

LUMBAR INTRADURAL DISC PENETRATIONS**LOMBER INTRADURAL DİSK PENETRASYONLARI****Serdar KAHRAMAN*, Sait ŞİRİN*, Ferhat HARMAN*, Ersin ERDOĞAN*****SUMMARY:**

Intradural lumbar disc herniations are unusual clinical pictures. The purpose of this paper is to discuss the incidence, clinical presentation, imaging and surgical management of intradural lumbar disc herniation. We present the cases of intradiscal herniated lumbar disc and intradural herniated lumbar disc as a special part of degenerative disc diseases. Since no extradural extruded disc fragment observed, intradural exploration must added to routine approach. All patients completely recovered after the surgery. Although preoperative imaging studies may not help us in the diagnosis of lumbar intradural disc herniation, the rare condition of intradural penetration of extruded disc should be kept in mind to explore the intradural compartment.

Keywords: Intradural, Intradiscal, Lumbar disc herniation

Level of Evidence: Case Report, Level IV

ÖZET:

Intradural lomber disk herniasyonları alışılmadık klinik durumlardır. Bu yazının amacı intradural lomber disk hernilerinin sıklığı, klinik görüntüsü, görüntüleme ve cerrahi tedavisini tartışmaktır. Biz dejeneratif disk hastalıklarının özel bir kısmı olan intradisküler lomber disk herni olgularını sunduk. Ektradural ekstrude disk fragmanı görülmediği sürece rutin yaklaşıma intradural eksplorasyon eklenmelidir. Tüm hastalar cerrahiden sonra tamamen düzeldi. Her ne kadar ameliyat öncesi yapılan görüntüleme çalışmaları lomber intradural disk herniasyonunun tanısında bize yardımcı olamadıysa da, ekstrude diskin nadir bir şekli olan intradural penetrasyon intradural kompartmanı eksplere edilirken akılda tutulması gereken bir durumdur.

Anahtar kelimeler: İntradural, intradisküler, lomber disk hernisi

Kanıt Düzeyi: Olgu sunumu, Düzey IV

(*) * Department of Neurosurgery, Gülhane Military Medical Academy, Ankara, Turkey

INTRODUCTION:

Intradural lumbar disc herniation (IDH) is a rare event, which was first described by Dandy ⁽⁷⁾, in 1942. Since then, over 120 cases have been reported in literature. Intraradicular disc herniation is a less common event compared to intradural disc herniation and only 20 cases have been reported so far ^(1,2,9,11,19,22,25-27,30,33-34), the first being described by Barbera et al. in 1984 ⁽⁴⁾. 92% of reported IDH's are seen in the lumbar, 5% in the thoracic and 3% in the cervical region. 0.04-0.33% of disc protrusions in the lumbar region are located intradurally ⁽²¹⁾. Despite the advances in neuroradiological imaging, it is still difficult to identify the lesion prior to surgery ⁽²¹⁾.

We present the cases of intradural herniated lumbar disc where preoperative diagnosis was not possible.

MATERIAL AND METHOD:

During 15-year period 1914 patients with lumbar disc herniation underwent surgery in our department. Out of these patients, intraradicular

disc herniation in two patients and intradural disc herniation in one patient were observed during surgery. The mean age was 43.6 years (range, 35-58) and male/female ratio was 1/2 (Table 1). In none of the patients a true preoperative diagnosis of intradural disc herniation could be made. After routine hemilaminotomy and foraminotomy, a consistent disc herniation was not observed and intradural exploration was selected due to tightness, enlargement and immobility of the root or the dural sac. Midline dural opening was performed for the intradural disc herniation and a small durotomy over the root was used in two patients with intraradicular disc herniation. With careful microdissection, free disc fragments were removed in all patients. A tear in the anterior wall of the dura was observed in the patient with intradural disc herniation but the similar intraoperative finding was not seen in two patients with intraradicular disc herniations. After removal of the disc fragments, roots were soft and mobile. Only midline dural opening was repaired primarily in the patient with intradural disc herniation.

Tablo - 1. Characteristics of the patients with lumbar intradural disc penetration.

Case #	Gender	Age	Level	Neurodeficit	Location	Surgery
1	Male	58	Left L4-5	Muscle weakness 4/5, hypoesthesia	Intradural	Total laminectomy + midline durotomy
2	Female	35	Left L5-S1	Absent Achilles reflex, hypoesthesia	Intraradicular	Hemilaminotomy + durotomy over root
3	Female	38	Right L5-S1	Absent Achilles reflex, hypoesthesia	Intraradicular	Hemilaminotomy + durotomy over root

RESULTS:

Postoperative course was uneventful in all patients and complaints of the patients disappeared immediately. Muscle weakness in one patient showed gradual improvement in the follow-up. No cerebrospinal fluid leakage was observed. One patient was discharged on the seventh day of surgery and the other two on the second day. All three patients had diagnosis of dural penetration of lumbar disc herniation during the surgery. Preoperative neuroimaging was not helpful for a definite diagnosis in all cases.

DISCUSSION:

Intradural lumbar disc herniation is a rare complication of disc disease and the first case was reported by Dandy in 1942⁽⁷⁾. The incidence of this condition in the lumbar region was 0.19-1.1 % of lumbar disc diseases. The highest incidence occurred in the fifth decade. The data suggests that the age incidence of this condition is one to two decades higher than the common disc herniation. Males represented 76% of the reported cases. Pain and neurological findings were worse than in patients with extradural lesions.

Intradural herniations are mostly seen at L4-5 level, followed by L5-S1 level, L2-3, and L1-2^(15,20). Intr radicular disc herniation, as a special type of intradural disc herniation, is a less common neurological disorder. It was first described by Barbera et al.⁽⁴⁾, in 1984. Since then twenty additional cases have been reported^(1,2,9,11,19,22,25,26,27,30,33,34).

Our cases are the 21st and 22nd cases of intr radicular herniated lumbar disc. All of the twenty-two patients were operated on with the diagnosis of lumbar disc herniation and intr radicular herniation was diagnosed during

surgery. All patients were immediately relieved of pain after surgery.

The retrospective analysis of 1914 patients, who received surgical treatment in our department within last 15 years, revealed an intradural disc herniation incidence of % 0.1. This rate is consistent with the other reports which indicate the rareness of this event⁽²⁰⁾.

The exact mechanism of intradural or intr radicular disc herniation is not known. Perforation of the posterior longitudinal ligament (PLL) and dura matter is required for intradural disc herniation to occur. Dandy⁽⁷⁾ reported that the sudden pressure of herniated disc on the anterior wall of the dural sac gradually erodes it until intradural penetration occurs. Blikra⁽⁵⁾ carried out an anatomic study of 40 cadavers, which revealed the presence of firm anatomic adhesions between the anterior wall of the dural sac and PLL, particularly at the L4-5 level. He suggested that these adhesions may be congenital fusions or may be caused by trauma, surgery, inflammation, osteophytes or disc protrusion fixed the dural sac. An anatomical study of 20 adult cadavers with no history of lower back pain and 20 late abortions and newborn infants revealed that there were only loose connections between the posterior longitudinal ligament and the anterior wall of dural sac at most levels. However, dense adhesions were observed in the lower cervical and lower lumbar regions. Interestingly, the adult and newborn/abortion groups were similar in terms of levels of adhesions, suggesting a congenital origin. Adhesions between the dura and the ligament cause fixation of the dural sac, and extruded disc material may tear the anterior wall of the dura. These adhesions probably occur as a result of several mechanisms, including traumatic irritation from a herniated disc, previous surgery^(2,15,21,31,34) or chronic local

inflammation^(12,31). However, this theory does not explain why intradural disc ruptures occur at the upper half of the lumbar, thoracic, and cervical sections of the spine. On the other hand, in the majority of the reported cases, there were no previous surgeries. Suzer et al.⁽³³⁾ contradicted with the authors who have suggested that previous lumbar surgery has been the cause of adhesion between the ventral dura and posterior longitudinal ligament or that intraradicular or intradural herniations have been occurred as a result of these adhesions. They thought that intraradicular or intradural herniations were being missed during routine lumbar disc surgery, and as a result of this subsequent surgery became necessary.

The neuroradiologic means adopted for our diagnoses were computed tomographic (CT) scanning and MRI. The use of myelography was abandoned several years ago, and the myelographic finding of intradural disc herniation is not specific. In about 65% of the cases, the finding is of a total myelographic block^(28,29), and is not always possible to determine intradural or extradural origin. CT scanning also does not provide a specific picture of intradural herniation^(3,13). The first descriptions of intradural lumbar disc herniation with MRI were by Epstein and Jenkins^(8,17). These authors reported the presence of an intradural formation corresponding with the intervertebral space in both T1- and T2- weighted images. The same finding was reported by Mercier⁽²⁴⁾ as well, but he did not notice any signal increase with contrast medium. These radiological pictures, being atypical for classic lumbar disc herniation pathology, are not specific and did not allow preoperative diagnosis in any case. Only in 1992, Wasserstorm⁽³⁵⁾ made a preoperative diagnosis of intradural lumbar herniation thanks to a MRI study with gadolinium. The author

described a 45-year-old man affected by intradural disc herniation at L4-5 level. Ring enhancement of the herniated formation in a T1-weighted image, after injection of contrast medium, was attributed to granulation tissue around lesion, which was later confirmed on histological examination. Whittaker⁽³⁶⁾ reported a clear enhancement of the herniated formation in a 66 year-old man after gadolinium injection. This patient had already undergone MRI study that merely evidenced lumbar disc protrusions of no surgical interest. The author believes that acute intradural disc herniations do not show the typical enhancement that, in his opinion, correlates to the age in which the pathology appears. In almost all cases described in literature, positive diagnosis of intradural herniation could be obtained only through surgery. Only eight cases of preoperative diagnosis are reported: two were obtained through CT scanning and myelography^(10,18) and six through MRI with the typical ring enhancement with contrast medium^(16,23,32,35,36).

The treatment of intradural disc herniations basically involves surgical removal of ruptured disc material⁽²¹⁾. In the surgical management of intradural disc herniations, routine hemilaminotomy and foraminotomy should be performed. No disc fragment in the extradural space, tense and immobile root, or enlarged root should lead us to intradural exploration to find a meaningful pathology supporting clinical and imaging findings. For midline dural openings, hemilaminotomy may be tailored to total laminectomy depending on the location and volume of the disc fragment. As pointed out by Kataoka et al., since the neurological prognosis appears to be closely connected to preoperative duration of neurologic symptoms, an indication for prompt surgical intervention must be a primary consideration for good recovery⁽²⁰⁾.

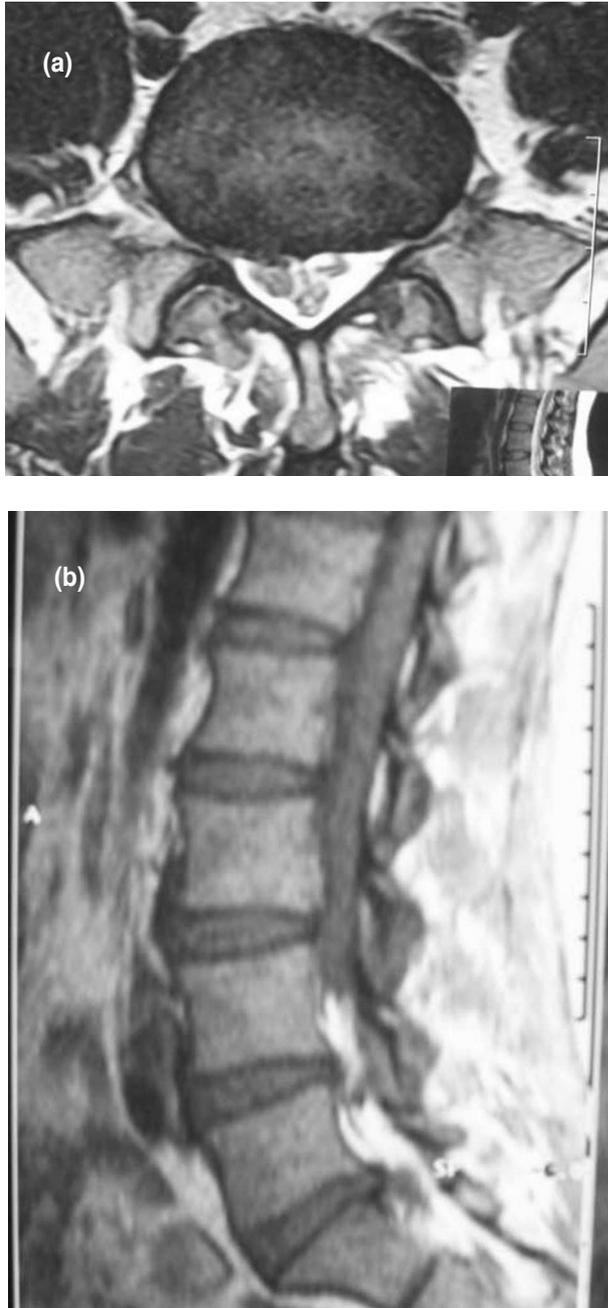


Figure 1. Axial T2 weighted (a) MR image shows enlargement of right S1 root and and sagittal T1 weighted (b) MR image shows extruded disc material.

CONCLUSION:

Although our study indicates a very low incidence for the intradural disc herniation, intradural and intraradicular disc herniations may

be more common than previously suspected and this pathological entity may be a factor in the failure of lumbar disc surgery. If we do not observe a disc herniation during surgery which is consistent with the clinical and radiological findings, we should suspect intradural or intraradicular disc herniation.

REFERENCES:

1. Acikgoz B, Ozcan OE, Iplikcioglu C, Sağlam S. Intraradicular disc herniation. *Neurosurgery* 1986; 19: 673-674.
2. Akdemir H, Oktem IS, Koc RK, Kavuncu I. Postoperative intraradicular lumbar disc herniation: a case report. *Neurosurg Rev* 1997; 20: 71-74.
3. Anda S, Dale LG, Vassal J. Intradural disc herniation with vacuum phenomenon. CT diagnosis. *Neuroradiology* 1987; 29: 407.
4. Barbera J, Gonzales-Darder J, Garcia-Vazquez F. Intraradicular herniated lumbar disc: Case report. *J Neurosurg* 1984; 60: 858-860.
5. Blikra G. Intradural herniated lumbar disc. *J Neurosurg* 1969; 31: 676-679.
6. D'Andrea G, Trillo G, Roperto R, Celli P, Orlando ER, Ferrante L. Intradural lumbar disc herniations: the role of MRI in preoperative diagnosis and review of the literature. *Neurosurg Rev* 2004; 27: 75-80.
7. Dandy WE. Serious complications of ruptured intervertebral discs. *JAMA* 1942; 119: 474-477.
8. Epstein NE, Syrquin MS, Epstein JA, Decker RE. Intradural disc herniations in the cervical, thoracic and lumbar spine. Report of three cases and review of the literature. *J Spinal Disord* 1990; 4396-4403.
9. Ergungor MF, Kars HZ. Intraradicular herniation of a lumbar disc: a case report. *Neurosurgery* 1987; 21: 909-911.
10. Fang CM, Huang TJ, Chen WJ, Lee ST, Hsu RW: Intradural lumbar disc herniation. A case report. *Chang Keng I Hsueh* 1994; 17: 297-300.
11. Finkel HZ. Intraradicular, intervertebral disc herniation. A case report. *Spine* 1997; 22: 1028-1029.

12. Graves VB, Finney HL, Mailander J. Intradural lumbar disc herniation. *AJNR* 1986; 7: 495-497.
13. Haughton VM, Elvedik OP, Magnaes B, Amundsen P. A prospective comparison of computed tomography and myelography and the diagnosis of herniated lumbar disks. *Radiology* 1982; 142: 103-110.
14. Hidalgo-Ovejero AM, Garcia-Mata S, Gozzi-Vallejo S, Izco-Cabezon T, Martinez-Morentin J, Martinez-Grande M. Intradural disc herniation and epidural gas: something more than a casual association? *Spine* 2004; 29: 463-467.
15. Hlavin ML, Hardy Jr RW. Lumbar disc disease. *Neurosurg Quarterly* 1991; 1: 29-53.
16. Isla AI, Roda Jmi Bencosme J, Alvarez MP, Blazquez MG. Intradural herniated dorsal disc. Case report and review of the literature. *Neurosurgery* 1988; 22: 737-739.
17. Jenkins LE, Bowman M, Colter HB, Gildenberg PL. Intradural herniation of a lumbar intervertebral disc. *J Spinal Disord* 1989; 2: 196-2200.
18. Kaiser MC, Sandt G, Roilgen A, Capesius P, Poos D, Ohanna F. Intradural disc herniation with CT appearance of gas collection. *AJNR Am J Neuroradiol* 1985; 6: 117-118.
19. Karabekir HS, Karagoz Guzey F, Kagnici Atar E, Yildizhan A. Intradicular lumbar disc herniation: report of two cases. *Spinal Cord* 2006; 44: 318-321.
20. Kataoka O, Nishibayashi Y, Sho T. Intradural lumbar disc herniation: report of three cases with a review of the literature. *Spine* 1988; 14: 529-533.
21. Koc RK, Akdemir H, Oktem IS, Menku A. Intradural lumbar disc herniation: Report of two cases. *Neurosurg Rev* 2001; 24: 44-47.
22. Lesoin F, Duquennoy B, Rousseaux M, Servato R, Jomin M. Intradural rupture of lumbar intervertebral disc: Report of three cases with review of the literature. *Neurosurgery* 1984; 14: 728-731.
23. Lidov M, Stollman A, Casden A, Som P, Bederson J. MRI of lumbar intradural disc herniation. *Clin Imaging* 1994; 18: 173-178.
24. Mercier P, Hayer G, Ben Ali H, Tounsi R, Fournier D, Menei P, Mansour BH, Guy G. Hernies discales lombaires intraducales. A propos de six cas et revue de la literature. *Neurochirurgie* 1997; 43: 142-147.
25. Mut M, Berker M, Palaoglu S. Intradicular disc herniations in the lumbar spine and a new classifications of intradural disc herniations. *Spinal Cord* 2001; 39: 545-548.
26. Nazzal MM, Croissant PD, Ali MA, Kaidi AA. Intradicular disc herniation: A case report and review of the literature. *J Spinal Disord* 1995; 8: 86-88.
27. Ozdemir N, Yilmaz HS, Acar UD, Tektas S. Intradicular lumbar disc herniation: report of two cases and review of the literature. *Br J Neurosurg* 2004; 18: 637-643.
28. Paini GP, Baldi PG, Barra N, Pasetti S. Rottura intradurale del disco intervertebrale. *Ateneo Parmense Acta Bio-Med* 1978; 49: 189-196.
29. Paini KC, Muduli H, Chander K, Kav VK. Intrathecal disc prolapse associated with lumbar canal stenosis. *Neurology (Bombay)* 1972; 20: 64-66.
30. Schisano G, Franco A, Nina P. Intradicular and intradural lumbar disc herniation: Experiences with nine cases. *Surg Neurol* 1995; 44: 536-543.
31. Smith RV. Intradural disc rupture. *J Neurosurg* 1981; 55: 117-120.
32. Snow RD, Williams JP, Weber ED, Richardson PH. Enhancing transdural lumbar disc herniation. *Clin Imaging* 1995; 19: 12-16.
33. Suzer T, Tahta K, Coskun E. Intradicular lumbar disc herniation: case report and review of the literature. *Neurosurgery* 1997; 41: 956-959.
34. Tsuji H, Maruta K, Maeda A. Postoperative intradicular intervertebral disc herniation. *Spine* 1991; 16: 998-1000.
35. Wasserstorm R, Mamourian AC, Black JF, Lehman RAW. Intradural lumbar disc fragment with ring enhancement on MR. *AJNR Am J Neuroradiol* 1993; 14: 301-304.
36. Whittaker CK, Bernhardt M. Magnetic resonance imaging shows gadolinium enhancement of intradural herniated disc. *Spine* 1994; 19: 1505-1507.