A Novel Balloon-Inflatable Catheter for Percutaneous Epidural Adhesiolysis and Decompression

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Epidural adhesions cause pain by interfering with the free movement of the spinal nerves and increasing neural sensitivity as a consequence of neural compression. To remove adhesions and deliver injected drugs to target sites, percutaneous epidural adhesiolysis (PEA) is performed in patients who are unresponsive to conservative treatments. We describe four patients who were treated with a newly developed inflatable balloon catheter for more effective PEA and relief of stenosis. In the present patients, treatments with repetitive epidural steroid injection and/or PEA with the Racz catheter or the NaviCath did not yield long-lasting effects or functional improvements. However, PEA and decompression with the inflatable balloon catheter led to maintenance of pain relief for more than seven months and improvements in the functional status with increases in the walking distance. The present case series suggests that the inflatable balloon catheter may be an effective alternative to performing PEA when conventional methods fail to remove adhesions or sufficiently relieve stenosis. (Korean J Pain 2014; 27: 178-185)

Key Words:
balloon, lumbar disc herniation, percutaneous epidural adhesiolysis, post lumbar surgery syndrome, spinal stenosis.

Various etiologies and pathophysiologies contribute to the development of chronic lower back pain and dictate the appropriate treatment. Epidural adhesions are considered one of the most important factors in the pathophysiologies of back pain. Epidural adhesions most commonly arise from postoperative epidural scarring and can also be seen in patients with spinal stenosis and disc herniation [1-3]. Epidural adhesions cause pain by interfering with the free movement of the spinal nerves and increasing neural sensitivity as a consequence of neural compression [4]. Although an epidural injection with a local anesthetic agent and glucocorticoid is an effective treatment for chronic lower back pain and/or radicular pain, this therapy often works for only a few weeks or may not improve the patient’s functional status [5,6]. It may be attributed to the reason that the injectate cannot spread out to the lesion.
properly due to the epidural adhesions [7]. Therefore, physicians may perform percutaneous epidural adhesiolysis (PEA) on patients who are unresponsive to existing and temporary treatments, with the goal of eliminating adhesions and allowing the delivery of injections to target sites.

PEA is commonly performed with a Racz catheter or a more steerable navigation catheter (NaviCath®, Myelotec, Inc., Roswell, GA, USA) and has proven to be effective [8,9]. However, the approach and correct placement of these catheters can be difficult in patients with severe adhesions or stenosis, leading to incomplete removal of the adhesions [10]. Moreover, the long-term effects (i.e., over more than 6 months) of this treatment are uncertain and controversial [11]. Importantly, there has not yet been any treatment developed to relieve stenosis itself through a nonsurgical method.

Previously, we have reported that transforaminal balloon treatment results in significant pain relief and functional improvement in patients with chronic refractory lumbar foraminal stenosis [12]. On the basis of this concept, a novel balloon catheter for more effective PEA and decompression was developed: the Zigzag-motion Inflatable Neuroplasty (ZiNeu®, JUVENUI, Seoul, Korea) catheter, which can be adjusted side-to-side and has an inflatable balloon attached to the end of the catheter tip (Fig. 1). In the present report, we describe four patients who suffered from persistent lower back pain radiating to the leg despite repeated conventional epidural steroid injections and other PEA modalities, and who were successfully treated with the inflatable balloon neuroplasty catheter.

**CASE REPORTS**

**1. Case 1**

A 75-year-old man presented to our clinic with pain in his back, both thighs, and calves that had persisted for seven months. He had a medical history of well-controlled hypertension and a depressive disorder. When he walked for 10 minutes, his pain was aggravated and accompanied by dysesthesia of the feet, and these symptoms were relieved by bending over. His pain score was 8 on the 11-point Numeric Rating Scale (NRS; 0 = no pain, 10 = worst pain imaginable), and his Oswestry Disability Index (ODI; ranging from 0–100; 0 = no disability) score was 56. No abnormal signs were seen on physical examination. Magnetic resonance imaging (MRI) of his lumbar spine revealed central stenosis at the L4-5 level due to a bulging disc, facet arthrosis, and thickening of the ligamentum flavum (Fig. 2). For two years, he had been treated with oral medication, a fentanyl patch, and five sets of epidural steroid injections. In addition, PEA had been performed three times (once with the NaviCath and twice with the

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**Fig. 1.** The inflatable balloon neuroplasty (ZiNeu) catheter. This instrument can be adjusted from side to side and has an inflatable balloon (arrow) attached to the end of the catheter tip. It also has a channel (arrow-head) to inject drugs or to leave another catheter at the target site for two- or three-day regimens.

**Fig. 2.** T2-weighted magnetic resonance images (MRI) of the lumbar spine in a 75-year-old man suffering from pain in his back, both thighs, and calves that persisted for seven months. (A) Sagittal and (B) axial views of the MRI show central stenosis at the L4-5 level caused by a bulging disc, facet arthrosis, and thickening of the ligamentum flavum.