Cox® Distraction for Lumbar Discogenic Pain with Motor Weakness Increased by Lumbar Extension

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INTRODUCTION:

The patient is a 54-year-old female who presents with chief complaints of right sided lower back pain of one week duration. The patient is a radiological technologist and commonly has to lift patients, but she denies injury while doing so. She states that she has constant right-sided sacroiliac pain as well as pain in her right buttock. Provocative factors include prolonged standing and prolonged walking. She denies palliative factors. Pain is rated at 7/10. She denies dysfunction of neither bowel nor bladder but does have right-sided groin pain. She denies pain with coughing or sneezing.

RELEVANT CLINICAL EXAM FINDINGS:

Palpatory tenderness is found over the midline of the lumbosacral junction from L4-S1 as well as over the right posterior superior iliac spine (PSIS). Active range of motion testing of the lumbar spine reveals mid-line lumbosacral pain at 10 degrees of extension by visual estimate. All other ranges of motion are full and pain free.

Orthopedic testing reveals Straight leg raise test on the right causes right-sided lower back and buttock pain at 15 degrees flexion, by visual estimate. Hibb's is positive on the right. Yeoman's test causes pain immediately upon knee flexion. Prone manual traction with sacral base contact and L1 contact decreases the patient's pain.

Findings are consistent with lumbar discogenic pain as well as sacroiliac pain.

Initially, treatment will be three times per week until there is a 50% decrease in pain. Treatment consists of Cox® Distraction, protocol 2 as well as interferential current and cryotherapy. Patient is also given supine pain free range of motion exercise as well as supine knee to chest stretch.

The patient is treated on two separate occasions and notices a decrease in sharp pain in her lower back. On the third visit, she reports paresthesias in her right lateral ankle. At that time, Cox® Protocol 1 is implemented along with soft tissue massage to the lumbar paraspinals, quadratus lumborum.

Upon presenting at the 4th visit the patient states that she is having an increase in her lower back pain and is noticing "drop foot". She has continued to lift patients since the onset of treatment but has now been taken out of work. The patient also notes that if she bends slightly forward from the waist, that she notices improved strength in her right foot. She denies dysfunction of neither bowel nor bladder.

Physical Exam Findings Reveal:

The patient has mid-line lumbosacral pain arising from seated position. Palpation reveals pain over the mid-line at L4-S1 as well as over the right posterior superior iliac spine. Active range of motion testing of

the lumbosacral spine reveals pain at 5 degrees of extension, by visual estimate. All other active range of motion testing of the lumbar spine is full and pain free. Passive internal rotation of the right coxofemoral joint while prone causes increased pain in the right lower extremity.

Orthopedic testing of the lumbar spine reveals pain in the right lateral thigh with Bechterew's test. Hibb's test on the right causes right-sided sacroiliac pain.

Neurological Testing:

Muscle Strength Testing Reveals:

Dorsiflexors and inverters 5/5 on left, 4/5 on right. Extensor hallucis longus (L5) were 5/5 left and 3/5 right. Foot plantar flexors and everters 5/5 bilaterally.

Deep tendon reflexes for the lower extremity revealed Patellar +2 (L) and +2 (R), Achilles were +2 (L) and +2 (R).

Sensory Testing Reveals:

Joint position sense as tested at 5th distal interphalangeal joint (DIP) was slightly decreased on right. Vibration as tested at 5th DIP is intact bilaterally. Light touch revealed that the left L4 and left L5 dermatomes were decreased. Patient also states that S1 on right foot feels "different".

Assessment:

Patient's findings are consistent with L4/5 radiculopathy with motor and sensory deficits present.

TREATMENT PLAN:

Treatment initially consists of Cox® Distraction Protocol 1 with therapeutic modalities, including interferential current, cryotherapy and soft tissue massage. I discussed having neurosurgical consult after 1 month if pain persists or sooner if muscle strength further digresses. Discussed co-management with pain management specialist due to debilitating pain present. MRI of lumbar spine ordered.

IMAGING:

MRI findings:

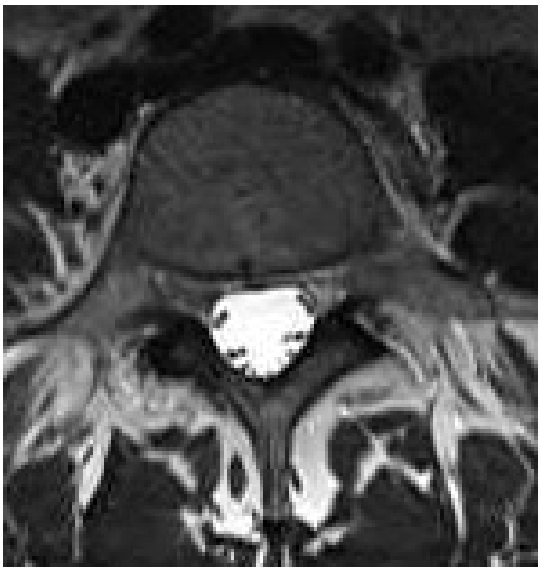
Report reveals at L5-S1 there is minimal loss of T2 disc signal and disc height with mild disc bulge and spondylosis. Small right posterolateral and foraminal broad protruded disc herniation through radial annular fissure with contact and minimal posterior deflection of the right L5 root/dorsal root ganglion

near the foramen entrance zone. Minimal left and mild baseline right foraminal stenosis and spondylosis. At L4-5, minimal loss of T2 disc signal with mild disc bulge and spondylosis and small focal radial outer annular fissure posterior centrally. Minimal flattening of ventral thecal sac with minimal central stenosis. Mild left facet DJD with small joint effusions and tiny posterior extraspinal projecting synovial cysts.

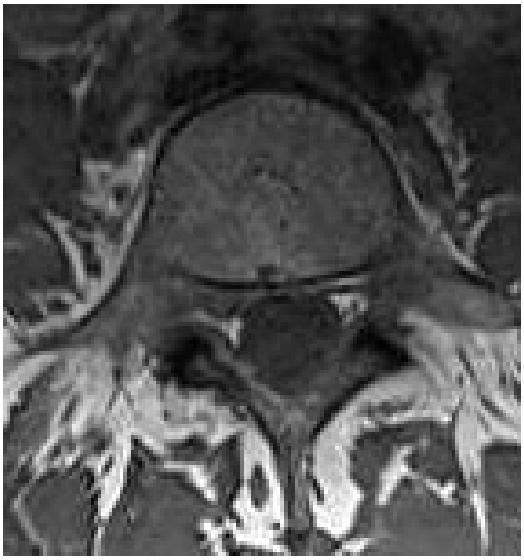
Impressions:

a. Mild degenerative disc disease with disc bulging and spondylosis and outer annular fissures, L4-5, L5-S1. Minimal L4-5 central stenosis from disc disease and mild facet joint osteoarthritis

b. Small but broad right posterolateral/foraminal L5-S1 protruded disc herniation impinging on the right traversing L5 nerve root in the foramen entrance zone.



Transverse view of L5 herniated disc



Transverse L5 herniation shows loss of fat in lateral recess

L5 disc herniation with cephalad migration and fragmentation

TREATMENT:

The patient was treated seven times over a ten day period and reported a 90% improvement with lower back pain. She also reported having less tingling over the top of her right foot, as well as much less pain in her lower back. The right buttock pain and groin pain persisted. She was able to work on a light duty basis without pain present. She was feeling some pain in her left calf. She no longer noticed any foot drop present.

The patient had previously scheduled an epidural injection for her lower back and received the injection from an esteemed colleague who is a Pain Management Specialist. The doctor's notes state under fluoroscopic guidance, that dexamethasone with lidocaine were injected through the L5-S1 foramen and into the epidural space. Following the injection, the patient reported that her groin pain improved, she no longer had paresthesias over the dorsum of her right foot, and didn't have any pain into the lower extremities. Treatment then switched to Protocol 2 of Cox® distraction. The patient was seen once more that week and reported that she was able to use the elliptical machine without any pain present. The patient was seen once a week for the next 4 weeks using Cox® distraction Protocol 2 as well as rehabilitative exercises for core stabilization, as well as massage therapy.

OUTCOME:

The patient was seen a total of twelve times over an approximate seven week period. She reported an overall improvement of 90% with regards to her back and lower extremity pain. She also reported a 90% improvement with regards to the strength in her lower extremities. The patient had returned to kickboxing as well as use of the elliptical machine without pain present.

DISCUSSION:

Rydevik has shown that the motor portion of the dorsal root ganglion is approximately 1/3 the size of the sensory portion (1). Therefore, a significant amount of pressure is needed to cause motor deficits with nerve root tension. In fact, Takahashi has shown that 60 mm Hg pressure causes neurological deficits whereas foot drop tends to occur at 104-256 mm Hg pressure (2). After five visits over an eight day period, the patient began reporting improvement in her motor strength where she was again able to walk without her foot "slapping against the ground," as she stated it. It is reasonable then to assume that the distraction technique was effective in significantly decreasing the intradiscal pressure as well as decreasing the nerve root tension. Gudavalli has shown that Cox® distraction increases the disc height by up to 17% and provides up to a 28% increase in intervertebral foraminal surface area as well as decrease the intradiscal pressure to as low as -192 mmHg (3,4).

Also of note with this patient was the increased weakness the patient experienced while standing, whereas there was an improvement in foot dorsiflexion while slightly bent forward into lumbar flexion. Schmid showed that there was a 16.4% decrease in cross sectional area of the spinal canal while moving from flexion to extension. He also showed the area of the osseoligamentous canal varied from flexion to extension by 44.4%. Additionally Schmid shows that the ligamentum flavum thickens to 4.3 mm in extension from 1.8 mm in flexion, thus further increasing the stenosing of the osseoligamentous canal (5). Singh shows that there was a correlation with the extent of disc bulging posteriorly with a reduction in foraminal area while moving from flexion to extension (6). The patient's findings support

these studies and demonstrate the reason why Cox® Distraction is effective for the treatment of lumbar discogenic pain as there is an increase in the surface area of the osseoligamentous canal .

The patient reported that in addition to the lower back pain, she also had groin and buttock pain. Vanderlinden has shown that dorsal root ganglion subarticular entrapment can lead to claudication, sciatica, and groin pain (7). Takahashi supports the claudication where he shows that 10 mm of compressive force can cause a 64% decrease in blood supply (8). Kobayashi provides further support to the claudication due to nerve root entrapment when he demonstrates that the Straight Leg Raise (SLR) test showed a decrease in intraradicular blood flow by 40 to 96% as the herniated disc compresses the nerve root (9). Konstantinou defines sciatica as having three criteria. First, there is a distribution of pain below the knee. Second, there is leg pain that is worse than back pain. Third, there is the feeling of numbness or pins and needles in the legs (10). Whether this is a true definition of sciatica or whether lower back pain may be equal to or greater than lower extremity pain is debatable in my opinion. However, the patient fits all three of these definitions from her subjective reports, including the presence of leg pain following the resolution of the lower back pain. The presence of groin pain may be multifactorial. Petko et al demonstrated that the sinuvertebral nerve innervates not only the level of the disc with the increased intradiscal pressure but also the disc within two to three levels above and below the disc via the grey ramus communicans (11). The sinuvertebral nerve is formed by a somatic root from a ventral ramus and an autonomic root from a grey ramus communicans (12). Raoul, et al. explain that the sinuverterbral nerve cannot directly reach a somatic element at each level of the lumbar spine, so must first reach the L2 spinal ganglion. They further describe what they call a hole in the somatic innervation at L3-5 so the pain takes another route via the sympathetic system (13). Due to this sympathetic innervation, Nakamura states that discogenic pain resembles visceral pain (14). Therefore, its plausible that the L4 and L5 discs could have been causing the groin pain due to this sympathetic innervation. Suseki has shown that the L4-5 lumbar facet capsule is innervated by the dorsal rami and the lumbar sympathetic trunk. With facet lesions in the lower lumbar spine, the L1 and L2 dermatomes would be stimulated via the lumbar sympathetic chain. Therefore, there could be anterior thigh and inguinal or groin pain from lower lumbar facet joint irritation (15). Olemarker has shown that the lumbar artery supplies the nerve root, dorsal root ganglion, facet, and muscles. He also demonstrated that 40 mm pressure on a nerve root occludes the arterioles (16). This ischemia may also explain the groin pain if there is a lack of blood supply to the nerve root and facet joints.

Following the injection of the L5-S1 epidural space, the patient no longer had pain or paresthesias in the lower extremities. Therefore it is reasonable to assume that a chemical radiculopathy may also have contributed to the groin pain. This chemical radiculopathy may also explain the presence of left-sided lower extremity pain as the left nerve root may have also been effected. Once this inflammation was decreased due to the injection, there was a marked improvement in the lower extremity symptomatology. This also demonstrates the benefit of co-management of our patients with discogenic

pain with our allopathic colleagues as I was able to introduce Cox® distraction Protocol 2 soon after the patient's injections.

The final area to address would be the initial impression by the radiologist of the MRI's. This being:

a. Mild degenerative disc disease with disc bulging and spondylosis and outer annular fissures, L4-5, L5-S1. Minimal L4-5 central stenosis from disc disease and mild facet joint osteoarthritis

b. Small but broad right posterolateral/foraminal L5-S1 protruded disc herniation impinging on the right traversing L5 nerve root in the foramen entrance zone.

These findings appear to be pretty typical for a patient presenting with lumbar discogenic pain. As opposed to a protrusion present, there was an extruded disc with fragmentation present, which presents a greater clinical challenge. This example shows the importance of looking at the MRI themselves, as well as some ability to be able to interpret the results of the study.

This case report demonstrates the benefit of Cox® distraction manipulation for treating lumbar discogenic pain with motor weakness. It also reflects the effects of extension of the lumbar spine on the interosseous ligamentous canal with a patient with an extruded disc. Finally it demonstrates the efficacy of co-management with our allopathic colleagues for lumbar discogenic pain.

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