Pilates and Rehabilitation of the Lumbar Spine

Breaking the Pain Cycle Associated With Lumbar Disc Herniation and other Age-Related Disc Changes – A Case Study

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ABSTRACT

Statistics indicate that approximately 80% of adults will be incapacitated by back pain at some point in their life. One of the keys to recovering from an episode of low back pain and for preventing future reoccurrences is to pursue an appropriate back exercise regimen, which focuses on core strength development coupled with the elements of stability and functional movement. The Pilates method provides all of these aspects of an effective back care program and more. The Pilates exercises develop core strength and stabilization and increase spinal mobility by challenging and stretching the main muscles that support the spine, which include the spinal flexors, spinal extensors, rotators and lateral flexors. Many of the movements in Pilates target the transversus abdominis, the multifidus, and the pelvic floor complex – the muscles which have been shown to be particularly influential on pelvic-lumbar stabilization and the prevention of back pain. In addition, Pilates teaches proper engagement of these muscles and integrates the knowledge and skills learned through the practice into daily life and activities. As a result, the muscles that support the spine and pelvis become stronger and suppler to balance stability with flexibility. Not only is the Pilates method effective at restoring functional movement to the body, it also greatly contributes to a positive emotional state which can influence the rate of recovery from injury. The practice of Pilates has the potential to significantly alleviate low back pain associated with intervertebral disc issues, in particular with lumbar disc herniation, as well as prevent reoccurrences of injury. The following case study outlines a conditioning program, using the BASI Block System, specifically adapted for a client with a history of low back pain and disc herniation.
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ANATOMICAL DESCRIPTION

The spine, also known as the vertebral column, is composed of a series of 33 bones called vertebrae stacked upon one another. The vertebrae are classified into five distinct regions – cervical, thoracic, lumbar, sacral, and coccygeal. The top three regions contain the 24 vertebrae that are responsible for the majority of movement of the spine. In adults, the sacral vertebrae are fused together to form the sacrum and the coccygeal vertebrae are fused together to form the coccyx or tailbone. The spine is curved with each region having either a kyphotic or lordotic curve. A kyphotic curve is concave anteriorly/convex posteriorly like the thoracic, sacral, and coccygeal regions. A lordotic curve is convex anteriorly/concave posteriorly as the cervical and lumbar regions. These curvatures are important for balance, flexibility, stress distribution and shock absorption.

The lumbar, thoracic and bottom five cervical vertebrae are joined to the adjacent vertebrae by a series of joints. The vertebral body, or main weight-bearing region of a vertebra, is joined to the vertebrae above and below by a thin region of cartilage known as an intervertebral disc, which forms a cartilaginous joint. The intervertebral discs are composed of two parts: (1) the annulus fibrosis, which is the tough, flexible outer ring of fibrous tissue, and (2) the nucleus pulposus, the soft, gel-like material inside the annulus fibrosis. The discs are vital for shock absorption and protection of the spine. The posterior portions of the vertebrae are also connected by facet joints. On the left and right side of each vertebra is a small tunnel called a neural foramen. The two nerves that branch off the spinal cord at each vertebra go through the neural foramina. The intervertebral disc sits directly in front of the opening.

The lumbar spine, or commonly known as the lower back, consists of five vertebrae, L1 through L5. The lumbar vertebrae are the biggest unfused vertebrae in the spinal column, which enables them to support the weight of the entire torso. The two lowest segments, L4-L5 and L5-S1 bear the most weight; therefore, they are the most prone to degradation and injury, such as bulging or herniated discs.
Disc herniation is most often the result of a gradual, aging-related wear and tear called disc degeneration. With age, discs lose some of their water content and dry out, which causes the disc to compress and become less flexible and more susceptible to tearing or rupturing with even a minor strain or twist. Any such event can cause the fibrous outer covering of the disc to break or distort to the extent that it puts pressure on a spinal nerve, particularly if the inner disc material extrudes. This may result in extreme pain, including muscle spasms that severely limit movement and if nerves are affected, radiating pain into an arm or leg. When a herniated disc occurs in the lumbar spine and compresses a nerve, symptoms of sciatica, including pain, tingling, weakness, and/or numbness felt from the low back into the buttocks and down the leg, may occur.
CASE STUDY

Lindsey, a 42-year-old athletic mother of three boys, came to Pilates to strengthen her core and gain stability to her problematic low back, with the ultimate goal of freedom from the pain cycle she had endured for the past year and a half. During our initial consultation, she disclosed that the results of an MRI had shown a disc herniation, mild central spinal stenosis, and mild bilateral neural foraminal stenosis at L4-L5. She also had mild bulging at L2-L3, L3-L4, and L5-S1 and mild facet arthropathy. All of her symptoms were indicative of age-related disc changes. She had spent the previous eight (8) weeks in physical therapy and was no longer in acute pain, so she was ready to embark on a program designed to give her longer lasting relief from the periodic back spasms to which she was becoming accustomed. The only contraindications given to Lindsey by her physical therapist were to avoid excessive spinal flexion and extension, mainly hyperextension of the lumbar spine.

During assessment of Lindsey’s alignment, postural deviations of lumbar hyperlordosis and forward head displacement were noted. Suspected imbalances indicative of her faulty alignment included weakness in the abdominals, glutes and hamstrings, and spinal extensors in the upper back, and tightness of the hip flexors and low back extensors. Abnormalities were also seen in Lindsey’s gait cycle, with an excessive stride for the length of her legs causing contact at the back of the heel and an excess of transverse movement in the pelvis. These issues were possibly due to a combination of long stride length and weak stabilizers.

Lindsey disclosed that she had a C-section with her first pregnancy (twin pregnancy) and experienced sciatica during her second pregnancy. Shortly after the birth of her third son, she began to experience painful muscles spasms in her back which would last anywhere from 3 to 10 days, severely limiting her mobility for a majority of that time. Not only did these episodes affect her physically, but they also weighed on her mentally and emotionally, creating a feeling of instability all around.
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The emphasis of the conditioning program was on the following: (1) strengthening the abdominals, especially the transversus abdominis and obliques to increase pelvic-lumbar stability; (2) stretch and strengthen the hip flexors, hamstrings and glutes to address hyperlordosis; (3) strengthen the spinal extensors of the upper back to counter forward head displacement; and (4) stretch the extensors of the lower back to increase mobility.

The BASI Fundamental Warm Up with the addition of Single Leg Lift was chosen for the first 20 sessions. For the Pelvic Curl, the focus was on activation of the pelvic floor, transversus abdominis, and hip extensor muscles for the proper articulation of the pelvis and spine. Single Leg Lift (Leg Lift Supine) was performed to build the skill of using the abdominals to stabilize the trunk as the legs move. Spine Twist Supine was chosen for learning spinal rotation while maintaining correct alignment of the core. Both Chest Lift and Chest Lift with Rotation offered great opportunities to learn effective recruitment of the spinal flexors and rotators. Once Lindsey exhibited sufficient strength and proficiency with the fundamental warm up exercises, I challenged her with either the BASI Intermediate Warm Up or the Warm Up Series on the Cadillac.

The Foot Work was introduced on the Reformer to learn proper stabilization of the pelvis throughout the movement. The emphasis was on hamstring engagement to gain strength to help correct Lindsey’s hyperlordosis. Foot Work progressed to the Cadillac, where continued emphasis of pelvic-lumbar stability
was made. The Wunda Chair presented an even greater stability challenge having to use skilled co-contraction of the abdominals and spinal extensors to maintain stillness in the upright position of the torso.

For the abdominal block, Lindsey began with exercises that challenge core strength, such as the Hundred Prep on the Reformer and Chest Lift and Chest Lift with Rotation on the Step Barrel. She progressed to the Hundred and Coordination on the Reformer, focusing on both abdominal strength and stability. She also practiced the Short Box Series, which offered abdominal engagement in spinal flexion, extension, and rotation. With her continued improvement, I challenged her with more difficult choreography, such as in Breathing with Push Through Bar and the coordinated sequencing of Bottom Lift with Roll Up Bar. Eventually she added Standing Pike Reverse and Cat Stretch Kneeling on the Wunda Chair to further develop the abdominal-hamstring force couple and for the enhancement of spinal mobility flowing from flexion to extension.

Hip Work provided another opportunity for practicing pelvic-lumbar stabilization. Lindsey started with the fundamental Supine Leg Series on the Reformer and progressed to the intermediate series. As she demonstrated greater ability to stabilize, I introduced her to Hip Work on other pieces of apparatus – the Cadillac and the Avalon. This challenged her stability even more by moving the legs with independent springs.

Lindsey responded well to the Pelvic Curl on the mat, even remarking at how much it loosened the tightness in her low back. However, because of Lindsey’s history of disc issues, I wanted to ease her gradually into the Spinal Articulation block. Per BASI recommendations, I did not introduce the Spinal Articulation block until after the first 10 sessions. She began with Bottom Lift on the Reformer, and progressed to Bottom Lift with Extensions. Both of these exercises were supremely effective at strengthening her hip extensors to help counter the hyperlordosis. I monitored her closely during the later sessions as she tried out Monkey Original and Tower Prep on the Cadillac and Semi-Circle on the Avalon. Lindsey gave continual feedback that she did not experience any pain while
performing the exercises. In fact, she enjoyed this block the most because of how great her back felt afterwards.

Stretching Lindsey’s tight hip flexors was one of the program’s focal points. She began on the Reformer with the Standing Lunge and progressed to the Kneeling Lunge. Both of these exercises gave a great stretch for her hip flexors with the added bonus of stretching the hamstring muscles that were getting worked so much in our sessions. For variety, she used the Ladder Barrel in later sessions, enjoying the additional stretches of the adductors and gluteal muscles.

Because of Lindsey’s athleticism, great mind-body awareness, and substantial progression in the initial five sessions, I introduced her to the Full Body Integration (F/I) block at her sixth session. She began on the Reformer, focusing on exercises that demanded a great deal of scapular and pelvic-lumbar stability, including Elephant, Up Stretch 1 and 2, and Down Stretch. Scooter was also chosen for activation of the hip extensors. In some sessions, I would put Lindsey on a red and a blue spring to change the muscular focus to the hamstrings and glutes for the Scooter and the Round Back and Flat Back knee stretches. In other sessions, she would be on one red spring to focus on the abdominals in those exercises. In later sessions, she practiced on the Cadillac, enjoying the stretching and spinal articulation components of Sitting Forward, Side Reach, and Kneeling Cat Stretch.

For the Arm Work block, Lindsey began with the Supine Arm Series on the Reformer. Once she executed this series with a high degree of scapular and trunk stability, she progressed to a series with a more challenging upright position of the torso. She practiced the series on the Avalon for which a sitting position is used, and eventually moved to the Arm Standing Series on the Cadillac.

The focus of the Leg Work block was on continued strengthening of her weak hip extensors. I had her start on the mat with the Gluteal Side Lying series. Then she added the Hamstring Curl and Single Leg Skating on the Reformer. For the later sessions, she practiced Squats on the Cadillac. The Hamstring Curl and Hip Opener on the Wunda Chair in a supine position provided Lindsey the opportunity for a more concentrated focus on the targeted muscles for each exercise.
The lateral flexion/rotation portion of the session was important work for Lindsey for its emphasis on the oblique muscles, which act with the transversus abdominis to protect the back and stabilize the core, particularly with movements of the arms and legs. She began with a couple of mat exercises – Leg Lift Side and Spine Twist, which she could continue to practice at home. The Mermaid on the Reformer provided the lateral work, side stretch, and rotation in one exercise. The Side Lift on the Cadillac as well as the Side Stretch and Side Kneeling Stretch on the Wunda Chair activated and stretched the obliques in different body positions.

The final block of each session, Back Extension, was focused primarily on strengthening the upper back extensors to help with Lindsey’s forward head displacement. Two mat exercises were introduced first – Basic Back Extension (Back Extension Prone) and Cat Stretch. With the Basic Back Extension, Lindsey strengthened her spinal extensors while developing the ability to simultaneously use her abdominals to protect her lower back. The Cat Stretch helped Lindsey to learn to emphasize hyperextension in the upper back while the co-contraction of the abdominals limited excessive hyperextension in the lower back. She was able to incorporate these concepts learned on the mat to the back extension exercises on the Reformer, Cadillac, and Wunda Chair.
CONCLUSION

Joseph Pilates said, “If your spine is inflexibly stiff at 30, you are old. If it is completely flexible at 60, you are young.” This was definitely true for Lindsey. Even though she had been active and fit for most of her life, due to her low back issues – the instability, the herniated disc and accompanying painful periodic back spasms, and the residual stiffness and lack of mobility – she felt old and unable to perform the demands of daily life. She was emotionally distraught as she was not able to care for her young children the way she wanted to, at times not even able to pick up her youngest child.

After just a few sessions of her Pilates conditioning program, modelled by the BASI Block System, Lindsey noticed many positive physical changes – greater abdominal strength, increased spinal mobility, and improved pelvic-lumbar stability. This gave her a sense of empowerment and renewed hope for her future. Through the subsequent sessions, with increasingly difficult exercises and greater challenges to the core, she continued to make huge strides in bringing balance to her body and maintaining freedom from back pain. After one of our final training sessions, Lindsey shared with me that the practice of Pilates has benefited every area in her life. Like the title of Joseph Pilates’ book, “Return to Life through Contrology” states, Lindsey attributes Pilates as bringing her back to life, one even better than before.

Just as Lindsey helped to relieve and rehabilitate her back condition with Pilates, others suffering from lumbar disc issues like disc herniation may also benefit from the practice. While each person’s specific pain or injury is different, the BASI Block System provides a safe structure whereby an individual conditioning program can be created to successfully aid him or her out of pain and back to life.
BIBLIOGRAPHY


