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Reproductive Emergencies Session II
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A. Rupture of prepubic tendon or abdominal wall

Rupture of the prepubic tendon or of the musculature of the abdominal wall can occur in late gestation in mares of all breeds, but draft horses, and idle horses appear to be at greater risk. Horses exhibit pain, and ventral edema; the boundaries of the hernia may be obscured by the edema. Ultrasonography of the abdominal wall will identify the area of muscle or prepubic tendon that is involved. Immediate treatment includes abdominal support, pain relief and in some cases support of the hind limbs. Outcome can vary from normal delivery at term to loss of the mare due to complete rupture of the prepubic tendon or necrosis of the skin overlying the muscle tear resulting in evisceration of gastrointestinal contents. The situation is commonly handled as a “watch and wait” situation as induction of parturition before term usually results in a weak, premature or non-viable neonate. Recent work has shown that maturation of the equine fetus can be induced precociously after 310 days of gestation by administration of 100 mg of dexamethazone for 3 days. In the study, Thoroughbred mares delivered viable, healthy foals within 7 days of the first treatment and none developed laminitis. Foals were smaller than the controls that were allowed to foal naturally and colostrum quality was poor. However, the procedure gives veterinarians a management option of the high risk mare that can be discussed with the owner.

Veterinarians may elect to induce parturition (see below) so that they can assist the mare during foaling. Traction will probably be necessary to extract the foal since rupture of the ventral musculature will prevent abdominal press. Repair of the rupture is reported to be effective post foaling, but the wisdom of rebreeding such mares is questionable.

B. Fetal hydrops

Excessive fluid accumulation in the placental sacs is known as fetal hydrops (hydrops allantois or hydrops amnion depending on which sac is affected). Both are rare in the mare, hydrops allantois being the more common of the two. Presenting signs include a history of rapid abdominal enlargement over 10-14 days after the 7th month of gestation. Mares will be depressed and uncomfortable with labored breathing, ventral edema, and possibly have difficulty walking. They may be recumbent. Risk of uterine rupture, abdominal hernia, or prepubic tendon rupture are all increased. To save the mare, prompt termination of the pregnancy is indicated. This may involve either induction of parturition with oxytocin (which may not be effective) or manual dilation of the cervix followed by vaginal delivery. Sudden removal of abdominal fluid associated with the pregnancy may result in blood pooling in the abdominal vasculature, leading to hypovolemic shock and death of the mare. Therefore supportive fluid therapy is indicated to maintain blood pressure. If possible, fluid should be drained gradually over a 12 to 24 hr period prior to removing the fetus. As fluid is drained from the uterus, the mare’s peripheral circulation can be supported by administration of hypertonic saline solution and lactated ringers intravenously. Hydrops allantois appears to be an
aberration of the placental pump that blocks maternal fluids entering the fetal sacs. It also has been associated with placentitis. There have been reports of re-occurrence in future pregnancies.

C. Uterine torsion

Uterine torsion usually presents as a mild to moderate colic during the last trimester of pregnancy. Diagnosis is based on rectal palpation of the broad ligaments. A tight band will be palpable from left dorsal to right ventral abdomen or vis versa when a torsion of less than 360 degrees is present. If the torsion is 360 degrees or greater (not common) it will be difficult to feel the bands as the mare will object to palpation and many of these mares will be extremely painful. Once identified the torsion needs to be corrected. Options for correction include rolling the mare, surgical correction with the mare sedated in the stocks or under general anesthesia. Rolling is indicated for mares early in the third trimester. It can be successfully performed by veterinarians experienced in the procedure. Mares close to term should not be rolled due to increased risk of uterine rupture. Surgical correction is probably the most effective treatment for uterine rupture.

D. Induction of parturition

There will be times in general equine practice that a veterinarian may be asked to induce parturition. The procedure should be approached with caution as inappropriate timing may result in delivery of a premature foal or dystocia. The equine fetus differs from other species in that final maturation occurs only in the last 5 to 7 days of gestation. Identification of mares that are in the last week of gestation is difficult because clinical signs of impending parturition vary greatly among individuals and gestation length ranges from 325 to 360 days. Candidates should be chosen based on a past history of foaling difficulties or injuries, repeated delivery of a stillborn, or a medical or surgical problem associated with the current pregnancy.

Timing of induction of parturition needs to be based on changes in the concentrations of calcium, sodium and potassium in mammary secretions as they are positively correlated with impending delivery and fetal maturation. Other parameters that need to be considered include the presence of colostrum in the udder (correlated with electrolyte changes in mammary secretions), a minimum of 335 days of gestation and a relaxed cervix (see below). Sodium and potassium concentrations in mammary secretions are similar to those of serum or plasma until the last 5 to 7 days of gestation (sodium 125 to 135 mmol/L; potassium 7 to 12 mmol/L). Sodium concentrations in mammary secretions then begin a rapid decline while potassium begins to rise such that the relationship inverts resulting in potassium concentrations being greater than sodium concentrations. Calcium concentrations change later than the sodium/potassium inversion and are therefore used as the most accurate indicator of fetal maturation. Calcium concentrations are low (less than 8 mg/dl [2 mmol/L]) until 48 hrs before foaling when they begin to rise dramatically to values greater than 60mg/dl (12 mmol/L). A calcium concentration greater than 60 mg/dl or 12 mml/L is recommended before one elects induce parturition. Changes in all 3 electrolytes can be determined with automated chemistry machines. Changes in the calcium concentration can be evaluated with commercial test kits that were originally designed to determine the hardness of commercial and residential water supplies. Two kits have been used successfully, the Predict a Foal kit, a strip test that changes color and the Foal Watch kit, a water
hardness test that changes color and gives a numerical value. We prefer using the Foal Watch® kit (Chemetrics Cat # K-1700; Calverton, VA22016; 540-788-9026) because it evaluates only calcium concentration while the Predict a Foal kit measures both calcium and magnesium. The latter test has a greater margin of error in regards to calcium concentration as magnesium may increase more rapidly in mammary secretions than calcium.

The Foal Watch kit requires more steps than the Predict a Foal and therefore has lost favor with some veterinarians. In the Foal Watch kit, a small amount of colostrum is mixed with distilled water and a dye. This solution is added one drop at a time to a glass tube that contains a clear liquid. The clear liquid changes from clear to orange to purple to gray to blue as the calcium content in the mammary secretions increases. In addition, the glass tube has numbers etched on the side ranging from 500 to 50 parts/million. As the calcium concentration in a sample increases the clear liquid turns blue more quickly and the value at which the blue color change occurred can be read off the glass tube. A level of 250 parts/million correlates with 40 mg/dl of calcium and mares with this level of calcium in their mammary secretions will routinely foal within 72 hrs. We elect to induce mares when the calcium content is at least 300 parts/million.

Either oxytocin or cloprostenol, can be used to induce parturition. We prefer the use of small doses of oxytocin (10–20 IU intravenously) because most mares will deliver their foal within 45 minutes of drug administration, whereas, mares take an average of 4 hrs to deliver after prostaglandin treatment. Because most mares are induced so that the veterinarian can help, it is easiest to give the injection and remain on the farm until the mare delivers. Although large doses of oxytocin (>100 IU) have been recommended, we have found these to sometimes produce adverse reactions, including signs of colic and excessive straining. We use doses between 10 to 20 IU of oxytocin, given 20 minutes apart through a catheter placed in the jugular vein. A catheter is placed so if any complications are experienced the mare can be anesthetized promptly if needed. Most mares only require 2 injections as they routinely deliver the foal within 40 to 50 minutes. The cervix should be evaluated before parturition is induced as a tight cervix in mares that were induced was associated with weak foals. If one does not induce mares until calcium is > 60 mg/dl or 300 parts/million in mammary secretions, a tight cervix will likely not be encountered.

If the mare does not break her chorioallantois within 20 minutes of the first injection, the perineal area of the mare needs to be washed and a vaginal examination performed to determine if the chorioallantois is separating from the endometrium, a term known as “red-bag”. If the chorioallantois is palpated in the vagina or is seen at the vulvar lips it needs to be cut immediately and the foal delivered because the foal will experience hypoxemia as its oxygen supply is greatly diminished. The mare may experience a dystocia, so the presentation, position and posture of the foal needs to be evaluated when the manual examination is conducted. If the foal is positioned abnormally, the veterinarian should spend only 5 to 10 minutes correcting the abnormality with the mare standing. One usually has greater success correcting the problem with the mare anesthetized. The mare can be given an injectable anesthetic, such as ketamine (2 mg/kg IV) after she is sedated with rompum (0.5-1.0 mg/kg). This combination provides 15 to 20 minutes of good anesthesia and gives the veterinarian time to correct the malposture or malpresentation and delivery the foal.

E. Hemorrhage
Hemorrhage from vessels that support the reproductive tract may occur during pregnancy, at foaling or days after delivery of a foal. It occurs most commonly in pluriparous mares > 12 yrs of age but has also been reported in maiden mares. Although sweating in combination with cold extremities are the classic signs of hemorrhage, clinical presentation may vary from depression to severe colic and unrelenting pain. Mares may exhibit pale mucous membranes if the bleed is not recognized immediately, while others’ may have pink mucous membranes because of the outpouring of red blood cells from the spleen. Diagnosis may be difficult especially if the mare hemorrhages before foaling. Transabdominal ultrasonography is extremely helpful in diagnosing free blood in the abdomen but it may not identify the mare that is bleeding into the broad ligament in late pregnancy.

The location of the bleed varies, with the middle uterine artery tearing more frequently than the ovarian, vaginal (uterine branch) or pudental artery. Hemorrhage may be restricted to the broad ligament or uterine wall. These cases can be identified after foaling by rectal palpation of the broad ligaments and uterus followed by ultrasonography of the afflicted areas. Free blood may be present in the abdomen, within the uterine lumen or in cases of vaginal artery or pudental artery rupture, blood may drain from the vulva or there may be a large swelling within the perineum medial to the thigh. Diagnosis is made by identification of free fluid in the abdomen visualized on ultrasonographic examination of the abdomen in combination with blood in the peritoneal tap. Recent work indicates that older pluriparous mares that hemorrhage exhibit aneogenesis of uterine blood vessels. Histologically the affected vessels exhibit sclerosis, fraying and disruption of the internal elastic lamina, adventitial elastosis and fibrosis and calcification of the intima of uterine and endometrial vessels. Aneogenesis is thought to be induced by hemodynamic alterations during pregnancy and puerperium and by active vascular remodeling after delivery. Afflicted mares will have similar histological changes in their endometrial biopsies.

Treatment will vary between mares and clinicians. Treatments used include intravenous fluids, hypertonic saline, hetastarch, formalin (500 ml to 1000 ml), acepromazine, naloxone (16 mg), blood transfusions, plasma expanders, aminocaproic acid, pentoxiphylline, non steroidal anti-inflammatory drugs and antibiotics. There is little refereed veterinary literature to validate the use of some of these medications in the horse. Clinicians must decide between several therapeutic options that may have opposing effects-volume expanders dilute coagulative factors and raise arterial pressure which may promote further hemorrhage. However, cardiac output must be supported to ensure oxygen delivery to organs. The goal of treatment is to restore circulating blood volume to maintain oxygen delivery to tissues and promote coagulation and thrombosis formation.

If a valuable mare is deteriorating rapidly, 2-3 L of hypertonic saline may be given rapidly through a large bore catheter followed with 10-20 L lactated Ringer’s solution over 2-4 h. Some clinicians prefer to give 3 L of hetastarch. Oxygen may be delivered by nasal insufflation at a flow rate of 5-10 L/minute. If the hematocrit is < 15%, whole blood transfusions (6 – 8 L) over several hours can be given. Monitoring progress through serial blood samples can be misleading if fluid therapy has been implemented. Hematocrit may be decreased due to diluting effects of plasma expansion and not due to ongoing blood loss. The conservative approach is to confine the mare to a dark, quiet stall with minimal disturbances. The foal should remain with the mare unless the dam becomes violent. Tranquilizers, especially acepromazine, should be administered with caution as the mare may collapse from hypotension. Broad spectrum antibiotics are given prophylactically while non steroidal anti-inflammatory drugs are given to decrease the inflammatory process associated with the
presence of free blood in the abdomen or within the broad ligament. Supportive care should be provided for 7 to 10 days after the incident. If a hematoma is identified in the uterine or vaginal walls or there is free blood in the uterine lumen it can result in formation of an abscess within the uterus, vaginal wall or a retroperitoneal abscess. Afflicted mares require long term antibiotic therapy and re-evaluation for 14 to 21 days to ensure that if an abscess has formed, it has resolved.

F. Uterine rupture

Uterine tears associated with parturition may occur after a routine foaling or after a dystocia. Tears at the tip of a uterine tear are most common and are thought to be associated with a foal vigorously kicking out with its hind legs while it is rotating from a dorso-pubic to a dorso-sacral position during first stage labor. Tears cranial to the cervix are seen in dams that are unable to deliver their foal due to malposition and after aggressive manual manipulation of a foal during dystocia. Mares that tear their uterus cranial to the cervix fail to produce the forelimbs of the foal after violent expulsive efforts during 2nd stage labor. The mare will require assistance to deliver her foal and during veterinary examination part of the foal may be found in the abdomen. If the tear is in the tip of the horn, foaling commences normally but the mare becomes systemically ill after delivery. The mare frequently appears normal to slightly depressed for 6 to 12 h after which time her depression may become more obvious or she may show signs of colic. Fevers are common. The interval from the occurrence of the tear to diagnosis and initiation of therapy has a marked impact on the prognosis for survival. Diagnosis is based on clinical signs, transabdominal ultrasonography and abdominocentesis. Manual evaluation of the reproductive tract will identify tears cranial to the cervix but it is little use if the tear is located at the tip of a uterine horn as the affected area can rarely be reached. Some tears may be identified by rectal palpation and transrectal ultrasonography. Mares with full thickness tears that have leaked uterine contents into the peritoneal cavity will have a high total protein (> 30 g/L), high white blood cell counts (> 15 x 10⁹; please add to the ninth power -9; computer is acting up and will not allow me to put a superscript in} and > 80% neutrophils in their peritoneal fluid sample. Intracellular and free bacteria may also be present. Recommended treatment is surgical repair of the rent. Tears located near the cervix are repaired with the mare standing while tears at the tip are closed with the mare under general anesthesia most commonly using a ventral abdominal approach. In cases where clients can not afford surgical repair, treatment with broad spectrum antibiotics combined with peritoneal and uterine lavage have resulted in mares recovering. However, future reproductive success may be poor as the tip of the horn may adhere to other structures within the abdomen.

G. Breeding accidents

Breeding accidents are not seen commonly as the majority of mares in this country are bred by artificial insemination. Thoroughbreds are the exception as they must be mated by natural cover. It is not uncommon for a vaginal or vestibular tear to be missed after natural mating as blood on the stallion’s penis at dismount is a common occurrence in a vigorous mating stallion. The lesion is frequently not identified until a 14 day pregnancy examination or until the next cycle when the mare is found not to be pregnant and a vaginal examination is performed. If the stallion’s penis tears the dorsal vestibular wall during breeding an abscess may form in the retroperitoneal space between the rectum and vagina preventing a veterinarian from passing his/her arm into the rectum. If the
condition is not treated, the mare may present weeks later because she can not defecate. Retroperitoneal abscesses should be treated with systemic antibiotics, non-steroidal anti-inflammatory drugs, metronitazole and laxatives. The size of the abscess and its resolution can be monitored by transrectal ultrasonography.

In cases of a tear completely through the cranial vaginal wall, the mare will present shortly after mating with pain, depression and dark muddy mucus membranes. If the tear is large, the mare may die. Clinical signs are related to pain and inflammation associated with the tear and with deposition of semen in the peritoneal cavity. Semen contains mycolic acid and when ejaculated into the peritoneal cavity it can induce a severe inflammatory reaction. Mares with a vaginal tear may have bowel in the vagina. Treatment is directed at preventing pain, abscess formation in the retroperitoneal space and evisceration. Mares may require intravenous fluids, sedatives, opioids, nonsteroidal anti-inflammatory drugs, broad spectrum antibiotics and possibly peritoneal lavage if the rent is large as bacteria may enter the abdomen through the vagina. Mares should receive laxatives as they will frequently not defecate because of pain. Vaginal tears are allowed to heal by second intention so the mare needs to be cross tied so she can not lie down for 4 to 5 days. Surgical repair is difficult but not impossible.

Mares that need to be bred after having experienced a vaginal tear should be sedated before mating. A combination of 2.5 mg of detomidine and 2.5 mg of torbugesic will usually cause the mare to relax, not buckle at the knees and accept the stallion. Stallion handlers need to be notified of the previous accident as they may elect to use a breeding roll. If the mare has a Caslick in the vulvar lips, it is advisable to remove before breeding as it may cause the horse discomfort resulting in more vigorous breeding behavior.