Resorption of thoracic disc herniation

Report of 2 cases

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The authors describe 2 cases of thoracic disc herniation, resulting in acute myelopathy without bladder dysfunction or progressive muscular weakness; the herniated disc apparently resorbed without surgical intervention. Thoracic disc herniations are less frequent than cervical or lumbar disc herniations and are usually associated with severe neurological deficits. In these 2 cases, the herniated discs exhibited marked decreases in size, corresponding to a favorable clinical outcome within a few months after the initiation of conservative treatment with prostaglandin E₁ and/or steroids in conjunction with physical therapy. The authors conclude that thoracic herniated discs are capable of undergoing natural resorption and that conservative treatment could be indicated, even in the presence of moderate myelopathy, when the myelopathy is not accompanied by bladder dysfunction or progressive muscular weakness.

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Thoracic disc herniations are less frequent than cervical or lumbar disc herniations. They are usually found in association with severe neurological deficits. We describe 2 cases in which the herniated discs exhibited marked decreases in size, corresponding to a favorable clinical outcome within a few months of conservative treatment with prostaglandin E₁ and/or steroids in conjunction with physical therapy. We believe that thoracic herniated discs are capable of undergoing natural resorption and that conservative treatment may be indicated, even in the presence of moderate myelopathy, when the myelopathy is not accompanied by bladder dysfunction or progressive muscular weakness.

Case Reports

Case 1

History and Presentation. During a baseball game, this 23-year-old man experienced severe sudden back pain after throwing a ball, causing him to fall to the ground. He then found it impossible to stand upright or walk. Physical examination revealed sensory deficits distally below his chest, hyperreflexivity of tendons, and pathological reflexes in his lower extremities. He denied having any muscle weakness or bladder dysfunction. Both MR imaging and computed tomography myelography showed a T₅–₆ disc herniation, resulting in spinal cord compression (Figs. 1 and 2). Gadolinium diethylenetriamine pentaacetic acid–enhanced MR imaging demonstrated enhancement surrounding the herniated disc mass (Fig. 1).

Treatment. The patient was started on a course of prostaglandin therapy for 1 month (10 μg alprostadil 3 times a week plus 15 μg limaprost alfadex daily) to increase blood supply to the compressed spinal cord.

Peritreatment Course. Two weeks later, the patient experienced symptom improvement, experiencing only mild lower-extremity numbness and some gait disturbance. One month after the start of treatment, the patient was finally able to walk up and down stairs, on his heels, and on his toes. Three months after the start of treatment, the patient was able to run. Magnetic resonance imaging revealed resorption of the herniated disc mass 2 months after the start of treatment and complete disappearance of the disc mass by 18 months (Fig. 3).
Case 2

History and Presentation. This 58-year-old man was a farmer who continually worked in an upright position during the day. One evening, he felt numbness in his lower extremities that persisted through the night, and he was not able to stand up or walk straight the next day. Neurological examination revealed severe sensory disturbances distally below the lower region of his abdomen down to his knees, hyperreflexivity of tendons, ankle clonus, and pathological reflexes in his lower extremities. The patient experienced no lower-extremity muscle weakness or bladder dysfunction. Magnetic resonance imaging showed an enlarged T11–12 herniated disc sequestrated at T-12 and enhancement surrounding the herniated disc mass after administration of contrast material (Fig. 4).

Treatment. The patient was started on a course of steroid therapy (500 mg of methylprednisolone sodium succinate for 5 days) as spinal cord injury treatment, resulting in improvement of his lower-extremity sensory disturbances. Next, he received prostaglandin injections (10 μg alprostadil 3 times a week, plus 15 μg of limaprost alfadex daily) for 2 weeks. After his 2-week course of prostaglandin treatment, he was then started on a regimen of physical therapy, including muscle exercise and walking practice.

![Fig. 1. Case 1. Magnetic resonance imaging studies. A–F: First visit to clinic. Sagittal and axial T1-weighted and Gd-enhanced (B and E), and T2-weighted (C and F) images. Disc herniation compresses the spinal cord anteriorly at T5–6. The herniated disc exhibits rim enhancement on the T1-weighted Gd-enhanced images (B and E).](image1)

![Fig. 2. Case 1. Computed tomography myelography studies obtained at the onset of treatment. Sagittal (left), axial view (center), coronal (right) scans.](image2)
Peritreatment Course. Three weeks after the start of treatment, the patient experienced symptom improvement, exhibiting only mild lower-extremity spasticity and numbness along with gait improvement. Two months after the start of treatment, lower-extremity hyperreflexivity and clonus had almost entirely disappeared, and sensory perception had almost normalized. The patient was able to walk without a cane and go up and down stairs. At this point...

**Fig. 3.** Case 1. Magnetic resonance imaging studies. Most recent visit 18 months after initiation of treatment: T1-weighted (A and D); T1-weighted and Gd-enhanced (B and E); and T2-weighted (C and F) images. The images show spontaneous herniated disc resorption.

**Fig. 4.** Case 2. Magnetic resonance imaging studies. A–F: First visit to clinic. Sagittal and axial T1-weighted (A and D); T1-weighted and Gd-enhanced (B and E); and T2-weighted (C and F) images. The images demonstrate disc herniation compressing the spinal cord anteriorly at T11–12 with sequestration at the T-12 vertebral level.
stage, the sequestrated disc material had disappeared, but disc protrusion remained on MR imaging (Fig. 5). Ten months after the onset of treatment, the patient was finally able to run.

Discussion

To the authors' knowledge, thoracic herniated discs are very rare, and the literature on the natural resorption process consists of only a few case reports. In these reports the authors described spontaneous resorption of thoracic herniated discs in patients who had exhibited thoracic radiculopathy, mild neurological deficits, or no symptoms, and who were treated with epidural block or vitamin B12. Our case reports represent the first description of spontaneous resorption of thoracic herniated discs in the absence of epidural blocks or surgery, in patients who had moderate thoracic myelopathy since the onset of symptoms and were unable to walk but were free from bladder dysfunction or progressive muscle weakness.

Magnetic resonance imaging studies have previously shown progressive decreases in the size of herniated lumbar discs, most commonly in those exposed to the epidural space, which appear to correlate with an abundance of vascularization. The tendency of the herniated disc to resorb spontaneously is directly proportional to the degree of Gd diethylenetriamine pentaacetic acid enhancement, suggesting that vascularization closely correlates with and contributes to the spontaneous resorption of a herniated disc. We have also reported on patients with herniated cervical discs in whom amyotrophy (Keegan type), radiculopathy, or mild myelopathy improved with conservative treatment and in whom MR imaging showed spontaneous resorption. In particular, extruded or contrast medium–enhanced herniated cervical discs decreased in size more quickly. Recently Autio et al. demonstrated that higher baseline scores of rim enhancement thickness, a higher degree of HNP displacement, and an age range of 41–50 years were associated with a higher resorption rate in cases of lumbar HNP. In addition, thickness of the enhancement was a strong determinant. In the present case report, we observed strong enhancement of contrast medium in the exposed herniated disc in each case. Based on our experience, even in cases of herniated thoracic discs, we believe that MR imaging findings can identify favorable prognostic parameters for resorption of herniated discs and thereby contribute to selection of the proper management strategy—surgery or appropriate conservative treatment—in patients with herniated thoracic discs. Although our 2 patients had acute myelopathy due to thoracic herniated discs, both patients were free of bladder dysfunction or progressive motor dysfunction. In addition, both herniated discs exhibited apparent rim enhancement surrounding the herniation. These clinical and MR imaging findings were quite similar to cases of cervical and lumbar herniated discs in which there is a good chance for spontaneous resorption due to conservative treatment. Thus, we selected conservative treatment instead of excision of the herniated disc mass.

For treatment, we administered prostaglandin E1, which is a vasodilator that increases blood flow in nerve tissue, even in spinal canal stenosis, thereby improving neurological symptoms. Prostaglandin E1 may also help enhance blood flow to compressed spinal cord tissue. Recently the precise mechanism of herniated disc resorption has been clearly delineated. Histological studies of surgical samples obtained in patients with herniated lumbar and cervical discs revealed granulation tissue with marked infiltration by macrophages and a mild elevation in the numbers of T lymphocytes concomitant with vascularization. This evidence suggests that neovascularization medi-

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**Fig. 5.** Case 2. Magnetic resonance imaging studies. Most recent visit 10 months after initiation of treatment. A–F, Sagittal and axial MR images demonstrating sequestrated disc resorption.
ates the resorption process of herniated discs. In addition, we have shown that infiltrating macrophages and disc cells in herniated discs express high levels of MMPs, including MMP-3 and MMP-7, which preferentially degrade the core proteins of aggrecan and collagen. This last finding also suggests that MMP induction by infiltrating macrophages facilitates spontaneous resorption of herniated disc tissue. We previously developed a coculture model to study the interaction between macrophages and disc chondrocytes that recapitulates in vitro the acute phase of a herniated disc. Both MMP-3 and MMP-7 were strongly upregulated when macrophages were added to the disc tissues. These two MMPs play a crucial role in the physiological resorption process of herniated discs. In addition, VEGF and its receptors VEGFR, and VEGFR, are expressed in human surgical samples of lumbar herniated discs. We have also demonstrated that VEGF plays a role in inducing angiogenesis in herniated discs. In addition, inflammatory cytokine tumor necrosis factor-α strongly induces both MMPs and VEGF from both macrophages and disc cells. Thus, tumor necrosis factor-α initiates upregulation of MMPs and VEGF in herniated disc tissues, culminating in the degradation of herniated disc matrix and resorption. In our thoracic HNP series, MR imaging documented apparent rim enhancement surrounding the herniated disc, suggesting that neovascularization into the herniated disc mass and activation of VEGF and MMP cascades might result.

The present report demonstrates that even thoracic herniated discs are capable of undergoing herniated disc resorption. Thus, deferring surgery and starting with conservative treatment should be considered in patients with moderate thoracic myelopathy without progressive motor paralysis or bladder dysfunction because thoracic herniated discs might spontaneously gradually decrease in size while symptoms improve. However, cases of thoracic disc herniation in which the patients have severe neurological deficits and present with progressive motor weakness or bladder dysfunction should be treated with surgery, even if we expect herniated disc resorption. Prostaglandin E, which may increase blood supply to the herniated disc mass and induce natural resorption processes, could be a candidate for conservatively treating thoracic myelopathy. In addition, contrast-enhanced MR imaging can be useful to track response to treatment and predict the course of natural herniated disc resorption. The favorable outcome in our 2 cases is encouraging and leads us to recommend conservative treatment for similar cases.

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