



# Pelvic Symphyseal Distraction Osteotomy with Handmade Cemented Prosthesis to Manage Obstipation Secondary to Pelvic Fracture Malunion in a Young Dog

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## Abstract

### Keywords

- pelvic symphyseal distraction osteotomy
- fracture malunion
- obstipation
- dog

A 5-month-old mixed breed dog suffered chronic obstipation secondary to malunion of multiple pelvic fractures. Pelvic symphyseal distraction osteotomy with a handmade cemented prosthesis was performed, resolving pelvic stenosis.

## Introduction

Malunion of pelvic fractures, particularly axial displacement of the ilium and acetabulum combined with formation of bony callus, can lead to pelvic canal narrowing<sup>1</sup> and subsequent obstipation. Megacolon represents the end-stage obstipation characterized by severe and irreversible dilatation of the colon associated with hypomotility.<sup>2</sup> Pelvic canal narrowing of more than 45% is associated with a high risk of constipation in cats<sup>3</sup>; however, it seems to occur rarely in dogs.<sup>4</sup>

Information on the management of obstipation due to pelvic canal stenosis in dogs is scarcer than in cats. Medical management involves the use of stool softeners, high-fiber diets, and eventually periodic enemas.<sup>2</sup> In feline patients, surgery is recommended if there is poor or no response to medical management.<sup>1</sup> When clinical signs of obstipation persist for less than 6 months, a pelvic widening procedure can be considered.<sup>1</sup> Pelvic widening procedures include removal of an impinging bone (partial pelvectomy, internal or

external hemipelvectomy), corrective osteotomy, and pelvic symphyseal distraction osteogenesis (SDO).<sup>5–9</sup> For cases extending beyond 6 months and affected by megacolon, a single subtotal colectomy is indicated due to irreversible neuromuscular damage in the colon,<sup>1,10</sup> helping to produce stools that can pass more readily through a stenotic canal.<sup>11</sup>

Revision of malunion fractures via corrective osteotomy or ostectomy has a substantial risk of complications, including sciatic or obturator nerve injury, and urethral or rectal damage.<sup>6</sup> SDO is a safer option because tissues ventral to the pelvis are less fibrotic.<sup>2</sup> SDO has been successfully described in cats<sup>1,6,10</sup> but to the best of our knowledge not in dogs.

## Case Report

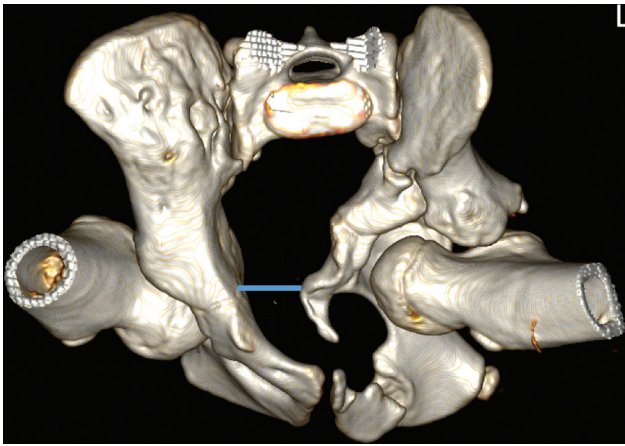
A 5-month-old female mixed breed dog weighing 26 kg was presented for obstipation secondary to malunion of severely displaced left iliac, pubic, and ischial fractures that occurred at least 3 months earlier. Bilateral sacroiliac luxation was also

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**Fig. 1** Three-dimensional rendering of the dog's pelvis; pelvic canal opening = 1.3 cm (blue line).

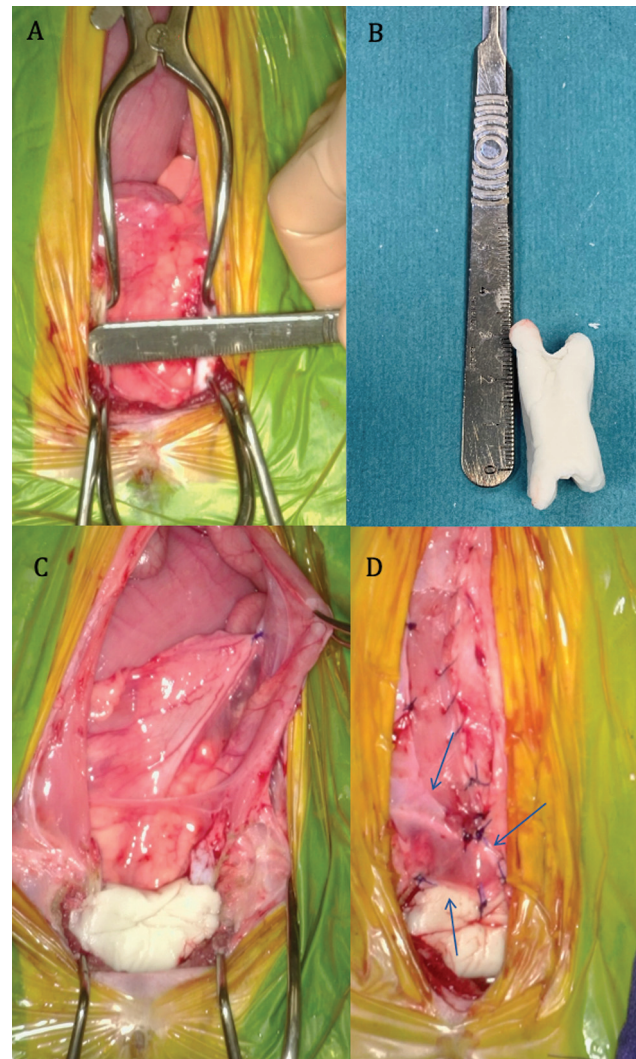
present. The dog's traumatic history was unknown as he was rescued by an animal care association. Initial treatment with stool softeners (docusate sodium) and laxatives (lactulose) was partially effective but lost efficacy over time.

On physical examination, the abdomen was tense, and a large volume of dry and hard faeces was palpated. Rectal examination revealed severe narrowing of the pelvic canal due to left medial bone displacement. The body condition score was 3/9. Despite the malunion of the pelvic fractures, the dog had no major gait abnormalities. Serum biochemistry, electrolytes, and complete blood count were within normal limits.

A computed tomography (CT) scan of the pelvis was performed (►**Fig. 1**) and showed multiple chronic malunion fractures of the left pelvic bones with medial displacement of the bone fragments, associated marked narrowing of the pelvic canal and left coxofemoral subluxation, as well as remodeling of the sacrum and sacroiliac joints. Evidence of secondary constipation due to pelvic diameter reduction was also noted. SDO was the surgical option elected.

The dog was placed in dorsal recumbency. An antimicrobial incision drape was placed at the level of surgical site. A ventral midline approach of the caudal abdomen and pelvis was performed. At the pubis level, gracilis and adductor muscles were elevated. Using an osteotome, the symphysis was completely split. Two Gelpi retractors were placed at the symphysis level, applying maximal distraction (►**Fig. 2A**). A concurrent rectal examination ensured satisfactory widening of the pelvic canal. The resulting spacing was measured, and an anvil-shaped methyl methacrylate spacer was designed and placed in the defect (►**Fig. 2B, C**). A hole was drilled in the cranial part of the spacer to get a fixation point during the closure. A local rotation flap using the external rectus fascia was required to achieve closure of the caudal abdominal wall (►**Fig. 2D**). The ventral midline was closed routinely.

Postoperative CT scan and radiographs were performed (►**Fig. 3**). The pelvic width at its narrowest point was almost doubled postoperatively, from 1.2 to 2.5 cm (►**Fig. 4**). The abaxial retraction, defined as the ratio between distraction and the transverse width of the sacrum, was 55%.



**Fig. 2** Intraoperative images. (A) Measurement of maximal symphyseal distraction. (B) Anvil-shaped methyl methacrylate PMMA spacer. (C) A spacer was placed in the defect. (D) Abdominal closure, blue arrows: external rectus fascia flap. PMMA, polymethyl methacrylate.

The dog recovered uneventfully and defecated immediately after surgery. The dog still showed no major gait abnormalities and was discharged 2 days after the procedure. Gabapentin for 7 days (8 mg/kg orally every 8 hours) and lactulose for 15 days (5 mL orally every 12 hours) were prescribed.

At the 3-month checkup, radiographs showed a caudal tilt of the cement without clinical significance (►**Fig. 5**). A clinical reexamination with radiographs at this time was declined by the owner.

## Discussion

The SDO procedure to alleviate pelvic canal stenosis in this puppy resulted in favourable outcomes without major complications.

In one cat, Oh and colleagues performed a combination of SDO and iliac osteotomy.<sup>10</sup> Hemipelvis lateralization is



**Fig. 3** Immediate postoperative radiographs.

improved with the iliac osteotomy, and distraction alone is more difficult when the sacroiliac joints are intact. In our case, maximal distraction was applied, and a concomitant rectal examination confirmed that distraction alone seemed sufficient. This was probably facilitated by the young age of the patient and inherent bone properties that can lead to plastic deformation. Performing only the distraction without osteotomy is probably possible only in juvenile patients. Moreover, preexisting bilateral sacroiliac luxation rendered iliac osteotomy unnecessary in our case.

In cats, hip joint biomechanics may be altered with SDO by modifying the alignment between the acetabulum and the femoral head, and no lameness has been reported after this type of surgery.<sup>1</sup> This might suggest that the impact of hip joint biomechanics after SDO is minimal. In our dog, no lameness was also observed

A potential complication associated with the SDO technique is sacroiliac luxation. In a cadaveric study in dogs, pelvic symphysiotomy and abaxial retraction between 50 and 75% of transverse sacral width leads to unilateral sacroiliac luxation.<sup>12</sup> In our case, abaxial retraction was 55%. The fact that sacroiliac joints were preoperatively luxated eliminated the risk of this potential complication.

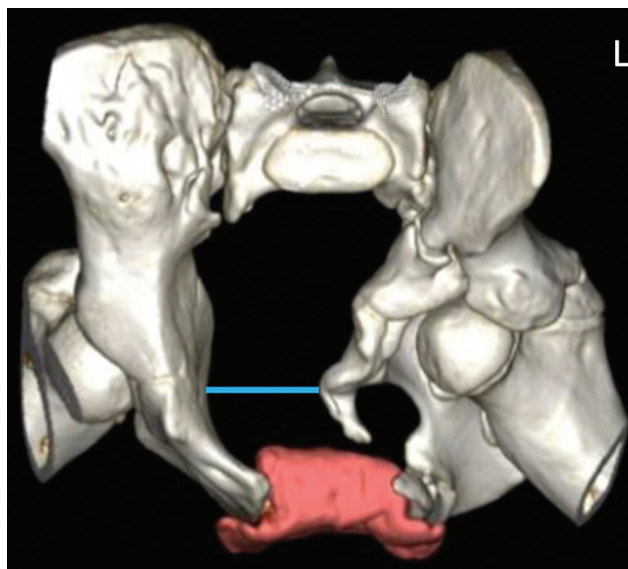
Urethral obstruction due to increased tension of the ischiocavernosus muscle has been described with this technique in a cat.<sup>13</sup> It has been managed by ischiocavernosus muscle release. The diameter of the urethra in dogs is larger and the occurrence of this complication seems less likely.

Abdominal wall hernia has also been described as a complication following pelvic widening procedure. A bladder hernia was reported in a cat.<sup>14</sup> For this reason, we have used a rotation flap of the external rectus fascia to close the caudal abdominal wall.

For pelvic symphysis distraction, various spacers have been described including metal (plate, spirally fashioned wire) or plastic spacers, bone grafts, and methylmethacrylate.<sup>1,2,6,9,10</sup> Readily available and easily shaped are the major advantages of the methyl methacrylate.<sup>2</sup> The anvil shape matches the edges of the symphysis allowing intrinsic stability. However, the addition of cerclage wire between pelvis and methyl methacrylate would have probably avoided the caudal tilt of the implant in our case.

McKee and Wong suggest that using ulnar autogenous bone graft may be preferable.<sup>15</sup> However, its use requires a second surgical approach, increasing operative time, cost, and potential complications at the level of the second surgical site. There is also the risk of possible necrosis of the autogenous bone graft.

Disadvantages of methyl methacrylate are the exothermic reaction during its polymerization process and the increased risk of infection. The spacer was prepared outside the surgical field in order to prevent thermal injury to soft tissues. To decrease a potential risk of infection associated with the



**Fig. 4** Three-dimensional rendering postdistraction; pelvic canal opening = 2.5 cm (blue line), cement prosthesis (red).





**Fig. 5** Three-month postoperative radiographs.

close proximity of the skin, we used an antimicrobial incision drape. Moreover, in the study of Leao and colleagues, the meta-analysis revealed no difference between the complication rates of methyl methacrylate and other materials (autologous bone and titanium).<sup>16</sup>

## Conclusion

The SDO procedure appears promising for the treatment of traumatic pelvic canal stenosis. The technique was easy to perform, and the complications were few. The polymethyl methacrylate should be fixed in order to prevent migration. Additional iliac osteotomy may be indicated in adult dogs.

### Author Contributions

M.H.: Primary manuscript authorship, design of the study, performance of surgical intervention, data gathering, data assessment, drafting of the manuscript, manuscript figure design, revision of the manuscript, and approval of the final version of the submitted manuscript. A.C.: Assistance during surgical intervention and approval of the submitted version of the manuscript. A.T.: manuscript figure design, manuscript review, and approval of the submitted version of the manuscript. A.B.: manuscript review and approval of the final version of the submitted manuscript. P.H.: Manuscript review and approval of the submitted version of the manuscript.

### Animal Care

Client consent was obtained.

### Funding

None.

### Conflict of Interest

None declared.

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