A 12-year-old 500-kg (1,100-lb) nulliparous American Paint mare was admitted to the veterinary teaching hospital at the University of Florida College of Veterinary Medicine because of signs of colic following natural breeding. The farm manager reported that the mare had been bred 3 times over a 72-hour period during estrus. The breeding behavior of the stallion was unremarkable, but blood was detected on the stallion’s penis at dismount following the final breeding. Colic-like behavior was detected in the mare approximately 30 minutes after the final breeding. The mare also postured to urinate and intermittently passed hemorrhagic vulvar discharge.

Two hours after the final breeding, the mare was administered flunixin meglumine (500 mg, IV) and xylazine hydrochloride (150 mg, IV). The mare then was observed for 1 hour. Despite administration of the medications, the mare continued to display signs of discomfort and was referred to the University of Florida for further evaluation.

A complete physical examination was performed at the time of admission. Samples were submitted for a CBC, serum biochemical analysis, and blood gas analysis and measurement of PCV and total protein concentration. Physical examination revealed tachycardia (60 beats/min) and evidence of recent hemorrhagic vulvar discharge (ie, blood clots and blood staining in the tail hairs).

A reproductive examination was performed to investigate the source of the vulvar discharge. The perineum was aseptically prepared. Vaginoscopic examination revealed a large laceration, with tearing, in the right dorsolateral wall of the cranial portion of the vagina that extended approximately 15 cm caudally from approximately the 2 to 7 o’clock positions. Digital manual vaginal examination confirmed a full-thickness perforation of the vaginal wall at approximately the 2 o’clock position. The cervix was intact, and there was no evidence of cervical trauma.

Transabdominal ultrasonography revealed no abnormal findings. A typical amount of anechoic fluid was detected in the abdomen. Abdominocentesis was performed, and the sample was submitted for fluid analysis and cytologic examination.

The CBC revealed neutrophilia (7,800/µL; reference range, 2,600 to 7,000 cells/µL) with a left shift (420 band cells/µL; reference range, 0 to 100 band cells/µL) and 1,700 lymphocytes/µL (reference range, 1,100 to 5,700 lymphocytes/µL). The fibrinogen concentration was elevated (500 mg/dL; reference range, 100 to 400 mg/dL). Results for an RBC count, venous blood gas analysis, and serum biochemical analysis were unremarkable.

Analysis of the abdominal fluid sample revealed an increase in the number of WBCs (estimated concentration, 114,000 WBCs/µL), which were predominantly nondegenerate neutrophils. Analysis also revealed evidence of scant hemorrhage and the presence of foreign material (Figure 1). Bacteria were not identified in the abdominal fluid sample. The volume of the abdominal sample was inadequate to permit analysis of the total protein concentration.

**Question**

What is the most likely diagnosis for the condition in this mare? Please turn the page.
Answer

Seminoperitoneum (seminal peritonitis) secondary to a full-thickness vaginal laceration that occurred during natural breeding.

Results

A catheter was placed in the mare’s left jugular vein, and an isotonic solution was administered at a maintenance rate of 1 L/h. The mare was also administered broad-spectrum antimicrobials (penicillin G potassium, 22,000 U/kg [10,000 U/lb], IV, q 6 h; and gentamicin, 6.6 mg/kg [3 mg/lb], IV q 24 h) and flunixin meglumine (1.1 mg/kg [0.5 mg/lb], IV, q 12 h).

Surgery was performed to repair the 15-cm vaginal laceration. Sedation and analgesia were achieved with detomidine hydrochloride (0.01 mg/kg [0.0045 mg/lb], IV) and butorphanol tartrate (0.01 mg/kg, IV). Caudal epidural anesthesia was performed by administration of a combination of lidocaine hydrochloride (0.16 mg/kg [0.073 mg/lb]) and xylazine hydrochloride (0.07 mg/kg [0.032 mg/lb]). The mare was restrained in a standing position. The tail was wrapped with gauze and tied to the side. Retractors were positioned in the vagina to enable the surgeon to see the defect. The laceration was sutured with a simple continuous pattern and No.2 polyglactin 910 on a tapered needle. The initial knot and 2 subsequent throws were placed with the aid of laparoscopic instruments. Following placement of these initial sutures, the edges of the laceration were brought into apposition but could not be seen clearly for accurate placement of subsequent sutures. Therefore, the use of laparoscopic instruments was discontinued, and the remaining portion of the laceration was closed by a continuous suture placed manually in a blind manner (ie, the surgeon was able to palpate the area for suturing but was not able to see the area). A 32F abdominal lavage tube was placed percutaneously into the abdomen on the ventral midline and sutured in place with No. 1 polydioxanone in a finger-trap pattern. Abdominal lavage was performed with 20 L of warmed isotonic solution.

After the surgery was completed, the mare was prophylactically administered mineral oil via a nasogastric tube to provide a laxative effect. The mare was confined to a stall and cross-tied for 4 days to prevent recumbency. Intravenous administration of isotonic solution was continued for 36 hours after surgery. Abdominal lavage was repeated the day after surgery with 20 L of warmed isotonic solution.

Abdominocentesis was repeated 11 days after surgical correction of the vaginal laceration. Transrectal palpation and ultrasonography of the reproductive tract were performed 11 days after the vaginal injury and surgical correction. Transrectal palpation did not reveal abnormalities in the reproductive tract. Ultrasonographic findings revealed a corpus luteum in the left ovary, which confirmed that the mare was in diestrus. Multiple small uterine cysts were also identified. In addition, the cranial portion of the vagina was assessed with transrectal ultrasonography. A suture line was clearly visible in the right dorsolateral portion of the vaginal wall. No fluid pockets or evidence of abscesses was visible. Vaginal examination with a speculum revealed that the repaired vaginal mucosa was adequately apposed, and vaginal adhesions were not identified.

Figure 2—Transrectal ultrasonographic image of the right dorsolateral portion of the vaginal wall obtained 11 days after surgical correction of the vaginal laceration. Notice that a suture line is clearly visible (arrows). Marks on the right side of the image are at intervals of 10 mm.

Figure 3—Same photomicrograph as in Figure 1. Notice the excessive number of inflammatory cells and the presence of a spermatozoon inside a neutrophil (arrow). Wright-Giemsa stain; bar = 20 μm.
Discussion

Investigation of hemorrhagic vulvar discharge in a nonpregnant mare requires a thorough history, complete physical examination, and full vaginal examination, including vaginoscopy and manual digital assessment. Possible sources for vulvar hemorrhagic discharge include varicosities, trauma, hematomas, and urinary tract hemorrhage. A recent history of breeding activity and acute onset of hemorrhagic discharge would suggest breeding-associated trauma as a likely inciting cause.

Vaginal trauma during natural breeding is infrequent in horses because the vagina stretches during coitus.1 Vaginal injuries are often superficial with mild lacerations to the mucosa and submucosa of the cranial portion of the vagina and cervix.1,2 A breeding roll is sometimes used during matings involving large or vigorous stallions to limit the extent of penile intromission.

Other sources of vulvar hemorrhagic discharge include disruption of the hymen in virgin mares and vaginal varicosities.3,5 Vaginoscopic examination is the first procedure typically performed to identify sources of hemorrhage. When a laceration is suspected, complete assessment also requires manual examination of the vagina. In some cases, the extent of the trauma may be severe enough to cause a full-thickness perforation of the vaginal wall. Although vaginal trauma is rare, a full-thickness perforation that communicates with the abdominal cavity is a life-threatening condition because peritonitis is likely to develop and eventration may occur.2,4 Abdominocentesis should be performed to establish the presence of peritonitis.

In the mare described here, vaginal examination revealed a full-thickness laceration as the source of hemorrhage and the cause of signs of colic. Presence of intra-abdominal spermatozoa confirmed the diagnosis of a full-thickness laceration and secondary seminal peritonitis (Figure 3). However, lack of spermatozoa in the abdomen does not rule out a full-thickness perforation and peritoneal contamination, particularly when there is other evidence of peritonitis (eg, increased number of WBCs or protein concentration in abdominal fluid). The ejaculate of stallions is not sterile and contains bacteria in addition to seminal components.3 Abdominal contamination necessitates aggressive treatment to reduce life-threatening consequences of peritonitis. Broad-spectrum antimicrobials and NSAIDs were administered to the mare of the present report. The history of the mare indicated routine vaccination against tetanus; thus, tetanus prophylaxis was not administered to the mare.

Vaginal lacerations can be managed via conservative medical management or surgically, depending on the interval between occurrence and identification of the injury as well as the severity of the lesion. Superficial lacerations of the vestibule and vagina may heal without treatment.5 However, the risk of adhesion formation is great with any vaginal injury. Vaginal adhesions are readily recognized during vaginal examination. Both vaginoscopic and manual examination should be performed when attempting to detect adhesions. Localized adhesions are an important potential complication following a breeding accident. The severity of adhesion formation can range from minor filamentous web-like strands to severe transmural adhesions that may substantially limit reproductive capability. The latter may also predispose a mare to chronic endometritis and fluid accumulation in the uterus. In mares that do not have full-thickness lacerations, application of corticosteroid-containing ointments to the vaginal wall may reduce the incidence of adhesion formation.5 However, corticosteroids could interfere with healing of a full-thickness defect, and application of corticosteroids should be delayed in mares such as the one in the present report.

Surgical correction of vaginal injuries is rarely required, but it has been suggested that recent lacerations involving the submucosa or full-thickness lacerations should be sutured when possible to reduce the risk of evisceration of the small intestines.5 Longstanding lesions and those that cannot be readily sutured are allowed to granulate and heal by secondary intention.5 Regardless of the treatment, the mare should be cross-tied for at least 3 or 4 days to prevent recumbency and minimize the risk of eventration.2,3

Surgery with the mare in a standing position is the preferred method at our veterinary teaching hospital because of concerns of an increased risk of evisceration during recovery from general anesthesia. Additionally, with a mare in a standing position, abdominal viscera can move ventrally, which increases the ease of access within the vagina, compared with that for a mare in dorsal recumbency with the weight of the viscera compressing the vagina. After the vaginal defect is sutured, a Caslick vulvoplasty procedure may be performed to minimize pneumovagina, which may cause the mare to strain as a result of irritation of the vaginal mucosa.3 The mare of the present report had an anatomically normal perineal conformation, and a Caslick vulvoplasty was not performed. Mares may also benefit from local softeners (eg, oral administration of mineral oil) to minimize straining during defection.

Abdominal lavage following surgical correction of a full-thickness vaginal laceration will decrease the severity of peritoneal contamination.3,4 In the mare described here, percutaneous abdominal lavage was performed at the time of surgery and 24 hours later. Repeated abdominocentesis allows clinicians to confirm that peritonitis is resolving. In addition to cytologic examination, bacterial culture of abdominal fluid allows for targeted antimicrobial treatment. Pathogens that may be found on the penis of a stallion include *Staphylococcus* spp, *Escherichia coli*, *Streptococcus* spp, *Proteus* spp, *Klebsiella* spp, and *Pseudomonas* spp. Although we did not identify bacteria during our initial cytologic examination, *Klebsiella* spp was isolated during aerobic culture. Antimicrobial susceptibility testing allowed for targeted antimicrobial treatment.

Additional possible complications that have been reported following breeding accidents in mares include abscesses and intra-abdominal adhesions.5,6 Intra-abdominal adhesions may predispose a mare to future episodes of colic.6 It is difficult for clinicians to predict the development of intra-abdominal adhesions. In cases involving severe peritonitis, the incidence of intra-abdominal adhesions is high. Abscesses are a pos-
sible complication of any traumatic lesion in the reproduc-
tive tract. Appropriate antimicrobial treatment may re-
duce the likelihood of abscesses, but it is difficult to pre-
pdict the development of abscesses.

Although breeding accidents are considered to be rare events, the consequences of breeding accidents are severe. Primary closure of a vaginal defect after a breeding accident, such as was performed in the mare described here, will likely require referral to a tertiary care facility. However, on-farm management is often instituted for this type of mare when the defect is allowed to heal by second intention. Caution must be exercised in all cases to ensure there is adequate management of secondary peritonitis and other sequelae, independent of where the care is provided. Early and accurate diagnosis allows appropriate treatment and can improve the prognosis.

Outcome

The mare was discharged to the farm manager 11 days after admission. Discharge instructions included stall rest and continued antimicrobial administration (enrofloxacin, 7.5 mg/kg [3.41 mg/lb], PO, q 24 h for 2 weeks). Recommendations included a repeated CBC and reproductive examination to determine pregnancy status 2 weeks after discharge from the hospital and a follow-up examination at our veterinary medical teaching hospital 7 weeks after discharge to investigate possible formation of vaginal adhesions. The CBC at 2 weeks after hospital discharge yielded unremarkable results, but a pregnancy examination was not performed at that time.

The mare was returned to the veterinary teaching hospital at the University of Florida approximately 7 weeks after the breeding injury so that a reproductive examination could be performed. Transrectal palpation and ultrasonography revealed that the mare was pregnant with a conceptus commensurate with a gestational age for the breeding that resulted in the vaginal injury. A single fetus was identified in the base of the left uterine horn. Adhesions were not detected during manual vaginal examination, and the site of the injury was virtually undetectable during vaginoscopic examination. It was recommended that the foaling be attended by veterinary personnel.

References