

Uterine torsion in a Quarter Horse mare in 2 nonconsecutive pregnancies

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Abstract

Uterine torsion is a relatively rare but serious periparturient condition that constitutes a reproductive emergency for both mare and foal. Although recurrence within the same pregnancy has been documented, recurrence across separate pregnancies remains unreported. We describe a mare that experienced clockwise uterine torsions during 2 pregnancies, on days 256 and 349 of pregnancy, respectively. Both pregnancies resulted in the delivery of live foals; however, the second uterine torsion led to an inoperable uterine tear necessitating euthanasia; oocytes were successfully harvested at postmortem resulting in 4 embryos via intracytoplasmic sperm injection.

Keywords: Peripartum mare, uterine torsion, uterine tear, oocyte recovery, embryos

Background

Uterine torsion accounts for ~ 5-10 % of periparturient emergencies in pregnant mares.¹⁻⁴ The condition typically occurs during mid to late pregnancy^{2,4} and involves rotation of the gravid uterus along its longitudinal axis, cranial to the cervix, at the level of the uterine body.^{2,5} Although it is commonly reported in draft breeds,⁶ there does not appear to be any specific breed predilection.⁶

The etiology of uterine torsion remains poorly defined; however, fetal size and movements, oligohydramnios, maternal rolling activity, lack of uterine tone, a deep abdominal conformation, anatomical variations of the uterus and its supporting structures are considered predisposing factors.^{1,7} Affected mares can have mild, intermittent abdominal discomfort that temporarily improves with analgesics.^{2,8} Mares may also present with severe colic, especially when uterine rotation is > 180° or there is gastrointestinal involvement.^{2,4,5} Uterine torsion can lead to serious secondary complications (e.g. vascular compromise and uterine rupture).^{1,5,9} Differential diagnoses include primary gastrointestinal disorders, normal parturient behavior, abortion and parturient hemorrhage.

Transrectal palpation remains the most accurate method for diagnosing uterine torsion in mares, based on the detection of taut, abnormally positioned broad ligaments.⁴ The extent of

uterine rotation typically ranges from 180° to over 360°, ^{1,10} and the rotational direction (clockwise or counterclockwise^{1,2}) can be determined based on broad ligament orientation as viewed from the caudal aspect of the mare. In clockwise torsion, the right broad ligament courses ventrally beneath the uterus and the left broad ligament is stretched dorsally across the uterine surface from left to right. Conversely, in counterclockwise torsion, the left broad ligament passes ventrally under the uterus, and the right broad ligament is stretched dorsally from right to left. Accurately identifying the direction of uterine torsion is essential, as treatment requires rotating the uterus in the opposite direction, to restore normal positioning.¹⁰

Uterine torsion in mares can be managed through both surgical and nonsurgical approaches. A commonly employed nonsurgical method is the 'plank in the flank' technique that involves rolling an anesthetized mare in the direction of the torsion while using a long wooden plank to stabilize the uterus. The plank is weighted by a moderately heavy individual to maintain firm contact and prevent the uterus from rotating with the mare's body, thereby facilitating correction of the torsion.³ For a clockwise uterine torsion, the mare is placed on right lateral recumbency whereas for a counterclockwise uterine torsion, the mare is placed on left lateral recumbency.⁸ If uterine torsion occurs during parturition, manual correction may be attempted per vagina. This involves

passing an arm through the cervix and into the uterus, grasping a part of the fetus, and gently rocking it back and forth to generate momentum to rotate the fetus in the direction opposite to the torsion.^{1,4} This technique is generally effective only when the degree of torsion is < 270°. ⁶ Surgical correction may be achieved via a standing flank laparotomy, wherein an incision is made in the paralumbar fossa on the side ipsilateral to the direction of the torsion, allowing manual derotation of the uterus.^{4,5} Alternatively, a ventral midline celiotomy may be performed to facilitate direct access to the uterus and manual correction.^{1,4} Although recurrence of uterine torsion within the same pregnancy has been documented,¹¹ to authors' knowledge, recurrence in the same mare across separate pregnancies has not been documented.

Case presentation

A 20-year multiparous Quarter Horse embryo recipient mare was presented for evaluation of an acute onset of colic. At admission, the mare was on day 349 of pregnancy and had exhibited mild abdominal discomfort for ~ 2 days. A history of uterine torsion was documented 6 years before, occurring on day 256 of pregnancy and involving a 360° clockwise rotation. Surgical correction was performed via ventral midline celiotomy, and a live foal was delivered without complication 74 days after surgery. One additional pregnancy occurred in 2022 that resulted in an abortion at 5 months of pregnancy.

At presentation, the mare was sweating with diffuse muscle fasciculations. Mucous membranes were pale pink, with a capillary refill time of 3 seconds. The mare was tachycardic (heart rate: 62 bpm) with a regular rhythm. Hematologic analysis revealed hemoconcentration and dehydration, with a packed cell volume of 52% (reference range [RR] 32-52 %) and total solids of 7.4 g/dl. Blood lactate concentrations were high at 5.7 mmol/l (RR: 1-2 mmol/l), along with hyperglycemia and azotemia (blood glucose concentrations: 267 mg/dl [RR: 72-114 mg/dl] and plasma creatinine concentrations: 3.82 mg/dl [RR: 0.6-1.8 mg/dl]).

A reproductive evaluation was initiated, beginning with visual inspection of the perineal region. Vulva was vertically oriented with well-apposed vulvar lips, and no observable evidence of vulvar discharge, fetal membranes, or fetal structures. Transrectal palpation of the reproductive tract revealed taut, abnormally positioned broad ligaments, with the right broad ligament coursing ventrally beneath the uterus and the left broad ligament extending dorsally from left to right (consistent with clockwise uterine torsion). Ultrasonographic examination of the reproductive tract assisted via abdominal palpation per rectum did not yield additional diagnostic information. Given the severity of clinical signs and the advanced stage of pregnancy, surgical intervention via ventral midline celiotomy was elected.

Preoperative medical management included intravenous penicillin G potassium (22,000 iu/kg; Sandoz Inc, Princeton, NJ, USA), gentamicin sulfate (8.8 mg/kg; Clipper Distributing Company, St. Joseph, MO, USA) and flunixin meglumine (1.1 mg/kg; MWI, Boise, ID, USA). Sedation was achieved using xylazine hydrochloride (0.6 mg/kg; Dechra Veterinary Products, Overland Park, KS, USA), followed by hypertonic saline (2 ml/kg) to support intravascular volume before anesthetic induction. General anesthesia was induced with intravenous midazolam (0.03 mg/kg; Hikma

Pharmaceuticals, Berkeley, NJ, USA), guaifenesin (50 mg/kg; Wedgewood, Swedesboro, NJ, USA), and ketamine hydrochloride (2 mg/kg; MWI). The mare was endotracheally intubated, and anesthesia was maintained with isoflurane in oxygen. The patient was positioned on dorsal recumbency; ventral abdomen was aseptically prepared for a midline celiotomy.

Entry into the abdominal cavity revealed a large volume of frank hemorrhage. Manual derotation of the uterus was successfully performed; however, a full-thickness uterine tear ~ 30 cm in length was identified along the caudoventral aspect of the uterine body, extending to the cervix (Figure 1). Hemorrhage from uterine blood vessels was controlled using hemostatic clamps. Despite supportive measures, the mare developed severe hypotension (mean arterial pressure: 42 mm Hg) and persistent tachycardia (heart rate: 55 bpm), prompting rapid delivery of the fetus via hysterotomy through the gravid uterine horn. Due to the extent of the uterine tear and

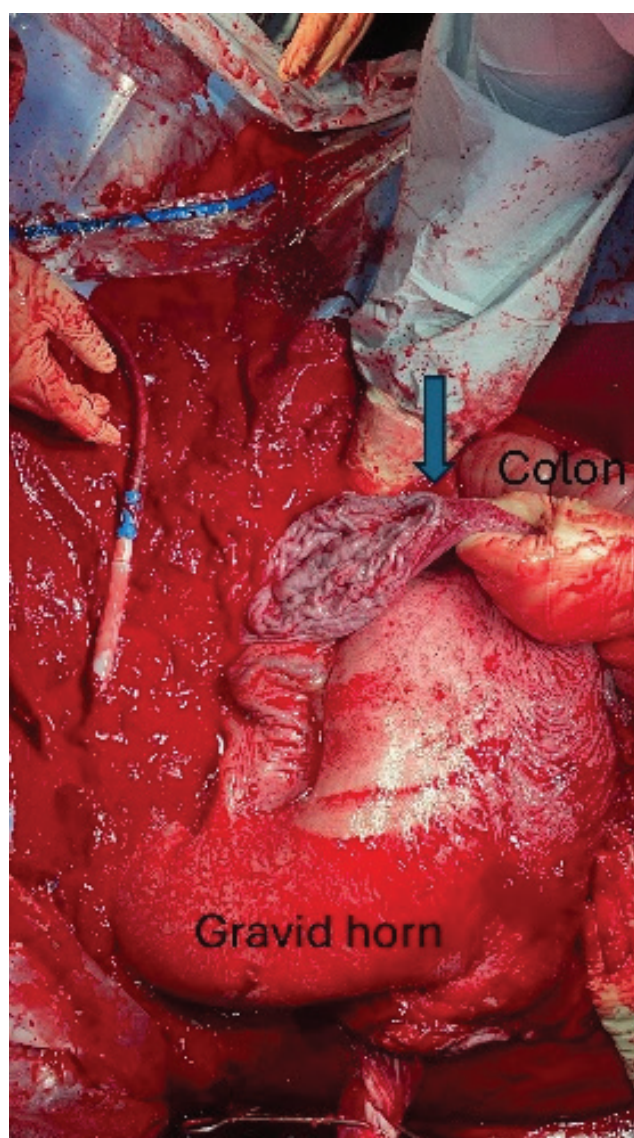


Figure 1. Intraoperative image after cesarian surgery (note the tear [blue arrow] in the cranial uterine body and large amount of frank hemorrhage in the peritoneal cavity)

the mare's hemodynamic deterioration, the prognosis was grave; humane euthanasia was performed. At postmortem, the ovaries were harvested at the owner's request for oocyte retrieval and subsequent intracytoplasmic sperm injection (ICSI).

A live QH/Arabian colt was delivered; however, the foal exhibited no spontaneous respiration and was markedly bradycardic (heart rate: 40 bpm). Immediate neonatal resuscitation was initiated, including endotracheal intubation with manual ventilation on room air, intravenous epinephrine (0.01 mg/kg), tactile stimulation. Foal responded favorably, achieving sternal recumbency within 10 minutes after birth. During the first 12 hours of life, the foal received supportive care, including 1 liter of plasma (Lake Immunogenics, Inc, Ontario, NY, USA) and high-quality colostrum. Foal was standing unassisted at 18 hours and had adequate immunoglobulin G concentrations (1,546 mg/dl). Foal was successfully introduced to a nurse mare at 24 hours. Mare and foal (Figure 2) were discharged 4 days after admission.

A total of 14 oocytes were retrieved from mare's ovaries at postmortem. Of these, 10 were placed into maturation media. Four were degenerated and were discarded; 4 of the 10 cultured oocytes successfully matured, yielding a 40% maturation rate. These mature oocytes underwent ICSI. Each of the fertilized oocytes cleaved and progressed to the blastocyst stage, representing a 100% blastocyst development rate. All 4 blastocysts were subsequently vitrified for future transfer. Oocytes are not typically collected from a recipient mare at postmortem; however, the mare's sentimental value to the owner warranted the procedure.

Discussion

This case represents the first documented recurrence of uterine torsion in a mare in 2 separate pregnancies. In both instances, the uterine torsion occurred in a clockwise direction, though at different stages of pregnancy, on day 256 and day 349, respectively. Each pregnancy resulted in the birth of a live foal; however, the second episode was complicated by a full-thickness uterine rupture, ultimately necessitating euthanasia of the mare.

Historically, the position of the cecum was thought to limit clockwise uterine torsion, giving rise to the hypothesis



Figure 2. Foal after discharge

that counterclockwise rotation was more prevalent.^{1,4} However, more recent studies documented clockwise and counterclockwise uterine torsions occurrence with equal frequency.²

Uterine torsion is generally defined as a rotation between 90 and 360°.⁵ It has been suggested that rotations of < 180° may fall within the normal range for fetal movements and may not require intervention.^{1,10} The degree of uterine rotation is an important determinant in mare and foal survival.¹⁰ Torsions exceeding 360° are associated with lower survival rates due to more severe blood flow obstruction that increases the risk of fetal compromise, fetal death and uterine rupture.¹⁰ The severity of clinical signs has also been linked with the degree of uterine rotation, the amount of vascular occlusion and any gastrointestinal involvement.^{6,7} Gastrointestinal involvement was reported in 12.6% of equine uterine torsions in a study but only 1 in 189 cases in another (authors attributed to prompt diagnosis and treatment).^{10,12} In the present case, the exact degree of rotation was difficult to determine due to extensive hemorrhage; however, the mare's severe clinical signs and the presence of a full-thickness uterine tear suggest a rotation of 360° or greater.

Transrectal palpation remains the gold standard for diagnosing uterine torsion in mares.⁴ Although transrectal ultrasonography typically offers limited diagnostic value due to the difficulty in obtaining clear and interpretable images, transabdominal ultrasonography can provide valuable complementary information, including intraabdominal hemorrhage, fetal viability, uterine and placental integrity, peritoneal inflammation, and concurrent gastrointestinal pathology. Vaginoscopy or digital vaginal examination is generally of limited diagnostic value, as equine uterine torsions rarely involve the cervix.^{2,13} In this case, a diagnosis was achieved via transrectal palpation, and transrectal ultrasonography did not yield any additional information. Given the severity of the mare's clinical signs and the advanced stage of pregnancy, further diagnostic procedures were not performed, and surgical intervention via ventral midline celiotomy was promptly initiated.

Day 320 of pregnancy appears to be a critical threshold for predicting survival for both mare and foal following uterine torsion correction.^{10,12} Uterine torsions occurring before day 320 are generally associated with better outcomes whereas those occurring at or beyond day 320 tend to result in poorer prognoses for both mare and foal.^{10,12} There is also a tendency for more severe rotations to occur later in pregnancy.¹⁰ The longer the duration of the uterine torsion and associated vascular compromise, the poorer the prognosis and the more likely that uterine rupture will occur.¹⁰ Uterine ruptures is the major cause of maternal death for mares with a uterine torsion.⁴ In the present case, the mare's advanced pregnancy, 2-day history of abdominal discomfort and clinical presentation were contributing factors to the poor maternal outcome. The foal's survival, in this case, was likely the result of the timely and coordinated intervention of the veterinary team.

Favorable pregnancy outcomes have been reported after uterine torsion correction.^{2,10,12} In the present case, the mare became pregnant on the first breeding attempt, 34.5 months after correction of the initial torsion and 32 months after delivery of the associated live foal. However, the subsequent pregnancy ended in abortion at 5 months of pregnancy. The

cause of the abortion was unknown but there was no evidence of being associated with uterine torsion. The mare's final pregnancy, the focus of this report, progressed to 349 days before a second uterine torsion occurred.

Ventral midline celiotomy is indicated in cases complicated by uterine rupture, severe colic, or fetal death.^{2,14} This approach is also recommended for mares beyond 320 days of pregnancy, as the foal's size and weight increase the difficulty of uterine derotation.¹² Additionally, ventral midline celiotomy provides superior visualization of the uterus and enables a thorough examination of the peritoneal cavity.¹⁴ Whenever possible, uterine torsion should be corrected with the fetus remaining in utero. Exceptions include cases where the fetus is nonviable or the uterus is too heavy to permit successful derotation without prior cesarian surgery.^{4,13}

In this case, ventral midline celiotomy was chosen due to mare's severe, unrelenting pain, unknown duration of uterine torsion and advanced pregnancy. This approach allowed exploration of the abdominal cavity, facilitated delivery of the fetus via cesarian surgery and enabled uterine tear identification.

Conclusion

This case demonstrated that uterine torsion can recur in separate pregnancies, although this appears to be rare. It is possible that the 2 incidences of uterine torsion in 2 separate pregnancies in the same mare were independent and random events. Regardless, it is important to recognize the potential for recurrence of uterine torsion in subsequent pregnancies in mares. The successful delivery of a viable foal and production of 4 vitrified embryos in this case were achieved through timely decision-making and coordinated efforts of a veterinary team.

Learning points

- Recurrence of uterine torsion in separate pregnancies is possible in mares
- Rapid intervention can result in successful delivery of a viable foal
- Advanced reproductive options (e.g. ICSI) are available to clients during critical situations

Author's contribution

LC was involved in the diagnosis, oocyte harvest, literature review and writing the original draft; LS was involved in the case management, cesarean surgery (mare), and editing; MA was involved in the case management, treatment plan (foal), and editing; TD was involved in the diagnosis, oocyte harvest, and editing.

The ICSI was performed by Dr. Matheus Felix as a pay for service procedure.

Conflict of interest

None to report.

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