UDC: 636.1.09:616.681-089.85(497.75)"2016/2024"
Professional paper

FIELD CASTRATION TECHNIQUE FOR STALLIONS AND TREATMENT OF POSTOPERATIVE COMPLICATIONS

Nesim SEFERI[1]*, Dashmir MAMUTI[1], Abduraman SEJRANI[2]
[1]Faculty of Agriculture and Biotechnology - study program - Veterinary Medicine
University of Tetova
[2]High School "Mosha Pijade" - Tetova
[*]*Corresponding author e-mail:* nesim.seferi@unite.edu.mk

Abstract

In my many years of practice as a doctor of veterinary medicine, I have performed the castration of many mixed breed stallions, aged 2-12 years, who have undergone surgical castration in the field.
This study included castrations from 2016 to 2024. During this 9-year period in the field, we performed the castration of 210 horses, 3 mules, and two donkeys, that is, a total of 215 animals. The castration was performed on a flat, clean, and wide surface with dust-free grass. In the castrations of stallions, the Roma method was used to knock the horse down. Previously, Acepromazine (Castran) 1 ml per 100 kg of body weight was applied and Metamizole (Castralgin) 40-50 mg per kg of body weight was used as an analgesic once (which corresponds to 8-10 ml of Castralgin per 100 kg of body weight). Castration was prepared by the owner, who was recommended to call for help at least three people who would help in the fall with a rope and fixation of the stallion during the surgical operation of castration. After the animal was fallen, the hind limbs were tied with a rope. The testicles were checked, their position, size, shape and consistency. After it was established that there were no morphological changes in the testicles, the surgical field was disinfected with Betadine 10% skin solution (povidone-iodine: 10%). The testicles were well fixed with one hand and the skin of the the scrotum with a scalpel, from an incision in each testicle. After cutting the skin with a scalpel, the testicles were removed with an emasculator, an instrument that simultaneously compresses and cuts the spermatic cord with its surfaces.

Keywords: Castration, emasculators, anesthesia, spermatic cord, complications.

1. Introduction

Castration of stallions is a surgical procedure to remove the male sex glands - the testicles. The procedure is most often performed to reduce aggressive and unpredictable behavior in horses that are not intended for breeding. Although the procedure is considered routine, various postoperative complications can occur, including excessive swelling and edema, hemorrhage, infection, omental hernia, evisceration, hydrocele, or septic peritonitis (Kilcoyne I, Watson JL, Kass PH, et al. 1998–2008), (Kilcoyne, 2013). In a recent retrospective study, 10% of horses undergoing routine, elective castration experienced complications related to the procedure (Kilcoyne, 2013). Seventy-six percent of these complications were classified as minor and did not require emergency treatment (Kilcoyne, 2013). Although the vast majority of horses that experience complications are successfully treated without long-term adverse effects, the increased morbidity and cost associated with additional veterinary care for a procedure that is perceived as "routine" often results in additional practitioner distress and client dissatisfaction. For any surgical procedure, it is more desirable to minimize the occurrence of postoperative complications than to deal with the morbidity, time, and effort associated with their management. A thorough understanding of the relevant clinical anatomy, strict attention to asepsis and surgical technique, and appropriate recommendations for postoperative exercise will minimize the incidence of complications associated with castration. (Kilcoyne, 2013), (Schumacher J. 2012). However, when complications arise, the physician must be able to recognize them quickly and treat them appropriately and aggressively to ensure a rapid and

https://doi.org/10.62792/ut.jasrd.v3.i5-6.p3171

successful outcome. Although a comprehensive discussion of the relevant male equine anatomy is beyond the scope of this presentation, the principles of proper surgical technique, perioperative care, and recognition and management of common complications associated with equine castration will be discussed.

2. Castration techniques

In general, there are three castration techniques, open, closed, or semi-closed, and each procedure has advantages and disadvantages. The open castration technique involves cutting the parietal tunic and leaving the parietal tunic open after castration. Cutting the parietal tunic exposes the caudal ligament of the epididymis, cutting this ligament releases the testis and epididymis from the parietal tunic. The testis and epididymis are then removed using the emasculator. With this technique, the parietal tunic remains open, creating a possible passage to the abdominal cavity; however, this technique requires the least dissection and can be performed with the horse sedated standing or lying down.

With the closed castration technique, the parietal tunic is dissected free from the scrotal fascia. The parietal tunic is not cut and is removed along with the testis and epididymis. Castration The closed castration procedure seals the parietal tunic either by the action of the emasculator or by using proximal ligature. The closed castration technique eliminates any possible communication between the abdominal cavity and the scrotal incision. Closed castration with proximal transfixing ligature is advised in cases that are at higher risk of evisceration (Schumacher, 2019).

The semi-closed castration technique involves isolating the tunica parietal from the scrotal fascia (as for closed castration) and then making an incision through the tunica parietal at the distal end of the spermatic cord. The testis, epididymis, and a portion of the blood vessels and spermatic cord are exposed through the incision, with the spermatic vasculature and cord either clamped or tied and cut. The tunica parietal is then removed along with the testis and epididymis. The tunica parietal can be clamped and cut separately from the testicular vessels and ductus deferens or sutured closed. This technique has the highest incidence of complications (Kilcoyne et al., 2013; Moll et al., 1995) likely due to increased tissue handling, contamination, and surgical time. Closed and semi-closed castration techniques can be performed standing, but are more often performed with the horse in lateral or dorsal recumbency under anesthesia.

Surgical access to the testis is most commonly achieved through a scrotal incision, which is left open to heal by secondary intention. Primary closure of the scrotal incision, when performed under aseptic conditions, reduces infection, edema, and signs of pain (Barber, 1985; Palmer & Passmore, 1989) and is also particularly useful for horses that cannot be exercised after castration, such as when there is concurrent lameness or when another castration procedure is being performed at the same time. In the castration of stallions, we have used the open technique, except for three cases where we have used the closed technique.

3. Material and methods

Complications

Complications can occur within minutes, hours, days, months, or even years after castration. The severity of complications ranges from those that are not bothersome to the horse but are distressing to the owner (hydrocele or persistent undesirable behavior) to mild complications that resolve with minimal intervention (edema, scrotal infection), to severe and life-threatening complications (hemorrhage, evisceration, septic peritonitis) (Rosanowski et al., 2018).

Although castration is considered a routine surgical procedure, reported case fatality rates range from 0.3% to 1% (Kilcoyne et al., 2013; Mason et al., 2005).

The most common complication after almost all castrations is **preputial** and **scrotal swelling** (Mason et al., 2005; Moll et al., 1995; Rosanowski et al., 2018). It has been reported to occur in up to 70% of castrations. The incidence of postoperative swelling is caused by many factors. Insufficient drainage, inadequate postoperative exercise, excessive tissue trauma, poor surgical technique, postoperative infection, excessive movement during surgery, and bleeding in the first 24 hours are all risk factors for postoperative swelling (Hodgson & Pinchbeck, 2019; Mason et al., 2005). Daily vigorous exercise and hydrotherapy should be started the day after castration to promote drainage and prevent closure of the scrotal wound. This helps significantly reduce the amount of swelling.

Scrotal swelling and **scrotal infection** are often mistakenly considered to be a single problem, as a castrated stallion may have a swollen but not clinically infected scrotum. This complication usually occurs 2-6 days after surgery and may present with only local signs of infection, including a warm, painful scrotal swelling with discharge, or horses may present with local and systemic signs of illness and infection, including numbness, anorexia, high fever, cellulitis, lameness, and umbilical discharge.

The most common immediate postoperative complication encountered after castration is **hemorrhage** or excessive bleeding. The incidence of excessive bleeding after castration is 1.8%-2.4% (Carmalt et al., 2008; Kilcoyne et al., 2013; Moll et al., 1995). The most common source of post-castration hemorrhage is the testicular artery (Cox, 1987), but the testicular vein and large cutaneous vessels can also result in significant hemorrhage.

Preoperative risk factors include older horses and donkeys, as these animals have larger spermatic vessels and a higher incidence of excessive post-castration hemorrhage (Hodgson & Pinchbeck, 2019; Sprayson & Thielmann, 2007). Intraoperative risk factors include sterility impairment, difficult surgical access, intrascrotal or tunica hematoma, poor surgical technique, malfunctioning emasculators, or inappropriate use of the emasculator (Hodgson & Pinchbeck, 2019; Mason et al., 2005; Schumacher, 2005). Inappropriate emasculator use includes inverted emasculator application, excessive tissue placed within the jaws of the emasculator (including scrotal skin), application of the emasculator at an angle, and insufficient application time. Improperly constructed or serviced emasculators, such as those that are too sharp, can result in the spermatic cord being severed before it can be adequately clamped.

An uncommon but potentially fatal complication of castration is **evisceration** or disembowelment. Evisceration refers to the passage of the intestines through the scrotal incision. Evisceration usually occurs immediately or within 4 hours after castration (Hunt & Boles, 1989; Hutchins & Rawlinson, 1972) but has been reported to occur 7–12 days (Boussauw & Wilderjans, 1996; Thomas et al., 1998). Horses less than 6 months of age are believed to be at higher risk for evisceration due to the potential persistence of a congenital inguinal hernia (Marien et al., 2001). A previous study reported that the overall incidence of this complication is low (0.2%). There are only two options for a horse that has eviscerated: euthanasia or anesthesia and surgical reduction of the small intestine.

Another complication, **septic funiculitis**, is an infection of the spermatic cord. Infection of the spermatic cord is called septic funiculitis and can be a consequence of scrotal infection. A sclerotic cord is a spermatic cord that is chronically infected with pyogenic bacteria (Schumacher, 2019). Risk factors include older horses (Duggan et al., 2021), intra- or postoperative bleeding, open castration techniques (Schumacher, 2019), and infection of the scrotal incision (Claffey et al., 2018). This can occur from the extension of the scrotal infection, especially if the scrotal cavity is not properly drained. Contaminated emasculator or ligature can also cause this condition. Clinical signs include preputial and scrotal edema, pain, fever, and sometimes lameness.

Septic peritonitis, or infection of the serous lining of the abdominal cavity, can occur after castration because the cavity surrounding the testicles (vaginal cavity) communicates with the abdomen (peritoneal cavity). Infection after castration has the potential to result in a contagious infection leading to peritonitis. Although rare, it can occur. Signs include abdominal pain, fever, increased heart rate, diarrhea, and weight loss. In all of the castrations performed by the study author, this complication did not occur.

Hydrocele is a rare, idiopathic accumulation of peritoneal fluid within the parietal tunica or vaginal sac, which can occur months or years after castration (Schumacher, 2019). Hydroceles only form after open castration techniques due to the retention of the parietal tunic (Cox, 1987). It is a painless, fluid-filled swelling in the scrotum that can develop months to years after castration and can become quite large (ranging from the size of a tennis ball to the size of a soccer ball). The condition is uncommon, but appears to be more common in mules than in horses. The cause is unknown. If the swelling does not increase in size and does not cause discomfort to the horse, no treatment is necessary. Otherwise, the hydrocele can be surgically removed.

Finally, **continued stallion-like behavior** sometimes occurs in horses after castration. Libido declines slowly over the 56 days following castration (Thompson et al., 1980), but castration does not guarantee the elimination of male behavior, and stallions may exhibit stallion-like behavior, including mounting and rearing after castration (Cox, 1986). This is a common undesirable outcome with 20%–30% of stallions castrated before or after sexual maturity still exhibiting stallion-like behavior (Line et al., 1985). Historically, persistent stallion-like behavior has been attributed to incomplete resection of the epididymis; however, the epididymis does not produce or release androgens and is therefore not the source of hormone-driven behavior (Cox, 1986; Line et al., 1985).

However, continued stallion-like behavior can occur if the surgeon mistakenly removes the epididymis instead of the testicle (Trotter & Aanes, 1981). When investigating a stallion that exhibits stallion-like behavior, it should be determined whether the behavior is congenital or whether incomplete castration has been performed. Treatment of persistent stallion-like behavior when complete castration is certain may be limited to limiting social interaction with other horses and more aggressive handling (Cox, 1987). However, persistent stallion-like behavior can occur if the surgeon mistakenly removes the epididymis instead of the testicle (Trotter & Aanes, 1981).

4. Results and discussions

In our 9-year study (20216-2024) a total of 215 stallions of different ages, from 2-12, were included in the castration of stallions (Castratio equi). The number of stallions that underwent castration surgery varied in certain years. We castrated more stallions in 2024, a total of 34 stallions, while fewer in 2020, a total of 15 stallions (Table 1).

Table 1. Number of stallions castrated in years expressed as a percentage

Year	Number of of castrated heads	Percentage %
2016	23	10.69
2017	18	8.37
2018	16	7.44
2019	26	12.09
2020	15	6.97
2021	27	12.55

2022	30	13.95
2023	26	12.09
2024	34	15.81
	Total heads = 215	100%

When complications occur, it is important that the client or veterinarian recognizes them early and that they are treated promptly and appropriately to minimize prolonged morbidity and client dissatisfaction.

From Table 2. it can be seen that the most dominant postoperative complications were those of excessive swelling or preputial edema, with 21 cases or a percentage of 9.76% of all castrations in the years of the study. We have recommended daily vigorous exercise to the owners, which should be started the day after castration to promote drainage and prevent closure of the scrotal wound. This has significantly helped to reduce the amount of swelling.

All horses that we castrate had some degree of preputial and scrotal edema, but in some cases, the swelling was quite pronounced.

Almost all horses experience bleeding after castration. However, if the bleeding does not subside after remaining still for 15-30 minutes, then your veterinarian should be contacted. The appropriate steps we have taken depend on the information confirmed to us by the owner regarding the amount, degree and duration of bleeding. Treatment has included clamping the spermatic cord with forceps, ligating the spermatic cord with sutures and re-clamping it with an emasculator. In cases where it has not been possible to identify the spermatic cord, we have filled the scrotum with gauze and secured it in place with towel clips. Once the bleeding has been brought under control, it is recommended that the horse be kept quiet in the stable and the scrotal area not be disturbed for 24 to 48 hours. In our practice, excessive bleeding has occurred in stallions that have been over 6 years old. However, we have treated all cases in time by stopping the bleeding by treating the wound and applying antihemorrhagics. However, two cases have ended in fatality due to bleeding, a donkey, which was 11 years old, and a horse, also 11 years old.

Table 2. Types of complications and number of heads with complications

Types of complications	Number of heads with complications	Percentage %
Scrotal swelling and seroma	21	9.76
Hemorrhage	8	3,72
Evisceration	0	0
Septic funiculitis	7	3,25
Septic peritonitis	0	0
Hydrocele formation	2	0,93
Continued stallion-like behaviour	5	2,32
Lethal outcome	2	0.93
No complications	170	79,0
	Gjithsej krerë = 215	100%

Complications of septic funiculitis, in our practice we have had 7 cases. The owners reported that the wound did not close and that the spermatic cord was thickened. Surgical removal of the affected cord was treated. Surgical treatment involved removal of the infected segment of the spermatic cord with or without ligature and the wound was left open to heal by secondary intention. We have resolved these conditions with antibiotic therapy and restoration of drainage, but occasionally, we have also removed the infected stump. In cases of non-treatment, the scrotum can heal, but the stump remains infected. Then the spermatic cord stump usually enlarges with granulation tissue and abscesses, resulting in drainage of the sinus tracts. Clinical signs include preputial and scrotal edema, pain, fever and sometimes lameness.
In our study of these years we have had two cases with hydrocele, which presented to us 2 months after castration. We have removed both with minor surgical intervention.
We had 5 cases of persistent stallion-like behavior. All cases were checked for any deviations during the castration process, but no deviations were noted. Only in one case did stallion-like behavior continue for a long time, up to 6 months after castration, but then the horse calmed down.

5. Conclusion

Complications of castration vary in frequency and severity and can be challenging to manage. A good understanding of the anatomy, surgical options, and management of complications will promote better outcomes for our current cases of triplets.
In our long-standing practice, we have used the open technique, with only a few specific cases using the semi-closed technique.
Castration remains one of the most common surgeries performed by equine veterinarians. Complication rates vary across studies, but remain relatively high with 10% to 28% of horses experiencing some form of complication and continues to be a major source of malpractice lawsuits against equine veterinarians. In our study, of a total of 215 castrations performed, complications occurred in up to 21%.
Complications of castration vary in frequency and severity and may require treatment of complications to promote better outcomes for our current castration cases. Complications include swelling, hemorrhage, evisceration, septic funiculitis, hydrocele formation, and persistent male behavior. While the most common of these complications is swelling or edema, proper postoperative care, including exercise and hydrotherapy, will reduce the risk of this occurring. Fortunately, the other complications mentioned are rare. If any of these problems are suspected after castration, the veterinarian who performed the castration should be notified.

Reference

[1]. Barber, S.M. (1985) *Castration of horses with primary closure and scrotal ablation.* Veterinary Surgery, 14, pp. 2–6.
[2]. Boussauw, B. & Wilderjans, H. (1996) *Inguinal herniation 12 days after a unilateral castration with primary wound closure.* Equine Veterinary Education, 8, pp. 248–250.
[3]. Carmalt, J.L., Allen, A.L. & Tucker, R.L. (2008) *Evaluation of common vaginal tunic ligation during field castration in draught colts.* Equine Veterinary Journal, 40, pp. 597–598.
[4]. Claffey, M., Duggan, V., Prendergast, M. & O'Sullivan, P. (2018) *Surgical management of post-castration spermatic cord stump infection in horses: a retrospective study of 23 cases.* Veterinary Surgery, 47, pp. 1016–1020.
[5]. Cox, J.E. (1986) *Behaviour of the false rig: causes and treatments.* Veterinary Record, 118, pp. 353–356.
[6]. Cox, J.E. (1987) *Surgery of the reproductive tract in large animals.* Liverpool: Liverpool University Press.

[7]. Duggan, V.E., Claffey, M., McGovern, F. & O'Sullivan, P. (2021) *The clinical features and short-term treatment outcomes of scirrhous cord: a retrospective study of 32 cases.* Equine Veterinary Education, 33, pp. 430–435.
[8]. Hodgson, C. & Pinchbeck, G. (2019) *A prospective multicentre survey of complications associated with equine castration to facilitate clinical audit.* Equine Veterinary Journal, 51, pp. 435–439.
[9]. Hunt, R.J. & Boles, C.L. (1989) *Post-castration eventration in eight horses (1982–1986).* Canadian Veterinary Journal, 30, pp. 961–963.
[10]. Hutchins, D.R. & Rawlinson, R.J. (1972) *Eventration as a sequel to castration of the horse.* Australian Veterinary Journal, 48, pp. 288–291.
[11]. Kilcoyne, I., Watson, J.L., Kass, P.H. & Spier, S.J. (2013) *Incidence, management and outcome of complications of castration in equids: 324 cases (1998–2008).* Journal of the American Veterinary Medical Association, 242, pp. 820–825.
[12]. Line, S.W., Clarke, A.S., Nicol, C.J. & Hemmings, A. (1985) *Effect of prepubertal versus post-pubertal castration on sexual and aggressive behaviour in male horses.* Journal of the American Veterinary Medical Association, 186, pp. 249–251.
[13]. Marien, T., Wilderjans, H., Spaas, J.H. & Schauvliege, S. (2001) *Laparoscopic testis-sparing herniorrhaphy: a new approach for congenital inguinal hernia repair in the foal.* Equine Veterinary Education, 13, pp. 32–35.
[14]. Mason, B.J., Watkins, K.L., Doran, I. & Keen, J.A. (2005) *Costs and complications of equine castration: a UK practice-based study comparing "standing nonsutured" and "recumbent sutured" techniques.* Equine Veterinary Journal, 37, pp. 468–472.
[15]. Moll, H.D., Turner, T.A. & Pleasant, R.S. (1995) *A survey of equine castration complications.* Journal of Equine Veterinary Science, 15, pp. 522–526.
[16]. Palmer, S.E. & Passmore, C.A. (1989) *Midline scrotal ablation technique for unilateral cryptorchid castration in horses.* Journal of the American Veterinary Medical Association, 190, pp. 283–285.
[17]. Rosanowski, S.M., Rogers, C.W. & Cogger, N. (2018) *Open standing castration in Thoroughbred racehorses in Hong Kong: prevalence and severity of complications 30 days post-castration.* Equine Veterinary Journal, 50, pp. 327–332.
[18]. Schumacher, J. (1988) *Effects of castration on peritoneal fluid constituents in the horse.* Journal of Veterinary Internal Medicine, 2, pp. 22–25.
[19]. Schumacher, J. (2019) *Testis, Testis.* In: Auer, J.A., Stick, J.A., Kümmerle, J.M. & Prange, T. (eds.) *Equine Surgery.* 5th ed. Amsterdam: Elsevier Health Sciences, pp. 994–1034.
[20]. Trotter, G.W. & Aanes, W.A. (1981) *A complication of cryptorchid castration in three horses.* Journal of the American Veterinary Medical Association, 178, pp. 246–248.
[21]. Thompson, D.L., Garza, F. & St George, R.L. (1980) *Sexual behaviour, seminal pH and accessory sex gland weights in geldings administered testosterone and/or estradiol-17β.* Journal of Animal Science, 51, pp. 1358–1366.
[22]. (Duplicated citation removed — Kilcoyne et al. 2013 appears only once above.)