Case Report

Facetoplasty Using Radiofrequency Thermocoagulation for Facet Joint Hypertrophy

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Lumbar spinal stenosis is one of most common pathologic conditions affecting the lumbar spine. Pain and/or disability in the low back and lower extremities with or without neurogenic claudication may occur as a result of compression of dural sac contents or nerve roots in the narrowed space. Bulging and protrusion, facet joint hypertrophy, and disc herniation combined with osteophytes and arthritic changes of facet joints can be the cause of lumbar spinal stenosis. Medical/interventional treatment may be considered as an initial treatment for patients with mild symptoms of lumbar spinal stenosis. Surgery is usually considered when medical/interventional treatment has failed. Even though surgery has been considered to be the definitive treatment for spinal stenosis conventionally, it has potential problems including general anesthesia related complications and failed back surgery syndrome. For that reason, minimally invasive techniques such as percutaneous endoscopic lumbar discectomy (PELD), epiduroscopic laser neural decompression (ELND), and nucleoplasty with radiofrequency have been developed as alternatives to surgery.

The authors present a case of treating lumbar spinal stenosis by using radiofrequency thermocoagulation. Radiofrequency therapy is used for spinal pain, usually in forms of neurotomy or nucleoplasty. The patient in this case had leg pain with neurogenic claudication caused by lumbar spinal stenosis from facet joint hypertrophy. His pain did not respond to conservative treatment including epidural steroid injection, but he didn't want to get surgery. As an alternative to surgery, we applied radiofrequency thermocoagulation with high temperatures of electrode to the hypertrophied facet joint for the decompressing of the spinal nerve and the patient's pain was improved without any complications after the treatment.

Key words: Low back pain, neurogenic claudication, lumbar spinal stenosis, facet joint hypertrophy, radiofrequency thermocoagulation, minimally invasive technique

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Pain and/or disability in the low back and lower extremities with or without neurogenic claudication may occur as a result of compression of dural sac contents or nerve roots in the narrowed space of the spinal canal (1). Lumbar spinal stenosis is one of the most common pathologic conditions affecting the lumbar spine, and its prevalence ranges from 1.7 to 13.1% (2,3). There are several causes of lumbar spinal stenosis such as disc bulging and protrusion, facet joint hypertrophy, and disc herniation combined with osteophytes and arthritic changes of facet joints.

Medical/interventional treatment may be considered as an initial treatment for patients with mild symptoms of lumbar spinal stenosis. Surgery has been considered to be a definitive treatment for spinal stenosis conventionally, especially when medical/interventional treatment has failed to relieve symptoms of spinal stenosis. However, it has potential problems including general anesthesia related complications and failed back surgery syndrome.

In the cases of lumbar spinal stenosis by intervertebral disc or fibrosis in the epidural space, minimally invasive techniques such as percutaneous endoscopic

lumbar discectomy (PELD), epiduroscopic laser neural decompression (ELND), and nucleoplasty with radiofrequency have been developed as alternatives to surgery (1,4). However, treating lumbar spinal stenosis caused by a facet joint hypertrophy is challenging with a non-surgical treatment. We tried to apply the radiofrequency thermocoagulation for lumbar spinal stenosis caused by facet joint capsule hypertrophy, and had a good result of functional improvement.

Case Report

A 61-year-old man complained of pain, numbness, and motor weakness in his left leg. His pain score was 5/10 on the numeric rating scale (NRS), and he could walk no more than 100 meters without resting because of neurogenic claudication. He had no previous medical history and no history of spine surgery. He had anterior spondylolisthesis, hypertrophy of both ligamentum flava and facet joint capsule, and central spinal stenosis on his magnetic resonance imaging (MRI) (Fig. 1).

He had gotten epidural steroid injection via caudal and transforaminal approaches several times, but there was no effect. We recommended he get surgery, but he did not want to. We planned to apply radiofrequency thermocoagulation to the hypertrophied facet joint capsule for decompressing the spinal nerve as a next step. The target was his left facet joint capsule at L4-5 which was hypertrophied to a size of 3.15 mm on MRI (Fig. 1). We expected that we could reduce the size of the capsule without any nerve damage using an electrode with 2 mm of active tip.

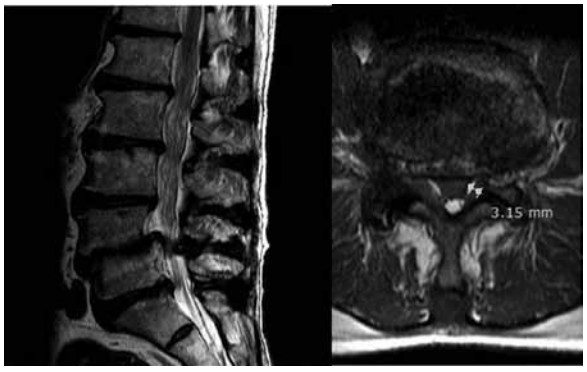

Fig. 1. *The patient's sagittal (left) and axial (right) MRIs show anterior spondylolisthesis, hypertrophy of both ligamentum flava and facet joint capsule, and central spinal stenosis. Left facet joint capsule at L4-5 is hypertrophied at a size of 3.15 mm (right).*

After obtaining an informed consent, the patient was prone and prepared with sterile draping. Local anesthesia at the midline of L4-5 level was performed, and then a radiofrequency needle with 2 mm of active tip was inserted through a 16-gauge angiocatheter to the hypertrophied facet joint capsule inside of the lamina under C-arm guidance (Fig. 2). After confirming that there was no response to the sensory and motor stimulation, thermocoagulation was performed using a radiofrequency generator (Cosman G4 Inc. Burlington, USA) for 60 seconds at 70°C twice and for 20 seconds at 80°C. When thermocoagulation was being performed for 20 seconds at 80°C, the patient complained of radicular pain, indicating it was time to stop the procedure. There were no complications at all. His pain score was reduced 5 to one according to the numeric rating scale (NRS) immediately after the procedure. When he came back to the clinic one week later, his gait and neurogenic claudication was improved.

Discussion

Lumbar spinal stenosis is one of the most commonly diagnosed spinal disorders and is the major reason for surgery for patients with low back pain with neurogenic claudication (5). Kalichman et al (3) reported that the prevalence of lumbar spinal stenosis increases with age and is high in the general population over 60 years in age. Stenosis can be caused by many factors such as intervertebral disc herniation, ligamentum flavum hypertrophy, facet joint capsule hypertrophy, and osteophyte formation. Symptoms of spinal stenosis exist in various forms including asymptomatic, low back pain, sciatica, or neurogenic claudication that may be related to how the spinal cord or spinal nerves are compressed. In this case, the patient complained of left leg pain and numbness which came from left spinal nerve root compression by a hypertrophied left facet joint shown on his MRI.

A facet joint is a diarthroidal synovial joint composed of bony articular pillars, synoviums, and ligamentous capsules. The functions of facet joints are connecting the adjacent vertebrae at all regions and providing support for the transfer and constraint of loads applied to the spinal column. Facet joint hypertrophy is one of the findings of facet joint degeneration caused by aging and/or non-physiological processes and accelerated by injury, trauma, or injection (6). Considering his age and previous history, the hypertrophy of the facet joint

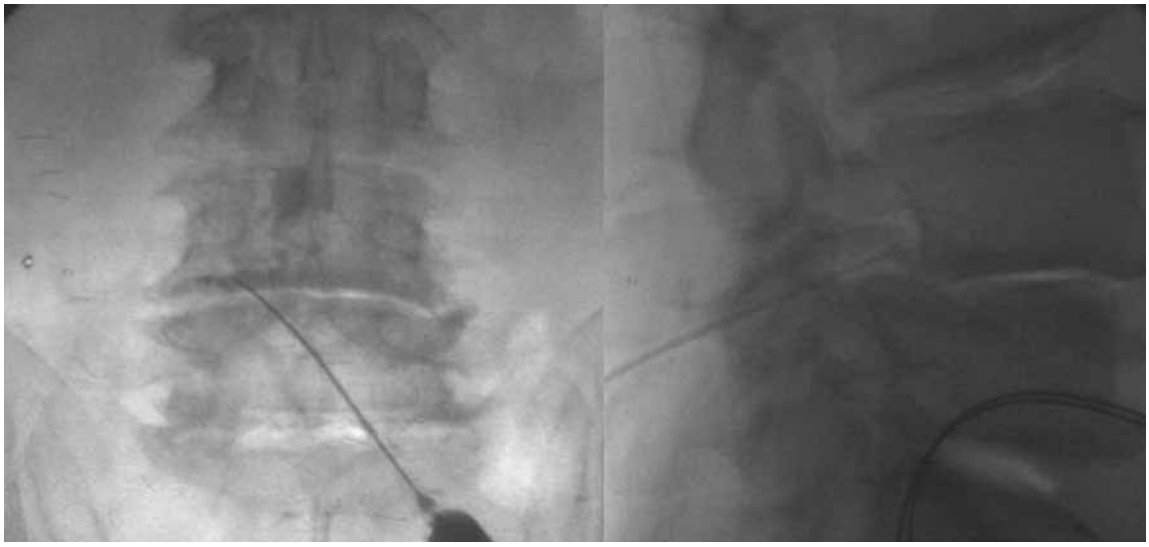

Fig. 2. *The active tip of the radiofrequency needle is located in the hypertrophied facet joint capsule inside of the L4-5 level left lamina.*

capsule from degenerative changes of his spine is due to aging.

Surgery has been considered to be a definitive treatment for spinal stenosis especially if medication/ interventional treatments fail to relieve symptoms of stenosis. However, surgery has possibilities of fatal operative complications and mortality and comorbidities increased with age (5). Moreover, failed back surgery syndrome, meaning that the final outcome of surgery did not meet the expectations, is emerging as one of the major problems after surgery recently (7). Nerland et al (8) reported that approximately 9% of patients experienced significant deterioration of functional status following decompressive surgery for lumbar spinal stenosis. For those reasons, many pain physicians try to use minimally invasive techniques such as PELD, ELND, and nucleoplasty for treating chronic low back pain in order to avoid problems of surgery.

We applied radiofrequency thermocoagulation to the hypertrophied facet joint capsule for the decompression of the spinal nerve in this case. Radiofrequency therapy has been used for spinal pain since 1974, when Uematsu et al (9) reported a case of dorsal root rhizotomy with radiofrequency. The principle of radiofrequency therapy is tissue lesioning by heat energy which is made by high-frequency electrical current from the active tip of an electrode. In cases of chronic spinal pain, radiofrequency is usually used for neurotomy or nucleoplasty (1). The principle of our treatment in this case is similar to that of nucleoplasty with radiofrequency. Reduction of the volume of the structure that compresses the spinal nerve by heat energy from radiofrequency can lead to decompression of the spinal nerve. This technique has advantages: it is possible to provide controlled and highly localized ablation, which results in minimal collateral damage to surrounding tissues. We thought this procedure could be performed safely because the lesion made by radiofrequency is limited to a size of 2 mm or less beyond the surface of the electrode (10). Low electrode temperature (around 52°C) is usually used for nucleoplasty, with a purpose to vaporize the plasma material of the disc (11). In contrast, we used high electrode temperatures (70°C, 80°C) to reduce the volume of the facet joint capsule. With temperatures over 70°C, fusion of collagen fibers occurs as well as tissue destruction by heat (12). Seeing that the patient has not complained of pain or abnormal sensation after the procedure, it seems as there has been no harm to adjacent tissues such as nerves near the facet joint.

Conclusion

Radiofrequency thermocoagulation to the facet joint hypertrophy is one of the effective treatment modalities for treating spinal stenosis, especially in cases not responding to medication or conventional intervention.

Disclaimer

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Conflict of Interest

Each author certifies that he or she, or a member of his or her immediate family, has no commercial association (i.e., consultancies, stock ownership, equity interest, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted manuscript.

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