



# Efficacy of the Percutaneous Laser Disc Decompression in Patients with Lumbar Disc Herniation

## Lomber Disk Hernili Hastalarda Perkütan Lazer Disk Dekompresyonunun Etkinliği

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### ABSTRACT

**Aim:** The aim of this study is to examine the safety and efficacy of the Percutaneous Laser Disc Decompression which is applied to patients with lower back pain and radiculopathy due to lumbar disc hernia.

**Material and Method:** In this study, we retrospectively examined the data of patients who underwent Percutaneous Laser Disc Decompression. Consecutive 71 patients who underwent Percutaneous Laser Disc Decompression between 2014 and 2015 were included in the study (average age 38.6±7.3). Visual Analog Scale was used in order to evaluate the pain levels of patients. Preoperative Visual Analog Scale scores were compared to scores obtained from the last examination. Student paired-sample t test was used in order to analyze all parameters by considering the statistical significance as p<0.05.

**Results:** There were 15 patients who were operated at L3–4 segment, there were 30 patients who were operated at L4–5 segment and there were 26 patients who were operated at L5–S1 segment. Mean Visual Analog Scale scores of patients before the operation decreased from 6.5±1.2 to 3.4±0.7 in the last neurological examination. All changes were statistically significant.

**Conclusion:** In selected cases, Percutaneous Laser Disc Decompression is an effective and safe technique in the short and medium term.

**Key words:** lumbar disc herniation; percutaneous laser decompression; pain

### ÖZET

**Amaç:** Bu çalışmanın amacı lomber disk hernisine bağlı bel ağrısı ve radikülopatisi olan hastalara uygulanan Perkütan Lazer Disk Dekompresyonu'nun etkinliğini ve güvenliğini araştırmaktır.

**Materyal ve Metot:** Çalışma Perkütan Lazer Disk Dekompresyonu uygulanan hastaların dosyalarının retrospektif olarak taranması ile hazırlandı. 2014–2015 yıllarında Perkütan Lazer Disk Dekompresyonu uygulanan ardışık 71 hasta (ortalama yaş 38,6±7,3) çalışmaya dahil edildi. Visual Analog Skala hastaların ağrılarının değerlendirilmesi için kullanıldı. Preoperatif Visual Analog Skala skorları, son muayenedeki

skorlarıyla karşılaştırıldı. Tüm parametreler Student paired-sample t test ile analiz edildi ve p<0,05 istatistiksel olarak anlamlı kabul edildi.

**Bulgular:** L3–4 mesafesinden opere olan 15, L4–5 mesafesinden opere olan 30, L5–S1 mesafesinden opere olan 26 hastaydı. Hastaların operasyondan önceki ortalama Visual Analog Skala skoru 6,5±1,2'ten son nörolojik muayenelerinde ise 3,4±0,7'e düşmüştü. Tüm değişiklikler istatistiksel olarak anlamlıydı.

**Sonuç:** Seçilmiş olgularda Perkütan Lazer Disk Dekompresyonu'nun kısa ve orta dönemde etkin ve güvenli bir yöntem olduğu görülmüştür.

**Anahtar kelimeler:** lomber disk hernisi; perkütan lazer dekompresyon; ağrı

### Introduction

Low back pain is one of the reasons for morbidities which lead to severe medical and socio-economic problems<sup>1,2</sup>. The 50–80% of the population experience lower back pain in their lives<sup>3</sup>. Lumbar disc herniation (LDH) is the most common reason for the lower back pain<sup>4</sup>. Majority of patients who experience lower back pain due to LDH get benefit from conservative treatment methods whereas the pain becomes chronic in some of them<sup>5</sup>.

Minimal invasive techniques such as transforaminal injections, facet joint injections, epidural steroid injections, intradiscal electrotherapy, nucleoplasty, and Percutaneous Laser Disc Decompression (PLDD) are frequently used in the treatment of LDH as the spinal anatomy is better understood and technical opportunities are further developed<sup>6</sup>.

PLDD has been applied for a long time and this minimal invasive technique aims to ensure the evaporation of the water in the nucleus pulposus and thus it decreases the pressure in the intradiscal pressure<sup>7</sup>. In this study, data of patients who were applied PLDD due to LDH were retrospectively examined.

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## Material and Method

In this study, we included 71 patients who were applied PLDD between 2014 and 2015. Patients who had disc herniation in their lumbar magnetic resonance imaging (MRI), who had radicular pain correlated with MRI results, and who had only one lumbar disc hernia were operated. All patients had the conservative and physical treatment more than three months but none of them got benefit from the physical treatment. We excluded patients who previously had spinal surgery, who were morbid obese (body mass index (BMI)>40), who previously had spinal fracture, who had the radicular pain because of more than one disc level, who had severe disc degenerations (the loss of disc height more than 50%), who had sequestered disc hernia, and whose PLL was not intact, who had cauda equina syndrome or progressive neurological deficit, and who had instability and spondylolisthesis. PLDD was not applied to these excluded patients.

Visual Analog Scale (VAS) scores were recorded in order to evaluate the lower back and leg pain before the operation and in the last clinic examination.

### Surgical Procedure

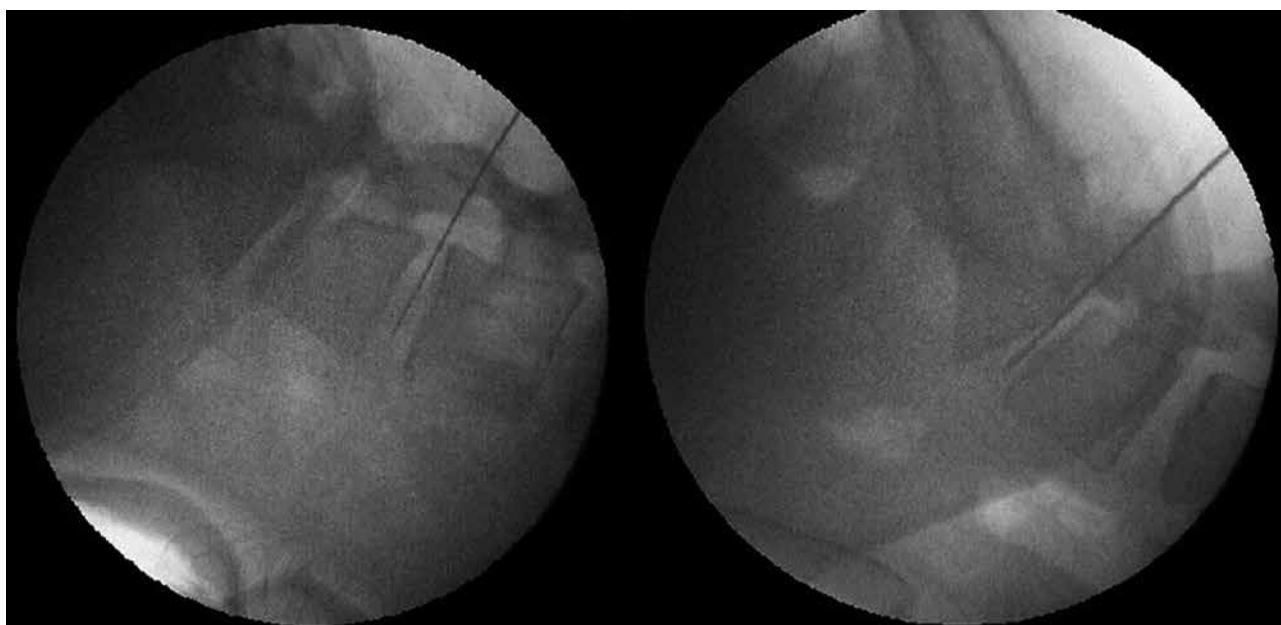
All surgical interventions were performed by the same surgeon. A good prone positioning of the

patient was ensured on the operation table and the distance determination was performed by using fluoroscopy. The needle entry hole was anaesthetized with the help of the local lidocaine injection as it is not deeper than the facet joint. Then, 18G needle was moved as it reaches the center of the nucleus pulposus and as it is parallel to the end plates. After ensuring that the needle enters into the nucleus pulposus by passing the annulus fibrosus, laser enters the fiber disc through the guide wire (Fig 1). Totally 1500 J (0.6 second pulse, 75 J for each pulse) laser energy was provided into the disc. The remaining gas was aspirated with the help of the aspirator and the intervention was finalized.

All statistical analyses were performed by using SPSS 18.0. Student t-paired sample t test was used in the analysis of VAS scores.  $P < 0.05$  was accepted as the statistical significant.

## Results

Of the 71 patients, 41 of them were female and 30 of them were male. The mean age was  $38.6 \pm 7.3$ . There were 15 patients who were operated at L3-4 segment, there were 30 patients who were operated at L4-5 segment and there were 26 patients who were operated at L5-S1 segment.



**Figure 1.** Portable X-Ray shows laser fiber at the level of the L4-5 and L5-S1 nucleus pulposus.

MRI was performed in patients before the operation and also in the last clinic examination (Fig. 2). Last neurological examinations of patients were performed after  $6.8 \pm 1.2$  months of the operation.

Mean VAS scores of patients before the operation was  $6.5 \pm 1.2$  (range 4 to 8) whereas VAS scores decreased to  $3.4 \pm 0.7$  (range 1 to 5) in the last neurological examination. All changes were statistically significant ( $p < 0.05$ ).

In this series, no major complications were observed. One patient was operated with microdiscectomy during the follow-up period (1.4%) whereas one patient had a spondylodiscitis (1.4%) and was treated with medical therapy.

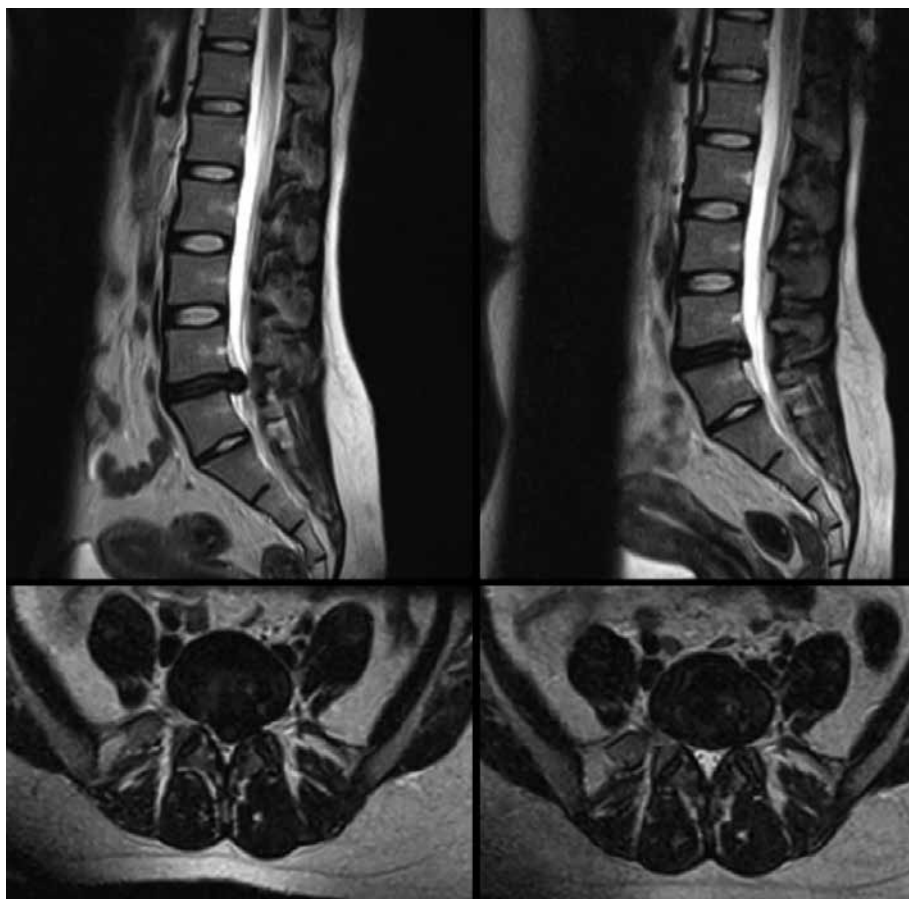
## Discussion

LDH is one of the most frequent reasons of lower back pain and radiculopathy (4). In the treatment of

the LDH, generally conservative treatment methods are used. However, surgical interventions are applied to patients who do not get benefit from the medical therapy<sup>1</sup>. Minimal invasive techniques such as nucleoplasty and PLDD are frequently used in the treatment of LDH as the spinal anatomy is better understood and technical opportunities are further developed<sup>8</sup>.

The PLDD treatment principle depends on the closed hydraulic system theory. Laser energy aims to decrease the pressure of the nucleus pulposus and peridiscal tissues by leading to the evaporation in the nucleus pulposus. In experimental studies, only 1.0 ml decrease in the intradiscal volume causes the decline in the pressure (312 kPa decrease). The decreased pressure in the center leads to the disc to retreat back to the hernia<sup>9</sup>.

PLDD has been performed more than 50000 patients till now. ND-yag laser was primarily applied by Choy in 1986 and there was a 75% success rate<sup>10</sup>. Then, laser



**Figure 2.** Preoperative and postoperative 6 months sagittal and axial MRI findings of 38 years old female patient.

technology was developed and Ion Resonance Laser, Excimer Laser and Argon Laser types were developed. In a retrospective study performed by Menchetti et al., they applied PLDD in selected patients and they reported that there was a 70% success rate in the 5 years follow-up period and there was no complication<sup>11</sup>. Gronemeyer had 74% successful results in the 4 years follow-up period of 200 patients<sup>12</sup>. Lee and Kang concluded that the appropriate patient selection is one of the most important factors which can affect the success rate in PLDD. They also stated that Nd:Yag laser gives positive results<sup>13</sup>. Kim determined criteria for patients who are required to be operated by using PLDD technique and suggested that PLDD should be applied to patients who have leg and lower back pain, who have protruding discs without sequestered disk according to MRI results, who have persistent pain despite the noninvasive treatments are applied more than three months, who do not have segmental instability and who do not have psychogenic factors<sup>14</sup>. In our study, we applied these criteria and we obtained results similar to the findings of the literature.

There are two limitations of the study. Primarily, the study is a retrospective study. Secondly, there is no control group in the study.

Conclusively, this study shows that PLDD is an efficient and safe technique in a short and medium term and it can be efficiently applied to patients with leg and lower back pain due to LDH.

## References

- Jacobs WC, Van Tulder M, Arts M, Rubinstein SM, van Middelkoop M, Ostelo R, et al. Surgery versus conservative management of sciatica due to a lumbar herniated disc: A systematic review. *Eur Spine J* 2011;20:513–22.
- Manchikanti L, Singh V, Calodney AK, Helm S 2nd, Deer TR, Benjamin RM, et al. Percutaneous lumbar mechanical disc decompression utilizing Dekompressor®: an update of current evidence. *Pain Physician* 2013;16:1–24.
- Nachemson AL. Newest knowledge of low back pain: A critical look. *Clin Orthop* 1992;279:8–20.
- Gupta S, Gupta M, Nath S, Hess GM. Survey of European pain medicine practice. *Pain Physician* 2012;15:983–94.
- Rubinstein SM, van Middelkoop M, Assendelft WJ, de Boer MR, van Tulder MW. Spinal manipulative therapy for chronic low-back pain: An update of a Cochrane review. *Spine* 2011;36:825–46.
- Erbas YC, Pusat S, Erdogan E. Percutaneous Laser Disc Decompression: Retrospective Analysis of 197 Cases and Review of The Literature. *Turk Neurosurg* 2015;25:766–870.
- Singh V, Manchikanti L, Benjamin RM, Helm S, Hirsch JA. Percutaneous lumbar laser disc decompression: A systematic review of current evidence. *Pain Physician* 2009;12:573–88.
- Brouwer PA, Brand R, van den Akker-van Marle ME, Jacobs WC, Schenk B, van den Berg-Huijsmans AA, et al. Percutaneous laser disc decompression versus conventional microdiscectomy in sciatica: a randomized controlled trial. *Spine J* 2015;15:857–65.
- Menchetti PPM, Bini W. Percutaneous treatment in lumbar disc herniation. In: *Minimally Invasive Surgery of the Lumbar Spine*. Springer Verlag 2014:83–105.
- Choy D. Percutaneous laser disc decompression (PLDD). *J Clin Laser Med Surg* 1998;16:325–33.
- Menchetti PPM, Canero G, Bini W. Percutaneous laser discectomy: Experience and long term follow-up. *Acta Neurochir Suppl* 2011;108:117–21.
- Gronemeyer DH, Buschkamp H, Braun M, Schirp S, Weinsheimer PA, Gevargez A. Image-guided percutaneous laser disk decompression for herniated lumbar disks: A 4-year follow-up in 200 patients. *J Clin Laser Med Surg* 2003;21:131–8.
- Lee SH, Kang HS. Percutaneous endoscopic laser annuloplasty for discogenic low back pain. *World Neurosurg* 2010;73:198–206.
- Kim PS. Nucleoplasty. *Tech Reg Anesthesia Pain Man* 2004;8:46–52.