

Case Report

Paraphimosis of 7 years' duration in a Percheron stallion

Peyton Draheim^a, Sophie Boorman^b, Reid Hanson^c, Candace Lyman^c

^aHagyard Equine Medical Institute, Lexington, KY, USA

^bVirginia-Maryland Regional College of Veterinary Medicine, Blacksburg, VA, USA

^cCollege of Veterinary Medicine, Auburn University, Auburn, AL, USA

Abstract

A 15-year-old Percheron stallion was presented to Auburn University Veterinary Teaching Hospital for evaluation of paraphimosis of 7 years' duration. Available history indicated that the paraphimosis was subsequent to a kick injury that occurred 7 years prior. Vital parameters were within normal limits. The penis and prepuce were markedly fibrotic and swollen, extending to the level of the distal tarsus, and evidence of chronic penile exteriorization was present. Due to apparent lack of penile sensation and the chronicity of the lesion, phallectomy and castration were recommended. Distal phallectomy via the Williams' technique was performed under general anesthesia, concurrently with closed castration. No excessive intraoperative hemorrhage was noted. Within 30 min postoperatively, the patient experienced mild hemorrhage from the stoma. Around 12 h post-surgery, the gelding exhibited dull mentation, pale mucous membranes, tachycardia, and tachypnea. The gelding was administered infusions of aminocaproic acid, 0.05% formalin, and a whole blood transfusion. By the following afternoon, packed cell volume had increased from 18 to 22% and total solids increased from 5.0 to 6.8 g/dL; vital parameters were within normal limits. The gelding was discharged 5 days postoperatively with normal vital parameters. Medications included phenylbutazone, trimethoprim sulfamethoxazole, and Red Cell®. Follow up telephone consultation with the owner several months postoperatively indicated the gelding had made a full recovery. This case describes resolution of a severely protracted paraphimosis and successful management of common, albeit concerning, postoperative complications.

Keywords: Paraphimosis, stallion, phallectomy, castration, penile paralysis, hemorrhage

Introduction

Paraphimosis is the inability of the animal to retract the penis into its normal position within the prepuce. Known causes of paraphimosis in the horse include trauma during breeding, debilitation and malnourishment, equine herpesvirus-1 infection, unresolved priapism, rabies, and administration of phenothiazine-derivative tranquilizers, most commonly acepromazine.¹ Regardless of the initial cause, the ultimate consequence of paraphimosis is accumulation of edema that is then exacerbated by gravity. The increased weight of the prolapsed and edematous penis and internal lamina of the prepuce can lead to chronic stretching of the internal pudendal nerves, resulting in permanent penile paralysis. In order to resolve paraphimosis and prevent penile paralysis, prompt treatment is warranted. While some cases may be resolved with medical management, more protracted and severe cases generally require surgical intervention. This paper describes the treatment and management of postoperative complications of chronic paraphimosis in a stallion.

History and physical examination

A 15-year-old Percheron stallion was presented to Auburn University Veterinary Teaching Hospital (AUVTH) for evaluation of paraphimosis of 7 years' duration. Available history indicated that the paraphimosis was subsequent to a kick injury that occurred 7 years prior. Due to a recent change in ownership, no further history was available other than the horse's current vaccination status. Vital parameters and mentation were within normal limits. The stallion had a body condition score of 3 on a 9-point scale. A complete blood count, chemistry panel, and fibrinogen were performed and were within normal limits. The preoperative packed cell volume (PCV) was 32% with a total solids (TS) of 8.7 g/dL. The penis and prepuce were markedly fibrotic and edematous, extending to the level of the distal tarsus, and the penile epithelium was thickened, friable, and cool to the touch (Figure 1). There was a lack of response by the stallion when a firm pinch was applied to the penile epithelium, suggesting nerve damage. Due to the apparent lack of sensation and the extreme



Figure 1. Color photograph of a 15-year-old Percheron stallion with chronic paraphimosis, with the distal end of the fibrosed penis extending to the level of the distal tarsus.

protracted nature of the paraphimosis in this case, partial phallectomy and castration were recommended.

Treatment

The stallion received preoperative antibiotics and anti-inflammatories (6.6 mg/kg gentamicin IV; 22,000 IU/kg procaine penicillin IM; 1.1 mg/kg flunixin meglumine IV). Following sedation with xylazine (1 mg/kg IV) and induction of general anesthesia with propofol (0.35 mg/kg IV) and ketamine (2.2 mg/kg IV), the patient was intubated and maintenance of anesthesia was accomplished with isoflurane in oxygen. The scrotum and penis were aseptically prepared and a stallion urinary catheter was placed (Figure 2). The use of electrocautery and an Esmarch tourniquet at the base of the penis provided hemorrhage control intraoperatively. A urethrostomy was created by making three separate 3cm-long incisions, forming a triangular-shaped wedge on the ventrum of the penis with the apex of the triangle directed proximally (Figure 3). The urethral catheter was removed and a stoma was created by apposing the urethral mucosa to the preputial epithelium with simple interrupted sutures (2-0 poliglecaprone 25) (Figure 4). The penis was then amputated approximately 5 mm distal to the urethrostomy site (Figure 5). A simple interrupted suture pattern provided compression and closure of the corpus cavernosum around the urethral lumen. Prior to final closure, the tourniquet was removed to observe for and repair focal areas of hemorrhage. Finally, a closed castration was performed routinely with Serra emasculators (Figure 6). No excessive intraoperative hemorrhage was noted.



Figure 2. Color photograph of the surgical field during sterile preparation for distal phallectomy and castration. Roll gauze has been used to secure the distal penis to a hoist to provide traction throughout the procedure.

Following an uncomplicated recovery from anesthesia, the gelding experienced mild postoperative hemorrhage from the penile stoma shortly after standing and swelling of the penile stump was noted (Figure 7). Vital parameters at this time were unremarkable. Around 12 h postoperatively, the patient was observed to have dull mentation, pale mucous membranes, tachycardia (72 beats per minute), and tachypnea (32 breaths per minute), though no active blood loss from the penile stump was noted during this time. The PCV and TS at this time were 18% and 5.0 g/dL, respectively. The gelding was administered intravenous infusions of aminocaproic acid (3.5 mg/kg/min for 15 min, then 0.25 mg/kg/min as a continuous rate infusion), 0.05% formalin (50 mL 10% neutral buffered formalin diluted in 1 L of isotonic fluids),² and received an unmatched whole blood transfusion (7 L). Within 12 h of initiating treatment, physical parameters stabilized. There was not a significant amount of blood within the gelding's stall; total estimated blood loss from the penile stump was 0.5 L. Transabdominal ultrasonographic examination did not reveal the presence of increased free fluid within the abdomen. By the following afternoon, the PCV had increased from 18 to 22% and the TS had increased from 5 to 6.8 g/dL; vital parameters remained within normal limits. The gelding was discharged 5 days post-surgery with normal postoperative physical exam findings and a PCV of 16%. Medications dispensed for continued administration at home included phenylbutazone (1.5 g PO q12 h), trimethoprim sulfamethoxazole (TMS; 30 mg/kg PO q12 h), and an oral



Figure 3. Color photograph of the urethrostomy site. The incision extends to the level of the stallion urinary catheter (indicated by the asterisk). The distal end of the penis is at the top of the image.

vitamin-iron-mineral supplement (Red Cell[®]; 30 mL PO q12 h). Recommendations provided to the owners included stall rest, daily hydrotherapy of the scrotum, and brief hand walks twice daily to manage postoperative scrotal edema.

Four days after discharge, the owners returned the gelding for assessment citing concerns of dull mentation; vital parameters were within normal limits except for a mild tachycardia (56 beats per minute). The urethral stoma appeared to be healing appropriately. The PCV was 16% and TS was 7.4 g/dL at presentation. The gelding remained stable throughout observation and was discharged 2 days later. Recommendations included continued stall rest and hydrotherapy in addition to application of Femycin ointment (lanolin, dexamethasone, and oxytetracycline) to the prepuce twice daily. An update provided by the owners several months after surgery indicated that the gelding had fully recovered and was being used under saddle (Figure 8).

Discussion

This case report describes the successful treatment of chronic paraphimosis in an aged stallion. The size of the penis, the poor condition of the horse, and the chronicity of the condition likely contributed to the postoperative anemia. This case highlights the need for judicious postoperative monitoring following phallectomy; it may be worth considering blood transfusions if the penis to be removed is particularly large.



Figure 4. Color photograph of the urethrostomy site after the urethral mucosa was sutured to the penile epithelium with absorbable simple interrupted sutures. The distal end of the penis is at the top of the image.

The horse in this case report was diagnosed with chronic paraphimosis, in which an animal is unable to retract the flaccid penis into the prepuce. Initially, the penis of the affected horse may appear slightly rigid rather than flaccid, which may lead to the premature and erroneous diagnosis of priapism rather than paraphimosis. This rigidity is due to the rapid pooling and clotting of blood within the corpus cavernosum penis (CCP), which occurs within 2–5 h of the inciting event.³ Priapism, which differs from paraphimosis in that it is a persistent erection, is primarily due to stasis of blood within the CCP, caused either by an excessive volume of arterial inflow or impeded venous outflow. A case of priapism may progress to paraphimosis if left untreated, as the protruded penis becomes edematous and the combination of muscle fatigue and stretching of the pudendal nerves leads to an inability of horse to retract the penis. Priapism may be managed with injection of diluted phenylephrine into the CCP, irrigation of the CCP with heparinized saline, or the creation of a shunt from the CCP to the corpus spongiosum penis (CSP).¹ Paraphimosis may be successfully managed medically if a diagnosis is made and treatment is initiated promptly. Medical treatment of paraphimosis differs from that of priapism, highlighting the importance of an accurate diagnosis in cases of chronic penile protrusion. Managing paraphimosis should focus on resolving the inciting cause, mitigating preputial edema, and preventing further trauma of exposed tissues.⁴ In this case, medical treatment was not attempted due to the severe chronicity of the disease.



Figure 5. Color photograph of the urethrostomy site post-transection of the distal penis and prior to compression of the CCP. The Esmarch tourniquet (asterisk) has not yet been removed.

The stallion in this report presented with extensive damage to the body of the penis. Paraphimosis results in prolonged exposure of the penis and prepuce which exacerbates edema and promotes muscle fatigue and pudendal nerve damage; the exposed epithelium becomes inflamed and friable, predisposing the underlying loose connective tissues to bacterial invasion. Infection of the underlying tissues leads to fibrosis, which permanently inhibits the normal telescoping action of the prepuce.⁵ Replacement of the penis into the preputial cavity is essential in resolution of the condition. A common method of retaining the penis within the prepuce involves the use of a probang device, which has been previously described.⁶ The use of a purse string suture or towel clamps to narrow the preputial orifice has also been described, though these methods tend to cause more inflammation to the already vulnerable prepuce.⁴ The degree of inflammation and edema dictates whether or not penile repulsion will be initially possible or if reduction of edema must be accomplished before the penis can be replaced within the prepuce.

If the penis cannot be replaced, methods of reducing edema include compressive elastic bandaging (i.e., Esmarch), manual massage under sedation or anesthesia, topical application of a hyperosmolar agent, and systemic administration of non-steroidal anti-inflammatories. Another method has been described whereby a 5-liter pressure infusion bag was applied over the prolapsed penis and prepuce in order to provide constant pressure. The amount of pressure may be adjusted as edema wanes without necessitating removal of the device.⁷



Figure 6. Color photograph of the surgical sites post-phallectomy and post-castration. The penile stump has been returned to its normal placement within the prepuce and sheath.

The use of an abdominal sling or bandage to maintain the penis and prepuce in a less dependent position is also useful in preventing the accumulation of further edema. The relatively inelastic preputial ring may act as a constrictor band and prevent replacement of the penis into the preputial cavity. In these cases a preputiotomy may be performed, whereby the preputial ring is incised longitudinally to relieve this constricting effect. The incision is left open to heal by second intention.⁸ If penile paralysis develops subsequent to paraphimosis, erectile function is likely permanently lost; however, affected stallions should retain the ability to ejaculate and may be trained to ejaculate with the aid of manual stimulation.⁹ Successful chemical ejaculation of a stallion with penile paralysis has also been reported.¹⁰ In the described case, the severe and protracted nature of the paraphimosis negated the consideration of any medical treatment options.

Many options have been reported for surgical management of paraphimosis. The Williams' technique of partial phallectomy under general anesthesia was performed in this case. Other surgical methods of distal phallectomy include the Vinsot and Scott's.^{11,12} The Vinsot technique is largely similar to the described Williams' technique, though contrary to the Williams' technique, the apex of the triangular urethrostomy is directed distally rather than proximally. A modified Vinsot technique of partial phallectomy has also been described that can be performed in the standing sedated horse, negating the need for general anesthesia in debilitated horses or in cases where client finances are a constraint.¹³ The standing method was not selected in this case due to the size of the penis and



Figure 7. Color photograph of the postoperative swelling of the penile stump.



Figure 8. Color photograph taken several months postoperatively. The gelding had improved in body condition since hospitalization.

the risk of hemorrhage. Finally, Scott's technique of partial phallectomy involves the creation of a circumferential incision at the intended site of transection. Dissection is

continued to the level of the urethra. A segment of the urethra, approximately 4–5 cm in length, is dissected away from the distal end of the penis and is ultimately stretched over the end of the penis and sutured to the penile or preputial epithelium.¹² The reason that the William's technique was selected in this case was to minimize the chances of postoperative formation of a urethral stricture at the urethrostomy site, as the other described techniques pose a higher risk of stricture formation.

The horse in this case was castrated under the same anesthetic episode as the distal phallectomy. When castration is indicated in a case of paraphimosis, it is typically performed several weeks prior to phallectomy to minimize the chances of the horse obtaining an erection post-phallectomy, which increases the chances of significant hemorrhage from the surgical site. However, in the described case, the client was reluctant to have the horse undergo two separate episodes of general anesthesia for financial reasons. Further, the horse's size and age gave the surgical team reason to reduce the number of anesthetic episodes. While castration can also be performed in the standing horse,¹⁴ the age of this stallion and size of the testicles necessitated meticulous ligation of the spermatic cord vasculature, which is more efficiently accomplished with the horse in dorsal recumbency under general anesthesia.

Postoperatively, this horse presumably experienced significant hemorrhage from the surgical site(s), as evidenced by the altered physical examination findings noted at 12 h postoperatively. However, there was not an abnormal amount of blood found in the stall, nor was any free fluid noted on transabdominal ultrasound. These findings make the question of where exactly the hemorrhage originated from, or where the resultant frank blood went, a perplexing one. It has thus been postulated that rather than an overt hemorrhagic event, the gelding's PCV decreased so dramatically as a result of the acute removal of a significant pool of blood within the fibrosed penis. Alternatively, it is possible that the horse was actually dehydrated on presentation with a PCV of 32% and a TS of 8.7 g/dL, as this TS value is slightly above the published reference range for draft horses (6.4–8 g/dL) but the PCV is within the reference range (24–42%).¹⁵ Intravenous fluids during and after surgery could have thus led to hemodilution and signs of anemia. When the intravenous administration of amino-caproic acid failed to alleviate clinical signs, intravenous formalin was administered, and ultimately a 7 L whole blood transfusion was performed. Perhaps prophylactic intraoperative administration of whole blood, rather than postoperative once the horse was showing signs of shock, would have prevented the occurrence of such complications. However, blood transfusions are rarely necessary in these cases, and as the patient was clinically stable with an adequate PCV prior to surgery (32%), there was no indication for such measures.

Conclusion

This report describes the successful surgical treatment of an extremely protracted case of paraphimosis in a mature stallion, as well as the management of significant postoperative complications. When treated appropriately and in a timely manner, paraphimosis can be resolved and the horse can return to normal function. However, if allowed to progress, penile paralysis may result and may require surgical management. Due to the high degree of vascularity of relevant anatomy, there is a risk of hemorrhage associated with partial phallectomy as well as with routine castration. This case demonstrates that these complications can be managed

successfully and the horse may return to normal function with appropriate postoperative care.

References

1. Sprayberry KA, Lu KG: Managing reproduction emergencies in the field: Part 1: injuries in stallions; injury of the external portion of the reproductive tract and gestational conditions in the mare. *Vet Clin Equine* 2021;37:339–366. doi: 10.1016/j.cveq.2021.04.007
2. Moreno CR, Delph KM, Beard WL: Intravenous formalin for treatment of haemorrhage in horses. *Equine Vet Educ* 2021;33:460–465. doi: 10.1111/eve.13451
3. McDonnell SM: Managing the paralyzed penis, priapism or paraphimosis in the horse. *Equine Vet Educ* 2005;17:310–311. doi: 10.1111/j.2042-3292.2005.tb00398.x
4. Schumacher J, Varner DD: Abnormalities of the penis and prepuce. In: McKinnon AO, Squires EL, Vaala WE, et al: editors. *Equine Reproduction*. 2nd edition, Ames; Wiley-Blackwell: 2011. p. 1130–1144.
5. Simmons HA, Cox JE, Edwards GB, Neal PA, Urquhart KA: Paraphimosis in seven debilitated horses. *Vet Rec* 1985;116:126–127. doi: 10.1136/vr.116.5.126
6. Koch C, O'Brien T, Livesey MA: How to construct and apply a penile repulsion device (Probang) to manage paraphimosis. *Proceedings of American Association of Equine Practitioners, Las Vegas, 2009 December*; p. 338–341.
7. Brouwer ED, Ribera T, Climent F, et al.: Alternative method to facilitate resolution of paraphimosis after penile trauma in the horse. *Equine Vet Educ* 2017;29:655–658. doi: 10.1111/eve.12556
8. Walker DF: Surgery of the penis. In: Walker DF, Vaughan JT, editors. *Bovine and Equine Urogenital Surgery*, Philadelphia, PA; Lea & Febiger: 1980. p. 10.
9. Love CC, McDonnell SM, Kenney RM: Manually assisted ejaculation in a stallion with erectile dysfunction subsequent to paraphimosis. *J Am Vet Med Assoc* 1992;200:1357–1359.
10. Feary DJ, Moffett PD, Bruemmer JE, et al.: Chemical ejaculation and cryopreservation of semen from a breeding stallion with paraphimosis secondary to priapism and haemorrhagic colitis. *Equine Vet Educ* 2005;17:299–304. doi: 10.1111/j.2042-3292.2005.tb00396.x
11. Schumacher J, Varner DD: Surgery of the penis and prepuce. In: McKinnon AO, Squires EL, Vaala WE, et al: editors. *Equine Reproduction*. 2nd edition, Ames; Wiley-Blackwell: 2011. p. 1130–1144.
12. Schumacher, J: Penis and prepuce. In: Auer JA, Stick JA: editors. *Equine Surgery*. 4th edition, St. Louis; Elsevier/Saunders: 2012. p. 840–866.
13. Arnold CE, Brinsko SP, Love CC, et al.: Use of a modified Vinsot technique for partial phallectomy in 11 standing horses. *J Am Vet Med Assoc* 2010;237:82–86. doi: 10.2460/javma.237.1.82
14. Kilcoyne I, Watson JL, Kass PH, et al: Incidence, management, and outcome of complications of castration in equids: 324 cases (1998–2008). *J Am Vet Med Assoc* 2013;242:820–825. doi: 10.2460/javma.242.6.820
15. Gelsler DR, Goble DO, Held JP: Normal hematology and serology of the Clydesdale draft horse. *Equine Prac* 1984;6:7–11.