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RESEARCH ARTICLE

Immediate effect of contract-relax antagonist-contract method on iliopsoas muscle and hamstring muscle stretching in chronic non-specific low back pain

Harini G, Rajesh Dinakaran

SRM College of Physiotherapy, SRM University, Kattankulathur, Kancheepuram, Tamil Nadu, India

Correspondence to: Rajesh Dinakaran, E-mail: drajeshdinakaran@gmail.com

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ABSTRACT

Background: Low back pain (LBP) is a common musculoskeletal problem in recent days, and 85% of LBP is NSLBP. Studies have shown that psoas syndrome can be the cause of pain in lumbosacral region in a clinical scenario. **Aims and Objectives:** To find out the immediate effect of contract-relax antagonist-contract (CRAC) method on iliopsoas muscle and hamstring muscle stretching on chronic NSLBP. **Materials and Methods:** Totally 30 subjects from both genders were selected based on inclusion criteria were aged from 20 to 30 years, chronic NSLBP of more than 3 months, iliopsoas muscle tightness at least one side ("positive" from modified Thomas test). Pain intensity at least 3/10 on a 10-cm visual analog scale (VAS). Hamstring tightness with a minimum of −6 cm (male), −10 cm (females) done by sit and reach test. CRAC technique and hamstring stretching were administered. **Results:** Pre- and post-test values of all the outcomes measure are 0.000, there is a significant result exist between the VAS scale, hamstring and iliopsoas flexibility, before and after the interventions ($P < 0.05$). **Conclusion:** CRAC stretching technique combined with hamstring stretching can reduce back pain.

KEY WORDS: Chronic Non-specific Low Back Pain; Contract-relax Antagonist-contract Method; Iliopsoas; Hamstring Flexibility

INTRODUCTION

Low back pain (LBP) is a common problem among musculoskeletal symptoms. A previous study showed that 85% of LBP are classified as non-specific LBP (NSLBP).[1] The common physical factors related to chronic LBP were abnormal posture, abnormal lumbopelvic alignment, alteration of lumbopelvic muscle length, and mobility.[2] Shortening of the iliopsoas muscle was found to be the primary cause of lumbar hyperlordosis and excessive anterior pelvic tilt.[3] Psoas syndrome (tight iliopsoas) may apparent as any of a range of clinical scenarios concerning LBP and frequently poses a diagnostic confront. The most common symptoms many patients come across are lumbosacral pain while sitting or standing, difficulty in attaining fully erect posture, contralateral gluteal region pain, and pain that radiates to opposite down the leg (generally stopping proximal to the knee).[4] These symptoms might imitate those of a herniated nucleus pulposus.[5,6] Psoas syndrome is usually commenced as spasm in bilateral iliopsoas muscle, which ultimately becomes more prominent on one side.[5] According to previous studies,[7,8] the shortening of the iliopsoas muscle induced abnormal loading on the lumbar spine and mainly caused increased lumbar lordosis and anterior tilting of the pelvis.

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Patients with LBP are often reported with short hamstring muscles (LBP) as well.[9-12] The reason behind such muscular tightness, however, is fully unstated. "Pelvic cross syndrome" is the one in which there is a reduction in the excessive lordosis of lumbar spine which is caused by an impairment of muscle in a specific pattern which is due to compensatory mechanism and is usually associated with hamstring tightness and is commonly seen in patients with LBP.[13-15] This psoas syndrome resulted in LBP with an anterior pelvic tilt and excessive lordosis in the lumbar spine.[6,9,10] The contract-relax (CR) method and CR-antagonist-contract (CRAC) method of proprioceptive neuromuscular facilitation (PNF) are the two techniques seen in literature more frequently than other techniques. The method of CRAC follow the literal procedure as method of CR, however, continued more. As a replacement of just passively stretching the targeted muscle (TM), there are antagonist muscles isomeric contraction is to the TM for a specific time period.[16] There was no study done on the biomechanical relationship between iliopsoas, and hamstring muscle in patients who have chronic NSLBP. Hence, this study is done to find out the effect of CRAC method on the above-mentioned reason.

MATERIALS AND METHODS

Participants

It's an experimental study with totally 30 subjects from both genders were selected based on inclusion criteria were aged from 20 to 30 years, chronic NSLBP of more than 3 months, body mass index range between 18.5 and 25 kg/m^2; lumbar lordosis angle >34.76 cm;[17] iliopsoas muscle tightness at least one side ("positive" from modified Thomas test);[18] pain intensity at least 3/10 on a 10-cm visual analog scale (VAS). Hamstring tightness with a minimum of −6 cm (male), −10 cm (females) done by sit and reach test.[19] History of abdominal, back, and hip surgery. Spine and hip fracture, menstruation at the time of testing. Pain and severe joint stiffness of hip and knee and problems of cardiovascular and respiratory systems. Physiological problems that cause referred pain at the low back were excluded. Informed consent was obtained from those who willing to participate in the study. The research was conducted according to the principles of the declaration of Helsinki. Pre-assessment was taken such as pain intensity, modified Thomas test, and sit and reach test was performed before and after the intervention.

Interventions

CRAC the first part of this stretch is similar to the hold-relax whereby the muscle being stretched, contracted isometric for 3–6 s, then the antagonist muscle will immediately contract for 3–6 s. The joint is then pushed into its new range.[16,20] The participants were explained about the intervention procedure before the administration of the procedure. The hold-relax stretching technique was used in the same position as the modified Thomas test. The shortened iliopsoas in both legs was treated by hold relax. The target hip was moved toward the floor until the participant felt a mild stretch sensation. Then, the participant was asked to perform a sub-maximum voluntary isometric contraction (MVIC) (approximately 25% MVIC)[21] of the iliopsoas muscles for 10 s, then completely relax for 10 s. During relaxation, the antagonistic gluteal muscle is contracted isometrically for 10 s. The participant's leg was slowly moved to the new range until a mild stretch sensation was felt and held at this position for 20 s. This hold-relax stretching to iliopsoas, and isometric contraction of gluteus maximus was repeated 5 times, followed by a 1-min rest, for 15 min. All subjects were immediately measured after intervention for post-test by the same examiner. Hamstring stretching: The participant was asked to sit in a long sitting position with both knees extended. Then, they asked to reach their toes without bending their knees and hold for 10 s and repeat for 3 times. They are asked not to hold breathe.[22]

Data Analysis

SPSS version 20.0 was used for statistical analysis. The level of statistical significant was set at "*P*" 0.05. Paired *t*-test was done to find difference between pre-test and post-test values of all outcome measures.

RESULTS

The mean of VAS in pre-test and post-test is 5.77 cm and 2.83 cm, respectively, the mean of sit and reach test in pre-test and post-test is 25.63 cm and 30.33 cm, respectively. The mean of right hip extension in pre-test and post-test is 21° and 28°, respectively. The mean of left hip extension in pre-test and post-test is 20° and 27.33°, respectively. The corresponding *P*-value on comparing pre and post-test values of all the outcomes measure is 0.000, there is a significant result exist between the before and after the interventions ($P < 0.05$).

DISCUSSION

Based on the above data, there is significant difference between the values of modified Thomas test which is done during pre- and post-test shows there is increase in length of iliopsoas muscle, after the intervention of CRAC, also there is significant difference between the values of Sit and Reach test which is done pre and post-test shows there is increased length of hamstring muscle. The combined effect of the above two mechanisms has reduced the intensity of pain, in low back region, that has been reflected in the significant value exists between pre- and post-test values of VAS. Since there was no study was conducted to explain this relationship to support the current study. However, the results were supported by the individualized effect of

Table 1: Mean and "*P*" value of all outcomes

Parameters	Mean	*n*	Significance (2 tailed)
Pair 1			
Pre-VAS	5.77	30	0.000*
Post-VAS	2.83	30	
Pair 2			
Pre Sit Reach test	25.63	30	0.000*
Post Sit Reach test	30.33	30	
Pair 3			
Pre right hip extension	21.00	30	0.000*
Post right hip extension	28.00	30	
Pair 4			
Pre left hip extension	20.00	30	0.000*
Post left hip extension	27.33	30	

*$P<0.05$ there is significant differences exist for pain intensity, length of hamstring muscle, length of iliopsoas muscle between pre- and post-test values ($P<0.05$). VAS: Visual analog scale

each of the above technique by Etnyre, and Lee assessed 74 participants of which 49 are male, and 25 are female. They compared changes of shoulder extension, hip flexion and among male and female by Static stretching, CR of PNF technique, and CRAC stretching PNF techniques, for over 12 weeks. From all the participants in this study range of motion, measurements were found before the beginning of the treatment, and the same measurements were taken once in every 3 weeks until the end of the study. There were increases in the range of motion were seen throughout the treatment groups, PNF stretching techniques were found to be more effective than the stretching done with static method for both hip flexion and shoulder extension.[23] However, one study was done CRAC on postural stability, that study investigates the effects of the CRAC stretching on hamstrings, plantar flexors, and hip flexor muscles to improve the postural stability, on 30 volunteers includes both men and women, they concluded that CRAC improves medial and lateral stability.[24] Previous studies conducted on one of the PNF technique which is hold-relax on iliopsoas muscle which is exactly the study about the relationship, what we tried here to correlate but hold-relax technique was used on 30–55 years of age with chronic NSLBP and lumbar hyperlordosis had significant reduction in pain.[16] About the hamstring flexibility, it was supported by a study conducted by Bandy *et al.*, where they took 93 subjects of age ranging from 21 to 39 years who had limited hamstring flexibility were randomly assigned to one of the five groups. The four stretching groups, stretched 5 days/week for 6 weeks. The results show that 30 s of sustained stretch causes increased hamstring length and range of motion.[25] Some researchers have hypothesized that tightness affects the lumbar lordosis, and that leads to LBP might be due to the attachment of iliopsoas to the pelvis and lumbar spine and also the hamstring muscle were attached to the ischial tuberosity, tightness of this muscle will induce the pelvis posteriorly that in turn results in flat back and LBP.[12]

Strengths and Limitations

In this study, we have analyzed the relationship between the iliopsoas and hamstring tightness on LBP, there was no study done to find out these relationship in one study, and this study will be a major contributor to kinetic chain linkage of musculoskeletal disorders especially LBP, which is encountered by majority of population from various fields. Limitation of the study was small sample size, and further study can be done involving biomechanical link between iliopsoas muscle and lower cross syndrome muscle. Different age groups can be concentrated, and analysis can be done on athletes as well. Lumbar lordosis can be considered as one of the outcome measures, instead of stretching exercise, treatment technique can be changed into techniques like Myofascial or Trigger point release can also be considered.

CONCLUSION

CRAC stretching combined with hamstring stretching will reduce chronic NSLBP.

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