

# SURGICAL PROCEDURES - Castration

## *Preoperative Considerations*

A general physical examination of the horse should precede castration, and the scrotum, especially that of very young horses, should be inspected for inguinal herniation and for the presence of both testes. Discovery of inguinal herniation or cryptorchidism may affect the choice of anesthesia and the surgical approach. Preoperative sedation of a fractious horse usually permits safe palpation of the scrotal and inguinal areas and occasionally facilitates palpation of an inguinal testis by causing the cremaster muscles to relax.

## *Standing Castration*



Castration performed with the horse standing can be difficult and dangerous to the surgeon if candidates for the procedure are not selected prudently. Standing castration of horses with poorly developed testes and of ponies is mechanically difficult. Donkeys and mules can be dangerous to castrate while they are standing because of their athletic agility. Stallions that elicit a hostile or evasive response to genital palpation are best castrated while they are anesthetized. Docile stallions with well-developed testes whose genitalia can be palpated without being sedated are usually the safest candidates for standing castration.

## PREPARATION OF THE HORSE

Sedating the horse to be castrated while standing is optional but advised. Drugs commonly used, either alone or in combination, are xylazine HCl, detomidine HCl, pentazocine, and butorphanol tartrate. Acetylpromazine, although commonly administered to tranquilize stallions before castration, can result, on rare occasion, in priapism or penile paralysis, and so its use in stallions should be avoided. Additional information about standing restraint of the horse can be found in Chapter 22.

The scrotum must be anesthetized on each side of the scrotal raphe from the cranial to the caudal pole of the testis along the proposed lines of incision. The spermatic cords can be anesthetized by injecting lidocaine solution, usually 15 to 30 mL, through a 22- to 20-gauge needle directly into each cord. This anesthetic technique ensures good anesthesia of the cord but occasionally causes a hematoma that interferes with application of the emasculator. Alternatively, about 25 mL of

lidocaine solution (without epinephrine) can be injected directly into the parenchyma of each testis through an 18-gauge, 1½-inch needle. The anesthetic solution diffuses proximally into each spermatic cord. The horse's tail should be bandaged to prevent it from contaminating the surgical field, and the scrotum should be scrubbed before and after administering the local anesthetic solution.

## RESTRAINT

The horse should be restrained by a competent handler, and to ensure adequate immobilization, application of a lip twitch may be necessary. The standing castration should be performed with both the surgeon and the handler positioned on the same side of the horse, usually the left side for the right-handed surgeon. The surgeon should be positioned at the horse's shoulder well out of kicking range with his head and shoulder pressed firmly into the horse's flank.

Standing castration can be performed safely and efficiently if candidates are selected prudently, the horse is adequately sedated, the spermatic cord and scrotum are properly desensitized with a local anesthetic agent, and the surgeon is technically proficient. A standing castration requires less expense and assistance and is often less time-consuming because the surgeon need not wait for the horse to recover from general anesthesia. Risks to the horse that attend general anesthesia are avoided. Because the spermatic cords and scrotum are locally desensitized, measures to rectify immediate postoperative complications, such as hemorrhage, can be accomplished without anesthetizing the horse.

### *Recumbent Castration*

## ANESTHESIA

To castrate a horse in the recumbent position, a clean, safe area in which to anesthetize and recover the horse is a prerequisite. A variety of intravenous anesthetics, alone or in combination, can be administered to provide safe and predictable anesthesia of sufficient duration. A thiobarbiturate administered as a bolus produces rapid anesthesia characterized by moderate analgesia and muscular relaxation, particularly if the horse has been sedated with xylazine. Recovery is usually satisfactory if repeated administration of the thiobarbiturate is not necessary. Ketamine, administered after sedating the horse with xylazine, provides 10 to 15 minutes of surgical anesthesia. Muscular relaxation and analgesia are only moderate but can be enhanced if butorphanol tartrate or diazepam is added to the pre-anesthetic regimen. If necessary, anesthesia can be extended by readministering half the dosage of xylazine and ketamine.

### *Surgical Techniques*

Techniques of orchidectomy are the open, closed, and half-closed techniques, regardless of whether the horse is castrated while standing or recumbent, or whether the approach is inguinal or scrotal. With the open technique of castration, the parietal (or common vaginal) tunic is retained. With the closed and the half-closed techniques, the portion of the parietal tunic that surrounds the testis and distal portion of the spermatic cord is removed. Regardless of the technique, the scrotal skin is most commonly left unsutured to heal by second intention. When the skin is left unsutured, the castration is sometimes referred to as an open castration, adding confusion to the terminology associated with

castration. When the scrotal or inguinal skin is sutured, the castration is sometimes referred to as a closed castration. To avoid confusion, the terms *open* and *closed* should be used to describe whether the parietal tunic of each testis was removed and should not be used to describe whether the scrotal or inguinal wound was sutured.

## OPEN TECHNIQUE

When performing the open technique of castration, the parietal tunic of testis is incised. The ligament of the tail of the epididymis (caudal ligament of the epididymis), which attaches the parietal tunic to the epididymis, is severed or bluntly transected. By transecting the fold of the mesorchium and mesofuniculum, the testis, epididymis, and distal portion of the spermatic cord are completely freed from the parietal tunic and removed using an emasculator.



## CLOSED TECHNIQUE THROUGH A SCROTAL APPROACH

With the closed technique, the parietal tunic is not incised, so it also is removed along with the testis and a portion of the cord. Using digital dissection, the parietal tunic surrounding the testis is freed from the scrotal ligament and scrotal fascia. By placing mild traction on the testis with one hand, the parietal tunic surrounding the cord is then separated from fascia surrounding the spermatic cord with the other hand. After the parietal tunic is separated from the surrounding fascia, it and its contents are removed using an emasculator. Care should be taken, when separating the fascia from the spermatic cord, to include the large pudendal vessels that lie within the fascia, so that these vessels are not included in the jaws of the emasculator.

## HALF-CLOSED TECHNIQUE

The closed technique just described can be converted to a half- closed technique by making a 2- to 3-cm vertical incision through the exposed parietal tunic at the cranial end of the testis or the distal end of the spermatic cord. A thumb (the left thumb if the operator is right-handed) is inserted through the incision into the vaginal cavity. The testis and a portion of the spermatic vasculature are prolapsed through the incision by applying downward traction on the tunic with the thumb while simultaneously using the fingers of the same hand to push the testis through the incision. The fundus of the parietal tunic inverts and follows the testis through the incision because of its attachment to the testis by the ligament of the tail of the epididymis. Traction is applied to the parietal tunic with the index and middle fingers, which are placed into the sac formed by the inverted

fundus. Traction can also be applied to the parietal tunic and the testis by applying a large Carmalt or Allis forceps to the parietal tunic before prolapsing the testis from the vaginal cavity. The half-closed technique should be considered a closed technique because the parietal tunic is removed along with the testis and the distal portion of the spermatic cord.

## CONSIDERATIONS CONCERNING ALL TECHNIQUES

For each technique, the emasculator is applied at a right angle to the spermatic cord, loosely closed to avoid incorporating scrotal skin, and slid farther proximally. The emasculator is applied so that the crushing component is proximal to the cutting blade. When correctly applied, the wing-nut of the emasculator is oriented distal toward the testis, and the emasculator is said to be positioned “nut to nut.” The scrotal skin is pushed toward the abdomen with one hand (with the spermatic cord positioned between the index and middle fingers) toward the horse’s abdomen, and the jaws of the emasculator are inspected to ensure that they do not contain scrotal skin. The tension on the cord is relieved, and the handles of the emasculator are compressed completely to crush and, depending on the emasculator used, to sever the cord. The time that should elapse before the emasculator is removed from the spermatic cord depends on the size of the cord being severed and the dependability of the emasculator used, but applying the emasculator for about 2 minutes is usually sufficient to achieve hemostasis. If the cord is exceptionally large, the emasculator can be applied for a longer time, or the parietal tunic and cremaster muscle can be crushed and severed separately from the testicular vessels and the ductus deferens.

## SELECTION OF TECHNIQUE

An advantage of the closed and half-closed techniques of castration is that removal of the parietal tunic decreases the incidence of postoperative complications, such as septic funiculitis and hydrocele. The half-closed technique permits inspection of the components of the cord and allows a greater portion of the ductus deferens and testicular vasculature to be exteriorized.

The closed technique of castration has no advantage over the open technique in preventing evisceration if a ligature is not applied to the cord proximal to the site of transection. The closed and half-closed techniques are indicated for disease conditions that may involve the parietal tunic, such as neoplasia and orchitis. The closed and half-closed techniques require more dissection than does the open method of castration, and this may be a disadvantage when performing a standing castration on a fractious stallion.

## **Cryptorchid Castration**

A retained testis can be removed through an inguinal, parainguinal, suprapubic paramedian, or flank approach. For each of these approaches, except the flank approach, the horse must be anesthetized.

### *Selection of Approach*

The paramedian and flank approaches allow removal of only an abdominal testis, because retraction of an inguinal testis into the abdomen can usually be accomplished only with difficulty. Abdominal testicular retention should be confirmed before either of these approaches is used, but often the testicular location cannot be determined reliably. The inguinal approach allows removal of either an abdominal or an inguinal testis. Because an inguinal testis is quickly encountered using an inguinal approach, prior determination of testicular location is not necessary. If the testis is not encountered in the inguinal canal using an inguinal approach, the testis can be removed from the

abdomen noninvasively through the vaginal ring or through a small parainguinal incision in the abdominal musculature.

Because the inguinal and parainguinal approaches allow removal of an abdominal testis through a finger-sized abdominal perforation, surgery is rapid, and convalescence is short. The lengthy incision required for the suprapubic paramedian and flank approach prolongs surgery and convalescence. The paramedian approach also increases the risk of postoperative evisceration or herniation. Rarely, an invasive approach is necessary to remove a large, neoplastic, abdominal testis. An abdominal testis can be removed with the horse standing using a flank approach, when general anesthesia is not practical.

### Inguinal Approach

For the inguinal approach, the horse is anesthetized and positioned in dorsal recumbency. The superficial inguinal ring is exposed through an elliptical, scrotal incision or through an 8- to 15-cm skin incision made directly over the superficial inguinal ring. A cryptorchid testis and the contralateral scrotal testis (or two cryptorchid testes) can be removed from one incision if the incision is created over the scrotum rather than over the superficial inguinal ring.

The inguinal fascia is separated digitally to expose the superficial inguinal ring. An inguinal testis is readily encountered when the superficial inguinal ring is exposed. The vaginal sac should always be opened and its contents examined to avoid mistaking the descended tail of the epididymis of a partial abdominal cryptorchid for a small, inguinal testis. After the superficial inguinal ring has been exposed, an abdominal testis can be retrieved. One noninvasive technique requires locating the rudimentary common vaginal tunic, or vaginal process. This structure contains a portion the epididymis or sometimes a portion of the gubernaculum testis. The body of the epididymis can be exposed through a small incision in the vaginal process and traced to the tail of the epididymis, which is connected to the testis by the proper ligament of the testis. By placing traction on this ligament, the abdominal testis can usually be exteriorized through the vaginal ring. The key to this technique is locating the vaginal process. The vaginal process of the partial abdominal cryptorchid testis lies everted within the inguinal canal and is readily encountered during inguinal exploration. The vaginal process of the complete abdominal cryptorchid lies inverted within the abdominal cavity, along with the epididymis and testis, and difficulty may be encountered in locating and everting it into the canal.

An inverted vaginal process can be everted into the inguinal canal by exerting traction on the scrotal ligament, which is also known as the inguinal extension of the gubernaculum testis (IEGT). This ligament is a remnant of the gubernaculum testis and attaches the vaginal process to the scrotum. The IEGT is located by carefully examining the margin of the superficial inguinal ring for a fibrous band that descends into the canal. The IEGT can be found on either the medial or lateral aspect of the ring, usually at the junction of the middle

and cranial third of the ring. The genitofemoral nerve courses through the canal and can be mistaken for the IEGT. This nerve usually lies farther caudal, in the middle or caudal third of the superficial inguinal ring. The IEGT is most easily located by grasping and retracting loose fascia at the junction of the middle and cranial thirds of the ring with the thumb and index finger of one hand and tracing it into the canal with the index finger and thumb of the other hand. The fascia tears if the IEGT is not contained within the fascia, but if the IEGT lies within this fascia, traction causes the inverted vaginal process to evert into the canal, where it and the epididymis or gubernaculum con-

tained within can be seen and palpated. The everted process is a glistening white structure, usually about the size of a fingertip.

A hypoplastic cremaster muscle can be seen attached to the lateral aspect of the vaginal process. An inverted vaginal process can also be everted using a sponge forceps. A finger is inserted through the vaginal ring into the inverted vaginal process, and a 25-cm curved sponge forceps is introduced beside the finger. The jaws of the forceps are opened and closed to grasp the apex of the vaginal process. Traction applied on the forceps everts the inverted vaginal process. The difficulty of this technique is locating the vaginal ring. The ring can usually be found beneath the third finger when four fingers are inserted into the inguinal canal.

After the vaginal process is everted and stripped of inguinal fascia, it is incised longitudinally (a No. 12 scalpel blade works best for this) to expose a portion of the epididymis contained within. The epididymis is grasped with a hemostat and exteriorized until the tail of the epididymis is located. The proper ligament of the testis connects the tail of the epididymis to the caudal pole of the testis, and by applying traction to this structure, the testis can be pulled through the vaginal ring and exteriorized for removal. Stretching the vaginal ring to accommodate passage of the testis may not be necessary if the stallion is immature. Usually though, the vaginal ring must be stretched to allow passage of the testis, and this is accomplished by inserting a finger through the incision in the vaginal process and through the vaginal ring. The finger is inserted through the vaginal ring to the level of the second joint, and by flexing the finger, the ring is dilated. The cord must then be crushed and severed with scissors after occluding the testicular vasculature with one or two ligatures. The contralateral testis is then removed, and the skin incision is sutured or left to heal by secondary intention.

#### *Parainguinal Approach*

If the vaginal process cannot be located using the previously described techniques, the testis can be removed noninvasively by converting the inguinal approach to a parainguinal approach. A 4-cm incision is made in the aponeurosis of the external abdominal oblique muscle, 1 to 2 cm medial and parallel to the superficial inguinal ring. The incision is centered over the cranial aspect of the ring. The internal abdominal oblique muscle underlying the aponeurosis is spread in the direction of its fibers, and the peritoneum is penetrated with a sharp thrust of the index and middle fingers. The vaginal ring is palpated caudolateral to the point of entry into the abdomen. The epididymis, ductus deferens, and gubernaculum are situated near the ring, and by sweeping the region with index and middle fingers, one of these structures can be grasped between them and exteriorized. The body of the epididymis is followed to the tail. Traction on the proper ligament of testis pulls the testis through the incision.

If difficulty is encountered in locating the epididymis or associated structures, or if exteriorizing the testis is difficult, the incision can be enlarged to accommodate a hand. After excising the testis, the incision in the aponeurosis of the external abdominal oblique muscle is apposed using heavy absorbable sutures in an interrupted or continuous pattern. The subcutaneous tissue and skin can be sutured or left unapposed to heal by secondary intention.

#### *Suprapubic Paramedian Approach*

For the suprapubic paramedian approach, an 8- to 15-cm, longitudinal skin incision is made 5 to 10 cm lateral to the ventral midline. The incision begins at the level of the preputial orifice and extends

caudally. The large subcutaneous vessels encountered caudally in the incision are ligated. The abdominal tunic and the closely adherent ventral sheath of the rectus abdominis muscle are incised longitudinally, and the underlying fibers of the rectus abdominis muscle are bluntly separated in the same direction. The dorsal rectus sheath, retroperitoneal fat, and peritoneum are penetrated with a finger. The perforation is bluntly enlarged, and a hand is introduced into the abdomen.

The testis is usually encountered near the vaginal ring. If the testis cannot be palpated, accessory structures at the vaginal ring can be located and followed to the testis, or the ductus deferens can be found in the genital fold of the bladder and traced to the testis. Both testes of a bilateral cryptorchid can be removed through one incision, but the contralateral testis is difficult to exteriorize. After removing the testis, the abdominal tunic, the subcutis, and skin are each closed separately with interrupted or continuous sutures.

### *Flank Approach*

For the flank approach, a 10- to 15-cm incision is made through the skin and subcutis in the paralumbar fossa of the affected side with the horse standing or recumbent. In a standing horse, the incision site must be anesthetized before the surgery. The external abdominal oblique muscle is transected in the direction of the skin incision, and the peritoneum is exposed by splitting the internal abdominal oblique and transversus abdominis muscles in the direction of their fibers. The peritoneum and retroperitoneal fat are perforated with a finger to enter the abdomen. The testis is located and exteriorized as described for the paramedian approach. If the testis cannot be exteriorized, an écraseur is used to transect the testicular vasculature. After the abdominal testis is removed, the internal and external abdominal oblique muscles, subcutis, and skin are each closed separately with interrupted or continuous sutures. Closing the peritoneum and transversus abdominis muscle is difficult and not necessary.

## **VIDEO LINKS**

<https://www.youtube.com/watch?v=MZ5L658nBGA> ( CLOSED TECHNIQUE THROUGH A SCROTAL APPROACH )

<https://www.youtube.com/watch?v=5HgLAGVSv78> ( OPEN TECHNIQUE ) . Only the first 5 minutes of this video need to be watched. Video can be watched on muted sound

[https://www.youtube.com/watch?v=bbsy\\_L5MPt0](https://www.youtube.com/watch?v=bbsy_L5MPt0) ( Inguinal Approach Cryptorchid )