Neurocirugía xxx (xxxx) 500743

Contents lists available at ScienceDirect

Neurocirugía

journal homepage: www.elsevier.es/neurocirugia

Review article

A systematic review of intradural disk herniation: A neurosurgeon's perspective

Revisión sistemática de la hernia discal intradural: perspectiva de un neurocirujano

Alberto Morello *, Enrico Lo Bue, Ayoub Saaid, Stefano Colonna, Alessandro Pesaresi, Federica Bellino, Marco Ajello, Alessandro Fiumefreddo, Diego Garbossa, Fabio Cofano

Neurosurgery Unit, Department of Neuroscience "Rita Levi Montalcini", "Città della Salute e della Scienza" University Hospital, University of Turin, 10126 Turin, Italy

ARTICLE INFO

Keywords:
Lumbar
Herniation
Transdural
Disk
Spine
Extramedullary

ABSTRACT

Intradural disk herniation (IDH) refers to the protrusion of the nucleus pulposus into the dural sac. While disk herniation is a relatively frequent condition, the intradural variant is exceptionally rare. Patients diagnosed with IDH often exhibit more pronounced clinical symptoms compared to those with extradural herniations. Establishing a definitive preoperative diagnosis remains challenging, as the pathophysiology and radiological features are not yet fully understood. Differentiating IDH from other intradural extramedullary pathologies, including schwannomas, neurofibromas, meningiomas, or metastatic lesions, can be complex.

A systematic review was conducted on the diagnosis and treatment of cervical, thoracic and lumbar IDH, following PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) and retrieving potentially relevant literature from PubMed and Embase. The search strategy included combinations of the terms "transdural" OR "intradural" AND "disc" AND "herniation". Age, sex, symptoms, herniated disk level, history of trauma, location of disk mass, imaging examination, pre- or intraoperative diagnosis and clinical outcomes were studied through the medical records. The type of surgery, the ventral dural defect management and the postoperative leakage of cerebrospinal fluid were also evaluated.

One hundred and sixty-one articles involving 285 patients were selected. Cases of IDHs occurred at the lumbar (64.3%), thoracic (21.9%) and cervical (13.8%) levels. The most common level IDH was located at L4–L5 (27.6%). 49 patients exhibited cauda equina syndrome. Only 44 patients (15.4%) were diagnosed as having IDH preoperatively, while most patients were diagnosed intraoperatively. Neurological functions improved variably according to cervical, thoracic and lumbar locations (respectively 2.5%, 5.6% and 21.7%).

IDH mostly involves the lumbar spine. Patients with IDH generally experience more severe symptoms than those with extradural disk herniation and have incomplete recovery of postoperative neurological functions. Diagnosing IDH remains challenging given its clinical presentations and radiographic features, and it is likely an underdiagnosed and underestimated condition.

Palabras clave:
Columna lumbar
Hernia discal
Transdural
Disco intervertebral
Columna vertebral
Extramedular

RESUMEN

La hernia discal intradural (HDI) se refiere a la protrusión del núcleo pulposo dentro del saco dural. Aunque la hernia discal es una afección relativamente frecuente, su variante intradural es excepcionalmente rara. Los pacientes con diagnóstico de HDI suelen presentar síntomas clínicos más intensos en comparación con aquellos con hernias discales extradurales. El diagnóstico preoperatorio definitivo sigue siendo un reto, ya que tanto la fisiopatología como las características radiológicas no se comprenden completamente. Diferenciar la HDI de otras patologías intradurales extramedulares, como schwannomas, neurofibromas, meningiomas o lesiones metastásicas, puede resultar complejo.

DOI of original article: https://doi.org/10.1016/j.neucir.2025.500743
* Corresponding author.
E-mail address: alberto.morello@unito.it (A. Morello).

https://doi.org/10.1016/j.neucie.2025.500743
Received 1 August 2025; Accepted 7 November 2025
Available online xxx

Please cite this article as: A. Morello, E. Lo Bue, A. Saaid et al., A systematic review of intradural disk herniation: A neurosurgeon's perspective, Neurocirugia., https://doi.org/10.1016/j.neucie.2025.500743

Se realizó una revisión sistemática sobre el diagnóstico y tratamiento de las HDI cervicales, torácicas y lumbares, siguiendo las directrices de Elementos de Información Preferidos para Revisiones Sistemáticas y Metaanálisis (PRISMA). Se consultaron las bases de datos PubMed y Embase utilizando las combinaciones de términos: «transdural» OR «intradural» AND «disc» AND «herniation». A partir de los registros médicos se analizaron: edad, sexo, síntomas, nivel discal afectado, antecedentes traumáticos, localización de la masa discal, estudios de imagen, diagnóstico pre o intraoperatorio y evolución clínica. También se evaluaron el tipo de cirugía, el manejo del defecto dural ventral y la presencia de fuga de líquido cefalorraquídeo en el posoperatorio.

Se seleccionaron 161 artículos que incluyeron un total de 285 pacientes. Los casos de HDI se localizaron en la columna lumbar (64,3%), torácica (21,9%) y cervical (13,8%). El nivel más frecuentemente afectado fue L4–L5 (27,6%). Cuarenta y nueve pacientes presentaron síndrome de la cola de caballo. Solo 44 pacientes (15,4%) fueron diagnosticados con HDI antes de la cirugía, mientras que en la mayoría el diagnóstico se estableció intraoperatoriamente. La recuperación neurológica fue variable según la localización: cervical (2,5%), torácica (5,6%) y lumbar (21,7%).

La HDI afecta principalmente a la columna lumbar. Los pacientes suelen presentar síntomas más severos que en las hernias extradurales, y la recuperación neurológica postoperatoria tiende a ser incompleta. El diagnóstico sigue siendo un desafío debido a las características clínicas y radiológicas, por lo que probablemente se trate de una entidad infradiagnosticada y subestimada.

Introduction

Intradural disk herniation (IDH) was initially reported in 1942 by Dandy, who documented a case of lumbar intradural disk rupture.[1]

Subsequent reports have described cervical and thoracic cases in 1959 and 1987, respectively.[2,3]

IDHs are infrequent and represent an unusual complication arising from disk protrusions. They account for approximately 0.3% of all disk herniation cases. On the other hand, there has been an upward trend in publications on IDH cases over recent decades, highlighting that this condition is probably underdiagnosed and underestimated (Fig. 1).

The exact pathogenesis and progression remain unclear, though adhesions between the annulus fibrosus, posterior longitudinal ligament (PLL), and anterior dura mater are believed to be contributing factors.

Preoperative diagnosis of IDH is challenging. Various neuroimaging techniques, including CT scans, MRI, myelography, and discography, have been described in the literature to evaluate the presence of an IDH.[4,5] Despite this, preoperative diagnosis is rare, with most cases diagnosed intraoperatively.[6,7]

The treatment of IDH poses additional challenges. Literature suggests that IDH should be treated as early as possible, emphasizing the necessity for prompt surgical intervention.[8]

Considering its rarity and the difficulties associated with diagnosis and management, a systematic review of literature regarding cervical, thoracic and lumbar IDH reported in literature was conducted. The objective of this study is to better evaluate the clinical characteristics of this condition and to suggest optimal strategies for detection and treatment.

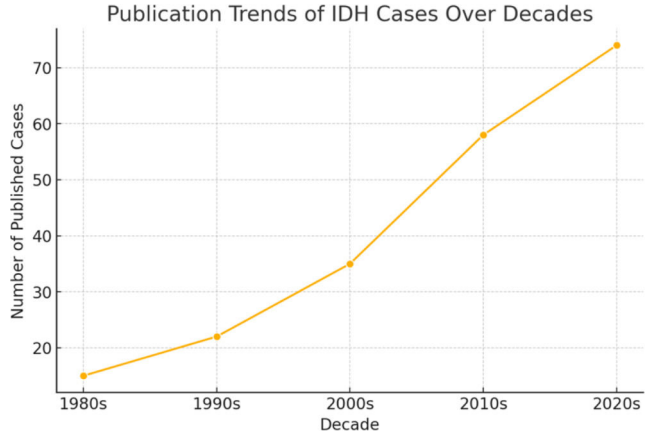

Fig. 1. Publication trends: line graph shows increasing reporting in recent decades.

Materials and methods

Literature search

This systematic review was performed in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (see Fig. 1, Supplementary Material).[9] Relevant studies were identified through searches in PubMed and Embase. No chronological limits of study publications were included. The final search was conducted on 5th of December 2024 (see Table 1, Supplementary Material).

The search utilized combinations of the keywords “transdural” OR “intradural” AND “disc” OR “disk” AND “herniation”. The abstracts were read for possible full text review and inclusion. Articles were screened and selected independently by two reviewers (A. M. and E. L. B.). Disagreements were resolved by discussion, and a third author (A. S.) conducted an independent review if agreement was not reached.

Inclusion and exclusion criteria

The full text of articles written in English published and involving human subjects were reviewed. Prospective clinical trials, retrospective studies, reports of case series and case reports with data on cervical, thoracic and lumbar IDHs were eligible for inclusion. Cadaver studies, laboratory or animal studies were excluded. Meta-analyses and systematic reviews were not included.

Data extraction

The names of the first and corresponding authors, type of study, publication date, number of patients, age, sex, symptoms, herniated disk level, history of trauma, location of disk mass, imaging examination, pre- or intraoperative diagnosis and clinical outcome were extracted. The type of surgery, the ventral dura defect management and the postoperative leakage of cerebrospinal fluid, when specified, were also evaluated.

Results

Study selection

A total of 2320 studies and case reports published up to 2023 were identified. 1359 records after duplicates were analyzed. Of these, 103 were excluded due to non-English language, 41 was a systematic review,

Table 1
The presentations of patients and surgical procedures and outcomes.

The presentations of patients		Surgical procedures and outcomes	
	Cervical presentation		*Cervical*
$N = 71$	Radiculopathy with or without muscle weakness	$N = 24$	ACDF
$N = 21$	Paraparesis	$N = 4$	ACCF
$N = 11$	Bowel and/or bladder disfunction	$N = 6$	Anterior + posterior approach
$N = 14$	Postural headache	$N = 4$	Posterior approach
$N = 10$	Paraparesis with other symptoms as ataxic gait or radiculopathy		*Thoracic*
$N = 7$	BSS and radiculopathy	$N = 17$	Laminectomy
$N = 4$	BSS/incomplete BSS	$N = 5$	Fusion with screws
$N = 3$	BSS and Horner's syndrome		*Lumbar*
	Thoracic presentation	$N = 76$	Laminectomy
$N = 9$	Paraparesis with other symptoms as ataxic gait or radiculopathy	$N = 25$	Fusion with screws
$N = 8$	Postural headache		*Outcomes*
$N = 4$	Bowel and/or bladder disfunction	$N = 85$	Complete recovery
	Lumbar presentation	$N = 108$	Incomplete recovery
$N = 90$	Radiculopathy with or without muscle weakness	$N = 83$	Not described
$N = 34$	Bowel and/or bladder disfunction		
	Location of disk mass		
$N = 107$	Central		
$N = 41$	Right		
$N = 36$	Left		
$N = 92$	Non described		
	Imaging examination		
$N = 174$	Only MRI		
$N = 53$	MRI + CT		
$N = 27$	MRI + CT + Myelography		
$N = 15$	XR + Myelography		
$N = 7$	CT + Myelography		

BSS = Brown–Sequard's syndrome; HS = Horner's syndrome; ACDF = anterior cervical discectomy and fusion; ACCF = anterior cervical corpectomy and fusion.

168 involved animal articles, and 22 had unavailable full-text. Ultimately, papers were removed after review of titles and/or abstracts. In the end, 161 articles describing 285 patients were included in this systematic review.[4,5,7,8,10–111,6,112–163] The selection process is shown in Fig. 1, Supplementary Material.

Study characteristics

The included studies were 147 case reports and 14 case series.[4,5,7,8,10–111,6,112–163] The articles were published to 2024. The numbers of patients in the reported studies ranged from one to thirty. See Table 2, Supplementary Material.

Patient characteristics

The average age of the patients in the articles was 54.1 years (range, 24–90 years). Among the patients, 58.94% ($n = 168$) were male and 40% ($n = 114$) were female (in 3 cases, gender was not available). The cases of IDHs occurred at the lumbar (64.3%), thoracic (21.9%) and cervical (13.8%) levels. The most common involved level was L4-L5 (27.6%, $n = 76$), followed by L2–3 (15.2%, $n = 42$), L3–L4 (12.3%, $n = 34$). Relevant spinal trauma was noted in 17 cases (6%), with trauma mechanisms including neck manipulation and motor vehicle accidents. Additionally, 50 cases (17.5%) had a history of previous surgical procedures.

Presentation

The most common presentation was radiculopathy with or without muscle weakness (56.5%, $n = 161$), followed by bowel and bladder disfunction (17.2%, $n = 49$), paraparesis with other symptoms as ataxic gait or radiculopathy (6.7%, $n = 19$), only paraparesis (7.4%, $n = 21$), postural headache in hypotension liquoral (4.2%, $n = 12$), Brown–Sequard's syndrome (BSS) and radiculopathy (2.5%, $n = 7$), BSS/incomplete BSS (1.4%, $n = 4$), BSS and Horner's syndrome (1.1%, $n = 3$). Nine cases (3%) remain unspecified. The clinical presentation was classified according to the location in Table 1.

Imaging manifestations

Myelography, computed tomography (CT), and Magnetic resonance imaging (MRI) were the three most commonly used imaging techniques for IDH. In this review, all patients underwent at least one examination using these techniques. 174 patients underwent only MRI. Additionally, 53 patients (18.6%) underwent both MRI and CT, while 27 patients (9.5%) had MRI, CT, and myelography (Fig. 2a). Nine cases (3.2%) remain unspecified.

The most common location of disk mass was central (37.5%, $n = 107$); followed by the right (14.4%, $n = 41$), and left (12.6%, $n = 36$) positions. In 101 patients (35.4%) the location of disk mass was not specified.

These data are summarized in Table 1.

Diagnosis, surgery and outcomes

Preoperative diagnosis of IDH was achieved in only 44 patients (15.4%), with the remaining 232 cases (81.4%) being identified intraoperatively. Nine cases (3.2%) remain unspecified. All patients underwent surgery. The surgical procedures are summarized in Table 1. In the remaining 115 patients, the surgical technique was not described in detail.

Neurological function improved completely in the post-operative period in 85 patients (29.8%): specifically, 7 patients (2.5%) with cervical, in 16 patients (5.6%) with thoracic, in 62 patients (21.7%) with lumbar IDHs. Instead, there was an incomplete recovery in 108 patients

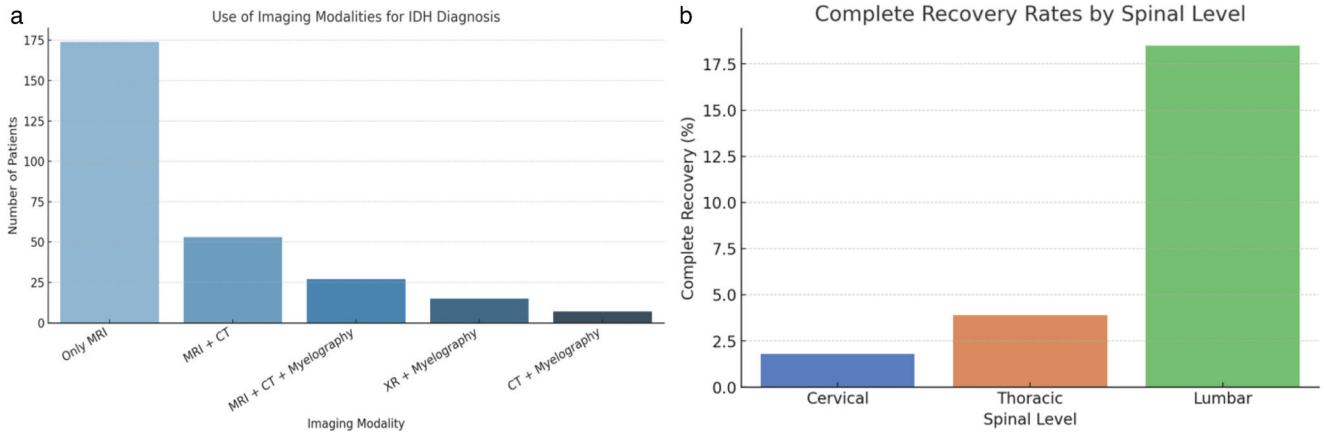

Fig. 2. (a) Preoperative diagnosis by imaging: bar chart highlights the low use of myelography despite higher diagnostic success. (b) Complete recovery rates by spinal level: bar chart underscores better outcomes in lumbar IDH.

Table 2
Dura defect management.

	CSF leakage during anterior surgery
$N = 17$	Yes
$N = 18$	Not described
$N = 3$	No
	Ventral dura defect management
$N = 38$	Only suture
$N = 21$	Suture with other material
$N = 25$	Dural substitute
$N = 144$	Not described
$N = 48$	Other material (Graft and fibrin glue, Surgicel, Gelatin sponge, Fibrin glue)
	Postoperative CSF leakage
$N = 9$	Yes
$N = 57$	No
$N = 210$	Not described

(37.9%). In 83 cases (29.1%), the postoperative neurological function was not described (Fig. 2b).

Dura management

During anterior cervical surgery, 17 cerebrospinal fluid (CSF) leakages of varying degree were encountered before dura incision, which indicated a breach of the arachnoid mater.

The method used to repair the breach of the arachnoid mater at cervical, thoracic and lumbar level included direct suture, fat or fascia graft with fibrin glue, surgical (cellulose matrix), dural substitute, and gelatin sponge.

The dura defect management is summarized in Table 2 .

Discussion

Intradural disk herniation (IDH), characterized by the displacement of the nucleus pulposus through the posterior longitudinal ligament (PLL) and dural sac into the intrathecal space, was first described by Walter E. Dandy in 1942. Despite its historical recognition, IDH remains exceedingly rare, accounting for an estimated 0.04–0.33% of all lumbar disk herniations. In our systematic review, IDH was reported more frequently in male patients (81.16%) than in females, with an average age of 54.5 years at diagnosis. The lumbar spine was most commonly affected (64.3%), followed by the thoracic (21.9%) and cervical (13.8%) regions. The L4–L5 level represented the most frequent site of involvement.

The precise etiology of IDH remains poorly understood. However, intraoperative findings often demonstrate adhesions between the PLL and ventral dura mater, which are considered potential contributors to the pathogenesis.[164,165] These adhesions may arise from chronic inflammation, previous surgical interventions, trauma, degenerative changes, or congenital structural anomalies, all of which can obliterate the epidural space. Additionally, PLL hypertrophy and ossification may exacerbate mechanical stress on the dura mater, enhancing its vulnerability. Teng and Papatheodorou hypothesized that the absence of a “dural tent”—the typical separation formed by an intact PLL—may indicate pathological adherence between the PLL and dura, facilitating disk material migration into the intradural space.[162]

The predominance of IDH in the lumbar spine may reflect the substantial biomechanical forces acting in this region. Repetitive stress or acute high-energy trauma may contribute to PLL degeneration and subsequent IDH formation. Supporting this theory, the majority of IDH cases in our review involved central disk herniations, a location typically reinforced by the PLL.[166,167]

Although only a small proportion of patients (5.8%) had a history of acute trauma, a notable number (17.7%) had undergone previous spinal surgery—predominantly involving the lumbar spine—suggesting a potential role of iatrogenic factors in IDH development.

Clinical manifestations of IDH vary by spinal level. Cervical IDH often presents with severe neurological deficits such as Brown-Séquard syndrome or quadriparesis, occasionally with delayed onset after trauma. In our cohort, the most common symptom was radiculopathy with or without muscle weakness (58.3%), followed by bowel or bladder dysfunction (17.7%) and varying forms of paraparesis. A particularly distinctive finding was cauda equina syndrome, sometimes associated with a longstanding history of lumbar pain, suggestive of intradural involvement. Postoperative recovery was incomplete in the majority of cases; only 30.8% achieved full neurological resolution, highlighting the condition’s clinical severity and potential for persistent deficits.

Radiological evaluation remains challenging. While plain radiographs may reveal degenerative changes, they do not directly visualize IDH. MRI and CT are routinely employed but may fail to distinguish IDH from other intradural extramedullary lesions such as schwannomas or meningiomas. In our review, preoperative diagnosis was achieved in only 16% of cases. These data confirm that this condition is both underdiagnosed and underestimated. Notably, among the subset of patients who underwent myelography in addition to MRI and CT, a significantly higher rate of preoperative identification (77.8%) was observed, indicating that myelography, though not widely available, may be particularly valuable in diagnostic workup.

Specific MRI and CT findings, such as discontinuity of the PLL, a poorly defined disk margin, disk material beyond the PLL, or the characteristic "Y-sign" on MRI, may raise suspicion for IDH. The "Y-sign," described by Sasaji et al., represents a division between the dura and arachnoid when disk material intrudes between them, and may serve as a useful diagnostic marker.[168,169]

Surgery remains the definitive treatment for IDH, allowing both decompression and confirmatory diagnosis. Accurate preoperative recognition is essential for planning the surgical approach, particularly regarding durotomy management and the extent of laminectomy. An anterior approach, particularly in cervical IDH, offers direct access to the disk and ventral dura without requiring lateral cord retraction, thus reducing intraoperative risk. Most arachnoid defects encountered intraoperatively were repaired with grafts, fibrin glue, or other materials, and postoperative cerebrospinal fluid leakage was infrequent, although documentation was often lacking.

This systematic review is limited by the retrospective nature of the included studies and incomplete data on radiological features and postoperative outcomes. Nevertheless, the findings underscore the rarity and clinical significance of IDH. The condition predominantly affects the lumbar spine, often presents with severe neurological symptoms, and frequently results in incomplete recovery. Improved awareness and diagnostic acumen, particularly through adjunctive imaging like myelography, may enhance preoperative identification and optimize surgical planning.

Author's contribution

Study concept: A.M. Study design: A.M. Data acquisition: E.L.B; F.B. Quality control of data and algorithms: A.M.; A.S. Data analysis and interpretation: E.L.B. Manuscript preparation: S.C.; A.P. Manuscript editing: A.M.; E.L.B. Manuscript review: M.A.; A. F.; D. G.; F. C. All authors agreed to the publication of this work.

Data and code availability

Data or information needed to re-produce the findings presented are available from the corresponding author upon reasonable request.

Clinical trial number

Not applicable.

Consent to participate

Not applicable.

Consent for publication

Not applicable.

Ethical approval

Not applicable.

Grants and support

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest

The authors declare that the article and its content were composed in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.neucie.2025.500743.

References

1. Dandy W. Serious complications of ruptured intervertebral disks. *J Am Med Assoc*. 1942;119:474–477, http://dx.doi.org/10.1001/jama.1942.02830230008002.
2. Marega T. Ernia del disco cervicale espulsa nel sacco durale. *Arch Putti Chir Organi Mov*. 1959;12:425–430.
3. Chowdhary UM. Intradural thoracic disc protrusion. *Spine (Phila Pa 1976)*. 1987;12:718.
4. Floeth F, Herdmann J. Chronic dura erosion and intradural lumbar disc herniation: CT and MR imaging and intraoperative photographs of a transdural sequestrectomy. *Eur Spine J Off Publ Eur Spine Soc Eur Spinal Deform Soc Eur Sect Cerv Spine Res Soc*. 2012;21(suppl 4):S453–S457.
5. 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.
6. Fiorenza V, Ascanio F, Di Lorenzo I. Clinicopathologic features of thoracolumbar interdural disc herniations: a retrospective case series with a systematic literature review. *World Neurosurg*. 2020;139:e391–e398.
7. Ducati LG, Silva MV, Brandão MM, Romero FR, Zanini MA. Intradural lumbar disc herniation: report of five cases with literature review. *Eur Spine J Off Publ Eur Spine Soc Eur Spinal Deform Soc Eur Sect Cerv Spine Res Soc*. 2013;22(suppl 3):S404–S408.
8. Schisano G, Franco A, Nina P. Intraradicular and intradural lumbar disc herniation: experiences with nine cases. *Surg Neurol*. 1995;44:536–543.
9. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:n71.
10. Caetano de Barros A, Caetano de Barros M. Traumatic extradural and intradural herniation of cervical disk treated surgically. *Surg Neurol*. 1984;21:577–580.
11. Negovetić L, Cerina V, Sajko T, Glavić Z. Intradural disc herniation at the T1–T2 level. *Croat Med J*. 2001;42:193–195.
12. Kaiser MC, Sandt G, Roilgen A, Capesius P, Poos D, Ohanna F. Intradural disk herniation with CT appearance of gas collection. *Am J Neuroradiol*. 1985;6:117–118.
13. Hodge CJ, Binet EF, Kieffer SA. Intradural herniation of lumbar intervertebral discs. *Spine (Phila Pa 1976)*. 1978;3:346–350.
14. Graves VB, Finney HL, Mailander J. Intradural lumbar disk herniation. *Am J Neuroradiol*. 1986;7:495–497.
15. Wang AM, Zamani AA. Intradural herniation of thoracic disc: CT metrizamide myelography. *Comput Radiol*. 1986;10:115–118.
16. Ergüngör MF, Kars HZ. Intraradicular herniation of a lumbar disc: a case report. *Neurosurgery*. 1987;21:909–911.
17. Anda S, Dale LG, Vassal J. Intradural disc herniation with vacuum phenomenon: CT diagnosis. *Neuroradiology*. 1987;29:407.
18. Schneider SJ, Grossman RG, Bryan RN. Magnetic resonance imaging of transdural herniation of a cervical disk. *Surg Neurol*. 1988;30:216–219.
19. Martin N, Guilbeau JC, Murat M, Debroucker T, Bouali I, Nahum H. Lumbar intradural disk herniation. X-ray computed tomographic diagnosis. *J Radiol*. 1988;69:681–684.
20. Jenkins LE, Bowman M, Cotler HB, Gildenberg PL. Intradural herniation of a lumbar intervertebral disc. *J Spinal Disord*. 1989;2:196–200.
21. Hamilton MG, Thomas HG. Intradural herniation of a thoracic disc presenting as flaccid paraplegia: case report. *Neurosurgery*. 1990;27:482–484.
22. Fox MW, Onofrio BM. Transdural approach to the anterior spinal canal in patients with cervical spondylotic myelopathy and superimposed central soft disc herniation. *Neurosurgery*. 1994;34:632–634.
23. Stone JL, Lichtor T, Banerjee S. Intradural thoracic disc herniation. *Spine (Phila Pa 1976)*. 1994;19:1281–1284.
24. Töppich HG, Feldmann H, Sandvoss G, Meyer F. Intervertebral space nerve root entrapment after lumbar disc surgery. Two cases. *Spine (Phila Pa 1976)*. 1994;19:249–250.
25. Ozer AF, Ozek MM, Pamir MN, Zirh TA, Erzen C. Intradural rupture of cervical vertebral disc. *Spine (Phila Pa 1976)*. 1994;19:843–845.
26. Snow RD, Williams JP, Weber ED, Richardson PH. Enhancing transdural lumbar disk herniation. *Clin Imaging*. 1995;19:12–16.
27. Akdemir H, Oktem IS, Koç RK, Kavuncu I. Postoperative intraradicular lumbar disc herniation: a case report. *Neurosurg Rev*. 1997;20:71–74.
28. Matsuura JA, Makhoul RG, Posner MP, Smith J, Litwack RS. Intradural herniation of a thoracic disc causing paraplegia coincident with epidural anesthesia. *Anesth Analg*. 1997;84:922–923.
29. Süzer T, Tahta K, Coşkun E. Intraradicular lumbar disc herniation: case report and review of the literature. *Neurosurgery*. 1997;41:956–959.
30. Connolly PJ, Rosenbaum AE, Sacks T, Kopacz KJ. Incomplete intradural lumbar disk herniation. *Orthopedics*. 1997;20:977–979.
31. Hidalgo-Ovejero AM, Garcia-Mata S, Izco-Cabezon T, Garralda-Galarza G, Martinez-Grande M. Intradural disc herniation associated with epidural gas. *Spine (Phila Pa 1976)*. 1998;23:281–283.
32. Stillerman CB, Chen TC, Couldwell WT, Zhang W, Weiss MH. Experience in the surgical management of 82 symptomatic herniated thoracic discs and review of the literature. *J Neurosurg*. 1998;88:623–633.
33. Bayassi S. [Intradural lumbar disk herniation (ILDH). Case report and literature review]. *Neurol Neurochir Pol*. 1998;32:1292–1295.

34. Singh P, Sarup S, Singh AP, Khanna R. Lumbar intradural disc herniation. *Neurol India*. 1998;46:326–328.
35. Hida K, Iwasaki Y, Abe H, Shimazaki M, Matsuzaki T. Magnetic resonance imaging of intradural lumbar disc herniation. *J Clin Neurosci Off J Neurosurg Soc Australas*. 1999;6:345–347.
36. Börm W, Bohnstedt T. Intradural cervical disc herniation. Case report and review of the literature. *J Neurosurg*. 2000;92:221–224.
37. Clatterbuck RE, Belzberg AJ, Ducker TB. Intradural cervical disc herniation and Brown–Séquard's syndrome. Report of three cases and review of the literature. *J Neurosurg*. 2000;92:236–240.
38. Koç RK, Akdemir H, Oktem IS, Menkü A. Intradural lumbar disc herniation: report of two cases. *Neurosurg Rev*. 2001;24:44–47.
39. Alonso-Bartolomé P, Canga A, Vázquez-Barquero A, García-Valtuille R, Abascal F, Cerezal L. Intradural lumbar disk hernia. *Neurologia*. 2001;16:181–184.
40. Mut M, Berker M, Palaoğlu S. Intraradicular disc herniations in the lumbar spine and a new classification of intradural disc herniations. *Spinal Cord*. 2001;39:545–548.
41. Winter SCA, Maartens NF, Anslow P, Teddy PJ. Spontaneous intracranial hypotension due to thoracic disc herniation. Case report. *J Neurosurg*. 2002;96:343–345.
42. Mithöfer K, Rachlin JR, Kleefield J, Mendel JB, Glazer PA. Intradural lumbar vertebral disk herniation: a case report and review. *Orthopedics*. 2002;25:437–439.
43. Asakuno K, Kim P, Kawamoto T, Ogino M. Dural arteriovenous fistula and progressive conus medullaris syndrome as complications of lumbar discectomy. Case report. *J Neurosurg*. 2002;97:375–379.
44. Rapport RL, Hillier D, Scearce T, Ferguson C. Spontaneous intracranial hypotension from intradural thoracic disc herniation. Case report. *J Neurosurg*. 2003;98:282–284.
45. Al-Barbarawi M, Sekhon LHS. Management of massive calcified transdural thoracic disk herniation. *J Clin Neurosci Off J Neurosurg Soc Australas*. 2003;10:707–710.
46. D'Andrea G, Trillò 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;27:72–75.
47. Aydin MV, Ozel S, Sen O, Erdogan B, Yildirim T. Intradural disc mimicking: a spinal tumor lesion. *Spinal Cord*. 2004;42:52–54.
48. Sarlième P, Delabrousse E, Clair C, Hussein HH, Schmitt C, Kastler B. Intradural disc herniation with cranial migration of an excluded fragment. *Clin Imaging*. 2004;28:170–172.
49. Hidalgo-Ovejero AM, García-Mata S, Gozzi-Vallejo S, Izco-Cabezón T, Martínez-Morentín J, Martínez-Grande M. Intradural disc herniation and epidural gas: something more than a casual association? *Spine (Phila Pa 1976)*. 2004;29:E463–E467.
50. Karabekir HS, Karagoz Guzey F, Kagnici Atar E, Yildizhan A. Intra-radicular lumbar disc herniation: report of two cases. *Spinal Cord*. 2006;44:318–321.
51. Lee JS, Suh KT. Intradural disc herniation at L5-S1 mimicking an intradural extramedullary spinal tumor: a case report. *J Korean Med Sci*. 2006;21:778–780.
52. Mailleux R, Redant C, Milbouw G. MR diagnosis of transdural disc herniation causing cauda equine syndrome. *JBR-BTR organe la Soc R belge Radiol = orgaan van K Belgische Ver voor Radiol*. 2006;89:303–305.
53. Choi JY, Lee WS, Sung KH. Intradural lumbar disc herniation – is it predictable preoperatively? A report of two cases. *Spine J*. 2007;7:111–117.
54. Almond LM, Hamid NA, Wasserberg J. Thoracic intradural disc herniation. *Br J Neurosurg*. 2007;21:32–34.
55. Sakai T, Tsuji T, Asazuma T, Yato Y, Matsubara O, Nemoto K. Spontaneous resorption in recurrent intradural lumbar disc herniation. Case report. *J Neurosurg Spine*. 2007;6:574–578.
56. Neroni M, Gazzeri R, Galarza M, Alfieri A. Intradural cervical disc herniation in a Klippel–Feil patient. *Spine (Phila Pa 1976)*. 2007;32:E608–E610.
57. Oztürk A, Avci E, Yazgan P, Torun F, Yücetaş S, Karabağ H. Intradural herniation of intervertebral disc at the level of Lumbar 1–Lumbar 2. *Turk Neurosurg*. 2007;17:134–137.
58. Benyamin R, Vallejo R, Yousuf N, Tamrazi A, Kramer J. Incidental diagnosis of intradural lumbar disc herniation during discography: a case report. *Pain Pract*. 2007;7:332–336.
59. Borota L, Jonasson P, Agolli A. Spontaneous resorption of intradural lumbar disc fragments. *Spine J*. 2008;8:397–403.
60. Turgut M, Tekin C, Unsal A. Intraradicular extruded disc herniation as a rare cause of failed back surgery – case report and review of the literature. *Neurol Neurochir Pol*. 2008;42:251–254, discussion 254.
61. Chaudhary KS, Bapat MR. Conus medullaris syndrome due to an intradural disc herniation: a case report. *Indian Jx Orthop*. 2008;42:94–96.
62. Aoyama T, Hida K, Akino M, Yano S, Iwasaki Y. Detection of residual disc hernia material and confirmation of nerve root decompression at lumbar disc herniation surgery by intraoperative ultrasound. *Ultrasound Med Biol*. 2009;35:920–927.
63. Han I-H, Kim K-S, Jin B-H. Intradural lumbar disc herniations associated with epidural adhesion: report of two cases. *J Korean Neurosurg Soc*. 2009;46:168–171.
64. Woischneck D, Schmitz B, Kapapa T. First description of an intradural disc herniation at the C7-T1 level. *Z Orthop Unfall*. 2009;147:600–602.
65. Akhaddar A, Boulahroud O, Elasri A, Elmostarchid B, Boucetta M. Radicular interdural lumbar disc herniation. *Eur spine J Off Publ Eur Spine Soc Eur Spinal Deform Soc Eur Sect Cerv Spine Res Soc*. 2010;19(suppl 2):S149–S152.
66. Demetriades AK, Naik S, Gunasekera L. Conus medullaris syndrome from a transdural disc herniation at the thoracolumbar junction. *Acta Neurochir (Wien)*. 2010;152:1081–1082.
67. Kim K-T, Kim Y-B. Spontaneous intracranial hypotension secondary to lumbar disc herniation. *J Korean Neurosurg Soc*. 2010;47:48–50.
68. Hsieh J-H, Wu C-T, Lee S-T. Cervical intradural disc herniation after spinal manipulation therapy in a patient with ossification of posterior longitudinal ligament: a case report and review of the literature. *Spine (Phila Pa 1976)*. 2010;35:E149–E151.
69. Turgut M. Intradural intraradicular disc herniation in the lumbar spine: apropos of a new case. *Spine J*. 2011;11:92–93.
70. Pan J, Li L, Qian L, et al. Intradural cervical disc herniation: report of two cases and review of the literature. *Spine (Phila Pa 1976)*. 2011;36:E1033–E1037.
71. Liu C-C, Huang C-T, Lin C-M, Liu K-N. Intradural disc herniation at L5 level mimicking an intradural spinal tumor. *Eur Spine J Off Publ Eur Spine Soc Eur Spinal Deform Soc Eur Sect Cerv Spine Res Soc*. 2011;20(suppl 2):S326–S329.
72. Kansal R, Mahore A, Kukreja S. Cervical intradural disc herniation and cerebrospinal fluid leak. *Neurol India*. 2011;59:447–450.
73. Arnold PM, Wakwaya YT. Intradural disk herniation at L1–L2: report of two cases. *J Spinal Cord Med*. 2011;34:312–314.
74. Whitmore RG, Williams BJ, Lega BC, Sanborn MR, Marcotte P. A patient with thoracic intradural disc herniation. *J Clin Neurosci Off J Neurosurg Soc Australas*. 2011;18:1730–1732.
75. Nagaria J, Chan C, Kamel M, McEvoy L, Bolger C. Episodic cauda equina compression from an intradural lumbar herniated disc: a case of "floppy disc". *J Surg Case Rep*. 2011;6, 2011.
76. Hasiloglu ZI, Abuzayed B, Imal AE, Cagil E, Albayram S. Spontaneous intracranial hypotension due to intradural thoracic osteophyte with superimposed disc herniation: report of two cases. *Eur Spine J Off Publ Eur Spine Soc Eur Spinal Deform Soc Eur Sect Cerv Spine Res Soc*. 2012;21(suppl 4):S383–S386.
77. Teufack S, Campbell P, Sharma P, et al. Thoracic myelopathy due to an intramedullary herniated nucleus pulposus: first case report and review of the literature. *Neurosurgery*. 2012;71:E199–E202.
78. Singh PK, Shrivastava S, Dulani R, Banode P, Gupta S. Dorsal herniation of cauda equina due to sequestrated intradural disc. *Asian Spine J*. 2012;6:145–147.
79. Kim H-S, Eun J-P, Park J-S. Intradural migration of a sequestrated lumbar disc fragment masquerading as a spinal intradural tumor. *J Korean Neurosurg Soc*. 2012;52:156–158.
80. 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*. 2022;45:305–310.
81. Ghaffari-Rafi A, Nosova K, Kim K, Goodarzi A. Intradural disc herniation in the setting of congenital lumbar spinal stenosis. *Neurochirurgie*. 2022;68:335–341.
82. Safi SS, Allyan A, Ali A, Raza A. Diagnosis and management of thoracic intradural extra-arachnoidal disc herniation. *Surg Neurol Int*. 2022;13:73.
83. Segi N, Ando K, Nakashima H, Machino M, Imagama S. Intradural lumbar disc herniation from the lateral inner surface of the dura without a penetration hole: a case report. *Cureus*. 2022;14:e22418.
84. Francio VT, Wie CS, Murphy MT, et al. Multispecialty perspective on intradural disc herniation: diagnosis and management – a case report. *Anesth pain Med*. 2022;17:221–227.
85. Bonomo G, Cusin A, Rubiu E, et al. Diagnostic approach, therapeutic strategies, and surgical indications in intradural thoracic disc herniation associated with CSF leak, intracranial hypotension, and CNS superficial siderosis. *Neurol Sci Off J Ital Neurol Soc Ital Soc Clin Neurophysiol*. 2022;43:4167–4173.
86. Song J, Oh JYL. Traumatic intradural disc herniation following a cervical facet dislocation: a case report. *J Spine Surg (Hong Kong)*. 2022;8:76–83.
87. Pholprajug P, Wiratapesuporn T, Satayasoontorn K, Atiprayoon S, Kotheeranurak V. Intradural disc herniation of L2/3: a case report and literature review. *North Am Spine Soc J*. 2022;11:100138.
88. Ayyappan Unnithan AK. A review of the diagnostic features of posteriorly migrated lumbar discs with reports of two cases. *Neurol India*. 2022;70:1213–1216.
89. Wen H, Xiao L, Chen Y, et al. Intradural disc herniation at the L2/3 level: a case report and literature review. *Ann Palliat Med*. 2022;11:3005–3013.
90. Cheng C-H, Che-Chao Chang MP, Lin H-L, Chuang H-Y, Lin R-M, Foo N-P. Intradural lumbar disc herniation: a case report and literature review. *Heliyon*. 2022;8:e12257.
91. Pommier B, Grelat M, Messerer R, Portet S, Barrey CY. Transdural spinal cord herniation: an exceptional complication of thoracoscopic discectomy: 2-dimensional operative video. *Oper Neurosurg (Hagerstown, Md)*. 2021;21:E48.
92. Alhani B, Nagappa S, Baird C, et al. Case series of intradural disc in recurrence of lumbar disc prolapse. *J Surg Case Rep*. 2021:rjaa611, 2021.
93. Chen J, Ni H-J, Xue F, et al. Upper lumbar intradural disc herniation: a rare case report and etiologic analysis. *J Pain Res*. 2021;14:1475–1481.
94. Serikyaku H, Higa S, Yara T. Intradural disc herniation at the L1-2 level. *Surg Neurol Int*. 2021;12:351.
95. Tanabe M, Ogihara S, Iida S, Ikemune S, Kikuchi J, Saita K. Intradural disc herniation concurrent with ossification of the posterior longitudinal ligament, ossification of the ligamentum flavum, and cauda equina schwannoma at the L1–L2 level: a case report. *Spine Surg Relat Res*. 2021;5:307–309.
96. Yu Y, Yang Z, Xiang Y, et al. Unexpected intradural disc herniation instead of space-occupying tumor at L3–L4 level: a case report and literature review. *Am J Transl Res*. 2021;13:10891–10895.
97. Lin Y-H, Chen D-C, Chen C-H, Huang H-M, Cho D-Y. Combined posterior and anterior approaches for cervical intradural disc herniation: a case report. *Biomedicine*. 2021;11:56–59.
98. Ihejirika RC, Tong Y, Patel K, Protopsaltis T. Intradural lumbar disc herniation: illustrative case. *J Neurosurg*. 2021. Case lessons 2: CASE21336.
99. Moon S-J, Han M-S, Lee G-J, Lee S-K, Moon BJ, Lee J-K. Unexpected intradural lumbar disk herniation found during transforaminal endoscopic surgery. *World Neurosurg*. 2020;134:540–543.

100. Lim D-J, Lee J-H. Posterior lumbar interbody fusion graft penetrated the lumbar thecal sac in a patient with rheumatoid arthritis: a case report. *Int J Surg Case Rep*. 2020;67:21–24.
101. Luo D, Ji C, Xu H, Feng H, Zhang H, Li K. Intradural disc herniation at L4/5 level causing Cauda equina syndrome: a case report. *Medicine (Baltimore)*. 2020;99:e19025.
102. Lee G, Han M-S, Lee S-K, Moon B, Lee J-K. Traumatic intradural ruptured lumbar disc with a spinal compression fracture: a case report. *Medicine (Baltimore)*. 2020;99:e19037.
103. Ponzo G, Furnari M, Umana GE, Giuffrida M, Nicoletti GF, Scalia G. Intradural lumbar disc herniations at the L1-L2 level: a case study and literature review. *Surg Neurol Int*. 2020;11:67.
104. Gopakumar S, Srinivasan VM, Ropper A, Raber M. Cervical intradural disc herniation: case report and operative video. *Cureus*. 2020;12:e7537.
105. Ashraf A, Babar Z-U-D. Intradural disc herniation: a case report and literature review. *Cureus*. 2020;12:e7600.
106. Cornips E, Grouls M, Bekelaar K. Transdural thoracic disk herniation with longitudinal slitlike dural defect causing intracranial hypotension: report of 2 cases. *World Neurosurg*. 2020;140:e311–e319.
107. Rathod T, Panchal S, Marathe N, Agrahari Y, Sathe A. Intradural disc herniation in the lumbar spine: a case report. *J Nepal Med Assoc*. 2020;58:345–348.
108. Low JCM, Rowland D, Kareem H. L1/2 intradural disc herniation with compression of the proximal cauda equina nerves: a surgical challenge. *World Neurosurg*. 2020;142:147–151.
109. Morozumi N, Aizawa T, Sasaki M, Koizumi Y, Kokubun S. Spontaneous resorption of intradural lumbar disc herniation: a rare case report. *Spine Surg Relat Res*. 2020;4:277–279.
110. Thohar Arifin M, Ikbar KN, Brilliantika SP, Bakhtiar Y, Bunyamin J, Muttaqin Z. Challenges in intradural disc herniation diagnosis and surgery: a case report. *Ann Med Surg*. 2020;58:156–159.
111. Ueberschaer M, Patzig M, Mueller K, Schwarting J, Trabold R, Tonn J-C. Case report of a cervical myelomalacia caused by a thoracolumbar intradural disc herniation leading to intracranial hypotension. *J Neurol*. 2020;267:3421–3424.
112. Fiechter M, Ott A, Beck J, Weyerbrock A, Fournier J-Y. Intradural non-calcified thoracic disc herniation causing spontaneous intracranial hypotension: a case report. *BMC Surg*. 2019;19:66.
113. Pedaballe AR, Mallepally AR, Tandon V, Sharma A, Chhabra HS. An unusual case of transdural herniation of a lumbar intervertebral disc: diagnostic and surgical challenges. *World Neurosurg*. 2019;128:385–389.
114. Celano EC, Sayah A, McGrail K. Cervical intradural disc herniation, case report and reflection on preoperative imaging. *Radiol Case Rep*. 2019;14:1076–1078.
115. Aprígio RM, Caramanti RL, Santos FOR, et al. Intradural disc herniation at the L1–L2 level: a case report and literature review. *Surg Neurol Int*. 2019;10:196.
116. Inoue T. Pure conus medullaris syndrome without lower extremity involvement caused by intradural disc herniation at L1/2: a case report. *Spine Surg Relat Res*. 2019;3:392–395.
117. Ge C-Y, Hao D-J, Yan L, et al. Intradural lumbar disc herniation: a case report and literature review. *Clin Interv Aging*. 2019;14:2295–2299.
118. Walker CT, Kalani MYS, Oppenlander ME, Godzik J, Martirosyan NL, Standerfer RJ, Theodore N. Circumferential dural resection technique and reconstruction for the removal of giant calcified transdural herniated thoracic discs. *J Neurosurg Spine*. 2018;28:167–172.
119. Rodrigo V, Claramonte M, Martín M, Calatayud JB. Intradural disc herniation: how I do it. *Acta Neurochir (Wien)*. 2018;160:945–947.
120. Jia J, Wei Q, Wu T, He D, Cheng X. Two cases in which 3D MRI was used to differentiate between a disc mass that mimics a tumor and neurinoma. *BMC Musculoskelet Disord*. 2018;19:154.
121. Brogna C, Lavrador JP, Patel S, et al. Posterior longitudinal ligament and its implications in intradural cervical disc herniation: case report and review of the literature. *Surg Neurol Int*. 2018;9:119.
122. Wipplinger C, Simian A, Hernandez RN, et al. Superficial siderosis of central nervous system as primary clinical manifestation secondary to intradural thoracic disk herniation. *World Neurosurg*. 2018;119:40–44.
123. Kim HS, Pradhan RL, Adsul N, Jang J-S, Jang I-T, Oh S-H. Transforaminal endoscopic excision of intradural lumbar disk herniation and dural repair. *World Neurosurg*. 2018;119:163–167.
124. Sharma A, Singh V, Sangondimath G, Kamble P. Intradural disc a diagnostic dilemma: case series and review of literature. *Asian J Neurosurg*. 2018;13:1033–1036.
125. Montalvo Afonso A, Mateo Sierra O, Gil de Sagredo del Corral OL, 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.
126. Huliyappa HA, Singh RK, Singh SK, et al. Transdural herniated lumbar disc disease with muscle patch for closure of durotomy – a brief review of literature. *Neurol Neurochir Pol*. 2017;51:149–155.
127. Baudracco I, Grahovac G, Russo VM. Spontaneous cervical intradural disc herniation presenting with Brown-Séquard and Horner's syndrome: lesson learned from a very unique case. *Eur Spine J Off Publ Eur Spine Soc Eur Spinal Deform Soc Eur Sect Cerv Spine Res Soc*. 2017;26:218–221.
128. Crivelli L, Dunet V. Intradural lumbar disc herniation detected by 3D CISS MRI. *BMJ Case Rep*. 2017, http://dx.doi.org/10.1136/bcr-2017-221728.
129. Schlag HR, Muquit S, Hristov TB, Morassi G, Boszczyk BM, Shafafy M. Subarachnoidal pleural fistula after resection of intradural thoracic disc herniation and multimodal treatment with noninvasive positive pressure ventilation (NPPV). *Eur Spine J Off Publ Eur Spine Soc Eur Spinal Deform Soc Eur Sect Cerv Spine Res Soc*. 2016;25:155–159.
130. Mitchell BD, Verla T, Reddy D, Winnegan L, Omeis I. Reliable intraoperative repair nuances of cerebrospinal fluid leak in anterior cervical spine surgery and review of the literature. *World Neurosurg*. 2016;88:252–259.
131. Yang H-S, Oh Y-M, Eun J-P. Cervical intradural disc herniation causing progressive quadriparesis after spinal manipulation therapy: a case report and literature review. *Medicine (Baltimore)*. 2016;95:e2797.
132. Ajayi O, Shoakazemi A, Tubbs RS, Moisi M, Rostad S, Newell DW. Atypical presentation of a sequestered posterolateral disc fragment. *Cureus*. 2016;8:e502.
133. Park Y-S, Hyun S-J, Kim K-J, Jahng T-A. Multiple intradural disc herniations masquerading as intradural extramedullary tumors: a case report and review of the literature. *Korean J Spine*. 2016;13:30–32.
134. Sawai T, Nakahira J, Minami T. Paraplegia caused by giant intradural herniation of a lumbar disk after combined spinal-epidural anesthesia in total hip arthroplasty. *J Clin Anesth*. 2016;32:169–171.
135. Tempel Z, Zhu X, McDowell MM, Agarwal N, Monaco EA 3rd. Severe intradural lumbar disc herniation with cranially oriented free fragment migration. *World Neurosurg*. 2016;92:582.e1–582.e4.
136. Matsumoto T, Toyoda H, Terai H, Dohzono S, Hori Y, Nakamura H. Utility of discography as a preoperative diagnostic tool for intradural lumbar disc herniation. *Asian Spine J*. 2016;10:771–775.
137. Kertmen H, Gürer B, Yimaz ER, Sekerci Z. Acute bilateral isolated foot drop: report of two cases. *Asian J Neurosurg*. 2015;10:123–125.
138. Sivaraju L, Thakar S, Hegde AS. Dorsal transdural migration of a sequestered intradural lumbar disc. *Spine J*. 2015;15:2108–2109.
139. Tamaki Y, Sakai T, Miyagi R, et al. Intradural lumbar disc herniation after percutaneous endoscopic lumbar discectomy: case report. *J Neurosurg Spine*. 2015;23:336–339.
140. Carroll LS, Teo JTH. Transdural spinal cord herniation with extradural cerebrospinal fluid collection. *Pract Neurol*. 2015;15:482–483.
141. Kasliwal MK, Shimer AL. Transradicular lumbar disc herniation: an extreme variant of intraradicular disc herniation. *Indian J Orthop*. 2015;49:672–675.
142. Mailleux P, Marneffe V, Michel I, Dehullu J-P. The "crumble disc sign": a specific MRI sign of intradural lumbar disc herniation, allowing a preoperative diagnosis. *J Belgian Soc Radiol*. 2015;99:25–29.
143. Warade AG, Misra BK. Spontaneous cervical intradural disc herniation. *J Clin Neurosci Off J Neurosurg Soc Australas*. 2014;21:872–873.
144. Rapoport BI, Hartl R, Schwartz TH. Cranial neuropathy due to intradural disc herniation. *Neurosurgery*. 2014;74:E561–E565.
145. Wang D, Wang H, Shen W-J. Spontaneous cervical intradural disc herniation associated with ossification of posterior longitudinal ligament. *Case Rep Orthop*. 2014:256207, 2014.
146. Kobayashi K, Imagama S, Matsubara Y, et al. Intradural disc herniation: radiographic findings and surgical results with a literature review. *Clin Neurol Neurosurg*. 2014;125:47–51.
147. Krajewski KL, Regelsberger J. Intradural lumbar disc herniation associated with degenerative spine disease and rheumatoid arthritis. *Spine (Phila Pa 1976)*. 2013;38:E763–E765.
148. Jain SK, Sundar IV, Sharma V, Goel RS, Gupta R. Intradural disc herniation – a case report. *Turk Neurosurg*. 2013;23:389–391.
149. Nam KH, Han IH, Cho WH, Choi BK. A pure fluid-filled intradural cyst associated with intradural disc herniation and possible pathogenesis: a case report. *Spine J*. 2013;13:e11–e15.
150. Lee H-W, Kwon Y-M. Traumatic intradural lumbar disc herniation without bone injury. *Korean J Spine*. 2013;10:181–184.
151. Randhawa PS, Roark C, Case D, Seinfeld J. Idiopathic spinal cord herniation associated with a thoracic disc herniation: case report. Surgical video, and literature review. *Clin Spine Surg*. 2020;33:222–229.
152. Rong Y, Wang J, Sui T, Liu W, Luo Y, Cai W. Cervical intradural disc herniation with Brown-Séquard syndrome: case report and literature review. *J Pain Res*. 2019;12:2403–2410.
153. Ding Q, Yu L. Spontaneous cervical intradural disc herniation presenting withbrown-sequard syndrome at C6-C7 level. *J Orthop Case Rep*. 2019;9:30–33.
154. Konishi S, Nakamura H, Kato M, Toyoda H, Dozono M. Cauda equina tumor mimicking an intradural disc herniation, with emphasis on differential diagnosis – a case report. *Acta Neurol Belg*. 2008;108:167–169.
155. Nam KH, Lee IS, Song YS, Han IH, Kim DH. Imaging characteristics of intradural disc herniation: a comparison with large disc extrusion. *Eur J Radiol*. 2021;137:109569.
156. Orakcioglu B, et al. Against the odds: massive lumbar intradural disk herniation in the elderly. *Global Spine J*. 2015;5:e84–e87.
157. Jin YZ, et al. Lumbar intradural disc herniation caused by injury: a case report and literature review. *Orthop Surg*. 2023;15:1694–1701.
158. Parnell AP. Cervical intradural disc protrusion. *J Neurol Neurosurg Psychiatry*. 1988;51:1007.
159. Destee A, Lesoin F, Di Paola F, Warot P. Intradural herniated cervical disc associated with chiropractic spinal manipulation. *J Neurol Neurosurg Psychiatry*. 1989;52:1113.
160. 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;3:396–403.
161. Roda JM, Gonzalez C, Blázquez MG, Alvarez MP, Argüello C. Intradural herniated cervical disc. Case report. *J Neurosurg*. 1982;57:278–280.
162. Teng P, Papatheodorou C. Intrathecal dislocation of lumbar intervertebral disc. *Neurochirurgia (Stuttg)*. 1964;7:57–63.
163. Eisenberg RA, Bremer AM, Northup HM. Intradural herniated cervical disk: a case report and review of the literature. *Am J Neuroradiol*. 1986;7:492–494.

164. Guan Q, Xing F, Long Y, Xiang Z. Cervical intradural disc herniation: a systematic review. *J Clin Neurosci Off J Neurosurg Soc Aust.* 2018;48:1–6.
165. Kirnaz S, Capadona C, Wong T, et al. Fundamentals of intervertebral disc degeneration. *World Neurosurg.* 2022;157:264–273.
166. Yildizhan A, Paşaoğlu A, Okten T, Ekinci N, Aycan K, Aral O. Intradural disc herniations pathogenesis, clinical picture, diagnosis and treatment. *Acta Neurochir (Wien).* 1991;110:160–165.
167. Cofano F, Berjano P, Vercelli G, Palmieri G, Pejrona M, Zenga F, et al. Spontaneous regression of calcified thoracic herniations: Can Hounsfield-units radiodensity have a predictive value? *Eur Spine J Off Publ Eur Spine Soc Eur Spinal Deform Soc Eur Sect Cerv Spine Res Soc.* 2020;29:1717–1723.
168. Sasaji T, Horaguchi K, Yamada N, Iwai K. The specific sagittal magnetic resonance imaging of intradural extra-arachnoid lumbar disc herniation. *Case Rep Med.* 2012;2012:383451.
169. Kang MS, Park JY, Kuh SU, et al. Preoperative radiographic clues for transdural disc herniation: could it be predictable? *Acta Neurochir (Wien).* 2019;161:2409–2414.