COMMON COMPLICATIONS IN THE EARLY POST-PARTUM PERIOD IN THE MARE
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RETAINED FETAL MEMBRANES

Introduction
Retention of the fetal membranes (RFM) is the most common post-partum complication in the mare. Overall consensus in the literature reveals that membranes should be considered to be retained if they are not delivered within three hours of parturition, although there is not a particular scientific basis to this time frame. The documented incidence ranges from 2 to 17% with certain breeds at higher risk (most notably Friesians with one study showing a greater than 50% incidence (Sevinga et al, 2004)). The risk of RFM also increases significantly in cases of dystocia.

The mechanism of placental separation in the mare is poorly understood. In the normal post-partum mare, it is postulated that the rupture of the umbilical cord leads to collapse of the placenta vessels followed by collapse of the chorionic villi (Roberts 1986). Furthermore, uterine contractions beginning at the tips of the uterine horns progressing toward the uterine body, along with inversion of the chorioallantois leading to tension on the chorionic villi also aid in expulsion of the fetal membranes. The exact etiology of retained fetal membranes is also poorly understood. It is likely that uterine inertia with confounding hormonal imbalances play important roles.

Diagnosis and Treatment

Diagnosis of retained fetal membranes is generally obvious when the entire placenta is retained. However, diagnosis can be made more difficult when the bulk of the placenta is passed, but a horn tip remains attached after membrane tearing. In these cases, it is imperative that the entire placenta be laid out and thoroughly examined. If the placenta is not available, or has been shredded, and the retained piece is large enough, it can frequently be palpated with vaginal/uterine examination and potentially visualized on ultrasound examination.

The appropriate timeframe for treatment initiation is debatable as the incidence of serious complications associated with retained fetal membranes varies significantly. Some mares will develop life-threatening disease with 12 hours of retention and others develop only a malodorous vaginal discharge with days of retention. However, due to the potential serious/fatal complications associated with RFM, early initiation of treatment is generally recommended. Treatment is generally aimed at encouraging uterine involution and microvilli separation and decreasing the incidence of metritis-laminitis-septicemia complex.

Initial intervention commonly involves the administration of oxytocin (an ecbolic agent). The drug can be administered intramuscularly as multiple boluses or intravenously as either a continuous rate infusion or in multiple boluses. When bolus dosing is used, repeated, frequent injections are often necessary as the half-life of oxytocin is reported to be minutes (Paccamonti et al, 1999). Reported bolus dose ranges and reported frequency of administration vary widely, from 5-IU to 60-IU every 1 to 12 hours. Oxytocin receptors on the mare’s uterus are significantly up-regulated at the time of parturition (due to high estrogen levels), so it is important to remember that even moderate doses can result in significant side effects (including colic, cramping, sweating, etc.). Choice of dose should depend on time from parturition. Higher doses may be tolerated if the mare is greater than 24 hours from parturition. An inappropriately high dose can lead to tetanic contractions of the uterus, which will not aid in placental expulsion. Alternatively to bolus dosing, oxytocin (60-IU) can be added to 1 to 2-L of normal saline and administered intravenously over...
30-60 minutes. This method of delivery is considered to mimic the mare’s physiologic release of oxytocin more closely than intramuscular bolus dosing. The addition of calcium to the solution is practiced by some as significantly lower calcium levels have been reported in Friesian mares 12 hours post-foaling (Sevenga et al, 2002).

Distention of the chorioallantoic cavity of the retained placenta with 9-12 liters of warm fluid (Burn’s Technique) is a commonly attempted early treatment. After distention, the fetal membranes are held closed to maintain retention of the fluid for 15-30 minutes. The resulting distention of the uterus leads to oxytocin release from the posterior pituitary with subsequent release of the placenta.

After prolonged retention, uterine lavage is frequently an important aspect of treatment, especially if only a small tag of placenta is retained. This treatment provides an important means of manual removal of uterine debris, lochia, and bacteria and to theoretically reduce the risk of metritis, laminitis, and sepsis. A variety of solutions used for this purpose are reported. A very dilute betadine solution (no more than 0.05%) instilled with a sterile stomach tube and pump is the author’s preference. While higher concentrations of povidone-iodine have been shown to induce a severe inflammatory reaction within the endometrium, lower concentrations do not produce this reaction and still maintain antimicrobial activity. Lavage is repeated up to twice daily depending on examination findings and the systemic status of the mare.

Systemic anti-microbial and anti-inflammatory treatment is generally indicated if membranes are retained beyond 12 hours, but can be administered earlier if the mare is considered to be at high risk. The timeframe for treatment initiation will depend on clinician preference. Antimicrobials should be broad spectrum in nature. The early post-partum uterine environment seems to favor the growth of gram-negative bacteria with gram-positive bacteria contributing later in the disease course. Common choices include sulfa-trimethoprim or a combination of penicillin and gentamicin. In severe cases, metronidazole may be indicated to provide coverage against anaerobic bacteria. In cases that advance to septic metritis, intrauterine antimicrobials should be considered as well. Flunixin meglumine should also be given to decrease inflammation and minimize the risk/incidence of endotoxemia.

The injection of bacterial collagenase into the umbilical cord vessels of a completely retained placenta has been evaluated as a means of hydrolyzing microcotyledonary attachments leading to placental release and passage (Haffner et al. 1998). While initial research (evaluation) has been promising, this form of treatment has not been used extensively in a clinical setting to the author’s knowledge.

There has been some conflicting evidence in the literature of a reduced risk of RFM in dairy cattle with supplementation of Vitamin E and/or selenium during the dry period (Bourne et al, 2007, Gupta et al, 2005, Harrison et al, 1984, Campbell and Miller, 1998). Supplementation is postulated to decrease the incidence of nutritional muscular dystrophy, which can increase the incidence of RFM. Supplementation is postulated to reduce oxidative damage/stress, which is suggested to play a role in the etiology of RFM (Putnam and Comben, 1987, Hogan et al, 1993). Supplementation has been adopted by some for use in the mare although its efficacy in RFM prevention in the mare is questionable.

Conclusion

Prognosis for the mare with retained fetal membranes is generally good, provided that treatment is initiated in a timely fashion and no secondary complications develop. Affected mares are not typically bred on foal-heat, as conception rates are likely decreased.
POST-PARTUM HEMORRHAGE

Introduction

Post-partum hemorrhage can occur from various sources including: ovarian vessels, uterine vessels (most commonly reported), iliac vessels, adrenal vessels, vaginal vessels, and/or the overall endometrial surface. With arterial rupture, hemorrhage can occur into the abdomen, into the uterine lumen, into the uterine wall, and/or into the broad ligament. Hemorrhage generally occurs during or shortly after delivery, although it can occur anywhere from several days prior to or several days after parturition. Older, multiparous mares are at highest risk, which is thought to be due to degenerative changes to vessel walls (Gruninger et al, 1998). However, it is important to note that post-partum hemorrhage can develop in mares of any age or parity. Parturition is frequently reported as uncomplicated.

Diagnosis and Treatment

Presenting clinical signs associated with significant post-partum hemorrhage are generally non-specific and include diaphoresis, frequent flehman response, increased vocalization, muscle fasciculation, and signs associated with colic. Hemorrhagic vaginal discharge is occasionally noted depending on the source and location of bleeding. Initial examination frequently reveals tachycardia and pale mucous membranes (although membranes may not be pale in the very early acute stages.) Anemia tends to become detectable within the first 12-24 hours. If hemorrhage is intra-abdominal, abdominocentesis will typically be consistent with gross hemorrhage and have a significant increase in red cells. Depending on other presenting clinical signs and how systemically stable the mare is at presentation, rectal and/or vaginal/uterine examination may or may not be performed. Generally, they are not performed if diagnosis is relatively clear due to fear of clot dislodgement with any manipulations. When performed, rectal palpation and ultrasound can reveal distinct enlargements within the uterine wall and/or broad ligament or be unremarkable depending on the location of the hemorrhage. Transabdominal ultrasound may reveal swirling of echogenic fluid around bowel structures if hemorrhage is intra-abdominal.

Various treatment approaches have been recommended for affected mares over the years and is generally aimed at increasing cardiovascular volume and organ perfusion, aiding hemostasis, providing analgesia and sedation, reducing the effects of endotoxemia, and providing antimicrobial prophylaxis. Of the utmost importance is to minimize stress for the mare in attempt to prevent any unnecessary increases in blood pressure that could facilitate a terminal bleed. In some instances, leaving the mare in a quiet environment without aggressive intervention can give a greater chance for survival. Generally, some combination of analgesics (butorphanol tartrate and/or flunixin meglumine) and sedative/analgesics (alpha2-agonists) are used in attempt to keep the mare comfortable and to decrease anxiety. Some authors recommend avoiding any sedative (i.e. acepromazine) that will significantly lower blood pressure in a patient that is already hypovolemic (Sertich, 1994), although others feel that the resulting hypotension will help restore circulating volume (Morresey, 2009). If pain control is not achieved with these medications, a constant rate infusion of lidocaine should be considered if available.

A fine balance must be maintained between restoring circulatory volume to prevent cardiovascular collapse while maintaining the integrity of the clot at the site of rupture. Overly aggressive fluid therapy will disrupt any previous clot formation and result in further hemorrhage. Polyionic fluids are generally used with an initial bolus of five liters over one half hour. For critical cases, hypotonic saline (2-4mL/kg IV bolus) may be considered, but should be used with caution. Plasma transfusions (provides some volume restoration and clotting factors likely help with hemostasis), synthetic volume expanders (such as hetastarch) and/or blood transfusions (useful when an estimated ≥25% of blood loss has occurred or hemorrhage is deemed to be rapid) may also be utilized. After initial stabilization, maintenance fluids should be continued until hypovolemia is mostly corrected and the mare’s water intake is considered adequate.
For hemostatic treatments, there is generally little empirical evidence within the literature due to a lack of primary research evaluating post-partum hemorrhage specifically. The administration of various pharmaceuticals in attempt to increase hemostasis has been recommended over the years and seems to fall in and out of favor. E-aminocaproic acid (a loading dose of 40mg/kg in saline administered slow IV) is the most recently reported hemostatic agent in favor (Scoggin and McCue, 2007). The drug, an inhibitor of fibrinolysis, has been reported to lower circulating fibrinogen levels and decrease PTT in clinically normal equids (Heidmann et al, 2005; Ross et al, 2007). These findings and clinical impressions associated with its use are promising that administration of this pharmaceutical will enhance the formation and stabilization of clots in mares with post-partum hemorrhage. After an initial loading dose, it is recommended to continue treatment at 10-20mg/kg IV every six hours until hemostasis is achieved. Alternatively, in a hospital setting a continuous infusion can be set at 15-mg/kg/hour after the initial loading dose. The Chinese herb, Yunnan baiyao, has been recently reported to help control hemorrhage. The mechanism of action is unknown and the formula of ingredients is a closely guarded secret of the Chinese government. Although very little clinical study has been performed, there are favorable reports from equine practitioners that use it. The current recommended dosage is 8-mg/kg orally every 6 hours for two to four days.

Other hemostatic treatments that have been utilized in the treatment of post-partum hemorrhage include intravenous naloxone, intravenous formalin, and systemic and local oxytocin. The use of naloxone (0.01-0.02 mg/kg IV), an opiate antagonist, was initially suggested due to anecdotical reports that it significantly decreased mare anxiety, increased mare comfort, and appeared to control hemorrhage. In other species, it has been shown to improve hemodynamic status, reverse hypotensive shock and decrease pain (Curtis and Lefer, 1980; Curtis and Lefer, 1983; Ludbrook and Rutter, 1988; Frithiof and Rundgren, 2006). However, its use has not been studied in the horse and the recommended dosage is much lower than the dosage used in the literature so its effectiveness in cases of post-partum hemorrhage in the mare is arguable. Intravenous formalin has been used in cases of post-operative hemorrhage in horses (Doyle et al, 2003) although its effects on hemostatic variables are certainly questionable. Suggested dosages (16-mL of 10% formalin in 45-mL of 0.9% saline) have been found to have no significant effect on clotting parameters in the horse, and higher doses have resulted in adverse affects including agitation, restlessness, muscle fasciculation, tachycardia, and tachypnea (Taylor et al, 2000). The use of oxytocin may be considered in cases of direct hemorrhage from the entire endometrial surface. The drug should be reserved for systemically stable cases where the practitioner is confident in the location of the hemorrhage. If used inappropriately, oxytocin can lead to increased mare discomfort causing significantly increased blood pressure and further hemorrhage.

Exploratory laparotomy for surgical repair is rarely attempted due to the risks associated with anesthetic agents in cases of hemorrhagic shock and the general difficulty in locating the hemorrhaging vessel.

Conclusion

During the acute phase of post-partum hemorrhage, prognosis for survival is guarded. However, the reported survival rate is over 80% (Arnold et al, 2008; Dolente et al, 2005) with approximately 50% of surviving mares going on to produce at least one other foal (Arnold et al, 2008). All subsequent pregnancies should be regarded as high-risk.
FURTHER READING


