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Original research article

Unilaterally posterior lumbar interbody fusion with double expandable peek cages without pedicle screw support for lumbar disc herniation

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ABSTRACT

Objectives: Posterior lumbar interbody fusion (PLIF) is usually bilateral procedure, and it is combined with posterior by bilateral pedicle screw support or with fixation. The purpose of this retrospective study was to compare the surgical outcomes of simple discectomy and PLIF without pedicle screw support in patients with lumbar disc herniation (LDH).

Patients and methods: 60 patients with single segment LDH were operated between February 2010 and June 2013. 40 patients were treated with simple discectomy (Group 1) and 20 patients were treated with PLIF using double expandable polyetheretherketone (PEEK) cages without instrumentation (Group 2) unilaterally. Pain and function were evaluated by the visual analog scale (VAS) and Oswestry disability index (ODI) before and 18 months after surgery. Besides, PLIF patients were evaluated with computerized tomography (CT) scan of lumbar vertebra for the evaluation of the height of the disc, instability and fusion.

Results: Both leg and low back pain VAS scores were significantly improved 18 months after surgery in both of the groups ($p < 0.001$). Significant decrease in VAS low back pain scores was seen in group 2 when compared to group 1 ($p < 0.001$). Height of the intervertebral disc space was preserved and no instability was detected in group 2. No recurrence and 80% fusion rate was achieved in group 2.

Conclusion: This study showed that unilateral PLIF intervention with double expandable PEEK cages without pedicle screw support would be sufficient in the management of single segment lumbar disc herniation in patients whom are thought to have lumbar stabilization.

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1. Introduction

Lumbar disc herniation (LDH) is one of the most common reasons for back and leg pain. Surgical management is considered in patients unresponsive to conservative treatment. Excision of the herniated nucleus pulposus with lumbar discectomy is still the most effective treatment option in this disease. [1,2]. Although discectomy has successful clinical outcome in the early period, its success rate decreases to 40–80% in the long term due to residual low back pain and recurrence disc herniation [3–5]. To avoid residual low back pain and recurrence of disc herniation, combination of interbody fusion with discectomy is advised [6,7]. The necessity and efficiency of utilizing fusion after simple discectomy in patients with single segment lumbar disc herniation is still controversial [3,5,8–11].

Various techniques like transforaminal lumbar interbody fusion (TLIF), anterior lumbar interbody fusion (ALIF), posterior lumbar interbody fusion (PLIF) and interbody cage devices have been described for fusion [1,5,12–14]. PLIF was first defined by Cloward for lumbar disc herniation [8]. Autograft, allograft, interbody cages are used for fusion in PLIF technique. Recently, expandable interbody cages are being used in PLIF. The advantages of expandable interbody cages in preservation of the intervertebral disc, height of the foramina and segmental lordosis have been shown [15,16]. Its other advantages are providing mechanical support and increasing the surface area for bone fusion. Its efficiency has been evaluated a few number of studies [15]. PLIF is usually a bilateral procedure. It is combined with posterior bilateral pedicle screw supporter with fixation. On the other hand, it is well known that unilateral facetectomy has not cause important instability [6,17,18]. Is posterior fixation with pedicle screws necessary for PLIF in unilateral facetectomy performed patients?

In this retrospective study, the clinical outcomes of bilateral lumbar expandable tool locked polyetheretherketone (PEEK) cage application without fixation via unilateral approach for PLIF and simple discectomy in patients with single segment lumbar disc disease who did not have prominent radiological instability were compared. Radiological findings in PLIF patients were also presented.

The purpose of our study is to evaluate the adequacy of PLIF with expandable PEEK cages without the support of the pedicle screw in patients with single level lumbar disc herniation with preserved intervertebral disc height and comparison of this technique with standard discectomy procedure according to clinical and radiological responses.

2. Materials and method

2.1. Patient selection

60 patients who were operated for lumbar disc herniation in our neurosurgery department from February 2010 to June 2013 were enrolled in the study. 40 patients underwent simple discectomy (Group 1). Unilateral PLIF application without posterior fixation with pedicle screw was performed to the remaining 20 patients (Group 2). Hospital archives and PACS were retrospectively analyzed. The inclusion criteria was; being 20–60 years old, back and unilateral leg pain unresponsive to at least 2 months of conservative treatment, single segment unilateral disc herniation seen on magnetic resonance imaging (MRI) and the presence of dynamic X-ray imaging preoperatively. Patients with preserved intervertebral disc height were enrolled in this study. Patients who had instability on the preoperative dynamic X-ray imaging of the lumbar region, presence of multilevel lumbar disc herniation, history of previous surgery were excluded from the study.

2.2. Surgical procedure

All patients underwent surgery under general anesthesia in the prone position. 40 patients underwent simple discectomy procedure (Group 1). After proper skin preparation followed by nearly a 5 cm skin incision, paravertebral muscles were dissected unilaterally. Partial hemilaminectomy was performed. Then, ligamentum flavum was excised. Simple discectomy was performed by clearance of disc tissue pressuring the neural tissue. The operation was terminated after ensuring the relief of neural tissue. After unilateral facetectomy, aggressive discectomy was performed and the endplates were shaved with the help of a curette on the symptomatic side in the PLIF group (Group 2). The expandable PEEK cage (CK Group, Tr, Turkey) supported with autograft and allograft bone grafts was placed in the intervertebral disc space. After the first cage was expanded it was pushed to pass the midline. Its placement was visualized with the fluoroscope then the second cage was placed on the same side and it is expanded (Fig. 1). The cages were carefully selected according to the height of the intervertebral disc space. Ultimate care was taken to avoid probable neural damage.

2.3. Outcome measures

Age, gender, level of surgery, durations of surgery and hospital stay were recorded for each patient. All of the patients had follow-up visits on the 2nd week, 12th and 18th months postoperatively. All of the patients underwent direct X-ray imaging in the early postoperative period and on the 12th month. PLIF patients were evaluated with CT scan of lumbar vertebra for the evaluation of the stability and fusion on the 12th month. The height of intervertebral disc space, lumbar axis and fusion rates were recorded based on CT imaging.

Oswestry disability index (ODI) scores and visual analog scale (VAS) pain scores were evaluated preoperatively and on the 18th months follow-up after surgery. The VAS pain score was measured by asking the patient to locate the severity of the pain on a horizontal line and score it on a scale of 0 to 10, with 0 representing no pain and 10 representing the most severe pain. The Oswestry low back pain disability questionnaire is an international tool in which disability is scored as follows: 0 to 20, minimal disability; 20 to 40, intermediate degree of disability; 60 to 80, disabling pain; and 80 to 100, bedridden with severe pain.

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