Case Presentation: Uterine Mass in a Mare

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Uterine masses in mares can be caused by hematomas, abscesses, or neoplasia. Clinical signs associated with uterine masses vary from none to colic, but the most common complaint in broodmares is infertility. Evaluation of uterine masses includes rectal palpation and ultrasonographic evaluation of the mass, uterus, and ovaries. Regional endometritis and accumulation of uterine fluid is common in mares with uterine masses. Accumulation of uterine fluid is associated with susceptibility to endometritis and reduced pregnancy rates. Uterine culture and cytology are indicated when uterine fluid accumulates, and hysteroscopy can be used to evaluate the endometrium and luminal aspect of the mass. The case presented here involves treatment of a recently postpartum mare with a uterine mass.

HISTORY

A 12-year-old quarter horse broodmare was admitted to the University of Minnesota Veterinary Teaching Hospital for evaluation of a uterine mass. The mare had delivered a healthy filly 45 days previously with no apparent difficulty. Ultrasonographic examination of the mare’s uterus at her foal heat revealed excessive fluid retention. The uterus was infused with 500 mg of gentocin in 500 ml of saline, and intramuscular lutylase was administered to shorten the mare’s estrous cycle. Twenty-five days after foaling, the mare was reevaluated via transrectal ultrasonography, and intrauterine fluid and an 8-cm, fluid-filled mass were detected (Figure 1). The mass was located on the cranial aspect of the left uterine horn. The mare was then referred for further evaluation.

At the University of Minnesota Veterinary Teaching Hospital, transrectal palpation revealed a mass involving the left uterine horn. Ultrasonographic examination of the uterus revealed a small amount of intrauterine fluid and an approximately 8-cm, anechoic, fluid-filled structure near the tip of the left uterine horn. The exterior uterine margin of the cyst was 7 mm thick. Subsequent hysteroscopy revealed a thin-walled, fluid-filled structure that projected into the uterine lumen and moved with the intestinal motility.
The differential diagnosis for the intrauterine mass included a large endometrial or intramural uterine cyst or an abscess. Endometrial cysts can be incidental findings in the equine uterus, particularly in older mares. Most endometrial cysts are small and do not interfere with pregnancy; their primary significance is that they are misinterpreted as embryonic vesicles on ultrasonography, resulting in a false-positive diagnosis of pregnancy. In contrast, large endometrial cysts, such as the one in this mare, are uncommon and can interfere with pregnancy. The cyst was thought to be responsible for accumulation of the intrauterine fluid by restricting normal uterine motility. The location of the cyst at the end of the uterine horn, near the uterine papillae, was also thought to potentially reduce fertility by physically impeding sperm transport to the left uterotubal junction.

Uterine cysts can be drained, ablated, or removed surgically. Of these treatment techniques, drainage is the least desirable because cysts often re-form. Ablation of a cyst can be accomplished by snaring the mass through the cervix or destroying the mass by heating the tissue with an intrauterine laser or electrocoagulation unit. The location and size of the cyst in this mare precluded snaring. Because of the large size of the cyst, ablation might have resulted in damage to adjacent tissue because it would be impossible to control the depth of heat-induced damage. The thickness (7 mm) of the exterior seromuscular layer of the cyst made creation of a full-thickness defect in the uterine wall a possibility. With these concerns and limitations in mind, removing the cyst and ipsilateral ovary via celiotomy was recommended.

The mare was fasted for 36 hours before surgery to reduce colonic contents and improve access to the mass. The uterine horn was approached via a 30-cm oblique ventral paramedian incision. The intramural mass was fluid-filled and originated 4 cm from the tip of the left uterine horn. After occlusion of the left ovarian vasculature with a TA-90 staple cartridge, the left ovary was removed, along with 6 cm of the left uterine horn containing the cyst (Figure 2). The uterine incision was closed in two inverting suture layers of 0 polydioxanone. The first day after surgery, the mare was depressed and uncomfortable, but she was bright and alert when discharged from the hospital 36 hours after surgery.

Histologic examination of the mass and uterus revealed a cyst in the myometrium that was lined with ciliated columnar epithelium. Local, erosive, suppurative endometritis was present.

The mare was examined 60 days after surgery and was not retaining intrauterine fluid. She was bred but did not become pregnant. Because of the time of year (August), she was not rebred for 6 months, at which time she became pregnant after one service. The mare delivered a healthy foal the following year, was rebred, and again became pregnant after one cycle. The mare was sold while pregnant, and follow-up was not conducted.

**DISCUSSION**

Uterine masses are uncommon in horses and are caused by neoplasia, abscessation, or cyst formation. The mechanism by which masses cause infertility is not known, but mechanical interference with uterine clearance of normal estrous secretions, sperm transport, or maternal recognition of pregnancy are potential causes. Large endometrial
Equine Rounds Notes and Commentary: Uterine Masses

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This case report on surgical removal of a uterine mass and the mare’s subsequent fertility is interesting because the type, size, and location of a uterine mass may interfere with future fertility and fetal outcome. Because there are no retrospective studies on the fertility of mares following removal of uterine masses, veterinarians have to make an educated guess on future fertility. Not all questions have clear-cut answers. Four important questions that must be answered follow:

- Why did the uterine mass form, and will it return?
- Will removing the mass interfere with uterine clearance after breeding?
- Will removing the mass decrease the likelihood of the mare becoming pregnant?
- How much of the surface area of the endometrium can be removed without interfering with fetal well-being in the future?

WHY DID THE UTERINE MASS FORM, AND WILL IT RETURN?

Myometrial cysts likely form as a result of uterine trauma during the birthing process. The equine fetus rotates from a dorsopubic position (i.e., the dorsum of the foal lies over...
the pubis of the dam) to a dorsosacral position during first-stage labor. It is hypothesized that the fetus rotates by stretching its body and kicking out with its hindlimbs. Uterine tears identified at the tip of a horn after foaling are presumably the result of the foal forcing a hind toe through the uterine wall. Consequently, there is no reason to expect that the mass will return unless a subsequent foal traumatizes the uterine wall.

**WILL REMOVING A UTERINE MASS INTERFERE WITH UTERINE CLEARANCE AFTER BREEDING?**

Alternatively, does the weight of the mass pull the affected portion of the uterus ventrally, thereby obstructing normal clearance of uterine fluid? A clinician may be able to answer the latter question during reproductive examination; however, the question that heads this section is more difficult to answer. Efficient uterine emptying is an orchestrated event that involves the myometrium receiving a signal to contract, followed by coordination and propagation of the contractions toward the cervix for a set amount of time. The initial signal may be conducted through nerves by the direct action of a hormone on smooth muscle cells or by the presence of fluid in the uterine lumen. A breakdown in any of these components or in the “cross talk” between the components results in accumulation of fluid in the uterus. Could removing a large portion of a uterine horn interfere with signal conduction or lymphatic drainage, or could it change the anatomic relationship of the two horns so that more fluid accumulates in the unaffected horn?

Since the early 1990s, we have recognized that the uterus of older pluripara mares does not empty quickly after breeding and retains fluid, resulting in a decreased conception rate. The primary abnormality in these mares appears to be a defect in uterine contractility; however, poor perineal conformation (i.e., sunken anus, cranial tilt to the dorsal aspect of the vulva) and a uterus located ventral to the pelvis contribute to fluid retention. Compared with fertile mares, mares that are susceptible to persistent mating-induced endometritis have delayed and less intense uterine myoelectrical activity in response to bacterial inoculation.1 Uterine myoelectrical activity also stops 12 to 14 hours sooner in susceptible mares than in fertile mares. The uterine defect appears to be an intrinsic contractile dysfunction of the myometrium because myometrial strips from susceptible mares that are stimulated with oxytocin and prostaglandin F$_{20}$ generate as much tension as myometrial strips from older, fertile mares.2 The rapid decrease in myoelectrical activity in susceptible mares may be induced by accumulation of nitric oxide, an inflammatory by-product, within the uterine lumen after insemination. Nitric oxide mediates smooth muscle contractions, and its absorption by the endometrium may dampen uterine myoelectrical activity.3 Other factors associated with a delay in uterine clearance of fluids are inadequate lymphatic drainage and angiosis (degenerative changes in arterial and venous vessel walls, including elastosis, fibrosis, and fibroelastosis).4,5 Fluid that accumulates in the uterus must either drain passively through the cervix or be reabsorbed via the lymphatics. Because the lymphatics lack smooth muscle in their walls, they rely on rhythmic uterine contractions to push the lymph dorsally toward the midline and major lymphatic vessels. If uterine edema becomes excessive or the muscle stops contracting, lymph accumulates within the stratum spongiosum and forms lakes (lacunae). Affected uteri have a boggy, spongy feel during rectal palpation 24 to 72 hours after breeding, and uterine edema can be visualized via ultrasonography after ovulation. Angiosis appears to indirectly reduce fertility by reducing endometrial perfusion and through disturbances in uterine drainage caused by reduced function of veins. The most obvious clinical finding in mares with angiosis and/or inadequate lymphatic drainage is the persistence of endometrial edema after ovulation. Endometrial edema develops as a normal physiologic effect of estrus, resulting in the typical estrous edema of the uterine wall. The edema disappears rapidly after ovulation as long as the drainage mechanisms are functionally intact. If these mechanisms are not intact, the result is a pathologic endometrial edema morphologically characterized by persistent lymphangiectasia. A ventrally dependent uterus appears to contribute to the problem.

Mares that accumulate intrauterine fluid commonly receive a uterine lavage 4 to 8 hours after breeding and an injection of either oxytocin (10 to 20 IU IV or IM) or prostaglandin (cloprostenol; 250 µg IM) to induce uterine emptying.6,7 Pregnancy rates of susceptible mares have reportedly increased with these treatments; however, the drugs do not always seem to be efficacious. Although both drugs induce uterine contractions, the type and length of contraction varies. Oxytocin is associated with high-amplitude myoelectric spike bursts that last for about 30 minutes, whereas cloprostenol causes a lower
amplitude spike burst that persists for up to 5 hours.

For fluids to be cleared from the uterus, muscular contractions must be coordinated and propagate from the tips of the horns to the cervix. Propagation of a contraction from an individual smooth muscle through the myometrium is caused by action potentials triggered in pacemaker regions. It appears that the pacemaker region originates in the uterine horn near the end of the uterine tube in humans, rats, and mice. The action potential spreads from the pacemaker area to the rest of the uterus. Abnormal propagation patterns have been reported in women, rats, and mice during labor. In these reports, contractile waves started near the cervix and spread toward the fundus. This contraction pattern was associated with dystocia and endometriosis in women.

We evaluated the propagation of uterine contractions in mares produced by administering oxytocin and the α₂-agonists xylazine or detomidine during estrus.⁸ The uterus is richly innervated with adrenergic receptors, and damage to these receptors may interfere with signal conduction. All three drugs induced uterine contractions. Oxytocin and detomidine produced waves of contractions that lasted for the 2-hour study. Xylazine produced a single contraction of high amplitude that persisted for approximately 11 minutes.⁹ All mares, whether fertile or susceptible to endometritis, responded to xylazine and oxytocin, but detomidine induced uterine contractions in only 50% of the susceptible mares.⁹ Uterine contractions propagated from the tip of the uterine horn to the cervix in reproductively normal mares after oxytocin and detomidine administration, but this normal propagation pattern was rarely seen in mares that were susceptible to endometritis. In those mares, the first area of the uterus to contract was the uterine body. This was followed by contractions in either the uterine body or the tip of the uterine horn. Myoelectric signaling appears to be defective in some older, pluripara mares with persistent endometritis. Although removing a portion of the uterus did not appear to interfere with myoelectric function in the mare described in the accompanying case report, it is not known whether uterine fibrosis or chronic endometritis interferes with myoelectric signaling processes.

**WILL REMOVING A PORTION OF THE UTERUS RESULT IN A SMALLER THAN NORMAL FOAL?**

In 1938, Walton and Hammond¹⁰ eloquently showed that the size of the uterus profoundly affected the birth weight of foals in their classic, between-breed crossing of Shetland ponies and shire horses. Tischner and Klimczak¹¹ observed a similar effect when they transferred pony embryos into the uterus of larger draft-type recipient mares and compared birth size and subsequent development of the foals with sex-matched full siblings born from the genetic pony mothers. Allen et al.¹²,¹³ recently used between-breed embryo transfer to create Thoroughbred-in-pony pregnancies in which the genetically larger Thoroughbred fetus endured cramping and nutritional deprivation in utero and pony-in-Thoroughbred pregnancies in which the smaller pony fetus was exposed to nutritional and spatial excess in utero. The placenta was evaluated in detail because it is the organ through which the fetus receives nourishment. Mean foal birth weight and mean values for the mass, gross area, and volume of the allantochorion were all highest in the Thoroughbred-in-Thoroughbred pregnancies and lowest in the pony-in-pony pregnancies. These parameters were higher in the pony-in-Thoroughbred pregnancies than in the Thoroughbred-in-pony pregnancies. Foal birth weight was positively correlated with the mass, gross area, and volume of the allantochorion.

All foals (n = 25) were followed for 3 years, and body weight, height at the withers, girth, poll-to-nose length, crown-to-rump length, and three foreleg long bone measurements were recorded at regular intervals.¹³ The results of that study indicate that postpartum growth was affected by restricted or enhanced growth in utero. In the first 6 months after birth, the growth rate was enhanced in the previously restricted Thoroughbred-in-pony foals and curbed in the previously enhanced pony-in-Thoroughbred foals compared with their respective controls (i.e., Thoroughbred-in-Thoroughbred, pony-in-pony). By 3 years of age, Thoroughbred foals that were carried by ponies were approximately 5% smaller, whereas there was a 15% difference in the control animals at birth. Thus the Thoroughbreds carried by the pony mares were merely scaled down versions of the Thoroughbred-in-Thoroughbred control animals. No major changes in conformation resulted from either restricted (Thoroughbred-in-pony) or luxurious (pony-in-Thoroughbred) in utero environments.

In the accompanying case report, the foal was healthy at birth. However, the size of the foal was not known. Size at birth and in the first 2 years of life may be important to some horse owners because these young animals may be shown in conformation classes.
or may be for sale as yearlings. There are many factors to consider when contemplating removing a mass involving the uterus. The author of the case report should be commended on the surgical and reproductive success of this case. The uterus is an amazing organ that undergoes dynamic changes during the estrous cycle and throughout pregnancy. Veterinary procedures (e.g., instilling antibiotics with a low pH or caustic detergents, removing cysts by laser, cesarean section, resection of a mass) may interfere with this finely tuned organ. Clinicians should proceed with caution and care.

REFERENCES


