Clinical Case Report: Physical Therapy Examination and Intervention of Traumatic Non-Discogenic Sciatica in a 16-year-old Football Player

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Background and Purpose

Patient's referred to physical therapy with a diagnosis of sciatica can be challenging to diagnose and treat as they may present with symptoms that are radicular, somatic or both. Lumbar radicular pain travels down the lower extremity along a narrow band and the perceived pain is qualitatively described by the patient as being sharp, shooting or lancinating. It can be experienced superficially and deeply. Lumbar radicular pain is generated in the dorsal root ganglion in the territory innervated by the affected axon. Somatic pain is typically felt deeply and is described as dull and achy. It is evoked by noxious stimulation of nerve endings. Radicular pain and somatic pain can co-exist. Therefore a patient may present with radicular pain, somatic pain or both (Govind).

In practice the term sciatica is often used generically, however, when creating a physical therapy plan of care it is important to distinguish between the different types of radiating lower extremity symptoms. Sciatic neuralgia is "pain in the distribution of the sciatic nerve due to pathology of the nerve itself" (Merskey), where as radicular pain is "perceived as arising in a limb or the trunk and is caused by ectopic activation of nociceptive afferent fibers in a spinal nerve or its roots or other neuropathic mechanisms" (Merskey). Additionally, conditions which mimic radicular pain without affecting the nerve roots (Table 1) must be considered (Govind). Radicular pain should not be confused with lumbosacral radiculopathy which is the "objective loss of sensory and/or motor functions as a result of conduction block; the features of which might include numbness, motor loss, wasting, weakness, and loss of reflexes" (Govind).

Lumbar disc pathology and stenosis often result in nerve root compression and are the most common causes of lower extremity radicular pain (Rydevik). Evidence suggests that a complex interaction of inflammation of the nerve root, immune system reaction between the

nerve root and the displaced portion of the disc or calcific spurring and pressure related elements cause radicular pain in sciatic nerve roots (Stafford). Radiographic examination, such as electromyography (EMG), magnetic resonance imaging (MRI) or computerized tomography (CT) scan routinely find compression of the nerve root via intervertebral disc herniation and/or spinal stenosis (Ido). In cases where diagnostic imaging of the lumbar spine is negative, other causes of sciatica must be considered.

Patients reporting low back pain and pain radiating into the lower extremity can have symptoms that arise from irritation or inflammation of various anatomical structures such as discs, facet joints, nerve roots and/or others. Differentiating the sources of the symptoms by selectively stressing specific tissues may implicate the anatomic structures involved and enable the physical therapist to direct treatment appropriately (Koury). The purpose of this case report is to describe the examination of and the intervention for a patient who presented to physical therapy with a diagnosis of sciatica and a normal lumbar MRI.

Table 1. Conditions mimicking radicular pain

•Spinal cord tumors
•Diabetic neuropathy
•The prodromal phase of herpes zoster
•Tabes dorsalis
•Direct contusion of the sciatic nerve
•Polyarthritis nodosa
•Gluteal injections
•Prolonged sitting
•Penetrating wounds
•Methyl methacrylate neuropathy following hip replacement

Source: Govind, 2004

Case Description

The patient was a 16-year-old male high school football and baseball player who was referred to the clinic with a diagnosis of sciatica secondary to a football incident. His chief complaints were intermittent low back and right posterior lower extremity pain that extended from the low back to the foot which were precipitated by a hit he took while playing football 4 ½

months prior to the initial physical therapy examination. The patient could not recall the details of the tackle, but related the onset of pain occurred immediately after the tackle and had not changed since.

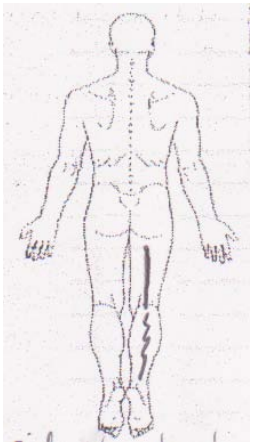

Figure 1. Body Chart of Patient's Symptoms at First Visit.

The patient described his pain, which he rated as 6 out of 10 at its worst, as sharp in the low back and shooting into the leg to the foot (Figure 1). The pain was exacerbated by sitting or driving for 45 minutes, performing leg strengthening exercises in the weight room, especially squats, or running; symptoms were abolished by lying prone or walking. Additionally, the patient related episodes of limping on the right leg.

The patient consulted his pediatrician who prescribed nonsteroidal anti-inflammatory drugs (NSAIDS). The patient stopped taking the prescribed medication, because "they did not help." Upon follow up with the pediatrician, an MRI was ordered and a referral made to orthopedics. Sagital and axial T1 and T2-weighted images of the lumbar spine revealed a "normal lumbar MRI," according to the radiologist on record (Figure 2). The orthopedist referred the patient to physical therapy.

Figure 2. Normal Lumbar MRI.

Source: Cobalt Appeal Fund

Examination

The objective examination revealed moderate tenderness to palpation over the right sciatic notch. Lumbar flexion and extension active range of motion in standing were within normal limits, though flexion reproduced low back and right lower extremity pain to the foot. Supine repeated lumbar flexion increased the patient's symptoms, while prone repeated lumbar extension abolished the patient's pain. Straight leg raise was positive on the

right at 62 degrees with complaints of ipsilateral posterior lower extremity pain to the knee and negative on the left. Bilateral patella and ankle jerk reflexes were 1+ and bilateral lower extremity myotome testing revealed no deficits. Hip passive range of motion internal rotation was 40 degrees bilaterally and external rotation was 35 degrees bilaterally. The patient had physical therapy for his neck and low back after a motor vehicle accident 6 years prior and had not experienced any recurrence of pain. The patient denied further significant medical history.

Evaluation

It is widely accepted in physical therapy that prone press-up exercises, an extension activity, promote centralization of lower extremity signs and symptoms caused by posterior lumbar disc herniation. According to McKenzie, symptoms due to disc herniation are usually said to be worse with flexion activities, sitting for example, and better with extension activities, such as walking (McKenzie). This patient's lower extremity signs and symptoms were abolished by prone press ups, lying prone and walking and exacerbated by supine repeated lumbar flexion and sitting which pointed to lumbar radicular pain due to disc displacement. However, MRI ruled out this diagnosis, necessitating evaluation of neural tissue tension.

Though there are conflicting theories concerning the formation of adhesions around a nerve, it is generally accepted that stretching of adhered neural tissues can cause symptoms such as pain, burning, numbness, and tingling (Breig, Chamley, Cyriax, Goodard, E l Mahdi, Fahrni, Maitland, McNab, Shiqing, Smyth). The term "adverse neural tissue tension" is used to describe any abnormal physiological or mechanical responses from the nervous system that are thought to limit movement of neural tissue that should otherwise be free to move or be stretched (Koury). The passive straight leg raise (SLR) which is used to examine the integrity and the mobility of

neuronal structures in the lower extremities (Butler) was positive for this patient. The positive SLR and tenderness at the sciatic notch, coupled with a negative MRI lead this physical therapist to reach a diagnosis of sciatica, which was consistent with the orthopedist's referring diagnosis.

Lumbar radiculopathy was ruled out based on objective findings of normal lower extremity deep tendon reflexes and muscle strength. Somatic pain was ruled out due to the patient's description of pain as sharp and shooting.

Intervention

Physical therapy intervention for this patient consisted of 8 visits over the course of 3 weeks with a follow up for re-evaluation and discharge from physical therapy 6 weeks post initial examination. The patient was instructed to hold all lower extremity strengthening exercises while undergoing physical therapy due to pain reproduction with these activities. He was not playing or practicing a sport at the time of physical therapy intervention. Moist heat packs and interferential electric stimulation were applied to the lumbar spine in prone for fifteen minutes at the beginning of the first 6 sessions of physical therapy; the patient then received posterior-to-anterior (PA) mobilization to the lumbar spine and prone manual traction for the first 3 visits, which was followed by a progressive exercise regimen throughout his course of physical therapy. The patient performed prone press-up exercises 10 times three times per day, supine piriformis muscle stretches 3 times 30 seconds twice per day and supine neural tension self mobilizations for the sciatic nerve 10 times two times per day in addition to a progressive dynamic lumbar stabilization program and posture and body mechanics education with verbal and tactile instruction.

Posterior-to-anterior (PA) mobilization and press-up exercises are common physical therapy interventions used to treat low back pain. Work by Powers, et al (2008) supports the use of PA mobilization and a press-up exercise for improving lumbar extension in people with nonspecific low back pain. Additionally, prone manual traction was performed, however, a double-blind controlled study of the effects of lumbar traction on sciatica by Mathews and Hickling (1975) concluded that the decrease in pain and improvement in straight leg raise range of motion was not statistically significant to support its efficacy.

A 2008 systematic review of the literature examining the therapeutic efficacy of neural mobilization, found that "a majority of the studies concluded a positive therapeutic benefit from using neural mobilization. However, in consideration of their methodological quality, qualitative analysis of the studies revealed that there was only limited evidence to support the use of neural mobilization" (Ellis). The authors of this systemic review recommended that "future research need examine more homogeneous studies, with regard to design, pathology, and intervention, and combine clinical outcome measures with in-vivo objective assessment of neural movement" (Ellis).

An in-vivo study of different nerve gliding exercises for the median nerve, published March 2009, concluded that "different types of neurodynamic techniques have different mechanical effects on the nervous system. Recognition of these differences may assist in the selection of treatment techniques" (Coppieters). In this case report, the patient's lower extremity signs and symptoms centralized to the knee. SLR test was negative for symptom provocation and demonstrated improved range of motion 6 weeks after initial evaluation. "Having demonstrated differences in mechanical effects, future research will have to evaluate whether these different techniques are also associated with different physiological and therapeutic effects" (Coppieters).

A systemic review published January 2009 in *Physical Therapy*, concluded that "motor control exercise is superior to minimal intervention and confers benefit when added to another therapy for pain at all time points and for disability at long-term follow-up. Motor control exercise is not more effective than manual therapy or other forms of exercise." Motor control exercise was defined as "the training of pre-activation of the deep trunk muscles, with progression toward more complex static, dynamic, and functional tasks integrating the activation of deep and global trunk muscles" (Macedo). The assumption is made that motor control exercise is significantly similar to a progressive dynamic lumbar stabilization program and posture and body mechanics education with active instruction, which were the treatments administered to this patient.

Motor control exercise may not be more effective than manual therapy in treating pain, but in this therapists opinion it must be included in a patient's physical therapy treatment, because the patient can continue to perform the exercise independently after discharge from therapy. As for motor control exercise not being more effective than other forms of exercise, a discussion is in order. The Philadelphia Panel recommends that there is good evidence to include stretching, strengthening, and mobility exercises as interventions for chronic LBP (pain > 12 weeks). They go on to clarify that exercise could have adverse effects due to increased stress on the spine (Albright). I have always practiced under the assumption that abdominal exercises such as sit ups and crunches cause undue stress on the spine and may be harmful. It is my assertion that absent proof that motor control exercise is the best form of exercise for spine pain, studies should be conducted to determine if it is the safest.

Physical Therapists commonly use superficial heating agents and electric stimulation to address severe pain as a component of patient care (Jewell, 2005). Unfortunately, I was unable

to find evidence supporting the use of moist heat packs and interferential current for sciatica. I propose that this lack of evidence has little bearing on this case report as these therapies do not influence the differential diagnosis of sciatic type pain.

Outcomes

The patient was able to progress to lower extremity strengthening in the physical therapy clinic without reproduction of signs and symptoms and was subsequently cleared to resume lower extremity weight training in the gym utilizing exercise techniques learned during his course of physical therapy. He was able to tolerate ice skating and able to participate in baseball practice and scrimmages without pain and without perception of limping. He noted that he was stretching prior to participating in baseball. The patient noted dull low back pain and right lower extremity pain to the knee (Figure 3) with sitting or driving greater than 60 minutes, which he rated as a 3/10 at its worst. There was no tenderness to palpation at the sciatic notch; active lumbar flexion in standing was painfree and SLR on the right was negative at 70 degrees. The patient reported 87 to 93% overall improvement. The patient was instructed to continue the stretching and mobilization regimen, dynamic lumbar stabilization and postural and body mechanics modification.

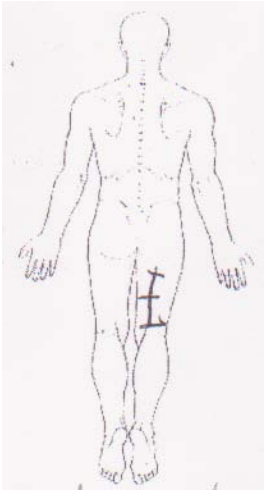

Figure 3. Body Chart of Patient's Symptoms 6 Weeks after First Visit.

Discussion

The patient in this case report experienced abolition of both low back pain and lower extremity signs and symptoms after 10 prone press-ups. Although the MRI was negative for disc herniation, the patient responded favorably, with regard to symptom abolishment, to prone press-ups or repeated lumbar extension in lying. As a 2008 outcomes research trial showed substantial intra- and inter-reader agreement for the classification of disc morphology via MRI (Lurie), it is fair to assume that this patient's symptoms were not caused by a lumbar disc herniation. The question, then, becomes why did prone press up exercises abolish symptoms? End range lumbar extension position in prone may have slackened the nerve pathway in question sufficiently to relieve neural tension resulting in abolishment of symptoms. Assuming that the neural signs reported by the patient are not related to a disc herniation, but instead direct trauma of the sciatic nerve, in this case a tackle while playing football, it stands to reason that the neural mobilizations were of benefit to this patient.

In fact, neural tension testing and subsequent neural mobilization were instrumental in correct diagnosis and treatment for this patient. A 1986 case report by Doctors Merrild and Søgaard provides confirmation for this assertion. They describe a case of a 39-year-old male with right sciatica without low back pain after falling two meters into a pit onto his right buttock (Merrild and Søgaard, 1986). The patient presented 6 months after the precipitating event with pain down the right lower extremity to the foot with sitting greater than 10 minutes, reduced sensation to touch and pain, slight weakness of ankle and hallux dorsiflexion, a positive Lasègue's sign and a positive Tinel sign over the sciatic nerve. DTR's were normal. Lumbosacral radiograph demonstrated spondylolisthesis at L4/5 with slight forward slip. Myelography demonstrated slight shortening of the fifth lumbar nerve root. Conservative

treatment was ineffective. Three weeks after right partial hemilaminectomy the patient's symptoms returned. Subsequent post operative findings, nine months after the fall, were unchanged physical assessment, negative disc herniation on CT scan and positive sciatic nerve disruption on EMG. Surgical decompression of tight fibrotic tissue about the sciatic nerve in the gluteal region resulted in significant reduction in signs and symptoms (Merrild and Søgaard, 1986). This case highlights the difficulties of differential diagnosis of lumbar radicular pain of spinal origin, in this case spondylolisthesis, versus sciatic neuralgia due to direct trauma of the sciatic nerve. It provides good evidence that direct trauma to the sciatic nerve can cause radiating pain into the lower extremity, fibrotic tissue can develop around the nerve and treating the nerve pathology itself can alleviate symptoms.

MRI, EMG or CT scan of the sciatic nerve may have aided in differential diagnosis of this patients pathology. The studies may have demonstrated peripheral neurapraxia, axonotmesis, or neurotmesis (Unknown); which would have provided useful additional information to better guide clinical decision making. A 2006 medical records review by Lewis et al (2006) concluded that "magnetic resonance neurography often identifies an abnormal increased signal in the proximal sciatic nerve 'at the sciatic notch, at or just inferior to the level of the piriformis muscle' in patients with extra spinal sciatica and allows more accurate diagnosis of sciatic nerve entrapment in suspected cases" (Lewis).

Clinically, it was reasonable to assume that an inflammatory process exists at the point of lesion. In this case the patient related that NSAID therapy, which can relieve pain, lower fever and reduce swelling (Griffin, 2009), was unsuccessful. A systemic review of the 26 randomized trials suggests that "NSAIDs might be effective for short-term symptomatic relief in patients with uncomplicated low back pain, but are less effective or ineffective in patients with low back

pain with sciatica and patients with sciatica with nerve root symptoms" (Koes, 1997). It may be that the NSAIDs were unsuccessful for this patient because he had low back pain with nerve root symptoms or it may be that he did not take an adequate amount of the medication to reach therapeutic levels. Unfortunately, it is not known what drug, dosage, frequency or duration was for this patient, therefore, and any inferences made regarding the effectiveness of pharmacological intervention in the case are unreliable.

Specific differential diagnosis was not performed to rule out piriformis syndrome (PS) in this patient, as the patient responded favorably to treatment of the lumbar spine and neurophysiologic structures. Conventionally, PS is diagnosed only after excluding all other possibilities. But Dr. Niu and his colleges have challenged this notion "because of the number of patients with PS who have had ineffective lumbar decompressive surgery" (Niu). PS may mimic intervertebral discitis, lumbar radiculopathy, primary sacral dysfunction, sacroiliitis, sciatica, and trochanteric bursitis. Alternatively, it may be a co-morbid condition or considered in a differential diagnosis (Boyajian-O'Neill). This case may present differently had detailed examination for PS been conducted. It may, also, have presented differently had piriformis stretch not been rendered as part of the patient's exercise program. This information suggests that PF be added to the initial list of possible diagnosis for patients complaining of lumbar and lower extremity pain, rather than considered as an afterthought.

Conclusion

In practice clinicians are often faced with incomplete information. For this patient, specific medication information was not recorded and medical testing was not sufficient to establish a definitive diagnosis. Nevertheless, treatment was provided based on a working

diagnosis. It is challenging to dissect effects of individual interventions on pain reduction and improved function for this case as it often is in the clinic. Perhaps the whole of the interventions were beneficial in combination. Perhaps performing lower extremity strengthening exercises with contraction of spine stabilizing muscles prevented pain during lower extremity exercise or perhaps the sciatic nerve was by then sufficiently mobile. This case highlights the importance of neuronal structure testing and subsequent neural mobilization treatment techniques and the evidence to support this approach. Absent confirmation via diagnostic testing or exploratory surgery, signs and symptoms suggest that this patient had direct contusion to the sciatic nerve sustained during a tackle while playing football. This physical therapist asserts that performing early neural mobilization exercise was instrumental in heeling by preventing the formation of tight fibrotic tissue about the sciatic nerve.

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