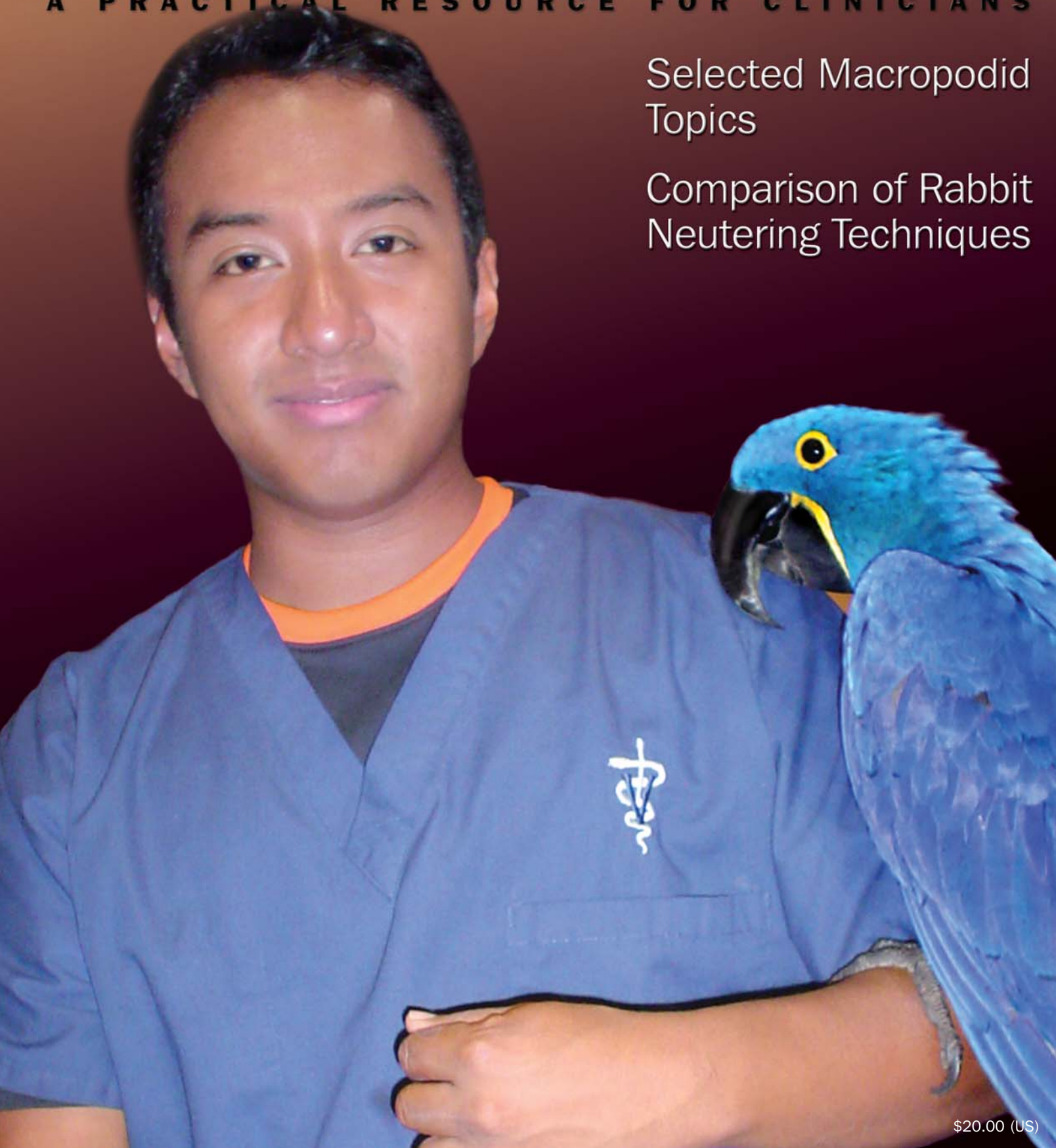
EXOTIC DVM

VOLUME 7
ISSUE 5

A PRACTICAL RESOURCE FOR CLINICIANS

Selected Macropodid Topics

Comparison of Rabbit Neutering Techniques



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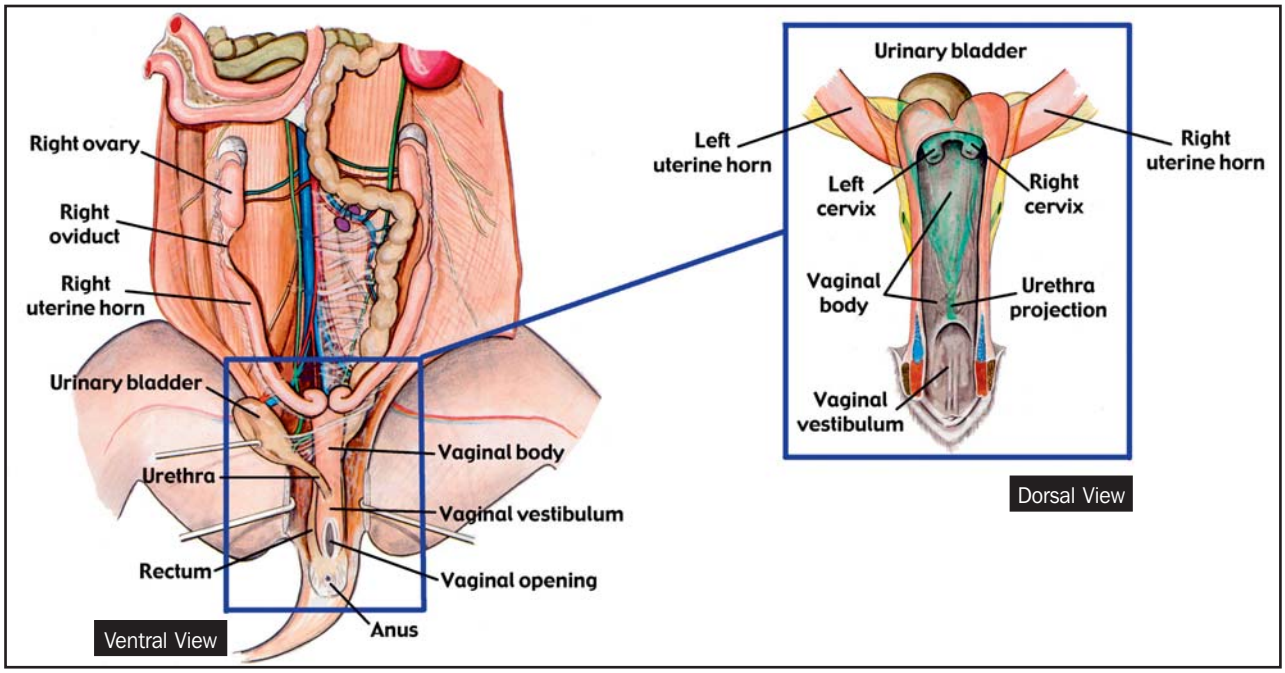
Surgical Techniques for Neutering the Female Pet Rabbit

Vittorio Capello, DVM

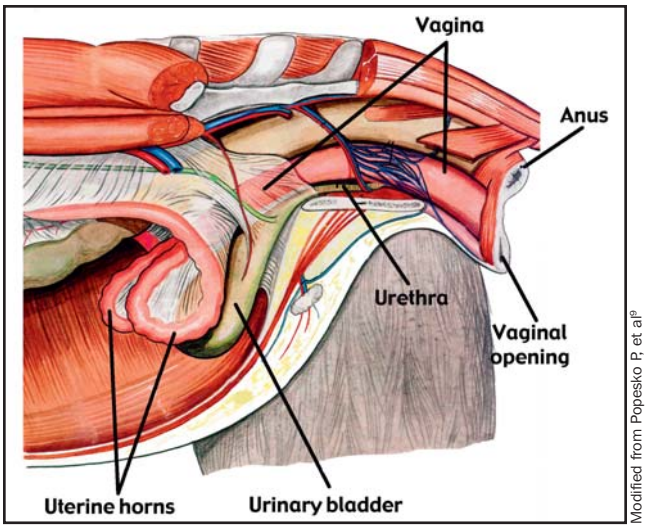
Reproductive Anatomy of the Female Rabbit

In rabbits, the ovaries, oviducts and uterus are paired organs similar to those in other placental mammal species. The ovaries are not located in a true ovarian bursa, as in some carnivore and rodent species, but are usually surrounded by fat, which also surrounds the mesovarium and mesosalpinx. The uterus is a completely paired organ, not partially paired as in most other placental mammal species. It is bicornuate with 2 cervices, which open separately and directly into the vagina. The mesometrium (broad uterine ligament) is usually filled with fat, especially in overweight or obese rabbits. The vagina is a long, large, flaccid unpaired organ. The urinary bladder is positioned ventral to the vagina, and the urethra opens into the caudoventral vaginal body. This marks the division between the vestibulum, positioned caudal to the urethral opening, and the larger true vaginal body positioned cranial to the urethral opening.



Modified from Popesko P, et al[3]

Fig 1. Ventral view of the reproductive organs in the female rabbit and dorsal closeup of the vagina.



Modified from Popesko P, et al[9]

Fig 2. Left lateral view of the reproductive organs in the female rabbit.

Table 1. Terminology for Neutering Techniques in Female Rabbits

- Ovariectomy (Ov)
- Ovariohysterovaginectomy (OvHV)
- Ovariohysterectomy (OvH)
- Salpingectomy

All these procedures are performed bilaterally with the exception of the vaginectomy (because the vagina is an unpaired organ).

Indications

Ovariectomy: The primary indication for selective ovariectomy is preventive neutering. The efficacy of ovariectomy alone to prevent uterine and vaginal disease, such as uterine neoplasia, is controversial, and there are anecdotal reports of both positive and negative outcomes. Clinical trials are necessary to determine if ovariectomy can be recommended for this purpose. In the author's experience, ovariectomy is primarily associated with reduction of uterine and vaginal disease when the procedure is performed in young rabbits before or at puberty, ideally before 9-12 months of age.

Ovariohysterectomy/Ovariohysterovaginectomy: Indications for ovariohysterectomy and ovariohysterovaginectomy include preventive neutering and treatment of ovarian, salpingeal, uterine and vaginal diseases. The author prefers ovariohysterovaginectomy for elimination of reproductive capability in rabbits older than 9-12 months of age.

Salpingectomy: Selective salpingectomy is a functional, but not anatomic, technique for elimination of reproductive capability and is indicated only in rare cases where maintenance of reproductive behavior is desired, e.g., when training or maintaining reproductive behaviors in breeding bucks. Except for disease of the salpinges, this technique has no effect on the incidence of reproductive diseases. For this reason, this surgical technique will not be described in this paper.

Table 2. Comparison Between Ovariectomy and Ovariohysterovaginectomy Techniques

OVARIECTOMY (Ov)		OVARIOHYSTEROVAGINECTOMY (OvHV)	
Advantages	**Disadvantages**	**Advantages**	**Disadvantages**
* Shorter procedure * Reduced potential risks related to anesthesia and laparotomy * Less invasive surgical approach	* Indication is limited to preventive, not therapeutic neutering * Prevention of reproductive diseases is controversial and anecdotal	* The only procedure for surgical treatment of reproductive disorders * Prevents diseases of the uterine remnant	* Longer procedure * Higher potential risks related to anesthesia and laparotomy compared to ovariectomy (in cases of preventive neutering)

Selective Ovariectomy (Ov)

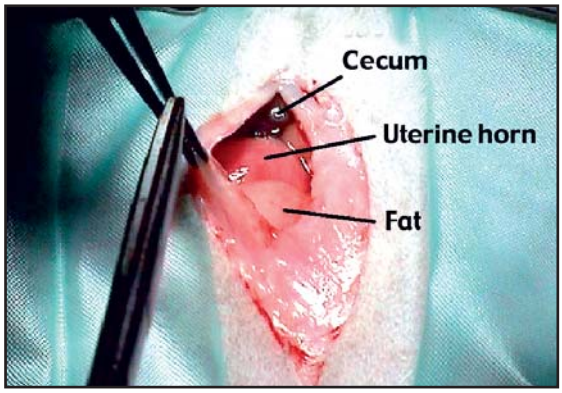


Fig 3. The rabbit is placed under general anesthesia and positioned in dorsal recumbency. The fur over the ventral abdomen is shaved and the surgical site aseptically prepared. The skin incision is made on the midline caudal to the umbilical scar and is about 3-5 cm long depending on the rabbit's size. After the linea alba has been incised along the midline, 3 anatomic structures are usually visualized: the cecum (green), one of the 2 uterine horns (pink) and the fat of the broad ligament (yellow).

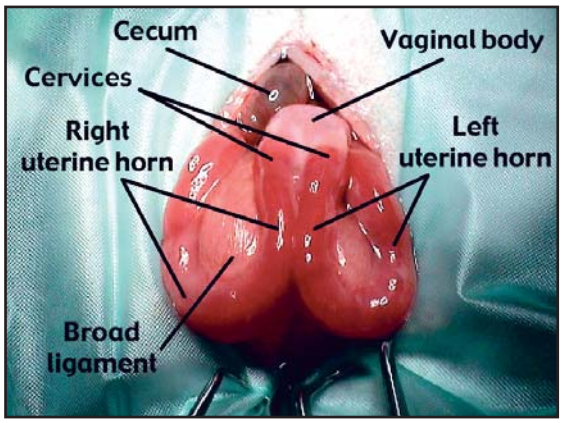


Fig 4. The uterine horns are gently retracted and exteriorized by grasping the broad ligament with forceps or fingers. This allows evaluation of the uterine horns and aids exposure of the ovaries.

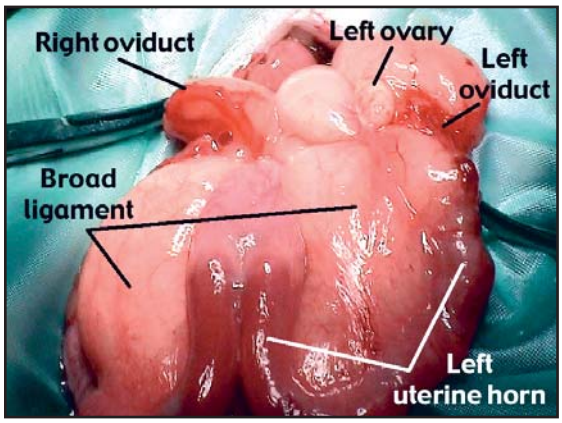


Fig 5. The uterine horns and broad ligament are further exteriorized together with the oviducts and ovaries. The broad ligament usually contains abundant fat.

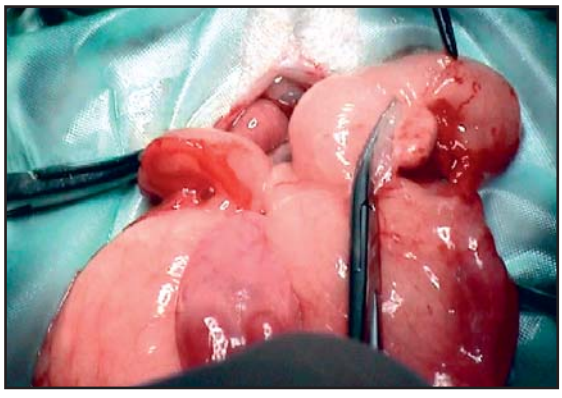


Fig 6. Ligation of the ovarian artery can be performed using various techniques (e.g., cauterization with an electro- or radiosurgery unit, application of hemoclips or ligation using 3-0 absorbable suture material). When the mesovarium is filled with fat, application of hemoclips is more difficult, because the ovarian vascular supply cannot be well visualized. In this case, it is useful to place a curved hemostat a few millimeters medial to the ovary, providing effective temporary hemostasis.

Fig 7. A second hemostat is placed cranial to the ovary, demarcating the infundibulum of the oviduct and its vascular supply.

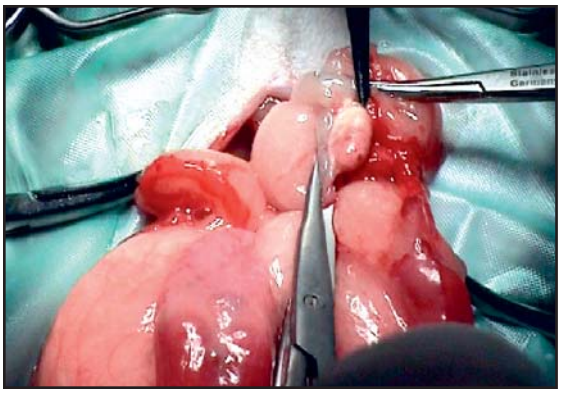


Fig 8. Once the hemostats have been clamped, ligation of the ovarian artery can be performed before or after dissection of the ovary. Because the ovary is small and friable and may be disrupted by manipulation, the author prefers the second option.

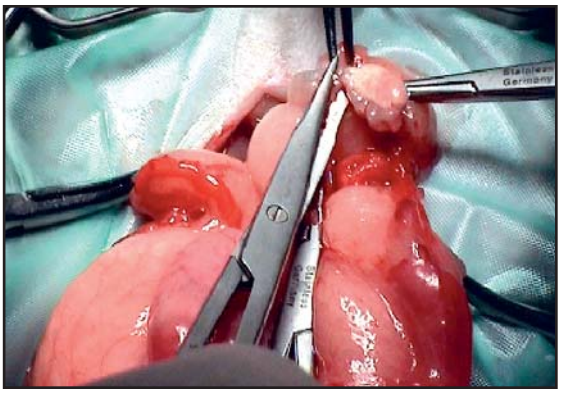


Fig 9. The mesovarium is dissected between the ovary and hemostat. The ovary is dissected completely and removed.

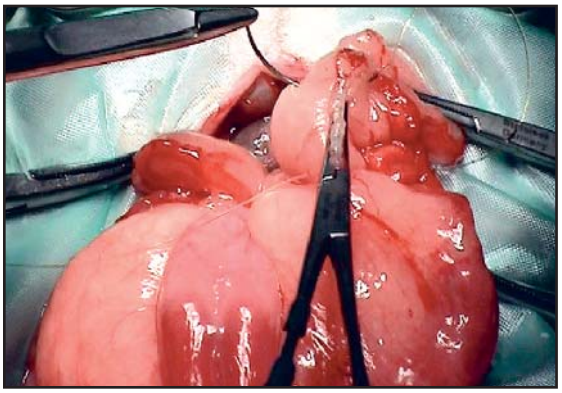


Fig 10. When visualization of the ovarian artery is difficult due to the presence of fat, a circumferential suture can be applied by placing a horizontal "U-shaped" single knot including the mesovary with a medial/lateral/medial pattern. The knot must be tightened carefully and securely.

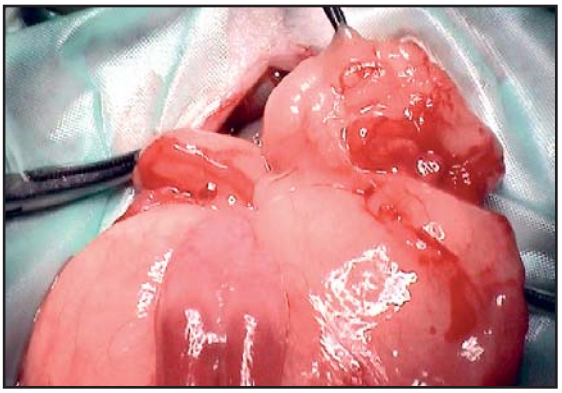


Fig 11. The mesovarium and mesosalpinx are carefully checked for bleeding, and the procedure is repeated on the contralateral ovary. The uterine horns and mesometrium are replaced into the abdominal cavity. The laparotomy incision and overlying tissues are sutured routinely.

Ovariohysterovaginectomy (OvHV)

Fig 12. Due to the unique anatomy of the vagina, urine can flow retrograde and be retained in the vaginal body. For this reason, when surgery of the distal reproductive tract is performed, it is best to place the rabbit in an anti-Trendelemburg position, slightly bent cranio-caudally; this position prevents reflux of urine into the body of the vagina. Otherwise, the urinary bladder can be emptied via manual expression before or soon after laparotomy.

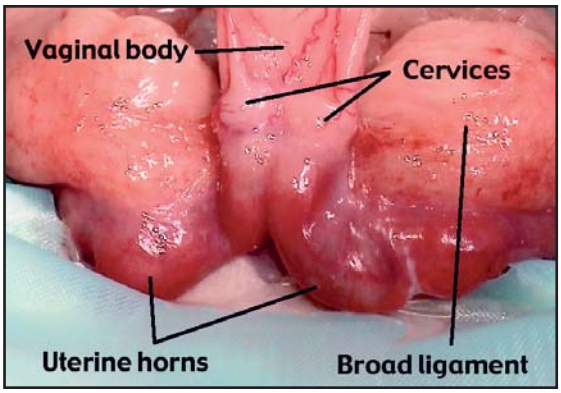


Fig 13. Shown is the appearance of the uterine horns, cervices and their anatomic relationships with the vagina. Two swellings are present in the left uterine horn; these were later diagnosed as adenocarcinoma on histopathologic examination.

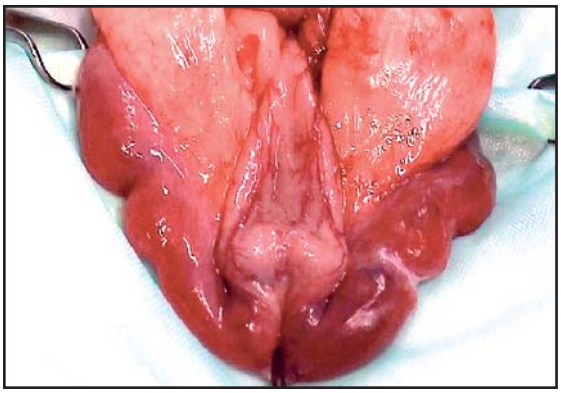


Fig 14. The vaginal body is exteriorized and reflected; the dorsal view is shown. The vaginal body is long, and 2 separate cervices are present. The uterine horns and both cervices are best removed via a true hysterovaginectomy, in which a portion of the vaginal body is resected and removed.

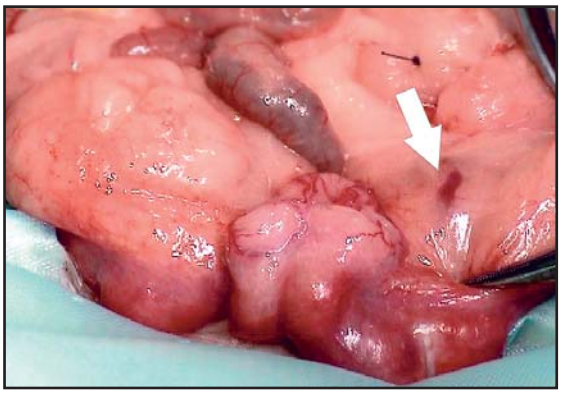


Fig 15. The uterine vascular supply (uterine artery and vein, arrow) is usually surrounded by fat, and visualization can be difficult. The fat included in the broad ligament has to be gently moved or carefully dissected to visualize these important vessels.

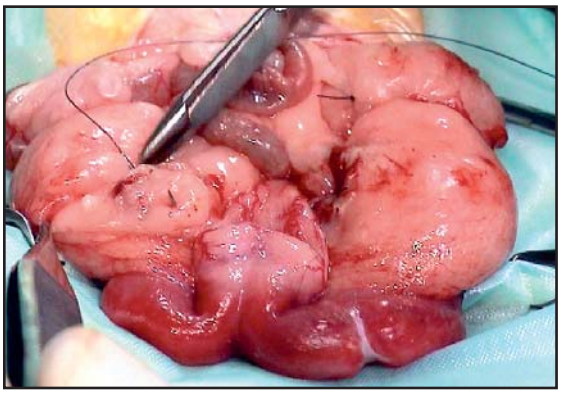


Fig 16. Ligation of the right uterine vascular supply is performed using 3-0 absorbable suture (Monocryl, PDS). The vascular supply to the left uterine horn and the ovaries has already been ligated in this picture.

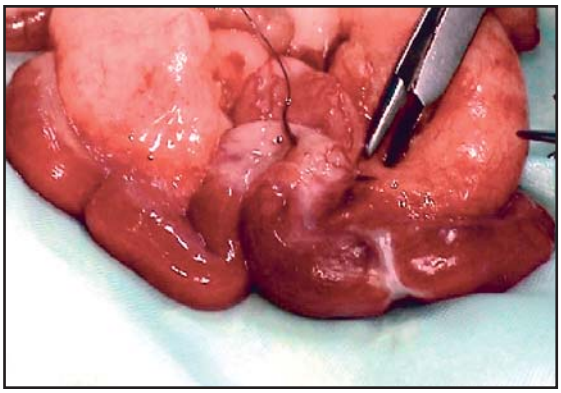


Fig 17. True hysterectomy is performed after ligation of the 2 single cervices. There are no specific advantages to this technique in the female rabbit; it represents a variant of the hysterovaginectomy procedure and is shown here only for demonstration purposes. The cervix of each uterine horn is ligated with 3-0 absorbable suture. With large rabbits, 2 transfixing sutures can be placed instead. Cervical tissue is thicker than vaginal tissue but is not as thick in the rabbit as in carnivore species.

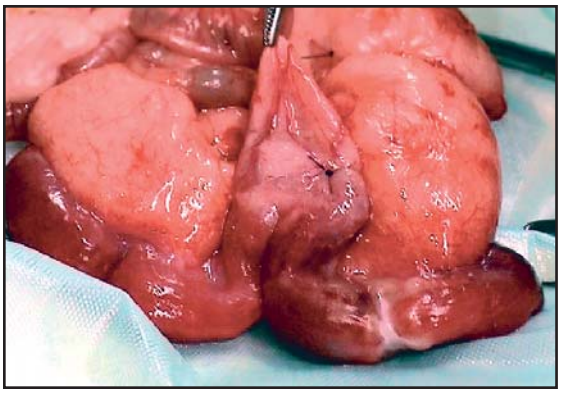


Fig 18. Ligation of the left cervix has been performed in this photo. The procedure is repeated on the right cervix.

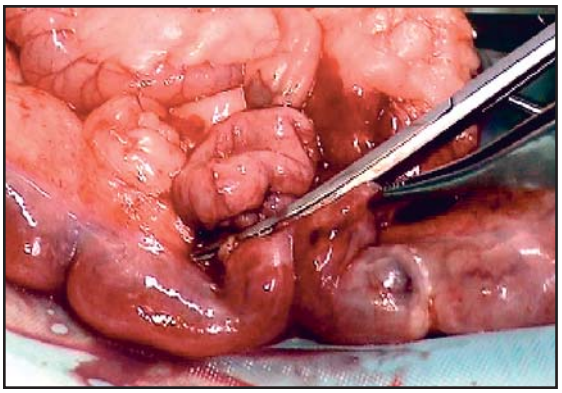


Fig 19. The distal end of the uterine horns is dissected cranial to the ligation of the two cervices. The broad ligament is dissected lateral to the ligation of the uterine vascular supply, and the ovaries, oviducts and uterine horns are removed.

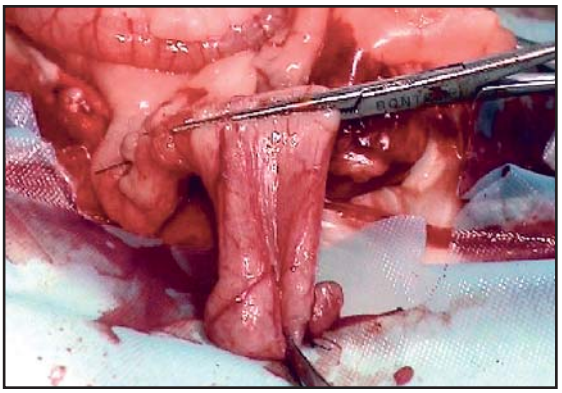


Fig 20. The ovariohysterectomy technique does not allow removal of the long vaginal body, so a true ovariohysterovaginectomy is recommended for rabbits. The dorsal approach to the reproductive tract interferes with visualization of the urinary bladder, so the clinician should be aware of its location relative to the surgical field. The urethra enters the vagina further caudally than the point of ligation and does not usually represent a surgical concern (Fig 1).

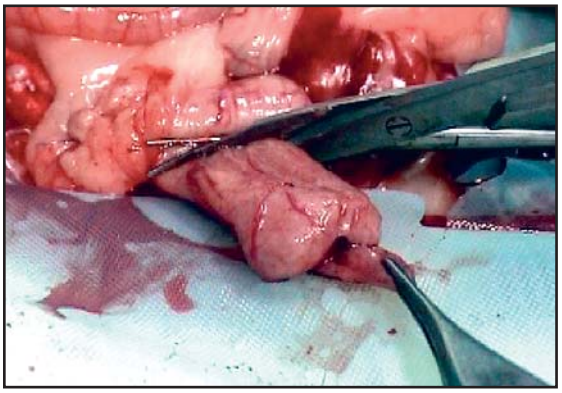


Fig 21. The vaginal body is dissected cranial to the clamp and removed.

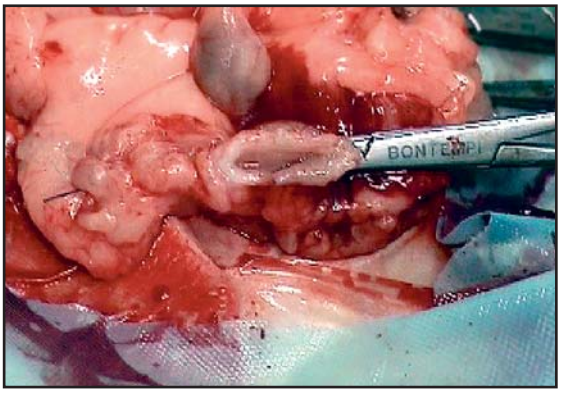


Fig 22. Shown is the appearance of the vaginal stump prior to suturing. Because the vaginal body is wide and flaccid, the stump must be sutured carefully to prevent post-surgical reflux of urine into the abdominal cavity.

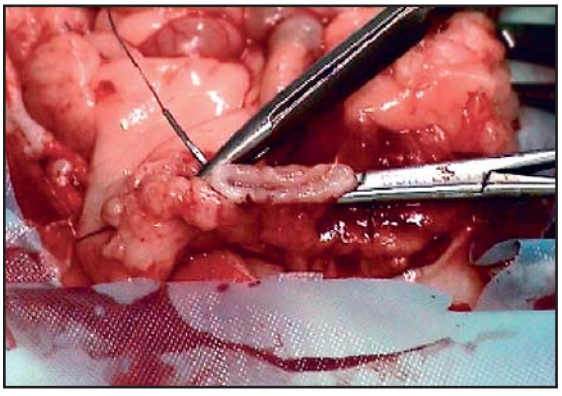


Fig 23. The vaginal stump is sutured using 3-0 or 4-0 absorbable suture material in a continuous pattern.

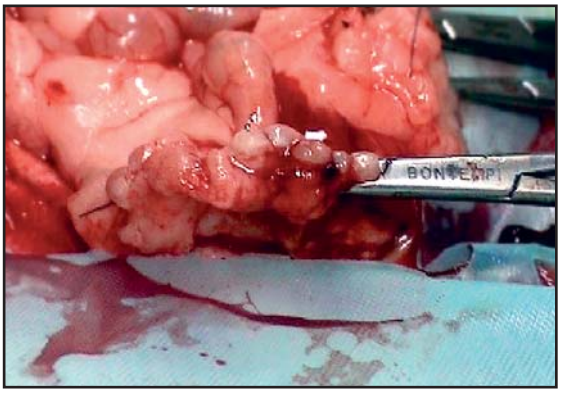


Fig 24. Appearance of the vaginal stump after suturing. With this technique, the risk for disease of the vaginal body is significantly reduced (see Fig 26).

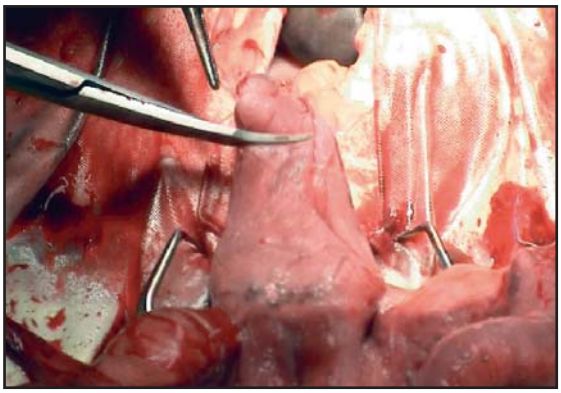


Fig 25. This step-by-step procedure (Figs 16-24) shows the vaginectomy following hysterectomy for demonstration purposes. Vaginectomy is usually performed at the same time as uterine removal, as shown in this picture of another rabbit. With small rabbits, ligation of the vaginal body may be performed with 2 transfixing sutures rather than with a continuous pattern, as shown above.

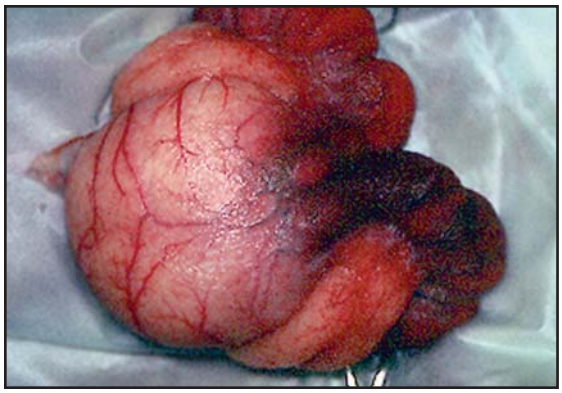


Fig 26. In this 7-year-old female rabbit with purulent vaginitis, the vaginal body is very flaccid and can be widely distended, resembling the urinary bladder. Due to the peculiar anatomy of the rabbit uterus and vagina, terms such as "purulent endometritis," "pyometra" or "diseases of the uterine remnant" are not correct, and the pathologic significance is different.

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