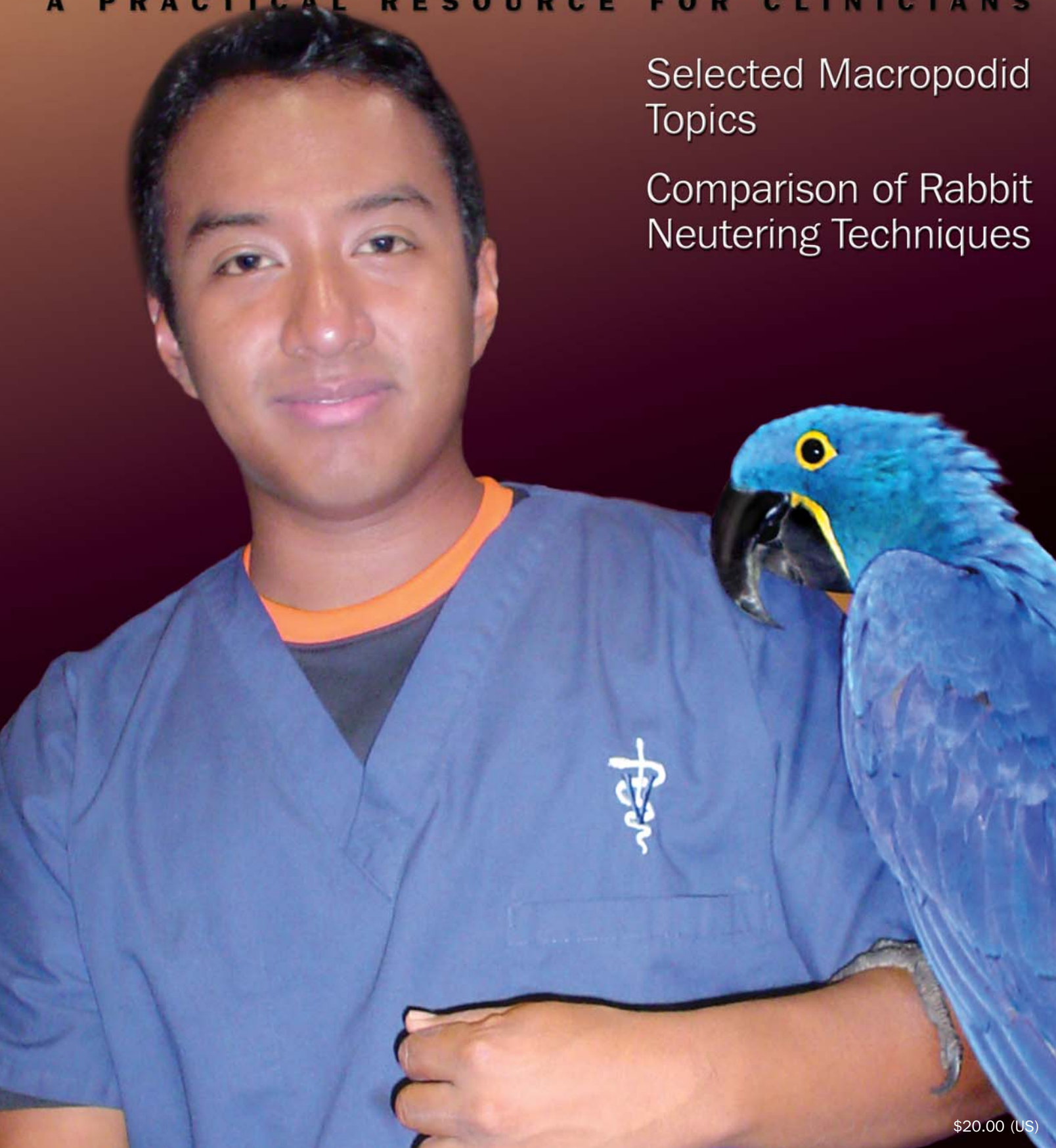
EXOTIC DVM

VOLUME 7
ISSUE 5

A PRACTICAL RESOURCE FOR CLINICIANS

Selected Macropodid Topics

Comparison of Rabbit Neutering Techniques



$20.00 (US)

EXOTIC DVM
VOLUME 7
ISSUE 5
A PRACTICAL RESOURCE FOR CLINICIANS

contents

Julio C. Reyes H.

Raffaele Melidone

Vittorio Capello

Timothy Portas

Observations from the Field

Selected Papers from 2005 International Conference on Exotics

Peer Reviewed

Species Spotlight Special Feature

Peer Reviewed

Departments

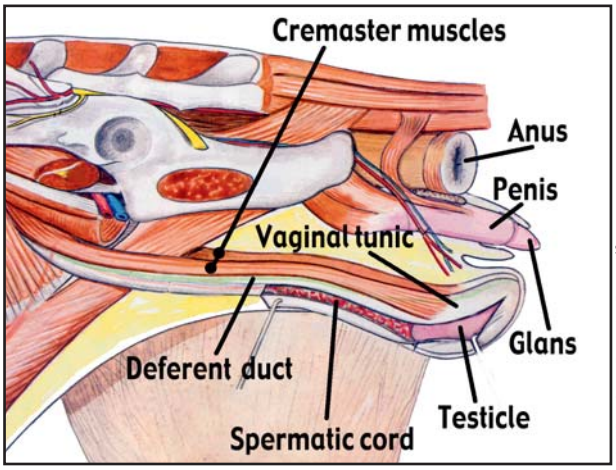
Surgical Techniques for Orchiectomy of the Pet Rabbit

Vittorio Capello, DVM

Urogenital Anatomy of the Male Rabbit

The urogenital anatomy of male rabbits is unique among placental mammal species and common in marsupial species. The penis is located caudal to the testicles, which lie in 2 separate hemiscrotal sacs (Fig 1). Another peculiarity similar to rodent species is that the inguinal canal remains open throughout life, allowing the testicles to move freely from the hemiscrotal sacs into the abdominal cavity and making rabbits (and rodents) "functional cryptorchids." The position of the testicles depends on many factors including body position, body temperature, breeding activity, fullness of gastrointestinal tract and amount of abdominal fat. The testicles are elongated rather than round. The epididymis is quite visible at the caudal pole of the testicle but is not as developed as in rodent species (Fig 2). Likewise, fat surrounds the testicles but to a lesser degree than in rodents. The glans of the penis is point-shaped, relatively undeveloped and covered by a prepuce.

The unique anatomy of male rabbits has important implications for surgical techniques. The open inguinal canals must be effectively closed during the surgical procedure. This closes the open communication between the hemiscrotal sacs and abdominal cavity and prevents hemiscrotal herniation of abdominal viscera (e.g., the intestines or urinary bladder) (Fig 3). The position of the penis caudal to the testicles allows the surgeon to perform a prescrotal approach with a single incision on the midline.



Modified from Popesko P, et al[10]

Fig 1. Appearance of external genitalia of the male rabbit after shaving the fur.

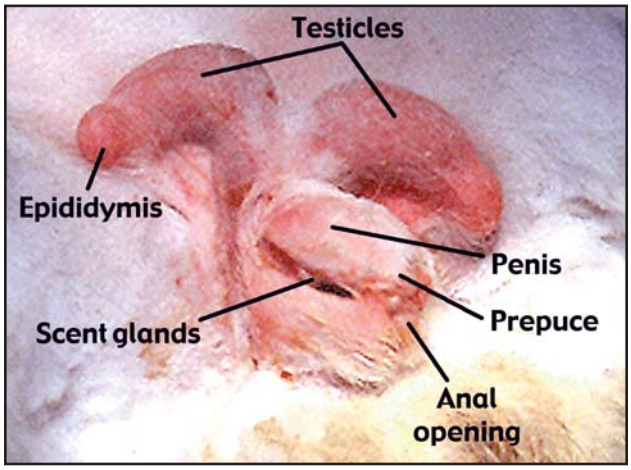


Fig 2. External male genital organs and the inguinal region, left side.

Table 1. Techniques for Neutering the Male Rabbit

- Orchiectomy
- Deferentectomy

* Preventive castration is performed when reproductive capability has to be interrupted or in order to reduce territorial or aggressive behavior.

* Therapeutic castration is indicated in cases involving diseases of the testicles (especially infections and neoplasia) and for surgical correction of inguinal or hemiscrotal herniation and true cryptorchidism.

* **Deferentectomy:** Selective deferentectomy represents a functional, not anatomic, technique for neutering. It is often improperly termed "vasectomy." "Vasectomy" comes from the term "vas deferens," but the deferent duct is not a true (blood) vessel. There are no specific indications for deferentectomy with the exception of neutering without orchiectomy for ethical or behavioral purposes. For this reason, this technique will not be presented and discussed in this paper.

Table 2. Surgical Approaches to Orchiectomy

- Prescrotal Approach (1)
- Scrotal Approach
  - Open Technique (2)
  - Closed Technique (3)
- Abdominal Approach (4)

Table 3. Comparison of Techniques for Neutering a Male Rabbit

1. PRESCROTAL APPROACH	
Advantages	**Disadvantages**
* Best technique for closure of the inguinal canals * Facilitates shaving and sterile preparation * Skin of the hemiscrotal sacs does not need to be sutured	* Longer procedure

2. SCROTAL APPROACH, OPEN TECHNIQUE	
Advantages	**Disadvantages**
* Shorter procedure	* Closure of the inguinal canal is more difficult. * Preparation difficult to achieve due to incomplete shaving * Delicate hemiscrotal skin is sterilely prepared

3. SCROTAL APPROACH, CLOSED TECHNIQUE	
Advantages	**Disadvantages**
* Shorter procedure * Facilitates closure of the inguinal canals	* Spermatic cord not ligated directly (covered by tunic) * True aseptic technique difficult to achieve due to incomplete shaving * Delicate hemiscrotal skin is sterilely prepared

4. ABDOMINAL APPROACH	
Advantages	**Disadvantages**
* Proper technique for repair of inguinal or hemiscrotal herniation or true cryptorchidism * Allows complete aseptic technique	* Longer procedure * More invasive surgery

1. Prescrotal Approach

Fig 3. The rabbit is anesthetized and placed in dorsal recumbency and the prescrotal area is shaved. The thin delicate hemiscrotal skin does not need to be shaved when using this approach.

Fig 4. The prescrotal area is gently scrubbed with dilute povidone iodine or chlorhexidine. When using this approach, the hemiscrotal skin does not need to be aseptically prepared. A transparent adhesive surgical drape is applied.

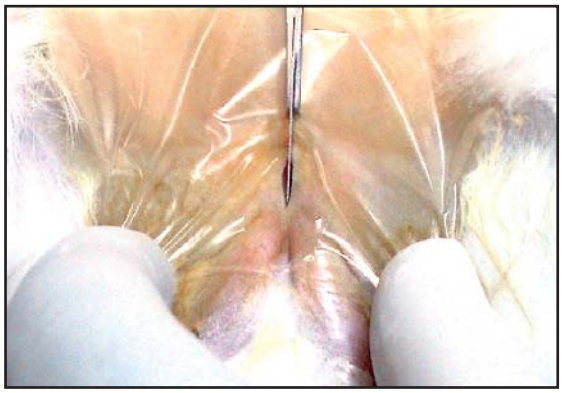


Fig 5. The skin is incised 1.5-2.0 cm on the midline immediately cranial to the base of the hemiscrotal sacs.

Fig 6. The subcutaneous tissue and inguinal fascia are bluntly dissected. The vaginal processes are located immediately deep to this tissue and superficial to their entrance into the abdomen through the inguinal canal.

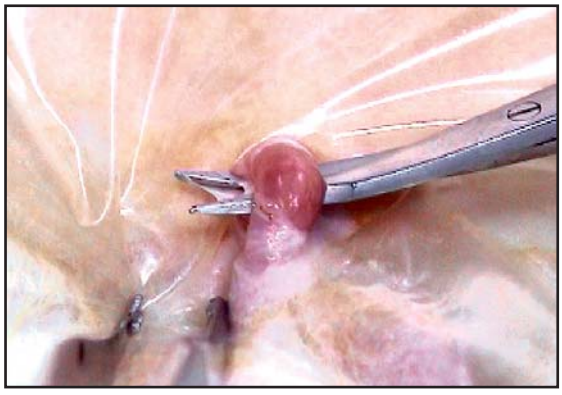


Fig 7. The vaginal process is bluntly dissected from the surrounding soft tissues and isolated.

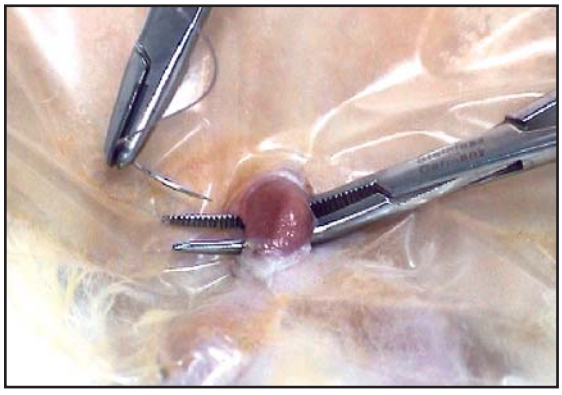


Fig 8. A curved hemostat is used to elevate the vaginal process while a suture is passed around it. The author prefers a 3-0 or 4-0 absorbable suture, depending on the size of the rabbit.

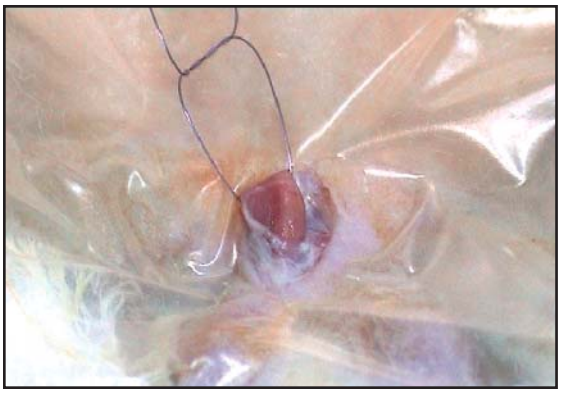


Fig 9. A knot is preformed in the circumferential suture but will not be tightened until after the orchiectomy.

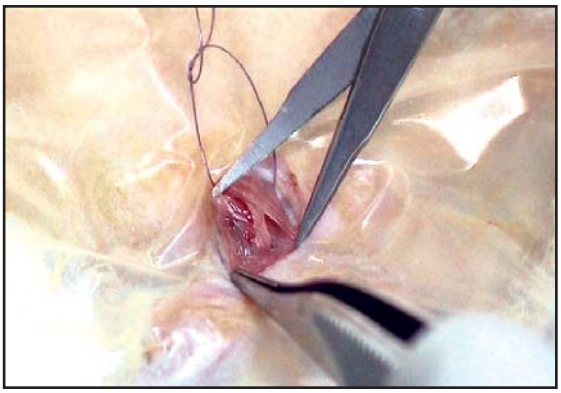


Fig 10. The vaginal process is incised in order to access the testicle and spermatic cord. The author recommends using blunt scissors rather than a scalpel blade to prevent iatrogenic incision of blood vessels.

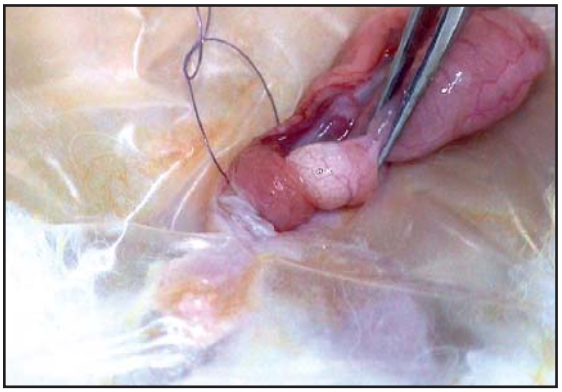


Fig 11. The testicle is grasped with the fingers and gently exteriorized through the vaginal process incision. It is drawn out until the epididymis is exteriorized and the hemiscrotal sac is everted.

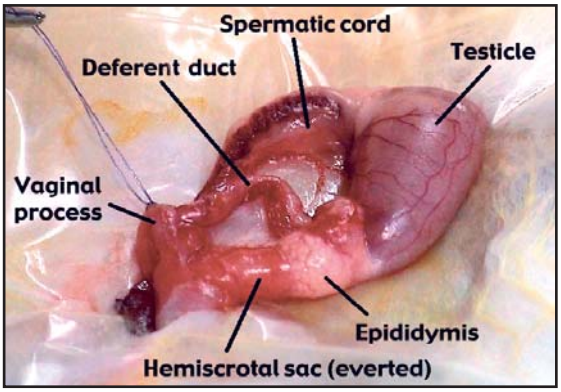


Fig 12. Appearance of the testicle and other anatomic structures after exteriorization from the vaginal process.

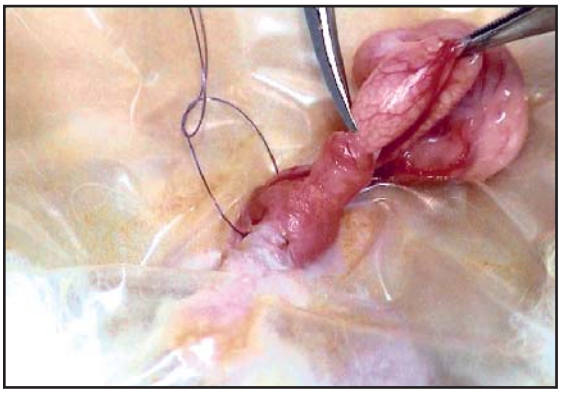


Fig 13. The ligament between the hemiscrotal sac and the tail of the epididymis is gently dissected and the testicle is freed from the hemiscrotal sac.

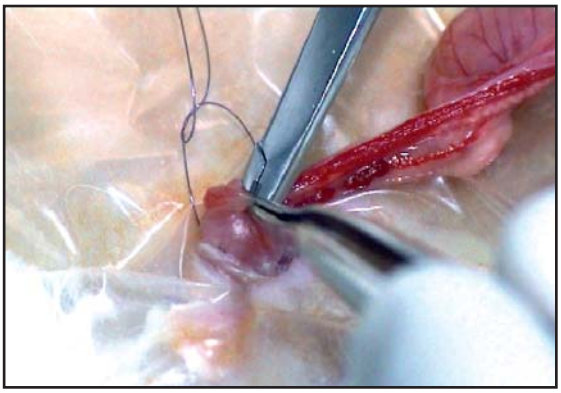


Fig 14. The hemiscrotal sac is again inverted and replaced in its normal anatomic position using a forceps or the tip of a needle holder as shown here.

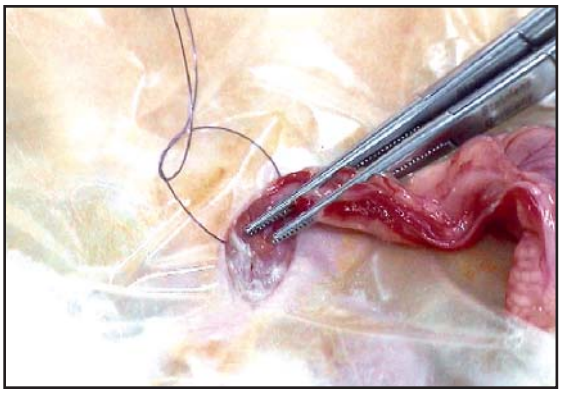


Fig 15. The spermatic cord (which includes the deferent duct as well as blood vessels and nerves of the testicle and epididymis) is double clamped.

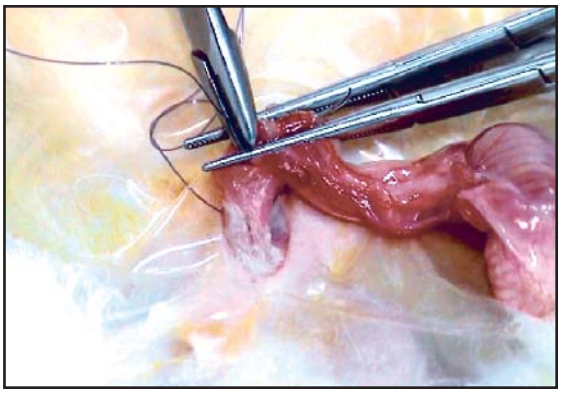


Fig 16. The spermatic cord is ligated with the same absorbable suture material previously described for the vaginal process. Ligation of the testicular blood vessels and deferent duct can be performed separately, especially in large rabbits.

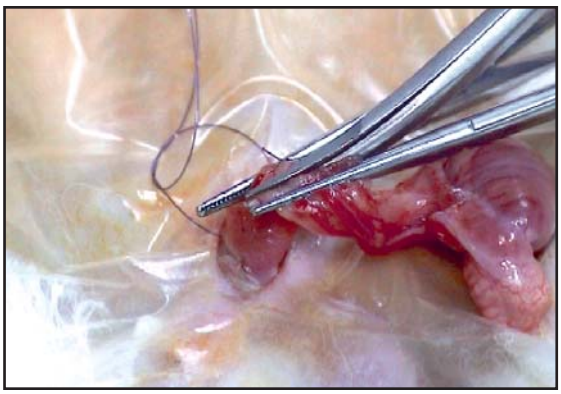


Fig 17. The spermatic cord is resected distal to the ligation, and the testicle is removed.

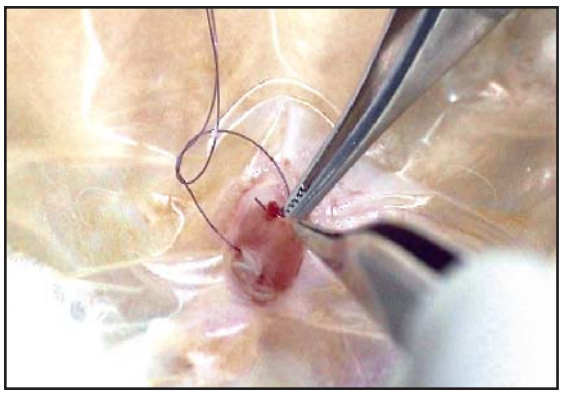


Fig 18. The spermatic cord ligation is checked for hemorrhage, and the stump is replaced in the vaginal process. Because the inguinal canal is open, the stump will retract into the abdominal cavity. A potential failure of the ligation would have to be addressed via an abdominal approach, not from the inguinal area as in species with a closed inguinal ring.

Fig 19. The circumferential suture that was preplaced around the vaginal process is tightened, resulting in closure of the vaginal process at its point of exit from the inguinal ring. The surgical procedure is repeated on the contralateral vaginal process and testicle.

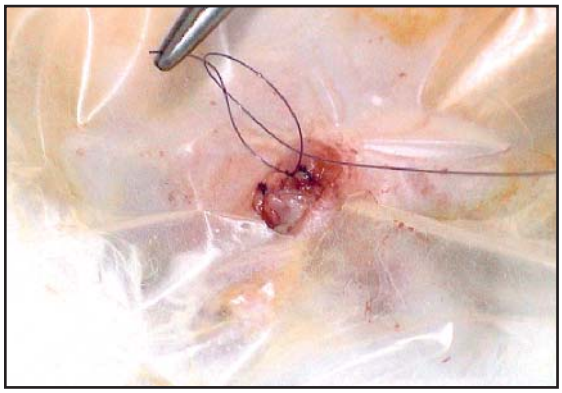


Fig 20. The inguinal fascia and subcutaneous tissue are closed with absorbable material using an interrupted or continuous suture pattern.

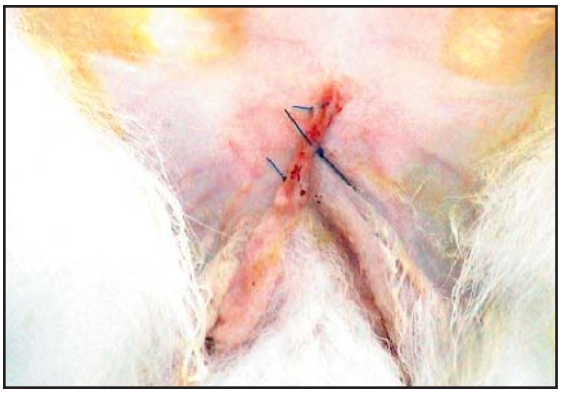


Fig 21. Either absorbable or nonabsorbable suture can be used to close the skin. Usually 2 or 3 interrupted sutures are enough for the small incision. Other options include intradermal suture or topical application of tissue adhesive.

Fig 22. A slight complication related to closure of the vaginal process is represented occasionally by edema of the 2 hemiscrotal sacs. This usually disappears within 5-6 days after surgery and resolves faster if the owner is willing to delicately massage the hemiscrotal sacs.

2. Scrotal Approach, Open Technique

The scrotal approach and the opening of the vaginal process is the most common surgical technique for castration of pet rabbits. It is similar to the technique performed in carnivores (e.g., cats, ferrets and skunks), but in these species the inguinal canal is closed after puberty. In rabbits, the vaginal process must be sutured during the surgical procedure.

Fig 23. Skin of the hemiscrotal sac is shaved. Care must be taken to prevent iatrogenic lesions to the thin delicate skin. Fine hairs are difficult to shave completely and should be controlled with scrubbing solution. Chlorhexidine is preferred over dilute povidone iodine solution, which can irritate the hemiscrotal skin.

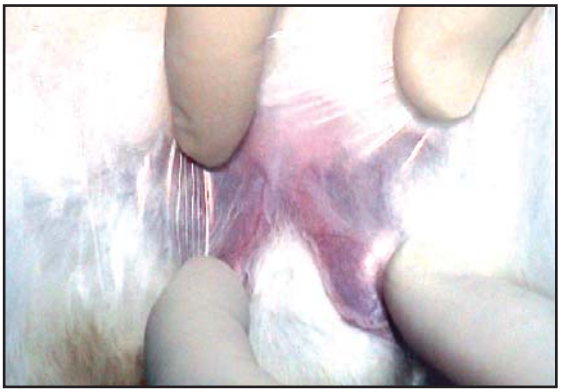


Fig 24. A transparent adhesive surgical drape is applied to the hemiscrotal sac.

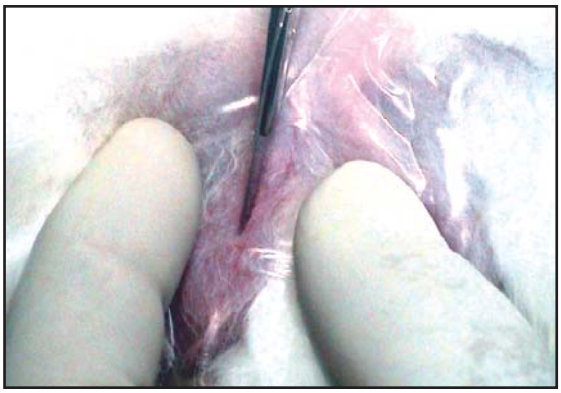


Fig 25. The skin is incised on the ventral midline of the hemiscrotal sac.

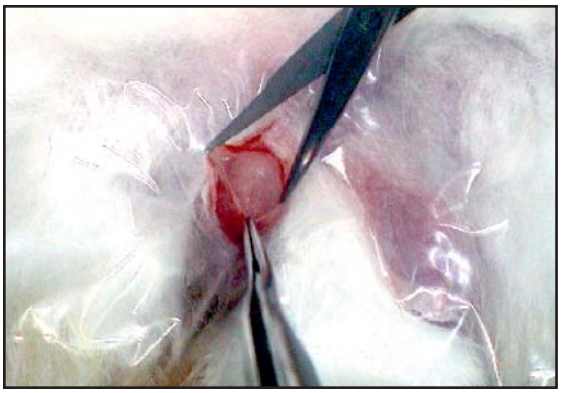


Fig 26. The thin subcutaneous tissue is bluntly dissected until the vaginal process is exposed.

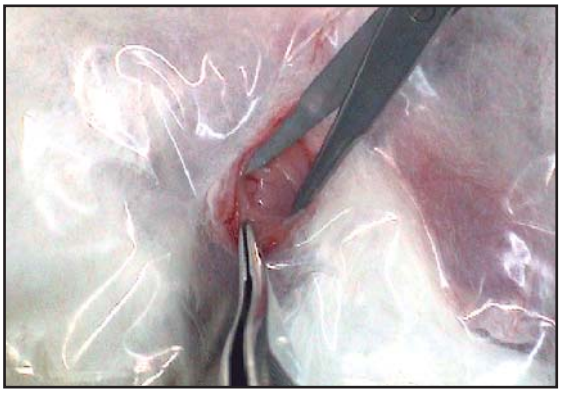


Fig 27. The vaginal process is incised to access the testicle and spermatic cord. The author recommends the use of blunt scissors rather than a scalpel blade to prevent iatrogenic incision of the testicle.

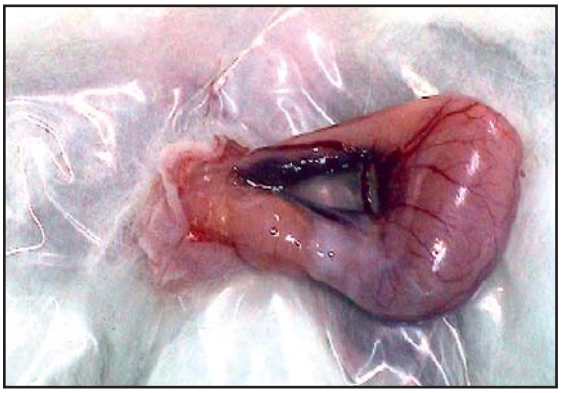


Fig 28. The testicle is grasped with the fingers and gently exteriorized through the incision of the vaginal process until the epididymis is exposed and the hemiscrotal sac is everted. From this point on, the surgical steps for orchiectomy are the same as shown in Figs 13-18.

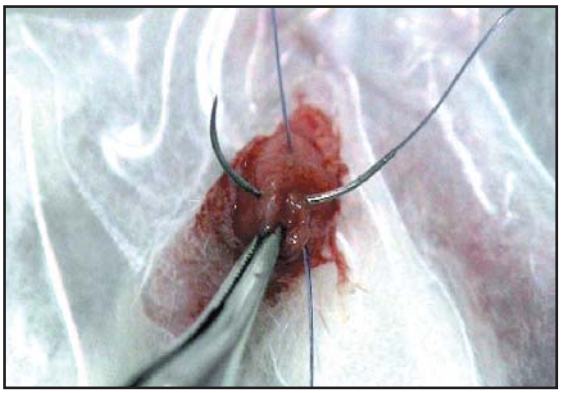


Fig 29. The vaginal process is closed with a transfixing suture. A circumferential suture is more difficult, because the vaginal process also needs to be dissected from the skin on the dorsal aspect of the hemiscrotal sac. Closure of the vaginal process is performed more caudally than with the prescrotal technique.

Fig 30. Simple apposition of the margins of the skin incision is sufficient for proper healing. Otherwise, the skin may be sutured or closed with tissue adhesive.

3. Scrotal Approach, Closed Technique

Orchiectomy using the scrotal approach can be performed without opening the vaginal process and directly accessing the testicle. This technique allows proper closure of the vaginal process but not direct ligation of the spermatic cord. For demonstration purposes, this technique is shown on the contralateral testicle of the rabbit shown in Figs 23-30.

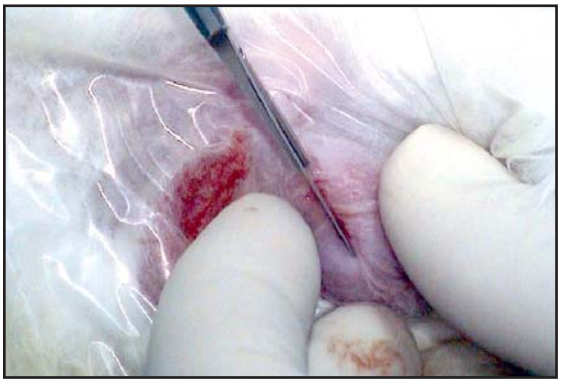


Fig 31. The surgical field is prepared as shown in Figs 23 and 24. The skin is incised on the ventral midline of the hemiscrotal sac.

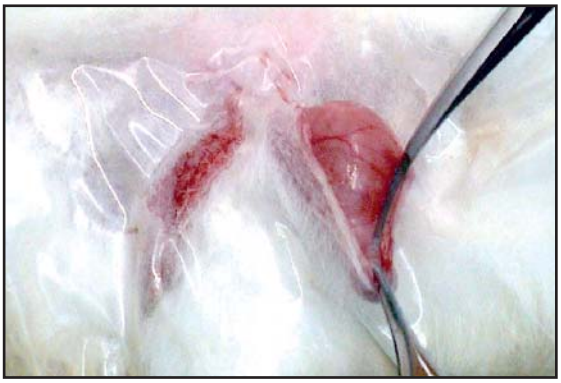


Fig 32. The thin subcutaneous tissue is bluntly dissected until the vaginal process is exposed. Dissection is extended up to the caudal pole and around to the dorsal aspect of the testicle.

Fig 33. The vaginal process, containing the testicle and the spermatic cord, is completely exposed.

Fig 34. The vaginal process is ligated as far proximally as possible. The ligation includes the blood vessels of the spermatic cord; therefore, it must be securely tied.

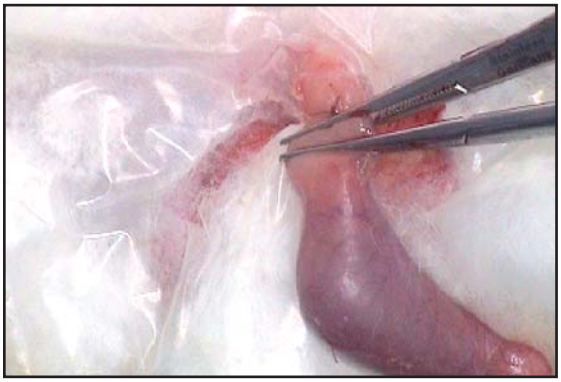


Fig 35. The proximal tract of the vaginal process is double clamped before it is transected. Placement of the proximal hemostat is very important in case of improper ligation of the spermatic cord. Alternatively, the ligation can be performed after the double clamping. The spermatic cord covered by the vaginal process is transected, and the entire testicle is removed.

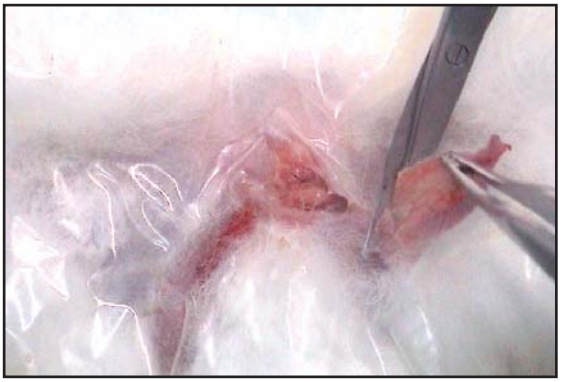
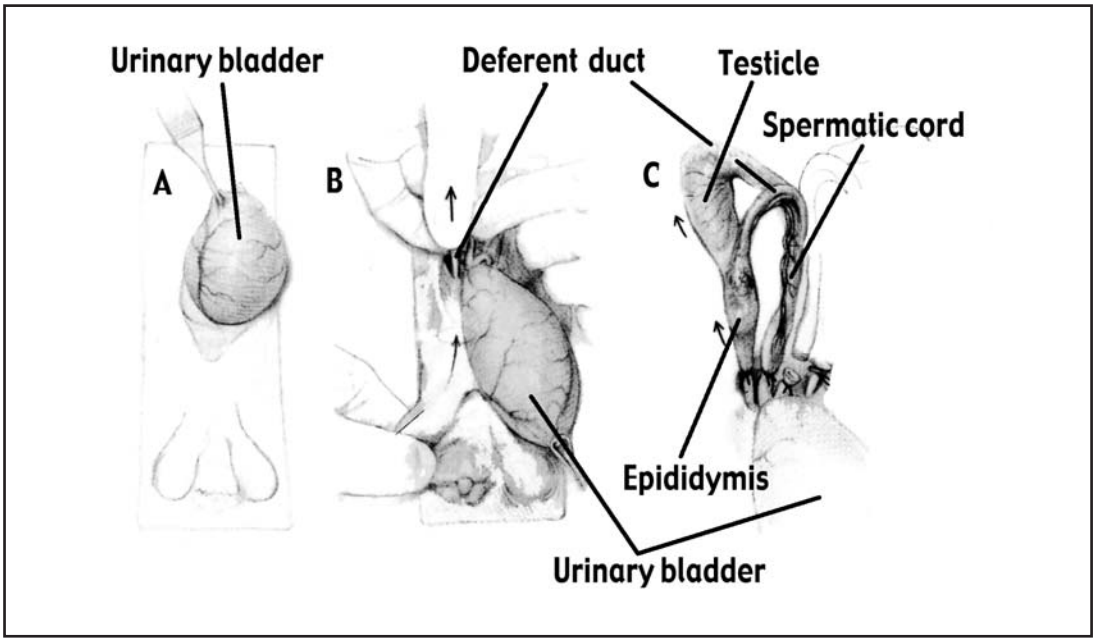


Fig 36. Because the hemiscrotal skin is very thin, it may be necessary to remove part of it following the orchiectomy.

Fig 37. Simple apposition of the margins of the skin incision is sufficient for proper healing; otherwise, the skin can be sutured as shown here. Alternatively, tissue adhesive can be applied.

Fig 38. Appearance of the hemiscrotal sacs after scrotal orchiectomy with the open (left) and closed (right) techniques.

4. Abdominal Approach



Modified from Hoyt RF Jr[4]

Fig 39. The rabbit is anesthetized and placed in dorsal recumbency. The caudoventral abdominal surface is surgically prepared. Celiotomy is performed on the caudal midline 4-5 cm cranial to the hemiscrotal sacs, and the urinary bladder is exteriorized (A) and reflected caudally (B). The deferent ducts are gently retracted, while the testicle is gently pushed from the hemiscrotal sac through the vaginal process (B). The testicle is exteriorized (C). Dissection of the tail of the epididymis from the caudal pole of the everted hemiscrotal sac and ligation of the spermatic cord are performed through the celiotomy site. The muscle and overlying soft tissue layers are routinely sutured.

Fig 40. True cryptorchidism in a 4-month-old rabbit. Hypoplasia of the left hemiscrotal sac is visible, and the left testicle is retained in the vaginal process.

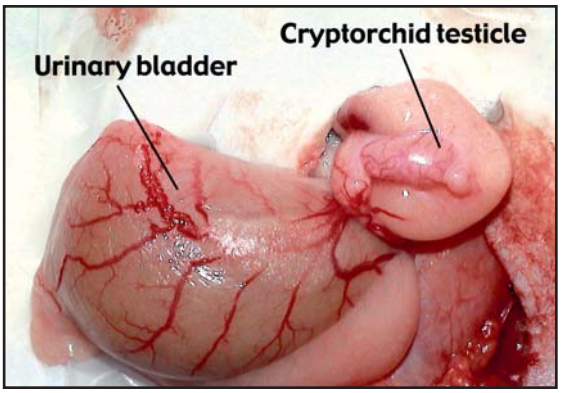


Fig 41. Removal of the cryptorchid testicle shown in Fig 40 via the abdominal approach.

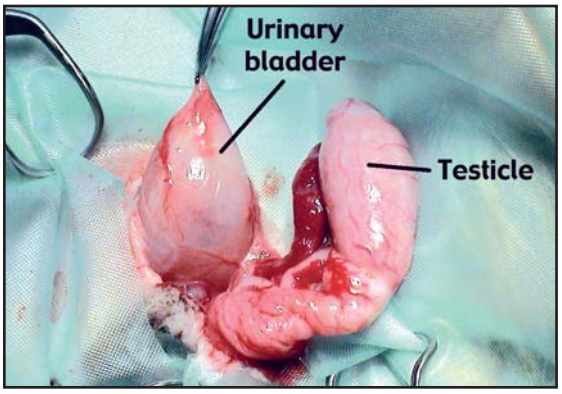
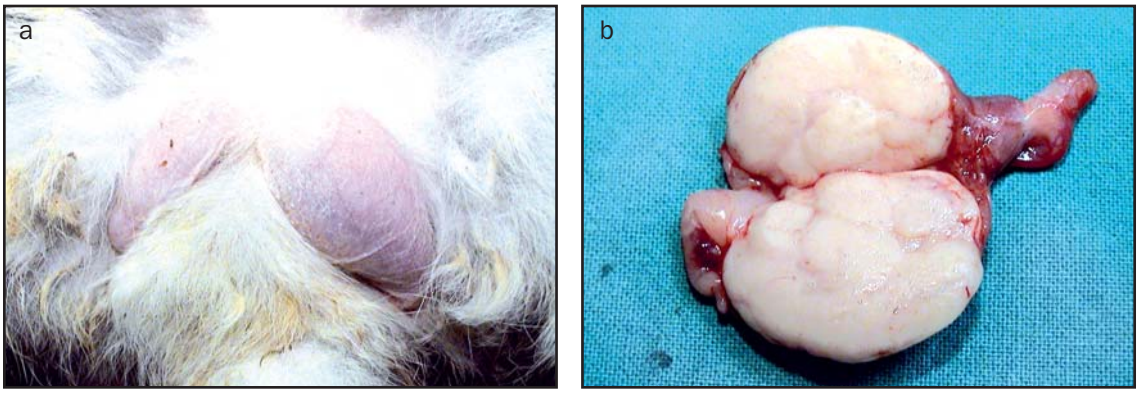


Fig 42. Surgical correction of inguinal herniation of the urinary bladder. Orchiectomy is performed at the same time via the abdominal approach.



Figs 43a,b. a) Firm and enlarged testicle in a 8-year-old rabbit suggestive of testicular neoplasia. **b)** Appearance of the dissected testicle after removal. Histopathology revealed a Leydig cell tumor (Leydigoma).

References and Further Reading

1. Donnelly TM: Basic anatomy, physiology and husbandry. *In* Quesenberry KE, Carpenter JW (eds): Ferrets, Rabbits and Rodents: Clinical Medicine and Surgery 2nd ed. WB Saunders, imprint of Elsevier Science, 2004, pp 136-146.
2. Harcourt-Brown FM: General surgical principles and neutering. *In* Harcourt-Brown FM: Textbook of Rabbit Medicine. Butterworth-Heinemann, imprint of Elsevier Science, 2002, pp 352-360.
3. Hoyt RF Jr: Abdominal surgery of pet rabbits. *In* Bojrab MJ (ed): Current Techniques in Small Animal Surgery 4th ed. Philadelphia, William & Wilkins, 1998, pp 777-790.
4. Jenkins JR: Soft tissue surgery. *In* Quesenberry KE, Carpenter JW (eds): Ferrets, Rabbits and Rodents: Clinical Medicine and Surgery 2nd ed. WB Saunders, imprint of Elsevier Science, 2004, pp 221-230.
5. Popesko P, Rjtovà V, Horàk J: A Colour Atlas of Anatomy of Small Laboratory Animals Vol I: Rabbit, Guinea Pig. London, Wolfe Publishing Ltd, 1992, pp 122-123.