

Treatment of multilevel lumbar disc disease by SED and thermal annuloplasty

Treatment of multilevel lumbar disc disease by Selective Endoscopic Discectomy™ and thermal annuloplasty: Case report

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Abstract: A 57-year-old man, who was symptomatic with low back pain and bilateral sciatica due to lumbar spondylosis, underwent a diagnostic workup consisting of plain X-rays, an MRI, and discography. The working diagnoses were scoliosis and diffuse degenerative disc disease. After 2 years of physical therapy and nonsteroidal antiinflammatory drugs, he still walked with a limp. Intraoperative discography with Isovue M 300 in combination with indigocarmine tissue staining confirmed painful annular tears at L2-3, L3-4, and L4-5, which were modulated by a bipolar radiofrequency probe and a Ho:YAG laser during Selective Endoscopic Discectomy.™ Postoperatively, the patient required only mild analgesics and walked without a limp during two years of followup.

Key Words: degenerative disc disease, discogenic pain, laser, bipolar, radiofrequency, discectomy, minimally invasive, endoscopy, lumbar spondylosis

Patients with multilevel degenerative changes of the lumbar intervertebral discs are generally not considered surgical candidates even if neuroradiologic studies reveal painful annular tears.⁶ The osteoarthritis of the spine is often treated with nonsteroidal antiinflammatory drugs. Minimally invasive spinal techniques such as evocative discography,⁵ Selective Endoscopic Discectomy™ (SED), and thermal annuloplasty⁷ offer relief of discogenic pain in cases that have not improved after lengthy physiotherapy.

Case Report

A 57-year-old man presented with a two year history of low back pain and bilateral sciatica. Past medical history, social history, and family history were noncontributory. His physical examination was unremarkable except for walking with a limp that favored his right lower extremity.

Prior workup consisted of plain X-rays (Fig. 1), an MRI (Fig. 2), and discography. The working diagnoses were scoliosis and diffuse degenerative disc disease (DDD). A series of nonsteroidal antiinflammatory drugs and a lengthy course of physiotherapy were ineffective in controlling his pain.



The patient elected to undergo minimally invasive spinal surgery including evocative discography with Isovue M 300 in combination with indigocarmine for tissue staining and Selective Endoscopic Discectomy. Evocative discography documented a Grade IV rim tear at L4-5 (Fig. 3A). Following removal of degenerative disc material at L4-5 (Fig. 4A), thermal annuloplasty began with the bipolar radiofrequency probe (Fig. 4B) and was completed with the Ho:YAG laser (Fig. 4C). The epidural space was visualized. The inferior facet of the superior lamina was decompressed, and the foraminal ligament was partially resected to free up the lateral recess. At the L3-4 level, discography identified a Grade IV annular tear (Fig. 3B) which also went circumferentially 360°. A small collagenized fragment was removed from the epidural space. After removal of the degenerative disc material, the bipolar radiofrequency probe was used to thermally treat the radial tear. At the L2-3 level, discography showed a far lateral annular tear (Fig. 3C). Following SED, thermal annuloplasty was accomplished with the radiofrequency probe and Ho:YAG laser.



Figure 3: a,b,c



Figure 4: a,b,c

Postoperatively, the patient was mobilized and able to be discharged home. Followup visits at bimonthly intervals up to two years have documented that the patient is free of his original pain. He no longer walks with a limp and requires only occasional doses of analgesics for aches associated with osteoarthritis of the spine.

Discussion

In spite of numerous reports validating discography as a selection tool for various treatment protocols of DDD, controversy continues, primarily because of physicians who do not perform their own studies but rely on the interpretations of other specialists.⁶ There also remained the futile attempts to distinguish concordancy versus non-concordancy since the unanesthetized patient was usually too traumatized by the severity of pain reproduction to decide. Using an analog scale of I - 10 separately for back and leg pain, the author asked the patient to describe the intensity of pain. Only scale numbers 5 or more were considered clinically sufficient for surgical intervention.

Findings of Annular Tear (modified Dallas Discogram Description)	
Grade I	normal cotton ball pattern no extension beyond central half of disc
Grade II	normal lobular pattern no extension beyond central half of disc
Grade III	fissured extension to inner annulus no disc protrusion
Grade IV	degeneration + extension to outer annulus may include disc protrusion

Grade V	degeneration past annular extension definite protrusion + possible extruded fragment
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The use of thermal energy to modulate and ablate tissue is not new. Modern electrosurgery traces its roots to the machines of Doyen in the 1920's and Bovie in the 1930's. Doyen's apparatus included the significant addition of a second electrode to provide a ground for the electrical current that had been passed through tissue.⁷ In the 1940's, Malis⁴ invented a spark gap machine consisting of a generator and a bipolar forceps that allowed no lateral spread to adjacent tissues. The first cold cutting device with highfrequency radiowave energy was developed in the 1970's (Ellman International, Hewlett, NY).

Laser - the application of thermal energy from a photon source - can also effectively vaporize tissue and thereby decompress a herniated disc. Absence of fat and osteophytes compromising the foramen, not seen on MRI, may be treated by laser foraminoplasty. The KTP laser was first to be approved by the FDA for disc vaporization, and Ascher¹ in 1986 and others^{2,3} performed percutaneous laser discectomy. The Ho:YAG laser is presently approved for hemostasis and vaporization in SED.

A search of the world literature found a paucity of articles on the treatment of multiple levels of DDD. The case report presented is part of a series of 40 patients with multilevel DDD, who were treated by minimally invasive techniques including evocative discography, SED, and thermal annuloplasty. A study in preparation for publication documents that SED visualizes the pathology of lumbar spondylosis at an endoscopic level and customizes treatment of the annulus, intravertebral disc, and foramen.

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COMMENTS

A 57-year-old man with low back pain and bilateral sciatica underwent discography which revealed painful annular tears at L2-3, L3-4, and L4-5. Patients with multilevel degenerative changes are generally not considered surgical candidates. Minimally invasive spinal techniques such as Selective Endoscopic Discectomy and thermal annuloplasty offer relief of discogenic pain in cases that have not improved after lengthy physiotherapy. Postoperatively, he required only mild analgesics and walked without a limp.

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ILLUSTRATIONS

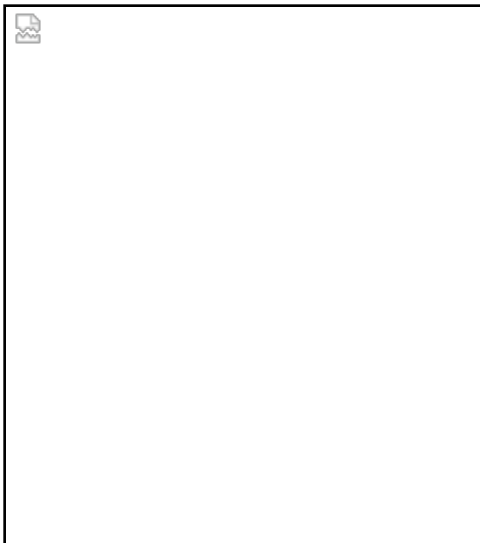


Figure 1: Plain X-ray showing dextroscoliosis.

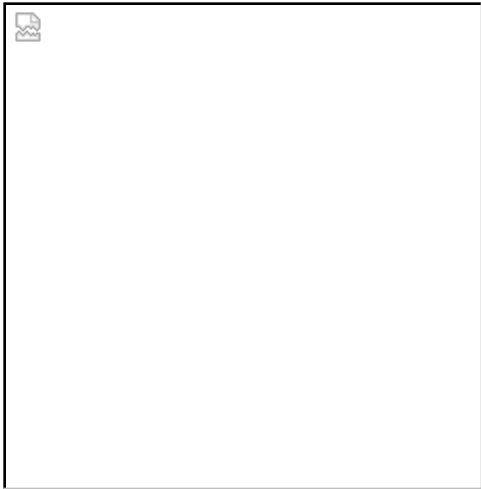


Figure 2: MRI demonstrating protruding discs at L2-3 and L3-4 (arrows) with generalized degenerative changes and L4-5 as well.

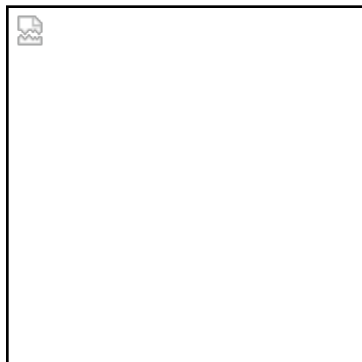


Figure 3a: Intraoperative discogram at L4-5 level demonstrating Grade IV tear with concordant pain.

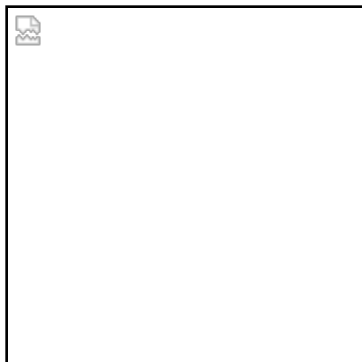


Figure 3b: Note Grade IV rim tear at L3-4 level.

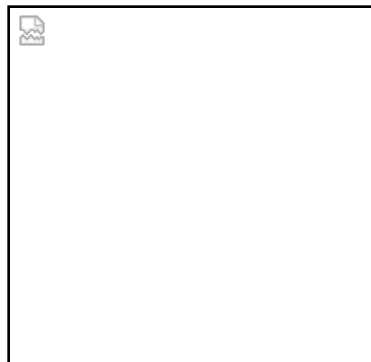


Figure 3c: At L2-3 level, there is a far lateral Grade V tear with concordant pain.

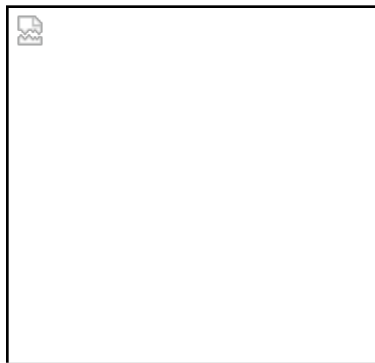


Figure 4a: Intraoperative photomicrograph of annular fissure (A) seen from inside the intervertebral disc space.

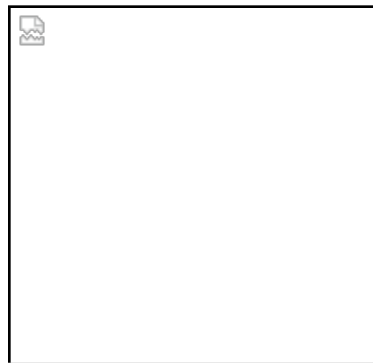


Figure 4b: Note the bipolar radiofrequency probe (P) thermally treating Grade IV tear.

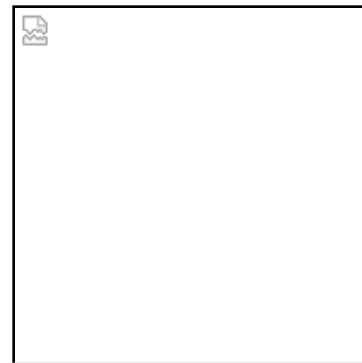


Figure 4c: Ho:YAG laser (L) shrinking and vaporizing the degenerative disc material.