Triple Pelvic Osteotomy and Autograft to the Gap of Ischium for the Treatment of Pelvic Canal Narrowing in a Cat

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Abstract Pelvic canal narrowing secondary to pelvic fractures can lead to episodes of recurrent constipation in cats. Triple pelvic osteotomy is considered as a surgical treatment method; however, there is potential for future recurrence of pelvic canal narrowing. This report describes a surgical method using a pelvic symphyseal autograft to keep the distraction of the ischial osteotomy gap to prevent the recurrence of pelvic canal narrowing. A triple pelvic osteotomy was planned to expand the narrow pelvic canal. The cranial ramus of the pubis was cut, and ischiatic and iliac osteotomies were performed. After expanding the ilium, the malunion pelvic symphysis was cut approximately 1 cm and then autografted to the gap of the ischiatic osteotomy line to keep the distraction. The patient showed clinical improvement postoperatively without recurrent pelvic canal narrowing related to triple pelvic osteotomy. However, constipation recurred on post-operative month-5. It was managed conservatively, and subtotal colectomy was performed eventually nine months post-operatively. There were no complications for five months of follow-up.

Key words constipation, triple pelvic osteotomy, autograft, subtotal colectomy, cat.

Received September 7, 2020 / Revised August 31, 2021 / Accepted September 3, 2021

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Introduction

In cats, mechanical stenosis of the pelvic canal secondary to idiopathic or pelvic malunion is a common cause of recurrent constipation. Megacolon in cats is primarily idiopathic (60%) (4), and pelvic narrowing accounts for approximately 25% of all cases (4,17). Pelvic fractures are common injuries resulting from trauma (3), and medial displacement of bone fragments may narrow the pelvic canal, precluding the passage of normal feces (7). This can lead to recurrent constipation episodes and eventually megacolon, characterized by hypomotility and irreversible distension of the colon (end-stage constipation) (2,10,15). Recurrent constipation has been reported to occur in approximately 80% of cats with severe pelvic canal narrowing (15), and in cats with pelvic canal narrowing >45%, as determined by the sacral index (SI), an indicator of the degree of stenosis of pelvic canal narrowing (9). There is a high risk of subsequent complications related to constipation (9). Current recommendations for the treatment of megacolon secondary to pelvic canal narrowing due to trauma is via pelvic canal widening, and subtotal colectomy is recommended for the development of refractory constipation after pelvic reconstruction (12). Medical treatment consists of oral administration of stool softeners, laxatives, and dietary adjustments. If medical treatment is not effective, surgical intervention may be necessary. Surgical techniques to widen the pelvic canal to relieve rectal impingement include pelvic symphyseal resection (6), steel insertion to increase pelvic diameter (11), osteotomy and symphyseal distraction using ulnar autograft (13), triple pelvic osteotomy (7), and hemipelvectomy (5). In a triple pelvic osteotomy, it reported a problem related to pelvic canal re-narrowing postoperatively because a caudal screw had loosened (7).

This report describes a surgical method, triple pelvic osteotomy with a pelvic symphyseal autograft that inserts an autograft to the ischial osteotomy gap to prevent the recurrence of the pelvic canal narrowing postoperatively.

Case Report

A three-year-old, neutered, female, domestic short-haired cat with chronic constipation was referred to the Animal Medical Center, Gyeongsang National University. Since it was adopted a year ago, this patient had severe constipation, having a stool every two weeks and had been conservatively managed with enemas and stool softeners every two weeks for five months. Seven days before visiting the hospital, a radiographic examination at a local animal hospital confirmed that the megacolon was getting worse. There was nothing

unusual other than a recent feed change and prescription of a stool softening agent.

Chronic constipation for more than a year was identified as the major problem. On physical examination, a collapsed anatomic structure of the pelvic cavity was palpated. Pelvic canal narrowing was confirmed in the rectal examination. Blood tests showed no remarkable factors other than increases in neutrophils and alanine transaminase (ALT).

Megacolon was revealed in the imaging examination, comparing the maximum extension of the descending colon with the length of the 5th lumbar spine (Fig. 1A) (16). The loss of the overall border of the abdominal organs was confirmed, as was a small mineral opacity in the intervertebral space between the 7th lumbar spine and the 1st sacrum (Fig. 1B). Displacement of the right acetabulum to the left was identified (Fig. 1C). The pelvic canal narrowing caused by the medial displacement of the right acetabulum was confirmed (Fig. 2A) on computed tomography. The distraction and malunion of the sacroiliac articulation and pelvic symphyseal malunion, including the ischial and pubic symphysis were also shown (Fig. 2B), and the sacral lesion was suspected as an old fracture.

Fig. 1. Radiography of the case: (A) Lateral abdominal radiography of the cat. The ratio of the maximal diameter of the colon to L5 length was 2.22 (>1.48), hence, megacolon was suspected. (B) A small mineral opacity in the intervertebral space between the 7th lumbar spine and the 1st sacrum was confirmed (arrow). (C) The displacement of the right acetabulum to the medial was identified (arrow).

Fig. 2. Computer tomography of the pelvis: (A) A pelvic canal narrowing was confirmed to be caused by the medial displacement of the right acetabulum (arrow). (B) The distraction and malunion of the sacroiliac articulation (arrowhead) and pelvic symphyseal malunion, including ischial and pubic symphysis are shown (arrow).

Fig. 3. Index on radiography: (A) Preoperatively, the ratio between the width of the sacrum at the cranial border and the width of the pelvic canal at the narrowest point (SI index) was 45%. (B) Postoperatively, the SI index was 29% decreased by 16%, and the 1 cm sized autograft implanted between the gap of the ischium is shown (arrow).

Surgical technique

A triple pelvic osteotomy was planned and performed for the pelvic canal narrowing. An autograft corrected from the malunion pelvic symphysis was operated on simultaneously to prevent the recurrence of pelvic canal narrowing postoperatively.

With the patient in dorsal recumbency, the origin of the right pectineus muscle was identified, and the skin over this point was incised. The subcutaneous tissue was incised, and the origin of the pectineus muscle was released to expose the cranial rim of the pubis. The periosteum was reflected cranially, laterally, and caudally from the pubic surface. A portion of the pubis adjacent to the medial wall of the acetabulum was osteotomized. Next, an osteotomy of the ischial floor was performed on the same side. The skin was sutured temporarily and re-positioned in left lateral recumbency to perform an osteotomy of the iliac osteotomy. The skin was incised from the center of the iliac crest and ended just caudal and distal to the greater trochanter. The subcutaneous tissue and superficial fascia were incised and elevated with the skin. Next, the intermuscular septum between the tensor fascia lata and middle gluteal muscle was separated. This in-

cision was extended from the ventral iliac spine to the cranial border of the biceps femoris muscle. Retraction of the middle gluteal muscle exposed the deep gluteal muscle and a portion of the iliac shaft. An incision to the origin of the middle gluteal muscle and the deep gluteal muscle was made. Subperiosteal elevation of the gluteal muscles exposed the crest, wing, and shaft of the ilium. An iliac osteotomy was performed, the caudal segment of the ilium was lateralized, and a plate was secured to these segments. The opening was closed routinely and approached the ventral aspect of pelvis again. The removal of the pelvic symphysis was performed, and autografting was performed for the malunion pelvic symphysis with a cut of approximately 1 cm to the gap of the osteotomized ischium to maintain the lateral displacement of the right ilium. This autograft was secured to the ischium using a locking plate. The incisions were closed routinely.

Postoperative outcomes and care

A postoperative radiographic evaluation showed a 1 cm autograft implanted between the gap of the ischium and confirmed the SI value, decreased by 16% (from 45% to 29%) (Fig. 3).

On POD (post-operative day)-1, knuckling was shown at

6-7 steps of ten steps on the right pelvic limb. It disappeared on POD-5, and walking improved gradually and returned to normal. Defecations were observed after POD-2; however, abnormal urination and decreased amount of urine appeared on POD-3, and surgical site swelling was confirmed on POD-6. Radiographic examinations were conducted on POD-7. Megacolon improved to near normal compared to pre-operative status; however, abnormal findings of suspected inguinal herniation were observed. Thus, abdominal ultrasonography was conducted and a herniation of the bladder was found. Consequently, herniorrhaphy using mesh was performed. Radiation and clinical evaluation were carried out three months postoperatively. The restored bladder herniation and union of the osteotomized area were observed, and we can confirm that the expansion of the pelvic canal was maintained without recurrent narrowing.

Improvements of the symptoms were found, including weight gain (from 2.0 kg to 3.2 kg), increased stool size (from 1.5 cm to 5-6 cm), and frequency of defecation (from once every two weeks to twice a day) were shown. However, constipation recurred five months postoperatively. There were no complications related to the device and reduction of the pelvic canal in radiographic examinations. It was managed with conservative medications (enema and stool softeners), and eventually, subtotal colectomy was performed nine months postoperatively. It was recovered and the constipation returned to normal, with defecation twice a day. There were no complications for two months of follow-up.

Discussion

The cat was diagnosed with chronic constipation, and malunion of the old pelvic fracture was thought to be the cause of constipation. It was corrected by triple pelvic osteotomy with the pelvic symphysis autografted to expand the narrowed pelvic canal. In a previous study, there was decreased canal expansion postoperatively when triple pelvic osteotomy was performed with only ilium plating, because a caudal screw had loosened and the right hemipelvis had slipped slightly medially (7). In this case, because the malunion of the pelvic symphysis and acetabulum was the reason for pelvic canal narrowing, we also planned triple pelvic osteotomy and autografted to the ischial osteotomy gap at the same time, removing the malunion pelvic symphysis in order to prevent recurrent narrowing.

On POD-1, knuckling was shown, which is suspected to be caused by temporary compression of the sciatic nerve (8). On POD-7, herniation of the bladder was confirmed, and reconstructive surgery using mesh was performed. The prepubic

tendon is identified as a structure that attaches abdominal wall muscles to the pelvis and assists in the role of urination, defecation, and expiration. While this structure is clearly identified in dogs, it is not clearly recognized in cats, where the abdominal muscles are strongly secured with the medial aspect of the thigh as aponeurosis (1). The damage and defect of the anatomical structure of the prepubic tendon during the autograft procedure may be the cause of the bladder herniation.

There was a high risk of recurrent constipation with 45% of pelvic canal narrowing. This degree of pelvic canal stenosis were corrected by surgical intervention to a moderate grade, reducing 16% (from 45% to 29%) (15). However, subtotal colectomy was recommended because the cat suffered from chronic constipation associated with pelvic malunion (12). It was not carried out because of the burden to the owners concerning the cost and incidence of persistent, severe diarrhea resulting in weight loss, perineal dermatitis, and rectal straining (14). There was a relapse of constipation five months postoperatively unrelated to the consequences of the surgical repair.

This report describes a procedure of autografting, using the removed malunion pelvic symphysis in the ischium osteotomy line with a triple pelvic osteotomy to avoid pelvic canal re-narrowing.

Conclusions

This case presented with chronic constipation related to malunion of an old pelvic fracture and was treated successfully by triple osteotomy combined with autograft from the pelvic symphysis, without recurrent pelvic canal narrowing.

Conflicts of Interest

The authors have no conflicting interests.

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