Effect of Specific Stabilization Exercise versus Conventional Back Extension in Management of Chronic Herniated Pulposus

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Research Article

Abstract: **Background:** Local stabilizing musculature activation occurs automatically in a preparatory manner prior to movement. Failure of this preparatory stabilizing mechanism is identified as primary cause of persistence low back pain. The aim of this study was to investigate whether specific stabilization exercises or conventional back extension exercises are effective in people with Chronic Herniated Pulposus (HNP). **Materials and Methods:** 20 patients with Chronic Herniated Pulposus (HNP) were randomized into two groups. 10 patients in Group A received Specific stabilization exercise while 10 patients in Group B received conventional back extension exercise. Pain perception was measured using the Visual Analogue Scale (VAS). Disability was measured using the Ronald – Morris Disability Questionnaire (RMDQ). Both the intervention periods were delivered at 5 times/week for 4 weeks. **Results:** Training of the specific stabilization exercise in group A showed a significant improvement in decreasing pain and in improving functional ability when compared to strengthening exercise in group B at $p < 0.05$ (t-test). **Conclusion:** There was decrease in the pain intensity and improvement in functional level in patients who were given conventional back extension exercise but there was a more marked relief in patients who were given Specific stabilization exercises after a treatment protocol of four weeks.

Key Words: Chronic Disc Prolapse, conventional back extension exercise, Specific stabilization exercises.

Introduction

Performing knee rehabilitation without first training the vastus medialis oblique (VMO) which is a local stability muscle can lead to patellofemoral problems and the same concept is being used on patients with low back pain. This concept of retraining the local stability system in people with low back pain has made its way into the physical therapy setting within the last four to five years and is not altogether a new way. [1] The concept is to create stiffness in the spine before load is placed on the spine, thus controlling mid range or neutral zone. Control of this mid range helps to reduce shear force and compression during movement and spinal loading. [1]When working properly, the local intrinsic musculature fibers works before the actual motion of an extremity or of the trunk occurs.[2]

Thus pre-contraction of the intrinsic musculature can become delayed or inhibited in the presence of pain or pathology. This delay, or inhibition of the stability system, decreased a patient's ability to control a joint neutral position during movement or underload.[2]

A Herniated Pulposus (HNP) was defined as one that herniated beyond the vertebral body margin but contained within an intact annulus. In adult disc herniation is common and often caused by trauma. Local stabilizing musculature activation occurs automatically in a preparatory manner prior to movement.[3] Failure of this preparatory stabilizing mechanism is identified as primary cause of persistence low back pain.[4] Literature that has developed from and is supportive of the "segmental stabilization/motor control" model has generated research highlighted by the following:

A) Transverse abdominis contrast separately from the other abdominal muscles and its contraction precedes that of primary mover. This preparatory spinal stabilization contraction is lacking in subject with LBP.
B) The lumbar multifidus muscle function in a similar, preparatory manner in normal subjects to provide segmental stability and movement guidance between segments.[5]

The typical back exercise programs, like gym based rehabilitation program, pool therapy, and Pilates are too advanced for low back pain patients prior to retraining the tonic holding capacity and isolated co-contraction of multifidus (MF) and transverses abdominis (TrA).[5]

The co-contraction of the TrA and the MF muscles occurred prior to any movement of the limbs, back injury patients were unable to recruit their TrA and MF muscles early enough to stabilize the spine prior to movement. Furthermore, the MF muscle showed poor recruitment in

back injury patients, again showing how the recruitment of these deep trunk muscles is very important.[6]

The aim of this study was to investigate whether specific stabilization exercises or conventional back extension exercises are effective in people with Chronic Herniated Pulposus. We hypothesized that the training programs consisting of specific stabilization exercises or conventional back extension exercises would be effective in reducing patient self-reported pain, disability and improving activity of deep stabilizing muscles (TrA and MF) as these muscles undergo atrophy after injury.

Methodology

The study was conducted in MGMs Institute of Physiotherapy, Aurangabad from July 2011-December 2011. This was a randomized clinical trial study design. Consent to carry out the study was granted by the Institutional ethical clearance committee. Patient diagnosed as Chronic Herniated Pulposus (HNP) for more than 3 months, both males & females between 20 and 40 years old were included in the study. The exclusion criteria consisted of Back pain attributed to any specific pathology: e. g., disc to any specific pathology, tumor, infection or fracture etc, inability to walk without a walking aid.

After taking the written consent and baseline examination, using drawing lots & sealed envelope; patients were randomized to two groups ie A & B. 10 patients in Group A received Specific stabilization exercise while 10 patients in Group B received conventional back extension exercise. Pain perception was measured using the Visual Analogue Scale (VAS). Disability was measured using the Ronald – Morris Disability Questionnaire (RMDQ). Both the intervention periods were delivered at 5 times/week for 4 weeks.

Both experimental groups followed two different exercise regimens separately.

WK	EXPERIMENTAL GROUP A	EXPERIMENTAL GROUP B
I	1) TrA Contraction in crook lying Position (Drawing in) 2) 4 point kneeling and trying to Hollow the lower abdominal	1) Prone with single arm/leg lifts 2) Prone with alternate arm and leg lifts
II	3) TrA Contraction in sitting and standing 4) Heel slides with transverses abdominis contraction	3) Prone on elbows 4) Prone with double – arm / leg lifts
III	5) Abdominal hollowing with legs Supported and hips and knees at 90° 6) Bridging	5) Prone on hands 6) Quadruped position and extend one arms / leg
IV	7) Abdominal hallowing with legs unsupported and hips and knees at 90° 8) Single leg bridging with spine n neutral position	7) Quadruped position and extend alternate arm and leg 8) Prone with both double arm and double leg lifts

GROUP A

1) TrA contraction in crook lying position.

2) 4 point kneeling and trying to hollow the lower abdominal

3) Heel slides with TrA contraction.

4) Bridging

5) Abdominal hallowing with legs unsupported and hips and knees at 90°

6) Single leg bridging with spine in neutral position

GROUP B

1) Prone with single arm/leg lifts

2)Prone with alternate arm and leg lifts

3)Prone on elbow.

4) Quadruped position and extend alternate arm and leg.

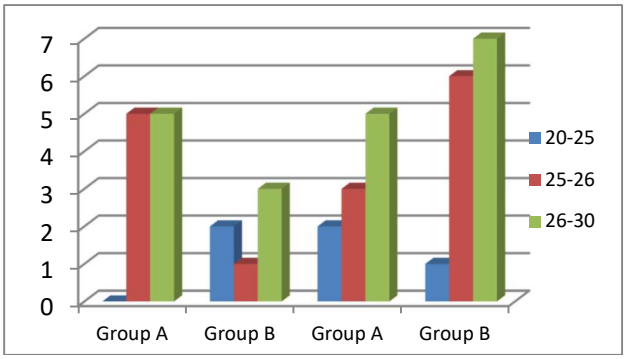
Results

The results of this study were analyzed in terms of pain relief by the Visual Analogue Scale (VAS), a responsive pain scale that yields reliable and valid data.(11) Disability by the Ronald – Morris Disability Questionnaire (RMDQ), a 24-item scale (0 ='no disability'), (24 = 'highest disability') with clinically acceptable reliability and validity. (12)

Statistical Analysis:

Table 1: Age-wise and sex-wise distribution of patients.

Age Group (yrs)	Male		Female		Total
	Group A	Group B	Group A	Group B	
20 -25	-	2	2	1	5
26 -30	5	1	3	6	15
Total	5	3	5	7	20



Graph 1 : *Age-wise and sex-wise distribution of patients.*

Table 2: Distribution of patients according to duration of pain.

Duration of pain	Group A	Group B	χ^2-value
0 – 6mths	3	2	0.53 Not –Significant p>0.05
7 – 12mths	5	4	
13 – 18mths	1	2	
19 – 24mths	1	2	
Total	10	10	

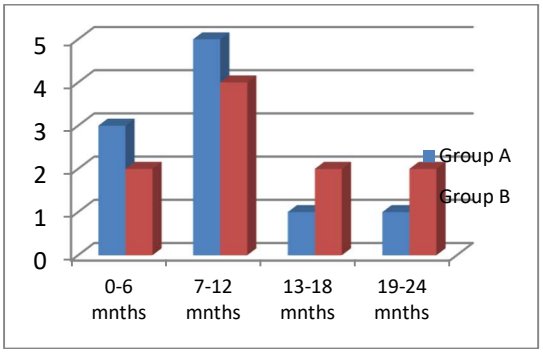


Table 3: Intra rater reliability of pain on VAS in group A and B

Statistics	Group A	Group B
ICC	0.82	0.90
P – value	0.007 Significant, p<0.05	0.001 Significant,p<0.05

Table 4: Intra rater reliability of RMDQ in group A and B

Statistics	Group A	Group B
ICC	0.83	0.88
P – value	0.008 Significant, p<0.05	0.002 Significant, p<0.05

Table 5: Comparison of pain in VAS for different days Students paired t-test: Group A

A. Descriptive statistics

Week	Mean	N	SD	SEM
Week 1	6.00	5	1.22	0.54
Week 2	3.40	5	1.14	0.50
Week 3	2.00	5	0.70	0.31
Week 4	0.60	5	0.54	0.24

B. Paired Samples Test

	Paired Differences					t(df=4)	P-value
	Mean	SD	SEM	95% CI of the Difference			
				Lower	Upper		
Week 1 – Week 2	2.60	0.54	0.24	1.91	3.28	10.61	0.000 S, p<0.05
Week 2 – Week 3	1.40	0.89	0.40	0.28	2.51	3.50	0.025 S, p<0.05
Week 3 – Week 4	1.40	0.89	0.40	0.28	2.51	3.50	0.025 S, p<0.05
Week 1 - Week 4	5.40	1.14	0.50	3.98	6.81	10.59	0.000 S, p<0.05

Table 6: Comparison of pain in VAS Students paired t-test: Group B

A. Descriptive statistics

Weeks	Mean	N	SD	SEM
Week 1	6.20	5	1.09	0.48
Week 2	5.00	5	0.70	0.31
Week 3	4.20	5	0.83	0.37
Week 4	2.60	5	0.54	0.24

B. Paired Samples Test

	Paired Differences					t(df=4)	P-value
	Mean	SD	SEM	95%CI of the Difference			
				Lower	Upper		
Week 1 – Week 2	1.20	0.83	0.37	0.16	2.23	3.20	0.033 S, p<0.05
Week 2 – Week 3	0.80	0.44	0.20	0.24	1.35	4.00	0.016 S, p<0.05
Week 3 – Week 4	1.60	0.54	0.24	0.91	2.28	6.53	0.003 S, p<0.05
Week 1 - Week 4	3.60	0.54	0.24	2.91	4.28	14.69	0.000 S, p<0.05

Graph : 3 Comparison of Pain in VAS for Group A And Group B

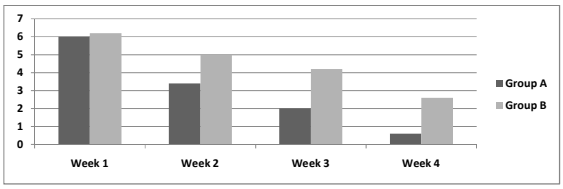


Table 7: Comparison of RMDQ for different weeks Students paired t-test: Group A

A. Descriptive statistics

Weeks	Mean	N	SD	SEM
Week 1	12.20	5	2.77	1.24
Week 2	7.20	5	1.78	0.80
Week 3	5.40	5	1.51	0.67
Week 4	2.80	5	0.83	0.37

B. Paired Samples Test

	Paired Differences					t (df=4)	P-value
	Mean	SD	SEM	95% CI of the Difference			
				Lower	Upper		
Week 1 – Week 2	5.00	2.12	0.94	2.36	7.63	5.27	0.033 S, p<0.05
Week 2 – Week 3	1.80	0.83	0.37	0.76	2.83	4.81	0.016 S, p<0.05
Week 3 – Week 4	2.60	1.14	0.50	1.18	4.01	5.09	0.003 S, p<0.05
Week 1 - Week 4	9.40	2.07	0.92	6.82	11.97	10.13	0.000 S, p<0.05

Table 8: Comparison of RMDQ for different weeks Students paired t-test: Group B

A. Descriptive statistics

Weeks	Mean	N	SD	SEM
Week 1	12.00	5	2.34	1.04
Week 2	9.00	5	1.00	0.44
Week 3	7.80	5	0.83	0.37
Week 4	5.80	5	1.30	0.58

B. Paired Samples Test

	Paired Differences					t (df=4)	P-value
	Mean	SD	SEM	95% CI			
				Lower	Upper		
Week 1 – Week 2	3.00	1.41	0.63	1.24	4.75	4.743	0.033 S, p<0.05
Week 2 – Week 3	1.20	0.83	0.37	0.16	2.23	3.207	0.016 S, p<0.05
Week 3 – Week 4	2.00	0.70	0.31	1.12	2.879	6.325	0.003 S, p<0.05
Week 1 - Week 4	6.20	1.48	0.66	4..35	8.04	9.347	0.000 S, p<0.05

Graph : 4 Comparison of RMDQ for different weeks for Group A And Group B

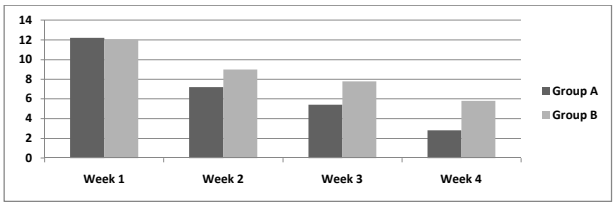


Table 9: Comparison of pain on VAS and RMDQ in both the groups

A. Descriptive Statistics

Parameters	Group	N	Mean	SD	SEM
Pain on VAS	Group A	5	0.60	0.54	0.24
	Group B	5	2.60	0.54	0.24
RMDQ	Group A	5	2.80	0.83	0.37
	Group B	5	5.80	1.30	0.58

B. Unpaired t-test

Parameters	t-test or Equality of Means					
	t (df=8)	p-value	Mean Difference	Std. Error Difference	95% CI	
					Lower	Upper
Pain on VAS	5.7	0.000 S, p<0.05	-2.00	0.34	-2.79	-1.20
RMDQ	4.33	0.003 S, p<0.05	-3.00	0.69	-4.59	-1.40

Discussion

This study is based on the current trends in exercise management for chronic low back pain: comparison between specific stabilization exercise and conventional back extension exercise.

The objective is to investigate the effect of the two exercises i.e. specific stabilization exercise and the conventional back extension exercises on relieving chronic low back pain. To analyze the above objective in this study we took visual analogue pain scale, Ronald and Morris disability questionnaire as outcome measures in terms of pain and functional status. The reliability and validity of the above measurement scales and questionnaire are well established.

1. **Pain as an outcome:** Study group A shows significant improvement in VAS then group B.

2. Functional improvement as an outcome: Study group A shows significant improvement in Ronald and Morris questionnaire value then group B this is because majority of patients with chronic disc prolapsed have lumbar instability specific stabilization exercise target the muscles which gives stability to the spine like multifidus and transverse abdominis muscle as the strength and improves the lumbar instability reduces.

The limitations of study were small sample size so study with large sample is needed. The age group should be expanded.

Conclusion

Training of the specific stabilization exercise in study group A showed a significant improvement in decreasing pain and in improving functional ability when compared to strengthening exercise in group B after a treatment protocol of four weeks.

Bibliograpy:

1. Emerson P. the evaluation of spinal stability in the physical therapy field. CNI Review, Online Library. A medical review journal.2001; 12(1).
2. Decandido P, reinig JW, Dwyer AJ. Magnetic resonance assessment of the distribution of lumbar spine disc degenerative changes. J Spinal Discord. 1988; 1: 9-15.
3. Adams Michael A, Freeman Brain JC, Morrison Helen, et al. Mechanical initiation of intervertebral disc degeneration . Spine. 2000; 25: 1625 – 1636.
4. Kazemi M. Adolescent lumbar disc herniation in a Tae Kwon Domartial artist: a case report. J Can Chiropr Assoc. 1999; 43(4): 236 – 242.
5. Richardson C, Jull G, Hodges P. Therapeutic exercise for spinal segmental stabilization in low back pain. Scientific Basis and Clinical

Approach. Churchill Livingstone. 1999; pp. 61 – 96.
6. O'Sullivan Peter B, Phyty Dip Manip Grad, Twomey Lance T. Evaluation of specific stabilization exercise in the treatment of chronic low back pain with radiologic diagnosis of spondylolysis or spondylolis thesis. Spine. 1997; 22(24): 2959 – 2967.

THE ROLAND-MORRIS LOW BACK PAIN AND DISABILITY QUESTIONNAIRE

Patient name: _____ Date:_____

Please read instructions: When your back hurts, you may find it difficult to do some of the things you normally do. Mark only the sentences that describe you today.

- ☐ I stay at home most of the time because of my back.
- ☐ I change position frequently to try to get my back comfortable.
- ☐ I walk more slowly than usual because of my back.
- ☐ Because of my back, I am not doing any jobs that I usually do around the house.
- ☐ Because of my back, I use a handrail to get upstairs.
- ☐ Because of my back, I lie down to rest more often.
- ☐ Because of my back, I have to hold on to something to get out of an easy chair.
- ☐ Because of my back, I try to get other people to do things for me.
- ☐ I get dressed more slowly than usual because of my back.
- ☐ I only stand up for short periods of time because of my back.
- ☐ Because of my back, I try not to bend or kneel down.
- ☐ I find it difficult to get out of a chair because of my back.
- ☐ My back is painful almost all of the time.
- ☐ I find it difficult to turn over in bed because of my back.
- ☐ My appetite is not very good because of my back.
- ☐ I have trouble putting on my sock (or stocking) because of the pain in my back.
- ☐ I can only walk short distances because of my back pain.
- ☐ I sleep less well because of my back.
- ☐ Because of my back pain, I get dressed with the help of someone else.
- ☐ I sit down for most of the day because of my back.
- ☐ I avoid heavy jobs around the house because of my back.
- ☐ Because of back pain, I am more irritable and bad tempered with people than usual.
- ☐ Because of my back, I go upstairs more slowly than usual.
- ☐ I stay in bed most of the time because of my back.