

## Role of Pressure Biofeedback in Lumbar Stabilization Exercises in Management of Mechanical Low Back Pain

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### Abstract

Mechanical low back pain (LBP) is the most common complaints in the urban society causing to absent from the work and activity limitation. Its health, social and economic burden is hefty. Despite developments in modern medicine in general and growing knowledge of spinal diseases, problem of nonspecific low back pain remains unsolved. In India, occurrence of LBP is also alarming; nearly 60% of the people have significant back pain at some time or the other in the lives and responsible to cause work-related disability in persons younger than 45 years. Even though there is ample evidence stating the efficacy of lumbar stabilization training but the evidence based practice are lacking that establish the role of pressure biofeedback training in lumbar stabilization. The present contribution intends to study whether pressure biofeedback in lumbar stabilization exercises has any role in the pain management and decreasing the relatedness disability as measured by Visual Analogue Scale (VAS) and Modified Oswestry Low back Pain Questionnaire (MOLBPQ) respectively. An intervention including lumbar stabilization exercises of 3 week protocol was given to 2 groups of 15 patients. Both groups showed decrease in pain and disability after intervention but the group involving lumbar stabilization exercises using pressure biofeedback group showed significant improvement as compared with the other group. Conclusively, lumbar stabilization exercises using pressure biofeedback are more beneficial than lumbar stabilization exercises alone in mechanical low back pain patients.

**Keywords:** Lumbar stabilization exercises; Pressure bio feedback; Mechanical low back pain.

### Introduction

Musculoskeletal disorders (MSD), with back pain accounts for more than half of the cases, are now the most common cause of chronic incapacity in industrialized countries.[1] Low back pain is associated with substantial morbidity for 80% of the general population at some stage during their lives.[2] Back pain is one of the most common reasons people go to the doctor or miss work. Annually, 7% of the adult population will present to their general practitioner with low back pain, with 32% presenting for repeated consultations

with back pain.[3] Self-reported disability in adolescents with LBP varies from 18% to 94%. [4] However, most adolescents reporting LBP show minor functional impairment and little impact on Health-Related Quality Of Life (HRQOL). In India, occurrence of LBP is also alarming; nearly 60% of the people have significant back pain at some time or the other in the lives.[5] A variety of strategies have been proposed by Snook and White (1994), to prevent LBP, considering its prevalence, cost and substantial impact on work disability. Mechanical LBP is the most common cause of work-related disability in persons younger than 45 years in the United States. In India, back pain is the second most common reason for visits to office based physicians. For individuals older than 45 years, mechanical LBP is the 3rd most common cause of disability and is generally associated with a work related injury.[6]

It is often referred to as clinical spinal instability. Instability could be the result of

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tissue damage, making the segment more difficult to stabilize. Insufficient muscle strength or endurance or poor muscle control, and instability are unusually a combination of all three components. When the neuromuscular control system is affected there is increased body sway which has been found in patients with low back pain indicating a less efficient muscle control system with decreased ability to provide the needed spinal stability.[7,8]. Lumbar spinal instability may be caused by degenerative disease, postoperative status, trauma to the spine or its surrounding structures, developmental disorders, like scoliosis and other congenital spine lesions, infection, and tumors. Studies have shown that there is dysfunction of transverse abdominis and multifidus in low back pain subjects.[9] Treatment of low back pain is one of the most controversial subjects in clinical medicine at the present time, yet it comprises of most interesting paradox. There is now considerable evidence documenting the efficacy of exercises in the conservative treatment of low back pain. Exercises can be relatively inexpensive, easily administered treatment method, which proves to be the most effective solution for the patients whose pain appears to be resistant to other treatment options. However the choice of exercise therapy is also fraught with difficulty for the clinician because aerobic exercises, strengthening exercises, coordination exercises, and specific stability exercises have all shown to be effective in the treatment of this condition.[10]

Research has developed specific exercises for transverse abdominis with the help of pressure biofeedback unit and concluded that this specific type of therapeutic exercise with pressure biofeedback provides effective pain relief for chronic and recurrent back pain sufferers through enhanced segmental stability.[9] The present study was designed to find out the efficacy of stability around the lumbar spine in patients with mechanical low back pain by providing stabilization exercises with pressure biofeedback.

## Methods and Materials

A total of 30 young adult patients with mechanical low back pain were selected from the hospitals of New Delhi and NCR between the age of 20-45 years. Patients with any history of neurological involvement, surgery and any congenital bony anomaly were excluded. Prior to the intervention, all the subjects were given proper instructions, task familiarization and their informed consent to participate in the study was taken, as per the ethical guidelines of Indian Council of Medical Research.[11]

### *Study design*

Pretest-Post test experimental study design was used.

### *Outcome measures*

VAS (visual analogue scale) was used to assess the intensity of pain before the treatment and after the treatment and Modified Oswestry disability low back pain Questionnaire was used to give a score that indicates each patient's level of functional disability.

### *Intervention*

A total of 30 patients was divided in 2 groups, each group having 15 patients of which 2 patients dropped out from group 2 in the second week of the 3 week intervention protocol. The first group was given lumbar stabilization exercises with pressure biofeedback Pressure Biofeedback Unit (Stabilizer TM, Chattanooga Group, INC., Chattanooga, TN) and other group was given stabilization exercises without pressure biofeedback. Both the groups underwent 3 week treatment program. Subjects were given lumbar stabilization exercises with and without the pressure biofeedback unit. Patients were made to hold the tuck in

maneuver of tummy for 10 secs and repeat each exercise ten times. Hot fomentation was given to patients in crook lying position and general stretching was given to the patient prior to exercise.

### Data analysis

The data were analyzed using SPSS 16. Descriptive analysis was used for demographic data. Dependent variables were analyzed using paired students t- test. Pearson's chi square test applied to study gender based group differences. The significance value was set at  $P < 0.05$ .

### Results

The mean age of the sample was  $30.4 \pm 7.6$  years and BMI  $19.8 \pm 2.6$  kg/m<sup>2</sup>. Pearson's chi square test revealed a resultant p value of 0.93 ( $\geq 0.05$ ) signifies no gender disparity between the two groups. The Student t-test analysis for pre-test of the outcome measures disability index and VAS reported no significant difference between the two groups mentioned in table 1 and table 2. In contrast, post test analysis for disability index and VAS showed a significant difference ( $p \leq 0.05$ ) with a p-value of 0.02, indicating significant improvements in Group 1 than Group 2

### Discussion

The aim of this study was to find out the efficacy of lumbar stabilization exercises using

pressure biofeedback and without pressure biofeedback for pain and functional disability in patients with mechanical low back pain. Everett C Hills *et al* (2006) reported that mechanical low back pain is common in individuals less than 45 years of age and also a common cause of disability [6] that form the basis for which similar group of patients was incorporated in the present study. The reasons for this could be the occupation, genetics or the personal behavior. Occupations that increase the risk for low back pain are those that involve more of lifting, twisting, bending and reaching.

According to the researches present in the literature, both males and females either have an equal propensity to develop low back pain or females are more prone to it. Our result is supported by work done by --- Peter M Kent *et al* (2005) who conducted a study on epidemiology of low back pain in primary care and found that there was a small gender differences in the frequency of general medical consultation for low back pain (mean 7.0% for females and 5.5% for males), but it is unclear whether real gender differences exist or reflect the sampling error as the statistical significance of this difference was not reported. [12]

Disability relates to the patient's perception of how their particular problem is affecting their activities of daily living and their quality of life. [13] The disability questionnaire is the key to determine the response to treatment as it provide information about a wide range of functional status. [14] The questionnaire is a reliable predictor of disability with ICC 0.83-0.94. [15] The results from a post intervention

**Table 1: Pretest -Posttest comparison of Disability Index between groups**

Disability index	Group (n=15)	Group 2 (n=13)	p- value
Pre- test	33.8 $\pm$ 11.55	31.54 $\pm$ 17.53	$p \geq 0.05$
Post- test	18.27 $\pm$ 5.76	27.61 $\pm$ 15.38	$P < 0.05$

Note: NS=Non Significant; \*=significant (p valued"0.05)

**Table 2: Pretest-Posttest comparison of VAS between groups**

VAS	Group 1 (n=15)	Group 2 (n=13)	p-value
Pre- test	5.47 $\pm$ 1.12	5.15 $\pm$ 1.14	0.87 <sup>NS</sup>
Post- test	2.2 $\pm$ 0.77	4.3 $\pm$ 1.31	0.02*

Note: NS=Non Significant; \*=significant (p valued"0.05)

of 3 weeks the inter group comparison of the present study revealed that the Disability index score was statistically significant in group A (with pressure biofeedback) as compared to group B (without pressure biofeedback). Lumbar stabilization causes co-contraction of transversus abdominis, posterior fibers of internal oblique and lumbar multifidus that increases the intra abdominal pressure and the tension of the thoracolumbar fascia.. These muscles are segmental muscles which directly attach to the lumbar vertebra hence are most responsible for segmental stabilization.[9,16] Consequently, stabilization of the spine is maintained by the intra abdominal pressure in the abdominal cavity and the stiffness of the lumbar spine.[16] Pressure biofeedback is a type of Knowledge of performance (KP) which is given during and after the performance of a task and is related how the task is performed. The therapist provides the information through the apparatus and by attending to the information the patient forms a close loop. Our results are also supported by the work done by Fábio Renovato França *et al*, (2010). They concluded that Segmental stabilization and strengthening exercises effectively reduce pain and functional disability in individuals with chronic low back pain.

### Conclusion

Biofeedback techniques are used to augment the patients sensory feedback mechanisms through precise information about body processes that might otherwise be inaccessible.[19] The findings of this study provide evidence to support previous research, which indicates that a difference exists in the deep abdominal function of patients with and without low back pain. Additionally it is suggested that the pressure biofeedback unit may be considered as a useful tool to act as an indicator of deep abdominal function. Lumbar stabilization exercises using pressure biofeedback are more beneficial than lumbar stabilization exercises alone in mechanical low back pain patients.

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