, till date few studies regarding the effect of scapular repositioning in shoulder impingement syndrome have been documented suggesting its effectiveness in decreasing pain and increasing shoulder strength [14] but there is lack of similar evidence for the relative benefit of passive pelvic fixation or pelvic repositioning in the treatment of low back pain and hence there is need to investigate the clinical utility of this concept in the treatment of low back pain. The aim of the study was to study the body of knowledge pertaining to acute lumbopelvic pain and relatively new manual therapy intervention in the treatment of acute lumbopelvic pain. The primary objective of this study was to investigate the efficacy of passive pelvic fixation (PPF) in the relief of lumbopelvic pain and restoration of mobility. Secondary objective of this study was to find out the short term effect of passive pelvic fixation on lumbopelvic pain related disability.

Methods

Subjects

A total of hundred and five participants aged 20 to 45 years with nonspecific lumbopelvic pain were screened for the study through the Orthopaedic Department, Pravara Rural Hospital (Tertiary Hospital), Loni, Tal- Rahata, Dist-Ahmednagar, Maharashtra State, India- 413 736 from Jan 2011 to Nov 2011 considering the inclusion and exclusion criteria of which sixty four were eligible and agreed to participate in the study. Five of these participants dropped out of the study as they lost follow-up. Control group had 30 participants where as Passive Pelvic Fixation

(PPF) group had 29 participants**.** Criteria for inclusion in the study were acute non-specific lumbopelvic pain (less than 6 weeks) [15], age 20 to 45 years [3], positive Active Straight Leg Raise (ASLR) [16,17,18,19] test and whose symptoms altered with PPF. Participants were excluded if they had any of the following 1) lumbar spine surgery in last 12 months [20], 2) Any systemic illness [20], 3) Spinal deformity, 4) On steroids or epidural anesthesia, 5) Clinical situations where movements were contraindicated, 6) Clinical situations where Microwave Diathermy (MWD) was contraindicated [21], 7) Psychological or psychosomatic disorders [20]. The study was designed as a single blind randomized controlled trial.

Outcome measures

The outcome measures used in the study were visual analogue scale (VAS) [22] to measure the intensity of pain before and after the intervention, lumbar active range of motion (AROM) [23] using Modified Schober's method for flexion and extension and finger to floor method to measure side flexion, range of Active Straight Leg Raise (ASLR) [11,24,25] as clinical indicator of lumbopelvic stability and Modified Oswestry Disability Questionnaire (MODQ) [26] as an outcome measure for a patient's functional disability due to low back pain.

Procedure

The study received approval from Ethical Committee of Pravara Institute of Medical Sciences, Loni. Participants were screened based on the inclusion and exclusion criteria and those willing to participate were briefed about the nature of the study and intervention in the language best understood by them and written informed consent was obtained. They were encouraged to clarify questions regarding the study, if any. The physical examination of lumbar spine and pelvis was carried out. Participants were then randomized into two groups i.e Control and PPF group using simple random sampling. (Figure 1) Allocation of participants to the two groups was done on alternate basis. The demographic data, pain rating with visual analogue scale, measurement of range of motion of lumbar spine, active straight leg raise range and MODQ score of the participants were recorded prior to any intervention. Reassessment was done on the 7^{th} day. The participants in control group received conventional physiotherapy in the form of microwave diathermy (MWD), stretching of hamstrings, stretching of dorsolumbar fascia and Maitland mobilization (grade I and II) [27,28]. MWD was given in prone or side lying position as per convenience at the lumbopelvic region in for ten minutes. [21]. The participants in PPF (Study) group received along with the conventional treatment, additional passive pelvic fixation as treatment.

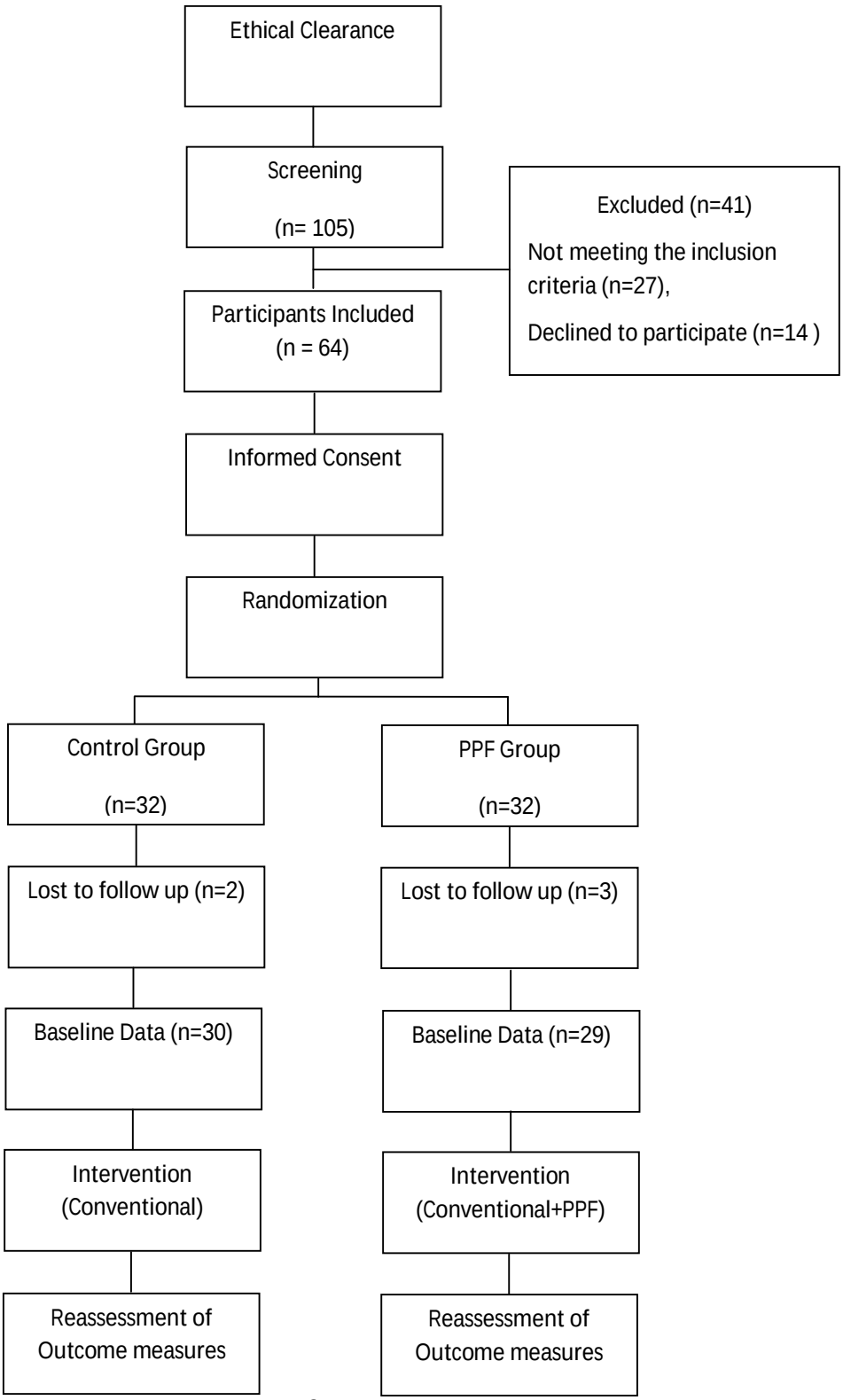

Figure 1. Flow diagram of the procedure used in the study

The starting position of the patient was standing with the therapist standing behind the patient. The therapist held the pelvis in neutral position at the anterior superior iliac spine level bilaterally with the thumb and index finger (Figure 2) while the patient performed the offending painful spinal movement (Figure 3). It was repeated 10 times. Patient was re-evaluated after every set of 10 repetitions. Total three sets of the above were given. It was continued for seven successive days. Outcome measures were reassessed on day 7. The data, thus obtained were considered for statistical analysis.

Figure 2 PPF-Starting Position

Figure 3 PPF-End Position

Results

Statistical analysis was done by GraphPad InStat software (Trial version 3.03) using various statistical measures such a mean, standard deviation (SD) and tests of significance such as unpaired 't' test. The results were concluded to be statistically significant with $p < 0.05$ and highly significant with $p < 0.01$. Unpaired 't' test was used to compare differences between the two groups i.e. the control group and the study group (PPF group). The baseline characteristics were comparable (Table 1). The visual analogue scale score showed statistically significant difference in control group participants and study group participants treated with PPF. There was statistically significant difference in the average range of lumbar flexion and extension between the control and study group participants. However, there was no significant difference in average bilateral lumbar side flexion and bilateral lumbar rotation in control group and PPF group after 7 days of treatment. ASLR score depicted statistically significant difference in the average range of ASLR in control group participants and study group participants treated with PPF. Functional disability in terms of MODQ score showed statistically significant difference in the average functional disability in control group participants and study group participants treated with PPF (Table 2, Figure 4).

Table 1: Demographic profile of both the groups (n=59).

Parameters	Control group	PPF group (Study)	'p' value
Age (years)	34.63±6.45	35.21±6.93	0.74
Height (cms)	161.53±6.42	158.41±5.82	0.056
Weight (kg)	62.90±7.97	64.07±10.03	0.62
BMI (kg/m^2)	24.11±2.86	25.5±3.51	0.102
Duration of symptoms (days)	25.3±8.16	26.1±8.93	0.73

BMI: Body mass index

Table 2: Comparison of all the outcome measures in both the groups between baseline and 7 days of intervention

Outcome Measures		Control Group	Study (PPF) Group	't' value	'p' value
VAS (cm)		4.50±0.84	5.22±0.94	3.126	<0.01
ASLR (deg)		06.47±3.45	13.45±6.42	5.225	<0.01
MODQ (percentage)		13.48±6.61	17.75±5.98	2.597	<0.05
Lumbar AROM	Flex. (cm)	2.01±0.84	2.56±0.74	2.662	<0.05
	Ext. (cm)	1.20±0.47	1.56±0.51	2.821	<0.05
	R.SF (cm)	1.36±0.67	1.75±1.20	1.557	>0.05
	L.SF (cm)	2.59±1.28	2.56±1.56	0.075	>0.05
	R.Rot (deg)	3.80±2.20	4.14±3.69	0.429	>0.05
	L.Rot (deg)	4.63±2.87	5.17±2.63	0.75	>0.05

VAS: Visual Analogue Scale, ASLR: Active Straight Leg Raise, MODQ: Modified Oswestry Disability Questionnaire, AROM: Active Range of Motion, Flex.: Flexion, Ext.: Extension, R.SF: Right side flexion, L.SF: Left side flexion, R. Rot: Right rotation, L. Rot.: Left rotation.

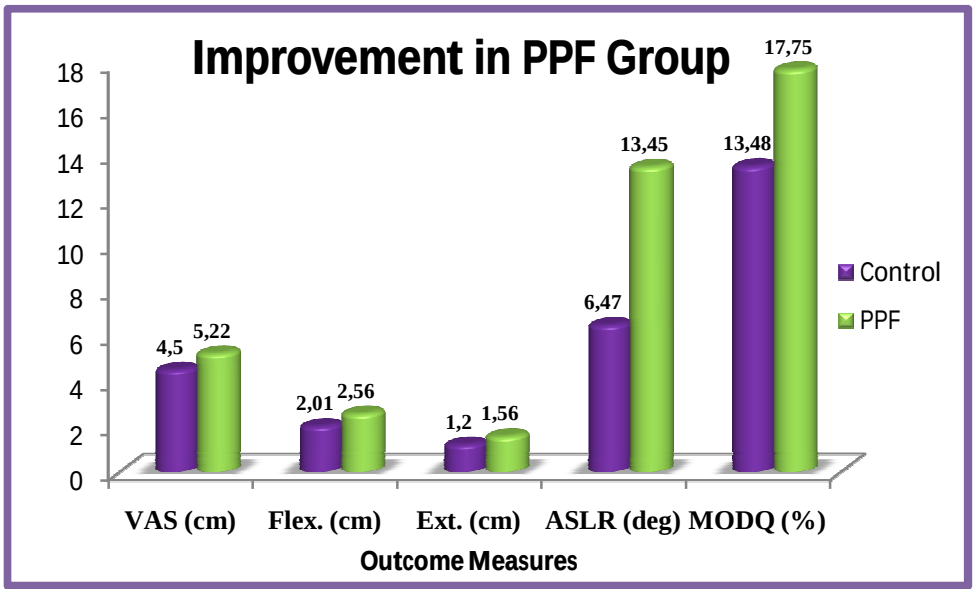

Figure 4 Improvement in Pain, Lumbar spine mobility, ASLR and functional disability in PPF Group

Discussion

Passive pelvic fixation group showed greater improvement in decreasing pain, increasing lumbar flexion and extension range, improving active straight leg raising and reducing functional disability related to low back pain in terms of Modified Oswestry Disability Questionnaire (MODQ). The pain relief might be due to the effect of microwave diathermy and the additional direct effect of passive pelvic fixation technique like neurophysiological change in pain modulation or mechanical effects of mobilization [29,30] or an effect on the motor system as

well as a local mechanical effect and thus, increased stability that may reduce the load on pain sensitive structures [24] and thereby relief of pain and inhibited muscle function which in turn may increase active range of lumbar movements. Further, this effect could be due to effects like placebo or psychological effect directly or indirectly by minimizing protective muscle guarding [29]. However, the cause and effect relationship was not investigated in the present study. Since there is hardly any similar study, the results of this study could not be interpreted in terms of the available literature. It has been reported that ilium compression has the potential to improve symptoms like pain and heaviness in subjects with Pelvic Girdle Pain during an ASLR and other aggravating movements, postures and functional tasks [24], via a number of possible mechanisms like increased intra-abdominal pressure with the activation of abdominal muscles and pelvic floor compression [11,16,17]. It has been shown that ilium compression activates transverses abdominus muscle [18,31,32]. This can be the possible explanation of augmentation of force closure leading to pelvic stability. However, the results are partly in accordance with the study of Darren et al (2010) [24] regarding manual pelvic compression on trunk motor control during an active straight leg raise in chronic pelvic girdle pain and partly in accordance with Angela R. Tate et al (2008) [14] who studied scapular repositioning and reported that it decreases pain and increases shoulder elevation strength in athletes with and without positive signs of shoulder impingement. There are other related studies about augmentation of force closure of the pelvic girdle with ilium compression [32,33,34] but implementation of the concept into a treatment technique is a relative new idea.

Improvement in ASLR score by pelvic fixation or stabilization might be due to the mechanical effects as produced with pelvic belt or improvement of muscle function or surgical joint fusion, relieving pain and decreasing discomfort in activities related to load transfer [11,31,32]. Decrease in pain and increase in range of motion could certainly have led to the functional improvement because it is the pain which limits the activities of daily living, causing disability. Reduction of pain and improvement of function have been documented in various studies [35,36]. Obvious limitation of this study included difficulty in generalizing the results for other patients and hence future research may be done in specific and nonspecific lumbopelvic pain. More research is required to investigate the effectiveness of PPF in terms of kinetic and kinematic analysis with advanced equipments.

Conclusion

Passive pelvic fixation may be used as an adjunct to conventional physiotherapy in acute non-specific lumbopelvic pain.

Acknowledgements

Ethical approval: Ethical Committee of Pravara Institute of Medical Sciences, Loni, Maharashtra state, India. (PMT/PIMS/RC/2011/06)
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Conflict of interest: None declared.

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