CASE REPORT

Unilateral uterine torsion in two non-gravid bitches: Imaging and histological features

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Abstract

A 4-year-old nulliparous Labrador Retriever bitch and a 7-year-old nulliparous cross-breed bitch were referred for weakness and vomiting. Ultrasonographic examination revealed in both cases a large abdominal mass-lesion with corpuscular fluid content; computed tomography examination revealed in both cases the uterine origin of the lesions, with findings consistent with torsion. Surgery confirmed the uterine torsion upon the ovarian pedicle in both cases, and at histological examination both presented a uterine polyp associated with haemorrhage and necrosis of the uterine wall. Both patients were released in good clinical conditions.

BACKGROUND

Uterine torsion is a rare condition, uncommonly reported in non-gravid bitches. The pre-surgical diagnosis of uterine torsion can be challenging, and imaging features of this particular condition have been to date reported in few cases, limited to radiographic and/or ultrasonographic (US) findings,^{1–8} while computed tomography (CT) features of uterine torsion in veterinary medicine have not been previously described. We describe two cases of unilateral uterine horn torsion in non-gravid bitches with particular attention to the US, CT and histological findings that can help in the diagnosis.

CASE PRESENTATION

A 4-year-old nulliparous Labrador Retriever bitch (case 1) was referred to San Marco Veterinary Clinic for investigation of a 2-day history of vomiting, weakness and polyuria-polydipsia. At physical examination, the abdomen was enlarged and tense, and body temperature was 39.7°C, pulse 104 bpm and respiratory rate 120 rpm.

A 7-year-old nulliparous crossbreed bitch (case 2) was also referred to the same clinic for weakness and acute vomiting. At abdominal palpation, the presence of an abdominal mass was suspected, and there was a marked abdominal pain. At physical examination, body temperature was 38.3°C, pulse 150 bpm and respiratory rate 30 rpm.

In both cases, the owners were unsure about when the last heats occurred; they both reported regular cycles, and no modifications regarding the cycles and/or the clinical manifes-

tations were present at the time of presentation. Unfortunately, a complete reproduction consultation has not been performed in these cases, as they both presented in emergency, and no obvious clinical signs were reported suggesting a disease specific of the urogenital tract.

INVESTIGATIONS

Complete blood count revealed in both cases: neutrophilia (segmented neutrophils [μ L]: 22555 case 1; 15050 case 2; reference interval 3743–10004 μ L) and monocyte leukocytosis (monocytes [μ L]: 5205 case 1; 1400 case 2; reference interval 229–711 μ L). Serum biochemistry analysis revealed high C-reactive protein levels in case 1 (CRP mg/dL: 21 reference interval 0.01–0.49) and a mild increase of lactates (mmol/L: 3.8, reference interval 1–3.5 mmol/L) in case 2. In both cases, urinalyses, serum electrophoresis and hemostatic profile were unremarkable.

In both cases, a US examination of the abdomen was performed with micro-convex (frequencies 3–9 MHz) and linear transducers (frequencies 8–16 MHz) with two different machines: case 1 with Acuson Juniper (Siemens Healthineers, Erlangen, Germany) and case 2 with Logiq P6 (GE Medical Systems, Milan, Italy).

In case 1, a large (approximately 20 × 10 × 15 cm) cavitary mass was seen, characterised by a thickened and irregular wall, with cystic lesions within, and a large amount of echoic fluid content (Figure 1(a)). This lesion was in continuity with the cranial aspect of the right uterine horn. At colour Doppler examination, no obvious vascularisation was seen within the wall, but some vessels of large diameter were seen

in the proximity of the mass, showing a tortuous appearance with turbulent flow (Figure 1(b)). The right ovary was not visualised, and the differential diagnosis for the described lesion was neoplastic uterine or ovarian process and uterine torsion.

The US findings of case 2 were similar, consistent with the presence of a fluid-filled (approximately $13 \times 6 \times 5$ cm) abdominal mass, but in this case no continuity was seen with abdominal organs, and the origin of the mass was then unclear.

Both bitches underwent a whole-body multiphase multidetector-row CT before surgery, for appropriate surgical planning and to exclude the presence of any other abnormalities consistent with metastases in case of neoplastic origin of the lesion.

The studies were performed with a third generation dual-source CT (192×2 DSCT) (Somatom Force; Siemens, Erlangen, Germany) (case 1) and with 16-multidetector-row computed tomography scanner (MDCT) (Lightspeed 16; GE Medical Systems, Milan, Italy) (case 2).

A pre-contrast series of the whole body was followed by a three-phase study of the abdomen. A bolus-triggering technique was used: for the arterial phase, the scan started when a pre-determined attenuation (100 HU) was reached within the ROI placed in the abdominal aorta; a delay separated the arterial and portal venous phases ranging from 12 to 20 seconds depending on the CT scanner used, and the interstitial phase was acquired 3 and 6 minutes after contrast injection. Bitches were placed in sternal recumbency, with the

LEARNING POINTS/TAKE-HOME MESSAGES

- 3-Uterine torsion is a rare condition, uncommonly seen in non-gravid bitches: in these two cases the presence of an intraluminal polyp predisposed to the torsion.
- 3-Haemorrhage and necrosis at variable degrees were present at histological examination.
- 3-On US examination, the uterine torsion appeared as fluid-filled large lesion, with thickened and irregular wall and poor vascular flow at colour Doppler.
- 3-Multiphase MDCT examination was helpful in the pre-surgical diagnosis of unilateral uterine horn torsion.
- 3-MDCT findings were fluid-filled mass lesion with thick and irregular wall, receiving arterial supply from the uterine artery, and presence of whirl sign

head first, and iodinated contrast agent (iohexol 370 mgI/mL, 2 mL/kg dosage followed by a saline flush) was each time injected in a cephalic vein at an injection rate of 2 mL/s using a dual barrel injector system.

FIGURE 1 US and CT images of case 1. (a) US bi-dimensional appearance, the twisted right uterine horn (RUH), presented as a cavitary mass, filled with corpuscular, echogenic fluid; the wall is irregularly, markedly thickened (arrows) and characterised by the presence of multiple cystic lesions (asterisks); (b) colour Doppler evaluation of large vessels seen lateral to the right uterine horn, showing tortuous appearance and turbulent flow. (c) and (d) Transverse and dorsal multiplanar reformations (MPRs) CT images in interstitial phase showing the presence of a large space-occupying fluid-filled lesion (arrows), characterised by thick and irregular wall, consistent with the twisted right uterine horn. RUH, right uterine horn

FIGURE 2 CT images and histological features of case 2. (a) and (b) Transverse and dorsal MPRs from CT examination of case 2 (portal venous phase). The left uterine horn (LUH) was twisted, and moderate amount of fluid-attenuating material (peritoneal effusion) was seen in the peritoneal cavity (asterisks). (c) Histological section of uterine stromal polyp with edema, haemorrhages and well-preserved mildly dilated endometrial glands. Abbreviations: J, jejunum; L, liver; S, spleen; St, stomach; UB, urinary bladder.

FIGURE 3 MDCT features of uterine torsion (case 1). (a) Maximum intensity projection (MIP) dorsal multiplanar reformation (MPR) in arterial phase, showing the feeding vessels of the mass (RUH) deriving from the right uterine artery (arrows). (b) Whirl sign. Maximum intensity projection (MIP) transverse section in interstitial phase of case 1, showing whirling vessels (between arrowheads) indicative of torsion. Abbreviations: L, liver; RUH, right uterine torsion; S, spleen.

For the 16-MDCT scanner, acquisition parameters were helical modality, detector configuration 16×1.25 mm (50% overlap), pitch 0.562:1 and 0.7 s rotation times. Dose parameters were 120 kVp and 200 mAs. For the 192×2 MDCT scanner, scan parameters used were one tube for arterial and interstitial phase (120 kVp) and two tubes for portal venous phase at 100 of 150 kVp. For all phases, 400 mAs/rot (0.28 seconds), collimation 192×0.6 mm, images were reconstructed at 0.3 mm using a soft-tissue reconstruction algorithm.

The MDCT examination in both cases confirmed the presence of a cavitory lesion, with thick wall, extremely irregular and heterogeneously enhancing, and large amount of fluid content (Figures 1(c), 1(d), 2(a), and 2(b)). Furthermore, the uterine origin of the lesions was confirmed: right uterine horn for case 1 and left uterine horn for case 2. Together with the continuity with the uterus, the evaluation in the arterial phase of the arterial support, coming in both cases from the uterine artery (Figure 3(a)), helped in the diagnosis. Whirl sign (Figure 3(b)) was identified lateral to the lesion in both cases.

Fat stranding (case 1) and peritoneal effusion (case 2) were also noticed.

TREATMENT

With the MDCT presumptive diagnosis of uterine torsion, both bitches underwent surgery, and an ovariohysterectomy was made without complications. The affected horns appeared markedly dilated (Figure 4(a)) and twisted upon the ovarian pedicle in both cases.

According to the surgical reports, in both cases the degree of torsion was approximately 360° .

Histologically, in both cases, lumen of uterus was expanded and partially filled with an intraluminal polypoid neoformation. In case 1 the architecture of polyp was effaced by haemorrhagic and necrotic changes. Endometrial lining and dilated endometrial glands were multifocally detectable. Mesometrium, as well as the uterine wall, was interested by haemorrhages and by congested and thrombotic vessels (Figures 4(b) and 4(c)).

In case 2, neoformation was better valuable, and it was consistent with a uterine stromal polyp with a characteristic endometrial lining, and a central core composed of variably dilated endometrial glands sustained by fibrovascular, edematous stroma. Polyp and uterine wall were interested by haemorrhages and vascular congestion (Figure 2(c)).

FIGURE 4 Intraoperative and histological appearance of case 1. (a) Intraoperative photograph of the twisted uterine horn in case 1, prior to resection. Notice the marked distention and the vascular congestion of the uterine wall. (b) and (c) Histology (H&E) showed residual endometrial glands associated with haemorrhages and fibrin deposits (b) and transmural uterine haemorrhages (c)

OUTCOME AND FOLLOW-UP

Both patients were hospitalised for 2 days after surgery and were subsequently released in good clinical conditions. At 1-month follow-up, in both cases the clinical examination and the blood examination were normal, and no postoperative complications were seen.

DISCUSSION

Uterine torsion is a rare condition affecting the bitch, and it is most frequently associated with late pregnancy.¹ In non-gravid bitches, torsion of the uterus has been described in association with haematometra, pyometra, cystic endometrial hyperplasia, segmental aplasia and inflammatory endometrial polyp.^{2–8}

Interestingly, in the two cases reported here, histology revealed an intraluminal polypoid neoformation that, as previously reported,^{5,7} could have caused the distension of the ovarian pedicle and broad ligament making uterus more susceptible to torsion. Both the uterine polyps and the uterine torsion in non-pregnant females are uncommon conditions in bitches; the two cases reported here, indeed, occurred in two different moments in time, with a delay of approximately 10 years between the two cases.

We hypothesise that the severity of haemorrhagic and necrotic lesions was different in the two cases because they represented two different stages of the pathologic process, the first more advanced compared to the second.

Uterine torsion has been reported both in small and large breed bitches, and the clinical signs and laboratory findings are unspecific.^{2,8} The radiographic findings reported are also non-specific and regarded the presence of one large or some smaller soft-tissue opacities in the mid-caudal abdomen, displacing the adjacent organs.^{5,6,8} US examination of the abdomen is reported to be useful in the recognition of the uterine origin of the abdominal masses.^{5,7} The presence of a corkscrew-shaped structure connected with a dilated uterine horn has been described in a case of uterine torsion associated with bilateral segmental aplasia.⁸

In the two cases described here, the US appearance of the twisted uterine horns was similar as previously described. A fluid-filled large lesion was seen in both cases, clearly

in connection with the uterine horn in one case; the wall was thickened and irregular, and in one case it showed very poor vascular flow at colour Doppler examination. As reported for splenic and hepatic torsions,^{8–10} colour Doppler imaging can aid in the diagnosis of uterine torsion. The corkscrew-shaped structure previously described in a case of uterine torsion, has not been visualised in our cases.

In the two cases reported here, the pre-surgical diagnosis of uterine torsion was made based on the MDCT features. In one case, the hypothesis of uterine torsion and/or uterine neoplasia was already made after US examination, while in the other case, the origin of the cavitory mass lesion was unclear at abdominal US. The recognition of the uterine origin of a large mass could be difficult with the exclusive use of US, as happened in one of our two cases. Conversely, in case of large abdominal masses, the use of a cross-sectional modality is extremely useful. Furthermore, contrast-enhanced studies in different phases were the most useful technique that led to the diagnosis in these two cases. In particular, the evidence of an arterial supply deriving from the uterine artery was indicative of the uterine origin of the mass-like lesion in both cases. Tomographic whirl sign is referred to the visualisation of whirling vessels, due to the torsion of the organs upon themselves, and has been previously reported in veterinary medicine in several cases of torsion of different organs,^{11–16} but has never been described before in case of uterine horn torsion. The recognition of a whirl sign adjacent to the mass has been considered indicative for torsion in these two cases.

In conclusion, we described two cases of unilateral uterine torsion, an uncommon condition especially in nulliparous bitches, in both cases due to the presence of uterine polyps. In these cases, multiphase MDCT examination was useful in the pre-surgical diagnosis of unilateral uterine horn torsion. The presence of a fluid-filled mass lesion with thick and irregular wall, receiving arterial supply from the uterine artery, together with the presence of whirl sign, was the most relevant finding.

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