Pelvic Symphyseal Distraction Osteotomy for Constipation Management Secondary to Pelvic Stenosis

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Abstract: A 7-year-old neutered male Korean domestic short-haired cat was referred to our clinic to treat constipation which had persisted for 6 months. The rectal examination revealed narrowing of the right lateral portion of the pelvic canal. A reduced pelvic canal diameter by pelvic fracture malunion was revealed on radiography. The pelvic canal diameter ratio measured from preoperative was 0.68. Based on rectal and radiographic examinations, constipation caused by pelvic canal narrowing was confirmed. Pelvic symphyseal distraction-osteotomy and iliac wedge osteotomy were performed. An iliac osteotomy of the ilium was performed to ease the pelvic symphyseal distraction. After the symphysis was split longitudinally, pelvic symphyseal distraction was maintained by using a spacer made of poly-methylmethacrylate. The osteotomy of the ilium was fixed using a bone plate and screws. Increased pelvic canal diameter was confirmed on post-operative radiography and the postoperative pelvic canal diameter ratio was 0.91. The patient received antibiotics, NSAIDs, crystalloids and Lactulose for post-operative care. The cat recovered normal defecation abilities and did not have constipation at one week postoperatively. No episodes of constipation persisting longer than 6 months have been reported by owners in previous studies. Pelvic symphyseal distraction osteotomy and iliac wedge osteotomy may prove to be a useful surgical procedure to treat pelvic canal stenosis that is caused by pelvic fracture malunion.

Key words: Feline pelvic fracture, Malunion, Pelvic Stenosis, Symphyseal distraction osteotomy.

Introduction

Pelvic bone fractures are common in companion animals and constitute 16% of all fractures in dogs and 25% of all fractures in cats (7). In cats with pelvic fractures, approximately 90% have fractures of the pubis and ischium, 60% have unilateral sacroiliac luxation, 50% have a fracture of the body of the ilium, 25% have bilateral sacroiliac luxation, and only 2% of fractures involve the sacral wing (2). Acetabular fractures are rare in cats (2). The most common cause of pelvic fracture is a traumatic fracture from an automobile-induced injury; however, other high energy traumatic incidents, such as falling from a height, account for some pelvic fracture cases (12).

In general practice, the majority of pelvic fractures are managed conservatively, especially in small dogs and in cats (4). However, surgical intervention should be considered in animals with pelvic fractures characterized by one or more of the following: more than 1/3 of the pelvic canal diameter narrowing by the fracture fragment, hip instability caused by fracture of the weight-bearing region (which includes the acetabulum, ilium, sacroiliac joint), neurologic deficit and severe pain (6,8). Feline pelvic fracture of a weight-bearing region are mechanically unstable and lead to pelvic canal stenosis because medial displacement of bone fragments and bony callus formation may narrow the pelvic canal (2,6).

Therefore, the pelvic canal can collapse and cause major complications, such as constipation or obstipation if the pelvic fractures are not surgically managed at the time of injury. These complications can progress and cause irreversible neuromuscular damage to the colon (3). If irreversible neuromuscular damage in the colon has not developed, pelvic symphyseal distraction-osteotomy can be applied (3). This surgical technique is challenging.

In this case study, we report the surgical technique and results of pelvic symphyseal distraction-osteotomy with iliac osteotomy to increase the pelvic diameter in a cat.

Case

A 7-year-old neutered male Korean domestic short-haired cat was referred to our clinic to treat constipation which had persisted for 6 months. On examination, the cat was bright, alert and in good condition. The cat had a good appetite and no abnormality was confirmed except for a moderate amount of palpable feces.

The rectal examination revealed that there was narrowing of the right lateral portion of the pelvic canal. The reduced pelvic canal diameter was caused pelvic fracture malunion and fecal impaction were revealed on radiography. The pelvic canal diameter ratio measured preoperatively was 0.68.
A ratio of the maximal diameter of the colon to L5 length was 1.19 on barium radiography (Fig 1C). A megacolon was not considered.

Based on rectal and radiographic examinations, constipation caused by pelvic canal narrowing was confirmed and pelvic symphyseal distraction-osteotomy and iliac wedge osteotomy were planned to increase the pelvic canal diameter. Cefazolin (22 mg/Kg) and tramadol (5 mg/Kg) were administered intravenously. General anesthesia was induced using propofol (6 mg/Kg) and maintained by isoflurane. The cat was positioned in dorsal recumbency and prepared for aseptic surgery. An iliac osteotomy of the ilium was performed to ease the pelvic symphyseal distraction. The osteotomy fragment of the ilium was fixed using a bone plate and screws. The pelvis was exposed by a ventral midline approach and the gracilis and adductor muscles were elevated and retracted. The surgical procedure involved longitudinal symphysis splitting to laterally distract the hemipelvis. Holes were drilled in the cranial pubis and cranial ischium on each side of the symphysis and an orthopedic cerclage wire was passed through the holes. Pelvic symphyseal distraction was maintained using a poly-methyl-methacrylate spacer. A rectal examination during the surgical procedure was performed to confirm the correct placement of the spacer and successful pelvic widening. Four holes were drilled through the spacer, which was fixed to the pelvis using the preplaced cerclage wires. A widened pelvic canal were confirmed on intraoperative fluoroscopy (Fig 2A). The ventral midline was closed in a routine fashion.

After surgery, the cat was given cefazolin and meloxicam by intravenous injection twice daily for 4 days. The cat was given Lactulose as oral laxatives until it was able to independently defecate. Post-operative management included intravenous administration of crystalloids for 2 days. Widened pelvic canal and increased pelvic canal diameter ratio were confirmed on post-operative radiography. The pelvic canal diameter ratio measured from the post-operative radiography was 0.91.

The cat recovered normal defecation ability and was not constipated at one week postoperatively. The cat showed no further episodes of constipation and 7 months after the surgery, the cat was reported to have normal defecation (Fig 2B).

**Discussion**

Pelvic symphyseal distraction-osteotomy and iliac osteotomy are useful for treating pelvic canal stenosis caused by pelvic fracture malunion.

In most cases, constipation is not evident until days to weeks after the injury, when fragment displacement and callus formation have impeded the passage of feces (6,9). It is important to determine the duration of clinical signs because

![Fig 1](https://example.com/f1.png)

**Fig 1.** Preoperative ventrodorsal radiograph of the pelvis (A). The right hemipelvis is displaced medially. Ventrodorsal (B) and lateral (C) barium radiograph. Radiography showed pelvic canal stenosis and colonic distension.

![Fig 2](https://example.com/f2.png)

**Fig 2.** (A) Intraoperative fluoroscopic image. Methylmethacrylate spacer placement increased the diameter of the pelvic canal. (B) Ventrodorsal radiograph of the pelvis 7 months after surgery.
pelvic widening is unlikely to be effective if clinical signs of constipation have been present for more than 6 months. After this point, there is an increased risk of irreversible neuromuscular damage to the colon and pathologic dilation; therefore, even if the inciting cause is corrected, the colon is unlikely to function normally (6,5,11). If constipation has been present for fewer than 6 months, pelvic canal widening is indicated and best achieved by pelvic symphyseal distraction-osteotomy. This procedure is no longer indicated after 6 months of persistent constipation in a patient and subtotal colectomy is recommended because of irreversible damage to colonic smooth muscle tissue (3). Although constipation was persistent for 6 months in this case, pelvic symphyseal distraction-osteotomy was performed instead of subtotal colectomy because megacolon was excluded by radiography. A ratio of the maximal diameter of the colon to L5 length in this patient was 1.19. A ratio of the maximal diameter of the colon to L5 length < 1.28 is a strong indicator of a normal colon in diagnostic radiography (sensitivity 96%, specificity 87%) (10).

Various spacer materials can be used to maintain and distract the symphysis which include metal, plastic, allograft bone, autograft bone and methylmethacrylate. In this case, a methylmethacrylate spacer was used to distract the symphysis using commercial bone cement. It is possible to use other materials as pelvic spacers, but we preferred methylmethacrylate because it is readily available, obtainable in a sterile form, and easily shaped. Moreover, it allowed us to prevent thermal injury to soft tissue since we were able to polymerize the methylmethacrylate outside of the surgical field (3).

Iliac osteotomy is performed for distraction symphysis because intact sacroiliac joints disturb hemipelvis lateralization. This procedure improved the hemipelvis lateralization and insertion of a spacer in the symphysis. A normal pelvic canal diameter ratio is > 1.1 (1). In this case, the pelvic canal diameter ratio on preoperative radiographs was measured as 0.68 and was measured as 0.91 on postoperative radiographs. After pelvic widening, the cat had an increased pelvic canal diameter ratio and the owner did not report additional episodes of constipation. Additional analysis of the pelvic canal diameter ratio and clinical relationship are required to validate and develop procedures for future successful pelvic stenosis reductions.

References

골반강 협착증으로 인해 발생한 변비를 가진 고양이에서의 골반강 확장술을 이용한 치료 증례

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요 약: 7살 중성화된 수컷 한국집 고양이가 6개월동안 지속된 변비를 주증으로 본원에 내원하였다. 직장검사에서 골반강의 우측 외측부분의 좁아짐을 보였고, 방사선검사에서는 골반골절의 부정유합으로 인한 골반강의 협착을 확인할 수 있었다. 골반강 직경 비율은 0.68이었다. 직장검사와 방사선검사를 바탕으로 골반강 협착으로 인한 변비로 진단하였다. 그래서 골반강을 절골하여 골반강 확장술을 시행하였고 이를 유아하게 하기 위하여 장골 절골술도 함께 시행하였다. 확장된 골반강을 유지하기 위하여 골반결합 사이에 폴리메칠메타크릴레이트를 성형하여 구조물로 삽입하였다. 절골한 장골은 뼈판과 나사를 이용하여 다시 고정시켜주었다. 방사선 검사에서 술 후 골반강 직경 비율은 0.91로 증가하였음을 알 수 있었다. 술 후 처치로는 항생제, 진통소염제, 락툴로오스경구제 투여와 함께 수액요법을 시행하였다. 환자는 골반강 확장술 후 일주일부터 정상적인 배변을 보였고, 그 이후 6개월동안 재발은 없었다. 이 증례를 바탕으로 골반강 확장술은 골반골절의 부정유합으로 인한 골반강 협착에 따라 발생한 변비에서 유용한 치료법으로 사료된다.

주요어: 고양이, 골반 골절, 부정유합, 골반강 협착증, 골반강 확장술