Management of Pyometra in a Mare After Traumatic Dystocia

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Introduction:

Dystocia and pyometra both occur in equids although more common in other species. This patient's presentation was unique in that her dystocia was severe enough to warrant fetotomy. Subsequent complications jeopardized the patient's health and reproductive future. Management of dystocia in mares is fraught with complications that may jeopardize not only the health of mare and foal, but the mare's reproductive future. Prolonged dystocia is often associated with severe vaginal and cervical adhesions.

Case Summary:

A 16-year-old quarter horse mare presented to MSU-CVM Equine Service on June 26th, 2019 on referral from her veterinarian for reproductive complications and failure to rebreed. She was bright, alert, and responsive and weighed 480 kilograms. Aside from elevated digital pulses bilaterally in the forelimbs, her physical exam was unremarkable. The mare had experienced a severe dystocia in May, and a fetotomy was performed. She acquired significant trauma to the birth canal during the procedure. The referring veterinarian had appreciated adhesions, or synechiae, within the vaginal canal and suspected a pyometra as well.

A sedated (detomidine and butorphanol administered intravenously) hysteroscopy was performed. Buscopan was also administered to facilitate relaxation of the vaginal musculature. Fibrous adhesions were visualized in the caudal vagina that extended from the vaginal vault to the floor. Significant circumferential stricture was also appreciated. These defects severely reduced the size of the vaginal lumen. This had interfered with the reproductive tract's ability to expel fluid and contaminants, leading to pyometra. Purulent material was pooled in the cranial vagina and within the right uterine horn, and there were numerous petechiations of the mucosa.

During this initial examination, swabs were taken from the uterus for culture, and *Escherichia coli*, *Streptococcus* sp. Group C, and *Fusobacterium necrophorum* were identified. Also of concern was the possibility of laminitis as identified by elevated digital pulses in both front feet. The mare was started on 1.1 mg/kg flunixin megulamine intravenously every 12 hours and 7 mg/kg enrofloxacin intravenously every 24 hours. The uterus was lavaged with betadine solution to be repeated every 24 hours, and ice boots were applied to the front feet and changed every 3 hours to combat any laminitis that may have been developing.

The following day, a vaginoscopy was performed to reduce the vaginal and cervical synechiae. The mare was sedated in the stocks using detomidine and butorphanol and was also administered a xylazine epidural along with intravenous Buscopan. A scope was passed into the vagina to visualize the fibrotic adhesions, which were then resected via cautery. During this process, smoke accumulated within the vaginal canal, making visualization difficult. Suction was intermittently used to remove the smoke. After the procedure, uterine lavage was performed and the mare was administered 1 ml oxytocin to promote uterine contraction and clearance of debris. Given the repeated entry into the vaginal canal and the use of cautery, microtrauma, inflammation, and subsequent reformation of fibrotic adhesions was a concern. Therefore, Animax ointment (nystatin, neomycin sulfate, thiostrepton and triamcinolone acetonide) was manually applied to the vaginal walls. Afterward, the patient was walked by hand to promote uterine clearance. The mare responded positively to treatment; the following day, purulent debris was observed draining from the vulva.

Forty-eight hours later, the mare was sedated and prepared using the same protocol as previously described. A revision of the initial procedure was performed. The prior resections were observed to be healing well; the birth canal was objectively more open, and there was less

purulent debris and inflammation within the vagina. Additionally, radiographs were obtained of the right front foot due to suspicion of laminitis. A 6 degree rotation of the third phalanx was appreciated, confirming mild laminitis.

The following day, the enrofloxacin was discontinued. Additional treatments were continued until the patient was discharged on September 2nd, 2019. A speculum exam of the vagina was conducted before discharge, during which photos were taken for documentation. The owner was instructed to continue application of Animax ointment and vaginal palpation with the referring veterinarian every seven days until a recheck scheduled at MSU-CVM for 4 weeks later.

The primary veterinarian continued rechecks for several months before the mare returned to MSU-CVM Equine Service in January. On presentation, she was bright, alert, and had a body condition score of 7/9. Her vitals were within normal limits, and there were bilateral mildly elevated digital pulses in the front limbs. A repeat hysteroscopy was performed. The vagina was free of fibrotic adhesions, but the cervical os was not appreciated. Manual palpation confirmed fibrosis of the cervical opening. The thin webbing covering the cervix was digitally reduced, releasing a large amount of purulent debris from the uterus. A diagnosis of pyometra was made. The mare was administered 20 units of oxytocin and 250 mcg of cloprostenol after uterine lavage with betadine water. Since digital pulses were appreciated, ice boots were utilized during the patient's stay.

The following day, vaginoscopy was repeated to evaluate response to therapy. There was mild inflammation around the cervix, but the cervical opening was patent. Purulent fluid was appreciated within the cranial vagina and the uterus and was collected for analysis. Fluid BUN and creatinine were elevated relative to serum levels, and cytology revealed large numbers of

degenerative neutrophils with few macrophages. No bacterial or fungal pathogens were seen. Given these findings, it is highly likely that urine was pooling in the cranial vagina due to poor reproductive conformation. Uterine lavage with betadine and saline solution, along with post-lavage oxytocin, was continued for the next five days until uterine fluid was no longer discolored. The last few treatments were performed sterile using a bovina catheter to introduce LRS with a 10% DMSO solution into the uterus. This mixture was then flushed using 2 liters of LRS. Animax ointment was again applied to reduce inflammation and the risk of infection.

Given poor vulvar conformation and the suspicion that it was contributing to recurrent pyometra, a vulvoplasty, or Caslick's procedure, was performed on January 13th. This procedure closes the dorsal aspect of the vulva and protects against pneumovagina and introduction of fecal material into the vagina. The following day, the mare was discharged with instructions that she should be rechecked in 4-6 weeks to evaluate resolution of pyometra and healing from the Caslick's procedure. It was also suggested that fluid analysis should be repeated to confirm urine pooling within the cranial vagina. Consideration was given to urethral extension surgery should urine pooling be positively identified.

Vaginoscopy was again performed on February 12th, 2020. The vaginal canal was free of adhesions, but the cervical os was not appreciated with the scope. On vaginal palpation, a very narrow cervical opening was identified. The cervix was then manually dilated so that the uterus could be lavaged with betadine solution. Before lavage, rectal ultrasound was used to evaluate the uterus and any fluid that it contained. The uterus was found to be mildly distended caudally with flocculent fluid, an improvement from the copious fluid during the previous recheck. Oxytocin was administered after lavage. During this stay, treatment was much the same; daily topical application of Animax ointment to the cervix and ice boots were utilized. Uterine lavage

and oxytocin administration were not pursued beyond the initial lavage on arrival. On the 16th of February, the sutures from the Caslick's procedure were removed after it was deemed that it had healed appropriately and that the dorsal labia were permanently fused. The mare was discharged on February 16th with instructions to return in two months for evaluation of her cervix and consideration of placing a cervical stent. The mare has not yet returned to MSU-CVM at the time of writing.

Discussion:

Management of dystocia in mares is fraught with complications that may jeopardize not only the health of mare and foal, but the mare's reproductive future. Many believe that dystocia in mares is more challenging to manage than in cattle because of the mare's longer birth canal, the longer length of fetal limbs, and rapid placental separation during stage 2 labor in the mare.[3] Prolonged dystocia is often associated with severe vaginal and cervical adhesions. It is thought that this is in part due to repeated entry of arms and equipment into the birth canal that damages the vaginal mucosa and leads to exposure of the underlying superficial tissue layers.[3] Thus, significant trauma can be induced before fetotomy is even attempted, and other procedures, such as embryo transfer and artificial insemination, may also promote synechiae formation.[8]

Though delivery of a fetus via cesarean section may decrease vaginal trauma relative to fetotomy, many factors must be considered when making the decision about which procedure to utilize. Post-surgical complications, client cost constraints, status of the fetus, and veterinarian's experience may all play a role in what procedure is ultimately selected.[3] In retrospective studies, partial fetotomy using 3 or less cuts was not found to significantly reduce future fertility, though there were commonly post-operative complications, such as retained placenta and endometritis,

that required additional medical management.[6] Unlike mares that undergo cesarean section, many mares that undergo a fetotomy may return to breeding within the same season.[9] Retrospective studies also report that mares undergoing fetotomy exhibit higher short-term fertility rates than mares that undergo cesarean sections.[2]

If fetotomy is pursued, there are several actions that can be taken to reduce vaginal trauma. If possible, the mare should be administered standing sedation as well as an epidural to eliminate straining in response to movement. It is imperative that the mare remains calm and quiet during the procedure, so a twitch may also be applied.[3] Good footing and lubrication are essential to reducing trauma. In mares where fetotomy is expected to be prolonged, general anesthesia and elevation of the hind quarters to allow retropulsion and manipulation of the fetus are indicated.[3] More cuts used to extract the fetus (i.e. a complete vs. a partial fetotomy) has been shown to result in more severe trauma and fibrosis within the birth canal, so every attempt at reducing the number of cuts required should be made.[3]

Cervical and vaginal synechiae are a common cause of reproductive deficiency in mares.[1] The mare's cervix is a dynamic structure that allows passage of semen and discharge of fluid during estrus. It becomes a barrier to fluid and debris during diestrus. Both intraluminal and cervical synechiae can impede clearance of bacteria and debris that predispose mares to pyometra. [1] Additionally, trauma to the vestibulovaginal sphincter (which is a natural barrier to bacterial invasion of the reproductive tract) during dystocia may result in increased risk of endometritis.[5] Pyometra, the accumulation of purulent debris within the uterus, most commonly results in complaints of infertility. Unlike in the bitch, this condition typically causes only subtle signs in mares.[8] In some cases, accumulation of fluid within the uterus can result in signs of colic and purulent vulvar discharge if the cervix is open.[1] Rarely, mares develop fever, cachexia, or

endotoxemia.[1] This mare's first pyometra was open; the cervix was not sealing fluid within the uterus. However, due to the extensive nature of her adhesions, the birth canal and cervix were narrowed and tortuous, resulting in reduced fluid clearance. While an open pyometra may be suspected by purulent debris draining from the vulva, pyometra is most commonly diagnosed via rectal palpation and ultrasound.[1] A large, fluid-filled, non-gravid uterus on digital palpation and accumulation of hyperechoic or flocculent uterine fluid on ultrasound are characteristic.[1] Additionally, positive bacterial culture of uterine fluid is diagnostic. [1] The most common isolates on culture of uterine fluid include *Streptococcus equi* subsp. *zooepidemicus*, *Escherichia coli*, *Actinomyces sp*., *Pseudomonas sp*., and *Pasteurella sp*.[4] Uterine biopsy is the gold standard for diagnosis of endometritis.[12]

For the best chance at resolution of bacterial pyometra, it is important to treat using systemic antimicrobials to which the isolated pathogens are susceptible in conjunction with promoting drainage of debris.[4,12] In the incidence of closed pyometra, dilation of the cervix or establishment of a patent canal in the case of severe cervical fibrosis must be achieved.[12] To reduce the risk of re-stricture during this critical phase, an intrauterine catheter with an inflatable cuff may be placed and maintained for several days.[8] Once a patent lumen is established, uterine lavage and post-lavage exercise, along with administration of uterotonic drugs such as oxytocin, promote clearance of purulent debris. [1]

Synechiae alone are not indications for surgical treatment; many mares with birth canals that are 75% or more normal can breed and carry a foal to term without further management.[10] Issues arise when mares experience infertility or pregnancy loss because of the effects of adhesions on the reproductive tract, or when persistent signs of pyometra are observed.[10] There are few treatment options available for mares with chronic or recurrent pyometra. Those that are

available are often incompletely successful at resolving the condition or have undesirable effects on reproduction. Traditionally, the treatment of choice, aside from regular uterine lavage, has been ovariohysterectomy. This procedure is challenging in mares and there are high rates of surgical and post-surgical complications. Abdominal hemorrhage, peritonitis, colic, thrombosis, uterine stump necrosis, and death are all recognized. [1] Of course, mares that undergo ovariohysterectomy are also permanently sterile and lose their value as breeding animals.

In addition to resection of synechiae using vaginoscopy and cautery, surgical wedge resection of fibrotic cervices has been documented to establish a patent opening for drainage of fluid from the uterus. [1] These procedures are less invasive than ovariohysterectomy and can be performed under standing sedation. As such, fewer complications are recognized and the procedures are much more economically feasible. Stricture and re-adhesion of the cervix are the most commonly reported complications, especially after cessation of topical steroidal ointments that are typically used post-operatively to reduce inflammation.[11] Both procedures may be difficult or impossible to perform on mares with a severe degree of cervical fibrosis. [1] There is also risk of perforating the vagina during surgery and exposing the peritoneal cavity to uterine fluid which may contain bacteria. [1] Mares that undergo cervical wedge resections are rendered a functionally incompetent cervix and are unable to carry a pregnancy.[1] However, due to the retainment of reproductive structures, they may still produce foals with advanced reproductive techniques such as embryo transfer. [1]

A second procedure that establishes cervical patency is the placement of a cervical stent. These devices are custom made and have been documented to reduce the incidence of pyometra in mares for several years following placement with no adverse effects on performance.[4] Stents can frequently be placed under standing sedation. Complications include formation of adhesions

around the foreign structure as well as displacement of the stent that allows for cervical re-stricture.[4] In some instances, mares that had stents removed due to displacement continued to have normal vaginal discharge and reduced reoccurrence of pyometra. It is therefore postulated by Krohn, et al. that long term placement of a stent may promote fibrotic change that prohibits complete closure of the cervix, providing a patent route of drainage without additional mechanical support. The placement of the stent can easily be evaluated transrectally or via vaginal exam. While very economically feasible, it may be required to repeat the procedure should the stent become displaced or blocked by debris. Like wedge resection, the cervix is functionally incompetent in these mares and embryo transfer is required to produce foals.[4]

In some mares, additional conformational defects may contribute to development of pyometra.[4] Chronic retention of debris within the uterus can lead to distention of the myometrium and dependent position of the uterus within the abdomen. Poor contractility and downhill placement of the uterus thus result in poor fluid clearance. [1] As in this case, downhill conformation of the reproductive tract can lead to the accumulation of urine within the cranial vagina. This incites an inflammatory response which promotes cervicitis and endometritis.[7] Inflammation incites fibrosis of inflamed tissue and leads to the development of pyometra. In mares with these conditions, establishment of a patent cervical opening may be ineffective as sole treatment for resolving pyometra. As such, mares should undergo thorough evaluation of their reproductive tract before being considered for surgery or stent placement.

Mares that are multiparous or underconditioned may have poor conformation of the external genitalia that allows for aspiration of air and fecal contents into the reproductive tract, resulting in bacterial infection.[5] A Caslick's surgery, which closes the vulva dorsal to ventral to the level of the ischium, may prevent pneumovagina and fecal contamination. Urine pooling may

be remedied via surgical extension of the urethra.[7] Surgical complications include stricture of the fabricated canal and dehiscence during healing.[7] It may be necessary to combine procedures in mares with conformation defects in order to best mitigate urine pooling, fecal contamination, and subsequent infection.

While vaginal and cervical synechiae are common sequelae to dystocia in mares, the low incidence of difficult dystocia in mares means that research is limited on the most effective way to prevent recurrent pyometra resulting from fibrosis of the reproductive tract. Certainly, the procedures detailed above help manage the condition, but the long-term outcomes of newer procedures, like cervical stents, resection with cautery, and wedge resections, have yet to be thoroughly evaluated. More research is necessary to improve these procedures and to determine their longevity, but they are at least effective in the short term. While vaginoscopic resection of synechiae did aid in clearance of the pyometra, it was not entirely successful at resolving it. Additionally, techniques like the Caslick's procedure and urethral extension surgeries may reduce the risk of developing pyometra in mares with poor conformation in conjunction with cervical fibrosis.

Unfortunately, no treatment plan for recurrent endometritis and pyometra has been described that preserves the mare's ability to conceive and carry her own foal to term, meaning that the described mare's career as a broodmare may have come to an end. However, with advanced techniques like embryo flushing and transfer, it may still be possible to produce foals with her genetics. At the time of writing, it is uncertain whether the mare will require placement of a cervical stent or additional treatment for pyometra. Given her history, conformation, and current condition, however, there is a high potential for ongoing cervical fibrosis. While she may never carry another foal, her condition may be managed and quality of life improved.

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