frontiers in Veterinary Science

TYPE Case Report
PUBLISHED 11 November 2026
DOI 10.3389/fvets.2026.1934121

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OPEN ACCESS

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RECEIVED 10 July 2026
REVISED 23 October 2026
ACCEPTED 23 October 2026
PUBLISHED 11 November 2026

CITATION
Bae S, Yoon J, Jeon Y, Lee H and Jeong J (2026) Case Report: Interlaminar approach for unilateral biportal endoscopy of a thoracolumbar intervertebral disc extrusion in a dog. *Front. Vet. Sci.* 13:1934121. doi: 10.3389/fvets.2026.1934121

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Case Report: Interlaminar approach for unilateral biportal endoscopy of a thoracolumbar intervertebral disc extrusion in a dog

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A 7-year-old castrated male Golden Retriever weighing 41 kg was presented with progressive ambulatory paraparesis and bilateral pelvic limb proprioceptive ataxia (modified Frankel grade 2). Computed tomography and magnetic resonance imaging confirmed a right-ventrolateral T13-L1 intervertebral disc extrusion reducing the cross-sectional area of the spinal cord by approximately 30% at the site of maximal compression. Spinal cord decompression was performed through a unilateral biportal endoscopic interlaminar approach, with the skin entry points of both portals positioned along the medial pedicle line. The interlaminar window was enlarged by partial laminotomy and partial medial facetectomy while preserving the pedicle and the majority of the articular processes joint. The wide dorsal endoscopic view provided direct visualization of an adherent, encapsulated disc fragment and an adjacent congested internal vertebral venous sinus facilitating their management. The dog recovered uneventfully from anesthesia. Mild residual left pelvic limb monoparesis was present at discharge and, at the final evaluation on postoperative day 109 (modified Frankel grade 2), at which time the paw placement response was normal in the right pelvic limb and intermittently mildly delayed in the left pelvic limb. No recurrence of clinical signs was reported by the owner on postoperative day 121. To the authors' knowledge, this is the first clinical report of an interlaminar unilateral biportal endoscopic approach for canine thoracolumbar intervertebral disc extrusion, broadening the minimally invasive options for this condition.

KEYWORDS
interlaminar approach, intervertebral disc extrusion, minimally invasive spine surgery, thoracolumbar, unilateral biportal endoscopy

1 Introduction

Intervertebral disc disease (IVDD) is the most common spinal disorder in dogs and a leading cause of spinal cord compression, producing clinical signs that range from spinal hyperesthesia to gait abnormalities and severe neurological deficits (1, 2). Its most frequent manifestation is Hansen type I disc herniation, in which complete rupture of the annulus fibrosus permits displacement of nucleus pulposus material into the vertebral canal, characteristically affecting the thoracolumbar region (1, 2). When the extruded

material causes marked spinal cord compression or progressive neurological dysfunction, surgical decompression by hemilaminectomy and removal of the offending disc material remains the mainstay of treatment and is associated with favorable long-term neurological outcomes (3).

Conventional decompression is most commonly accomplished through open dorsolateral approach using different techniques such as hemilaminectomy, mini-hemilaminectomy, and pediculectomy, which provide direct access to the vertebral canal and yield consistently favorable clinical outcomes (3). Dorsolateral approach to the vertebral column nonetheless requires substantial elevation and retraction (4). Minimally invasive spine surgery (MISS) has therefore been pursued as a means of achieving comparable neural decompression while limiting iatrogenic soft-tissue disruption, perioperative morbidity, and recovery time (4).

Among MISS techniques, unilateral biportal endoscopy (UBE), adapted from human spinal surgery, employs two independent portals on the same side. One portal accommodates an endoscope under continuous saline irrigation for magnified, wide-angle visualization, and the other permits unrestricted instrument manipulation, thereby combining endoscopic illumination with the manipulative freedom of open surgery while sparing the paraspinal musculature (5). In human spine surgery, the interlaminar approach is a well-established UBE corridor for the lumbar spine and is widely used both for intervertebral disc herniation and for unilateral laminotomy with bilateral decompression in spinal stenosis (6–8). In veterinary medicine, biportal endoscopic spine surgery has been described only recently. In the thoracolumbar region it has been evaluated in ex vivo cadaveric and *in vivo* preclinical studies (9, 10) and, applied clinically in a series of dogs with intervertebral disc herniation (11). Notably, these thoracolumbar reports have uniformly employed a lateral mini-hemilaminectomy corridor, whereas an interlaminar UBE approach has thus far been described only in the cervical spine (12).

The present report describes the clinical application of a UBE interlaminar approach for spinal cord decompression in a dog with a T13-L1 intervertebral disc extrusion, detailing the surgical technique, the postoperative neurological course, and the distinctions between this interlaminar approach and previously reported mini-hemilaminectomy techniques.

2 Case description

A 7-year-old castrated male Golden Retriever weighing 41 kg (body condition score 7/9) was referred for evaluation of a 2-year history of chronic, slowly progressive bilateral pelvic limb dysfunction. The owner reported a gradually worsening gait abnormality characterized by scuffing of both pelvic limbs, together with reluctance to ascend stairs and difficulty rising on smooth flooring. There was no history of acute trauma. Relevant medical history included a left femoral head and neck ostectomy performed approximately 3 years previously. On neurological examination, the dog was ambulatory paraparetic with general proprioceptive ataxia on both pelvic limbs (modified Frankel grade 4) and adopted a wide-based stance when standing (13). Paw placement test responses were bilaterally mildly delayed in the pelvic limbs, whereas the thoracic limbs were normal, and mentation and cranial nerve responses were unremarkable. Patellar and pelvic limb withdrawal reflexes were normal bilaterally. Spinal palpation elicited thoracolumbar hyperesthesia. Neuroanatomical localization was consistent with T3–L3 myelopathy.

Complete blood count and serum biochemistry were within normal limits. Survey spinal radiography was performed as an initial screening study to exclude gross osseous abnormalities; it revealed narrowing of several thoracolumbar intervertebral disc spaces and spondylosis deformans. These findings were considered nonspecific and did not allow identification of the area responsible for the myelopathy (1). Computed tomography was therefore performed to evaluate the osseous structures and to detect mineralized disc material, and additionally provided the bony anatomy used to plan portal placement. It demonstrated mineralized extruded disc material within the vertebral canal at the level of T13-L1 intervertebral disc, located right-ventrolaterally to the spinal cord and compressing approximately 30% of its cross-sectional area at the site of maximal compression, together with degenerative changes of the left T13-L1 articular processes joint (Figures 1A, B). Magnetic resonance imaging was performed to evaluate the extruded material, the spinal cord, and the degree of compression, for which it is more sensitive than CT (14). It confirmed a right-ventrolateral intervertebral disc extrusion at T13-L1 that extended dorsally to nearly the level of the dorsal margin of the spinal cord. The extruded material compressed and displaced the cord laterally to the left, with loss of the epidural fat signal and attenuation of the lateral subarachnoid cerebrospinal fluid column at this level (Figures 1C, D). The affected disc was Pfirrmann grade 3 (15) On the basis of the clinical, neurological, and imaging findings, a diagnosis of T13-L1 intervertebral disc extrusion was established, and surgical decompression was elected.

2.1 Surgical procedure

A UBE interlaminar approach was selected for spinal decompression and removal of the extruded disc material, adapting previously described preclinical UBE techniques for the canine thoracolumbar and cervical spine with slight modification (9, 12). Whereas the earlier thoracolumbar technique entered the vertebral canal through a lateral mini-hemilaminectomy corridor, the present approach entered the canal dorsally through the interlaminar space; the resulting modifications to portal placement are described below.

The dog was premedicated with midazolam (0.2 mg/kg, IV), induced with propofol (4 mg/kg, IV), and maintained with isoflurane (1–1.5%) in oxygen. Constant-rate infusions of remifentanil (6 μg/kg/h) and ketamine (5–10 μg/kg/min) were provided for intraoperative analgesia. For perioperative antimicrobial prophylaxis, cefazolin (22 mg/kg, IV) was administered 30 min before skin incision and repeated every 90 min during surgery.

The dog was positioned in sternal recumbency for a dorsal approach. The T13-L1 level was confirmed fluoroscopically using a Kirschner wire and a periosteal elevator. The skin entry points of the two portals were planned on the right side

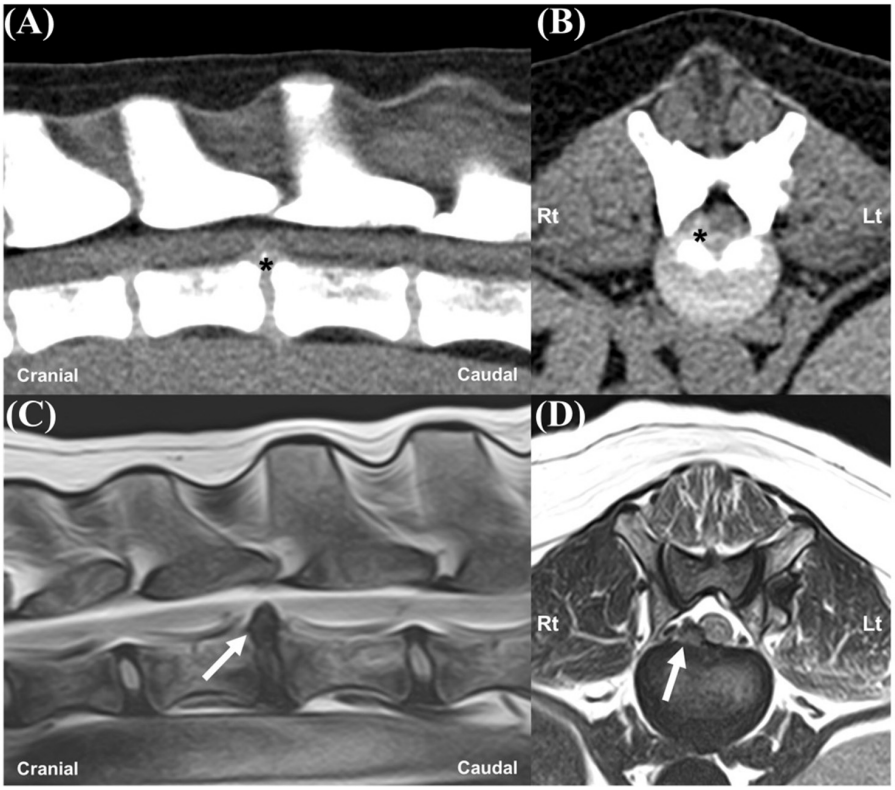


FIGURE 1
Preoperative diagnostic imaging of the T13-L1 intervertebral disc extrusion. **(A)** Transverse CT image (bone window) and **(B)** sagittal CT reconstruction showing the extruded disc material (black asterisk) within the right side of the vertebral canal at T13-L1, reducing the cross-sectional area of the vertebral canal at the site of maximal compression by approximately 30% at the site of maximal compression. **(C)** Sagittal and **(D)** transverse T2-weighted MR images; the extruded material (white arrows) lies right ventrolaterally, extends dorsally, and displaces the spinal cord to the left. Rt, right; Lt, left.

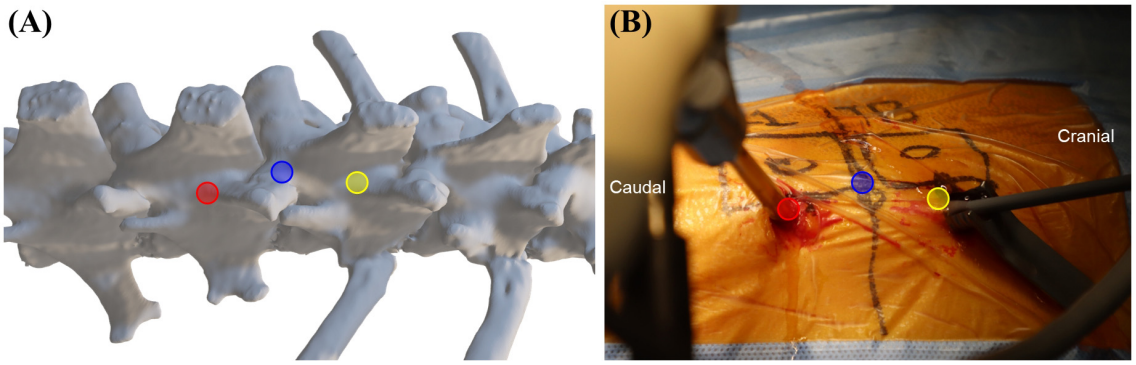


FIGURE 2
Portal placement for the interlaminar approach. **(A)** Three-dimensional CT reconstruction (right oblique view) showing the initial bone contact points of the viewing portal on the L1 lamina (red) and of the instrument portal on the T13 lamina (yellow), and the docking point at the T13-L1 interlaminar space adjacent articular processes joint (blue). **(B)** Intraoperative photograph with the outlines of the underlying vertebrae drawn on the skin, the same initial bone contact points projected onto the skin: the viewing portal contact point on the L1 lamina (red) and the instrument portal contact point on the T13 lamina (yellow).

along the medial pedicle line, with the viewing portal entry at the level of the L1 pedicle and an instrument portal entry at the level of the T13 pedicle. In the previously described UBE technique, one portal was positioned immediately lateral to the mammillary process, approximately two to three times the spinous process-to-mammillary process distance lateral to the dorsal spinous process, and the second portal was placed approximately 2 cm cranial or caudal to the first to facilitate triangulation and minimize instrument collision (9). In contrast, the portals in our case were positioned closer to the midline, immediately lateral to the T13 and L1 dorsal spinous processes, at a distance approximately equal to the previously described reference distance. This positioning provided a dorsomedially directed working trajectory from the skin entry points toward the

articular process joint and the dorsal lamina, while maintaining adequate triangulation. Skin and fascial incisions were made at each portal site with a No. 11 blade, and the portals were established by serial dilation and blunt dissection with periosteal elevator. Initial bony contact was made at the L1 lamina through the viewing portal and at the T13 lamina through the instrument portal. The docking point was set at the T13-L1 interlaminar space adjacent to articular processes joint (Figure 2).

A rigid endoscope was introduced through the viewing portal under continuous saline irrigation (Supplementary Video 1). Through the instrument portal, the soft tissue overlying the bone was dissected with a periosteal elevator and a radiofrequency probe to expose the anatomical landmarks. The base of the L1 spinous process was identified first; proceeding cranially, the right T13-L1 articular processes joint and the caudal part of T13 spinous process were then exposed. These three structures served as the anatomical landmarks for the interlaminar site of bone removal. Bone removal was commenced at the interlaminar space with a 5mm hooded burr and shaver system (375-950-100, FORMULA shaver system, Stryker, Kalamazoo, MI, USA), and once the vertebral canal was reached, a Kerrison rongeur was used to enlarge the interlaminar window by partial laminotomy of the adjacent laminae and partial medial facetectomy, while preserving the pedicle and the majority of the articular processes joint.

Through the dorsal interlaminar window, the extruded disc material was identified within the vertebral canal, together with a congested venous sinus lying caudal and ventral to it. This dorsal approach provided a wide view of the venous sinus, which was being compressed by the extruded disc material; gentle probing of the extruded disc material transiently relieved congestion of the sinus. The extruded material was fibrotic and enclosed within a capsule adhered to the spinal cord. The capsule was therefore fenestrated, and the contained disc material was removed in a piecemeal fashion with pituitary forceps and a probe. Although the extruded material had appeared as a single mass on the preoperative MRI, removal of the first fragment revealed a second fragment immediately caudal to it, which was subsequently removed in the same manner. Following removal of all compressive material, the spinal cord was seen endoscopically to return toward its normal position within the vertebral canal, and the congestion of the venous sinus resolved. Hemostasis was achieved with bone wax (W31C, Ethicon LLC, Guaynabo, PR, USA) and a flowable gelatin-thrombin hemostatic matrix (Floseal® Hemostatic Matrix, Baxter Healthcare, Deerfield, IL, USA), and the subcutaneous tissue and skin were closed routinely. The surgical time, from skin incision to skin closure, was 157 min.

The dog recovered uneventfully from anesthesia. On immediate postoperative neurological examination, the dog remained ambulatory with paraparesis and bilateral pelvic limb proprioceptive ataxia, comparable to the preoperative findings. Postoperative analgesia was provided with a fentanyl patch (100 μg/h) and meloxicam (0.1 mg/kg, SC, q24 h) for 7 days, and cefazolin (22 mg/kg, IV) was continued for 3 days postoperatively. Sling-assisted walking was provided during the first postoperative day, rehabilitation comprising electroacupuncture was also instituted. The surgical site healed without complication, and paraparesis progressively improved. The dog remained hospitalized until postoperative day 8 at the owner's request for in-hospital postoperative care and rehabilitation. By discharge on postoperative day 8, the dog was ambulatory with only mild residual left pelvic limb monoparesis (modified Frankel grade 2).

At the recheck on postoperative day 35, the gait was markedly improved relative to the preoperative status, with paw placement response normal in the right pelvic limb and mildly delayed in the left. At the final evaluation on postoperative day 109, mild residual left pelvic limb monoparesis persisted (evident in approximately 1 of every 10 strides), and the paw placement response was normal in the right pelvic limb and intermittently mildly delayed in the left. Postoperative cross-sectional imaging (CT or MRI) was not performed. The neurological improvement was maintained and no recurrence of clinical signs was reported by the owner at the telephone follow-up on postoperative day 121.

3 Discussion

In the present report, a large-breed dog with a chronic T13-L1 intervertebral disc extrusion was treated by surgical spinal decompression performed through a UBE interlaminar approach, and progressive neurological improvement was observed at follow-up examinations through postoperative day 109, with sustained improvement and no recurrence of clinical signs reported by the owner on postoperative day 121. To the authors' knowledge, this is the first clinical report of an interlaminar UBE approach for thoracolumbar intervertebral disc extrusion in a dog. Unilateral biportal endoscopy of the canine thoracolumbar spine has been documented in *ex vivo* and *in vivo* preclinical studies and, more recently, in a clinical series (9–11). However, these reports uniformly employed a lateral mini-hemilaminectomy corridor, and an interlaminar approach had been described only in the cervical spine (12). The present case establishes the clinical feasibility of an interlaminar corridor in the canine thoracolumbar spine and, in doing so, broadens the minimally invasive options available for intervertebral disc extrusion (4).

The advantages of this approach follow from the principles of minimally invasive spine surgery. First, as in other UBE techniques, the vertebral canal is reached through two small portals, which limits the elevation and dissection of the epaxial musculature required for open hemilaminectomy (4). Second, the interlaminar corridor is created by partial laminotomy and medial facetectomy, so that the pedicle and the greater part of the articular processes joint are preserved rather than removed as in hemilaminectomy; at the same time, entering the canal from a dorsal direction provides a direct view of the internal vertebral venous plexus, allowing decompression to proceed without directing the working instruments against it. Third the continuous saline irrigation inherent to the technique further preserves a clear operative field and provides tamponade against minor venous bleeding (5). In dogs, the feasibility of UBE has been progressively established across different spinal regions, including the thoracolumbar and lumbosacral spine (9, 11, 16).

The operative time in this case (157 min) was longer than that reported for thoracolumbar UBE in dogs, which has ranged from approximately 50 to 80 min in clinical and experimental settings (9–11). No study has yet compared UBE with an open approach in

dogs, although in humans UBE has been associated with a longer operation time than open microdiscectomy (7). Several factors likely contributed to the longer time in the present case: this was the first clinical application of the approach at our institution, and a marked reduction in operative time with experience has been documented consistently in canine UBE studies (10, 12, 16); and the adherent, encapsulated material required piecemeal removal. The reduced soft-tissue disruption offered by an endoscopic corridor must therefore be weighed against a longer period of general anesthesia.

The principal contribution of this case lies in the choice of surgical corridor. Previous descriptions of canine thoracolumbar UBE have approached the vertebral canal through a lateral mini-hemilaminectomy (9–11). A laterally directed corridor of this kind works close to the ventrolateral floor of the canal, where the exiting spinal nerve and the internal vertebral venous plexus, which runs ventrally over the vertebral bodies and intervertebral discs in a characteristic rhomboidal pattern, are encountered (17).

In the present case, the disc had extruded in a right-ventrolateral direction and extended dorsally, displacing the spinal cord to the left, and the congested venous sinus lay immediately adjacent to and partly obscured by the extruded material; therfore mini-hemilaminectomy corridor would have directed the working instruments toward the the engorged vertebral venous plexus to reach the material (17). A dorsal interlaminar approach was therefore selected. The dorsal interlaminar corridor selected here corresponds to the approach most widely used for biportal endoscopic spinal cord decompression in the human lumbar spine (6, 7). Entering the canal more dorsally kept the working trajectory away from the ventrally located venous plexus and afforded a wide endoscopic view of the operative field (17). By enlarging the interlaminar window with partial laminotomy and medial facetectomy while preserving the pedicle, this corridor allowed the adherent disc material and the congested plexus to be managed under clear visualization (17).

Whether the dorsal interlaminar corridor is appropriate depends on the anatomy of the vertebral canal and the location of the extruded material. Entering the canal dorsally brings the spinal cord into the working field first, ventrally located material may be less accessible than through a lateral approach, and concurrent lateral fenestration of the affected disc is not possible. The clinical relevance of the last point remains uncertain: a recent systematic review and meta-analysis found no significant difference in overall recurrence with or without prophylactic fenestration, although fenestrated discs themselves were rarely the site of recurrence and the quality of the available evidence was rated low, so that a protective effect can be neither confirmed nor excluded (18). In the present case, the relatively small cord-to-canal ratio of this large-breed dog and the dorsal extension of the extruded material favored the dorsal corridor; in dogs with a larger spinal cord or a predominantly ventral extrusion, a lateral corridor is likely to remain the more direct route.

The interlaminar approach depends on reliable bony landmarks for orientation. In human lumbar biportal endoscopic surgery, the interlaminar corridor is routinely established with reference to bony landmarks such as the base of the spinous process, the adjacent laminae, and the articular processes joint, identified under fluoroscopic guidance (6, 19). The same landmark-based decompression has been extended to the human thoracic spine and to the thoracolumbar region (20, 21) The applicability of this landmark-based interlaminar localization to the canine thoracolumbar spine had not previously been confirmed. A cervical interlaminar approach has been described in the dog through a relatively accessible interlaminar window (12), but the thoracolumbar interlaminar space is considerably narrower, so that the feasibility and reproducibility of the technique in this region required confirmation. In the present case, the base of the L1 spinous process was identified first, and the dissection then proceeded cranially to expose the T13 to L1 articular processes joint and the T13 spinous process, with the portals placed along the medial pedicle line at the levels L1 and T13 (9). Accurate fluoroscopic localization together with careful identification of these landmarks proved essential to establish and orient the working corridor within the narrow interlaminar space. The consistent relationship between the adjacent spinous processes and the articular processes joint provided a reproducible reference for aligning the interlaminar window over the affected disc, supporting the feasibility of this landmark-based interlaminar approach in the canine thoracolumbar spine.

A further feature of this case concerned the management of the venous sinus adjacent to the extruded material. A congested venous sinus was encountered immediately adjacent to the extruded material, in keeping with the ventral course of the internal vertebral venous plexus over the disc (17) and with the frequent association between thoracolumbar disc extrusion and epidural venous hemorrhage (22). The wide field afforded by the dorsal interlaminar corridor allowed this engorged plexus to be identified and managed under direct vision rather than blindly, with the saline irrigation helping to maintain visibility during dissection of the adherent material (5). Once the fragments had been removed, the venous congestion resolved, confirming adequate decompression. These observations suggest that a dorsal interlaminar corridor may be particularly well suited to cases in which ventrolaterally extruded intervertebral disc material also extends dorsally, displacing the spinal cord laterally and the internal vertebral venous plexus dorsally from its normal ventral position, as a lateral mini-hemilaminectomy corridor may increase the risk of venous plexus laceration and hemorrhage (17, 22).

Several limitations of this report should be acknowledged. As a single case, it does not permit generalization, and confirmation in larger prospective and comparative studies is required. Because the interlaminar UBE approach is technically demanding and new to the canine thoracolumbar spine, its reproducibility will need to be established across additional cases and surgeons (23). In particular, the consistency of the bony landmarks used for localization remains to be defined. Because the interlaminar window and its relationship to the spinous processes and articular processes joint may vary between individuals and breeds, anatomical studies will be needed to confirm that landmark-based localization is reliable across patients. Additionally, postoperative cross-sectional imaging (CT or MRI) was not performed to objectively confirm the extent of decompression or to exclude residual disc material. Finally, the follow-up period was relatively short, and longer

observation is needed to confirm the durability of the recovery and to exclude recurrence.

4 Conclusion

This report describes the first clinical use of a unilateral biportal endoscopic interlaminar approach for the treatment of thoracolumbar intervertebral disc extrusion in a dog, achieving adequate decompression and a favorable neurological outcome. The dorsal interlaminar corridor may be particularly suited to cases in which the extruded material extends dorsally, displacing the spinal cord laterally and the internal vertebral venous plexus dorsally, and in which the vertebral canal provides sufficient working space; breed and vertebral canal morphology should be considered when selecting this approach. Further studies in larger case series are needed to confirm the reproducibility, indications, and long-term outcomes of this approach in the canine thoracolumbar spine.

5 Patient perspective

The owner reported that the dog returned to comfortable, independent ambulation with no signs of pain or discomfort, and only mild residual left pelvic limb paresis remaining. The functional outcome was satisfactory, and the owner expressed high satisfaction with the minimally invasive procedure.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical approval was not required for the studies involving animals in accordance with the local legislation and institutional requirements because this was a case report describing the routine clinical diagnosis and treatment of a single client-owned dog. Written informed consent was obtained from the owner for participation of their animals in this study and for publication. Written informed consent was obtained from the participant/patient(s) for the publication of this case report.

Author contributions

SB: Investigation, Conceptualization, Visualization, Data curation, Methodology, Writing – original draft, Formal analysis. JY: Methodology, Writing – original draft, Investigation, Conceptualization, Formal analysis, Data curation, Visualization. YJ: Conceptualization, Software, Visualization, Validation, Writing – review & editing, Investigation. HL: Funding acquisition, Writing – review & editing, Conceptualization, Investigation, Resources, Project administration, Methodology. JJ: Funding acquisition, Project administration, Methodology, Supervision, Writing – review & editing, Conceptualization, Investigation.

Funding

The author(s) declared that financial support was received for this work and/or its publication. This research was supported by the research fund of Chungnam National University.

Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fvets.2026.1934121/full#supplementary-material

SUPPLEMENTARY VIDEO 1
Unilateral biportal endoscopic interlaminar approach and spinal cord decompression and removal of the extruded disc material at T13-L1 in a dog, showing the dorsal approach, enlargement of the interlaminar window with preservation of the pedicle and articular processes joint, management of the congested internal vertebral venous sinus, and piecemeal removal of the extruded disc material.

References

1. Brisson BA. Intervertebral disc disease in dogs. *Vet Clin North Am Small Anim Pract.* (2010) 40:829–58. doi: 10.1016/j.cvsm.2010.06.001

2. Fenn J, Olby NJ. Canine Spinal Cord Injury Consortium (CANSORT-SCI). Classification of intervertebral disc disease. *Front Vet Sci.* (2020) 7:579025. doi: 10.3389/fvets.2020.579025

3. Aikawa T, Fujita H, Kanazono S, Shibata M, Yoshigae Y. Long-term neurologic outcome of hemilaminectomy and disk fenestration for treatment of dogs with thoracolumbar intervertebral disk herniation: 831 cases (2000–2007). *J Am Vet Med Assoc.* (2012) 241:1617–26. doi: 10.2460/javma.241.12.1617

4. Hettlich BF. Minimally invasive spine surgery in small animals. *Vet Clin North Am Small Anim Pract.* (2018) 48:153–68. doi: 10.1016/j.cvsm.2017.08.008

5. Lin GX, Huang P, Kotheeranurak V, Park CW, Heo DH, Park CK, et al. A systematic review of unilateral biportal endoscopic spinal surgery: preliminary clinical results and complications. *World Neurosurg.* (2019) 125:425–32. doi: 10.1016/j.wneu.2019.02.038

6. Eum JH, Heo DH, Son SK, Park CK. Percutaneous biportal endoscopic decompression for lumbar spinal stenosis: a technical note and preliminary clinical results. *J Neurosurg Spine.* (2016) 24:602–7. doi: 10.3171/2015.7.SPINE15304

7. Kim SK, Kang SS, Hong YH, Park SW, Lee SC. Clinical comparison of unilateral biportal endoscopic technique versus open microdiscectomy for single-level lumbar discectomy: a multicenter, retrospective analysis. *J Orthop Surg Res.* (2018) 13:22. doi: 10.1186/s13018-018-0725-1

8. Heo DH, Park DY, Hong HJ, Hong YH, Chung H. Indications, contraindications, and complications of biportal endoscopic decompressive surgery for the treatment of lumbar stenosis: a systematic review. *World Neurosurg.* (2022) 168:411–20. doi: 10.1016/j.wneu.2022.09.023

9. Nam S, Jeon Y, Kim J, Jeong J, Jeong S, Lee Y, et al. Unilateral biportal endoscopy (UBE) spine surgery for thoracolumbar intervertebral disc diseases in dogs: an ex vivo cadaveric and in vivo preclinical study. *Vet Surg.* (2026) 55:816–27. doi: 10.1111/vsu.14324

10. Lee SH, Park JH, Kim DE, Hwang G, Moon CH, Lee D. Anatomical validation and technical feasibility of biportal endoscopic spinal surgery including technical notes in a cadaveric canine thoracic intervertebral disc disease model. *Animals (Basel).* (2026) 16:435. doi: 10.3390/ani16030435

11. Kim Y, Lim JH Ryu Y, Choi DJ. Biportal endoscopic spine surgery for treatment of thoracolumbar intervertebral disc herniation in 13 dogs. *Front Vet Sci.* (2025) 12:1638065. doi: 10.3389/fvets.2025.1638065

12. Bae H, Lee H, Nam S, Jeon Y, Jeong J. Unilateral biportal endoscopic partial cervical laminectomy and facetectomy: an ex vivo study and case report. *Vet Surg.* (2026) 55:657–71. doi: 10.1111/vsu.70095

13. Cooper JJ, Young BD, Griffin JF, Fosgate GT, Levine JM. Comparison between noncontrast computed tomography and magnetic resonance imaging for detection and characterization of thoracolumbar myelopathy caused by intervertebral disk herniation in dogs. *Vet Radiol Ultrasound.* (2014) 55:182–9. doi: 10.1111/vru.12114

14. Levine GJ, Levine JM, Budke CM, Kerwin SC, Au J, Vinayak A, et al. Description and repeatability of a newly developed spinal cord injury scale for dogs. *Prev Vet Med.* (2009) 89:121–7. doi: 10.1016/j.prevetmed.2009.02.016

15. Bergknut N, Auriemma E, Wijsman S, Voorhout G, Hagman R, Lagerstedt AS, et al. Evaluation of intervertebral disk degeneration in chondrodystrophic and nonchondrodystrophic dogs by use of Pfirrmann grading of images obtained with low-field magnetic resonance imaging. *Am J Vet Res.* (2011) 72:893–8. doi: 10.2460/ajvr.72.7.893

16. Kim J, Lee H, Jeong J, Jeon Y. Biportal endoscopic lumbosacral foraminotomy in dogs: technical feasibility and anatomical assessment in cadavers. *Front Vet Sci.* (2025) 12:1637089. doi: 10.3389/fvets.2025.1637089

17. Ariete V, Barnert N, Gomez M, Mieres M, Perez B, Gutierrez JC. Morphometrical study of the lumbar segment of the internal vertebral venous plexus in dogs: a contrast CT-based study. *Animals (Basel).* (2021) 11:1502. doi: 10.3390/ani11061502

18. Pontikaki AE, Pavlidou K, Polizopoulou Z, Savvas I, Kazakos G. Prophylactic effect of fenestration on the recurrence of thoracolumbar intervertebral disc disease in dogs. *Animals (Basel).* (2022) 12:2601. doi: 10.3390/ani12192601

19. Wang Y, Maimaiti A, Tuoheti A, Xiao Y, Zhang R, Kahaer A, et al. The method of portal making in lumbar unilateral biportal endoscopic surgery with different operative approaches according to the constant anatomical landmarks of the lumbar spine: a review of the literature. *Global Spine J.* (2024) 14:1838–61. doi: 10.1177/21925682241230465

20. Zheng B, Li P, Zhang XL, Zhou H, He ZB. Selective facet joint and interlaminar fusion using unilateral biportal endoscopy for thoracolumbar compression fractures: a comparative study. *Sci Rep.* (2025) 15:27322. doi: 10.1038/s41598-025-13326-3

21. Kang MS, Chung HJ, You KH, Park HJ. How I do it: biportal endoscopic thoracic decompression for ossification of the ligamentum flavum. *Acta Neurochir (Wien).* (2022) 164:43–7. doi: 10.1007/s00701-021-05031-7

22. Bridges J, Windsor R, Stewart SD, Fuerher-Senecal L, Khanna C. Prevalence and clinical features of thoracolumbar intervertebral disc-associated epidural hemorrhage in dogs. *J Vet Intern Med.* (2022) 36:1365–72. doi: 10.1111/jvim.16442

23. Xu J, Wang D, Liu J, Zhu C, Bao J, Gao W, et al. Learning curve and complications of unilateral biportal endoscopy: cumulative sum and risk-adjusted cumulative sum analysis. *Neurospine.* (2022) 19:792–804. doi: 10.14245/ns.2143116.558