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CASE REPORT

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An apparently healthy female British shorthair cat with a rare complication of colonic stenosis after flank approach ovariohysterectomy

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Abstract

Background Colonic stenosis is a rare postoperative complication of ovariohysterectomy in cats, leading to dyschezia and fecal diameter reduction. In cats, while there are reports of colonic stenosis after midline approach ovariohysterectomy, there are no specific reports of flank approach ovariohysterectomy.

Case presentation This report describes a severe case of a one-year-old British shorthair female cat presenting with gastrointestinal signs, including dyschezia and reduced fecal diameter, three weeks after flank approach ovariohysterectomy. Despite abdominal radiography, proctography with barium sulfate, colonoscopy, CT, and hematological analysis, the cause of colonic stenosis remained unclear. During exploratory laparotomy, an annular tissue band was found encircling the descending colon, resulting in severe local stenosis. After excision of the tissue band, the presenting clinical signs of the cat were rapidly improved. This result suggests that colonic stenosis caused by tissue band should be considered when diagnosing postoperative complications in flank approach ovariohysterectomy in cats.

Conclusion Colon stenosis due to annular tissue band restriction should be considered one of the differentials for postoperative complications in flank approach ovariohysterectomy in cats.

Keywords Colon stenosis, Feline, Postoperative complication, Flank approach ovariohysterectomy

Background

Ovariohysterectomy (OVH) is a common surgical technique used for the removal of the ovaries and the uterus in companion animals, with a variety of surgical approaches developed in recent years. For example, there are midline approach OVH, flank approach OVH, and laparoscopic-assisted OVH [1–3]. While the incidence of common complications following OVH used to occur in approximately 20% of cases [1], the incidence of complications has significantly decreased in the past decade due to the emergence of multiple effective surgical techniques [2–4]. These common postoperative complications include hemorrhage, wound healing complications, ovarian remnant syndrome, uterine stump pyometra, granuloma formation, ureteral trauma, vaginoperitoneal fistula formation, urinary incontinence, diarrhea, vomiting, hematochezia, corneal ulceration, and colon stenosis [1, 4].

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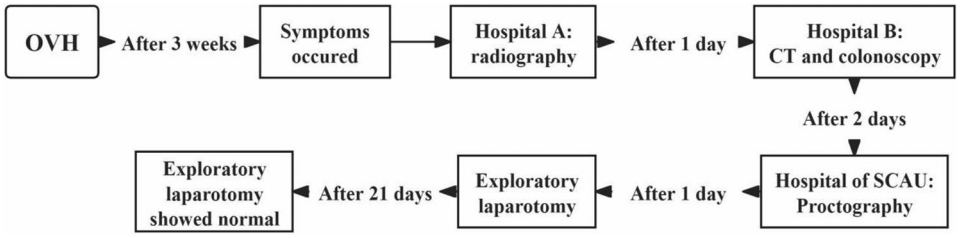

Fig. 1 Complete timeline of this case report. OVH, Ovariohysterectomy. SCAU, South China Agricultural University

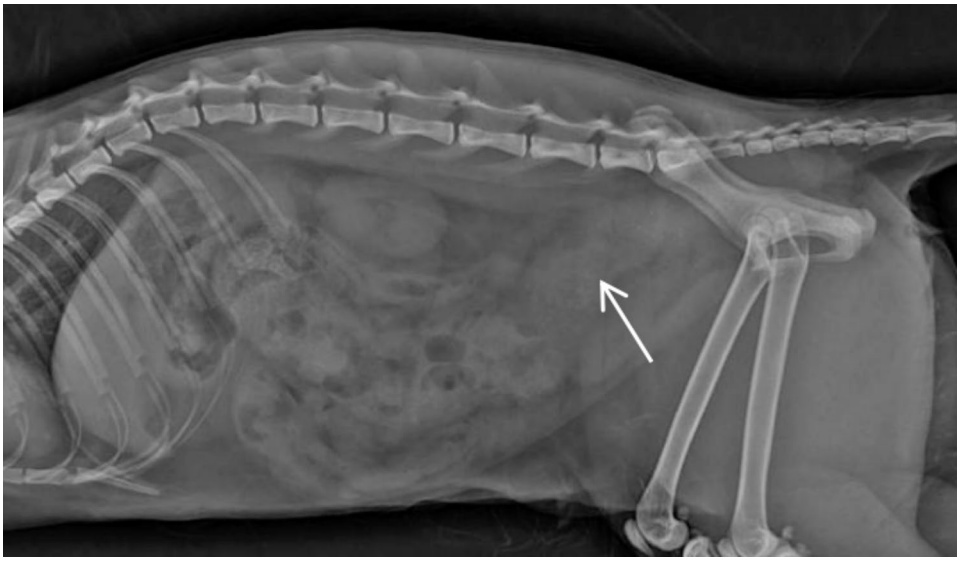

Fig. 2 A lateral survey abdomen radiograph demonstrates colon thickening with large amounts of feces (arrow)

The cat in this report developed signs of dyschezia and reduced fecal diameter three weeks after flank approach OVH. When reviewing the existing study, the author found that similar complications have been reported in two other feline cases and two canine cases, all of which occurred after midline approach OVH [1, 5, 6], but there have been no relevant reports of signs of dyschezia in cats after flank approach OVH. In each of these cases, an annular band constricted the descending colon, resulting in local stenosis of the descending colon. In all feline cases, including the case in this report, clinical signs occurred no more than ten weeks after OVH [5, 6].

This report describes the first colon stenosis in a female cat following flank approach OVH, resulting in difficulty in defecation and reduced fecal diameter. In addition, this report outlines the management of colon stenosis after flank approach OVH and documents the comprehensive prognosis post-treatment.

Case presentation

A one-year-old 3.20-kg spayed female British shorthair cat named "Milk Tea" was presented to the Animal Hospital of South China Agricultural University with dyschezia and reduced fecal diameter (Fig. 1). Her history of vaccination and deworming was complete. Three weeks prior, she had undergone a right flank approach OVH at a private animal hospital. The surgical incision was approximately 2 cm long, and the right flank was selected. A uterine retractor was used to gently pull out the uterine horns and ovaries from the abdominal cavity, and an ultrasonic scalpel was used to cut off the ovarian ligaments, arteries, and veins. Both uterine horns were pulled out of the abdominal cavity to expose the uterine body fully. An ultrasonic scalpel cut off the uterine body and the broad ligament. The uterine stump was placed back into the abdominal cavity after confirming no bleeding at the cut ends. The incision was closed routinely.

Preoperative defecation was expected, while signs of dyschezia and fecal diameter reduction occurred three weeks postoperatively. Over time, clinical signs worsened with hyporexia and constipation. The owner then took Milk Tea to the private Animal Hospital A for treatment. At Animal Hospital A, lateral abdominal radiography revealed colorectal enlargement with abundant feces in the intestinal lumen (Fig. 2). Veterinarians at Animal Hospital A administered an enema with physiological saline and paraffin oil, and some feces were excreted following the enema. However, Milk Tea was unable to

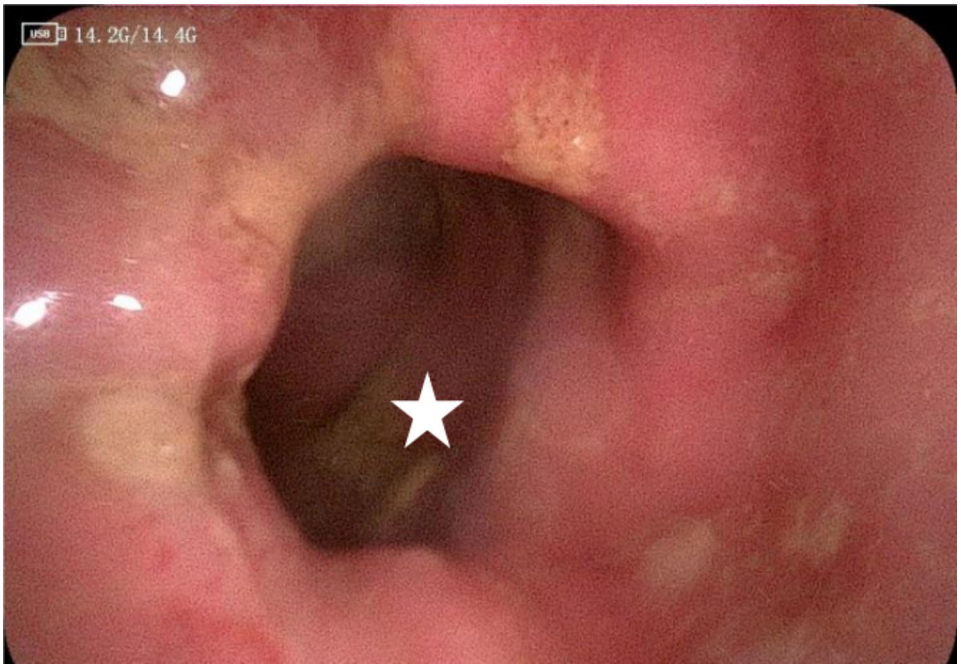

Fig. 3 Colonoscopy image of the descending colon. Local intestinal annular stenosis (asterisk), with smooth mucosa and no other abnormalities, indicates that the stenosis may be caused by extraintestinal compression

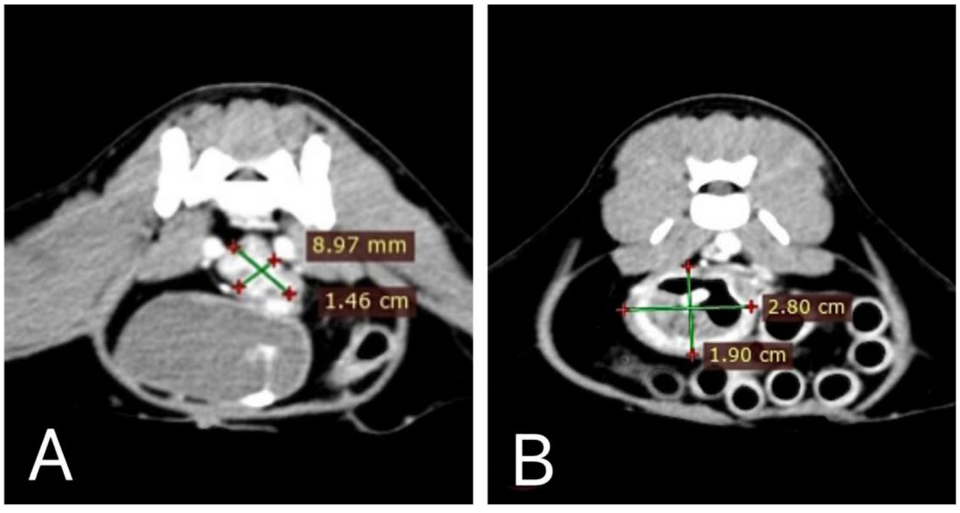

Fig. 4 Cross-sectional CT images of the descending colon. **(A)** The stenotic part (1.46 cm×0.897 cm), **(B)** The head side of the stenotic part (2.80 cm×1.90 cm)

defecate independently during the home observation. Milk Tea was referred to another private Animal Hospital B four days later for further evaluation. Abdominal CT scanning and colonoscopy were performed at Animal Hospital B. Before these diagnostic tests, an enema was performed to eliminate feces from the colorectum. A colonoscopy revealed significant local stenosis in the descending colon. During the exploration of the entire remaining part of the colon, the mucosa of the colon was smooth, and no space-occupying lesions were detected (Fig. 3). The CT scanning revealed local stenosis of the descending colon. The most extended axis length of the colon lumen in the stenosis site was 1.46 cm, with peripheral contrast enhancement. The colon wall in the cranial aspect of the stenosis site was focally thickened with peripheral contrast enhancement, and the most extended axis length of the lumen was 2.80 cm. Other loops of the small intestine, ascending colon, and transverse colon were thickened with foamy gas and fluid contents. However, there was no apparent foreign body obstruction (Fig. 4), and the cause remained unclear. Veterinarians at Animal Hospital B did not perform any treatment.

Two days later, Milk Tea was treated at the Animal Hospital of South China Agricultural University. Physical

examination revealed that the cat was lethargic, the abdomen was hard on palpation, and BCS was average. Proctography with 30% barium sulfate (12 mL/kg) was subsequently performed and revealed significant stenosis in the descending colon near the dorsal side of the middle part of the bladder, and from the level of L6 through L7 and the colon cranial to the stenosis was more significant than the caudal part (Fig. 5). To clarify the cause of colon stenosis further, the veterinarian suggested performing an exploratory laparotomy for Milk Tea.

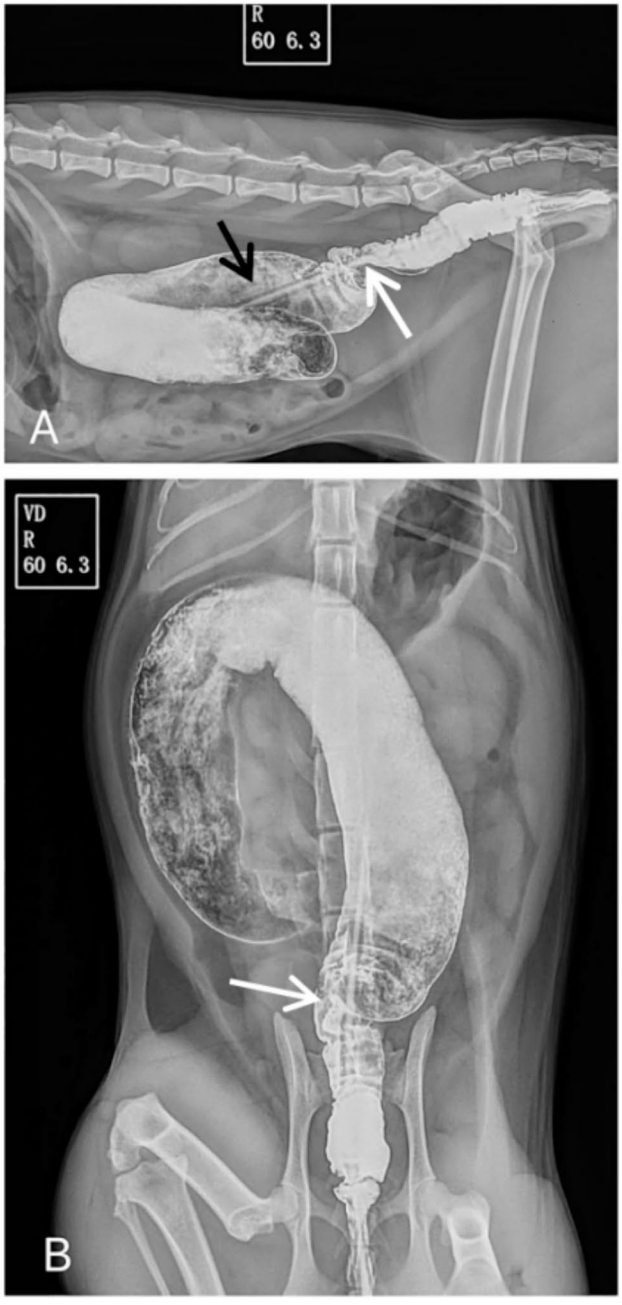

Fig. 5 Radiograph obtained immediately after proctography with 30% barium sulfate. **(A)** Right lateral abdominal radiograph showing significant stenosis in the descending colon near the bladder (white arrow). The tube is used for proctography (black arrow). **(B)** Ventrodorsal abdominal radiograph showing stenosis in the descending colon (white arrow)

One day after proctography, The cat was premedicated with dexmedetomidine (0.003 mg/kg, IV) and butorphanol (0.5 mg/kg, IV), and induced with propofol (4 mg/kg, IV). Anesthesia was maintained with isoflurane in oxygen throughout the surgery. The cat was positioned in dorsal recumbency. A ventral midline incision was made from the umbilicus to the pubis. The stump of the uterine body was identified on the dorsal side of the bladder neck, with a length of approximately 1 cm. An annular band formed by connective tissue on the dorsal side of the uterine stump constricted the descending colon, thus limiting the potential for dilation. This connective tissue extended from the right abdominal wall to the uterine body stump. There were no adhesions between the serosal surface of the colon and the annular band, which could be slid on the colon under traction (Fig. 6). After the annular band was excised by surgical scissors, the colon at the stricture was released. There were no other abnormalities in the abdominal cavity. The midline incision was closed routinely.

The cat had an uneventful postoperative recovery. Meloxicam (0.2 mg/kg, SC, q24h) and butorphanol (0.2 mg/kg, IV) were administered for analgesia for three days after surgery, and ampicillin sodium (20 mg/kg, IV, q8h) was administered as antibiotic therapy. On the evening of the surgery day, the cat defecated, urinated without difficulty, and started eating with a good appetite.

The cat stayed in the hospital for postoperative monitoring for the next three weeks. On the 21st day after surgery, colonography was performed with a 30% barium sulfate (12.5 mL/kg) enema to re-examine the cat, revealing that the size of the descending colon lumen was average. The local stenosis had been significantly improved (Fig. 7). The cat was discharged on the same day, and the owner was advised to continuously monitor the cat's defecation. According to the follow-up discussion with the owner four months postoperatively, the cat regained normal body condition with a good appetite and no recurrence of the presenting signs.

Discussion

Compared to costly laparoscopic surgery, the flank approach for OVH is a rapid and low-cost procedure that reduces tissue trauma [7, 8]. The flank approach OVH also provides the ease of observing the surgical wound from a distance, preventing leakage, hemorrhage, and inflammation from epidermis tissues after the operation, and reduces the risks of evisceration if wound dehiscence occurs [9]. Given the authors' observations, pet owners were generally more satisfied with the cosmetic effect of surgical wounds caused by the flank approach OVH

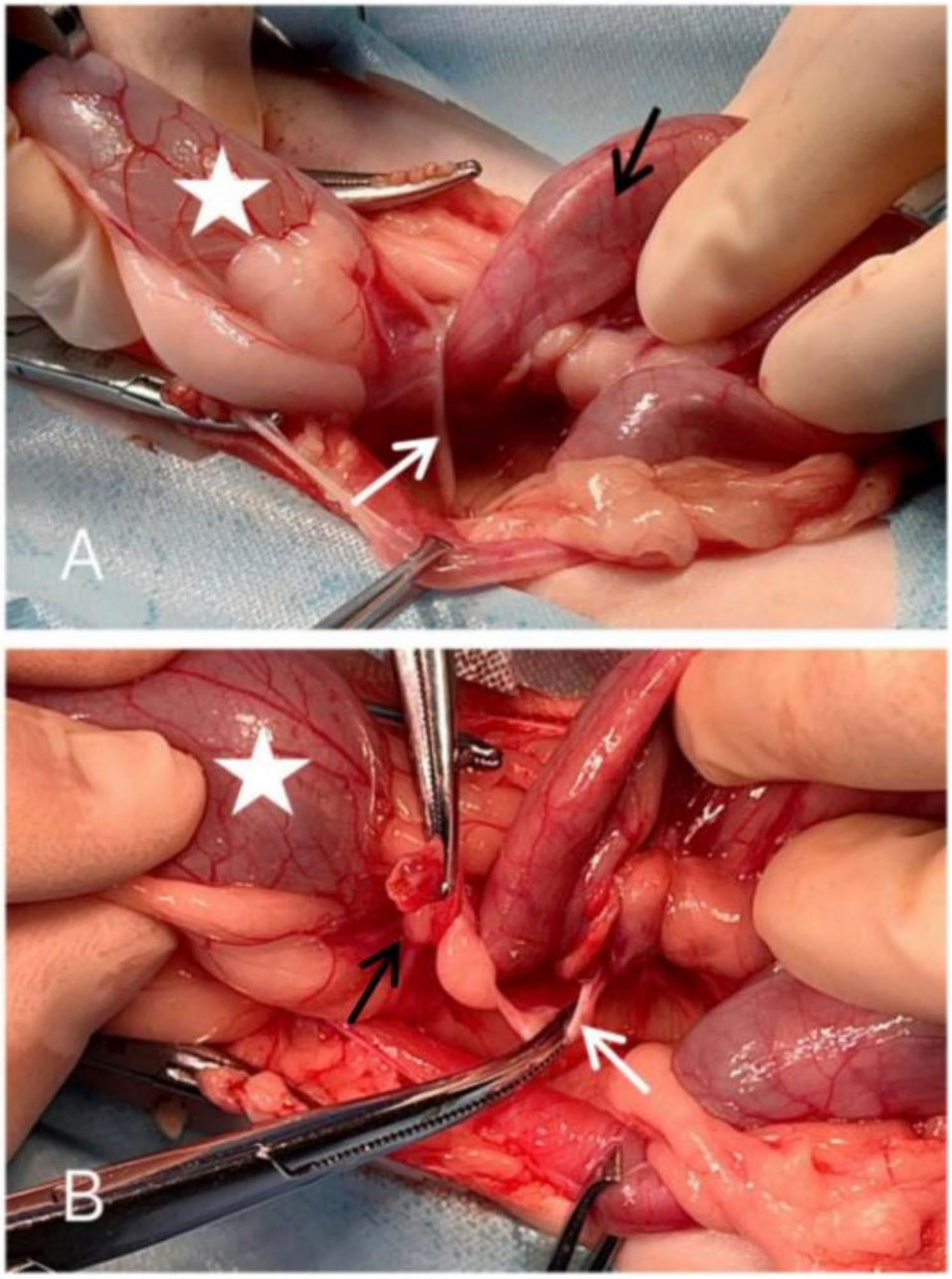

Fig. 6 The exploratory laparotomy of Milk Tea. **(A)** The annular band constricting the descending colon was exposed (white arrow). **(B)** The annular band (white arrow) was pulled from the descending colon, connecting to the uterine body stump on the other side. Bladder (asterisk). Descending colon (black arrow)

than the midline approach OVH. Therefore, the flank approach OVH has gradually become popular in China in recent years, following the trend set by British veterinarians [8]. No evidence suggests that flank approach OVH in female cats carries a higher risk of complications than midline OVH [8]. In this case, Veterinarians at another private animal hospital performed the flank approach OVH. The author thoroughly communicated with the lead surgeon who operated to understand the surgical process and details. The review of the entire surgical process ruled out factors such as surgical errors, residual suture materials, granuloma formation, and uterine residue [5, 6, 9].

In early studies, intestinal obstruction in dogs and cats after OVH was primarily due to using non-absorbable suture materials for ligation, resulting in granulomas or abscesses formation at the ligation site [6]. In all cases, the origin of the granuloma was thought to be a reaction to contaminated, multifilament, non-absorbable suture material [6]. Secondary to granulomas from

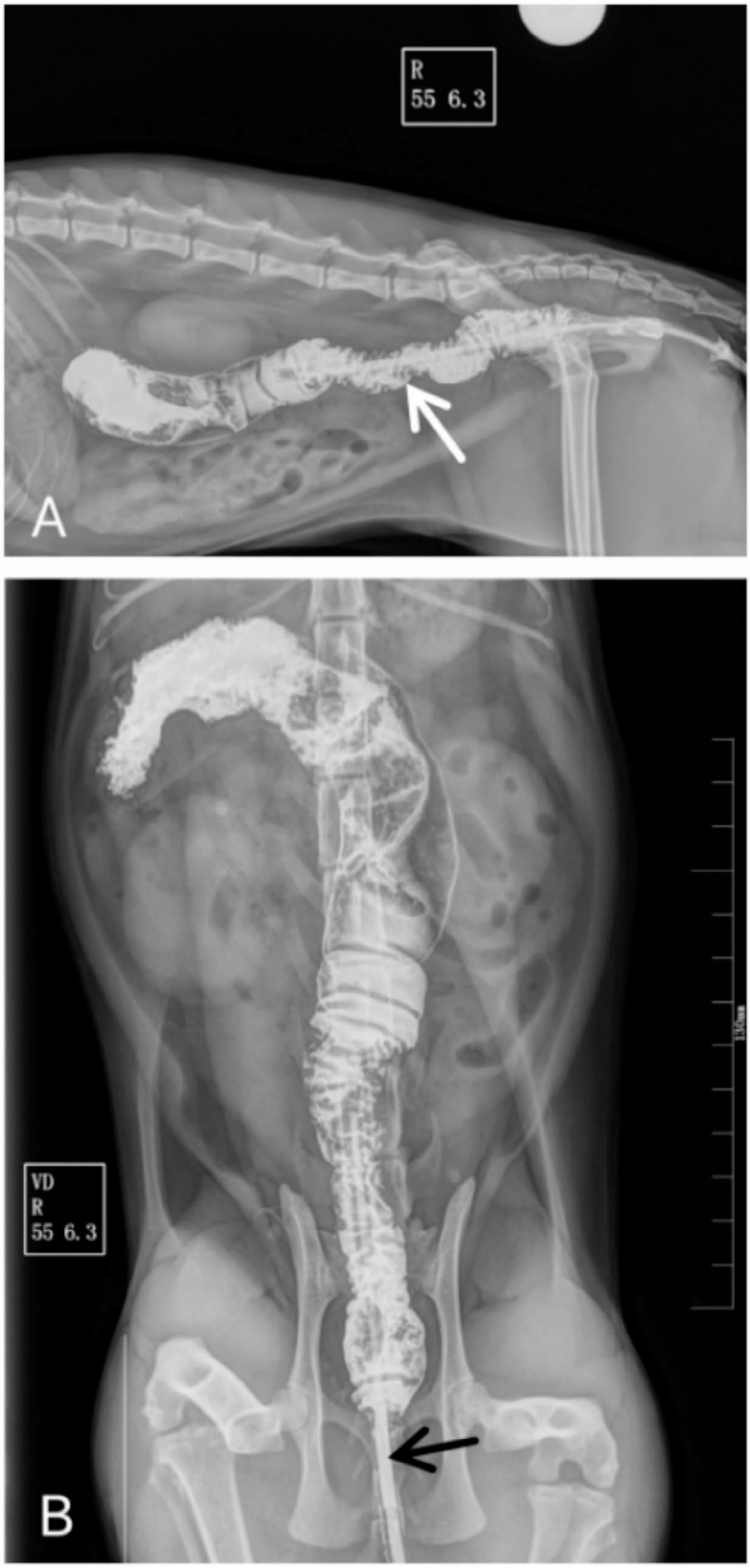

Fig. 7 Radiograph obtained immediately after colonography with 30% barium sulfate enema on the 21st day after surgery. **(A)** Right lateral abdominal radiograph showing relief of the preoperative colonic stenosis (arrow). **(B)** Ventrodorsal abdominal radiograph showing the tube used for imaging (arrow)

non-absorbable sutures, extensive adhesions occurred in the small intestine, colon, mesentery, and greater omentum, ultimately leading to intestinal obstruction [5]. However, there are still reports of uterine stump abscesses even after replacing multifilament non-absorbable sutures with monofilament absorbable sutures. No pathogenic factors previously associated with intestinal obstruction were reported in this case. Instead, a tissue ring encircling the colon caused colonic stenosis, a relatively rare phenomenon. Unlike granulomas, this tissue ring did not directly adhere to the intestinal wall but could slide under traction along the colon. After ruling out other pathogenic factors, the author attempted to speculate on this lesion's origin and cause.

While colonic stenosis has been reported in female dogs and cats following midline OVH, this is the first report of such a complication in a queen cat following lateral OVH, which also speculates on the formation mechanism and source of tissue bands that cause colon stenosis. In cats, the uterine body and the colon are parallel in the sagittal plane, with the uterine horns extending toward both sides of the abdominal wall and terminating at the ovaries [10]. The broad ligament extends on the mesometrium, which carries the round ligament along its edges (Fig. 8A) [11]. Due to the specific locations of the incisions in flank approach OVH, simultaneous traction of the ovaries, uterine broad ligament, and round ligament contralateral to the incision creates a certain angle between the tissue and the descending colon (Fig. 8B). After the ovary and the uterine horn are removed, the residual broad ligament and round ligament on the opposite side of the incision may not return to their original position (Fig. 8C). According to the authors, the angle may remain, and the residual tissue can adhere to surrounding tissues, eventually forming a fibrous structure around the descending colon, compressing the descending colon, which can lead to colon stenosis (Fig. 8D). However, the exact cause of the annular tissue band remains unclear and requires further investigation through additional case studies.

Radiography showed significant dilation of the colon lumen, and differentials include idiopathic megacolon, neoplasia, colon stenosis secondary to fungal infection, colonic torsion, and extraluminal colon stenosis [6, 12, 13]. In female dogs experiencing intestinal obstruction due to granuloma adhesion after OVH, intestinal resection and anastomosis are typically performed depending on the intestinal viability. Other treatment methods for these conditions include enema, balloon dilation, fecal softeners, and colonic stent implantation [14]. In several similar cases of colon stenosis after OVH in female cats, excision of the adhered tissue ring was the only procedure needed to relieve the presenting signs; surgical treatment of the uterine stump or the colon was not necessary. In this case, after removing the tissue ring encircling the colon, the stenosis was significantly relieved, and the patient's clinical signs were soon resolved. It highlights the importance of recognizing the cause of colon stenosis after OVH rather than solely attributing it to functional damage to the colon, specifically tissue ring constriction in this case.

To potentially avoid such complications, using laparoscopic-assisted OVH may provide better results. Laparoscopic-assisted OVH involves less postoperative pain than traditional OVH via celiotomy in reasonable surgical time [2, 7]. Moreover, laparoscopic OVH allows surgeons to visualize anatomical structures better [15]. The additional magnification and illumination may help ensure complete ovarian and uterus tissue removal, reducing the risk of postoperative complications [2]. The use of an ultrasonic scalpel may also be beneficial. Research has indicated that any surgical technique that completely avoids hemorrhage and carbonization may reduce adhesion formation [16]. Compared with electrosurgery and CO_2 laser scalpel, ultrasonic scalpel generates minimal heat, resulting in the smallest thermal damage area and the best healing effect among the three [17]. In addition, during flank approach OVH, it is essential to fully reposition the uterine stump and the residual broad ligament and round ligament of each uterine horn to minimize the risk of tissue adhesion during the healing process.

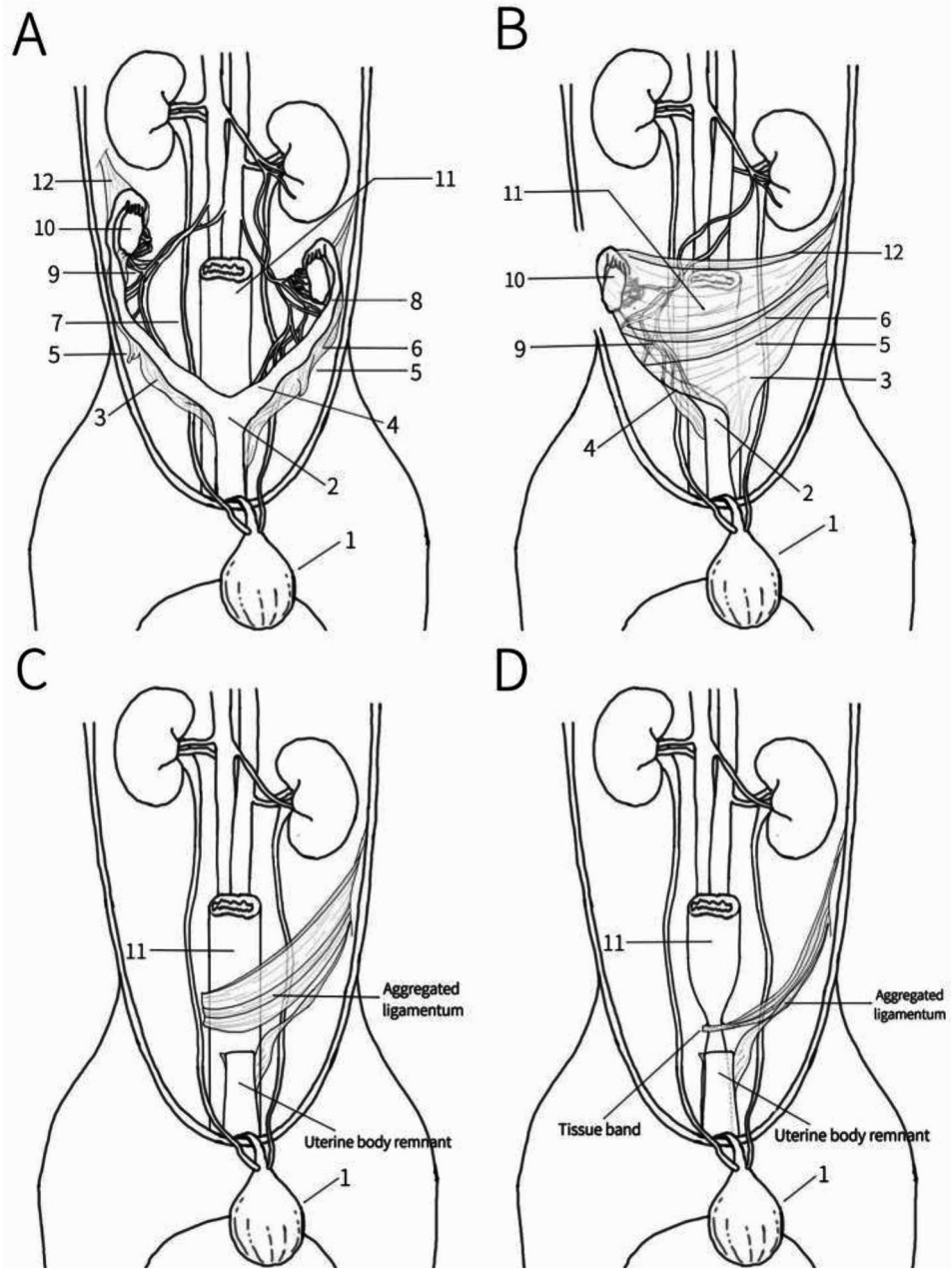

Fig. 8 Schematic diagram illustrating the formation mechanism and source of tissue bands that cause colon stenosis. **(A)** The anatomical relationship of the reproductive system of female cats. **(B)** The left ovary and uterine horn were extracted through the right abdominal incision. **(C)** The aggregated ligamentum remained close to the remnant of the uterine body and the colon. **(D)** The annular tissue band was formed and compressed the descending colon, resulting in local stenosis. (1) Bladder. (2) Body of uterus. (3) Mesometrium. (4) Uterine horn. (5) Round ligament. (6) Broad ligament. (7) Ureter. (8) Ovarian ligament. (9) Ovarian artery and vein. (10) Ovary. (11) Colon. (12) Suspensory ovarian ligament

Conclusion

This report describes a rare but symptomatic complication following a flank approach OVH, where fibrous tissue adhesion and hyperplasia lead to colonic stenosis. Based on this case report, the author considers that the fibrous tissue band might be derived from remnants of the uterine and ovarian ligaments. In cases of post-OVH complications in cats, veterinarians should consider the possibility of such complications.

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Author contributions
Yixing Xie: Conceptualization, Investigation, Writing – original draft, Writing – review & editing. Yintong Deng: Writing – review & editing. Jiaxun Mai:

Visualization. Heyu Li: Writing – review & editing. Yizhou Chen: Writing – review & editing, Supervision.

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Data availability
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Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
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Competing interests
The authors declare no competing interests.

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References

1. Adin AC. Complications of Ovariohysterectomy and Orchiectomy in Companion animals. Vet Clin North Am Small Anim Pract. 2011;41(5):1023–39.
2. Case JB, Boscan PL, Monnet EL, Niyom SR, Imhoff DJ, Wallace ML, Smeak DD. Comparison of surgical variables and pain in cats undergoing ovariohysterectomy, laparoscopic-assisted ovariohysterectomy, and laparoscopic ovariectomy. J Am Anim Hosp Assoc. 2015;51(1):1–7.
3. Miller PK, Rekers W, Ellis K, Ellingsen K, Milovancev M. Pedicle ties provide a rapid and safe method for feline ovariohysterectomy. J Feline Med Surg. 2016;18(2):160–4.
4. Corriveau KM, Giuffrida MA, Mayhew PD, Runge JJ. Outcome of laparoscopic ovariectomy and laparoscopic-assisted ovariohysterectomy in dogs: 278 cases (2003–2013). J Am Vet Med Assoc. 2017;251(4):443–50.
5. Smith MC, Davies NL. Obstipation following ovariohysterectomy in a cat. Vet Rec. 1996;138(7):163.
6. Coolman BR, Marretta SM, Dudley MB, Averill SM. Partial colonic obstruction following ovariohysterectomy: a report of three cases. J Am Anim Hosp Assoc. 1999;35(2):169–72.
7. Reece JF, Nimesh MK, Wyllie RE, Jones AK, Dennison AW. Description and evaluation of a right flank, mini-laparotomy approach to canine ovariohysterectomy. Vet Rec. 2012;171(10):248.
8. Coe RJ, Grint NJ, Tivers MS, Moore AH, Holt PE. Comparison of flank and midline approaches to the ovariohysterectomy of cats. Vet Rec. 2006;159(10):309–13.
9. Munif MR, Safawat MS, Hannan A. Left lateral flank approach for spaying in cats. Open Vet J. 2022;12(4):540–50.
10. Prozorowska E, Jackowiak H, Skieresz-Szewczyk K. Morphology and topography of internal reproductive organs in the female cat during prenatal and postnatal development: scanning electron microscope and three-dimensional reconstruction study. J Morphol. 2018;279(12):1764–75.
11. Watson A. Vaginal ring and round ligament of the uterus in the female cat. Anat Histol Embryol. 2009;38(4):319–20.
12. Tzimtzimis E, Papazoglou L, Patsikas M, Tsioli V, Kouti V, Konstantinidis A, Rallis T. Colonic impaction in dogs: a retrospective study of 58 cases (1996 to 2014). J Small Anim Pract. 2019;60(7):444–9.
13. Czajkowski PS, Fryer KJ. Colonic torsion in 4 great danes. J Vet Emerg Crit Car. 2020;30(5):581–6.
14. Hume DZ, Solomon JA, Weisse CW. Palliative use of a stent for colonic obstruction caused by adenocarcinoma in two cats. J Am Vet Med Assoc. 2006;228(3):392–6.
15. Elliott RC, Kirberger RM, Joubert KE. Computed tomography determined changes in position of the hepatobiliary and gastrointestinal systems after CO2 insufflation to determine optimal positioning for abdominal laparoscopy. Vet Surg. 2015;44(S1):100–11.
16. Bhatta N, Isaacson K, Flotte T, Schiff I, Anderson RR. Injury and adhesion formation following ovarian wedge resection with different thermal surgical modalities. Lasers Surg Med. 1993;13(3):344–52.
17. Holub Z, Jabor A, Sprongl L, Kliment L, Fischlová D, Urbánek S. Inflammatory response and tissue trauma in laparoscopic hysterectomy: comparison of electrosurgery and harmonic scalpel. Clin Exp Obstet Gynecol. 2002;29(2):105–9.

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