Counterstrain as a Diagnostic and Treatment Tool for Rectus Femoris Origin Injuries: A Case Report

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CASE REPORT

Abstract

Counterstrain (CS) is an osteopathic manipulative technique that utilizes indirect and passive positions of strained tissues to address musculoskeletal dysfunctions. As such, CS has potential as a treatment option for muscle strain injuries, such as rectus femoris origin (RFO) injuries. This case highlights an instance where the CS technique was used as an effective and inexpensive diagnostic tool to confirm the involvement of the reflected head of the rectus femoris muscle (RHRF) in an RFO injury.

The presentation of symptoms in this case, like many other hip pain cases, was nonspecific, making it difficult to diagnose without the use of advanced imaging techniques, which are often time consuming and costly for patients. The use of CS was able to support a diagnosis of a reflected head of the RFO injury. After an osteopathic structural examination, it was noted that the patient had multiple bilateral tender points of the anterior thoracic region and hip: anterior thoracic-10 (AT10), proximal psoas (PP, formerly abdominal lumbar 2), iliacus, and reflected head of the rectus femoris (RHRF).[1] In his 1981 text, Jones referred to an anterior medial trochanter tender point that is similar to the RHRF point; however, the location was described to be more lateral, rather than inferior, to the anterior inferior iliac spine than the RHRF point.[2] Once all tender points were identified, treatment using the CS technique was administered weekly over the period of a month, and the patient noted markedly reduced tenderness of the tender points treated and was able to reincorporate soccer and other athletic activities back into his life.

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Financial disclosures: none reported.

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Manuscript submitted for publication September 19, 2018; final revision received January 31, 2019; accepted for publication May 8, 2019.

At the time this manuscript was submitted and reviewed, Dr. Goering chaired the American Academy of Osteopathy's Publications Committee, which oversees publication of *The AAO Journal*. The double-blind review process prevented reviewers from knowing the authors' identities.

Introduction

Injuries of quadriceps and hamstring muscle groups are common among athletes, especially with sports that require repetitive kicking. Within those muscle groups, the rectus femoris muscle is highly susceptible to injuries due to its origin and insertion points overlapping the hip and knee joints, respectively.[3,4] This muscle arises from two heads that attach to the ilium: the direct head and the reflected head. The tendon of the direct head originates at the anterior inferior iliac spine (AIIS) while the tendon of the reflected head originates from the upper region of the acetabulum rim *(see Figure 1)*. At its distal end, the rectus femoris muscle tendon inserts at the upper pole of the patella.[5] Due to its unique layout across 2 major joints, the rectus femoris muscle is subject to significant stretch and stress, particularly when the knee is flexed and the hip is extended, risking potential strains, avulsions, or other injuries.[6–8]

Furthermore, a retrospective review of pelvic and hip MRI procedures in rectus femoris origin injuries showed that a majority of acute RFO injury cases involved the reflected head, and a majority of the chronic RFO cases involved the direct head.[9] Acute RFO injuries stemming from the reflected head have been reported.[10–13] Unfortunately, current guidelines are not well defined regarding

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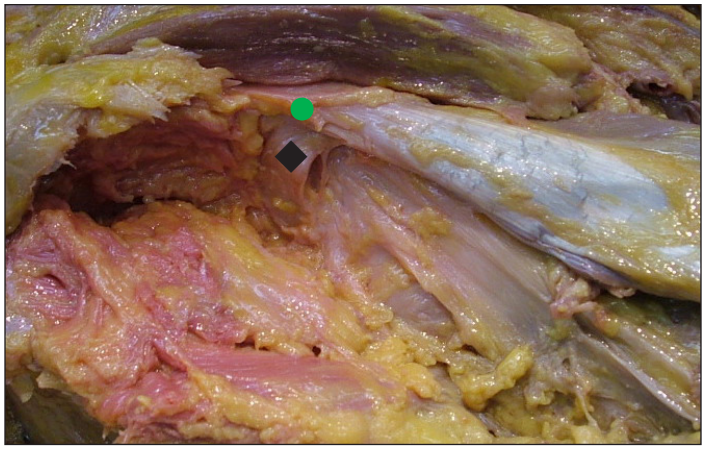

Figure 1. *A dissection of the rectus femoris muscle, highlighting the two origin points of the muscle: the direct head (green circle) that arises from the AIIS and the reflected head (black diamond) that arises from the upper region of the acetabulum rim.*

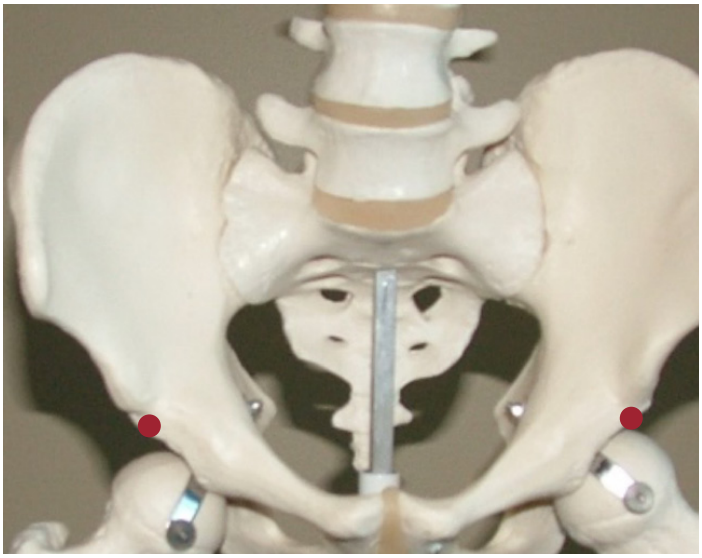

Figure 2. *The tender point of the reflected head of the rectus femoris muscle is located on the superior rim of the acetabulum, below the anterior inferior iliac spine, as shown by the red dots.*

(continued from page 19)

whether the evaluation of such injuries leads to operative versus nonoperative care, nor are those evaluations well documented.

Individuals with injuries to the RFO often present with nonspecific symptoms of anterior hip pain and ambiguous physical exam findings. Often, in order to pinpoint the exact location(s) of the pain, multiple imaging procedures are required such as x-ray, MRI, and CT scans.[14,15] Through the use of osteopathic manipulative medicine (OMM), the identification of tender points, which are small areas of hypersensitive tissue found in the muscular, tendinous, and ligamentous tissues, can be performed. Specifically, the identification of the RHRF tender point, which is located on the superior rim of the acetabulum below the AIIS *(see Figure 2)*, can play a critical role in the diagnostic process, making OMM an appropriate first-line treatment option in RFO injuries.

Report of Case

A 25-year-old male amateur soccer player approached one of this paper's authors in a nonclinical setting. He presented with persistently worsening bilateral hip pain that began on the right hip around 24 months previously.

History

The patient had been a competitive soccer play since the age of 11. During the ages of 11 through 18, he played soccer approximately 20 hours per week. While attending undergraduate college, he played 6 hours per week, and by 2014, he played recreationally 2 hours per week.

Beginning in September of 2015, after the reduction in his time playing soccer, he began experiencing significant pain in his right hip during soccer play. This limited his ability to play for more than 45 consecutive minutes. He played through the pain for a year, at which point he could no longer play soccer for more than a few minutes at a time before the pain became intolerable. This pain not only inhibited his athletic endeavors, but also affected his activities of daily living such as walking long distances and climbing stairs.

At this point, a physical therapist was consulted who then initiated a strengthening and stretching regimen as a treatment of weak hip flexors. The patient also was instructed to take a break from any soccer play for 4 months. After 4 months of rest and physical rehabilitation, he returned to playing soccer recreationally by slowly transitioning back to 2 hours per week. He noted that after the physical therapy sessions, the pain was attenuated but still present. He was then able to play soccer for up to an hour before the pain was too intense to continue.

Throughout the following year, the right hip pain gradually worsened and similar pain presented in the left hip as well, though the severity of the pain in the left hip never reached the same intensity as that of the right hip. The patient reported that at times, he could not flex his hips enough to walk upstairs without pain and had to slowly rise out of bed in the mornings to minimize the pain. Two years after the onset of his hip pain, in September 2017, he was able to play soccer for 30 minutes before needing to stop and stretch due to bilateral hip pain. Eventually, while attending medical school, the patient found he could not sit in class for more than

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30 minutes and sought advice from the school's OMM department.

Initial Presentation

Following an informal discussion of symptoms, the patient received an osteopathic structural exam to investigate the potential source of the hip pain, and a thorough medical history was taken. The patient denied any self-treatment or self-medication including nonsteroidal anti-inflammatories, acetaminophen, or other pain-related medications. Aside from the physical therapy sessions, the patient did not seek other medical attention for this problem. Prior to the onset of the hip pain, the patient was involved in a minor car accident where he was rear-ended at low speed. The patient did not seek medical attention following that incident. No other history of trauma nor of pertinent medical procedures was reported.

Physical and Osteopathic Structural Exam

The patient stated that, at the beginning of the school term (September 2017), it was painful to climb up stairs due to his bilateral hip pain. Physical examination findings showed decreased active and passive ranges of motion and motor strength across the hip joint bilaterally.

Presentation of this case, like many other hip pain cases, was nonspecific and ill defined, making it difficult to diagnose without the use of advanced imaging techniques, which are often time consuming and costly for patients.

In this case, the use of counterstrain (CS) was able to support a diagnosis of a reflected head of the rectus femoris origin (RFO) injury. After an osteopathic structural examination, it was noted that the patient had multiple bilateral tender points of the anterior thoracic region and hip: anterior thoracic-10 (AT10), proximal psoas (PP, formerly abdominal lumbar 2), iliacus, and RHRF.

Physical examination findings showed minimal atrophy of the right rectus femoris muscle. Active and passive range of motion (ROM) were decreased in marked flexion and external rotation of the hip bilaterally, with the right hip having significantly less ROM with pain on flexion. The muscle strength of the more affected right leg was reduced with flexion and external rotation, partly due to the pain induced. Deep tendon reflexes of the lower extremities were normal.

Upon further osteopathic structural examination, several CS tender points were found to be very sensitive to palpation: R-iliacus (IL), R-AT10, R-PP, R-RHRF and L-RHRF. Of all these tender points, the patient indicated that the R-RHRF tender point was the most tender. Although the RHRF tender points were present bilaterally, the right side presented with more tenderness to palpation than the left.

Overall, clinical impressions were that the bilateral anterior hip pain partly resulted from an inflamed and strained RHRF muscle. These injuries are often seen by the first author in an acute phase. While the injury was no longer acute, the patient had not exacerbated the injury to the extent of an avulsion injury. The marked decrease in hip flexion and RHRF tender points bilaterally supported the diagnosis. The remaining CS tender points likely resulted due to compensation of the surrounding muscles in response to the prolonged bilateral anterior hip pain.

Treatment and Follow-up Plan

The physician used the CS treatment model to address the patient's anterior hip pain. This technique is used to address musculoskeletal dysfunctions by placing the patient in an indirect and passive position. Thus, the utilization of this technique relies heavily on the physician's palpatory skills in the diagnosis of CS tender points, which are small areas of hypersensitive tissue found in the muscular, tendinous, and ligamentous tissues.

After identifying the CS tender points, the physician continues to monitor the tender point with light pressure, not inducing tenderness, while placing the patient into a position that shortens the tender tissues, providing relief of the tender point tension and the nociceptive feedback association with the tension. This position is

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Figure 3. *The CS treatment position for the R-RHRF tender point. Patient is supine and the physician has one hand (left) monitoring the RHRF point and the other hand (right) inducing 90° knee flexion, internal rotation of the hip, and slight abduction or adduction as needed.*

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held for 90 seconds, after which the physician returns the patient passively and slowly to a neutral resting position.[16] The principles of CS revolve around the proprioceptive theory, which explains the agonist-antagonist relationships between muscle groups and the neuromuscular imbalances that are a result of the neural and reflex mechanisms engaged by overexcited muscles.[17]

According to the patient in the present case, the R-RHRF registered as the most sensitive CS tender point. Treatment of this tender point requires the patient lie supine with the physician standing on the affected side, lifting the affected leg to induce hip flexion to 90°, followed by slight internal rotation of the hip and abduction or adduction of the hip as needed *(see Figures 3 and 4)*.

Two-thirds reduction of tenderness was achieved and the treatment position was held with the patient remaining passively relaxed until therapeutic pulse was noticed by the physician through the slight pressure monitoring the tender point. All of the other CS tender points noted earlier were addressed similarly using their respective treatment positions as listed by Jones in his 1995 text.[1,17] Upon completion of the treatment session, the patient was instructed to stay well-hydrated and return for subsequent treatments on a weekly basis until this problem with hip pain was sufficiently improved.

Figure 4. *The CS treatment position for the R-RHRF tender point. This view highlights the internal rotation of the hip joint that is needed for this CS tender point treatment.*

For the following month after the initial treatment, the patient received CS treatment once a week, and it was noted that the patient experienced improvement gradually with increased ROM and muscle strength in hip flexion and external rotation. All tender points improved gradually. The patient then stated that he could play soccer for over an hour without pain, but prolonged periods of hip flexion (ie, sitting down for multiple hours) could result in a "lockout" sensation that resolved after stretching.

Results and Discussion

Within 1 month, with 4 CS treatment sessions, a 25-year-old man who had suffered from 24 months of progressively worsening bilateral hip pain, which hindered him in routine activities of daily life, was able to resume much of his active lifestyle. Prior to the initial CS treatment, he was not able to play soccer for periods longer than 30 minutes without hip pain being too intense to continue playing. After the 4 treatments, he stated that he could play soccer for over an hour before feeling pain in his hips. Moreover, he noted the attenuation of the pain compared to the times before the treatments and noted that the present pain was quickly relieved with stretching.

This case highlights 2 important factors in treatment plans of nonspecific hip pain: the importance of effective diagnostic tools and the positive impact that appropriate, nonoperative CS care can make in cases of RFO injuries. The presentation of anterior hip pain can indicate a variety of musculoskeletal dysfunctions, and proper treatment relies on a correct diagnosis. Physicians who have knowledge of CS techniques can utilize their palpatory skills to correctly identify tender points that are indicative of muscle involvement in the affected region. These tender points can be addressed using CS techniques, relieving the cause of the pain by providing relaxation for tender muscle fibers identified, allowing the structurally injured tissues an opportunity to heal.

As highlighted in this case, the involvement of the RHRF muscle can be diagnosed by detecting its specific tender point. The unique layout of the reflected head creates an obstacle of diagnosis without imaging. Yet, with knowledge of CS, the physician was able to pinpoint the origin point of the injured muscle and apply appropriate intervention. As a result, the patient experienced significant clinical improvement without invasive surgical involvement.

Though this patient did experience a positive outcome with CS treatment, there are some limitations to this manual technique, such as patient compliance and ability to follow direction, as well as limitations of positioning secondary to injury. If symptoms do not

(continued on page 23)

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improve after CS treatment of specific tender points, it is important to reevaluate the patient using advanced imaging and consider other treatment plans.

Conclusion

Physicians with the knowledge of OMM, particularly the CS technique, should consider using it as a first-line diagnostic and treatment tool for patients with nonspecific anterior hip pain. This technique is noninvasive, cost effective, atraumatic, and diagnostic to the tissues involved.

Counterstrain allows for accurate identification of muscle tender points and addresses many of the underlying structural causes of RFO injuries as well as other musculoskeletal dysfunctions. Treatment using the CS technique to address RFO strain injuries involving the RHRF provides a noninvasive option that could greatly benefit patients. It has been shown that counterstrain for the hip musculature has resulted in the increase of strength and decrease of pain in tender points.[18] It would be beneficial and necessary to see more clinical research with long-term follow-up conducted that evaluates the effectiveness CS for RFO specific injuries.

Acknowledgement

The authors would like to thank Matthew LaPlante, OMS II, for his help throughout the writing process for this article. Additionally, we would like to thank Janice Blumer, DO, FAAO, for her help during the editing process.

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