Open posterior cervical diskectomy is a surgical procedure for removing only the target lesion in cervical disk disease. Because this procedure does not require fusion, unlike anterior cervical diskectomy and fusion, it is associated with fewer complications, such as arthrodesis and damage to anterior structures. However, posterior cervical diskectomy is associated with a risk of damage to the posterior muscles and structures, especially the extensor muscles, and it carries a higher risk of bleeding and nerve injury. Additionally, spending extended time in the prone position increases the risk of associated morbidity. Minimally invasive posterior cervical diskectomy was recently introduced and is the most widely used technique. It is the gold standard in terms of cost-effectiveness for cervical radiculopathy, particularly in cases of foraminal soft disk protrusion and spurs. The uniporal posterior percutaneous endoscopic cervical foraminotomy and diskectomy technique also is used for surgical treatment.

A new endoscopic technique that uses a biportal endoscopic approach has been applied to conventional arthroscopic systems for spinal disease. This technique was adopted for cervical foraminal soft disk protrusion, with good clinical results.
This is the first report of posterior percutaneous endoscopic cervical diskectomy with a unilateral biportal endoscopic approach.

**Materials and Methods**

**Study Design**

After approval by the ethical research board was obtained, 14 consecutive patients underwent posterior percutaneous endoscopic cervical diskectomy with the unilateral biportal endoscopic approach between February and August 2015. The new procedure was explained to the patients in detail, and all patients provided informed consent.

**Patients**

Patients were included if they met the following criteria: cervical radiculopathy that was not improved with conservative therapy, 1-level soft disk protrusion, lateral displacement, no previous cervical surgery, and no large or calcified disk with cervical myelopathy.

**Procedure**

Pre- and postoperative magnetic resonance imaging, computed tomography, and plain radiographic films were obtained. Patients underwent surgery under general anesthesia in a specific prone position on a radiolucent frame for posterior surgery equipped with a chest bar (Wilson Plus Radiolucent Frame; Mizuho OSI, Union City, California) (Figure 1). Compression-free eyeball and intubation tube devices were placed on the face, and mild neck flexion and traction were performed with plaster. After routine draping was performed, the 2 portal sites were placed with 18-gauge spinal needles with intraoperative C-arm fluoroscopy in an anteroposterior view (Figure 2A). In the authors’ experience, a lateral view is not effective for selecting the portal site on the facet joint. The scope and working port were placed 2 cm apart to avoid cross-interference. Needles were placed at the facet joint area (slightly lateral to the V point) to prevent cord and nerve injury. Subsequently, K-wire insertion and skin and fascia incisions were performed to create a 4-mm viewing portal and a 6-mm working portal. Muscle splitting was performed with a sequential dilator, with minimal injury to the multifidus of the cervical area (Figure 2B). The precise location of the lesion was determined with C-arm fluoroscopy (Figure 2C), and a conventional arthroscopic system (Image 1; Arthrex, Florida) was placed in the viewing portal to expose the interlaminar space. The angles of the arthroscope and the conventional spinal operative device were maintained parallel to each other, and the device was advanced slightly deeper than the arthroscope to an identifying position. Angles to the laminae and facet joint were maintained in a vertical line to prevent nerve or cord injury during the procedure. Under arthroscopic guidance, bleeding control and soft tissue removal were performed with a bipolar radiofrequency instrument (Ellman Surgitron; Ellman International, New York) and other standard spine surgery instruments through the working portal. Partial laminotomy and foraminotomy were performed at the junction between the most lateral aspect of the interlaminar space and the most medial aspect of the facet area. An oval opening of 1.5 to 2 cm was created in the bone. When the cervical cord and the axillary part of the cervical nerve root were located, the ruptured disk particle was removed with a small blunt hook. After the soft disk material was removed, all instruments were withdrawn, and the wound was closed (Video).

Follow-up evaluations were performed in the outpatient clinic. Patients completed a questionnaire (described previously) during the follow-up visit. Neck Disability Index (NDI) and visual analog scale scores for the neck and upper extremities were documented preoperatively. This information was obtained again 3, 6, and 12 months postoperatively and at the last follow-up.

**Statistical Analysis**

The Wilcoxon signed-rank test was used for the analysis. Statistical analysis was performed with SPSS, version 12.0 (SPSS, Chicago, Illinois). Statistical significance was set at $P<.05$.

**Results**

Because 1 patient was lost during the follow-up period, 13 patients were included in the final analysis. The number of women (n=8) was slightly higher than the number of men (n=5). Mean age was
47.1 years (range, 37-56 years), and mean duration of conservative treatment was 2.5 months (range, 1.5-5 months). Mean follow-up was 14.8 months (range, 12-18 months). One patient underwent surgery at the C4-C5 level (7.7%), 4 patients at the C5-C6 level (30.8%), and 8 at the C6-C7 level (61.5%). Eight lesions were on the left side, and the others were on the right side. Patients were usually discharged 2.5 days (range, 2-5 days) after surgery (Table). Foraminotomy alone was performed for the first and second cases. Because the procedure was new, the precise location of a part of the axillary area in the pathologic nerve root could not be identified correctly. However, sufficient decompression was confirmed. In 11 cases, the patient underwent effective foraminotomy with diskectomy. No specific complications occurred during surgery and the immediate postoperative period. No patient required additional surgery for sustained or aggravated symptoms during postoperative hospitalization.

Preoperative NDI, neck visual analog scale score, and upper arm visual analog scale score were 27.0±2.5, 6.2±0.8, and 7.0±1.1, respectively. Follow-up scores at 3 months (NDI, 8.5±1.6; neck visual analog scale score, 3.2±0.9; arm visual analog scale score, 3.1±1.1), 6 months (NDI, 7.6±1.5; neck visual analog scale score, 2.7±1.0; arm visual analog scale score, 2.7±1.0), and 12 months (NDI, 6.9±1.3; neck visual analog scale score, 2.4±1.0; arm visual analog scale score, 2.3±0.9) showed that symptoms had improved significantly (P<.05). Scores at the last follow-up also showed statistically significant improvement over preoperative scores (P<.05) (NDI, 6.8±1.4; neck visual analog scale score, 2.4±0.9; arm visual analog scale score, 2.2±0.6) (Figure 3). Comparative pre- and postoperative magnetic resonance imaging findings confirmed removal of the disk and release of the compressed area (Figure 4). Restoration of bone function and decompression were confirmed with computed tomography (Figure 5).

**DISCUSSION**

Cervical radiculopathy is among the most common diseases of the spine and is often treated conservatively. However, if conservative treatment is ineffective, surgery is an alternate method to relieve symptoms. Two of the most common surgical procedures are anterior cervical disectomy and fusion and posterior cervical foraminotomy. The treatment option for cervical degenerative disease is anterior cervical disectomy and fusion, and this procedure usually produces good results. However, in some cases, a posterior approach is preferred because it provides direct access to the foraminal lesion without the need for extensive disectomy.

Posterior cervical foraminotomy also has other benefits, including the ability to preserve the intervertebral disk and movement, avoid graft-related complications, and reduce adjacent segmental disease. Additionally, posterior cervical foraminotomy is more cost-effective than anterior cervical disectomy and fusion. However, posterior cervical foraminotomy also has drawbacks, such as axial pain, paraspinal muscle spasm, and loss of normal alignment after surgery.

A decade ago, a minimally invasive surgical technique, posterior percutaneous endoscopic cervical disectomy with a uniportal approach, was introduced. In 2007, a study of posterior percutaneous endoscopic cervical disectomy reported that 81 patients (93%) had substantial satisfaction with a fully endoscopic technique that used a 6.9-mm uniportal approach. Another prospective randomized controlled study reported a success rate of 87.4% with a 5.9-mm uniportal scope. These authors concluded that the uniportal endoscopic technique is a sufficient and safe alternative to conventional microsurgical procedures.

A new endoscopic technique has been introduced for spine surgery that uses a standard arthroscopic device and a biportal approach. The 0° angled scope can reduce optic angle distortion more effectively than a uniportal scope. Most im-

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**Table**

<table>
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<th>Demographic</th>
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<td>Hospitalization, mean (range), d</td>
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**Figure 3:** At the final follow-up (F/U) examination, the neck and arm visual analog scale (VAS) scores (A) and the Neck Disability Index (NDI) (B) improved significantly (P<.05). Abbreviation: preop, preoperative.
importantly, the location of the scope and the working portal are different, and the operator can maneuver them comfortably with conventional microsurgical tools while using familiar methods applied during conventional surgery. This procedure has an advantage compared with the uniportal endoscopic approach because it offers a 3-dimensional view, similar to posterior cervical discectomy. The wide view and the use of continuous irrigation prevent complications, such as vascular or nerve injury, that can occur with the standard approach. Moreover, there is a substantially reduced risk of damage to the posterior structures of the cervical spine. A free working space enables easy control of bleeding with conventional techniques, insertion of a hemostatic gelatin sponge, and use of a bipolar radiofrequency probe.

The unilateral biportal endoscopic procedure was first reported in 1996 for the treatment of lumbar disectomy, and clinical results were reported in 1998. In 2013, a modified approach to lumbar disectomy was reported, with good results. A few years ago, the authors only used this technique for the lumbar area, especially for central stenosis and foraminal stenosis. Earlier, the authors usually performed minimally invasive posterior cervical discectomy with a tubular retractor, and most patients reported overall satisfaction, with few having postoperative continuous neck pain or neck stiffness. However, a change was made to the biportal endoscopic approach for lumbar disease, and the technique was used for cervical foraminal soft disk protrusion. The approach is similar to open posterior cervical discectomy and is associated with easy access and reduced intraoperative time. Previous experience with the biportal endoscopic procedure for treating the lumbar spine helped in performing the new procedure, posterior percutaneous endoscopic cervical diskectomy with a unilateral biportal endoscopic approach. Although a longer follow-up period with additional cases is necessary to confirm the outcomes, the current study showed that posterior percutaneous endoscopic cervical diskectomy with a biportal endoscopic approach is a good alternative procedure for treating cervical lateral soft disk and foraminal stenosis.

**CONCLUSION**

Posterior percutaneous endoscopic cervical diskectomy with a unilateral biportal endoscopic approach is a good alternate surgical technique; however, the results must be confirmed with additional
clinical cases and a longer follow-up period.

REFERENCES


