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Percutaneous ventral decompression for degenerative lumbar spondylolisthesis in medically compromised geriatric patients

Riskli hastalıkları olan yaşlı olgularda perkütan ventral dekompresyon ile dejeneratif lomber spondilolistesis tedavisi

Ho-Yeon Lee, M.D., PhD., Sang-Ho Lee, M.D., PhD., Song-Woo Shin, PhD.

Department of Neurosurgery, Wooridul Spine Hospital, Seoul, Korea

Objectives: The purpose of this study was to present the surgical technique of percutaneous ventral decompression for degenerative lumbar spondylolisthesis (DLS) in medically compromised geriatric patients and to evaluate its results.

Patients and methods: The study included 11 consecutive patients (mean age 67 years; range 51 to 85 years) with DLS accompanied by compressive central canal stenosis and lateral recess stenosis. The affected levels were L_{3-4} in two patients, and L_{4-5} in nine patients. All the patients had complaints of bilateral buttock pain, leg pain, and back pain, with significant limitation in ambulation. The mean walking distance before surgery was 150 meters, and the mean preoperative Oswestry Disability Index (ODI) score was 72.2%. Coexisting diseases included diabetes (n=4), cardiac disease (n=5) cerebrovascular accident (n=2), or malignancy (n=2). Percutaneous ventral decompression of the thecal sac was performed under local anesthesia through the posterolateral approach and using endoscopic tools, without violation of the posterior bony structure. The mean follow-up period was 25.1 months (range 11 to 38 months).

Results: The mean operation time was 72 minutes (range 50 to 100 min). The mean ODI score decreased to 27.4% (range 4% to 54%) at the final follow-up. All the patients could walk without any difficulty after surgery. Postoperative CT images demonstrated an enlarged spinal canal in all the patients. The only complication was transient quadriceps weakness in one patient. None of the patients showed progression of spondylolisthesis.

Conclusion: Percutaneous ventral decompression is a safe and effective minimally invasive method for treating DLS in medically compromised geriatric patients, especially when general anesthesia is not recommended.

Key words: Aged; decompression, surgical; lumbar vertebrae/pathology/surgery; spinal stenosis/pathology/surgery; spondylolisthesis/surgery/radiography.

Amaç: Riskli hastalıkları olan yaşlı olgularda saptanan dejeneratif lomber spondilolistesis (DLS) perkütan ventral dekompresyon ile tedavi edildi. Bu çalışmada, uygulanan cerrahi teknik, sonuçlarıyla birlikte sunuldu.

Hastalar ve yöntemler: Çalışmaya, DLS ile birlikte kompresif santral kanal stenozu ve lateral reses stenozu bulunan 11 ardışık hasta (ort. yaş 67; dağılım 51-85) alındı. Etkilenen düzey iki hastada L_{3-4}, dokuz hastada L_{4-5} idi. Tüm hastalarda, yürümeyi ciddi derecede kısıtlayan iki taraflı kalça ağrısı, bacak ve sırt ağrısı vardı. Ameliyat öncesinde ortalama yürüme mesafesi 150 metre; Oswestry Sakatlık İndeksi (OSİ) skoru ortalaması %72.2 idi. Tüm olgularda diyabet (n=4), kalp hastalığı (n=5), serebrovasküler olay (n=2) ve malign hastalık (n=2) gibi başka sorunlar görüldü. Tedavi olarak, tekal kesenin perkütan ventral dekompresyonu, lokal anestezi altında, posterolateral yaklaşımla ve endoskopik yolla, posterior kemik yapısına zarar vermeden gerçekleştirildi. Ortalama izlem süresi 25.1 ay (dağılım 11-28 ay) idi.

Bulgular: Ortalama ameliyat süresi 72 dakika (dağılım 50-100 dakika) bulundu. Ortalama OSİ skoru ameliyattan sonraki son kontrolde %27.4'e düştü (dağılım %4-54). Cerrahi sonrasında tüm hastalar güçlük çekmeden yürüyebiliyordu. Tüm hastaların ameliyat sonrası bilgisayarlı tomografi görüntülerinde spinal kanalın genişlemiş olduğu gözlendi. Tek komplikasyon olarak bir hastada geçici kuadriseps zayıflığı gelişti. Spondilolistesis hiçbir hastada ilerleme göstermedi.

Sonuç: Perkütan ventral dekompresyon, riskli hastalıkları olan yaşlı olgularda, özellikle genel anestezi önerilmiyorsa, DLS tedavisinde güvenli ve etkili bir minimal invaziv cerrahi yöntemdir.

Anahtar sözcükler: Yaşlılık; dekompresyon, cerrahi; lomber vertebra/patoloji/cerrahi; spinal stenoz/patoloji/cerrahi; spondilolistesis/cerrahi/radyografi.

• *Correspondence: Ho-Yeon Lee, MD, PhD. Department of Neurosurgery, Wooridul Spine Hospital, 47-4 Chungdam-Dong Gangnam-Gu, Seoul 135-100, Korea. Tel: +00 - 82 - 2 - 513 8151 Fax: +00 - 82 - 2 - 513 8146 e-mail: mediple@wooridul.co.kr*
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The narrowing of the spinal canal in degenerative lumbar spondylolisthesis (DLS) is composed of anteriorly translated inferior facets of upper vertebra (posterior element) and a posterior body of lower vertebra (anterior element) with or without disc herniation.[1,2] Theoretically, neural decompression in DLS is possible via the traditional removal of a posterior element and/or an anterior element. With the advances in transforaminal endoscopic techniques, access to the ventral side of thecal sac is becoming possible, without violation of the posterior bony elements.[3-5] In this study, we performed percutaneous ventral decompression of the posterior body of the lower vertebra and/or disc herniation via the posterolateral route under local anesthesia in elderly and medically compromised patients.

PATIENTS AND METHODS

Between November 2001 and February 2004, 11 patients (mean age 67±9.1 years; range 51 to 85 years) underwent percutaneous ventral decompression. All the patients demonstrated compressive central canal stenosis and lateral recess stenosis at the level of DLS. Spondylolisthesis was at L_{3-4} in two patients, and L_{4-5} in nine patients. All the patients had bilateral buttock pain, leg pain, and back pain, with significant limitation in ambulation. The mean walking distance before surgery was 150 m, and the mean preoperative Oswestry Disability Index (ODI) score was 72.2% (range 51% to 91%). Coexisting diseases included diabetes (n=4), cardiac disease (n=5) cerebrovascular accident (n=2), or malignancy (n=2), of which two patients suffered from two diseases simultaneously. The mean follow-up period was 25.1 months (range 11 to 38 months).

Surgical technique

The patient was placed in the prone position, and the posterolateral approach was used under fluoroscopic guidance. The skin entry point was approximately 9 to 10 cm from the middle at the level of the L_4 pedicle on the lateral view. Using a 24 G spinal needle, facet block was performed through the superolateral synovial recess after skin infiltration with 1% lidocaine, supplemented with conscious sedation. Then, an 18 G needle was placed in the junction between the pedicle and the vertebral body of L_5 for the initial foraminal target. During cannula insertion, the center of the target was moved laterally due to the greater diameter of the cannula (6 mm) than that of the needle. However, the cannula still faced the superior aspects of the vertebral body/pedicle junction of L_5. Before reaching the annulus, the epidural tissue was retracted superiorly and the head of the cannula moved cranially (levering). Then, the whole posterior annulus, from pedicle to pedicle, was removed with the use of mechanical tools and a Ho:YAG laser. The cannula was replaced with a beveled one. The tongue of the cannula was turned to protect the neural tissue by overriding the posterior body (Fig. 1a). After endoscopic confirmation (Fig. 1b), the posterosuperior portion of the body was subcortically fenestrated with a cutter from the ipsilateral to the contralateral side of the pedicle (Fig. 1c). An eggshell like bony remnant and ligamentous elements were removed with a side-firing laser and forceps under endoscopic control (Fig. 2). To work through the endoscope, hydrostatic pressure was applied by means of a semiclosed system, with a rubber cap placed on the top of the irrigator connector combined with a can-

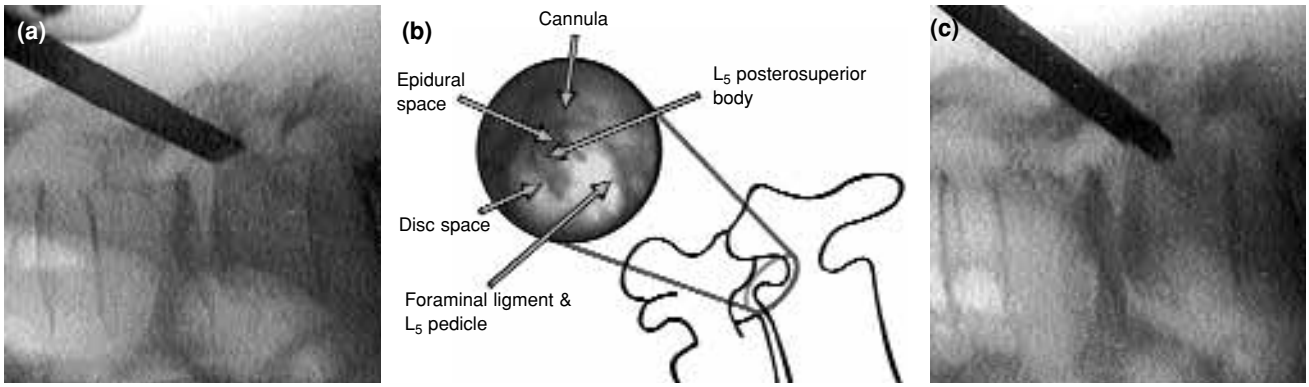

Fig. 1. (a) Lateral C-arm image demonstrating protection of dura by a beveled cannula. **(b)** Endoscopic image demonstrating that the posterosuperior L_5 body is exposed to be cut before turning of the cannula. **(c)** Anteroposterior C-arm image demonstrating fenestration of the interpedicular portion of the L_5 body with a cutter.

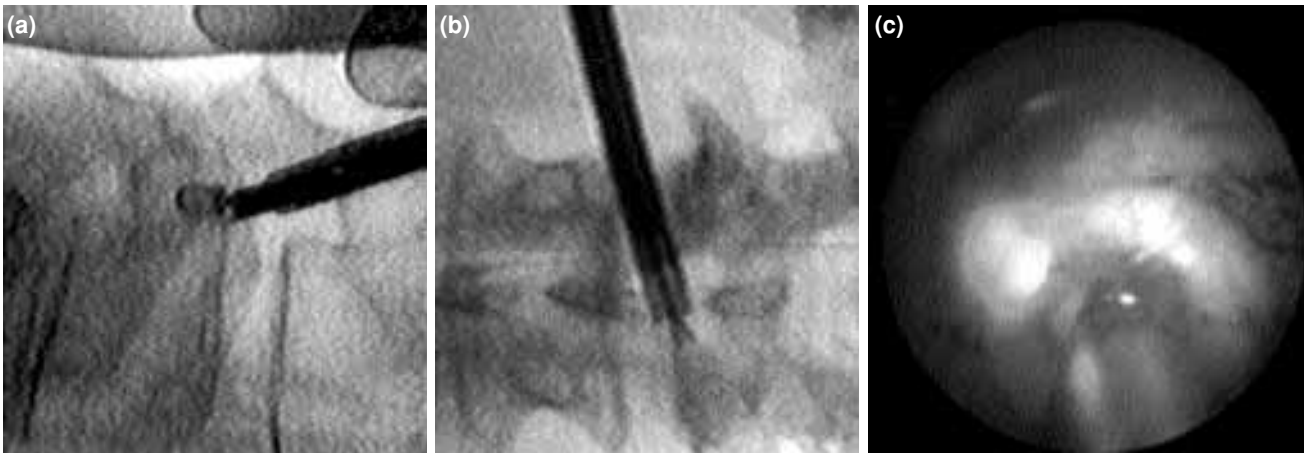

Fig. 2. The eggshell like bony remnant and ligamentous elements are removed by **(a)** forceps and **(b)** laser under **(c)** endoscopic view.

nula to control bony and epidural bleeding. As with open procedures, venous bleeding was reduced after sufficient decompression. Following inspection of the ventral side of the thecal sac, and after traversing the nerve roots, the cannula was taken out. A postoperative CT scan was obtained in order to confirm that sufficient decompression had been achieved (Fig. 3). The illustration shows the change in preoperative stair-like anterolisthesis to a slopy course after the removal of the posterior part of the lower vertebra (Fig 4).

Fig. 3. A postoperative sagittal reformatted CT scan in bone windows demonstrating that the posterior body of L_5 has been removed.

RESULTS

The mean operation time was 72±16.9 minutes (range 50 to 100 min). The mean ODI score improved from 72.2% (range 51% to 91%) to 27.4% (range 4% to 54%). All the patients could walk without any difficulty after surgery. Postoperative sagittal reformatted CT images demonstrated an enlarged spinal canal in all the patients (Fig 3). The only complication was transient quadriceps weakness in one patient. None of the patients had infection, discitis, dysesthesia, dural tears, or vascular injury.

DISCUSSION

Surgical treatments for DLS can be broadly divided into decompression with fusion (with or without instrumentation) and decompression alone.[6-9] In elderly, medically compromised and osteoporotic patients, decompression without fusion is usually preferred.[10-12] This traditional decompression technique is usually described as the removal of posterior bony elements, with or without discectomy.

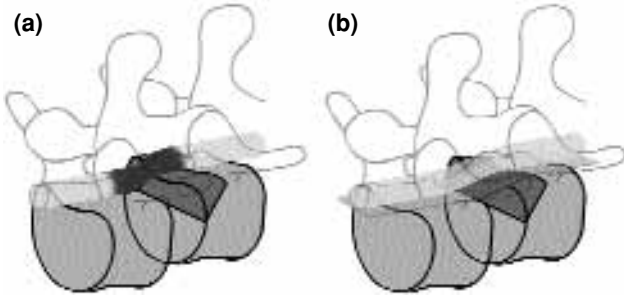

Fig. 4. Demonstration of the appearance **(a)** prior to (stair) and **(b)** after (slope) cutting the posterior part of the lower vertebra.

However, the pathologic anatomy of DLS consists of anteriorly translated inferior facets of the upper vertebrae (posterior elements) and a posterior body of the lower vertebrae (anterior elements) with intervertebral disc degeneration. Neural decompression in DLS is possible either posteriorly or anteriorly. However, a previous study showed that 10% of the patients required additional fusion surgery due to the progression of spondylolisthesis following posterior decompression alone.[11] To avoid the risk of progression, anterior decompression without violation of the posterior elements is considered to be the ideal method in patients who are not eligible for fusion surgery. Satomi et al.[2] reported good results following anterior lumbar interbody fusion alone. However, this method bears the potential drawbacks of fusion surgery.[13] Therefore, the authors felt that a posterolateral transforaminal endoscopic approach might be an ideal solution to accomplish anterior decompression without violation of the posterior elements. In DLS, the intervertebral bony foramen is elongated anteroposteriorly, and the exiting root is displaced more anteriorly. In this study, insertion of the endoscopic cannula was found to be easier in patients with DLS than is normally the case, and the redundant posterior annulus could be removed without difficulty. The simple turning of the beveled cannula, with its tongue facing the vertebral body, could protect the dura during fenestration. By combining fenestration and endoscopic removal, we could perform a safe pedicle-to-pedicle decompression without violation of the facet. This percutaneous ventral decompression of the posterior body of the lower vertebra was performed in three medically compromised, geriatric patients, without progression of spondylolisthesis during the follow-up period.

It is our opinion that, in medically compromised, geriatric patients with degenerative spondylolisthesis, percutaneous ventral decompression of the posterior body of the lower vertebra can be successfully accomplished with a satisfactory outcome. Whether this technique is applicable to all patients with degenerative lumbar spondylolisthesis is in question because of the small number of cases and short follow-up period in this study. This technique, however, enabled medically compromised, geriatric patients to regain their independence and return to their normal activity levels. This procedure can be readily performed by surgeons who have sufficient experience with percutaneous endoscopic procedures.

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