Uterine Torsion in Mares

Elizabeth H. Yorke, DVM
Fred J. Caldwell, DVM, MS, DACVS
Aime K. Johnson, DVM, DACT
Auburn University
Auburn, Alabama

Abstract: Uterine torsion typically occurs during mid to late gestation and is estimated to cause 5% to 10% of all equine obstetric emergencies. Clinical signs include abdominal pain that may be mistaken for gastrointestinal distress, parturition, or abortion. Uterine torsion is an emergency for the mare and fetus, and early recognition and intervention are essential to optimizing the chance of survival. This article reviews the etiology, diagnosis, treatment, and prognosis of uterine torsion in mares.

Uterine torsion is estimated to cause 5% to 10% of obstetric emergencies in horses. Torsion typically occurs within the last 3 months of gestation and is not commonly associated with parturition. Uterine torsion has been described in most breeds, but draft breed mares may be overrepresented. The definitive etiology has not been elucidated, but the following have been implicated: rolling activity of mares, sudden falling of mares, vigorous fetal movement, and a large fetus in a small volume of fluid.

The incidence of uterine torsion is lower in mares than in cows. The condition has been reported to account for 19% of bovine obstetric referral cases and 10.7% of bovine dystocias. The disparity in incidence between mares and cows may be related to anatomic differences in supportive structures of the uterus. The sublumbar attachment of the ovaries and the dorsal insertion of the broad ligaments in the uterus of mares may provide more stability to the gravid uterus than the ventral attachment of the broad ligaments in the bovine uterus. With uterine torsion in mares, the twist usually occurs at the uterine body, not the cervix or vagina, as in cows.

Patient History and Clinical Signs
The clinical signs of uterine torsion can be confused with gastrointestinal (GI) pain, parturition, or abortion and may include mild to moderate intermittent abdominal pain, restlessness, lethargy, anxiety, and anorexia; in addition, tachycardia may be noted on physical examination. The response to analgesic medications is usually short-lived. Rupture of the uterus in situ due to prolonged uterine torsion may provide more stability to the gravid uterus than the ventral attachment of the broad ligaments in the bovine uterus. With uterine torsion in mares, the twist usually occurs at the uterine body, not the cervix or vagina, as in cows.

Figure 1. The yellow overlay represents the gravid uterus and the right (R) and left (L) broad ligaments. (A) Normal uterine position. (B) The illustration demonstrates counterclockwise uterine torsion. The left broad ligament (L) is taut and displaced ventrally and caudally. The right broad ligament (R) is located more cranially.

Uterine torsion in horses is typically diagnosed by transrectal palpation of the broad ligaments of the uterus; therefore, any mare exhibiting signs of abdominal pain during the third trimester should be assessed in this manner. A taut broad ligament is palpable, coursing transversely in the direction of the torsion (FIGURE 1). The uterus may twist 90° to 360° on its long axis, although most torsions result in a 180° rotation. The direction of the rotation may be clockwise or counterclockwise, as viewed from behind the horse. Some authors think that clockwise torsions occur more often, while other authors report no difference in frequency. In most instances, the direction can be determined by the relative displacement and asymmetry of the left and right broad ligaments. Clockwise torsion is present if the left ligament is tautly stretched dorsally across the abdomen and courses toward the right ventral...
abdomen, with the right ligament diving ventrally along the right body wall. The opposite orientation occurs with counterclockwise torsion. Transabdominal ultrasonography and abdominocentesis may provide further information about fetal viability, uterine wall health, peritoneal inflammation, or concurrent GI disease. Abdominocentesis in late pregnancy in mares carries the risk of inadvertent amniocentesis. Therefore, to avoid the enlarged uterus, it may be prudent to use abdominal ultrasonography to identify pockets of peritoneal fluid suitable for abdominocentesis. Vagino-vaginal examination is typically unrewarding because equine uterine torsions rarely involve the cervix.

Uterine torsion may result in concurrent intestinal obstruction. The small colon can become incorporated in the torsion, resulting in partial or complete occlusion of the small colon lumen. Jung et al reported that of 19 horses undergoing ventral midline celiotomy for uterine torsion, approximately half had concurrent GI disease, including typhlocolitis, cecal impaction, large colon impaction, gastric rupture, large colon volvulus, and right dorsal displacement of the large colon. Ruffin et al reported a case of small intestinal incarceration in a mare with uterine torsion at 126 days of gestation. When intestinal involvement accompanies uterine torsion, clinical signs are typical of those associated with acute GI distress.

**Treatment**

Treatment of uterine torsion should be initiated immediately following diagnosis in order to optimize the chance of survival of the mare and fetus and to preserve the mare’s future fertility. Treatment options include nonsurgical and surgical approaches.

The most common type of nonsurgical management involves rolling of the mare under general anesthesia while applying abdominal pressure with a plank. The plank maintains the fetus and uterus in position while the mare is rolled around them, essentially allowing the mare’s body to rotate around the axis of the uterus. The mare is anesthetized and placed in lateral recumbency on the paralumbar region, and a person of moderate size stands or kneels on the plank. The mare is then rolled 360° in the direction of the torsion. For example, for a clockwise torsion, the mare should be in right lateral recumbency and rolled in a clockwise direction as viewed from behind. The mare is rolled first into the opposite lateral recumbency, then into sternal recumbency, and finally into right lateral recumbency (FIGURE 2). The plank is repositioned as necessary. During the procedure, we maintain general anesthesia using a guaifenesin-xylazine-ketamine (triple drip) intravenous infusion. Triple drip is formulated by adding 500 mg of xylazine and 1000 to 2000 mg of ketamine to a liter of 5% guaifenesin and is administered to effect up to a rate of 1 mL/kg/h.

Palpation per rectum is performed after each roll to determine whether uterine torsion has been corrected. Several attempts may be necessary before the torsion is reduced. If further rolling is required, the mare is rolled over its feet in the same direction, and the procedure is repeated. After correction, the mare is recovered from anesthesia and transrectally palpated while standing to ensure that the torsion has been completely reduced. If reduction is not achieved within 1 hour, surgical correction should be pursued.

Nonsurgical correction may be more successful in torsions occurring in mid gestation than in those that are near term. Advantages of nonsurgical correction include the ability to perform it in a field situation and the possible economic benefit of avoiding surgery. In large animals such as draft mares, rolling may be less efficacious because it is more difficult to perform. Some authors caution that this procedure carries an increased risk of placental detachment, abortion, and fetal or maternal death. Uterine rupture in a mare at term has also been reported. We do not recommend the rolling technique in full-term mares because of the increased risk of complications associated with the procedure. Several assistants are required to perform this procedure, which may make it difficult to perform in a field situation. In addition, although rolling is an economical option for correcting uterine torsion, it does not allow the evaluation of uterine or GI lesions. Another disadvantage is that if rolling is unsuccessful, the mare may need to be recovered from anesthesia and transported to a referral center before surgical intervention can be performed, delaying resolution of the torsion and possibly increasing the complication rate. Rolling is best used in light-breed mares at 7 to 10 months of gestation that are systemically stable at diagnosis and have owners who are reluctant to pursue more expensive surgical options. The direction of the torsion should be clear on transrectal palpation. If this technique is used, at least four or five people should be available to assist. Potential complications should be discussed with the owner before performing this procedure, and other options should be pursued if the torsion is not corrected within 1 hour.
If the mare is at term and the cervix is open, manual derotation of the fetus and uterus through the dilated cervix is an option.19 This situation is quite rare, as most torsions occur before parturition. To perform this procedure, the mare is sedated, a well-lubricated hand is passed into the uterus, and the fetus is grasped ventrolaterally. The fetus and uterus are gradually rocked in sequentially larger arcs until the torsion is reduced. This is usually possible only if the torsion is <270°.19 Another alternative is to place obstetric chains on the limbs of the fetus and pass a detorsion rod into the uterus.15 The chains are attached to the end of the rod, which is used to facilitate rotation of the fetus and uterus to correct the torsion. Possible complications include injury to the mare’s cervix or uterus or to the fetus.1 After correction of the torsion, the mare should enter stage two of parturition; however, vascular congestion, edema, and reduced contractility of the uterus may delay progression of labor, which usually requires assisted delivery.19

Surgical options for correcting a uterine torsion include the flank or the ventral midline approach. In the flank approach, the mare is standing, and sedation and local anesthesia are used. Epidural analgesia may also be of benefit during and after surgery. Instead of using local anesthetics such as lidocaine, which increase the risk of collapse during surgery, we recommend using epidural α2-adrenergic agonists or opioids because they provide excellent analgesia and sedation without the risk of collapse.20 Various epidural regimens have been described.20 We typically use detomidine (40 µg/kg) or detomidine and morphine (40 µg/kg and 0.1 mg/kg, respectively) with sterile saline in a total volume of 10 to 20 mL. An epidural catheter may be placed to facilitate repeated administration of medication.

The flank area is surgically prepared, and 2% lidocaine or mepivacaine is infiltrated subcutaneously and intramuscularly at the intended incision site to provide local anesthesia. The flank incision is made on the side toward which the uterus is twisted, and a modified grid pattern is used to approach the abdominal cavity. A vertical incision is made through the skin in the middle of the paralumbar fossa, midway between the last rib and the tuber coxae, with the dorsal aspect of the incision located at the dorsal edge of the internal oblique muscle. The external abdominal oblique muscle is sharply divided in a vertical direction. The internal abdominal oblique and transverse abdominal muscles are separated bluntly along the direction of their fibers. The peritoneum is punctured with a finger to enter the abdominal cavity.14 The direction of the uterine torsion is confirmed by intraabdominal palpation of the dorsal surface of the uterine body and the direction of displacement of the broad ligaments. The surgeon’s hand is placed under the gravid uterine horn, and the uterus and fetus are gradually rocked back and forth, allowing the uterus to flip into its normal position.11 Alternatively, the fetal hocks may be gently grasped.9 To decrease the chance of uterine perforation, the uterus should be lifted and pushed, rather than pulled, into position. In the later stages of pregnancy, correction of torsion by a single flank incision may be difficult due to the size and weight of the fetus. In such cases, a second incision may be made in the opposite flank to allow a second surgeon to manipulate the uterus and fetus simultaneously.

After repositioning, the uterus and broad ligaments should be palpated in the abdomen or per rectum to confirm correction of the torsion. The remainder of the abdomen is also palpated to evaluate for concurrent disease.9 Fetal responses should be assessed to determine whether the fetus is alive, keeping in mind that any sedation may diminish these responses.

The peritoneum is not routinely closed. The internal and external abdominal oblique muscles are apposed with #1 or #2 absorbable suture material in a simple continuous pattern. The subcutaneous tissue may be included in this layer or closed separately with an absorbable suture material. The skin is apposed with nonabsorbable monofilament suture.

Transabdominal ultrasonography to evaluate the fetal heart rate provides the best monitoring during and following surgery. If confirmed dead during surgery, the fetus can be extracted vaginally after cervical dilation, via cesarean section immediately after correction of the torsion, or the mare may be allowed to deliver naturally after surgery. A nonviable fetus is typically expelled within 1 or 2 days after fetal death. The mare should be under continuous monitoring, as assisted delivery will be necessary and dystocia is likely.

Standing flank laparotomy eliminates the risks associated with general anesthesia and may be less expensive to perform; however, correction may be challenging in late gestation due to the size of the uterus and fetus. In addition, severely painful mares may not be amenable to correction via standing surgery. Collapse of the mare during surgery can result in evisceration, the consequences of which may be fatal. Standing flank laparotomy is ideal for mares that may not be good anesthetic candidates, either due to systemic compromise or size (e.g., draft mares).

A ventral midline approach should be performed if uterine rupture or devitalization is suspected, if concurrent GI disease is suspected, if a dead fetus is present and the cervix is closed, or if attempted corrections with the patient standing are unsuccessful.11 This may also be the best surgical option for failed nonsurgical rolling when at a referral center because the mare is already under general anesthesia. Advantages of this approach include improved access to the abdominal cavity, which allows assessment of uterine wall viability and concomitant GI tract problems. Dorsal recumbency also reduces tension on the mesometrium, facilitating correction of the torsion. To perform a ventral midline approach, a 15- to 25-cm ventral midline incision is made just cranial to the umbilicus.19 Intraabdominal administration of at least 20 L of 0.9% saline solution at body temperature has been advocated to “float” the uterus, further easing manipulation and reducing the risk of tissue damage.19 If the uterus is severely compromised, hysterectomy can be performed after removal of the fetus. The ventral midline approach may be useful for mares exhibiting severe pain that may be prone to collapse during standing surgery. This procedure should be performed at a veterinary hospital with surgical facilities. Because of possible compromise of ventilation under anesthesia (caused by the gravid uterus and dorsal recumbency), a mechanical ventilation system should be available. A foal care team should also be available to assist if a live foal is delivered via...
Uterine Torsion in Mares

cesarean section. Disadvantages of the ventral midline approach include high cost and the risks associated with general anesthesia. In addition, catastrophic incisional dehiscence is possible during parturition, particularly if it occurs soon after surgery.

Postoperative care depends on the condition of the mare and fetus and usually includes fluid therapy, broad-spectrum antimicrobials, and antiinflammatories. We routinely use potassium penicillin (22,000 IU/kg IV q6h), gentamicin (6.6 mg/kg IV q24h), and flunixin meglumine (1.1 mg/kg IV or PO q12h). Mares that undergo surgical correction via the flank or the ventral midline approach are confined to stall rest for 30 days after the procedure, followed by 30 days of small paddock turnout to ensure incisional healing. The mare may be maintained in cross ties in a stall to prevent lying down or rolling, which could result in recurrence of the torsion. If pregnancy was maintained, the mare should be carefully monitored for signs of parturition. If the fetus remains viable, supplemental progesterone (0.044 to 0.088 mg/kg PO q24h) may be administered to help decrease excessive uterine contractions and maintain a closed cervix. This may be continued until parturition or until 340 days of gestation. The fetus should be monitored at least twice daily in the week following correction to assess fetal heart rate and viability. If the heart rate falls below 60 bpm consistently, fetal compromise is likely and fetal death and abortion may be imminent. The total progestin level may also be monitored weekly to assess fetal viability. An excessively elevated total progestin level indicates fetal compromise. Alternatively, a low total progestin level indicates severe fetal compromise, likely leading to fetal death and premature delivery. In an uncomplicated pregnancy, the total progestin level ranges between 4 and 10 ng/mL until day 300 of gestation. The concentration begins to increase at around day 180 of gestation until it peaks at approximately 26 ng/mL by 300 of gestation. The concentration begins to increase at around day 180 of gestation until it peaks at approximately 26 ng/mL by day 340. Treatment of mares with al ternogest does not alter the result of progestin assays, as cross-reactivity is insignificant.

Complications

Complications of uterine torsion include premature placental separation, uterine wall necrosis, uterine rupture, adhesions, peritonitis, endotoxic shock, and recurrence of torsion. If fetal death occurs, abortion typically manifests within several days to 1 week. Signs of impending abortion may include loss of the cervical mucosal plug, udder development, vulvar discharge, or early signs of parturition, such as restlessness. Owners should be advised of the potential for neonatal complications following correction of the torsion. Fetal hypoxia may result from compromised uterine blood flow, and affected foals are at increased risk for hypoxic-ischemic encephalopathy. Neonatal complications are more common when uterine torsion occurs after day 320 of gestation. When treatment of any disease or injury is considered in a periparturient mare, supportive therapy for the fetus or foal should not be neglected and the subsequent delivery and birth should be considered high risk.

Prognosis

The prognosis for maternal and fetal survival is good if the GI tract is not involved and the uterine wall is minimally compromised. The prognosis is worse if there is myometrial thrombosis (due to strangulation) or uterine rupture with secondary peritonitis. In a study of 19 mares that underwent ventral midline celiotomy for correction of uterine torsion, 37% of the mares with torsions from 180° to 360° were found to have tissue injury, consisting mainly of compromised uterine perfusion and edema of the broad ligaments. No such changes were observed in mares with a uterine torsion of <180°.

In 1981, Pascoe et al reported survival rates of 50% and 70% for fetuses and mares, respectively, following the standing flank surgical approach. The future ability of the mare to successfully produce a foal was not affected. In 1988, Wichtel et al reported a success rate of 85% for correction of uterine torsion by rolling. In 2008, Jung et al reported that management of uterine torsion by ventral midline celiotomy maintained pregnancy at a rate of 86.6% with a live foal born at term.

In 2007, Chaney et al reported on the outcome of 63 mares diagnosed with uterine torsion at four referral hospitals. The overall mare survival rate was 84%. When uterine torsion occurred before 320 days of gestation, 97% of mares survived; when torsion occurred after 320 days, 65% survived. The overall foal survival rate was 54%. When uterine torsion occurred before 320 days of gestation, 72% of foals survived; 32% survived after 320 days. The study concluded that the prognosis for the mare and foal improved if torsion occurred before 320 days of gestation. Increased fetal size and weight of the reproductive tract after 320 days may make torsion correction more difficult, resulting in decreased survival due to compromised blood flow and tissue oxygenation. Chaney et al also compared survival following correction by rolling, standing flank laparotomy, and ventral midline celiotomy. No significant difference in mare survival was found between the methods of correction; however, when the torsion occurred before 320 days of gestation, standing flank laparotomy improved foal survival more than ventral midline celiotomy.

Summary

Uterine torsion should be suspected in any pregnant mare exhibiting signs of abdominal pain, especially between 8 and 11 months of gestation. Although uterine torsion is relatively uncommon, complications can be life-threatening for the mare and fetus. To optimize the clinical outcome, equine practitioners should be well versed in recognizing uterine torsion, its potential complications, and the appropriate interventions.

References

7. Aubry P, Warrick LD, DesCôteaux L, Bouchard E. A study of 55 field cases of uterine...
1. Which statement regarding uterine torsion in mares is false?
   a. Uterine torsion is commonly associated with parturition.
   b. The twist usually occurs at the uterine body, not the cervix or vagina, as in cows.
   c. Uterine torsion usually presents acutely.
   d. Most torsions result in a 180° rotation.
   e. Torsion typically occurs within the last 3 months of gestation.

2. Uterine torsion is most commonly diagnosed by
   a. vaginoscopic examination.
   b. ultrasonography.
   c. abdominocentesis.
   d. radiography.
   e. palpation per rectum.

3. Reported complications of uterine torsion do not include
   a. premature placental separation.
   b. adhesions.
   c. peritonitis.
   d. uterine rupture.
   e. prepubic tendon rupture.

4. According to one study, approximately ___ of horses that underwent surgery for uterine torsion had concurrent GI disease.
   a. 10%
   b. 25%
   c. 35%
   d. 50%
   e. 75%

5. Which of the following does not indicate use of a ventral midline surgical approach to correct uterine torsion?
   a. Uterine rupture is suspected.
   b. Concurrent GI disease is suspected.
   c. Attempted corrections with the patient standing are unsuccessful.
   d. A dead fetus is present, and the cervix is closed.
   e. Torsion is present before 320 days of gestation.

6. The prognosis for the mare and foal is better if torsion occurs _______ days of gestation.
   a. before 320
   b. after 320
   c. after 360
   d. after 380
   e. none of the above

7. Which of the following medications is not typically used in postoperative care for uterine torsion?
   a. broad-spectrum antimicrobials
   b. furosemide
   c. antiinflammatories
   d. intravenous fluids
   e. progesterone

8. For cases of uterine torsion treated with ventral midline celiotomy, which of the following is closest to the reported rate of pregnancy maintenance with a live foal born at term?
   a. 26%
   b. 40%
   c. 55%
   d. 86%
   e. 95%

9. When plank-on-the-flank rolling is used on a mare with a clockwise uterine torsion, the mare is placed in _______ lateral recumbency and rolled _______ as viewed from behind.
   a. right; clockwise
   b. right; counterclockwise
   c. left; clockwise
   d. left; counterclockwise
   e. none of the above

10. You diagnose uterine torsion in a mare at 320 days of gestation. The patient exhibits severe pain and collapses several times during the examination. Which of the following treatments should be selected?
    a. ventral midline celiotomy
    b. plank-on-the-flank rolling with the patient under general anesthesia
    c. manual derotation of the fetus and uterus through the cervix
    d. the flank approach using sedation and local anesthesia with the mare standing
    e. conservative management consisting of administration of NSAIDs to decrease pain and inflammation