Reconstructive surgical procedures to enhance mare fertility
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Abstract
Surgical techniques for repair of pneumovagina, urovagina, perineal lacerations, recto-vaginal fistulas, and cervical lacerations are described.

Keywords: Pneumovagina, urovagina, perineal laceration, recto-vaginal fistula, cervical laceration

Preparation for standing perineal surgery
The mare is restrained in standing stocks, and the tail is wrapped and elevated. Ensure you have a quick release knot on the tail in case the mare does go down in the stocks. The rectum is evacuated and the perineum, vagina, and rectum are cleaned depending on the surgical procedure. An epidural anesthesia may be performed for some procedures (see below). Appropriate instruments (long-handed instruments) should be available. A headlight is very helpful for this type of procedure. Often the mare’s foal is present, so you may have to sedate both the mare and foal during the procedure. The foal can also be confined in a small pen next to the mare.

Methods of providing anesthesia for surgery
- Local infiltration anesthesia
- Epidural anesthesia
  - Local anesthetics
    - Lidocaine 2% (20 mg/mL)
    - Mepivacaine 2% (20 mg/mL)
  - Depress axonal conduction in sympathetic, sensory, motor fibers
  - May cause motor weakness and collapse in hind legs
  - Onset in 15 minutes and duration of two to four hours
  - Alpha-2 adrenergic agonists
    - Inhibits release of a spinal neurotransmitter important in pain perception
    - Caudal analgesia, no extra-spinal effects, and motor tone maintained
    - Slower onset (30-45 min), longer duration of analgesia (2.5-3.5 hr)
    - Xylazine - 100 mg/mL
- Epidural technique:
  - A 1.5” x 18 ga needle is used
  - Wearing sterile gloves, place needle into the space between S-5/Cy-1 or Cy-1/Cy-2 after the area has been clipped and aseptically prepared
  - The solution should be injected with no resistance
  - “Hanging-drop” technique

Pneumovagina
Pneumovagina is commonly treated by performing an episioplasty or Caslick’s procedure. In certain cases where there is atrophy or a laceration of the perineal body, a perineal body reconstruction procedure (Gadd technique) can be performed. A Gadd technique involves closure of the dorsal vulva after two large triangular flaps of mucosa, which connect dorsally, have been removed. Removal of the mucosal flaps can be performed using local anesthesia. The defect created by removing the mucosa is then sutured closed to appose the dorsal aspect of the vulva. The skin of the vulva is closed as with the Caslick’s procedure. This procedure can be performed easily and efficiently and carries a very good prognosis.

Urovagina/urine pooling
This condition is primarily observed in older multiparous mares. Urovagina results from laxity of ovarian and/or pelvic supporting ligaments due to age and repeated pregnancies. Urovagina can also result from poor conformation and body condition. The sagging of the uterus into the abdomen will pull the vagina with it. The urethral orifice is pulled forward and when urine is voided, some gravitates cranially, causing vaginitis, cervicitis, endometritis, and infertility. Some mares may initially pool urine in the vagina intermittently and careful conservative management of breeding may be occasionally successful in these mares. Clinical signs include
infertility, urine scalding, and often these mares have an odor like urine or ammonia. The diagnosis is based on clinical signs and vaginoscopy. If the urine pooling cannot be controlled medically, then surgical intervention is recommended. In some cases an endometrial biopsy is recommended prior to surgery to evaluate the endometrial tissue.

Surgical correction of urine pooling is one of the most frustrating reproductive surgeries. The urethroplasty procedure may be performed without problems, but the outcome is difficult to predict. Surgical repair failure can result in fistula development. Fistula development results in continued urine pooling and surgical closure of the fistula can be difficult to achieve. In many cases the entire procedure should be repeated.

Mares are sedated and the urinary bladder can be catheterized. Epidural anesthesia is performed as described earlier. The rectum is evacuated and the vulva and vagina are cleaned using a diluted iodine solution. The choice of urethroplasty technique generally depends on the surgeon’s preference and potentially the mare’s conformation. The general urethroplasty technique involves creating a mucosal tunnel from the urethral orifice near the mucocutaneous junction. Several techniques which create a mucosal tunnel have been described.

The author tries to perform a technique that is a combination of the Brown and McKinnon techniques. The tunnel is sutured in multiple layers, but the tunnel is made by creating the mucosal shelves for the tunnel more dorsally within the vestibule. After completion of the tunnel it is very important to maintain a urinary catheter. In the author’s opinion this is very important for the success of the procedure. Generally, a Foley catheter is used for 14 to 21 days and the catheter is changed every four to five days. The catheter should be flushed daily with an antibiotic solution (10 mL of gentomycin in a liter of saline) to prevent crystal blockage of the catheter. In the author’s experience, the cases where the mare cannot maintain the urinary catheter are more susceptible to fistula development. Mares are discharged the same day or the following day on systemic antibiotics and nonsteroidal anti-inflammatory agents.

Another technique involves pulling the entire vestibule caudally by transecting the perineal body horizontally. The new position of the vulva is sutured in place at the site of the perineal body transection to maintain the new position of the vestibule. This creates a shelf, which often becomes contaminated and collects fecal material, but this does not represent a significant long-term problem. This technique has been described for alleviating pneumovagina as well.

The main complication following urethroplasty is the risk of fistula formation and continued pooling of urine. Other complications include signs of colic and straining to urinate. Parturition can disrupt a previous urethroplasty technique and a second surgery may be required to reestablish the urethral extension.

Recto-vaginal lacerations

Perineal lacerations generally occur during foaling in primiparous mares because of the forceful expulsion of the foal. The extent of the damage varies and can be classified into three degrees. First degree perineal lacerations involve the mucosa of the dorsal vestibule and vulva. These lacerations are generally treated by performing an episiotomy or Caslick’s. Second degree lacerations involve the submucosa and muscularis of the vagina, vestibule and perineal body. The laceration does not involve rectal mucosa or anal sphincter. Most of these lacerations heal satisfactorily by second intention. In cases with significant damage, the result may be the development of pneumovagina. As with first degree lacerations, an episiotomy may be all that is needed to correct the pneumovagina. In cases with significant disruption of the perineal body, a Gadd technique may be required. Third degree perineal lacerations are the most serious due to fecal contamination of vestibule, vagina, and uterus resulting in infertility. The laceration involves penetration through the rectal-vaginal shelf and musculature of the vagina, vestibule and rectum. Repair is usually delayed until the necrotic tissue has sloughed and the wound has healed by second intention. In most cases, three to four weeks postpartum is adequate. However the repair should be done as soon as possible to prevent long-term fecal contamination of the uterus. Preoperative preparation and postoperative management involves softening the feces to minimize tension on the surgical repair. If available, mares should be placed on lush pasture prior to surgery until feces are soft and then kept on lush pasture for at least two weeks after surgery. Other methods of softening the feces include substituting hay and grain diet with a pelleted ration three to four days before surgery, and adding mineral oil and magnesium sulfate. Perioperative antibiotics and nonsteroidal anti-inflammatory agents are administered.

Epidural anesthesia is generally used on mares with third degree perineal lacerations and rectal vaginal fistulas. Caudal epidural anesthesia (S6-Cy1 or Cy1-Cy2) is performed, using a combination of 100 mg xylazine hydrochloride and 40 mg 2% mepivacaine hydrochloride, diluted with sterile saline solution to make a final injection volume of seven to ten mL. The rectum, vulva and vagina are cleaned of gross contamination using a dilute iodine solution. The method of repair can involve one or two stages. A one-stage repair involves complete closure of the rectal-vaginal shelf and perineal body. In a two-stage repair, the rectal-vaginal shelf is repaired.
Initially, and then at least three to four weeks later, the perineal body is repaired to complete the second stage. Generally the second stage can be performed using local anesthesia.

Closure of the rectal-vaginal shelf can be performed using either of two methods. In both methods, an incision is made to create a rectal shelf and a vaginal shelf on both the left and right sides of the defect. The incision is generally through the demarcation of the rectum and vagina, but should extend more into the vagina as the incision courses caudally. This helps eliminate tension on the final repair. Shelves are created at the cranial aspect of the defect as well. It is important to extend cranially about 2 to 4 cm when creating the shelves in the cranial aspect of the defect, and the shelves on the sides should be undermined laterally so that there is minimal tension on the closure. The shelves can be closed using a simple continuous pattern in a cranial to caudal direction. The vaginal side is closed first in 3 to 4 layers and then followed by the rectal side. Another method involves moving in a cranial to caudal direction using an interrupted six-bite pattern to close both the vaginal and rectal layers together. Post-operatively, mares are treated with broad-spectrum antibiotics and nonsteroidal anti-inflammatory agents. It is important to keep the feces soft so that the surgical repair does not dehisce. Mineral oil may have to be given daily to help keep the feces soft in some cases. The main complication following surgery is the potential for fistula formation or dehiscence along the suture line. The prognosis is generally very good to excellent following repair, but this may be due to the advantages of the lush grass in our area. Recurrence the following year is a possibility, therefore special attention during parturition is important.

Recto-vaginal fistula

Recto-vaginal fistulas occur when the foal's foot penetrates through the rectal-vaginal shelf, but does not rip all the way out through the anal sphincters and perineal body. Generally the fistula is caudal to the remnant of the hymen (within the vestibule), but in rare cases can be cranial to it (within the vagina). Some fistulas can heal spontaneously and not require surgical repair. The fistula is generally large after parturition, but heals and contracts to be only a few centimeters in diameter in three to four weeks. Fistulas can also occur with partial dehiscence of surgically repaired third degree rectal vaginal tear. Surgical repair is required to restore the mare's fertility. Perioperative management is the same as for third degree rectal vaginal tears. Methods of surgical repair include: converting the fistula to a third degree perineal laceration, direct closure through the vagina, direct closure through the rectum, or transecting the perineal body horizontally to expose the fistula for repair. I personally prefer to transect the perineal body horizontally and then to transect the fistula to create a rectal defect and a vaginal defect. The rectal defect is closed first in one layer by evertting the edges of the fistula into the rectum. Closure of the rectal side first ensures a stronger and easier closure. The vaginal defect is then closed in two to four layers using an inverting pattern. Absorbable suture material is used for closure of both the rectal and vaginal defects. The dead space between the rectal and vaginal closures is left open to heal by second intention. The skin is closed on the left and right sides of the perineal incision but the center is left open to provide drainage. Post-operatively, mares are treated with broad-spectrum antibiotics and nonsteroidal anti-inflammatory agents. The prognosis is generally very good to excellent following repair, but this may be again due to the advantages of the lush grass in our area. Recurrence the following year is a possibility, therefore special attention during parturition is important.

Cervical lacerations

Cervical tears can be a potential cause of infertility in mares. Late-term abortion or a difficult dystocia have been associated with the development of cervical tears. The inability of the cervix to close properly will potentially result in a chronic uterine infection. Digital examination of the cervix is very valuable for evaluation, and the laceration may not be evident on visual examination. I like to evaluate the cervix during diestrus, because it is easier to identify the injury within the fibromuscular layer. Surgical repair of large cervical lacerations is needed to restore the future fertility of a mare. Surgical repair should be delayed until three to four weeks after parturition. I generally prefer to perform the surgery during diestrus. This surgery requires long instruments, a good head light and a dorsal speculum.

In most cases, cervical lacerations are repaired with the mare standing in stocks using epidural anesthesia. Tears that involve the dorsal aspect of the cervix are easier to repair in standing mares. Tears that involve the ventral aspect of the cervix are generally more difficult to repair with the mare in a standing position. The cervix is retracted caudally using either stay sutures or cervical retractors. I prefer stay sutures placed on each side of the defect. The edges of the defect are debrided using long-handled scissors and closed using a two- to three-layer closure. The goal of the surgical repair is to create a cervical os that one finger can be passed through easily.

Tears that involve the ventral aspect of the cervix are generally more difficult to repair because of lack of visibility of this area. In some cases, the temperament of the mare or a small vestibule (limiting visualization) makes standing surgical repair difficult. If the cervical repair is not successful, the mare will continue to be infertile.
Secure closure of ventral cervical lacerations can be achieved by positioning the mare into a Trendelenburg position. The hind quarters of the mare are elevated using a hoist system. These tears can be easily and efficiently repaired in this position.

Post-operatively, mares are treated with broad-spectrum antibiotics and nonsteroidal anti-inflammatory agents. Recommendations are made to digitally apply antiseptic or antibiotic ointments to the cervix every couple days for ten to 14 days to ensure the cervical os remains patent. Prognosis is generally good but this depends on the size and location of the cervical tear. The mare become pregnant after a cervical repair, but the mare still may not be able to carry the foal to term. The cervical repair may not be able to withstand the weight of the pregnancy which can result in the development of placentitis in the last trimester.

References