Post-Parturient Hemorrhage in the Mare

Jennifer Lovvorn Zarecor

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CPC ADVISOR:

Heath King, D.V.M., D.A.C.T.

Assistant Clinical Professor, Theriogenology

Introduction

A broad spectrum of etiologies exists in the mare exhibiting signs of colic in the early post-partum period. This ranges from mild signs of pawing, abdominal watching, restlessness, and anorexia to signs of intractable abdominal pain including thrashing, tachycardia, abdominal distension, and death. Whether the form of colic is mild, moderate, or severe, it is imperative that all mares exhibiting abdominal pain are assessed following parturition as even mild colic may progress to more severe disease depending on the source of the discomfort. Etiologies of post-parturient colic may involve gastrointestinal conditions or problems associated with the urogenital tract. One such disorder within the reproductive system is rupture and subsequent hemorrhage of major arteries supplying the uterus, vagina, or ovaries.

Arterial rupture in the post-parturient mare can occur in horses of any age, breed, or parity, but a predisposition exists in older multiparous mares (Frazer, 2003; McKinnon 2013; Scoggin and McCue, 2007; Ueno 2010, et al.; Williams and Bryant 2012). The most commonly ruptured vessel is the middle uterine artery although other arteries may be affected (Ueno 2010, et al.). If not rapidly diagnosed and treated, mares often succumb to the severe hypovolemia and cardiovascular compromise. However, in some cases, the hemorrhage becomes confined within the broad ligament and a hematoma forms which may reduce or stop the hemorrhage and allow the mare to survive. Occasionally, hematomas will be incidental findings upon rectal palpation or transrectal ultrasonography when the mare is being bred in the weeks following foaling. Although this disease is well-recognized amongst clinicians, there are few reports which outline prescribed treatment protocols, pathogenesis, etiology, and prevention.

History and Presentation

As previously stated, middle uterine artery rupture is a disease which occurs mainly, although not exclusively, in older, multiparous mares. Mares who experience dystocia are also predisposed to

arterial rupture and resulting hemorrhage (Arnold, et al. 2008). Although breed predilections are suspected in horses suffering from post-parturient hemorrhage, there are currently no studies stating what breeds may be affected.

The clinical presentation of mares suffering from arterial rupture and subsequent hemorrhage is variable depending on the location of the rupture, presence or absence of hematoma formation, and existence of other pathology in the reproductive or gastrointestinal tract (i.e. uterine rupture, cecal torsion, large intestinal volvulus). Oftentimes, clinical signs are non-specific and can range from pawing, sweating, and rolling associated with mild abdominal discomfort to cardiovascular shock characterized by tachycardia, pale mucous membranes, and prolonged capillary refill time. In its milder forms, it may go unnoticed and attributed to normal discomfort from uterine contractions following parturition. Diagnosis may be challenging as the broad range of signs can often be confused with what may be more common causes of colic.

However, there are many means of diagnosis which can be accomplished in the field through mechanisms such as rectal palpation, vaginal palpation, and vaginal examination. In a hospital setting, methods such as transrectal or transabdominal ultrasound, complete blood count, serum chemistry, and peritoneal fluid analysis can aid in diagnosis. Care must be taken while performing any tests on mares suspected of post-parturient hemorrhage as elevation in blood pressure from stress can destabilize the hematoma in the broad ligament and result in increased hemorrhage and threaten the life of the patient. The foal should be kept in sight of the dam and proper chemical restraint utilized as needed to relax the mare.

Pathophysiology

Despite the lack of scientific studies involving the etiology and pathogenesis of post-parturient hemorrhage, there is evidence which heavily suggests an underlying pathology within the arterial walls

which predispose some mares to rupture (Arnold 2008, Ueno 2010). A study by Ueno and colleagues which identified the pathology in 31 Thoroughbred mares after fatal peripartum hemorrhage, demonstrated smooth muscle atrophy, fibrosis of the tunica media, and calcification of the internal elastic lamina adjacent to the area of rupture. Areas of the lumen of the proximal uterine artery were also found to be dilated in older mares, forming small aneurisms where smooth muscle was decreased and fibrosis increased. Most commonly, the site of rupture occurs in the uterine artery (middle uterine artery) within 15cm of the bifurcation of the external iliac artery; however, other cases have occurred in the internal pudendal artery, the distal uterine artery, the internal pudendal artery, and the caudal mesenteric artery (Ueno et al. 2010). By using 5 control mares, Ueno et al. also demonstrated that the previously mentioned vascular pathology was rare in younger mares despite several parities. It is hypothesized that these degenerative changes within the urogenital vasculature are due to fatigue of the arterial walls following repeated and cyclic loading associated with maintaining pregnancy as well as the hemodynamic changes that may occur during parturition. The presence of aneurisms and ruptures in the proximal uterine artery at a sharp curve following the branch of the external iliac artery substantiates the presence of wall shear stress that may contribute to damaging the walls of the vasculature (Ueno 2010).

During parturition, it is likely that bleeding results with a compromise in the integrity of the vascular walls in conjunction with increases in blood pressure, intraabdominal pressure, and heart rate. Although bleeding can occur at any point in the peri-parturient period, it is often most significant within the first 24 hours following foaling (McKinnon 2013). The location of the hemorrhage is dependent on the location and the extent of the ruptured vessel. Hemorrhage may occur in the abdomen with the formation of a hematoma in the broad ligament. The pressure placed on the broad ligament due to hemorrhage generates the abdominal pain and resulting signs of colic. Bleeding may also be severe enough that it cannot be contained within the broad ligament or so that it occurs directly into the

abdomen. This is more likely to result in acute death of the mare. Hemorrhage has also been observed following other peri-parturient conditions such as uterine torsion, uterine prolapses, and uterine tears (McKinnon 2013). With hemorrhage in conjunction with other pathology in the reproductive tract or hemoperitoneum, there is always a risk of resulting peritonitis as well as hematoma abscessation.

Differential Diagnoses

Since the signs of post-parturient hemorrhage can mimic those of colic of gastrointestinal origin, it is important that differential diagnoses are comprehensive and include those associated with the urogenital and reproductive tracts as well as those that involve the small and large bowels. Following the stress of normal parturition or dystocia, it is not abnormal for mares to show a small amount of abdominal discomfort due to the trauma which occurs to the uterus and vaginal wall. This may be evident through the formation of contusions that may be seen during a speculum exam of the vagina. No matter if signs of colic are extremely mild, all post-partum mares should be examined by a veterinarian if they appear uncomfortable or painful as small hemorrhage is also possible and may become more severe as time elapses. Further disorders of the reproductive tract which may result in bleeding include uterine tears, uterine prolapse, uterine torsion (more likely to occur pre-partum). Gastrointestinal conditions may result separate from or in conjunction with hemorrhage. Such disorders include large colon torsion, cecal or colonic rupture, rectal prolapse, tears of the mesentery, and incarcerated bowel (Steel and Gibson 2001). Bowel may also be significantly bruised during parturition when the small colon, rectum, or cecum become compressed between the uterus and pelvic wall, resulting in signs consistent with impaction colic (Frazer 2003). Herniation of the abdominal wall or diaphragm is also possible during parturition (Frazer 2003, Steel and Gibson 2001).

Although many of these diseases and disorders can be easily diagnosed, it is vital to assess the mare for any potential of concurrent hemorrhage. Whether the issue originated in the gastrointestinal

or reproductive system, ongoing bleeding is possible and should be diagnosed as rapidly as possible to increase the probability of preserving the life of the mare.

Treatment & Management Options

Treatment of mares with post-parturient hemorrhage is based upon the clinical presentation, mare value, and ability to transport. Appropriate management is often achieved through strict stall rest and intensive medical management unless concurrent gastrointestinal etiologies are suspected. In mares demonstrating mild forms of disease 24 hours or more following parturition, conservative management and cage rest are often sufficient (McKinnon 2013). The aim of treatment is to provide sedation and analgesia, aid in hemostasis, provide fluid resuscitation, and provide antimicrobial prophylaxis (Arnold 2008; McKinnon 2013; Mogg et al. 2006). Reducing the effects of endotoxemia is also an important consideration depending on the etiology of the hemorrhage or concurrent pathology. Treatment largely depends on the facilities that are available. As such, a referral hospital may be better equipped in stabilizing and treating these mares versus an ambulatory clinician who is much more limited in resources. However, depending on the extent of the hemorrhage, it may be best in some mares to manage them on the farm as the stress of transportation itself may lead to clot destabilization and fatal bleeding. It may also be prudent to forego rectal palpation or echography until the mare has been properly sedated to avoid stress or pain-induced increases in blood pressure that could increase bleeding.

Unless the mare is violently painful and a potential danger to the foal, the foal should be kept near her to reduce separation anxiety. Anti-inflammatories (flunixin meglumine) as well as other forms of pain relief such as butorphanol or xylazine should be used to decrease pain to make the mare more comfortable and allow more invasive diagnostics. If clinical signs and physical exam findings are highly suggestive of hemorrhage, then venous access through a jugular catheter is imperative. Blood should be

collected for a complete blood count as well as a biochemistry panel. These results may direct fluid therapy as the mare's condition progresses.

Maintaining cardiovascular volume and stabilizing mares in hypovolemic shock may be accomplished with a polyionic solution such as lactated Ringer's solution, hypertonic saline, a hemoglobin-based oxygen carrying solution, hetastarch, or a blood transfusion. Fluid therapy depends on the condition of the animal as well as the financial capabilities of the owner. It also is reliant on whether the hemorrhage has been adequately controlled. Although there are many therapeutic protocols to promote hemostasis, there are few studies to corroborate their efficacy. Aminocaproic acid is the current mainstay medication for hemostasis and, according to Scoggin and McCue, inhibits fibrinolysis via inhibition of plasminogen-activator substances. Further hemostatic agents which have been used with some anecdotal success include the Chinese herb, yunnan baiyao, as well as naloxone, conjugated estrogens, and formalin (Arnold et al. 2008; LeBlanc 2008; Scoggin and McCue 2007). The current evidence available for many of these therapies are lacking and conflicting at best; however, there are dosage suggestions which may be used if conventional therapy fails.

Other treatments that may be beneficial include antimicrobial therapy to reduce secondary complications such as hematoma abscessation or peritonitis. Antibiotic protocols include procaine penicillin G and gentamicin, penicillin and enrofloxacin, ceftiofur and gentamicin, ceftiofur alone, trimethoprim sulfonamide, and metronidazole (Arnold 2008). Mares showing signs of endotoxemia should also receive appropriate doses of polymyxin B and pentoxifylline. Pentoxifylline is proposed to increase the flexibility of red blood cells which can help provide oxygen to ischemic tissues (Scoggin and McCue 2007). Depending on the condition of the mare's reproductive tract and presence of fluid or retained fetal membranes, oxytocin administration may also be warranted.

Expected Outcome & Prognosis

Prognosis of mares with peri-parturient hemorrhage is variable and depends mainly on the amount of bleeding that has occurred and to what extent treatment has been performed. Mares with severe arterial ruptures frequently die acutely due to profound hypovolemia. In one study, mares treated for hemorrhage had good survivability with a rate of 84% (Arnold et al. 2008). However, it is important to note that this only included mares who were referred and did not include individuals that died in transit or mares that were not referred since they had a good chance of survival without therapy. Prognostic indicators in mares with signs of post-partum hemorrhage include the amount of time which has elapsed before evidence of clinical signs as well as the heart rate of the animal. Mares showing clinical signs of hemorrhage 24 hours following foaling with a heart rate less than 65 beats per minute tend to have excellent prognoses, whereas those with rates greater than 90 beats per minute with clinical signs within 12 hours of foaling have poorer likelihood of survival (Sprayberry & Robinson 7th edition).

Conclusion

Hemorrhage as a result of arterial rupture may occur in mares of any age or parity; however, there is a predisposition in older mares of greater parity. It may occur following normal parturition or dystocia. In cases of severe hemorrhage in which bleeding is uncontrolled, death occurs rapidly due to cardiovascular compromise. In milder cases, hemorrhage can occur within the broad ligament or the wall of the uterus resulting in formation of a hematoma which may impede further blood loss and preserve the life of the mare. Although hemorrhage can occur in a variety of locations within the vasculature of the abdomen, it mainly happens at the proximal 15cm of the uterine artery (Ueno 2010). Pathology of mares with fatal arterial hemorrhage included degenerative changes within the arterial wall including smooth muscle atrophy, fibrosis, and calcification of the internal elastic lamina. Treatment depends on the extent of hemorrhage and is indicated for cardiovascular volume resuscitation,

hemostasis, analgesia, antimicrobial prophylaxis, and management of endotoxemia. With intensive medical therapy and monitoring, prognosis can be good although rapid diagnosis and treatment are necessary. Despite being a well-known disease process, arterial rupture in the mare requires much more study to further elucidate etiology, pathogenesis, treatment, and prevention.

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