How to Manage Cervical Incompetence by Application of a Cervical Cerclage Suture in the Pregnant Mare

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Placement of a cerclage suture over the caudal os of the cervix can effectively restore cervical closure in pregnant mares at risk of anatomical or functional incompetence, unresponsive to progestagen supplementation. Author's address: Qatar Racing and Equestrian Club, Muaither Rayyan, PO Box 7559, Doha, Qatar; e-mail: stefbucca@gmail.com.

1. Introduction

Cervical incompetence in the mare is widely recognized as a major cause of pregnancy failure. Failure to attain adequate closure during pregnancy is a key predisposing factor to ascending placentitis. In humans, cervical insufficiency is of major concern[1] and can result in preterm birth and late-term abortions, similar to observations in mares. Emerging clinical[2,3] and laboratory-based evidence[4] suggests that focusing on the uterine cervix may provide significant elements of diagnostic value to identify patients at risk for preterm delivery, offering guidelines to implement preventive intervention.[5] A variety of techniques have been used in human medicine to address cervical incompetence, including medical therapy with progesterone, cervical cerclage, and the placement of a cervical pessary,[6–8] some of which may be applicable in the mare. A recent study in human medicine compared vaginal progesterone versus cerclage, with the use of placebo/no cerclage as the control treatment.[9] The authors concluded that progesterone and cervical cerclage are equally effective for the prevention of preterm birth and adverse perinatal outcomes in patients with a short cervix and history of preterm birth.

A common treatment strategy used on mares that have previously lost a foal because of placentitis or that have anatomical abnormalities in the caudal reproductive tract making them at risk of ascending placentitis is to administer an antimicrobial, a non-steroidal anti-inflammatory drug and altrenogest daily until delivery of the foal.[10] The shortcoming of this treatment is that mares may still have a preterm delivery/fetal loss with histopathological evidence of ascending placentitis despite treatment. This report describes a technique for cervical cerclage applied to a population of mares with known cervical incompetence.

2. Materials and Methods

Six cervical cerclage procedures were carried out on four mares. Two mares underwent the cerclage procedure during two successive pregnancies. Three of the four mares were aged Thoroughbreds and the fourth was a 9-year-old Arabian mare. Cervical incompetence was detected through serial

NOTES

Table 1. Historical and Gestational Parameters of Six Cervical Cerclage Procedures

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Age, years	17	18	19	21	14	9
History of pregnancy loss	2 years	N/A	3 years	N/A	1 year	None
Gestation at initial diagnosis, days	220	205	170	154	218	213
Gestation at cerclage suture, days	234	226	191	183	240	226
Gestation at parturition, days	339	344	362	371	348	328

ultrasound examinations.[11] The gestational age at the time of diagnosis varied between mares but ranged from 5 to 8 months of gestation.

Case 1, a 17-year-old Thoroughbred mare, presented a 2-year history of abortion and a histopathological diagnosis of ascending placentitis despite weekly administrations of altrenogest and antimicrobials, each month of gestation. Case 1 was presented at 220 days of gestation for investigation of her history of pregnancy loss. Premature cervical ripening was evident on ultrasound examination, and a cerclage suture was placed at 234 days of gestation, after 2 weeks of increased altrenogest administration (of 0.088 mg/kg twice daily) with no improvement in ultrasound cervical parameters.

Case 2, the same mare as in case 1, the year after her first cervical cerclage treatment, was monitored for ultrasound evidence of cervical ripening from day 120 of gestation. Signs of cervical ripening were detected 205 days after ovulation, with cervical parameters progressing from grade 3 to grade 4[11] despite altrenogest administration. Cervical cerclage was then carried out.

Case 3, a 19-year-old Thoroughbred mare, had a 3-year history of pregnancy loss and histopathological evidence of ascending placentitis despite altrenogest/antimicrobial treatment administration. Signs of cervical ripening were detected at day 170 of gestation, and a cervical cerclage suture was placed 21 days later.

Case 4, same mare as in case 3, the year after her first cervical cerclage treatment, showed evidence of cervical ripening at day 154 of gestation and was treated with cervical cerclage after 3 weeks of altrenogest administration, with no improvement in cervical parameters.

Case 5 was initially presented for intermittent vaginal bleeding at approximately 7 months of gestation. The source of bleeding was readily identified in some vestibular varicosities and promptly corrected, but ultrasonography of the caudal reproductive tract showed evidence of premature cervical ripening. Case 5 had already been placed on altrenogest and antimicrobial treatment by the referring veterinarian because of the mare's history of abortion caused by ascending placentitis the previous year. After cervical assessment with evidence of premature cervical relaxation, treatment with altrenogest continued at an increased dose of 0.088 mg/kg twice daily for 3 weeks. A cervical cerclage suture was placed at day 240 of gestation because of the persisting state of cervical relaxation and the significant increase in the combined thickness of the utero-placental unit (CTUP) at the cervical pole (11 mm).

Case 6, a 9-year-old Arabian mare at her second gestation, was referred for mild signs of early mammary development at 7 months of gestation. The mare had a history of stillbirth and dystocia the previous year. She had been bred naturally very late that year and was not checked for pregnancy afterward.

No abnormalities were detected on clinical examination of the mare, but, on rectal palpation, the cervix was short and fibrotic. Ultrasonography of the caudal reproductive tract per rectum revealed a short (<6 cm) cervical canal with disrupted central linear striation and a heterogeneous echo pattern of the muscular layer. An area of increased CTUP (12.4 mm), markedly hypoechoic, was identified at the cervical pole, extending rostrally to the caudal body of the uterus for 6 to 8 cm. Transabdominal feto-placental evaluation was unremarkable. Ascending placentitis associated with cervical incompetence was suspected and was probably related to cervical damage received during dystocia correction the previous year. A cervical cerclage suture was placed 13 days after initial diagnosis.

Table 1 summarizes historical and gestational parameters relevant to the procedure.

Technique

The application of a purse-string suture over the vaginal os of the cervix was carried out on the sedated mare that was restrained in stocks. The mare's rectum was evacuated and the tail wrapped and tied to one side. The perineum was surgically scrubbed and dried. Sedation was administered before the procedure (detomidine HCL[a] 0.02 mg/kg in association with butorphanol tartrate[b] 0.04 mg/kg). The mare's cervix was visualized with the use of a modified Finochietto retractor (Fig. 1). The cervix was then grasped with long-handled Knowles forceps (Fig. 2). A purse-string suture was placed with the use of long-handled instruments and a single-stranded No. 2 nylon suture (Fig. 3). Three partial-thickness bites (avoiding penetration of the cervical lumen), approximately 1.5 to 2 cm long, were applied to the circumference of the external cervical os, starting dorsally at the

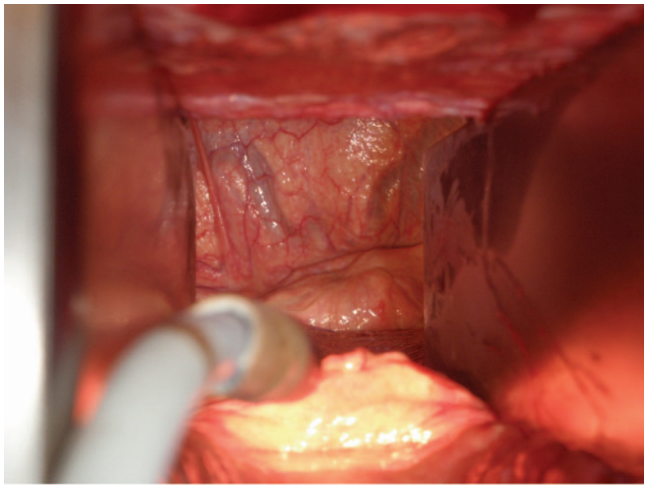

Fig. 1. The cervix is visualized through the use of modified Finochietto retractors.

Fig. 3. Placement of a purse-string suture over the vaginal os of the cervix, with the use of long-handled instruments and single-stranded No. 2 nylon suture.

2 o'clock position to end at the 11 o'clock position (Fig. 4). The length of the bites varied according to the state of relaxation of the cervical os and therefore its size. The knot was electively tied in an upper position (11 to 1 o'clock positions) to facilitate removal at the appropriate time.

Antimicrobials, non-steroidal anti-inflammatory drugs, and altrenogest were administered perioperatively and continued for about 5 days after intervention. After cerclage placement, treated mares were kept under close observation for signs of impending parturition, while cervical parameters and cerclage suture were monitored by transrectal ultrasonography. The cerclage suture was removed at the mare's due date or in the presence of early mammary development. Suture removal was performed in the standing sedated mare, restrained in stocks, with the use of long-handled scissors and Finochietto retractors (Figs. 5, 6, and 7).

3. Results

After cervical cerclage, all mares delivered live foals. Foals survived to at least 1 year of age. Serial evaluation of the caudal reproductive tract did not reveal abnormalities (placental changes, cervical shortening) after cerclage sutures were placed. Post-foaling inspection and examination at foal heat were also unremarkable for potential complications of the cerclage procedure.

4. Discussion

Cervical incompetence in the mare is commonly associated with difficulty conceiving or carrying a foal to term and is widely recognized as a major cause of

Fig. 2. The cervix is grasped with the use of long-handled Knowles forceps.

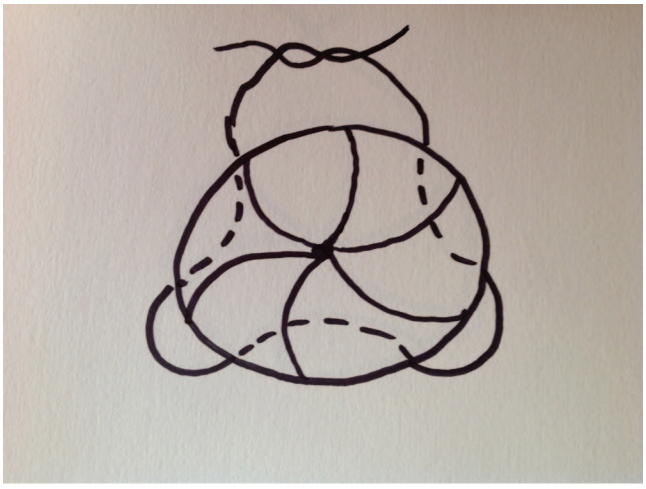

Fig. 4. Schematic drawing of the placement of a cervical cerclage suture.

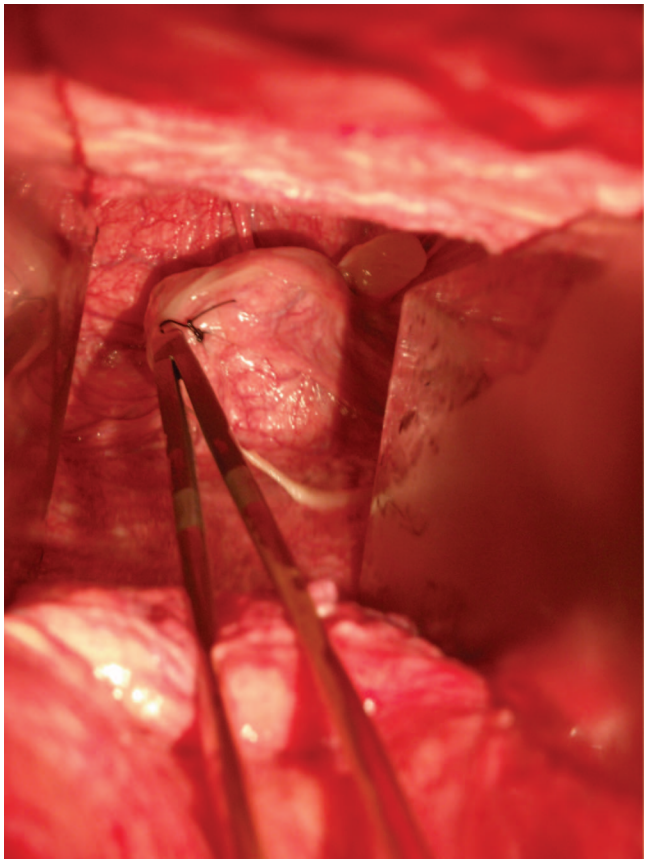

Fig. 5. Cerclage suture removal. The suture is grasped with the use of a long-handled needle holder.

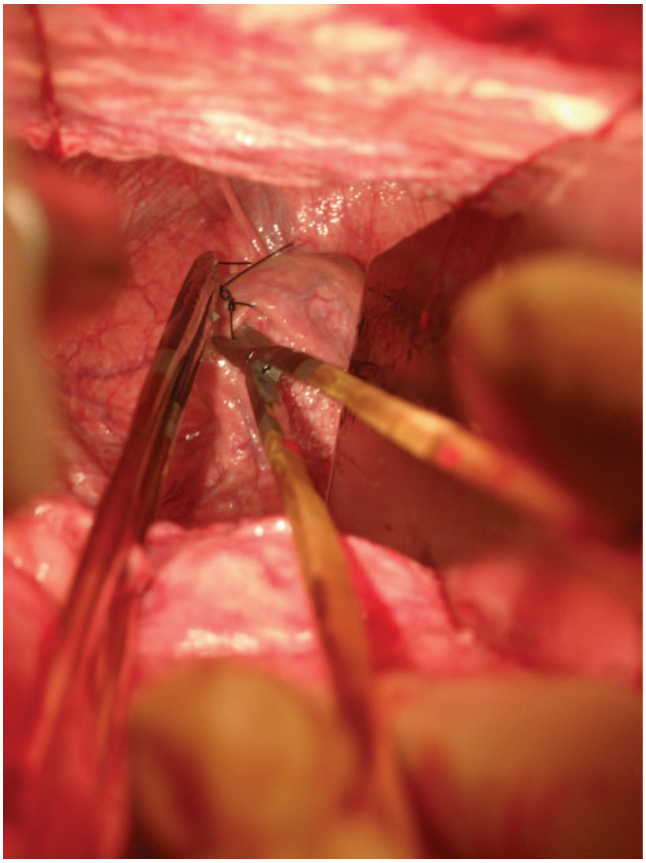

Fig. 6. Cerclage suture removal. The suture is cut with the use of long-handled scissors.

pregnancy failure. Yellon et al[12] have appropriately referred to the cervix as the "gatekeeper for pregnancy." The cervix functions as the final and most cranial barrier to ascending aggressors because it separates the uterine lumen from vaginal content. Failure of the cervix to form a functional barrier will expose the uterine environment to physical, chemical, or biological challenges from the caudal reproductive tract and predispose the mare to chronic endometritis and ascending placentitis. Cervical incompetence recognizes anatomical and functional origins. In humans,[13] it has been reported that remodeling of the cervix occurs slowly over a length of time and that the progressive changes in the cervix precede the uterine contractions by several weeks in normal pregnancy.[14] Similar conclusions may be drawn from the results of a recent study on the ultrasonographic features of the equine pregnant cervix.[11] The study indicates that in the mare, evidence of cervical remodeling leading to ripening may be observed during the last 2 months of gestation, with gradual changes in size and echotexture. Cervical ripening entails changes in cellular structure and molecular biology of the cervical cells,[14] and this gradual process will alter the mechanical attributes of the cervix, with a certain degree of variability among individuals. Premature remodeling/ripening of the cervix and shortening of the cervical canal may be suggestive of preterm birth, on the basis of loss of mechanical support and because the bacterial flora of the caudal genital tract is moved closer to the fetal membranes overlaying the internal os. Cervical ripening causes utero-placental instability at its interface, with resulting areas of detachment, hemorrhage, and inflammatory change, radiating from the cervical pole. Avillous detached areas may prolapse into the inner cervical os, under the mechanical forces of fetal extremities and fetal fluid pressing on it. Large detached areas may create a marked "funneling" effect, in which the free allantochorion may prolapse through the length of the cervical canal and become exposed to microorganisms ascending from the vagina, through the relaxed cervix. Premature cervical ripening may be a transient phenomenon and may spontaneously resolve; it may be observed in pregnant mares recovering from systemic disease and/or post-surgery. Gestation will progress undisturbed to term, providing that the local inflammatory process subsides and microorganism colonization of the allantochorion at the cervical pole is prevented.

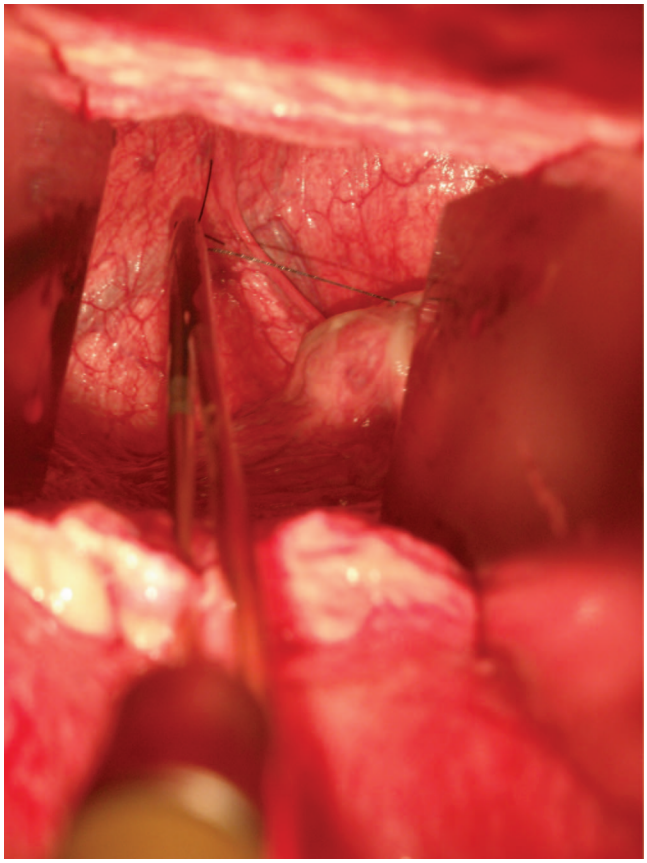

Fig. 7. Cerclage suture removal. The suture is gently pulled out.

Changes of the utero-placental unit at the cervical pole may be detected by transrectal ultrasonography as a consequence of premature cervical ripening in the mare, suggestive of ascending placentitis. The presence of sonographically identifiable collections of material referred to as "amniotic sludge," accumulated above the internal os, represents a correspondent change associated with adverse pregnancy outcome in women who have premature cervical ripening.[15] There is general agreement that some cases of premature cervical ripening are related to infection.[14] In humans, infection may account for up to one-third of preterm births, and the inflammatory response elicited by infectious agents has also become the accepted mechanism for preterm birth. In contrast, other instances associated with premature cervical ripening are attributed to less defined causes such as genetic background of the mother or fetus, environmental factors, intercurrent illness, or health conditions,[14] and this may very well hold true in the pregnant mare.

Progesterone is considered a key hormone for pregnancy maintenance, and a decline in progesterone action is implicated in the onset of parturition. If such decline occurs in the midtrimester in women, cervical shortening may occur, and this would predispose to preterm delivery. It is recognized that progesterone has a demonstrable effect on the rate of cervical shortening and preterm delivery when administered to women admitted for preterm labor between 25 and 33 +6 weeks of gestation.[16] A similar effect may be observed in mares with ultrasonographic evidence of premature cervical ripening during altrenogest supplementation, with significant improvement in cervical grading (author's observation) and gradual palpable increases in cervical tone and length. In the author's experience, failure to respond to altrenogest supplementation is the major indication for cervical cerclage in cervical incompetence cases, particularly when increments in CTUP are observed at the cervical pole. Mares that have chronic medical conditions, endocrine imbalances, and toxic disorders have been observed to show ultrasound evidence of premature cervical relaxation, even under progestagen supplementation (personal communication). Under these circumstances, a cervical cerclage procedure is likely to prevent the development of ascending placentitis.

In the case series presented in this report, cases 1 and 3 showed the inadequacy of progestagen treatment alone in promoting adequate cervical competence, as histopathology of fetal membranes indicated ascending placentitis as the cause of pregnancy failure for the previous two gestations in case 1 and for the 3 preceding years for case 3. Placement of a cervical cerclage suture prevents exposure of the cervical lumen and ultimately of the allantochorion to aggressors from the caudal reproductive tract. It also provides a means of stabilizing and strengthening the cervix from the mechanical forces applied by fetal parts and fetal fluid volumes shifting back and forth during episodes of activity. Penetration of the cervical luminal mucosa during placement of the cerclage suture should be avoided because it may create an intralumenal inflammatory focus and the opportunity for bacterial colonization from the caudal reproductive tract. Particularly during episodes of cervical funneling, the allantochorion may advance toward the vaginal os of the cervix, with ample opportunity for bacterial contamination.

5. Conclusions

Focus on the uterine cervix may identify mares at risk for ascending placentitis/preterm delivery and may yield approaches to prevent it. Ultrasonographic monitoring of cervical parameters can be easily applied under field conditions and should be implemented in mares with a repeated history of preterm delivery and evidence of ascending placentitis, starting as early as 4 months of gestation. Placement of a cervical cerclage suture is warranted when progestagen supplementation fails to achieve adequate cervical closure and significant changes of the utero-placental unit take place at the cervical pole. Although no complications have been reported in association with cervical cerclage, close supervision of treated mares for signs of impending

parturition is of critical importance to prevent cervical damage in the case of untimely delivery with the suture still in place.

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