Original Article

Lower Back Pain

Effectiveness of Core Stabilization Exercises Versus Mckenzie's Exercises in Chronic Lower Back Pain

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ABSTRACT

Objective: To determine the effectiveness of core stabilization and McKenzie's exercises on intensity of pain, disability and lumbo-pelvic stability was compared in non-specific chronic low back pain (CLBP) patients.

Study Design: Randomized controlled trial study

Place and Duration of Study: This study was conducted at Departments of Physical Therapy, Institute of Physical Medicine and Rehabilitation, Dow University of Health Sciences Karachi and Peoples University of Medical & Health Sciences, Nawabshah during 2012-13.

Materials and Methods: Thirty patients with non-specific CLBP were enrolled through convenience sampling and were randomly assigned core stabilization and McKenzie exercises. Intensity of pain, disability, and lumbo-pelvic stability were evaluated by Visual Analouge Scale, The Oswestry disability Questionnaire, and Stibilizer Pressure Biofeedback Unit, respectively. Eighteen sessions were done for both groups. t-tests and ANCOVA test were used for statistical analysis ($p<0.05$).

Results: Although the score of pain decreased in both groups ($p<0.05$), the decrease of intensity of pain was more than in Core Stabilization Exercises Group ($p<0.05$). The score of disability questionnaire decreased in stabilization exercise group ($p<0.05$). During Knee Lift Abdominal and Bent Knee Fall Out maneouvres, pressure of biofeedback unit did not significantly differ before and after interventions, in both groups ($p>0.05$).

Conclusion: The stabilization exercises can reduce pain and disability in nonspecific CLBP patients.

Key Words: Low Back Pain, Core Stabilization, McKenzie's exercises, Pakistan.

INTRODUCTION

Chronic low back pain (CLBP) is one of the major public health problems, with high economic and social costs, loss of job and disability in many of communities[1,2]. As a result, rehabilitation approaches and exercises have focused on management or treatment of low back pain[3]. Accordingly, some of exercises could be utilized for spinal stabilization due to improved spinal stability and to increase control of the spine[4]. It is proposed that specific stabilization exercises program might lead to change in central motor program and automatically feed forward recruitment of deep core muscles[5]. Therefore, stabilization exercises are more effective than conventional treatments to decrease pain and disability in CLBP[6,7]. However, Some authors found that general exercises with or without stabilization exercises could exhibit the same outcome on improvement of pain and disability in subjects with CLBP[8,9]. Another approach is McKenzie's method which focuses on sustained postures or repeated movements[10,11]. Although McKenzie's exercises could improve pain intensity in acute, subacute and CLBP[12] . Some studies found that there are no difference between McKenzie's exercises, strengthening exercises and primary care in reduction of pain, and disability in patients with acute and CLBP[11]. Very little research is done on comparing effectiveness of stabilization and McKenzie's exercises in non-specific CLBP. As mentioned above, based on lack of consensus on appropriate treatment method, lack of sufficient objective evidences about the effects of stabilization exercises on the lumbo-pelvic stability in CLBP, lack of a comparative study between Mackenzie's and stabilization exercises in non specific CLBP, the main goal of this study was to compare the effects stabilization and McKenzie's exercises on pain intensity, disability and lumbo-pelvic stability in non-specific CLBP subjects.

MATERIALS AND METHODS

This study was a randomized controlled trial study. to Departments of Physical Therapy, Institute of Physical Medicine and Rehabilitation, Dow University of Health Sciences Karachi and Peoples University Of Medical & Health Sciences, Nawabshah, participated in this interventional study.

Thirty non-specific CLBP patients, referred to above mentioned institutes during the period 2012-1 were enrolled for the study. All participants sign written informed consents. Patients were enrolled through simple non-probability sampling and were randomly assigned into two groups: McKenzie's exercises group (n=15) and Stabilization exercises group (n=15). The

examiner who assessed the outcomes was blinded to group assignment.

Thirty patients with age between 18-50 years, non-specific CLBP in the area between the costal margin and buttocks, with or without reference to the lower extremity in previous three months were included in this study. Patients were excluded who reported a history of recent fracture, trauma or previous surgery at lumbar region, spondylosis or spondylosthesis, spinal stenosis, neurological disorders, systemic diseases, pregnancy, cardiovascular diseases, concomitant treatment with physical therapy modalities.

Data collection: At baseline and after last treatment session, Visual Analouge Scale (VAS) and The Oswestry disability Questionnaire (ODQ) were used for outcome measures, based on following procedures

Pain assessment: The VAS was used for pain assessment; whereby pain was rated from 0 to 100 mm, in which the 0 represented no pain and 100 represented maximum pain tolerance. Subjects were indicated the best number described for their pain[12] .

Disability assessment: The ODQ was completed to assess percentage of functional disability in patients with CLBP. This questionnaire is a gold standard tool to indicate ability of patients with CLBP[13]. It consists of 10 sections and each of the section includes 6 rates, from zero to five. The first section of this questionnaire rates pain and the other sections assess activities of daily living. Total score of questionnaire was recorded as percentage[14].

Lumbo-pelvic stability assessment: Stability of lumbo–pelvic region was assessed by the Stabilizer PBU, Chattanooga, Australia[7]. This device measures pressure changes from 0 to 200 mmHg with accuracy of 2 mmHg[7]. Monitoring of lumbopelvic motion was performed by recording the pressure changes during Knee Lift Abdominal Test (KLAT) and Bent Knee Fall Out Test (BNFOT) [7]. The baseline pressure was set to 40 mmHg [15]. The pressure values was recorded at the end of the manoeuvres. Inter-observer reliability correlations for KLAT and BNFOT were 0.85 and 0.87, respectively[15].

Intervention: For warming up, participants pedaled a stationary bike for 5 minutes and performed stretching exercises for 10 minutes[8]. Then, Patients were randomaly assigned in stabilization exercises group or McKenzie's exercises group.The training program was scheduled 18 sessions in 6 weeks for both groups.

Core Stabilization exercises group: The stabilization exercises were performed in 6 steps: 1- Segmental Control Exercises (SCE) with emphasis on training the isolated contraction of Transverse Abdominis (TrA), Multifidus (MF), and pelvic floor muscles, 2- SCE with emphasis on co-contractions of TrA, MF, and pelvic floor muscles in the prone, supine, and four foot kneeling positions, 3- SCE in closed kinematic chain, 4- SCE in open chain exercise applied by adding leverage of the limbs, 5- SCE in functional situations, 6- Co-contraction of TrA and MF muscles while external load, complication of movements and light aerobic activities[10].

McKenzie's exercises group: In the Mckenzie's group, six exercises were performed: four extension type and two flexion type exercises. The extension type exercises were performed in prone and standing positions and the flexion type exercises were carried out in the supine and sitting positions. The final position of each exercise was maintained for 10 seconds[13]. The McKenzie's exercises were repeated 80 and 100 times[14].

Statistical analysis: Results were computed as mean values and standard deviation (SD). Criterion of significance was set as $p<0.05$. Kolmogrov Smirnov test was used to describe normal distribution. ANCOVA test was used to compare variables between McKenzie's and the stabilization groups. Paired t-test was used to compare variables before and after interventions.

RESULTS

Thirty patients with non-specific CLBP participated in this study. The demographic features of patients are listed in Table 1 & Chart I. The patients in stabilization exercises group did not differ from the McKenzie's exercises group, before intervention.

Within group comparison: Paired t-test was used to compare intra-group variables, before and after interventions. After intervention, the score of pain decreased in both groups ($p <0.05$). The mean score of disability decreased in stabilization group ($p <0.05$). The mean values of motor control tests did not show significant differences in both groups ($p> 0.05$) (Table 2).

Between group comparison: Inter-group comparison was done by ANCOVA. The mean score of disability and mean values of lumbo-pelvic stability did not showed significant differences between two groups ($p >0.05$). However, the score of pain differed from in both groups ($p <0.05$). The decrease of pain was more in stabilization exercises group ($p <0.05$) (Table 2).

Table No.1: Inter-group comparison of subjects' characteristics

	Stabilization Group	McKenzie's Group	p-value[c]
Age (y)	40.13± 10.82[b]	36.60 ± 8.21	0.323
Height(cm)	170.53 ± 8.54	172.13 ± 7.98	0.600
Weight(kg)	74.96 ± 4.10	26.66 ± 4.74	0.432
BMI[a]	25.80 ± 4.10	26.66 ± 4.74	0.600

a BMI= Body Mass Index.

b Values are Means and Standard Deviation.

c Statistically significant results at $p \leq 0.05$.

Table No.2: Inter-group & intra-group comparison of outcome variables

Outcome Variables	Stabilization Group		Mckenzie's Group		Inter-Group Comparison
	Before	After	Before	After	p-value
Pain (ordinal)	4.33 ± 1.58[b]	1.53 ± 1.40	4.40 ± 1.95	2.66 ± 1.39	0.033[c]
Functional (ordinal)	20.66 ± 10.51	12.26 ± 8.87	31.60 ± 17.09	22.93 ± 13.51	0.073
Rt KLAT (mmHg)[a]	61.06 ± 12.51	60.60 ± 11.33	59.80 ± 7.82	58.33 ± 9.17	0.622
Lt KLAT (mmHg)	62.93 ± 10.03	62.66 ± 11.91	58.53 ± 9.72	59.46 ± 9.97	0.894
Rt BNFOT (mmHg)	29.86 ± 1.76	29.33 ± 2.71	29.60 ± 2.77	29.06 ± 2.78	0.887
Lt BNFOT (mmHg)	30.20 ± 1.37	29.26 ± 2.40	29.20 ± 2.33	28.33 ±2.46	0.428

a Rt KLAT= Right Knee Lift Abdominal Test, Lt KLAT= Left Knee Lift Abdominal Test,
Rt BNFOT= Rt Bent Knee Fall Out Test, Lt BNFOT= Lt Bent Knee Fall Out Test.

b Values are Means and Standard Deviation.

c p- value for difference between group.

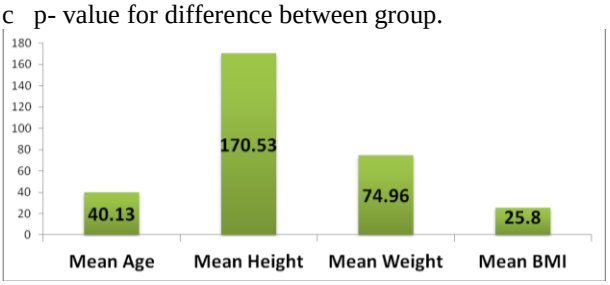

Chart No.1: Characteristics of stabilization group

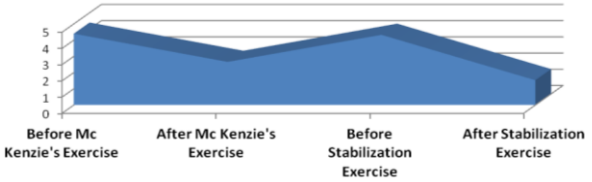

Chart No.2: Scores of pain before and after core stabilization and McKenzie's exercises

DISCUSSION

The McKenzie's exercises reduced pain and stabilization exercises reduced pain and disability. However, lumbo-pelvic stability did not change after intervention in both groups. Many clinical researchers have focused on the managment of Low Back Pain[12,15]. Although McKenzie's method is a common approach of low back pain management[16], there are a few studies with regard to effectiveness of McKenzie's method on LBP[11,17]. Currently, stabilization exercises have been used for management of patients with CLBP. Researchers confirmed that stabilization exercises have been influenced on pain and function in CLBP patients[12,15]. It was showed that stabilization and McKenzie's exercises reduced the score of pain and disability. These results are in accordance with several studies which supported McKenzie's exercises or stabilization exercises could decrease intensity of pain and improve the score of disability in patients with CLBP[12,15]. Our results showed that decrease of intensity of pain was more than in stabilization group. Superiority of stabilization exercises to decrease of pain is in accordance with several studies which supported stabilization exercises are more effective than other treatment in CLBP[6,7]. This study supported that stabilization exercises are effective exercises to reduce intensity of pain and improve functional ability in patients with CLBP. It is proposed that the efficient neuromuscular control is necessary for trunk stability and correct patterns of muscle recruitement[18,19]. Furthermore, it is reported that central motor program can change after performing stabilization exercises[20]. However, no alternation in lumbo-pelvic stability after intervention in both groups was evident. In addition, the motor control is a complex process that involves multiple systems and subsystems[21]. Therefore, to change a movement pattern, changes in musculoskeletal system, neural systems, and coordination between systems are necessery[22]. Therefore, based on these results, we propose that KLAT and BNFOT maneuvers and PBU instrument are not sensitive enough to measure the lumbo-pelvic stability. Accordingly, lack of change in lumbo-pelvic stability might be due to short duration of exercises protocol which could not lead to learning effects. Another study with similar objectives concluded that a 4-week spinal stabilization exercise program significantly improved functional status in patients presenting with CLBP[23]. Kofotolis N & Kellis E also endorsed the same result[24]. However, Roussel N et al cited that the intra-observer reliability of this evaluation method was still a challenge & it needed further research on this subject[25]

CONCLUSION

The study supported that stabilization exercises can reduce pain and disability in CLBP patients. However, these exercises do not change lumbo-pelvic stability. The presented method in this research will need further research to evaluate lumbo-pelvic stability with either more sensitive instrument or better maneuvers.

REFERENCES

1. Chou R, Qaseem A, Snow V, Casey D, Cross JT, Shekelle P. Diagnosis and treatment of low back pain: A joint clinical practice guideline from the Life Sci J 2013; 10(10s) 302 American College of Physicians and the American Pain Society. Ann Intern Med 2007; 147(7): 478-491.

2. Suka M, Katsumi Yoshida K. Low back pain deprives the Japanese adult population of their quality of life: A questionnaire survey at five healthcare facilities in Japan. Environ Health Prev Med 2008; 13: 109-115.
3. George SZ, Childs JD, Teyhen DS, Wu SS, Wright AC, Dugan JL, et al. Rationale, design and potocol for the prevention of low back pain in the military (POLM) trial. BMC Musculoskelet Disord 2007; 8: 92.
4. Limaa POP, Oliveira RR, Costa LOP, Laurentino GEC. Measurement properties of the pressure biofeedback unit in the evaluation of transversus abdominis muscle activity: A systematic review. Physiother 2011; 97: 100-106.
5. Millisdotter M, Strömqvist B. Early neuromuscular customized training after surgery for lumbar disc herniation: A prospective controlled study. Eur Spine J 2007;16:19-26.
6. Goldby LJ, Moore AP, Doust J, Trew ME. A randomized controlled trial investigating the efficiency of musculoskeletal physiotherapy on chronic low back disorder. Spine 2006;31(10): 1083-1093.
7. Franca FR, Burke TN, Hanada ES, Pasqual MA. Segmental stabilization and muscular strengthening in chronic low back pain - a comparative study. Clinics 2010;65(10):1013-1017.
8. Koumantakis GA, Watson PJ, Oldham JA. Trunk muscle stabilization training plus general exercise versus general exercise only: Randomized controlled trial of patients with recurrent low back pain. Phys Ther 2005; 85(3): 209-225.
9. Cairns MC, Foster NE, Wright C. Randomized controlled trial of specific spinal stabilization exercise and conventional physiotherapy for recurrent low back pain. Spine 2006; 31(19): E670-681.
10. McCarthy CJ, Arnall FA, Strimpakos N, Freemont A, Oldham JA. The biopsychosocial classification of non-specific low back pain: A systematic review. Phys Ther Rev 2004; 9(1): 17-30.
11. Petersen T, Larsen K, Jacobsen S. One-year follow up comparison of the effectiveness of treatment and strengthening training for patients with chronic low back pain: Outcome and prognostic factors. Spine 2007; 32(26): 2948-2956.
12. Skikic EM, Suad T. The effects of McKenzie exercise for patients with low back pain, our experience. Bosn J Basic Med Sci 2003;3(4):70-75.
13. Kinkade S. Evaluation and treatment of acute low back pain. Am Fam Physician 2007;75(8): 1181-1188.
14. McKenzie RA. Mechanical Diagnosis and Therapy for Disorders of the Low Back. In: Twomey LT, Taylor JR, editors. Physical Therapy of the Low Back. 2nd ed. New York: Churchill Livingstone; 1994.p.171-96.
15. Machado LAC, Maher CG, Herbert RD, Clare H, McAuley J. The effectiveness of the McKenzie method in addition to first-line care for acute low back pain: A randomized controlled trial. BMC Med 2010; 8: 10.
16. Battie MC, Cherkin DC, Dunn R, Ciol MA, Wheeler KJ. Managing low back pain: Attitudes and treatment preferences of physical therapist. Phys Ther 1994; 74:219-226.
17. Schenk RJ, Jozefczyk C, Kopf A. A randomized trial comparing interventions in patients with lumbar posterior derangement. J Man Ther 2003; 11(2): 95- 102.
18. Zazulak B, Cholewicki J, Reeves NP. Neuromuscular Control of Trunk Stability: Clinical Implications for Sports Injury Prevention. J Am Acad Orthop Surg 2008;16:497-505.
19. Bazrgari A, Shirazi-Adl C, Lariviere C. Trunk response analysis under sudden forward perturbations using a kinematics-driven model. J Biomech 2009;42:1193-1200.
20. O'Sullivan PB, Twomey LT, Allison GA. Evaluation of specific stabilization exercise in the treatment of chronic low back pain with radiologic diagnosis of spondylolysis or spondylolisthesis. Spine 1997; 22: 2959-2967.
21. O'Sullivan PB, Twomey L, Allison GT. Altered abdominal muscle recruitment in patients with chronic back pain following a specific exercise intervention. J Orthop Sports Phys Ther 1998;27: 114-124.
22. Panjabi MM. The stabilizing system of the spine. Part II. Neutral zone and instability hypothesis. J Spinal Disord 1992;5(4):390-397.
23. Sung PS. Multifidi muscles median frequency before and after spinal stabilization exercise. Arch Phys Med Rehabil 2003;84(9):1313-1318.
24. Kofotolis N, Kellis E. Effects of two 4-week proprioceptive neuromuscular facilitation programs on muscle endurance, flexibility and functional performance in womem with chronic low back pain.Phys Ther 2006;86(7):1001-1012.
25. Roussel N, Nijs J, Truijen S, Vervecken L, Mottram S, Stassijns G. Altered breathing patterns during lumbopelvic motor control tests in chronic low back pain: A case-control study. Eur Spine J 2009;18:1066-1073.

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