



Novel Therapeutic Options for Management of Musculoskeletal Disorders

Musculoskeletal Case No. 14, November 2004 This is a PASSOR Recognized case

Presenting Symptom(s): 1) Low back pain; 2) Left lower limb pain

Case prepared by: J. Robert Alexander, Jr, MD; Bradly Goodman, MD

Affiliations: Spine & Orthopaedic Specialists of South Carolina, Charleston, SC (Alexander); Alabama Orthopedic and Spine Center, Birmingham, AL (Goodman).

Disclosures: J.R. Alexander, None; B Goodman, None.

Please note: The opinions expressed in these cases reflect the view of the authors and do not reflect official views or positions of AAPM&R. AAPM&R is not liable for decisions made or actions taken by you or any third party in reliance on any of the information contained herein. Reference to any products, services, hypertext link to the third parties, or other information by trade name, trademark, supplier, or otherwise does not constitute or imply endorsement, sponsorship, or recommendation by AAPM&R. Finally, we encourage you to read AAPM&R's Privacy Policy.

Appropriate Audience: Residents and practicing physicians

Learning Objectives: After completing this educational activity, participants will be able to: (1) utilize comprehensive history and physical examination in combination with imaging studies and interpretation to diagnose potential causes of lumbar pain and radicular symptoms, (2) appreciate the most common cause of lumbar pain and appropriate treatment options, and (3) discuss potential interventional blocks that can be utilized for symptomatic relief in this patient population.

Level of Difficulty: Moderate

This case is no longer available for CME credit.

History

A 35-year-old white man presents for initial evaluation as a self-referral with complaints of chronic low back pain and intermittent radiation into the left lower limb along the posterolateral aspect of the extremity to the level of the heel and fifth digit of the foot. The patient reported no lumbar or limb pain prior to injury at the gym that occurred while lifting weights approximately 4 months prior to initial visit. The individual had a course of physical therapy and was feeling somewhat better until 4 weeks later when he again re-aggravated his low back pain and subsequently began to develop left lower limb pain in what he describes as the posterolateral aspect of the extremity to the level of the foot.

- Prior to continuing, please develop a differential diagnosis and list each possible diagnosis in order of likelihood.



- Is there any other additional information from the clinical history that may change the priority of your differential list?

Commentary I

At this point the differential should include the following:

1. Discogenic pain. Discogenic pain could be secondary to an annular tear in the outer third of the annulus given that this area has proven innervation on cadaver studies. This type of pain can produce axial discomfort as well as somatic and radicular referral patterns of pain. It should also be noted that a tear in the annulus could theoretically result in leakage of inflammatory components present in the nucleus propulsus resulting in irritation and inflammatory changes at the site of the exiting and transiting nerves with resultant radicular pain. Also note that disc herniations may actually impinge upon the exiting and transiting nerves roots resulting in pain that may present as radicular in nature. Central disc herniations can result in central stenosis.
2. Zygapophyseal pain. This is a little lower on the differential given the patient has clear radicular symptoms although facetogenic pain can cause a somatic referral pattern into the lower limbs. The patient could also have a zygapophyseal joint cyst resulting in subarticular recess stenosis and/or neuroforaminal stenosis.
3. Ligamentous flavum hypertrophy could result in subarticular recess stenosis and subsequent nerve root impingement.
4. The patient could have non-specific low back pain.
5. The patient may have myofascial pain syndrome with associated trigger points, which are noted to have typical referral patterns. This is often associated with taut bands and one occasionally sees myofascial twitching with deep palpation or needling.
6. Sacroiliac joint etiology has been known to produce focal pain and occasionally a referral pattern involving the lower limb. It should be noted that SI joint pain is responsible for approximately 15-20% of all patients with chronic low back pain (see references 1 and 2). As a result, this certainly needs to be included in the differential although the radicular symptoms make this diagnosis less likely. There are case reports implicating ventral capsular tears in the SI with resultant S1 radicular pain.
7. One always needs to be cognizant that a life threatening cause of lumbar pain and radicular symptoms needs to be included on every differential. Possibilities include a tumor, either primary or metastatic in origin.
8. Given the patient had a traumatic event that he felt elicited the current symptoms, one needs to also include hematoma in the differential although it would be unlikely that the hematoma or a life-threatening situation as discussed above would result in a history as described, especially considering that the patient did improve for a 4-week period of time prior to re-aggravation of symptoms.
9. One should, given the patient had a traumatic history, include syring in the differential. It should be noted that this is certainly not a classic history for syringomyelia.
10. One should include possible infectious process contributing to the patient's symptoms. Again, given the chronicity and lack of systemic findings, this would be low on the differential.



11. One can also consider possible rheumatologic disorders such as seronegative arthropathy including spondylitis, Reiters syndrome, or psoriatic arthritis. Again, given the patient's history, these are low yield but should certainly be considered in the differential of any patient with lumbar symptoms.
12. One should also consider the possibility of a hip etiology of individual symptoms. He did reportedly injure himself during weight lifting and it is possible that he could have an undiagnosed fracture, avascular necrosis, or more common findings of degenerative changes involving the hip joint itself. Given the patient history and presentation, he did not complain of groin pain and he has a clear description of radicular symptoms, this again would be low on the differential. However, it should certainly be considered as a possibility in a new patient presenting with lumbar pain.
13. One must also consider piriformis syndrome and note that this can present with gluteal pain and radiation into the lower limb. Although not pertinent in this patient, females commonly complain of discomfort with intercourse and this should be considered an indication for including piriformis syndrome in the differential in the female population.
14. In a patient with Grey-Turner's sign after injury, consider retro-peritoneal hemorrhage with subsequent nerve root impingement.
15. Other systemic neurologic conditions could include diabetic neuropathy/amyotrophy, post herpetic pain, and shingles. These are excluded by his past medical history.

History, continued

History, continued

In continuing the history, additional information would certainly help us to prioritize the differential diagnosis list, the patient should be questioned regarding the following historical details:

1. The initial onset of symptoms and presence of a traumatic or aggravating factor. This question has been answered in the initial history.
2. Are symptoms slowly progressive in nature, worsening over time as opposed to remaining stable or improving following the initial insult?
3. Is there a new onset of weakness, paresthesias, or bowel and bladder changes? These can be indicative of low threshold for surgical referral. Patient should describe his current level of pain using a standard rating scale, such as the visual analog scale or numeric scale.
4. Is there symptomatic relief or worsening with positional changes? What activities and subsequent effects on current symptomatology.
5. What treatments has he received, including, medications, modalities, physical therapy, chiropractic manipulation, trigger point injections, and interventional blocks?
6. What imaging studies have been done, including plain films, MRI, and CT including CT/myelograms? Attempts should be made to obtain images for review.
7. What treatment has been effective and for how long?
8. Where there similar episodes in the past? How long did they last and what treatments were effective?



9. Obtain a comprehensive past medical history, social history, current medication list, allergies, past surgical history, and review of systems. Determine use of anti-platelet or anti-coagulation medications in the event that an interventional block is to be performed. These medications would need to be stopped prior to the procedure.

History, concluded

Symptoms have been slowly progressive in nature following the re-aggravation of previous injury. The patient reports no new onset of weakness and only has rare paresthesias involving the left lateral foot. The patient reports no bowel and bladder changes. His current VAS is a 4/10 with a maximum of 7/10 aggravated by sitting or hip flexion to perform such activities as donning and doffing socks or shoes. The patient reports some relief with supine positioning. He also reports that back and leg symptoms are intermittent in nature with the leg causing more severe discomfort than the lumbar pain. To date, the patient has utilized Flexeril and Motrin with minimal relief. He has also utilized hydrocodone on an as needed basis, prescribed by his primary care physician. The patient was initially given this prescription 2 days after the initial insult and still has medication remaining 6 months later. He also reported a course of physical therapy with a focus on appropriate exercise 8 weeks in duration without significant relief of symptoms. The patient has no other complaints on today's visit. The patient has no history of lumbar surgical intervention.

- If necessary, revise your differential diagnosis based on the additional clinical history.
- On which details of the physical examination should you focus at this point?

Commentary II

Given the patient's further history, discogenic etiology of the patient's symptoms resulting in nerve root impingement and subsequent radicular complaints, remains number one on the differential. One still has to consider such possibilities as zygapophyseal joint pain, myofascial pain, and sacroiliac joint pain. Again, other possibilities cannot be completely excluded at this time, including hip etiology and myofascial pain, although these would be much lower on the differential given classic radicular complaints. Physical examination should certainly help elicit a more definitive diagnosis if appropriate examination maneuvers are performed.

Physical Examination

Well-nourished, well-developed cooperative Caucasian male in obvious discomfort with ambulation. He has tenderness to palpation over both lumbosacral paraspinal muscles, left greater than right. The patient has an appreciable right lateral bend when standing erect. The patient has no significant tenderness over the mid-line intralaminar region segmentally from L1 through S1. Motor exam Grade 5/5 bilateral lower extremities including the iliopsoas, quadriceps, tibialis anterior, extensor hallucis longis and gastrocsoleus muscles. The patient does have an antalgic gait but is able to toe and heel walk without difficulty despite discomfort. Sensory examination is intact to light touch. Pin prick was not tested. Deep tendon reflex is 2+ at the patella and Achilles on the right and 1+ at the patella and Achilles on the left. Babinski's down-going bilaterally. No appreciable muscle atrophy.

- At this point, review your differential diagnosis and revise as appropriate.



- Are there additional observations on physical examination that might be helpful in narrowing your differential list?

Commentary III

Certain aspects of the physical examination that would make discogenic pain a likely possibility include pain with lumbar flexion, positive straight leg raise, decreased reflexes in combination with absence of pain on lumbar extension if disc HNP is continued, negative Fabere's, patient not pointing directly at the posterior-superior iliac spine (only consistent physical examination findings associated with SI joint pain per recent article by Dreyfuss – see reference 4). Parts of the examination that are difficult to interpret and are not as clearly consistent with a single level radiculopathy secondary to disc herniation are the absent quadriceps and Achilles reflex as those represent L4 and S1 and the normal strength, tenderness in the back.

Given the partial physical exam provided above, indications for discogenic etiology are supported as the patient reports a compensatory right lateral bend consistent with removing pressure off the left disc and subsequently relieving stenosis in the left neuroforamen. The patient also has decreased reflexes on the left compared with the right. Of course, as mentioned above further examination should be performed including palpation over the bilateral SI joints, palpation over the bilateral sciatic notches in an attempt to elicit a referral pattern of pain with irritation of the sciatic nerve, straight leg raise bilaterally, Fabere's bilaterally, and internal and external rotation of the hip. The physician can also consider non-organic signs such as Waddell's signs, although these would not naturally be expected in a patient with no other reinforcers and who has remained active both vocationally and avocationally during the entire course.

Physical Examination, concluded

The patient had no tenderness to palpation over the bilateral SI joints. The patient reported significant tenderness to palpation over the left sciatic notch with radiation of pain into the left gluteal region and the left lower limb. The patient reported increased aggravation of segmental pain in the lumbar region bilaterally with lumbar flexion. No discomfort with lumbar extension. Straight leg raise was markedly positive on the left for axial and radicular symptoms and contralaterally positive on the right in that this reproduced axial discomfort. Fabere's was negative bilaterally. Internal and external hip rotation was without limitations and did not reproduce patient's symptomatology. No other evidence of non-organic signs.

Clinical Impression

Most likely diagnosis for this patient at this time is chronic low back pain segmentally, most severe at L5-S1, with radiation into the left gluteal and the left lower limb along the S1 distribution involving the posterolateral aspect of the extremity to the level of the heel and fifth digit of the foot to the level of the heel. Symptoms have been slowly progressive for 5 months and are most likely discogenic in nature, given physical exam findings in combination with patient history.

- What diagnostic tests would you order at this time?



Commentary IV

AP and lateral x-ray of the lumbar spine were obtained. He was treated with a Medrol Dosepak followed by a trial of Vioxx given that patient had not responded to ibuprofen utilized on a PRN basis at home prior to initial visit. It should be noted that the patient was not started on Bextra or Celebrex secondary to sulfa allergy. We also performed a left multifidous triangle injection described in Caillet's text (see reference 11) with a combination of lidocaine, marcaine, and Depo-Medrol. These medications are chosen as they are readily available in our clinic. The patient was instructed to continue his home exercise as previously instructed via his physical therapy sessions.

Test Results

Bilateral films, AP and lateral, were reviewed and found to be significant for mild spondylosis at L4-5 and L5-S1. Normal lumbar lordosis was appreciated. No obvious osteoarthritic changes were appreciable. No compression fractures were noted. AP view significant for lumbar scoliotic changes with a left convexity. This was most likely secondary to compensatory lateral bending. Sacroiliac joints were well maintained bilaterally without degenerative changes. Bilateral hips were appreciated and found to be without arthritic or degenerative changes. Zygapophyseal joints were also well maintained and without degenerative change.

- What is the impact of the additional test results on the final diagnosis?

Commentary V

Plain lumbar AP and lateral films suggest but do not confirm that the patient's symptoms are secondary to a discogenic etiology. Definitive confirmation cannot be established due to the fact that numerous studies show the lack of correlation of back or radicular pain with x-ray.

Commentary VI

Given the findings of spondylosis at L4-5 and L5-S1, as well the chronicity of symptoms for greater than 3 months in duration, we obtained a MRI of the lumbar spine to further evaluate possible etiology of the patient's symptoms.

Test Results, continued

MRI of the lumbar spine was reviewed and found to be significant for disc dessication at L4-5 and L5-S1. The most significant finding was a large herniated nucleus propulsis at L4-5 paracentrally to the left. Other levels were essentially unremarkable without obvious degenerative change. No appreciable spondylolisthesis. Lumbar lordosis was well maintained. No obvious compression fractures were noted. No obvious abnormalities consistent with malignancy, hemangiomas, or syrinx. T1 and T2 weighted images were reviewed. (Figures 1 and 2)

- Considering all the data from the history, physical examination and laboratory studies, what is/are your final diagnostic impression(s)?



Final Diagnostic Impression

Chronic low back pain segmentally at L4 through S1 with intermittent radiation into the left lower limb along the S1 distribution to the level of the heel consistent with a discogenic etiology. MRI of the lumbar spine reviewed and discussed above. Findings were most significant for herniated nucleus pulposus paracentrally to the left at L4-5. It should be noted that the patient's radicular symptoms are in the classic S1 distribution and the left paracentral herniated nucleus pulposus could certainly result in nerve root involvement at L5 and S1 but more commonly affects the L5 nerve.

Commentary VII

Given the findings on plain films and the MRI of the lumbar spine in combination with physical examination findings and patient history, it is highly likely that the patient's symptomatology is secondary to a discogenic etiology. As stated previously, discogenic pain is the most common source of low back pain with radicular symptoms in the general population according to Bogduk, (see reference 12). Pain that is discogenic in nature could be via one of three causes. First, it has been reported in the literature that the outer third of the annulus is innervated and a simple annular tear involving the outer third could, in and of itself, prove to be a pain generator according to Bogduk (see reference 12). It should also be noted that annular tears provide a means for the contents of the nucleus pulposus to leak out of their normal anatomic location, thus releasing inflammatory mediators, irritating the exiting and transiting nerve roots, and subsequently became a source of pain generation. Thirdly, a disc protrusion, extrusion, or herniation could result in subarticular and/or neuroforaminal stenosis resulting in direct compression of the exiting and transiting nerve roots, thereby mediating a painful response.

- What treatment would you now initiate?

Commentary VIII

On the patient's initial presentation, x-rays of the lumbar spine, AP and lateral, were obtained and were found to be remarkable for spondylosis at L4-5 and L5-S1. At that time he was initiated on a Medrol Dosepak and instructed to begin a trial of Vioxx upon completion. The patient was not initiated on Bextra or Celebrex secondary to sulfa allergy. He was administered a left multifidous triangle injection with a combination of lidocaine, marcaine, and Depo-Medrol. He was further instructed to continue his home exercise program as previously implemented during his physical therapy sessions. Also, given the chronicity of his pain, a MRI of the lumbar spine was ordered and the patient was instructed to follow up after imaging for review, interpretation, and determination of patient improvement. In the event that he was not markedly improved, the decision was made to proceed with additional interventional measures.

On the initial follow up the patient reported no relief of his symptoms. MRI of the lumbar spine, as discussed previously, was most significant for herniated nucleus pulposus at L4-5 paracentrally to the left. The patient was scheduled, and underwent a interlaminar lumbar epidural steroid injection at L4-5 on the left with a combination of 2 cc of 40 mg per cc Kenalog and 8 cc of ¼% preservative free marcaine. (Figures 3 and 4) Decision to proceed at L4-5 based on MRI interpretation which indicated a larger epidural space at that level compared with L5-S1 subsequently decreasing the possibility of an inadvertent dural puncture. Contrast spread under fluoroscopic visualization was appreciable in a caudal direction toward the site of pathology thus insuring appropriate injectate flow.



The patient returned 2 weeks later and reported that his VAS went from an 8/10 to a 6/10 after the lumbar epidural steroid injection and that he was disappointed in the amount of pain relief. He remained compliant with the anti-inflammatory medication and home exercise program.

At this time the patient was scheduled for and underwent an intradiscal steroid injection (IDSI) at L4-5. (Figure 5) The literature is not definitive on the efficacy of IDSI's. Current care indicates interlaminar or transforaminal epidurals as accepted interventions in patients that fail a combination of oral medications and physical therapy. However, in patients that do not respond to epidurals, surgery is often the only viable option in many centers. If we accept current theories of an inflammatory locus inside the disc, the rationale for attempting intradiscal steroid injection appears reasonable – essentially an extension of the interventional spine axiom – “put the water where the fire is.” IDSI's directly address the inflammatory mediators located within the nucleus (see reference 13).

The patient returned for follow up 2 weeks later and was completely pain free with a VAS of 0/10. He reported that symptomatic improvement was first appreciated 72 hours after intradiscal steroid injection. At 3-month follow up the patient remained completely pain free with a VAS of 0/10. He was markedly pleased with results of intradiscal steroid injection.

Final Discussion

Intradiscal steroid injections provide an alternative in the treatment of discogenic lumbar pain, with or without radicular symptoms. There are ongoing studies utilizing injection of chondroitin sulfate directly into the disc but we are unaware of current prospective investigations utilizing steroids directly injected into the disc. It should be noted that in our current practice, patients that fail lumbar epidural steroid injections and/or transforaminal epidural steroid injections and are unlikely to have zygapophyseal joint or sacroiliac joint etiology are routinely administered intradiscal steroid injections. Anecdotally, 50% response or greater is encouraging given these individuals had often failed multiple prior spinal injections and may, as in this case, be deemed appropriate candidates for surgery intervention. One can argue a Transforaminal epidural steroid injection (TFESI) should have been done in this case, but the decision was made to address the disc directly. Other minimally invasive procedures are also considered by some interventionalists include IDET and nucleoplasty.

The published literature on intradiscal steroids (see references 6 -10) suggests both positive and negative results. Further research into the efficacy of steroid injected directly into the disc could eventually provide a multitude of interventionalists a viable option in the treatment of discogenic lumbar pain with or without radicular symptoms.

Bibliography

1. Schwarzer AC, Aprill CN, Bogduk N. The sacroiliac joint in chronic low back pain. *Spine* 1995;20:31-7.
2. Maigne JY, Aivaliklis A, Pfeifer F. Results of sacroiliac joint double block and value of sacroiliac pain provocation tests in 54 patients with low back pain. *Spine* 1996;21:1889-92.
3. Dreyfuss P, Dryer S, Griffin J, Hoffman J, Walsh N. Positive sacroiliac screening tests in asymptomatic adults. *Spine* 1994;19:1138-43.



4. Dreyfuss P, Michaelsen M, Pauza K, McLarty J, Bogduk N. The value of medical history and physical examination in diagnosing sacroiliac joint pain. *Spine* 1996;21:2594-602.
5. Riew KD, Yin Y, Gilula L, et al. The effect of nerve-root injections on the need for operative treatment of lumbar radicular pain. A prospective, randomized, controlled, double-blind study. *J Bone Joint Surg Am* 2000;82;11:1589-93.
6. Bertin P, Rochet N, Arnaud M, et al. Intradiscal injection of triamcinolone hexacetonide for acute, subacute, and chronic sciatica. Results at 3 months an open-prospective study of 30 cases and review of the literature. *Clin Rheumatol* 1990;9:362-6.
7. Duquesnoy B, Debais F, Heuline A, Treves R, Desproges Gotteron R, Charissoux JL. Unsatisfactory results of intradiscal injection of triamcinolon hexacetonide in the treatment of sciatica caused by intervertebral disk herniation [French]. *Presse Med* 1992;21:1801-4.
8. Aoki M, Kato F, Mimatsu K, Iwata H. Histologic changes in the intervertebral disc after intradiscal injections of methylprednisolone acetate in rabbits. *Spine* 1997;22:127-31;discussion 32.
9. Simmons JW, McMillin JN, Emery SF, Kimmich SJ. Intradiscal steroids: a prospective double-blind clinical trial. *Spine* 1992;17(6 Suppl):S172-5.
10. Schellhas K, Heithoff K, Pollei S. Lumbar disc high intensity zone: pain management with intradiscal steroids. 1996. Available at: http://www.spine.org/conf_abstracts_10_20_96/142-Schellhas.html. Accessed October 21, 2004.
11. Cailliet, Rene. *Low back pain syndrome*. 4th ed. Philadelphia: FA Davis; 1988.
12. Bogduk N. *Clinical anatomy of the lumbar spine and sacrum*. 3rd ed. New York: Churchill Livingstone; 1997.
13. Olmarker K, Rydevik B. Pathophysiology of the spinal nerve roots as related to sciatica and disc herniation. In: Herkowitz HN, Rothman RH, Simeone FA, editors. *Rothman-Simeone the spine*. Philadelphia: WB Saunders; 1999. p 159-72.