



NOTE

Theriogenology

Surgical repair of third-degree perineal lacerations with rectovestibular fistulae in dairy cattle: a series of four cases (2010–2018)

Reiichiro SATO^{1)*}, Nao KAMIMURA¹⁾ and Kazuyuki KANEKO²⁾¹⁾Laboratory of Farm Animal Internal Medicine, School of Veterinary Medicine, Azabu University, 1-17-71 Fuchinobe, Chuo-ku, Sagami-hara, Kanagawa 252-5201, Japan²⁾Laboratory of Obstetrics and Gynecology, School of Veterinary Medicine, Azabu University, 1-17-71 Fuchinobe, Chuo-ku, Sagami-hara, Kanagawa 252-5201, Japan

ABSTRACT. We describe the successful surgical repair of third-degree perineal lacerations with rectovestibular fistulae in four cases using the single-stage modified Aanes method with purse-string suture of the vaginal vestibule and rectum. Fistulae formation and dehiscence of the repair were not observed after surgery. Two cows had five calves and one cow had four calves after surgery. The pregnant cows delivered normally. Additionally, there was no dehiscence of the suture line during the subsequent parturition. The breeding and fertility results obtained after the surgery are presented. According to the results of the present study, the modified Aanes method for the repair of third-degree perineal lacerations with rectovestibular fistulae appears to have a good prognosis for fertility following surgery in cows.

KEY WORDS: cattle, modified Aanes method, perineal laceration, rectovestibular fistula, single-stage surgical technique

J. Vet. Med. Sci.

81(5): 703–706, 2019

doi: 10.1292/jvms.19-0004

Received: 5 January 2019

Accepted: 19 March 2019

Published online in J-STAGE:
2 April 2019

Perineal lacerations occur as a result of rapid extraction during delivery, fetal displacement, maternal-fetal disproportion [2, 3, 8, 10, 16] delayed parturition, or a large offspring during a primiparous delivery. These causes of perineal lacerations have been reported in humans [6], dogs [15], horses and cows [16].

These injuries are classified into first-, second-, and third- degree lacerations, according to the extent and severity of tissue damage [12].

First-degree perineal lacerations involve only the skin and vulvar mucous membrane. Second-degree perineal lacerations involve the skin, mucous membrane, and perineal body and constrictor vulvae muscles. Third-degree perineal lacerations involve structures damaged in a second-degree laceration in addition to the anal sphincter and all tissues between the vestibule or vagina and rectum [3].

Furthermore, fistulae may also form between the rectum and vagina (such as the rectovestibular fistulae and rectovaginal fistulae) as a result of failure of the surgical repair of third-degree perineal lacerations, breeding trauma, laceration during delivery, or perianal and perivulvar abscesses [6, 15].

Similar to third-degree perineal lacerations, rectovestibular fistulae and rectovaginal fistulae also cause fecal leak into the vagina. In addition, when the cervical canal is relaxed during estrus, the uterus is invaded by feces, and this leads to reduced reproductive performance. Therefore, in third-degree perineal lacerations with rectovestibular/rectovaginal fistulae, the purpose of surgery is to create a functional wall between the rectum and vagina or vaginal vestibule to prevent the decrease in reproductive rate as a result of fecal leakage into the vagina.

The surgical repair of third-degree perineal lacerations or rectovestibular fistulae has been the subject of several reports [1, 3, 11], and the procedures commonly used are the Goetz and the Aanes techniques [7, 11, 13, 18].

In horses, the Aanes method is performed in two separate stages, but in cows, a single-stage procedure is used, including the suture of three sections: the rectum, vagina, and rectovaginal septum.

In this paper, we report four cases of rectovestibular fistulae in cows, which were treated using a modified Aanes method involving the suture of only two sections (the vagina and rectovaginal septum) using purse-string sutures.

Between 2010 and 2018, three of the four cows described were treated in a field at Hokkaido, and one was admitted to the Azabu University Veterinary Teaching Hospital for the repair of third-degree perineal lacerations and rectovestibular fistulae. These experiments were performed in compliance with regulations of the Guide for Animal Care and Use Committee at Azabu University, School of Veterinary Medicine (No. 160516-10).

*Correspondence to: Sato, R.: r-sato@azabu-u.ac.jp

©2019 The Japanese Society of Veterinary Science



This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives (by-nc-nd) License. (CC-BY-NC-ND 4.0: <https://creativecommons.org/licenses/by-nc-nd/4.0/>)

Table 1. Preoperative and postoperative case records of 4 cows that underwent repair of the rectovestibular fistulae by modified Aanes method

Case No.	Breed	Age (year)	Parity	Causation	Lengths of laceration (cm)	Time interval between laceration and surgery (day)	Number of times of surgery	Postoperative complications	Calving after surgery
1	Holstein	2	1st	Maternal-fetal disproportion	11	35	1	None	5
2	Holstein	2	1st	Maternal-fetal disproportion	9	54	1	None	5
3	Holstein	3	2nd	Malposition	9	41	1	None	4
4	Holstein	3	2nd	-	10	38	1	Dihiscence	-
						100	2	Dihiscence	-
		4	3rd	-	10	140	3	Dihiscence	-
		5				676	4	Dihiscence	-
					924	5	None	Pregnant	

All cows were of the Holstein breed and their ages ranged from 2–3 years (mean=2.5 ± 0.6 years) at the time of laceration (Table 1).

Surgical technique: Food was withheld for 24 hr, although water was provided *ad libitum*. First, 7,300 IU/kg of procaine penicillin G (Kyoritsu Seiyaku Inc., Tokyo, Japan) was injected into the muscles 1 hr before surgery. The cows were restrained in a standing position. Local anesthesia consisted of a lumbar epidural injection of 0.1 mg/kg of 2% lidocaine hydrochloride (Pfizer Japan Inc., Tokyo, Japan) and 0.025 mg/kg of 2% xylazine hydrochloride (Selactar 0.2%; Bayer, Ltd., Tokyo, Japan) administered between the first and second lumbar vertebrae using the epidural needle (16G, 12 cm in length; Hakko Syoji, Tokyo, Japan). The tail was tied on one side. As much fecal material as possible was removed from the rectum. The perineal region and vaginal vault were cleaned by repeatedly flushing with 5% chlorhexidine hydrochloride according to standard surgical principles and were then thoroughly dried. Local anesthesia for the perineal region consisted of a subcutaneous injection of 10 ml 2% lidocaine hydrochloride (Pfizer Japan Inc.). After preparation of the perineal region, the modified Aanes technique (single-stage surgical technique) was used for suturing and closure of the lacerations.

First, stay sutures were placed on the disrupted dorsal commissure of the vulva, and the perineum was stretched to the left and right (Fig. 1A). The ventral aspect of the rectum and healed margin of the laceration on the dorsal aspect of the vagina, which were joined together, were dissected using an incision, and the area was divided into two parts: the vaginal side (vaginal shelf) and rectal side (rectal shelf) (Fig. 1B). The completed incision extended from the shelf formed by the intact rectum and vagina, along the scar-tissue margin, to the level of the dorsal commissure of the vulva. During the suture of the vaginal shelf, the area between the two shelves was expanded by 3 to 5 cm towards the right and left sides to allow the two shelves to face each other, while ensuring that the suture was not too tight. After the margin of the vaginal shelf was grasped with an intestinal forceps, the left and right shelves were juxtaposed to each other. To ensure that there was no eversion of the vaginal shelf, closure was performed starting from the cranial side of the vaginal shelf by continuous horizontal mattress sutures using 2–0 polydioxanone (PDS) (Fig. 2A).

The cavity, which had formed between the vaginal shelf and rectal shelf, was sutured using 2–0 PDS after ensuring that no rectal mucosa remained inside. The suture was essentially in a purse-string pattern, passing through the rectal submucosa, perivaginal tissue, and vaginal submucosa on both sides of the common vault (Figs. 1C and 2B). Sutures were not placed in the rectal mucous membrane. The skin of the perineum and lips of the vulva were closed by using No. 0 nylon sutures to make simple horizontal mattress patterns (Fig. 1D). The skin sutures were removed approximately one week after the surgery.

Postoperative care included daily cleaning of the suture line with slightly acidic electrolyzed water for five days after the sealing of the suture line. Injectable kanamycin sulfate (Kanamycin, Meiji Seika Pharma Co., Ltd., Tokyo, Japan) was injected intramuscularly at a rate of 1,000 mg/kg for five days, and flunixin meglumine (flunixin, Meiji Seika Pharma Co., Ltd.) was injected intravenously at a rate of 2 mg/kg for three days. After surgery, the cows were fed normal diet.

Rectovaginal laceration occurred during parturition. The clinical records of all the cows are presented in Table 1. The mean length of the rectovestibular fistulae in the four cows was 9.7 ± 1.2 cm (range; 9–11 cm).

One of the four cows (No. 4) developed perineal lacerations during the second parturition (when it was three years old) and was surgically treated 38 days after delivery by a referring veterinarian. However, dehiscence of the suture site occurred approximately two weeks after surgery, and the animal was re-operated on 62 days after the first surgery (100 days after delivery). However, even after the second surgery, dehiscence recurred approximately three weeks later. Thus, a third operation was performed 102 days after the first surgery (140 days after delivery), but the dehiscence recurred approximately three weeks later. The owners decided against surgical repair and performed artificial insemination while carrying out vaginal irrigation. As a result, the cow became pregnant. Thirty days after the third parturition (676 days after occurrence of the initial laceration), surgical repair was performed by a referring veterinarian (for the fourth time), but dehiscence recurred two weeks later. Even after the return of estrus, the cow exhibited infertility due to vaginal contamination with feces. Therefore, the animal was sent to the Azabu University Animal Hospital (Fig. 3). After admission, the fifth surgical repair was performed (924 days after the occurrence of the initial laceration), and after surgery, the clinical course was favorable with no dehiscence of the surgical wound. Thus, the animal was discharged on day 26 after the fifth surgery.

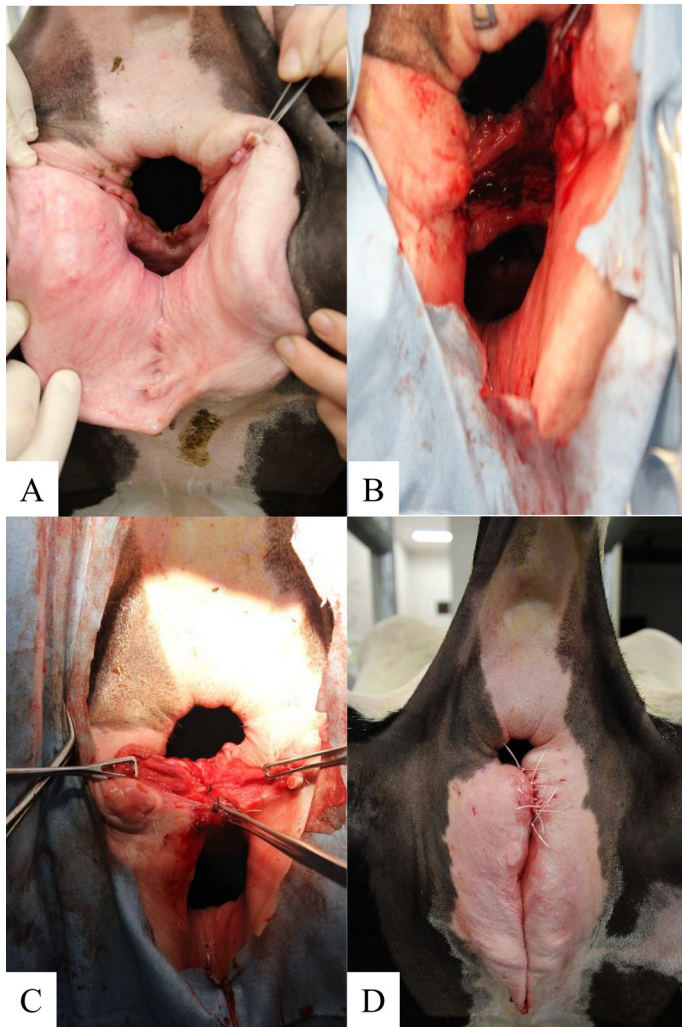


Fig. 1. Stay sutures were placed to tie the disrupted dorsal commissure of the vulva, and the perineum was expanded towards the right and left sides (A). The ventral aspect of the rectum and the healed margin of the laceration on the dorsal aspect of the vagina, which were fused together, were dissected using an incision that divided the area into the following two parts: the vaginal side (vaginal shelf) and the rectal side (rectal shelf) (B). The cavity that formed between the vaginal shelf and the rectal shelf was sutured in a purse-string pattern (C). The skin of the perineum and lips of the vulva were closed with simple horizontal mattress sutures using a No. 0 nylon suture (D).

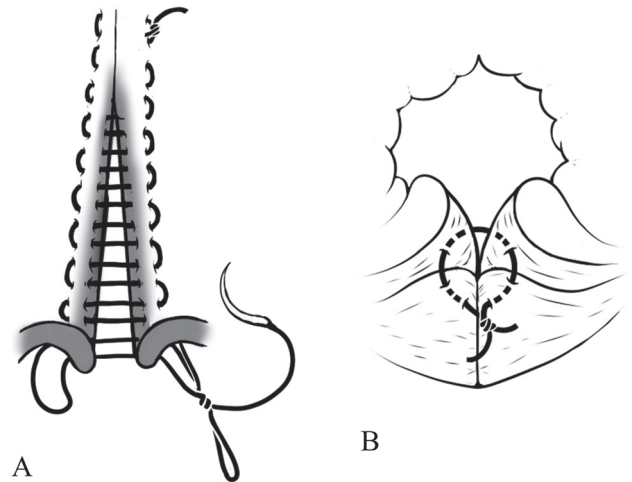


Fig. 2. Schematics of the suture technique. The vaginal roof was closed with continuous horizontal mattress sutures (A). The cavity that formed between the vaginal shelf and the rectal shelf was sutured in a purse-string pattern (B).



Fig. 3. The third-degree perineal laceration and rectovestibular fistulae in the fourth cow.

Third-degree perineal lacerations with rectovestibular fistulae in four cows were repaired successfully, and perineal conformation was improved by the surgical technique. Fistula formation and dehiscence of the repair were not observed after surgery in any of the four cases.

The time interval between the last parturition and first surgery was 35 to 54 days. The pregnant cows delivered normally, and there was no dehiscence of the suture line during the subsequent parturition. The breeding and fertility results obtained after surgery are presented in Table 1.

In horses, the Aanes method is conventionally performed in two separate stages because their feces are hard. In contrast, cow feces are soft and place less stress on suture lines during defecation, permitting a single-stage procedure [3, 5, 7]. Previously, the Aanes method was performed using suturing in three sections (the rectum, vagina, and rectovaginal septum). Herein, we report a single-stage modification of the Aanes technique which involves the use of purse-string sutures in only two sections (the vagina and rectovaginal septum). This resulted in favorable outcomes in four cows with rectovestibular fistulae.

First-degree perineal lacerations usually require no medical treatment. However, in deep and severe injuries, perivaginal adipose tissue from the site of injury may protrude into the vagina. As a result, necrosis and infection may occur, leading to an ascending infection which may affect the reproductive and urinary tracts. Therefore, local or systemic administration of antimicrobial

agents may become necessary in first-degree perineal lacerations. Similar to third-degree perineal lacerations, vulvar and perineal functions can also be impaired in second-degree perineal lacerations, allowing air and feces to enter the vagina, and making it impossible for the vagina to be sterile. Thus, second-degree perineal lacerations may also require surgical repair [7, 11, 18].

Further, failure of the surgical repair of third-degree perineal lacerations may lead to the formation of fistulae between the rectum and vagina, such as rectovestibular fistulae and rectovaginal fistulae [6, 15]. In horses, a strong expulsive force during delivery and fetal rotation from a dorso-ventral position to a dorso-sacral position can cause overstretching of the lateral and upper walls of the birth canal [4, 9, 14], and in most cases, this causes third-degree perineal lacerations and rectovestibular fistulae [11, 18]. In cows, the position of the fetal limbs during delivery is different from that in horses, and as a result, second-degree perineal lacerations often occur, but rectovestibular fistulae are uncommon [5].

In horses, postoperative complications include urine pooling, complete dehiscence of the repair, constipation, tenesmus, and reduced performance [10]. In addition, dehiscence of the surgical wound is the most common postoperative complication of third-degree perineal lacerations and can develop regardless of the type of surgical repair [10]. To prevent postoperative complications, surgery was delayed for four to six weeks after injury. This allowed for resolution of the inflammation associated with acute trauma (such as edema and necrosis) and for contraction and epithelialization of the tissue used for shelf reconstruction [3]. In horses, the muscles under the perineum and anal sphincter muscle are tight, and horse feces is hard. Thus, if the surgical repair is performed in a single stage, dehiscence of the suture line may occur postoperatively due to the strain associated with defecation. For these reasons, the Aanes method is performed in two separate stages. A sufficient anal size can be secured by an interval of approximately two weeks between the first and second stages of surgery. Moreover, controlling the fecal hardness as well as the amount of feces through the use of laxatives and relevant forage during this time interval [2, 17] prevents the suture line from being overstretched [1, 7], thus facilitating defecation [10]. However, given that cow feces are softer than those of horses, and considering the perioperative pain experienced by the animal, it is preferable to minimize the number of operations and sutures. We therefore modified the Aanes method to a single-stage procedure that we used successfully in cows.

In our case series, third-degree perineal lacerations and rectovestibular fistulae were repaired successfully using the modified Aanes method (single-stage surgical technique), and there was no dehiscence of the suture line or fistula formation afterwards. Additionally, none of the cows that produced foals after the initial injury suffered a perineal laceration during subsequent foaling. According to the results of the present study, the single-stage surgical technique for the repair of third-degree perineal lacerations and rectovestibular fistulae appears to have a good prognosis for subsequent fertility in cows.

ACKNOWLEDGMENTS. The authors thank M. Tayama for preparing the figures, and the staff and student assistants at Azabu University for caring for the heifer during hospitalization. This work was partially supported by a research project grant awarded by the Azabu University Research Services Division.

REFERENCES

1. Aanes, W. A. 1964. Surgical repair of third-degree perineal laceration and rectovaginal fistula in the mare. *J. Am. Vet. Med. Assoc.* **144**: 485–491. [Medline]
2. Colbern, G. T., Aanes, W. A. and Stashak, T. S. 1985. Surgical management of perineal lacerations and rectovestibular fistulae in the mare: a retrospective study of 47 cases. *J. Am. Vet. Med. Assoc.* **186**: 265–269. [Medline]
3. Dreyfuss, D. J., Tulleners, E. P., Donawick, W. J. and Ducharme, N. G. 1990. Third-degree perineal lacerations and rectovestibular fistulae in cattle: 20 cases (1981–1988). *J. Am. Vet. Med. Assoc.* **196**: 768–770. [Medline]
4. Frazer, G. S., Perkins, N. R. and Embertson, R. M. 1999. Normal parturition and evaluation of the mare in dystocia. *Equine Vet. Educ.* **11**: 41–46. [CrossRef]
5. Gilbert, R. O., Susan, C. C., Fubini, S. L. and Steiner, A. 2017. Surgery of the bovine reproductive system and urinary tract. pp. 478–482. *In: Farm Animal Surgery 2nd ed.* (Fubini, S. L. and Ducharme, N. G. eds.), Elsevier, St. Louis.
6. Greenwald, J. C. and Hoexter, B. 1978. Repair of rectovaginal fistulas. *Surg. Gynecol. Obstet.* **146**: 443–445. [Medline]
7. Hendrickson, D. A. 2007. Equine urogenital surgery. pp. 179–184. *In: Techniques in Large Animal Surgery, 3rd ed.* (Hendrickson, D. A. eds.), Blackwell, Ames.
8. Hudson, R. S. 1972. Repair of perineal lacerations in the cow. *Bov. Pract.* **7**: 34–36.
9. Jeffcott, L. B. and Rosedale, P. D. 1979. A radiographic study of the fetus in late pregnancy and during foaling. *J. Reprod. Fertil. Suppl.* **27**: 563–569. [Medline]
10. Kazemi, M. H., Sardari, K. and Emami, M. R. 2010. Surgical repair of third-degree perineal laceration by Goetz technique in the mare: 7 cases (2000–2005). *Iran. J. Vet. Res.* **11**: 184–188.
11. LeBlanc, M. M. 1999. Diseases of the vagina, vestibule and vulva. pp. 1175–1193. *In: Equine Medicine and Surgery, 5th ed.* (Colahan, P. T., Mayhew, I. G., Merritt, A. M. and Moore, J. N. eds.), Mosby, St. Louis.
12. Noakes, D. E. 2009. Injuries and diseases incidental to parturition. pp. 308–312. *In: Veterinary Reproduction and Obstetrics 9th ed.* (Noakes, D. E., Parkinson, T. J. and Gary, C. W. eds.), Elsevier, London.
13. Phillips, T. N. and Foerner, J. J. 1998. Semitransverse closure technique for the repair of perineal lacerations in the mare. *Proc. Ann. Conv. Am. Assoc. Equine Pract.* **44**: 191–193.
14. Purohit, G. N. 2011. Intrapartum conditions and their management in the mare: A review. *J. Livest. Sci.* **2**: 20–37.
15. Soderberg, S. F. 1986. Vaginal disorders. *Vet. Clin. North Am. Small Anim. Pract.* **16**: 543–559. [Medline] [CrossRef]
16. Straub, O. C. and Fowler, M. C. 1961. Repair of perineal lacerations in the mare and cow. *J. Am. Vet. Med. Assoc.* **138**: 659–664.
17. Vaughan, J. 1986. Equine urogenital systems. pp. 756–775. *In: Current Therapy in Theriogenology, 2nd ed.* (Morrow, D. A. ed.), Saunders, Philadelphia.
18. Woodie, B. 2006. The vulva, vestibule, vagina and cervix. pp. 845–852. *In: Equine Surgery, 3rd ed.* (Auer, J. A. and Stick, J. A. eds.), Saunders, Philadelphia.