ISCoS The International Spinal Cord Society

www.nature.com/scsandc

CASE REPORT

Posterior epidural sequestrated disc presenting with contralateral radiculopathy: a very rare case

Withawin Kesornsak[1], Kanthika Wasinpongwanich[1,2]✉ and Verapan Kuansongtham[1]

INTRODUCTION: Posterior epidural sequestrated disc is a fairly uncommon condition. We report a case of an unusual presentation of posterior epidural migration with contralateral symptoms. We emphasize a high index of suspicion for early recognition and treatment to promote a good neurological recovery.

CASE PRESENTATION: A 58-year-old man with a history of severe back pain for 1 week developed sudden right leg weakness while walking. Neurological examination revealed motor and sensory impairments of the right lower extremities (positive right straight leg raising test, right tibialis anterior grade 2/5, right extensor hallucis longus grade 1/5, decreased pinprick sensation of L4-5 dermatome right side) according to the Standards for Neurological Classification of Spinal Cord Injury as Asia Impairment Scale D. Magnetic resonance images showed an acute disc herniation at L4-5 on the left side, cranially migrated and sequestrated to the posterior epidural area, causing severe compression to the cauda equina in the thecal sac. The patient was successfully treated with surgery (transforaminal lumbar interbody fusion) on an urgent basis. We saw significant neurological recovery on the first day after surgery. Motor power recovery was achieved with a minor deficit at 4 weeks. At the follow-up examination at 3 months, the patient had no residual neurological deficits as Asia Impairment Scale E.

DISCUSSION: Posterior epidural sequestrated disc with contralateral radiculopathy is very rare. This case brings a new presentation of posterior epidural sequestrated disc. To our knowledge, this is the first report of a case with an unusual presentation of contralateral radiculopathy.

Spinal Cord Series and Cases (2021)7:98 ; https://doi.org/10.1038/s41394-021-00460-z

INTRODUCTION

Lumbar disc herniation may be classified into protrusion, extrusion, and sequestrum [1]. Normally, the sequestrated pieces can migrate both upward and downward. The migration of sequestered pieces to the anterior, posterior epidural, or intradural spaces can occur, although it is rare [2–11]. A herniated disc with contralateral symptoms is also rare [12, 13], and the choice of surgical approach side is controversial [14, 15]. Magnetic resonance imaging (MRI) is helpful in the diagnosis and management of a herniated disc with contralateral symptoms [15, 16].

We report a case of an unusual presentation of posterior epidural migration with contralateral symptoms to highlight the diagnostic and treatment challenges it involved.

CASE PRESENTATION

A 58-year-old man, otherwise healthy, had chronic back pain for 2.5 years without radiating pain. After a long-distance drive, he developed severe back and leg pain and went to the hospital nearby, where MRI revealed an acute disc herniation. Conservative treatment by pelvic traction and medication for 4 weeks was attempted but was unsuccessful. Therefore, he was scheduled for surgery the following week. A few days after the patient initially presented at the hospital, he developed sudden and severe back pain with radiating pain and numbness on the right leg. The pain prevented him from moving his leg, and the right leg motor power worsened. He denied having numbness around the perianal area nor difficulties in urination and defecation.

On examination, the straight leg raising test was positive on the right side, weakness of the right tibialis anterior muscle was grade 2/5 and that of the extensor hallucis longus muscle was grade 1/5, and decreased pinprick sensation was noted at L4 and L5 dermatome on the right side Asia Impairment Scale D.

MRI of the L4-5 disc level on the left side demonstrated an iso- to hyposignal intensity mass on sagittal T1-weighted and hypersignal intensity mass on T2-weighted images, with upward migration and sequestration to the posterior epidural area compressing the thecal sac (Fig. 1).

Minimally Invasive Transforaminal lumbar interbody fusion surgery was performed with right side approach. The free disc fragment was found and removed from the left side. The operative finding demonstrated a large mass similar to the sequestrated piece of the L4-5 disc over the thecal sac. This epidural mass was sent to the lab for pathological analysis, and entire fragments of chondroid matrix were found to be interspersing with the intervertebral disc. Pain and motor power improved significantly a few days postoperatively, Right tibialis anterior grade 2/5 to 5/5, right extensor hallucis longus grade 1/5 to 3/5 on

[1]Spine Institute, Bumrungrad International Hospital, Bangkok, Thailand. [2]School of Orthopedics, Institute of Medicine, Suranaree University of Technology, Nakhon Ratchasima, Thailand. ✉email: Wasinpongwanichk@gmail.com

Received: 27 April 2021 Revised: 19 October 2021 Accepted: 26 October 2021
Published online: 06 November 2021

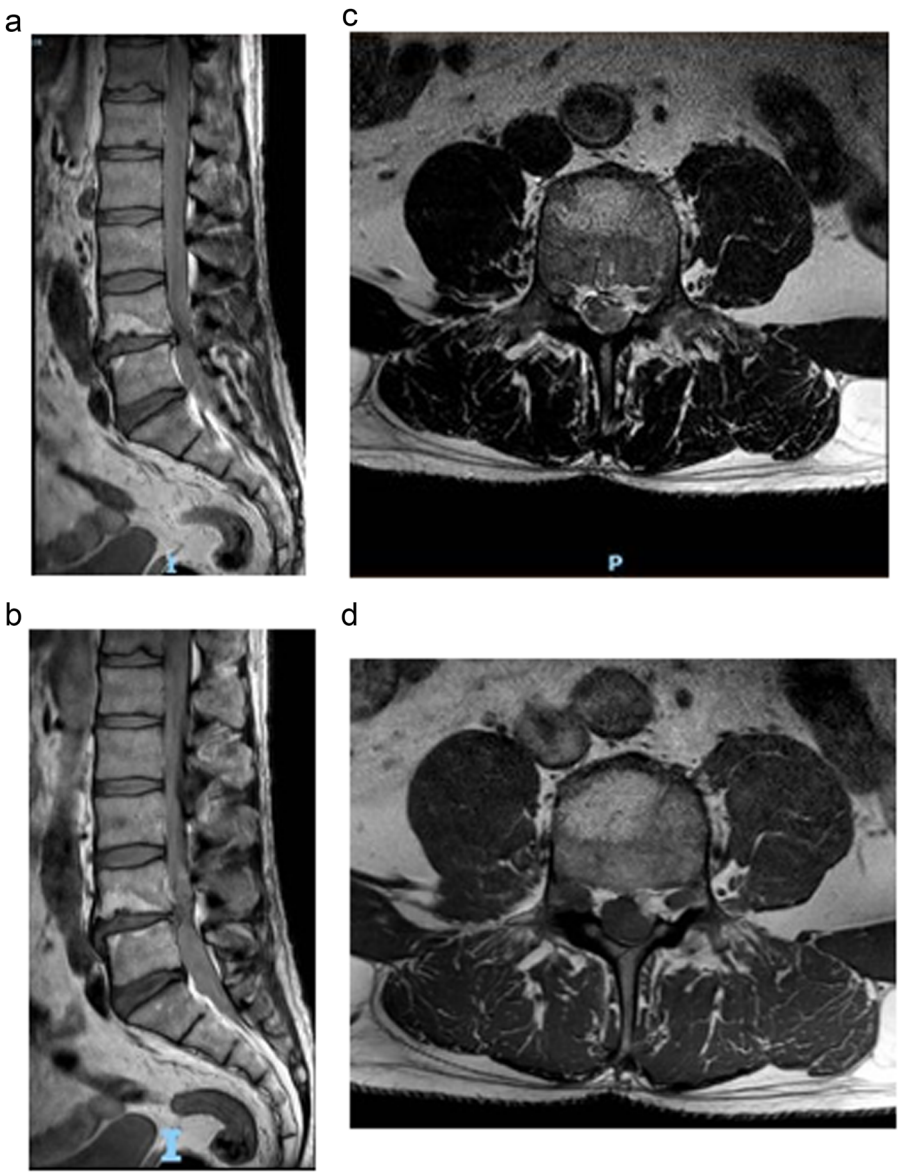

Fig. 1 Magnetic resonance images showing the herniated disc. a Sagittal T2-weighted image showing a hypersignal intensity mass at L4-5 on the left side, which has migrated upward and sequestrated to the posterior epidural area, compressing the thecal sac. **b** Sagittal T1-weighted image showing an iso- to hyposignal intensity mass at L4-5 on the left side. Axial T2-weighted (**c**) and T1-weighted (**d**) images showing an acute disc herniation compressing the thecal sac from the left side.

day 5 postoperatively. Numbness resolved on day 4 postoperatively. A 1 month follow up, right extensor hallucis longus was return to grade 5/5. Patient was allowed to resume daily activity at 3 months postoperatively Asia Impairment Scale E. Fig. 2

DISCUSSION

For lumbar disc herniation, the incidence of a sequestrated disc has been reported to be 28.6% [1]. Only 1.04% of the sequestratrum migrated to the posterior epidural space [17]. The first report of "posterior epidural migration of disc" in 1973 by Lombardi [18]. Most patients with posterior epidural sequestrated disc present with bilateral symptoms and different degrees of weakness [2–11, 19–21]. Moreover, bowel bladder involvement was not uncommon among patients with posterior epidural sequestrated disc [2–11, 19, 20]. Nearly half of patients (46.8%) have cauda equina syndrome [17]. The duration of symptoms varies from days to years [14]. The fastest progression of symptoms has been reported to be in 6 h [10], and the longest reported duration of symptoms was 11 years [22].

The case history of similar appearances on MRI is shown in Table 1. Most of the cases showed the posterior epidural mass with hyperintensity on T1-weighted images, iso- or hyperintensity on T2-weighted images, and rim/ring-like enhancement after Gadolinium injection [2–9, 11, 19, 20]. These MRI findings were often indistinguishable from tumor, infection, and hematoma [15].

Treatment of posterior epidural sequestrated disc was mostly surgical (e.g., decompressive laminectomy, hemilaminectomy, discectomy, and transforaminal lumbar interbody fusion) [2–11, 14, 20, 23]. Only one case was treated conservatively [6].

The recovery from symptoms was considered excellent. Most cases were completely recovered after surgical procedures. Time to complete neurological recovery has been reported from 1 month to 18 months [2, 10, 14, 22, 24].

The mechanism behind herniated disc causing contralateral radiculopathy symptoms in Posterior epidural sequestrated disc

Table 1. Summary of cases of posterior epidural sequestrated disc reported in literature.

	Level and cases	Clinical presentation	MRI	Management
Dösoğlu M [1]	L3-4, 1	Bilateral leg weakness and bowel and bladder retention.	Left L3–L4 posterior epidural lesion, ring-like enhancement after contrast injection.	An emergency left-sided L3–L4 fenestration.
Hyojun K [2]	L2-3, 1	Progressive bilateral weakness and pain in both legs without lumbago, no bowel bladder retention.	A mass-like lesion in L2-3 dorsal epidural space. The T2-weighted image (T2WI) showed a hyperintense lesion that was isointense and surrounded by hyperintense fat tissue on the T1-weighted image.	Decompressive laminectomy.
Mugge L [19]	L3-4, 1	Progressive neurological deficits including bilateral foot drop along with bowel and bladder dysfunction.	Herniated disk epidurally with disc extrusion and mass effect and compression at the L3-L4 level, wrapping around the posterior aspect of the dura.	Bilateral laminectomy of L3.
Kuzeyli K [4]	3 Case 1: L4-5 Case 2: L1-2 Case 3: L2-3	1: Left lateral leg pain, grade3/5 Left foot dorsiflexion. 2: Bilateral 2 of 5 weakness of the hip flexion, urinary incontinence. 3: Paraparetic with 3 of 5 muscle strength. The paresthesia was below L3.	1: Located posteriorly and laterally to the left aspect of the dural sac at L4–L5. 2: L1–2 at the posterior aspect of the thecal sac. On T1-weighted hyperdense, the lesion enhanced with gadolinium injection. 3: Isointense lesion at the left posterior epidural space of L2–L3 level, ring enhancing after gadolinium injection.	1: L4 left hemilaminectomy. 2: Right-sided standard L1 hemilaminectomy. 3: L2 left hemilaminectomy.
Robe P [5]	2 Case 1: L3-4 Case 2: L3-4	1: Bilateral anterior thigh paresthesias consistent with abnormal sensation. 2: Bilateral leg numbness and steppage gait,severe paresis of both plantar and dorsal flexors of foot.	1: A mass that was located posteriorly and laterally to the right aspect of the dural sac at the L3-4 level, ring-like enhancement after gadolinium injection. 2: A left posterolateral lesion in the epidural space, in relation to the L3-4 disc, Cyst like Gadolinium enhanced.	1: L3–4 laminectomy. 2: L3-4 laminectomy.
Tarukado K [6]	4 Case 1: L2-3 Case 2: L2-3 Case 3: L4-5 Case 4: L3-4	1: Low back pain and right anterior thigh pain. Hypesthesia of the L3 dermatome on the right side. 2: Left buttock and anterior thigh pain followed by low back pain. No sensory or motor disturbances. 3: Hypesthesia of the L4 and L5 dermatome on the left side and 4 of 5 strength on dorsiflexion of the left toes. 4: Hypesthesia was revealed in both legs, and 4 of 5 strength on dorsiflexion both feet. No bladder or bowel dysfunction	1: A mass in the posterior epidural space on the right side L2– L3 level., low- to isointensity on T1- and high and low intensities on T2- weighted MRI., rim enhancement after gadolinium (Gd) injection. 2: A posterior epidural lesion attached to the L2–L3 disc on the left side, rim enhanced after gadolinium (Gd) injection 3: A proximal migrated posterior epidural lesion attached to the L4–L5 disc on the left side. 4: Low- to isointensity on T1-weighted and high and low intensities on T2-weighted.	1-3: Conservative treatment. 4: L3–L4 laminotomy.
6. Hirabayashi S [7]	L2-3, 1	Grade 2 or 3 left lower extremities, grade 3 or 4 right lower extremities below the iliopsoas muscle, urinary disturbances.	An oval smooth rounded lesion at dorsal surface of dura mater at L2-3.	Left L2 hemilaminectomy.
Takano M [8]	L3-4, 1	Weakness with grade of 3 in the extensor hallucis longus and peroneus longus muscles of both legs, no urinary disturbances	A mass located posteriorly and laterally to the left aspect of the dural sac at the L3 level, heterogeneous ring-like enhancement.	L2-4 laminectomy.
Teufack SG [9]	L4-5, 1	Severe back pain with bilateral radiculopathy, 4/5 in the tibialis anterior and extensor hallucis longus in both lower extremities	A mass in the dorsal epidural space. Hyperintense on T1-weighted with a rim of enhancement after gadolinium injection; isointense to hyperintense on T2-weighted.	L4-L5 central laminectomy.
Bonaroti EA,1998 [10]	L2-3, 1	Motor power 4/5 proximal muscle, 3/5 distal muscle in both legs. Urinary disturbance.	A posterior Epidural lesion extending form L2-4.	L2-3 discectomy.

Table 1 continued

	Level and cases	Clinical presentation	MRI	Management
Li K [11]	L5-S1, 1	Intermittent low back pain, frequent urination Hypersthesia of the posterolateral aspect of the lower limb, no decline on motor power.	A tumor-like mass filling almost the entire spinal canal at the L5–S1 level, causing cauda equine compression. hypodense on T2-weighted and T1-weighted images, rim enhancement after gadolinium (Gd) injection.	L5-S1 standard total laminectomy.
Montalvo Afonso A [20]	,3 Case 1: L4-5 Case 2: L4-5 Case 3: L3-4	1: Progressive bilateral leg weakness, more on left side, urinary incontinence. 2: Intermittent lumbagos, progressive back pain with radiating leg right, no weakness, bowel bladder involvement. 3: Abnormal sensation L5 dermatome. No motor power and bowel bladder involvement.	1: Left extradural posterolateral lesion, isointense on T1 hyperintense on T2, severely compressing the thecal sac, rim enhancement after GD injection. 2: Hypointense T1 and hyperintense T2- weighted images lesion at the left posterior epidural L4–L5 space suggestive of disc fragment. 3: Large intradural lesion from midline to dorsal left radicular foramen at L3–L4.	1: An emergent L4–L5 bilateral laminectomy. 2: L4–L5 microdiscectomy and transforaminal interbody fusion (TLIF). 3: A thinned dorsal duramater.
Hawkins JC [23]	L4-5, 1	Back pain and a recent, acute progression of bilateral lower extremity (TA, EHL < grade 3/5) paresthesias and weakness.	Heterogeneous, but predominately T2-weighted, hyperintense mass in the left lateral and dorsal epidural spaces.	L4-5 laminectomy.
Theodorou DJ [14]	,3 Case 1: L2-3 Case 2: L4-5 Case 3: L4-5	1: Back pain with bilateral weakness 3/5 proximally on the left leg and 4/5 on the right leg, and 4/5 distally in both legs, impaired sensation. 2: Weakness of the EHL, and TA. There was mild hypoesthesia involving the L4 dermatome. 3: Weakness 3/5 proximally and there was decreased pinprick sensation in the L4–L5 dermatomes of the lower right extremity.	1: A posterior epidural mass lesion, compressing the spinal cord. The lesion was of intermediate T1- and increased signal intensity on T2- weighted, rim-enhanced after Gd injection. 2: A degenerative and extruded intervertebral disc at L4–L5 and a small mass lesion in the dural sac exhibiting increased signal intensity on both the T1-weighted and T2-weighted images. 3: An anterior epidural mass lesion at the L4–L5 level, compressing the thecal,similar to case 1.	1:Decompressive laminectomy. 2: 2-level laminectomy. 3: Decompressive laminectomy and discectomy.

EHL extensor hallicis longus, *TA* tibialis anterior, *Gd* gadolinium.

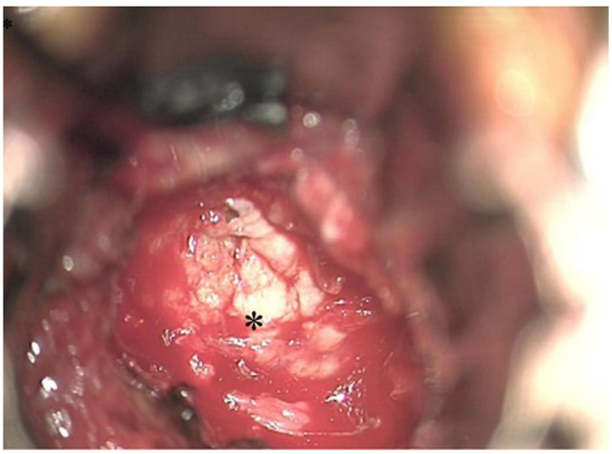

Fig. 2 Intraoperative Images. microscopic view, during minimally invasive transforaminal lumbar interbody fusion; the large sequestrated piece (*) of the L4-5 disc compressed the thecal sac.

emains unclear. However, the literature review confirmed that the phenomenon exists [25]. The series by Sucu and Gelal proved that contralateral disc herniation can be the cause of leg pain. In that study, they operated only on the predominant side of the herniation seen on MRI, and the contralateral symptoms resolved, which shows that sciatica probably was caused by neurological traction rather than by direct compression [22]. However, the explanation of the contralateral symptoms has not yet been established but probably multifactorial [25]. In this case, the different from the previous study as this is not herniated which compressed from the anterior but the epidural disc (compressed from posterior) that caused contralateral symptoms. Mirovsky and Halperin demonstrated five cases of eccentric compression of the spinal canal causing contralateral-side symptoms, and all cases had lesions occupying the space of the spinal canal at or above the herniated level [26]. The pressure applied to the spinal nerve root or the thecal sac may have impaired the intraneural blood flow [27]. Choudhury et al. described three cases with the prominence of spondylotic changes and stenosis contralateral to the side of disc herniation [12]. The absence of the dural ligament (Hoffman's ligament) was proposed by Kornberg to account for the situation; without the dural ligament, the ipsilateral nerve root can be easily displaced posteriorly, while the contralateral nerve root can be tracted, rather than the ipsilateral nerve root being compressed [13].

In the present case, the patient presented with rare symptoms, namely severe pain and weakness on the right side, while the L4-5 sequestrated disc was found mainly in the epidural area on the left side on MRI. Minimally invasive transforaminal lumbar interbody fusion was performed. Contrary to suggestions by Sucu and Gelal [22] and Mirovsky and Halperin [26] to surgically approach through the side of the compression according to imaging studies, we approached for facetectomy and discectomy as part of Transforaminal Lumbar Interbody Fusion from the side of the main symptoms (contralateral to disc herniation), which was the right side. "Over the top decompression" was not performed. The weakness, pain and paraesthesia of the right leg resolved on early postoperative days. Our findings support the hypotheses that the contralateral side symptoms may be associated with indirect pressure or traction to the contralateral side nerve, rather than direct compression by the disc [22, 26]. Therefore, the approach from the symptom side was suitable for this case.

Our findings are in line with those of a previous study that demonstrates practical value in diagnosis and surgical approach decision [26]. Contralateral herniation is often ignored by surgeons as a coincidental finding on MRI; however, if significant canal compromise is noted at the symptomatic level, we strongly suggest surgical consideration.

CONCLUSIONS

We report a rare case of posterior epidural sequestrated disc with an unusual presentation with contralateral radiculopathy. If significant canal compromise is noted at the symptomatic level, we strongly suggest surgical consideration.

REFERENCES

1. Brock M, Patt S, Mayer HM. The form and structure of the extruded disc. Spine (Philos Pa 1976). 1992;17:1457–61. https://doi.org/10.1097/00007632-199212000-00003.
2. Dösoğlu M, Is M, Gezen F, Ziyal MI. Posterior epidural migration of a lumbar disc fragment causing cauda equina syndrome: case report and review of the relevant literature. Eur Spine J. 2001;10:348–51. https://doi.org/10.1007/s005860100300.
3. Kim H, Kwon BS, Park JW, Lee HJ, Lee JW, Lee EK. et al. Posterior epidural migration of a lumbar intervertebral disc fragment resembling a spinal tumor: a case report. Ann Rehabil Med. 2018;42:621–5. https://doi.org/10.5535/arm.2018.42.4.621.
4. Kuzeyli K, Cakir E, Usul H, Baykal S, Yazar U, Karaarslan G. et al. Posterior epidural migration of lumbar disc fragments: report of three cases. Spine. 2003;28:e64–7. https://doi.org/10.1097/01.BRS.0000042272.17850.49.
5. Robe P, Martin D, Lenelle J, Stevenaert A. Posterior epidural migration of sequestered lumbar disc fragments. Report of two cases. J Neurosurg. 1999;90:264–6. https://doi.org/10.3171/spi.1999.90.2.0264.
6. Tarukado K, Ikuta K, Fukutoku Y, Tono O, Doi T. Spontaneous regression of posterior epidural migrated lumbar disc fragments: case series. Spine J. 2015;15:e57–62. https://doi.org/10.1016/j.spinee.2013.07.430.
7. Hirabayashi S, Kumano K, Tsuiki T, Eguchi M, Ikeda S. A dorsally displaced free fragment of lumbar disc herniation and its interesting histologic findings. A case report. Spine (Philos Pa 1976). 1990;15:1231–3. https://doi.org/10.1097/00007632-199011010-00026.
8. Takano M, Hikata T, Nishimura S, Kamata M. Discography aids definitive diagnosis of posterior epidural migration of lumbar disc fragments: case report and literature review. BMC Musculoskelet Disord. 2017;18:151. https://doi.org/10.1186/s12891-017-1516-2.
9. Teufack SG, Singh H, Harrop J, Ratliff J. Dorsal epidural intervertebral disk herniation with atypical radiographic findings: case report and literature review. J Spinal Cord Med. 2010;33:268–71. https://doi.org/10.1080/10790268.2010.11689706.
10. Bonaroti EA, Welch WC. Posterior epidural migration of an extruded lumbar disc fragment causing cauda equina syndrome. Clinical and magnetic resonance imaging evaluation. Spine (Philos Pa 1976). 1998;23:378–81. https://doi.org/10.1097/00007632-199802010-00018.
11. Li K, Li Z, Geng W, Wang C, Ma J. Postdural disc herniation at L5/S1 level mimicking an extradural spinal tumor. Eur Spine J. 2016;25:80–3. https://doi.org/10.1007/s00586-015-4125-5.
12. Choudhury AR, Taylor JC, Worthington BS, Whitaker R. Lumbar radiculopathy contralateral to upper lumbar disc herniation: report of 3 cases. Br J Surg. 1978;65:842–4. https://doi.org/10.1002/bjs.1800651205.
13. Kornberg M. Sciatica contralateral to lumbar disk herniation. Orthopedics. 1994;17:362–4.
14. Theodorou DJ, Theodorou SJ, Kakitsubata Y, Papanastasiou EI, Gelalis ID. Posterior and anterior epidural and intradural migration of the sequestered intervertebral disc: Three cases and review of the literature. J Spinal Cord Med. 2020. https://doi.org/10.1080/10790268.2020.1730110.
15. Watanabe N, Ogura T, Kimori K, Hase H, Hirasawa Y. Epidural hematoma of the lumbar spine, simulating extruded lumbar disk herniation: clinical, discographic, and enhanced magnetic resonance imaging features. A case report. Spine (Philos Pa 1976). 1997;22:105–9. https://doi.org/10.1097/00007632-199701010-00017.
16. Chen CY, Chuang YL, Yao MS, Chiu WT, Chen CL, Chan WP. Posterior epidural migration of a sequestrated lumbar disk fragment: MR imaging findings. AJNR Am J Neuroradiol. 2006;27:1592–4.
17. Akhaddar A, El-Asri A, Boucetta M. Posterior epidural migration of a lumbar disc fragment: a series of 6 cases. J Neurosurg Spine. 2011;15:117–28. https://doi.org/10.3171/2011.3.SPINE10832.
18. Lombardi VJ. Lumbar spinal block by posterior rotation of anulus fibrosus. Case report. Neurosurg. 1973;39:642–7.
19. Mugge L, Caras A, Miller W, Buehler M, Medhkour A. A successful outcome despite delayed intervention for cauda equina syndrome in a young patient with a posterior epidural disc extrusion. Cureus. 2019;11:e4645. https://doi.org/10.7759/cureus.4645.

20. Montalvo Afonso A, Mateo Sierra O, Gil de Sagredo Del Corral OL, Vargas López AJ, González-Quarante LH, Sola Vendrell E. et al. Misdiagnosis of posterior sequestered lumbar disc herniation: report of three cases and review of the literature. Spinal Cord Ser Cases. 2018;4:61.https://doi.org/10.1038/s41394-018-0100-9.
21. Elsharkawy AE, Hagemann A, Klassen PD. Posterior epidural migration of herniated lumbar disc fragment: a literature review. Neurosurg Rev. 2019;42:811–23. https://doi.org/10.1007/s10143-018-01065-1.
22. Sucu HK, Gelal F. Lumbar disk herniation with contralateral symptoms. Eur Spine J. 2006;15:570–4. https://doi.org/10.1007/s00586-005-0971-x.
23. Hawkins JC, Natkha VP, Seibly J. Posterior epidural migration of a lumbar disc herniation causing cauda equina syndrome: a case report. Cureus. 2018;10:e2739. https://doi.org/10.7759/cureus.2739.
24. Kim JS, Lee SH, Arbatti NJ. Dorsal extradural lumbar disc herniation causing cauda equina syndrome: a case report and review of literature. J Korean Neurosurg Soc. 2010;47:217–20. https://doi.org/10.3340/jkns.2010.47.3.217.
25. Ruschel LG, Agnoletto GJ, Aragão A, Duarte JS, de Oliveira MF, Teles AR. Lumbar disc herniation with contralateral radiculopathy: a systematic review on pathophysiology and surgical strategies. Neurosurg Rev. 2021;44:1071–81. https://doi.org/10.1007/s10143-020-01294-3.
26. Mirovsky Y, Halperin N. Eccentric compression of the spinal canal causing dominantly contralateral-side symptoms. J Spinal Disord. 2000;13:174–7. https://doi.org/10.1097/00002517-200004000-00014.
27. Rydevik B, Brown MD, Lundborg G. Pathoanatomy and pathophysiology of nerve root compression. Spine (Philos Pa 1976). 1984;9:7–15. https://doi.org/10.1097/00007632-198401000-00004.

ACKNOWLEDGEMENTS

We would like to thank Dr. Khin Myat Myat Lwin, Senior Specialist and Anchana Iam-a-non, research co-ordinator at Bumrungrad International Hospital for the kind co-operation.

COMPETING INTERESTS

The authors declare no competing interests.

ADDITIONAL INFORMATION

Supplementary information The online version contains supplementary material available at https://doi.org/10.1038/s41394-021-00460-z.

Correspondence and requests for materials should be addressed to Kanthika Wasinpongwanich.

Reprints and permission information is available at http://www.nature.com/reprints

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.