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Use of transilial vertebral blocking procedure for defecation disorders in cats: Surgical technique and outcomes in four cases

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Summary

This article presents the use of a transilial vertebral blocking procedure (TVBP) in 4 cats with varying degrees of defecation disorders, such as difficulty in assuming a defecation posture, constipation and, ultimately, development of megacolon. Each patient showed lumbosacral hypersensitivity and tenderness. In all patients, radiological examination revealed lesions at the L7-S junction of the spine (L7 – seventh lumbar vertebra, S – sacrum). For 3 patients, the suggested primary course of action was the injection of methylprednisolone acetate into the spinal canal. One patient had had a problem with passing stool since a traffic accident. X-ray examination revealed an inveterate pelvic fracture, which, however, did not result in a significant narrowing of the pelvic canal. Nevertheless, lumbar spine lesions (ventral curvature) with a significant degree of sacral verticalization were observed. The cat was not administered any anti-inflammatory medication. The average postoperative follow-up period was 19 months (from 14 to 28 months). The clinical condition improved in all patients. Two patients who had required daily enemas prior to surgery showed significant improvement. In a patient with an inveterate pelvic fracture, enemas were performed approximately once every 4 months, and the diameter of the colon decreased by about 50% to 20 mm without signs of dilatation. All patients demonstrated a lasting and significant improvement in bowel movements after the surgical procedure, which involved the transilial fixation of the L7-S space with Kirschner wire. No severe postoperative complications were observed. Practical significance: The transilial blocking procedure can be a safe alternative to colectomy in cats with defecation disorders due to abnormalities in the lumbosacral spine in cats.

Keywords: cat, megacolon, constipation, lumbosacral stenosis, transilial vertebral blocking procedure

Lumbosacral lesions are often observed in cats with defecation problems (24). Cats may experience defecation disorders that are either short-term or lead to irreversible colon dilatation, also known as megacolon. The loss of large intestine function can lead to the dilation of the large intestine and a subsequent development of megacolon (1). This condition does not seem to be influenced by any sex- or age-related factors. The article highlights the relationship between lumbosacral spine disorders and defecation problems in cats. There are only a few publications addressing intervertebral disc disease in cats and its impact on colonic dysfunction.

One of the frequently observed signs in cats with intervertebral disc disease, spondylosis or lumbosacral stenosis is difficulty in assuming a defecation posture. Additional signs include spinal hypersensitivity, decreased physical activity, particularly reluctance to jump onto elevated surfaces, and low tail carriage (5, 6, 19). Diagnostic imaging involves X-rays, computed tomography (CT) and magnetic resonance imaging (MRI). There are few reported treatment approaches for the intervertebral disc disease and cauda equina syndrome in cats. The surgical techniques described include dorsal laminectomy, fenestration, dorsal stabilisation with screws and polymethylmethacrylate (PMMA), as well as a combination of these methods (5, 6, 10, 11). One treatment approach for cauda equina syndrome in dogs is the minimally invasive transilial vertebral blocking procedure (20). In light of recent findings confirming the relationship between lumbar lesions and concomitant defecation disorders in cats,

surgical treatment involving transilial blocking of the L7-S junction was implemented (24). Based on the promising clinical outcomes observed in this species, this method was also chosen for cats with megacolon. This publication aims to outline the surgical technique and results of transilial vertebral blocking procedure in 4 cats with signs of defecation disorders, megacolon and concomitant degenerative lumbosacral stenosis. The goal of this approach was to minimise the invasiveness of the L7-S junction stabilisation procedure and the number of implants required.

Material and methods

Medical records of 4 cats with defecation difficulties, including megacolon, were analysed and revealed both clinical and radiological evidence of lumbosacral spine involvement. The data includes patients treated and monitored from 2020 until the end of 2024.

The data recorded for each patient included age, sex, breed, body weight, clinical signs, medical history, sign duration, and the results of clinical and radiological tests. The patients were qualified for treatment on the basis of clinical examination and X-ray results. Three-dimensional imaging (MRI and CT) was not performed due to financial limitations. Three of the 4 patients were administered an anti-inflammatory corticosteroid (methylprednisolone acetate) injection into the spinal canal to confirm that the main cause of defecation problems was associated with the spine. Finally, data regarding the outcomes of the surgical procedures were gathered, and postoperative complications were documented. It is believed that cauda equina syndrome (CES) in cats results from the progressive degeneration of the intervertebral disc, leading to instability in this region (5, 6, 17, 19). Due to its increased mobility compared to the rest of the lumbar spine, the lumbosacral junction is particularly susceptible to injury and overload (4). Initially, degeneration of the intervertebral disc occurs, leading to the overloading of the articular facets. This condition promotes a progressive subluxation of the L7-S junction, instability and the formation of osteophytes on the lower surface of the articular facets and the endplate of L7, leading to the narrowing of the L7 intervertebral foramina. In addition, the hypertrophy of the interlaminar ligament reduces the lumen of the spinal canal from a dorsal view (3, 21). Both mechanisms of the progressive narrowing of the space cause compression of the nerve roots. One study suggested that cats are most likely to develop Hansen type II intervertebral disc disease, which may suggest dynamic nerve compression in this species (18). However, this theory has been challenged, among others, by Muñan S. C. et al. (19). There is limited research on the relationship between lumbosacral lesions and the secondary defecation disorders they cause. It has been clearly demonstrated that cats with L7-S junction disease are predisposed to defecation disorders (10, 18, 24). However, the cause of this condition has not been identified. The authors assume that this is linked to the anatomy of this spinal segment. Nerves from L4 to S3 form the pelvic plexus, which provides innervation to the pelvic limbs, bladder, perineal region and, in particular, the distal part of the colon (16). The external anal sphincter receives somatic innervation from the pudendal nerve, while the internal anal sphincter is innervated by the hypogastric nerve (2). It has been proven that the defecation reflex and the control of distal colon motility in cats are related to the transmission of information through parasympathetic nerve fibres in the spinal cord. They play a crucial role in initiating the propulsive activity of the colon and the defecation reflex (8). These nerves originate at the level of the L4-L6 vertebrae. They extend further to the sacral segments of the spine (8, 16). Based on evidence from human medicine, the authors hypothesize that lumbosacral stenosis and other structural abnormalities in this region impair colon innervation, affecting nerve conduction, which in turn affects colon motility (atonic bowel) and the defecation reflex (26). As a consequence, the accumulation of faecal material in the colon leads to the development of megacolon.

Tab. 1. The patients' data included breed, age, sex, whether they had been neutered and body weight

Cat No.	Breed	Age (in months)	Sex	Neutering status	Body weight
1	European Shorthair	33	Male	Yes	3.2 kg
2	European Shorthair	102	Female	Yes	3.5 kg
3	Maine Coon	89	Male	Yes	9.8 kg
4	British Shorthair	100	Male	Yes	4.5 kg

Tab. 2. The table shows the frequency of clinical signs

Signs	Number of cases	No. 1	No. 2	No. 3	No. 4
Reluctance to jump onto elevated surfaces	n = 3	+		+	+
Bunny hopping	n = 2	+		+	
Difficulty in assuming a defecation posture	n = 4	+	+	+	+
Nervousness	n = 2		+		+
Skin hypersensitivity in the lumbar region	n = 4	+	+	+	+
Difficulty in jumping onto elevated surfaces	n = 3	+		+	+
Tenderness in the lumbosacral region	n = 4	+	+	+	+
Constipation and inability to pass stool, requiring enemas	n = 2	+		+	

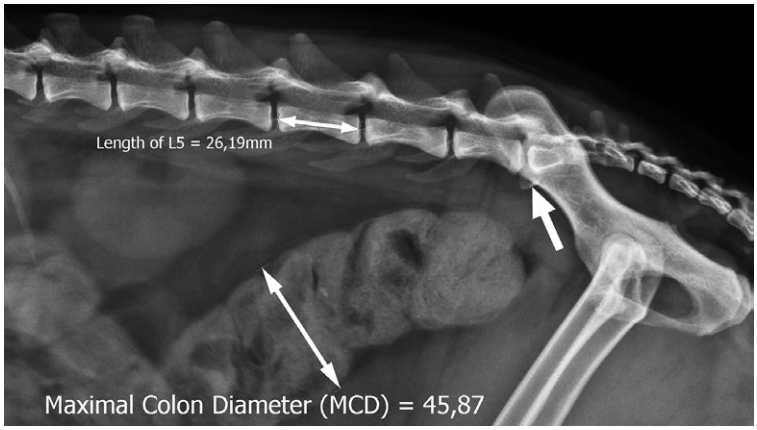
Description of clinical cases. The medical records of 4 cats with various degrees of defecation problems were reviewed. The group consisted of two European Shorthair cats, one Maine Coon and one British Shorthair, with three males and one female. All cats were neutered. Their body weight ranged from 3.2 kg to 9.8 kg. The age of the patients ranged from 33 to 102 months, and the average was 81 months (Tab. 1). The main clinical signs observed before the surgical procedure included difficulty in assuming a defecation posture and prolonged time between defecations. The clinical signs included reluctance to jump onto elevated surfaces (n = 3), bunny hopping (n = 2), difficulty in assuming a defecation posture (n = 4), nervousness (n = 2), hypersensitive skin (n = 4), difficulty jumping onto elevated surfaces (n = 3), tenderness in the lumbosacral region (n = 4) and inability to defecate, requiring enema administration (n = 2) (Tab. 2). Cats 1 and 3 required regular

enemas, even for several days in a row. None of the patients showed improvement with conservative treatment. The two cats that required daily enemas also showed no improvement. During orthopaedic examination, all patients exhibited skin hypersensitivity and noticeable tenderness in the lumbosacral area. A decision was made to perform an X-ray of the lumbosacral spine and pelvis in two orthogonal views. One of the main signs associated with intervertebral disc disease at the L7-S junction is difficulty in assuming a defecation posture, tenderness in the lumbosacral region, low tail carriage, reluctance to jump and gait disturbances (6) (Tab. 2). All of the cats exhibited at least some of the above signs. All of the cats showed lumbosacral lesions. The most accurate diagnostic methods for diagnosing and identifying instability in this region are thought to be magnetic resonance imaging (MRI) and dynamic MRI (5, 6). Due to financial constraints, the aforementioned examination was not conducted.

X-ray analysis. A routine X-ray of the lumbar spine and pelvis was performed in both dorsoventral and lateral projections. The patients were administered routine sedation prior to the X-ray examination. Additionally, an X-ray of the abdominal cavity was performed, covering the lumbar spine section and the L7-S junction to assess the degree of intestinal filling. The ratios of maximum colon diameter to L5 lenght (MCD:L5L) before and after TVBP were compared. The maximum colon diameter to length of L5 vertebra index (MCD:L5L) ranged from 0.76 to 1.72, averaging 1.16, (Tab. 3 and Tab. 4) (Fig. 1, 2). Lesions in the structure of the L7-S junction were found in all patients (25). The

Tab. 3. Radiological findings

Number of clinical cases/cat number	X-ray	No. 1	No. 2	No. 3	No. 4
n = 1	Pelvic fracture, abnormal ventral curvature of the spine, sacral verticalization	+			
n = 3	Spondylosis deformans		+	+	+
n = 3	Sclerosis of the endplates of L7-S		+	+	+
n = 3	Narrowing of the L7-S intervertebral space		+	+	+
n = 1	Sacral verticalization with a concomitant ventral curvature of the lumbar spine and an inveterate pelvic fracture	+			



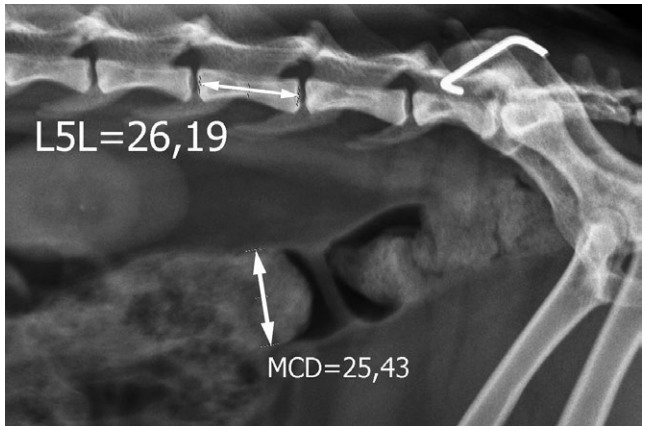


Fig. 1 and Fig. 2. Preoperative and postoperative X-ray images show the length of the L5 vertebra (L5L) and the maximum colon diameter measured at L5 height (MCD)

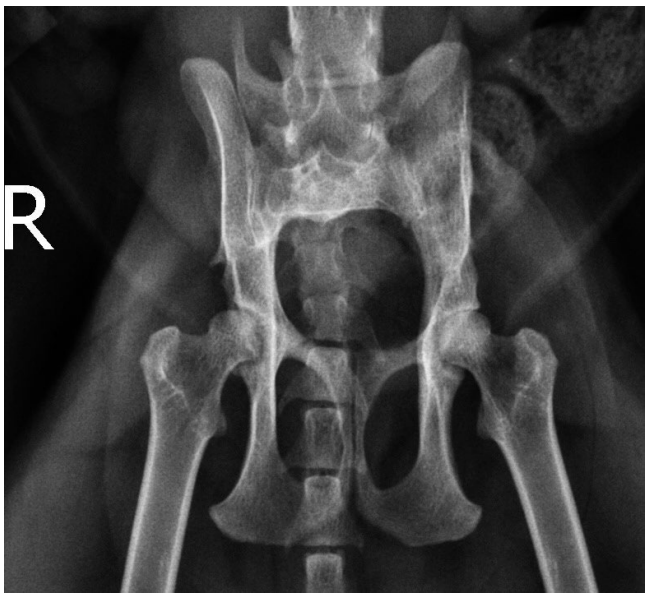


Fig. 3 and Fig. 4. X-ray images of a patient after pelvic fracture. Visible verticalization of the sacrum (white arrow)

changes observed in the radiographs included spondylosis deformans at the L7-S level (n = 3), sclerosis of the endplates of L7-S (n = 3), narrowing of the L7-S space (n = 3), verticalization of the sacral bone and ventral curvature of the lumbar spine (n = 1) (Fig. 3, Fig. 4) (Tab. 3). A dorsoventral X-ray of one patient revealed a healed pelvic fracture, with no visible signs of pelvic canal narrowing (Fig. 4). The position of the implant and the alignment of the seventh lumbar vertebra in relation to the sacrum were evaluated after the surgical procedure.

Anaesthesia. As part of the qualification process for the procedure, an epidural injection of methylprednisolone acetate was administered in addition to the clinical examination and X-ray. All patients that received an epidural injection of the anti-inflammatory corticosteroid drug were given standard sedation. All patients received a dose of 1 mg/kg body weight of methylprednisolone acetate (DepoMedrone®, methylprednisolone acetate 40 mg/ml, Zoetis). The drug was administered into the spinal canal under radiography guidance (Fig. 5). In the case of patient 1, with an inveterate pelvic fracture, no epidural injection of the medication was administered. Clinical improvement was observed in three patients after the administration of an anti-inflammatory drug.

The cat owners were recommended the minimally invasive transilial vertebral blocking procedure and informed that it had shown good results in dogs with cauda equina syndrome (20). As an alternative to this method, a colectomy procedure was proposed for the two patients requiring continuous enemas. After being informed about all perioperative aspects, the owners consented to the transilial vertebral blocking procedure for their pets. Premedication for each cat involved dexmedetomidine at a dose of 3 µg/kg (Dexdomitor®, Zoetis) and midazolam (Dormazolam®, Dechra) at a dose of 0.3 mg/kg. To increase the effectiveness of premedication in more aggressive animals, gabapentin was administered at a dose of 10-20 mg/kg, with a maximum dose of 100 mg per patient. Such premedication enabled the surgeon to administer safe sedation, place an intravenous catheter and prepare the patient for the procedure. The induction was performed using propophol at a dose of 1 mg/kg, and anaesthesia was sustained with isoflurane in a mixture of oxygen and air.

Fig. 5. An X-ray image showing the administration of methylprednisolone acetate into the spinal canal

Surgical procedure. Each patient was placed in a small positioner in the sternal position with their hind limbs slightly extended forward, just above the abdominal line. The purpose of this positioning was to achieve the maximal flexion of the L7-S junction. The surgical area was aseptically prepared according to standard procedures. A standard midline approach to the seventh vertebra made it possible to visualise its spinous and transverse processes. The sacrum was not exposed, and dorsal laminectomy was not performed (22). Only the tissues were exposed to assess the proper alignment of the Kirschner wire through the caudal aspect of the L7 spinous process. The transiliac pin insertion point was determined on the basis of the safe corridor described in a publication by Garcia-Pertierra et al., but in that article the authors described the use of Kirschner wires with a diameter of no more than 2.0 mm (7). A mini-intergluteal approach to the tuber coxae was developed. Kirschner wire was inserted as in the minimally invasive transilial vertebral blocking procedure (20) (Fig. 6, 7). Two guiding wires were used to properly position the implant

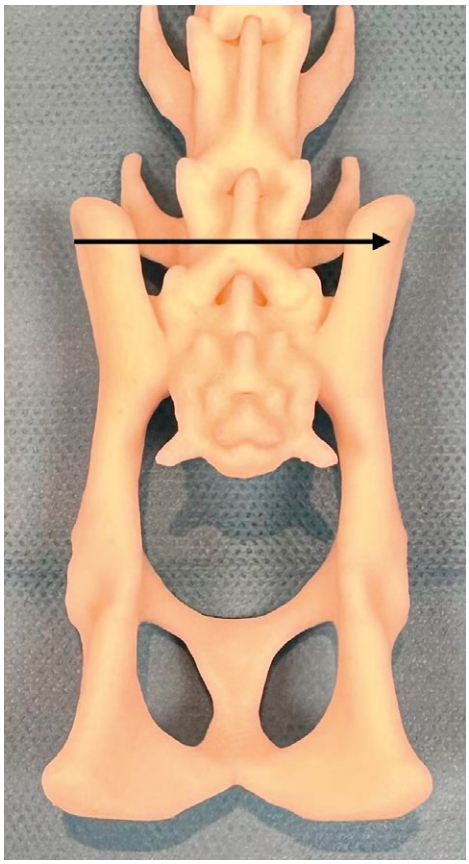


Fig. 6 and Fig. 7. Direction and site of implant insertion through the iliac tubercle (arrow, arrow + asterisk)

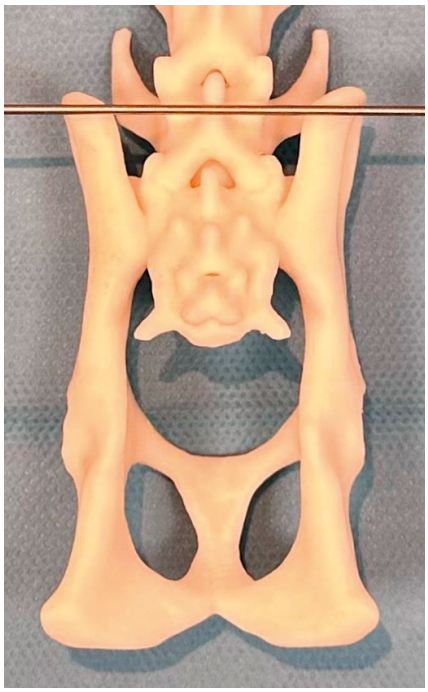


Fig. 8. The photograph shows a guiding wire applied from the dorsal side in order to determine the correct implant placement

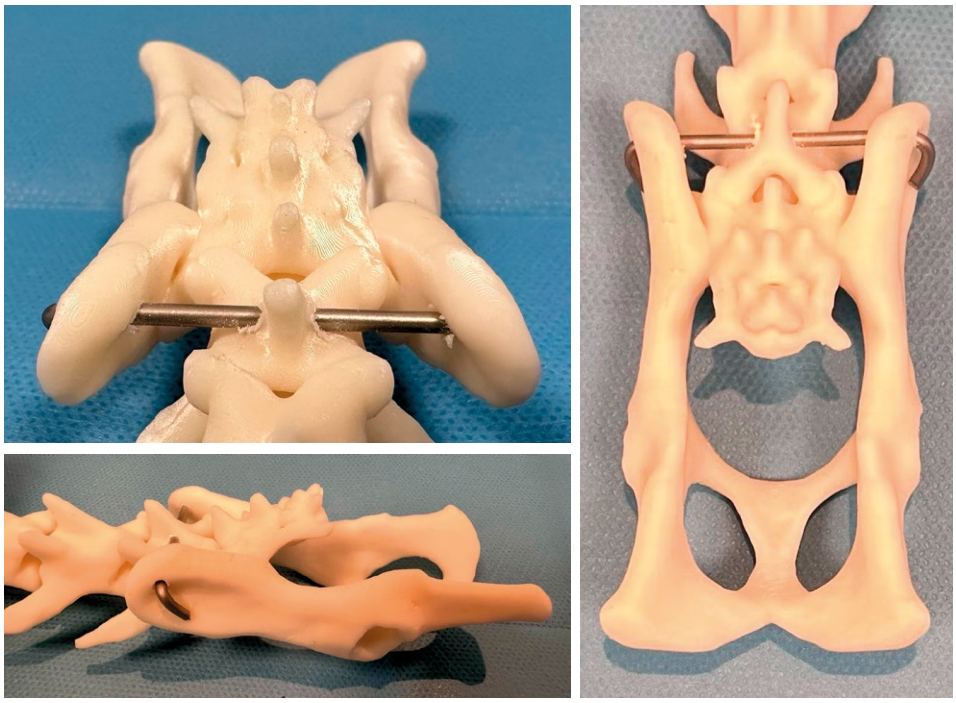


Fig. 9-11. Implant placement and bending

(Fig. 8). One was placed on the patient at the level of the caudal part of the spinous process, and the other was positioned at the base of the L7 spinous process. The Kirschner wire was inserted at the base of the process, as close as possible to the dorsal plate of the L7 vertebra, leaving approximately 1-2 mm of bone on the caudal side (Fig. 9-11). In three patients, Kirschner wire with a diameter of 2 mm was inserted, whereas 2.2 mm wire was used in the Maine Coon cat. After passing the Kirschner wire through the contralateral iliac plate, the second mini-intergluteal approach was developed based on its exit point to bend the implant. The Kirschner wire was bent on both sides. The wounds were closed using the standard procedure. The wound was closed with absorbable monofilament Monosyn® 2-0 and 3-0 (Braun) sutures, and skin closure was performed with non-absorbable monofilament Nylon® 3-0 (Atramat). All transilial vertebral blocking procedures lasted from 25 to 30 minutes. The time was measured from skin incision to skin closure.

Post-operative care. For effective postoperative pain management, buprenorphine was administered at a dose of 0.01 mg/kg (Bupaq® Multidose, Orion Pharma) every 6 hours via mucous membranes, along with meloxicam (Melovem®, Dopharma) at a dose of 0.1 mg/kg orally SID (single in day) for a period of 4 days. This treatment plan ensured control of postoperative pain and reduced the likelihood of effects from extended opioid use. Physical and neurological evaluations of all cats were carried out daily. Manual assessment and bladder emptying were performed daily until the cat was able to urinate itself. Normalization of urination occurred on the first day after the surgery in cats 2 and 4. In cats 1 and 3, the bladder was emptied manually twice on the first day after surgery. Normal urination returned in these patients on the second day after surgery.

Results and discussion

Two patients (cats 1 and 3) required an enema in the first week after the procedure. A subsequent constipation episode requiring an enema occurred in cat 1 with an inveterate pelvic fracture after 4 months (Fig. 12). This patient required another enema after further 5 months. Previously, enemas had been performed on him even for several consecutive days. The intervals between enemas in this case were a maximum of 7 days. Cat 3 required an enema 5 days after the surgical procedure. Another enema was performed after 5 months, and no further enemas were needed for the remainder of the follow-up period (i.e. 15 months after the surgery). These two cats were maintained on

Fig. 12. The X-ray image shows implant placement in a patient with a history of pelvic fracture and sacral verticalization

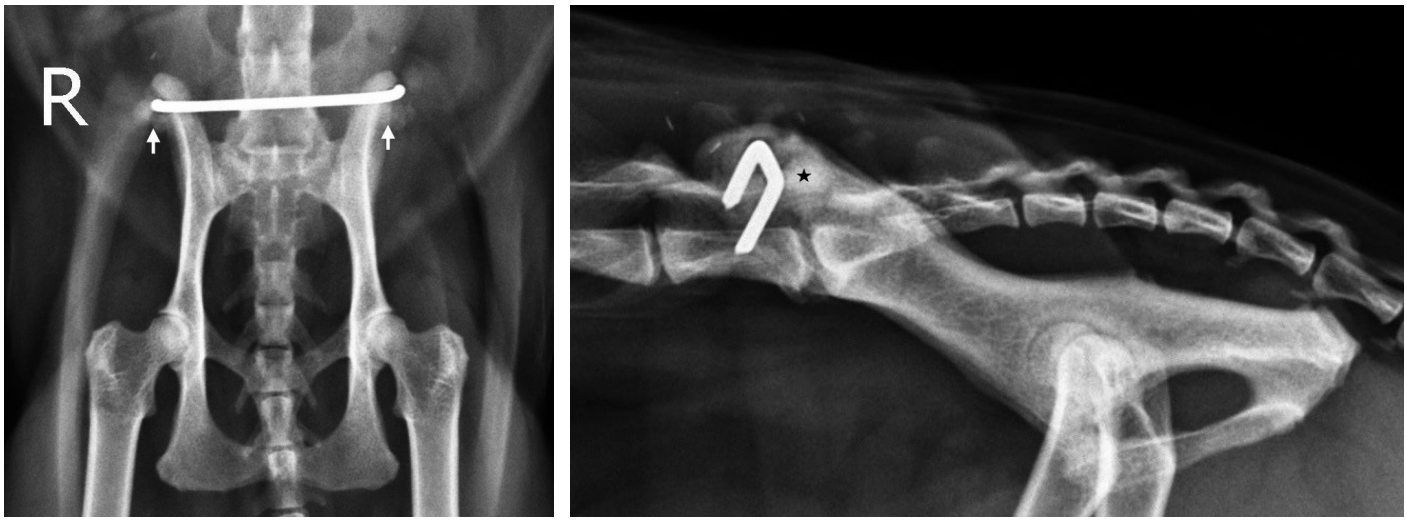


Fig. 13 and Fig. 14. The X-ray images show mineralisation around the bent ends of the Kirschner wire (arrows and asterisk)

long-term stool softeners. In the other two cats, the signs associated with defecation problems, difficulty in assuming a defecation posture, skin hypersensitivity and tenderness of the lumbar region disappeared completely. However, cat 2 developed complications in the form of inflammation and mineralisation near the bent ends of the Kirschner wire (Fig. 13, 14). Pain appeared 3 months after the procedure. Clinical examination revealed no pain in the lumbosacral region, yet tenderness was observed around the exit points of the bent ends of the Kirschner wire. Radiological examination showed foci of mineralisation in the area of the bent implant. A decision was made to perform a surgical procedure to remove the pathological tissue. A follow-up one month after the reoperation confirmed that there were no abnormalities, and the patient's condition had significantly improved. Since then, the patient's condition has been stable with no signs of pain or defecation problems. The average follow-up period is 19 months (cat 1 = 1 year and 8 months, cat 2 = 1 year and 1 month, cat 3 = 1 year and 3 months, cat 4 = 2 years and 5 months). All patients showed a reduction in the colon diameter relative to preoperative measurements. The average reduction was 37% (cat 1 = 14%, cat 2 = 29%, cat 3 = 45%, cat 4 = 60%). (Tab. 4).

The transilial vertebral blocking procedure in cats with defecation disorders and concomitant lumbosacral stenosis appears to be a promising surgical technique for treating neurological defecation dysfunctions as evidenced by the permanent improvement in the clinical condition of the operated cats observed over a long period of time. This technique has been shown to be an effective method for treating cauda equina syndrome in dogs (20). One of the treatment options for degenerative lumbosacral stenosis in dogs is the administration of an epidural corticosteroid (12). Three of the four patients received epidural methylprednisolone acetate before the surgical procedure. This method had not previously been used in the treatment of megacolon. All patients showed clinical improvement, which confirmed the rationale behind qualifying the patients for the transilial blocking procedure. It is important to remember that a prolonged use of corticosteroids or NSAIDs may lead to complications. Therefore, surgical intervention seems to be a reasonable treatment option. Since defecation disorders and the development of megacolon in cats may be due to neurological issues, a decision was made to apply the transilial block procedure (24). It has also been shown in humans that spinal cord injuries may lead to colon dilation and megacolon (9). In cats, degenerative lumbosacral

Tab. 4. The table presents results reported by the owners in telephone conversations and determined during postoperative follow-up visits, the follow-up period after the transilial vertebral blocking procedure, postoperative complications, the ratio of maximum colon diameter to L5 length (MCD:L5L), B – preoperative, P – postoperative and the colon diameter

Cases	Results (defecation after surgical procedure)	Follow-up period (in months)	Complications	MCD:L5L Index B – before surgical procedure; P – after surgical procedure	Colon diameter at L5 height (mm) B – before surgical procedure; P – after surgical procedure
No. 1	Satisfactory/Very good	20	None	(B) MCD:L5L = 1.01 (P) MCD:L5L = 0.88	B – 21.63 P – 18.77
No. 2	Very good	13	Mineralization foci at the ends of the bent Kirschner wire	(B) MCD:L5L = 0.76 (P) MCD:L5L = 0.55	B – 15.48 P – 10.99
No. 3	Satisfactory/Very good	15	None	(B) MCD:L5L = 1.75 (P) MCD:L5L = 0.97	B – 45.87 P – 25.43
No. 4	Very good	29	None	(B) MCD:L5L = 1.14 (P) MCD:L5L = 0.46	B – 23.26 P – 9.30

stenosis is characterised by the presence of Hansen type II intervertebral disc herniation, soft tissue hypertrophy, osteophyte formation at the L7-S junction, spondylosis and instability (6, 14). No definitive evaluation of lumbosacral instability in cats has been reported to date (6). In our clinical case series, defecation issues of various severity were observed, ranging from difficulty in assuming a defecation posture to the development of megacolon. Moreover, each patient exhibited noticeable tenderness in the lumbosacral region. Assuming that the defecation problems were due to neurological disorders, an X-ray examination was performed, which confirmed the presence of pathologies in this region. These included osteophytosis at L7-S, spondylosis deformans, sacral verticalization, ventral curvature of the lumbar spine, sclerosis of the endplates at L7-S and narrowing of the intervertebral space.

There are few reports regarding lumbosacral spinal stabilisation in cats. One such stabilisation technique involves the use of miniature positive-profile pins being embedded in a bolus of gentamicin-impregnated polymethylmethacrylate (6).

The transilial vertebral blocking procedure using Kirschner wire or a dedicated implant, as in the MTV (Minimally Invasive Transilial Vertebral Blocking Procedure), has many advantages over the traditional method of L7-S junction stabilisation (20). They include a reduced trauma from the procedure, fewer implants used and a shorter operative time. Thanks to these advantages, TVBP can also be performed on cats of advanced age. The authors believe that due to the flexibility of the Kirschner wire and the need for an additional mini-intergluteal approach to the opposite iliac plate, the use of an implant based on the MTV method should be considered. It will help decrease the invasiveness of the procedure.

X-ray examination showed that this procedure led to a reduction in the colon diameter, confirming that lumbosacral lesions can cause defecation disorders and the development of megacolon. Blocking the sacral bone in a fixed position leads to the expansion of the space for the spinal cord, cauda equina, and bilaterally for the L7 nerves. Müller et al. suggest in their study that the MTV procedure may increase the central spinal canal space while simultaneously expanding the intervertebral space at L7-S, ultimately reducing the protrusion of the intervertebral disc at this location (20). It has also been proven that the dynamic instability of the lumbosacral region plays an important role in the development of lumbosacral disease (6, 15). Therefore, three-dimensional imaging of the L7-S segment using CT or MRI should be considered in patients with defecation disorders and no radiological signs in this segment.

These clinical cases indicate that the transilial vertebral blocking procedure expands the intervertebral space of the L7-S junction horizontally, thus reducing nerve compression (20). With regard to the dynamic compression caused by the expansion of this space, this procedure also alleviates nerve root compression. The authors of the present study opted for the least invasive method of the surgery. The limitations of this approach lie in the incomplete expansion of this space, as, for example, dorsal laminectomy is not carried out (6). It has also been demonstrated that the dorsal laminectomy of the healthy L7-S space in dogs increases the triaxial instability of this segment of the spine (23). The surgeries performed demonstrated that the stabilisation of the L7-S space reduces the dynamic instability of the L7-S intervertebral space that leads to nerve root compression and impaired innervation of structures responsible for the passage of feeces and the defecation reflex.

The available literature shows a complete lack of measurement tools to assess the clinical outcomes of cats after spinal surgeries (6). Kinetic and kinematic evaluations are considerably more difficult in this species. As a result, the assessment of treatment outcomes involved an interview with the owner, a veterinary examination of the patient's condition and an abdominal radiography to assess the degree of colon filling. The key points discussed with the owner were the ease of defecation, changes in mobility, the resolution of pain on palpation in the lumbosacral region and the necessity of enemas. Significant improvements were noted in these aspects. The owners rated the ease of defecation and overall wellbeing from satisfactory to excellent. There was also a noticeable improvement in mobility. The cats were more eager to jump onto elevated surfaces. Cat 3 started to play again, which had not happened before. Cat 2, which required a reoperation for the removal of mineralization foci, showed a permanent improvement in clinical condition. Following the surgery, all patients showed increased mobility, with no pain on palpation of the lumbosacral region.

Due to the small sample size and the absence of a control group or groups of patients treated conservatively or by other surgical techniques, further studies are needed. Such studies should also consider an analogue assessment of the patient's clinical condition before the transilial vertebral blocking procedure to obtain a detailed clinical evaluation of the patient before and after the surgery. There are many reports on the conservative and surgical treatment of constipation or megacolon. However, they are not directly correlated with neurological disorders and their treatment. The results obtained in the present study demonstrate an improvement in defecation and a reduction in the colon diameter after the transilial vertebral blocking procedure. The elimination of dynamic instability causing nerve root compression in the lumbosacral region is effective and requires further, more detailed studies on a larger group of patients.

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