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Effects of Physical Therapy on an Elderly Patient with L5-S1 Radiculopathy: A Case Study

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Effects of Physical Therapy on an Elderly Patient with L5-S1 Radiculopathy: A Case Study

by

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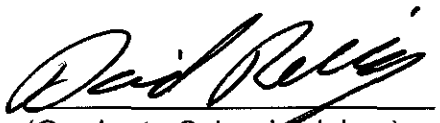

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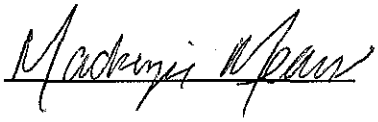
Signature 

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ABSTRACT

Background and Purpose. Low back pain is a major disabling diagnosis for adults over 60 with 36-70% suffering from this condition.[1] There is little research demonstrating the effectiveness of physical therapy on the outcome of older patients with a lumbar disc herniation resulting in lumbosacral radiculopathy. The purpose of this scholarly project is to use a case report to explore the effectiveness of physical therapy in elderly patients with lumbosacral radiculopathy as the result of a L5-S1 disc herniation. **Case Description.** The case study reviews an 81-year-old male who presented to physical therapy with insidious onset of left lateral hip pain resulting from a herniated L5-S1 disc. The examination and treatment techniques used to treat this patient were adapted from the Ola Grimsby Institute.[2] The treatment focused on manual therapy to increase the mobility of the thoracic and lumbar spine and therapeutic exercises for lumbo-pelvic recruitment. **Outcomes.** Upon discharge, this patient had full lumbar range of motion, 0/10 pain on the analog pain scale, and returned to performing all activities of daily living. He completed all of his recreational activities including walking more than two miles and swimming all strokes. **Discussion.** This case study supports physical therapy for the treatment of L5-S1 radiculopathy resulting from a herniated disc in an elderly patient. This patient had very few comorbidities, an unlikely finding within the elderly population, that affected his outcomes. Although the current client demonstrated substantial improvements, further research needs to be done on a variety of patients with varying comorbidities over the age of 65.

CHAPTER I

BACKGROUND AND PURPOSE

Low back pain (LBP) is one of the most commonly treated symptoms in physical therapy (PT), making it the second most common reason for ambulatory care visits.[3] Additionally, LBP is a major disabling diagnosis for adults over 60. Cases of chronic LBP increase as adults age, with 36-70% suffering from prolonged LBP.[1] Individuals aged 80 years and older are three times more likely to experience severe LBP than those aged between 50-59.[4] Age-related physical, psychological, and mental changes can impact the prognosis and management of LBP in older adults. These changes contribute to the findings that individuals over 65 are more likely to develop chronic LBP that lasts more than 3 months. Studies have also found that subsequent low back pain episodes are more common in older adults. There are multiple factors that can contribute to incidences of reoccurring LBP including biological, psychological, and social factors.[1]

Biological, psychological and social factors each contribute to both direct and indirect side effects of living with LBP. Individuals with LBP can suffer from inability to work, decreased performance in activities of daily living, interrupted sleep schedules, bowel and bladder changes, psychological issues, and many other symptoms. The indirect costs such as sick leave, early retirement, lost household productivity, and inactivity can be just as detrimental as the direct costs of living with LBP.[5] Older adults who receive PT within 28 days after a physician visit for LBP show modest improvement in function at 12 months compared to those who did not, making improvements in both the direct and indirect side effects.[6] Gellhorn et al. found that patients within the Medicare population that utilized PT for acute episodes of low back pain had lower subsequent health care utilization costs.[7] According to Dagenais et al., the

total medical care costs of individuals living with LBP were $1,015 higher per year than those without back pain, with a total incremental cost of $26 billion.[5] A review article of LBP reported the largest direct costs for care of LBP are PT (17%), inpatient services (17%), pharmacy (13%), outpatient services (8%), diagnostic imaging (7%), specialists (7%), surgery (5%), chiropractic (5%), other services (5%), conservative medicine (2%), education (1%), and mental health (1%).[5] Because of the increased direct and indirect costs of healthcare related to LBP, it is essential to diagnose the cause of the pain and get treatment as quickly as possible.

A guideline by de Campos (2017) found that initial primary care management of LBP significantly decreased the time it takes for the symptoms to subside.[8] Low back pain symptoms can arise from diagnoses such as spondylolisthesis, herniated spinal disc, spinal stenosis, musculoskeletal imbalances, and many others. One of the most common causes of LBP is a lumbar disc herniation, which is defined in one article as a localized displacement of disc material (nucleus pulposus or annulus fibrosis) beyond the margins of the intervertebral disc space.[9] The highest prevalence of disc herniation is among people aged 30-50 years and occurs at lower lumber levels (L4/5 and L5/S1) in 95% of people aged 25-55 years.[10] Risk factors leading to a disc herniation include age, smoking, weight bearing sports, and repeated lifting.[10] As a person ages, the annulus tends to crack and tear leading to degeneration and weakening of the annulus resulting in the herniation of the nucleus pulposus through the annulus.[11] The most common symptom of a herniated disc is lumbosacral radiculopathy.

Lumbosacral radiculopathy is a condition that results from the compression of one or more spinal nerve roots with associated radiating leg pain and paresthesia.[12] This compression can occur due to the displacement of the disc material from a herniated disc pressing on the nerve root. Neurological impairments such as altered dermatomes and myotomes can also be present.[12]

Impairments within the nervous system can present with varying degrees of pain, numbness, and weakness and are most commonly in the distribution of the nerve root.[13] The location of symptoms the patient may present with are dependent on the location of the neural tissue compression.[1] For instance, a lumbar disc herniation at the L5-S1 level will affect the S1 nerve root and may present with the loss of the ankle reflex, weakness at the ankle including plantarflexion, and numbness/pain that can radiate along the outside of the calf down to the foot and toes. Lumbosacral radiculopathy can be caused by mechanical compression, ischemia, or inflammatory irritation.[14,15] Identifying the factors that are exacerbating the back pain can improve the effectiveness of the selected treatment strategies. Treatments span from self-management advice, education, simple non-invasive interventions (such as physical therapy), injections, and surgery.[8] Lumbosacral radiculopathy can be treated by a skilled physical therapist using manual therapy techniques, exercises to target the cause of the radiculopathy, and a motivated patient to continue to perform the exercises to prevent subsequent LBP occurrences. Treating a lumbar disc herniation is imperative because there is a high rate of reoccurrence. A disc herniation in a patient who has been previously diagnosed, but symptom-free for the past 6 months, regardless of ipsilateral or contralateral herniation, is defined as a recurrent disc herniation.[16] Jordan et al. reported non-drug treatments, such as spinal manipulation, seem to be more effective at relieving local or radiating pain in people versus sham manipulation.[10] These same researchers also reported non-steroidal anti-inflammatory drugs (NSAIDs) and cytokine inhibitors do not improve symptoms caused by disc herniation.[10] A study performed by Zigengus et al. concluded that initiating therapy early in the course of treatment is associated with fewer physician visits, earlier discharge from care, fewer restricted workdays, and fewer days away from work.[17] The therapy performed in the study included therapeutic exercise, patient

education, manual therapy, electrotherapeutic modalities, mechanical modalities, and physical agents.[17] However, PT is only sought by 37%-65% of people with radiculopathy occurring from a disc herniation.[18] There is little research demonstrating the effectiveness of physical therapy on the outcome of patients with a lumbar disc herniation resulting in lumbosacral radiculopathy. The purpose of this scholarly project is to use a case report to explore the effectiveness of physical therapy in elderly patients with lumbosacral radiculopathy as the result of a L5-S1 disc herniation.

CHAPTER II

CASE DESCRIPTION

The patient in the case study was an 81-year-old retired male who reported being very active and lived in his two-story home with his wife. He reported being involved in the community and participated in swimming, walking, and social events with his wife and friends. He presented with insidious onset of left lateral hip pain starting after his second knee replacement in February of 2016. Previously, he was able to perform all activities of daily living (ADLs) and household chores such as fixing his fence independently. Symptoms of burning, tingling, and aching into his left thigh, which increased after he stood up from prolonged sitting, were his main complaints. The same symptoms occurred when he stood for more than one hour. His pain at its worst went all the way down into his left calf resulting in numbness and tingling. He was unable to stay asleep throughout the night, waking up at least three times. Simple household chores such as vacuuming and anything where he had to lift an item off the floor were also difficult. He was usually active in that he walked two miles a day and swam every other day, however, he had been unable to walk more than one mile since the onset of his symptoms. He had back problems in the past and received physical therapy to strengthen his core, which decreased his symptoms. A current regimen of NSAIDs, taken per his physician's recommendation, were not decreasing his pain levels. Currently, he was on no other medications. He denied any bowel and bladder changes. A history of arthritis, which was the reason for his knee replacements on his left in 2016 and his right in 2014, was documented. The client received physical therapy after the knee replacements and reported great results. His stated goals were to decrease the pain in his left hip, walk more than 1 mile each day, and sleep throughout the night.

The patient complaints of burning, tingling, and numbness down his left leg were consistent with differential diagnoses including nerve impingement, left trochanteric bursitis, thoracic disc injury, cauda equina, inflammatory metabolic disease, and complications from his knee replacement. The patient reported no previous medical history of heart disease, high blood pressure, diabetes, cancer, dizziness, stroke, or lung disease. He had not received any imaging of the spine. The following physical therapy diagnostic tests and procedures were chosen to differentiate the underlying cause of the pain. The lack of comorbidities this 81-year-old patient demonstrated made him an exceptional candidate for this case study due to the fact that we were able to determine the effectiveness of physical therapy in an elderly patient without other disorders swaying the results.

Examination

The examination was based on the Ola Grimsby Institute's evaluation of the lumbar spine and hip.[2] The postural evaluation demonstrated cervical lordosis, decreased kyphosis, abducted bilateral scapulae, left ASIS/PSIS/iliac crest elevation, left greater trochanter elevation, left foot external rotation, left calf atrophy, and right quadriceps atrophy. He had a McGill Pain Questionnaire score of eight, providing a quantitative measure of clinical pain that can be treated statistically. The McGill Pain Questionnaire has a high level of sensitivity to detect differences among different methods of pain relief.[19] An Oswestry Low Back Pain Score was completed. The patient demonstrated a score of 14% disability, putting him in the minimal disability category.[19] The Oswestry Low Back Pain Scale is the 'gold standard' to measure functional low back disability, providing high construct validity, high test-retest reliability, and ease of administration and scoring.[20] He was hypo-mobile with a grade two bilateral rotation at L4-S1, which was safe to treat with all forms of manipulation, mobilization, and exercise (Table 1).[21]

There was significant pain relief with long axis traction through his left hip. Refer to Tables 2 and 3 for initial lumbar and hip AROM scores measured with a goniometer.[22]

Table 1.
Clinical Grading of Joint Mobility[21]

Grade	Definition	Recommended Intervention
0	Ankylosed	Surgery, No PT treatment
1	Considerable limitation	Articulation, Avoid exercise
2	Slight limitation	Articulation, Manipulation, Self mobilization
3	Normal	No treatment needed
4	Slight increase	Postural correction, Taping, Self stabilization
5	Considerable increase	Postural correction, Taping, Collars, Dry needling, Sclerosing injections
6	Pathologically unstable	Surgery, No PT treatment

Table 2.
Initial Lumbar AROM in standing

Forward Bending	Hand reach to mid shins; painful
Backward Bending	5 degrees; painful with distal sx
Right rotation	20 degrees
Left rotation	10 degrees; painful with distal sx
Right side-bending	Reach to mid thigh; hinge at TL junction
Left side-bending	Minimal motion; painful with distal sx

Table 3.
Initial Hip AROM

	Right	**Left**
Flexion (supine)	120 degrees; pain lateral hip	125 degrees; pain lateral hip
Extension (prone)	5 degrees	10 degrees
Internal rotation (seated)	20 degrees	20 degrees
External rotation (seated)	55 degrees	55 degrees

Strength Tests. Lumbar selective tissue testing was done to assess the strength of groups of muscles that perform a specific motion, see Table 4. All motions were done in a seated position. Lumbar flexion was performed with the patient's hands interlaced behind the neck with his elbows facing forward. An upward force at the elbow from the therapist was initiated. Lumbar extension was performed the same way with a downward force at the elbows from the therapist. Side-bending was assessed by the therapist bending over and pushing the top of the

shoulder into the side of the patient's shoulder and having them resist in both directions. Lumbar rotation and all hip motions were tested as outlined by *Cram Session in Goniometry and Manual Muscle Testing*, see Table 5.[23]

Table 4.
Lumbar Selective Tissue Testing: Seated[23]

Forward flexion	Strong and painless
Extension	Weak and painless
Side-bending right	Strong and painless
Side-bending left	Strong and painful
Rotation right	Strong and painless
Rotation left	Strong and painless

Table 5.
Initial Hip Manual Muscle Testing[23]

	Right	**Left**
Flexion (supine)	4+/5	4+/5
External rotation (seated)	5/5	4+/5
Internal rotation (seated)	5/5	5/5
Abduction (side-lying)	4/5	4/5
Knee flexion (seated)	5/5	4+/5

Neurologic Tests. The left S1 myotome demonstrated a fair grade and heel raises were fatiguing after six repetitions on the left. Hyposensitivity to sharp/dull was reported at the left L3 dermatome and hyposensitivity to light touch was reported at the right S1 dermatome. All lower extremity reflexes tested normal.

Special tests. Special tests were performed on both the lumbar spine and hip to assess for underlying pathologies. The supine straight leg raise (SLR) test was done to test neural tension and replication of symptoms. Symptoms of shooting pain radiating down the posterior thigh and buttock along the distribution of the sciatic nerve are considered positive.[24] The SLR was performed in a standardized manner.[22] The patient did not complain of symptoms when the test was performed on either leg, so the SLR was considered to be negative bilaterally. The SLR has been found to have a sensitivity of .67 and a specificity of .89.[24,25] Lumbar quadrant testing for

facet pathology was positive on the left. Done in a seated position, the patient crossed his arms while the therapist stabilized the lumbosacral region with one hand and the other hand on the patient's shoulder to control the trunk movement. The patient was passively directed into trunk extension with an axial force applied.[22] Quadrant testing has been associated with either a cartilage problem or a disc problem.[26] The slump test is a progressive series of maneuvers that places the sciatic nerve under increasing tension.[22,24] It was performed by having the patient sit on the side of the table with his back straight, looking straight ahead. The patient then slumped, allowing the thoracic and lumbar spine to collapse into flexion, while still looking straight ahead. Then, the patient fully flexed the cervical spine. Next, the patient extended one knee then dorsiflexed the foot. At each step throughout the test, the patient informed the PT whether radicular pain was being produced.[22] The patient's slump test was positive on the left, but negative on the right. The slump test has a sensitivity of .84 and a specificity of .83.[24] The Thomas test is used to test rectus femoris flexibility. It was performed by having the patient lay supine with the knees flexed over the edge of the table. The patient then drew one knee to the chest and held it there. The PT then checked if the other leg remained at a 90-degree angle and the hip and posterior thigh remained in a stationary position, flat against the table.[22,27] The specificity of the Thomas test has been reported to be 0.9 to 1.0.[28] The patient's Thomas test was positive on the right for rectus femoris and iliopsoas, but negative on the left. The 90/90 hamstring flexibility test was completed to assess the extensibility, length, and excursion of the hamstring. It was performed by having the patient lie on his back with one hip flexed to 90 degrees. The other leg was on the table with the hip and knee extended. Next, the patient actively extended the knee that was in the 90 degree position until resistance was felt while the contralateral leg remained against the table. A goniometric measure was then taken.[22] The 90/90

hamstring flexibility performed on this patient revealed a 20 degree difference with the right leg being more restricted than the left. The intratester reliability of the 90/90 test was found to be .99.[29] The functional leg length discrepancy test was performed while the patient lie supine on the exam table. One study found that this test is inaccurate due to the fact that there was a +/- 8.6mm for direct measurement of leg length inequality.[30] A functional leg length discrepancy was found with the left leg being .5cm longer than the right. Femoral shear was performed in a standardized method while the patient lay supine. Femoral shear was tested to rule out a disc and/or SI pathology. Notably, the patient response was positive on the left.[19,22] The hip scour test was performed in supine while the therapist passively flexed, adducted, and internally rotated the hip with the knee in full flexion. The therapist then applied a downward force along the shaft on the femur while passively abducting and externally rotating the hip then bringing the hip back to the starting position. Hip scour for labral integrity was positive on the right with a clunk in flexion, adduction, internal rotation of the hip (FADDIR).[22] Sensitivity was reported to be .62-.91 and specificity .43-.75.[31-33] Balance was graded as fair with eyes open and poor with eyes closed.

Palpation. The patient had increased tone and guarding with pain throughout the gluteus medius and lateral rotators on the left. He also had pain to palpation at his left iliotibial (IT) band and lumbar paraspinals. There was no tenderness upon palpation at the tensor fascia latae (TFL), quadratus lumborum or iliopsoas on either side. He did report significant pain relief with long axis traction through the left hip.

Evaluation

This patient presented to physical therapy with signs and symptoms of lumbar radiculopathy at L5-S1 into the left lateral hip with increased symptoms during lumbar

extension, left side-bending and left rotation. He had some positive neurological signs including weakness at the left S1 myotome and hyposensitivity in the left L3 and right S1 dermatomes. There was increased muscle guarding in his left paraspinals and gluteal region causing hypomobility from L4-S1. Functionally, he had pain with nearly all activities throughout his day with the pain increasing during all active motions. The diagnosis codes used for this patient included M54.17-Radiculopathy, lumbosacral region, M99.03-Segmental and somatic dysfunction of lumbar region, and M25.552-Pain in left hip.

Prognosis and Plan of Care

Given this patient's previous level of function and motivation to return to his typical activities of daily living, his prognosis was established to be excellent. However, due to his age, my CI and I agreed that his course of treatment may take longer than the average patient. This patient's short term goals were:

Following PT intervention, the patient will:

1. Have full and pain-free lumbar AROM to return to walking 2 miles a day.
2. Improve bilateral hip IR to at least 30 degrees bilaterally for improved biomechanics to decrease strain through the lumbar spine.
3. Have a neutral pelvic position in standing for a normal LLD to decrease strain through the lumbar spine.
4. Have negative seated neural tension testing to decrease radicular symptoms with activity.
5. Have grade 3 normal rotation of lumbar spine to return to daily household chores.

The patient's long term goals included:

Following PT intervention, the patient will:

1. Have 0% impaired, limited or restricted lumbar spine function with Changing and Maintaining Body Position to return to sitting for more than 1 hour without pain.
2. Improve 90/90 hamstring test to within 20 degrees from neutral to return to swimming without pain.
3. Ambulate at least 2 miles without increased pain levels or requiring a rest break.
4. Return to swimming all strokes without back pain.
5. Be independent in HEP to address and manage current condition.

The patient's plan of care included the goals stated above, general interventions including manual therapy, exercises for lumbo-pelvic recruitment and optimal stimulus of repair, and discharge plans of discontinuing therapy by 12 weeks.

CHAPTER III

INTERVENTIONS

Interventions were aligned with the Ola Grimsby Institute residency and fellowship programs. The initial exercise program steps are 1) normalize joint motion, 2) provide soft tissue repair stimulus, 3) resolve muscle guarding, 4) normalize motor patterns (coordination), 5) improve function, and 6) elevate overall training level.[2] This was accomplished through manual therapy and therapeutic exercise. Manual therapy was a main focus in this patient's care. For the first 8 weeks, soft tissue mobilizations were performed to the lumbar paraspinals, gluteus maximus, gluteus medius, TFL, IT band, quadratus lumborum, and lateral rotators for 20 minutes on the left side and 10 minutes on the right. This was done manually with massage cream and hands on the lower back followed by a massage ball on the gluteal area. Some of the soft tissue techniques included effleurage, petrissage, deep friction massage, and myofascial muscle release. Each technique was used when needed and at the discretion of the therapist. Active pump was performed to the bilateral lumbar multifidi which included an active contraction of the muscle with a passive stretch. This was done by having the patient in side-lying with one hand on his anterior ASIS and the other on his posterior lumbar paraspinals. The patient was asked to contract into posterior rotation then relax while a gentle stretch was applied into anterior rotation. During these movements, the hips were held in neutral. The active pump technique was performed 8-10 times on each side. This technique was done in conjunction with mobilizations to the lumbar spine and left hip as well as exercises.

Lumbar mobilizations included rhythmic rotation in side-lying through midrange of L1-S1 and flexion gapping for pain inhibition and segmental mobility. Cranial and caudal locking was also performed through end ranges of motion as the physical therapy program progressed to

increase segmental mobility and stretching of the paraspinals. Long axis belted left hip distraction was performed 6-8 times with 10-15 second holds at each session. The patient reported significant pain reductions following daily manual therapy. Pain reduced from 5/10 to a 2/10 on the pain scale for left rotation and side-bending, which was what caused the most pain initially. There was also increased daily motion into left rotation and left side-bending following manual interventions. Exact daily measurements were not taken at each session, but increases in motions prior to manual therapy and post manual therapy were seen by both the therapists and the patient. These manual interventions were kept the same through the first 8 weeks while lumbar rotation mobilizations progressed as the sessions continued. During weeks 9-12, manual therapy was utilized as needed, but the treatment session focused on therapeutic exercises.

All exercises were chosen for lumbo-pelvic recruitment, optimal stimulus of repair to the lumbar spine, recruitment of the gluteus medius, maximus, and minimus as well as deep external rotator (piriformis, gemellus superior and inferior, obturator internus and externus, and quadratus femoris) recruitment and enhanced dynamic coordination of spinal musculature. The first week of exercises consisted of:

- Squats at 50% weight bearing on a total gym with 2 sets of 10 (Figure 1)
- Weighted caudal trunk rotation on a disc using a pulley system for 2 sets of 10 reps only to the right (Figure 2)
    - Progressed to partial rotation to the left at 4 weeks and full rotation to the left at 8 weeks
- Weighted anterior (Figure 3) and posterior (Figure 4) cranial trunk rotation using a pulley system with 2 sets of 10 reps only to the right

    - Progressed to partial rotation to the left at 4 weeks and full rotation to the left at 8 weeks
    - Patient started the exercise program in the seated position to ensure hips were kept in neutral. As coordination improved, he progressed to semi-seated at 6 weeks and standing at 8 weeks
- Side bending over a bolster with 2 sets of 10 reps only to the right (Figure 5)
    - Performed to increase flexibility of spine
    - Progressed to left side-bending at week 4
- Eccentric hamstring stretches 2 sets of 15 bilaterally (Figure 6)
    - Performed to improve hamstring extensibility

Each week, exercises progressed by increasing the resistance followed by increased weight as the patient's tolerance increased. If decreased function or elevated pain occurred, exercises were modified as to not increase the patient's pain. By week 6, exercises were modified and new exercises were added to match the patient's progression. These exercises included:

- Squats on the total gym with 65% weight bearing with his feet externally rotated to get maximal recruitment of gluteus medius and the deep external rotators with 2 sets of 20 (Figure 1)[34]
- Weighted pulley side steps with 2 sets of 3 walkout repetitions bilaterally (Figure 7)
    - Performed to increase hip abductor strength
- Thoracic extension over a bolster with 2 sets of 10 (Figure 8)
    - Performed to create more flexibility throughout entire spine
- Birddogs over an exercise ball with 2 sets of 5 alternating (Figure 9)

    - Initially lifted only arms, then only legs, then progressed to alternating arms and legs
- Weighted pulley PNF chops with 2 sets of 10 bilaterally (Figure 10)
    - Initially performed only to the right then slowly added in left PNF pattern
- Ball squat on the wall with 2 sets of 10 (Figure 11)
    - Progressed from total gym in order for the patient to be in a more weight bearing position

As his symptoms continued to lessen, the exercises were progressed in repetitions and then in weight. Each week, left rotation was progressed a little more until he was able to perform his exercises pain-free into full left rotation by the end of his treatment plan.

CHAPTER IV

OUTCOMES

This patient made substantial improvements in passive segmental mobility as well as active range of motion of the lumbar spine. He started with pain at 5/10 and limited motion with left rotation and left side bending at his initial visit. At the four-week progress note, his pain level was variable based upon the activities he had performed that day. He was able to walk one mile without pain, but would experience symptoms if he went any further. Left side bending and rotation continued to cause pain into his left hip and occasional shooting pain into his left calf if the movements were done suddenly. His main complaint continued to be his inability to perform household chores. He stated that sleeping had been getting better, but his pain continues to wake him up at least once per night. The seated slump test was re-tested with a negative result, indicating decreased neural tension throughout the spine. His 90-90 hamstring test and SLR were still considered positive for bilateral hamstring tightness.

At the eight-week progress note, the patient continued to experience occasional symptoms into his left hip with left rotation, but not with left side bending. The shooting pains into his calf had ceased around week five. He was happy to report that at week seven, he could walk two miles without any symptoms. He stated that he had been performing more chores around the house due to his decreased pain levels, however, if he overexerted himself, the pain would appear in his left hip again. The patient had started to ease back into swimming and stated it was going well. He was starting to get more familiar with his body and what it could tolerate at this point in the recovery process. His hip range of motion was re-tested with improved results indicating improved biomechanics of the hip, decreasing strain through the lumbar spine. The

main goal for this patient continued to be returning him to his prior level of function so he could return to performing household chores.

Upon discharge, right and left rotation and side bending were equal bilaterally with no pain. He was able to return to walking more than two miles a day and swim all strokes without any pain. He was very motivated to get back to performing daily activities pain-free, therefore, he did the exercises we gave him every day. Because of this, we individualized his home exercise program upon discharge to keep him interested in the exercises and progress them to have optimal stimulus of repair to the lumbo-pelvic region. (Appendix: Home Exercise Program) By performing exercises that did not increase his pain, he gained strength and recruitment of muscles, improved motor control, and emphasized the stimuli to the lumbar spine in order to repair the collagen, cartilage, bone, muscle, and ligaments. After 12 weeks of perseverance and hard work, this patient was able to return to his prior level of function, reach all of his goals and return to walking, swimming, performing household chores, and sleeping throughout the night.

CHAPTER V

DISCUSSION

The purpose of this case report was to explore the effectiveness of physical therapy in an elderly patient with lumbosacral radiculopathy as the result of a L5-S1 disc herniation. This patient initially came to physical therapy with 5/10 pain in his left hip and was unable to rotate or side bend his lumbar spine to the left. Functionally, he was unable to walk more than one mile, perform ADLs, or sleep throughout the night. His physical therapy diagnosis was L5-S1 lumbar radiculopathy resulting from a herniated disc. Using manual therapy and fundamental exercises based off of the Ola Grimsby Institute, he was able to return to his prior level of function.[2] Individuals over 65 are more likely to develop chronic LBP that lasts more than three months, however, physical therapy reduced this patient's symptoms within 12 weeks of his initial visit.[1] All of his special tests were negative, including 90/90 hamstring test, slump test, and Thomas test, upon discharge. This patient's successful outcomes indicate the effectiveness of manual therapy and a consistent exercise routine targeting lumbo-pelvic recruitment to return an elderly patient back to his prior level of function.

This patient presented to physical therapy with the classic symptoms of radiculopathy, a condition that results from the compression of one or more spinal nerve roots with associated radiating leg pain and paresthesia.[12] During the evaluation, the slump test was positive reproducing his symptoms into his hip, indicating neural tension. Special tests for the hip were applied but were found to be negative. His thoracic and lumbar segmental mobility throughout his spine was decreased. This indicated that physical therapy needed to focus on interventions that improved intervertebral mobility rather than strictly stabilization exercises, therefore mobilizations and manipulations were chosen for this patient. Studies have reported that non-

drug treatments, such as spinal manipulation, seem to be more effective at relieving local or radiating pain in people versus sham manipulation.[10] This patient was able to start light exercises the first week of treatment, which was beneficial to him. A study performed by Zigengus et al. found that initiating therapy, such as therapeutic exercise, patient education, manual therapy, electrotherapeutic modalities, mechanical modalities, and physical agents, early in the course of treatment was associated with fewer physician visits, earlier discharge from care, fewer restricted workdays, and fewer days away from work.[17]

Even though this patient was able to get back to his prior level of function, it took him 12 weeks to become completely pain-free. However, the patient showed steady progression toward obtaining his goals each week. There were some setbacks throughout his course of treatment, especially returning to PT after the weekend. We did not address proper body mechanics right away, which we felt added to his symptoms. He demonstrated poor core control when squatting and bending over. This changed our course of treatment by incorporating more core stabilization exercises. If this had been caught earlier in his plan of care, it may have reduced the amount of setbacks this individual had and, therefore, decrease the number of PT visits. Multiple studies have shown that adding core stabilization exercises to a physical therapy program not only improve lumbo-pelvic stability, but also decrease non-specific low back pain.[35-37] More diagnostic and functional tests and measures should have been performed to determine this patient's core strength.

All of the tests and measures performed during the examination and evaluation had high reliability and validity. However, the patient was not given an Oswestry Low Back Pain Questionnaire upon discharge. Even though the patient was completely pain-free and stated he could perform all ADLs, this should have been completed to provide a more comprehensive

outcome assessment. Another measurement that should have been taken each visit was lumbar ROM following manual therapy. The patient's improvements in lumbar ROM were noticed by both the therapists and the patient, but confirming measurements should have been documented. Also, 12 weeks is not an ideal plan of care, however, the patient's number of weekly visits decreased from three to two during weeks 10-12. The last week of visits were to ensure the patient understood his comprehensive home exercise program and to provide further patient education on the importance of core stabilization during all daily activities.

We did not look into alternate methods to treat and assess back pain, such as the McKenzie Method, the Mulligan Concept, or Sahrmann's Movement System Impairment Syndromes, which may have provided an alternative treatment approach for this patient. The McKenzie Method uses an assessment process that enables the therapist to place the patient into a subgroup of mechanical pain, including derangement syndrome, dysfunction syndrome, postural syndrome, or other. Patients in the derangement syndrome subgroup would be treated by movements in the direction that centralizes their symptoms or causes a lasting reduction in their intensity. For clients in the dysfunction subgroup, movement is applied in the direction that remodels soft tissues. Patients in the postural subgroup are encouraged to adopt postures that keep the joint in a neutral position.[38] The Mulligan Concept has produced improvements in patients with low back pain by utilizing mobilization with movement.[39] There are a number of techniques that Brian Mulligan and his colleagues have found that help improve movement restrictions, pain with movement, and functional restrictions.[40] Shirley Sahrmann classifies musculoskeletal pain into Movement Impairment Syndromes in order for the therapist to use diagnostic schemes for treatment programs. Her philosophy is to correct the patient's movement pattern, and not just the limitation to that pattern.[41]

Further research is needed to determine if other spinal assessments and treatments such as those listed above would be more beneficial and provide more efficient outcomes for patients with similar signs and symptoms. This patient did not have many comorbidities, however, the general elderly population may have previous injuries, consume multiple medications daily, or have other systemic diseases which can all contribute to different outcomes for the patient. Performing this research on a variety of patients over the age of 65 would be beneficial to assess the differences in outcomes. An important aspect of PT is the home exercise program. We did not have a formalized method in which we monitored whether the patient performed his exercises at home. Further research needs to be done with a more standardized way of tracking the patient's outcomes.

APPENDIX

APPENDIX: FIGURES

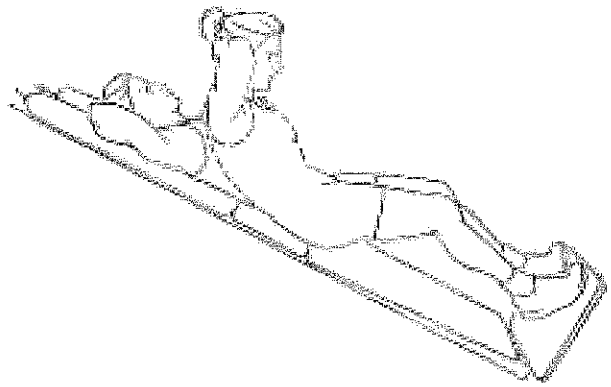

Figure 1
The patient starts with feet shoulder width apart and bends knee to 70 degree angle then pushes back up into knee extension. *Note: patient should not perform a curl up.
http://blog.totalgym.com/tag/squats/

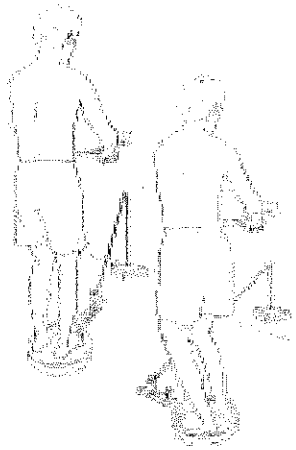

Figure 2
The patient stands on a rotation plate hooked up to a pulley system. The knees are slightly flexed and lumbar spine in neutral with the arms holding onto a bar stabilizing the upper body. The patient then rotates the lower body to a 45 degree angle keeping the upper body facing forward.[2]

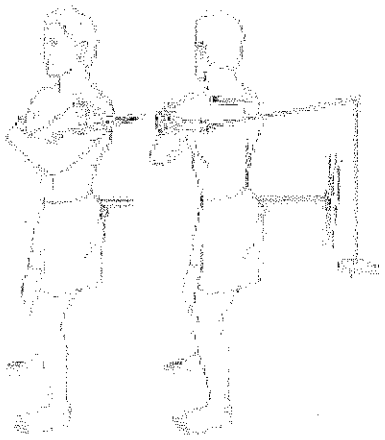

Figure 3
The patient begins exercise by crossing arms and grasping pulley handle then turning away from the pulley machine. The patient must keep the hips stabilized in a neutral position while turning shoulders to the right. The pull of the weight stack is directly in front of the patient's shoulder.[2]

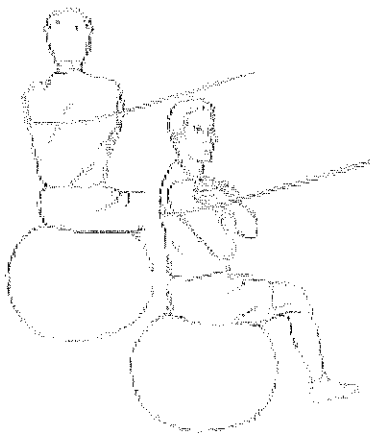

Figure 4
The patient begins exercise seated (not on ball, but on a stable surface) with hips and knees at 90 degrees with a weighted strap around the outside of one shoulder and down to the opposite waist angle, where the right hand is holding the other end of the strap. The pull of the weight stack is directly in front of the patient's shoulder on which the strap rests. The patient is instructed to slowly rotate his trunk to the left against the resistance while keeping his pelvis anchored and balanced.[2]

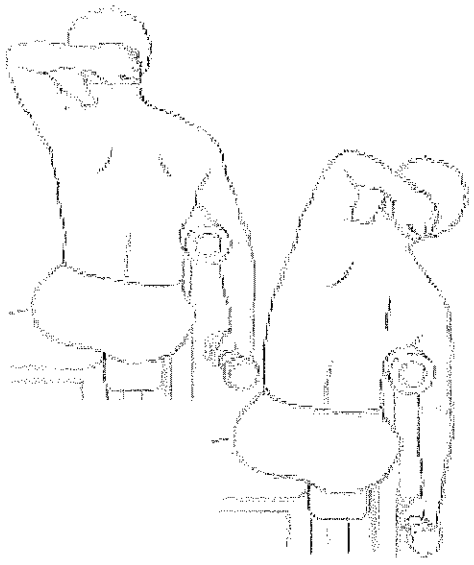

Figure 5
Right side-bending was performed by adjusting the bolster seat to mid-thoracic level of the patient. The patient was then instructed to side-bend to the right over the bolster while focusing on motion coming from the spine rather than the hips. The patient returns to neutral and repeats.[2]

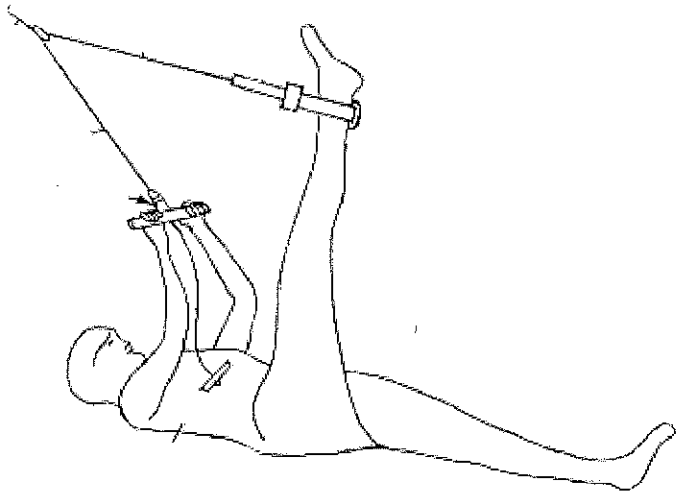

Figure 6
The patient lies supine and is attached to a pulley system similar to the one shown. The patient then extends leg by contracting posterior musculature then allows the pulley system to bring the leg back into flexion, stretching the posterior musculature.
https://targetexercises.com/shop/images/source/AlROMhamstring.jpg

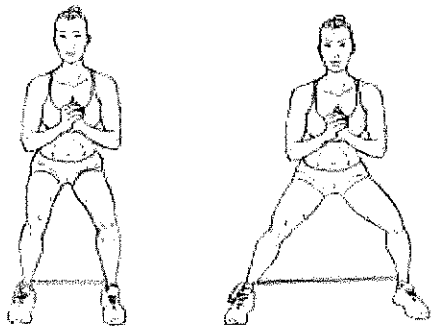

Figure 7
The weighted pulley side step was performed in this same manner, except with a pulley handle being held in the center of the chest with both hands and no band around the ankles. The patient takes 3-5 controlled steps away from the pulley system then returns in the same fashion. https://newscenter.azblue.com/no-time-no-problem-exercise-for-busy-bodies/

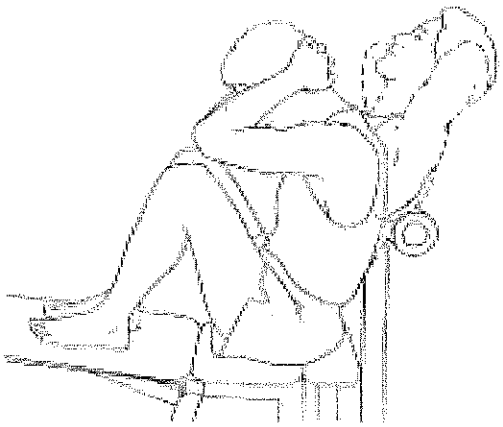

Figure 8
The patient starts with hips flexed creating lower lumbar flexion with hands interlocked behind the neck. The patient then extends the thoracic spine over the bolster ensuring the hips stay neutral. There should be no pain with this exercise.[2]

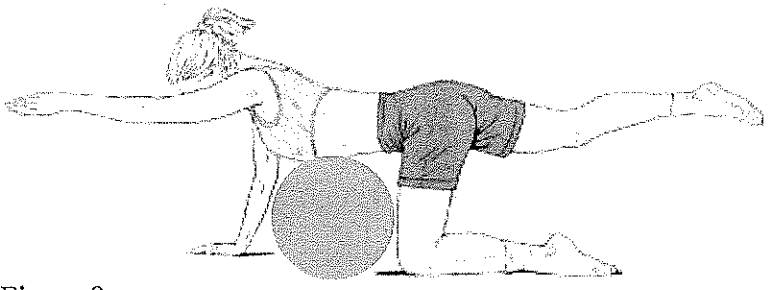

Figure 9
The patient is situated over the exercise ball with the chest resting in the center. Patient then lifts left arm and right leg keeping the core contracted. The arm and leg come back to starting position then alternate. It is important to maintain balance throughout entire exercise. https://www.researchgate.net/publication/23664459_A_modern_approach_to_abdominal_training-Part_III_Putting_it_together

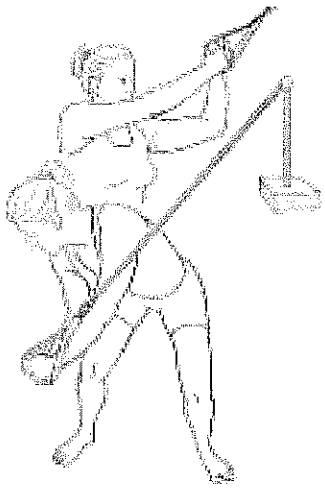

Figure 10
Patient starts with right shoulder facing pulley system and grabs handle slightly above right shoulder. Patient then pulls the handle down and across body toward opposite knee. This is done simultaneously while performing a mini-squat. The patient then returns to the starting position. Patient should keep hips neutral with slight rotation coming from the spine.[2]

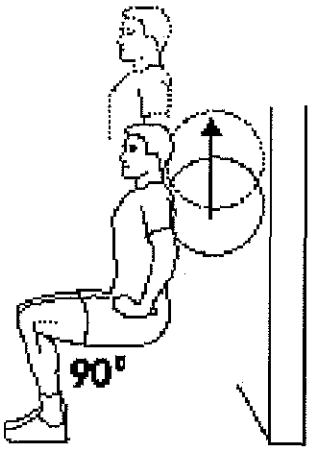

Figure 11
Patient starts with ball against the wall just above the small of the back. The patient contracts core while squatting down to a 90 degree angle at the knees and then returns to starting position. http://www.build-muscle-and-burn-fat.com/stability-ball-exercises.html

APPENDIX: HOME EXERCISE PROGRAM

Workout 1:

- Rows with band 2 x20
- Anterior cranial rotation 2 x20/side
- Side pulldown on 1 foot 2 x20/side
- Pulley side step x20
- Kneeling back extension 2 x20
- Plantigrade mule kicks x15/leg
- March on pillow/stand on 1 leg x30sec
- Theraband at bottom of door, put it around 1 ankle, hip abd, flex, ext

Workout 2:

- Lat pulldown 2 x20
- Posterior cranial rotation 2 x20/side
- Abdominal crunch on ball 2 x20
- Squat with weight in hand 2 x20
- Birddogs on ball 2 x20
- S/L clam shell with band x20/side
- Seated leg kick outs on exercise ball x20

Workout 3:

- Reverse Fly 2 x20
- Forward pulldown 2 x20/side
- Chops 2 x20/side
- Side hops with hold x20
- Bridges 2 x20 (progress to bridges on ball)
- Stairs (can skip stairs) 3 flights
- Agility training in hallway

Child's pose for pain relief
Foam roller
Side bends over a chair
Leg across body stretch
Wife can pull leg-traction
Walking
Swimming

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