Clinical Case Report Competition

West Coast College of Massage Therapy

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Second Place Winner

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The effects of contractile myofascial release applied to the psoas major and lumbosacral distraction on degenerative disc disease pain and neurological symptoms

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Abstract

Background: Degenerative disc disease (DDD) and resulting low back pain have a large socioeconomic impact on the health care system. At this time there is no cure for DDD. A variety of surgical techniques and methods have been developed to help treat the symptoms of pain but not the cause or continued degeneration. This case study explores the effects of treating the psoas major muscle with Contractile Myofascial Release (CMFR) and lumbosacral distraction to alleviate lower back pain and neurological symptoms associated with DDD.

Methods: The patient is a 37 year old male, diagnosed with lumbosacral disc degeneration and previous surgical instrumented fusion of L5-S1. Five treatment sessions were performed over three weeks using a manual therapy protocol of CMFR to the psoas major and lumbosacral distraction. Assessment methods used included orthopedic special tests, dermatome testing, deep tendon reflex testing, lumbar range of motion, manual muscle testing, Oswestry Low Back Pain Questionnaire and patient feedback.

Results: There was a slight decrease with overall pain and neurological symptoms. The patient reported a decrease with neurological symptoms and the Oswestry Low Back Pain Questionnaire overall score but no change with the category of disability. Psoas major bilaterally increased in strength and palpable tone. Deep tendon reflexes showed no change.

Conclusions: A combination of CMFR to the psoas major and lumbosacral distraction show promising results with slight reductions in pain and neurological symptoms. However neither change could be defined as clinically significant. More research is needed to track the long term effects of this manual therapy. Treatment of the psoas as well as lumbar distraction could be an important key to future studies regarding lumbar stabilization, low back pain and degenerative disc disease.

Keywords: Psoas, Lumbar Distraction, Myofascial, Massage, Manual Therapy, Degenerative Disc Disease, Low Back Pain

Introduction

Degenerative lumbar disc disease and resulting low back pain have a large socioeconomic impact on the health care system. Taher et al. (2012) explains that low back pain is the single most common cause for disability among individuals aged 45 years or younger. The economic losses in the United States are estimated to exceed $100 billion per year due to indirect reduced productivity.

At this time there is no cure for degenerative disc disease (DDD). A variety of surgical techniques and methods have been developed to help treat the symptoms of pain but not the cause or continued degeneration of the disease. Can a manual therapy of contractile myofascial release (CMFR) applied to the psoas major combined with lumbosacral distraction reduce chronic low back pain and neurological symptoms associated with DDD?

Degenerative Disc Disease

The intervertebral discs (IVD's) are found between the bodies of adjacent vertebrae from the second cervical vertebra to the sacrum. IVD's account for about 25% of the height of the vertebral column. Each disc has an outer fibrous ring called the annulus fibrosus and an inner soft, highly elastic substance called the nucleus pulposus (Tortora & Derrickson, 2009, p. 219).

The aging process inherently succumbs to degeneration of certain tissues in the body. DDD is an accelerated degeneration of the IVD's caused by a loss of elasticity of the nucleus pulposus and a decrease in the water content inside the

disc affecting the chemical balance and function of the disc. According to Taher et al. (2012) age, genetics and environmental factors are all components of DDD while age and genetics are considered primary factors and environmental factors are considered to be secondary.

Severe DDD and its accompanying pain is most commonly treated with spinal fusion surgery. Taher et al. (2012) argue that "fusion procedures offer a way of eliminating motion between spinal segments, and thus alleviate discogenic pain associated to degenerative changes, they address only the symptom and not the cause of DDD. Furthermore, there are significant concerns regarding alterations in adjacent segment motion, which may lead to the introduction of adjacent segment degeneration" (p.3).

Another less invasive non-surgical treatment used for DDD pain is lumbar traction administered either manually or mechanically. Corkery (2001, p.191) explains the rational for using traction in terms of its effects on the IVD's; increasing intervertebral space and tension of the posterior longitudinal ligament; and suction to draw the protrusion of the disc towards the center of the joint. This treatment can bring relief but is only a factor in the overall scope of DDD.

Psoas major

The psoas major muscle originates from the vertebral bodies, IVD's and transverse processes of T12-L5 and inserts into the lesser trochanter of the femur

and is innervated by branches of the lumbar plexus nerves from L1-L4 (Houglum & Bertoti, 2012, p.392).

A study done by Kepler, C. et al. (2010, p.50) on the anatomy of the psoas muscle in relation to the lumbar plexus describes how the psoas muscle has an intricate and direct relationship with the IVD's, lumbar plexus and femoral nerves. The psoas major has two layers - superficial and deep. Embedded between these muscles is the lumbar plexus, which is a dense collection of nerves that innervate the transverse oblique abdominals, the pelvic floor, deep hip rotators and most thigh muscles (Kirchmair, 2009, p. 111).

Sajko, (2009, p.312) suggests that the psoas major is the largest muscle in cross section at the lower levels of the lumbar spine. It is the only muscular structure associated with the lumbar spine anteriorly and has direct attachments to the lumbar IVD's with exception to the L5/S1 disc. Posteriorly the lumbar spine is well supported by the deep paraspinal muscles, quadratus lumborum and, more superficially, by the latissimus dorsi and Thoracolumbar fascia.

Because the psoas major muscle lies deep in the abdomen it can be difficult to palpate and in turn treat. As Sajko, (2009, p.316) points out there is growing evidence of the important role this muscle plays in stabilizing the spine and should be considered by clinicians when assessing and treating patients with low back pain.

Case Study

Introduction

In preparing a treatment protocol for this case study several factors were considered before deciding which modalities and treatment techniques would be effective. Anatomical structures were identified which would have a direct and indirect connection with the lumbar discs. One research study by Moustafa & Diab (2012, p 60) revealed the benefits of traction therapy to the lumbar spine for patients with discogenic lumbosacral radiculopathy. Research conducted by Sajko & Stuber (2009, p. 314) on the anatomy, biomechanics and clinical implications of the psoas major muscle confirmed its importance in stabilization of the lumbar spine and its close connection to low back pain.

Two main modalities were selected for this case study to have the greatest possible combined effect on the patient's symptoms. The psoas major muscle was targeted for treatment because of its direct attachment and relation to the lumbar spine and lumbar IVD's. CMFR was chosen to treat the psoas major, to allow for a greater ability to affect fascial changes within the muscle tissue. Lumbosacral distraction was chosen for its direct decompression of the IVD's and as a passive stretch to the psoas major muscle origins along the lumbar spine. Five treatment sessions were performed over a three week period in January 2013.

Patient History

The patient is a 37 year old male. He was diagnosed with lumbosacral disc degeneration in 2008 by a neurologist. In 2009 he underwent surgical instrumented fusion of L5-S1 to repair a severe retrolisthesis of L5. Following surgery, the patient participated in physiotherapy, chiropractic and massage therapy. The surgery and post operative therapy were successful and the patient was able to live relatively pain free for about two years.

A magnetic resonance imaging (MRI) was performed in 2010. It revealed severe L5-S1 degenerative disc changes and post instrumented fusion. Degenerative disc and facet changes at the L4-5 level were seen with moderately severe spinal stenosis, and small central disc protrusion was causing cauda equina compression. The MRI also revealed small left-sided disc protrusions at T11-12, T12-L1 and a small central disc protrusion at the L2-3 level which were not causing any obvious neurological impingement at the time.

Since 2011, symptoms of pain have increased along with recent neurological symptoms including numbness and tingling down the left anterior thigh and leg following a L5 dermatome. The patient had not participated in physiotherapy or chiropractic therapy in the previous month before the onset of this case study. The patient had received massage treatments one to two times per month within the six months prior to the case study. There was no treatment to the psoas major or distraction of the lumbosacral spine.

Observations

A postural assessment with an anterior view using a plumb-bob revealed a severe right lateral deviation with slight ipsilateral rotation of the upper torso starting at approximately the pubic symphysis joint. A lateral view revealed a severe thoracic hypokyphosis and severe lumbar hypolordosis.

Palpation

Thoracic and lumbar curvatures in the sagittal plane were hypokyphotic and hypolordotic respectively, with board-like hypertonicity of the surrounding erector spinae group musculature.

Initial assessment of the right psoas major muscle belly revealed it to be hypertoned, ropey, dense, yielding and tender. The left psoas major muscle belly was hypotoned, mushy, soft and tender. During the third treatment palpation of bilateral psoas major muscles were more toned and distinguishable. Tone increased with both the psoas major muscle belly and tendon. A marked difference of greater tonicity and palpable muscle size of the right muscle belly over the left muscle belly stayed apparent over the course of all five treatments.

Movement and Functional Testing

Full lumbar active, passive and resisted range of motion was tested. All active, passive and resisted range of motions were full, within normal limits and without pain.

A squat and rise was performed by the patient within normal limits and without pain. A standing toe touch was performed within normal limits and without pain.

Neurological Testing

Deep tendon reflex testing was performed with a reflex hammer bilaterally at the patellar tendon and Achilles tendon. The superficial plantar reflex was tested bilaterally with the end of a paperclip. Deep tendon and superficial reflexes showed no remarkable changes compared to the initial assessment and final assessment (Table 1).

Table 1: Deep Tendon Reflex Testing Results for Treatments 1 & 5

	Left side	Right side
Patellar tendon L3-L4	1	2
Achilles tendon S1-S2	2	1
Plantar reflex S1-S2	2	2

Deep Tendon Reflex Grading 0-4, 0 = Absent, 1 = Diminished, 2 = Normal, 3 = Exaggerated , 4 = Clonus (Magee, 2008, p. 51)

Dermatome testing was performed with a dual pronged paperclip bilaterally on the lower limb. At initial assessment the patient reported strong tingling sensations on the left anterior lateral thigh and lower leg following an L5 dermatome pattern. All other dermatome sensations were reported as normal.

At final assessment the patient reported a light, fuzzy, tingling sensation, on the left anterior lateral lower leg in a L5 dermatome pattern. The patient reported sensations of a lesser intensity as compared to the initial assessment. All other dermatome sensations were described as normal.

Referred Pain

There was no referred pain reported. The patient reported pain in the low back region between L1 and S1.

Special Testing

Special tests relating to DDD and its symptoms were performed at the initial visit prior to treatment. Only tests which yielded positive results were repeated prior to treatment during subsequent sessions. Special tests producing a negative result were discontinued from subsequent treatment sessions. During the final treatment all special tests were repeated regardless of previous positive or negative results (Table 2).

Table 2: Special Test Results

	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5
Positive Test	- Thomas test (right side) - Kendell test (bilateral) - Supine to sit (right leg, short to long)	- Supine to sit (right leg, short to long) - Kendell test (bilateral)	- Supine to sit (right leg, short to long) - Kendell test (bilateral)	- Supine to sit (right leg, short to long) - Kendell test (bilateral)	- Supine to sit (right leg, short to long) - Kendell test (bilateral)
Negative Test	- Valsalva - Dural slump - SLR - Nachlas - Flamingo test - Standing stork - Quadrant test*	- Thomas test	N/A	N/A	- Valsalva - Dural slump - SLR - Nachlas - Flamingo test - Standing stork - Quadrant test

* For the first two treatments the Quadrant test was recorded as positive but it was later determined as a false positive according to Magee (2008, p. 574).

Manual Muscle Testing

Manual muscle testing was performed according to the protocol laid out by Kendall et al. (2005). All muscles given a grade 5 were discontinued from subsequent assessments until the final assessment. Exception was given to the psoas major because of its initial grade and treatment focus. MMT of psoas major was subsequently performed at the third, fourth and fifth treatments (Table 3).

Table 3: Manual Muscle Testing								
	Treatment 1		Treatment 3		Treatment 4		Treatment 5	
	Right	Left	Right	Left	Right	Left	Right	Left
Psoas major	4	3+	5	5	5	5	5	5
Rectus femoris	5	5	-	-	-	-	5	5
Gluteus maximus	5	5	-	-	-	-	5	5
Hamstring group	5	5	-	-	-	-	5	5

Oswestry Low Back Pain Questionnaire

An Oswestry Low Back Pain Questionnaire was given to the patient just prior to the initial assessment and again just prior to the final treatment. In the first questionnaire the patient indicated duration of back pain to be six years, and leg pain six months. All ten sections were completed. The questionnaire was tallied and scored after the first treatment was finished. A score of 32% (16/50) was calculated. This result fell into the moderate disability category of 20-40%. The same questionnaire was given again just prior to the fifth and final treatment. A score of 30% (15/50) was calculated, which also falls into the moderate disability category. There was no change with the overall disability category.

Treatment Goals

Goals of treatment included; decrease psoas major hypertonicity and muscle belly fascial restrictions; decompress the lumbar spine and IVD's; and decrease pain and neurological symptoms associated with DDD.

Treatment Modalities Used

Five 90 minute treatments were given over a three week period in January 2013. Treatment followed a preset protocol of modalities which were repeated for each session. Each treatment began with the patient lying supine on the table. The treatment protocol was performed bilaterally.

Prior to the CMFR of the psoas major a cross hands fascial release was applied to the superficial fascia of the inguinal region covering the lower abdomen and proximal thigh. A three dimensional strain was applied over the abdomen in a cephalad direction and over the proximal thigh in a caudal direction. Two to three separate applications were applied with two to three fascial releases felt for each. Cross hands superficial fascial release was applied to warm up the superficial tissue around the psoas major, and to free up fascial restrictions of the abdominal aponeurosis and musculature over the site where CMFR to the psoas major was to be performed.

CMFR was then applied to four different regions of the psoas major muscle: tendon, musculotendinous junction, distal muscle belly and proximal muscle belly. Once pressure was applied to the muscle, the patient performed twelve repetitions of active hip flexion to ninety degrees with full hip lateral rotation, followed by full hip and knee extension to the table. Parallel and cross fiber frictions were then applied to the iliopsoas tendon insertion at the lesser trochanter of the femur to stimulate the golgi tendon organs. A proprioceptive

neuromuscular facilitation (PNF) stretch was applied with contract-relax and agonist-contract to the psoas major muscle.

The patient then lay prone with a pillow under the lower legs and a pillow placed under the abdomen. Swedish massage techniques of palmer effleurage, palmer kneading and ulnar border stroking were applied with massage lotion to warm up and increase circulation to the muscles of the lumbar erector spinae group, multifidi, quadratus lumborum, lower latissimus dorsi, gluteus maximus and gluteus medius. As described by Dixon (2006, p.114) protocol for a lumbosacral distraction was followed and applied for five minutes. A sacral float was then applied for one minute to decompress the sacroiliac joints, promote sacral nutation and lumbar lordosis.

Remedial Exercise

A strengthening exercise for the psoas major was given to promote recruitment of neuromuscular fibers and proprioceptive fibers within the muscle. The psoas major muscle was isolated from other hip flexors by placing it in Kendall's (2005, p 423) MMT position for iliopsoas (with emphasis on psoas major). The exercise is to be performed while lying supine with the hip slightly abducted and laterally rotated, and knee fully extended. The leg is raised slowly with a concentric contraction in a plane of flexion and abduction, in-line with the muscle belly origin and insertion, up to a 45^{o} angle. The leg is then slowly lowered with an eccentric contraction back to the starting position.

Frequency: 1x a day, 3 days per week.

Intensity: Slow with equal concentric and eccentric contractions using patients own body weight.

Duration: 2 sets of 20 repetitions each or to fatigue.

Management Plan

Treatments are to be continued once per week with focus on CMFR to the psoas major and lumbosacral distraction. Subsequent treatments are to include posterior structures of the pelvis. These subsequent treatments should include techniques such as CMFR, myofascial release, muscle energy techniques (MET) and Swedish techniques to decrease hypertonicity of the gluteus maximus, gluteus medius, gluteus minimus, piriformis and the sacrotuberous ligament. Remedial strengthening exercise is to be continued to the psoas major, including a PNF agonist-contract stretch after strengthening exercises are completed.

Results

A slight decrease with pain was shown with the Oswestry Low Back Pain Questionnaire from the initial score of 32% to 30% at the final treatment. Both of these scores fell into the same category of moderate disability.

A slight but noticeable decrease with neurological symptoms was reported with dermatome testing. In the final assessment, no abnormal sensations were reported by patient while testing the left lateral anterior thigh L5 dermatome in

comparison to the initial dermatome assessment. While testing the left anterior lower leg dermatome the patient reported a light, fuzzy, tingling sensation with less intensity compared to initial dermatome testing of the same area.

The most profound result was the increase in strength of the psoas major bilaterally, as well as palpated tone and texture of the muscle belly and tendon. After two treatments there was a noticeable improvement in strength with MMT of the psoas. The initial MMT of psoas major graded a right 4 and left 3+ plus. Prior to the third treatment MMT psoas grade increased bilaterally to a grade 5. Psoas major continued to test bilaterally with a grade 5 in subsequent assessments (Table 3). Though the maximal MMT grade that can be given is a grade 5 there was a noticeable increase in strength and stability of the patient's leg while performing maximal resistance during the MMT break test and concentric resisted movements.

There was no change with deep tendon reflexes (Table 1).

Conclusion

In combination, CMFR to the psoas major and lumbosacral distraction showed slight improvements with reducing lower back pain and neurological symptoms associated with DDD. However neither change could be defined as clinically significant given the limited amount of data collected, overall time frame, and minimal treatments conducted during the study. More research is needed to track the long term effects of this combination of manual therapy.

Future case studies using pre and post MRI scans are recommended to obtain more empirical data regarding the changes occurring between the psoas major muscle, lumbar spine and IVD's.

CMFR and lumbosacral distraction did show promising results with psoas major muscle strength and palpative tone in a short time frame of only three weeks (Table 3). Considering CMFR is a more direct technique to treat the psoas major muscle, more consideration should go into future studies on the effectiveness of this technique and DDD. Therapists should keep in mind contraindications to treating the psoas major directly with CMFR. It can be painful and uncomfortable and not all patients can tolerate treatment to this region. Treatment of the psoas major could be an important key to future studies regarding lumbar stabilization, low back pain and DDD.

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