Available online at **www.ijmrhs.com**

ISSN No: 2319-5886

International Journal of Medical Research & Health Sciences, 2017, 6(8): 47-52

Effects of Hemibridge with Ball and Balloon Exercise on Forced Expiratory Volume and Pain in Patients with Chronic Low Back Pain: An Experimental Study

Jorida Fernandes[1] and Akshay Chougule[2]*

[1]MPT, Lecturer, Karnataka Lingayat Education Society University Institute of Physiotherapy, Belagavi, Karnataka, India

[2]BPT, Karnataka Lingayat Education Society University Institute of Physiotherapy, Belagavi, Karnataka, India

**Corresponding e-mail: akshaychougule307@gmail.com*

ABSTRACT

Background and objectives: *Suboptimal breathing patterns and impairments of posture and trunk stability are often associated with musculoskeletal complaints such as low back pain. Respiration is also affected by poor neuromuscular control of core muscles. Immediate effects of hemibridge with ball and balloon exercise has been studied on chronic pain in athlete population.* ***Objective:*** *To evaluate the effects of hemibridge with ball and balloon exercise on pain, forced expiratory volume and functional abilities in patients with chronic low back pain using Visual Analogue Scale (VAS), Forced Expiratory Volume (FEV) and Modified Oswestry Disability Questionnaire (MODQ).* ***Methods:*** *The present experimental study was conducted among 30 participants between the age of 21 to 55 years with chronic non-specific LBP. The participants were given a hemibridge with ball and balloon exercise. Pre-interventional and 3rd day Post-interventional outcome measurements were taken using VAS, FEV1 and FEV6 and MODQ.* ***Results:*** *The difference between pre-and post of VAS was statistically highly significant (p=0.0001). The p value of FEV6 and MODQ by paired t test was statistically significant with p value of 0.02 and 0.0007 respectively.* ***Conclusion:*** *The study concludes that there is an immediate effect of hemibridge with ball and balloon exercise on pain, FEV6 and functional ability in patients with chronic LBP.*

Keywords: Hemibridge, Forced expiratory volume, Pain, Chronic, Vitalograph COPD6

INTRODUCTION

Non-specific low back pain is the universal term that refers to any type of back pain in the lumbar region that is not related to severe pathology and does not have a specific cause [1]. It can either be acute subacute or chronic in nature [2].

In the Western industrialised countries, LBP is a major health problem [3]. The annual prevalence of LBP is stated to be 15% to 45% with a point prevalence of approximately 30% [4]. Sixty percent of individuals who experience acute LBP recover in 6 weeks and up to 80% to 90% recover within 12 weeks [4]. The incidence of LBP in India has been reported to be 23.09%. It has a lifetime prevalence of 60% to 85% [5,6]. Among these individuals, 67% have psychological problems, 57% were in blue colour job, 26% had to leave their profession and 38% were not satisfied with their present job [5].

Impaired kinematics of diaphragm and pelvic floor muscle and changes in breathing pattern were observed in patient with back pain undergoing a motor task. Studies have found that diaphragm contributes biomechanically to maintain trunk stability. It has been reported that, diaphragm by activation of the phrenic nerve, resulted in, an increase in intra-abdominal pressure which eventually increases spinal stiffness. Diaphragm plays two roles - it is a primary muscle for respiration and also acts as a trunk stabilizer. Along with diaphragm, transversus abdominis, pelvic floor muscle and multifidus also stabilize the trunk. The tonic activities of the transversus abdominis and diaphragm are regulated to meet respiratory demands during both inspiration and expiration and provide spinal stability, when there are monotonous limb movements. It has been found that, inefficient muscular stabilization results in delayed contraction of transverses abdominis causing LBP. Therefore, these changes in kinematics of trunk stabilizers may be responsible for back pain [7].

Suboptimal breathing patterns and impairments of posture and trunk stability are often associated with low back pain. Treatment with traditional core stabilization exercises has caused recurrence of LBP. Respiration is also affected by poor neuromuscular control of core muscles. Immediate effects of Bridge Ball and Balloon exercise has been studied on chronic pain in athlete population. These exercises provide an optimal zone of apposition (ZOA) of the diaphragm that may help to address LBP. These exercises have been designed in such a way, that all the core muscles get recruited while performing the exercises [8]. Extensive research has been done in the field of physiotherapy on acute LBP. Limited evidence is available for chronic LBP with hemibridge with ball and balloon exercise in non-athlete population.

Hence the need of the study arises to evaluate the effects of hemibridge with ball and balloon exercise on pain, forced expiratory volume and functional abilities in patients with chronic low back pain using Visual Analogue Scale (VAS), Forced Expiratory Volume (FEV) And Modified Oswestry Disability Questionnaire (MODQ).

METHODS

Participants

Twenty-nine participants were included in the study from tertiary care hospital.

Inclusion criteria

Patients with age group 21 to 55 years, twelve weeks from the first onset of pain (chronic pain), non-specific LBP.

Exclusion criteria

Central nervous system dysfunction (hemiparesis, myelopathy, cerebellar ataxia) radiculopathy, acute and subacute LBP, amputation of lower limb, angina, and other cardiac conditions.

Participants were briefed about the nature of the study and the intervention and only those willing to take intervention for 3 days, informed consent was obtained and were recruited for the study.

A baseline assessment of pain, FEV1 and FEV6 and functional abilities was done using VAS, FEV and MODQ.

Equipment

Vitalograph COPD6, ball (squeeze ball) and balloon.

The procedure for FEV is as follows. FEV will be performed in sitting position. Patients will be asked to take a maximal inspiration and then to forcefully expel air for as long and as quickly as possible.

Measurement that are made include:

1) FEV1: Forced expiratory volume in 1 second

2) FEV6: Forced expiratory volume in 6 seconds [9].

Protocol

Participants were given exercise called as hemibridge with ball and balloon exercise for 3 sessions over 3 days (Figures 1a and 1b).

Instructions

1) Lie on back with feet on a wall and knees and hips bent at 90° angle.

2) Place a 4-6” ball between knees

3) Place right arm above head and a balloon in left hand

4) Inhale through nose and as exhale through mouth perform a pelvic tilt so that tailbone is raised slightly off the mat. Keep low back flat on the mat. Do not press feet flat in the wall; instead dig down with heels

5) Shift left knee down so that it is below the level of right without moving feet. should feel left inner thigh engage.

6) With left knee shifted down, take right foot off the fall should feel the back of the left thigh engage. Maintain this position for the remainder of the exercise.

7) Now inhale through nose and slowly blow out into the balloon

8) Pause 3 seconds with tongue on the roof of mouth to prevent airflow out of the balloon.

9) Without pinching the neck of the balloon and keeping tongue on the roof of the mouth, inhale again through nose.

10) Slowly blow out as stabilize the balloon with hand.

11) Do not strain neck or cheeks as blow.

12) After the fourth breath in, pinch the balloon neck and remove it from mouth. Let the air out of the balloon.

13) Relax and repeat the sequence 4 more times [8].

Figure 1 (a) Copyright© Postural Restoration Institute ™, used with permission

Figure 1 (b) Copyright© Postural Restoration Institute ™, used with permission

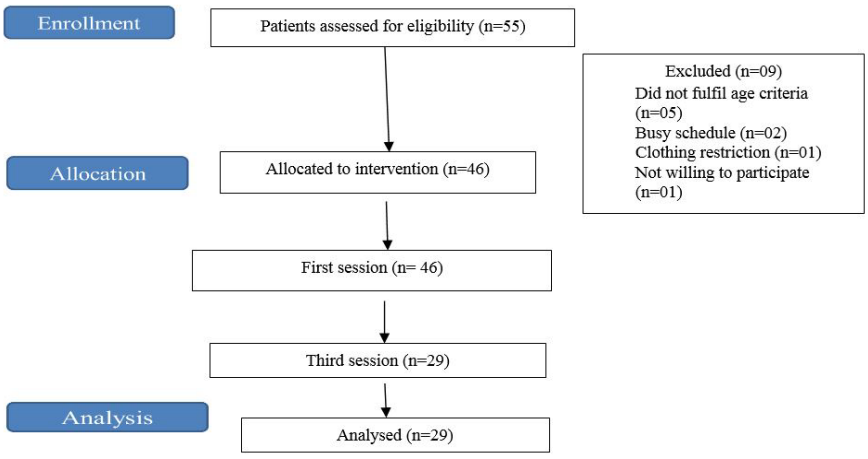

Figure 2 Participant flow diagram

RESULTS

Demographic data of the participants are provided in Table 1. The participants treated with hemibridge ball and balloon exercise for LBP and FEV had significantly greater postintervention reduction in pain and FEV6 ($p<0.05$*). Post intervention they also demonstrated significantly greater change in functional ability in the participants ($p<0.0007$). No significant change was found in FEV1 ($p=0.09$). Complete results of Mann-Whitney U test and paired t-test are provided in Table 2. Seventeen participants dropped out after the first session as they were expecting faster results (Figure 2). No adverse effects were reported.

Table 1 Demographic characteristics of the subjects

Participants (n= 29)	Mean ± SD
Age (years)	27.7 ± 7.5
Gender (n)	
Women	18
Men	12
Weight (kg)	66.3 ± 9.6
Height (cm)	165.5 ± 9.8
BMI	24.3 ± 3.1

Table 2 Values of Pain, FEV1, FEV6 and MODQ

Variables	Pre-treatment (n=29)	Post treatment (n=29)	p-value
VAS	4.8 ± 1.1	4.4 ± 1	0.0001*
FEV1	3.5 ± 0	3.5 ± 0	0.09
FEV6	4.12 ± 0.86	4.14 ± 0.89	0.0244*
MODQ	19.4 ± 8.3	18.3 ± 8.4	0.0007*
* $p<0.05$; Values are mean ± SD			

DISCUSSION

This study used hemibridge with ball and balloon exercises, to correct the postural instability which is a cause to pain. The pain scores on VAS were low when measured prior to the treatment. Even though statistically significant change was noted, clinically very minimum change was seen. The ZOA of the diaphragm is an important element that helps to maintain optimal respiration and trunk stabilization, thereby preventing LBP. The exercise used in the present study targeted the ZOA and spine to a proper position, so that the diaphragm can function effectively to perform respiration and to maintain posture. These exercise cause slow breathing and is considered further to relax the neuromuscular system and decrease the resting muscle tone. Respiratory function has been reported to be related to low back pain. A correlation study done by Mellin indicate that chronic low back pain is associated with the restriction of the movements in the thoracic spine and this association may affect respiratory function test [10]. In the present study, the value of FEV1 showed clinically minimum change.

The FEV6 values were statistically significant. The change in the FEV6 could be attributed to the component of blowing the balloon of hemibridge with ball and balloon exercises. During the activity, coordinated activity of transversus abdominis and diaphragm is required to maintain respiration and stability. During inhalation, there is concentric contraction of diaphragm and eccentric contraction of transversus abdominis and during exhalation there is concentric contraction of transverses abdominis and eccentric contraction of diaphragm. Blowing the balloon requires deep inhalation followed by forceful exhalation. The eccentric contraction of both diaphragm and transversus abdominis during exhalation and inhalation may have developed strength and optimize ZOA and therefore improve the respiratory function [8].

The hemibridge with ball and balloon exercise is designed to promote optimal posture by utilizing the diaphragm in the most efficient way and correcting the lumbar spine position. It also concentrates on neuromuscular control of the deep core muscles. Activation of these muscles may have contributed to correction of lumbar lordosis, thereby correcting faulty posture causing pain. Blowing the balloon during exhalation helps in the activation of the abdominal muscles and inhibition of the paraspinal muscles. This also contributes in the correction of the lumbar lordosis thereby increasing the functional ability of the participant [8].

Limitation

Long term follow-up of pain, FEV1, FEV6 and MODQ could not be assessed. A large majority of participants dropped out of the study after the first session as they were expecting quick relief within one session.

Future Scope

ZOA could have been assessed using Diagnostic ultrasound. Use of EMG biofeedback to study each of the muscle recruited during the exercise to correct posture and prevent pain. Effects of these exercises can be studied in acute and subacute cases of LBP.

CONCLUSION

The study concludes that there are immediate effects of hemibridge with ball and balloon exercise on pain, FEV6 and functional ability in patients with chronic low back pain. The traditional notion that the chronic nonspecific LBP can be treated only with the electrotherapeutic should be abandoned and newer and creative methods of exercise therapy should be implemented to correct non-specific low back pain.

Findings

Using hemibridge ball balloon exercise changes the position of ZOA thus improving the efficacy of the diaphragm to act as a strong trunk stabilizer and therefore reducing LBP.

Implications

These exercises are easy to administer and can be performed at home independently also, results can be attend quickly and is cost effective. Continuation of these exercise can correct the improper posture.

Caution

Our study examined the immediate effect of hemibridge with ball and balloon exercise on pain, FEV1, FEV6 and quality of life. The effects of chronic application of these exercises and its long-term effects is yet to be examined.

DECLARATIONS

Ethics approval

The study was approved by institutional review committee and was conducted in conformity with the principles outlined in declaration of Helsinki.

Funding

The project is self-funded.

Competing interests

The authors declare that they have no competing interests.

REFERENCES

[1] Balagué, Federico, et al. “Non-specific low back pain.” *The Lancet* 379.9814 (2012): 482-491.

[2] Nachemson AL, Waddell G, Norlund A. Epidemiology of neck and low back pain. In: Nachemson AL, Jonsson E, editors. Neck and back pain: the scientific evidence of causes, diagnosis and treatment. Philadelphia (PA): Lippincott Williams & Wilkins, USA, 2000.

[3] Mayer, Tom G. “Functional restoration for spinal disorders.” *The Sports Medicine Approach* (1988).

[4] Merritt, Hiram Houston, Henry L. Moses, and Lucy Moses. *A Textbook of Neurology*. Philadelphia: Lea & Febiger, 1979.

[5] Sharma, S. C., et al. “Incidence of low back pain in workage adults in rural North India.” *Indian Journal of Medical Sciences* 57.4 (2003): 145-147.

[6] Krismer, M., and M. Van Tulder. “Low back pain (non-specific).” *Best Practice & Research Clinical Rheumatology* 21.1 (2007): 77-91.

[7] Ostwal, Priyanka P., and S. K. Wani. "Breathing patterns in patients with low back pain." *International Journal of Physiotherapy and Research* 2.1 (2014): 347-353.

[8] Boyle, Kyndall L., Josh Olinick, and Cynthia Lewis. "The value of blowing up a balloon." *North American Journal of Sports Physical Therapy: NAJSPT* 5.3 (2010): 179.

[9] Represas-Represas, Cristina, et al. "Screening for chronic obstructive pulmonary disease: validity and reliability of a portable device in non-specialized healthcare settings." *Plos One* 11.1 (2016): e0145571.

[10] Mellin, Guy, and Ritva Harjula. "Lung function in relation to thoracic spinal mobility and kyphosis." *Scandinavian Journal of Rehabilitation Medicine* 19.2 (1987): 89-92.