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Other Companion Animals
Comparison between Surgical Techniques for Neutering & Spaying Different Pet Rodent Species & Rabbits

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Many surgical procedures have the advantage of more than one available technique, which can be chosen based on surgeon preference, or for other surgical or anatomical reasons. While surgical neutering of exotic companion mammals is routine, the availability of alternative techniques can be beneficial as well.

SURGICAL TECHNIQUES FOR ORCHIECTOMY OF THE PET 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 cranial to the penis in two separate hemiscrotal sacs. Another very important anatomical feature, similar to rodent species, is that the inguinal canal remains open throughout life, allowing the testicles to move freely from the hemiscrotal sacs to the abdominal cavity, making rabbits (and rodents) “functional cryptorchids”. 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 of rabbits are elongated and not round shaped. The epididymis is quite visible at the caudal pole of the testicle, but is not as developed as in rodent species. The fat surrounding the testicles is present, but less abundant than in rodents.

The unique anatomy of male rabbits has important implications for surgical techniques. Due to the presence of the open inguinal canals, it is highly recommended or necessary to close them during the surgical procedure. This closes the open communication between the hemiscrotal sacs and the abdominal cavity, and prevents hemiscrotal herniation of abdominal viscera (e.g, the intestines or urinary bladder), or fat. The position of the penis caudal to the testicles allows the surgeon to perform a prescrotal approach with a single incision on the midline.

Indications for orchiectomy can be both preventive and therapeutic. They are described elsewhere, and are beyond the goal of this paper.

Prescrotal approach

With this approach, the prescrotal area is easily clipped and aseptically prepared, avoiding the need to attempt more difficult clipping and preparation of the thin delicate hemiscrotal skin. The skin is incised 1.5-2 cm. on the midline immediately cranial to the base of the hemiscrotal sacs. The subcutaneous tissue and inguinal fascia are bluntly dissected, and the vaginal processes are located immediately deep to this tissue and superficial to their entrance into the abdomen through the inguinal canal. The vaginal process is bluntly dissected from the surrounding soft tissue, and isolated. A circumferential suture using 3-0 or 4-0 absorbable material is passed around it, but will not be tightened until after the orchiectomy.

With the open technique, the vaginal process is incised in order to access the testicle and the spermatic cord. The testicle is exteriorized and the hemiscrotal sac is everted. The tail of the epididymis is...
dissected, and the testicle is freed from the hemiscrotal sac. The hemiscrotal sac is again inverted and replaced in its normal anatomic position. The spermatic cord is double clamped and ligated, using adsorbable suture or hemoclips. Then, the spermatic cord is resected and the testicle is removed. The stump is replaced inside the vaginal process. At this point, the circumferential suture that was preplaced around the vaginal process is tightened, resulting in closure of the inguinal ring. Alternative techniques include the use of hemoclips or a transfixing suture.

With the closed technique, the dissection of the vaginal process is extended up to the caudal pole of the hemiscrotal sac. Then the vaginal process is ligated with a circumferential suture. This technique allows proper closure of the vaginal process and the inguinal ring, but not direct ligation of the spermatic cord. For this reason, it must be securely tied. Inguinal fascia, subcutaneous tissue and skin are sutured as routine.

Scrotal approach
The scrotal is still the most common surgical approach for castration of pet rabbits. It can be performed both with the open and closed techniques. With this approach, closure of the vaginal process is performed more distally than with the prescrotal approach, and can be more difficult. Also, the delicate skin of the hemiscrotal sacs are clipped, scrubbed and incised; with higher risk of postoperative complications.

Abdominal approach
The abdominal approach via a caudal laparotomy on the midline has been described in pet rabbits both for elective and therapeutic indications related to testicular neoplasia and/or inguinal hernias.

SURGICAL TECHNIQUES FOR NEUTERING THE FEMALE PET RABBIT
In rabbits, the ovaries, oviducts and the 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 the mesosalpinx. The uterus is a complete paired organ, not partially paired as in most of other placental mammal species. It is bicorunate with two 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 ventrally to the vagina and the uterine horns, 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.

Indications for neutering can be both preventive and therapeutic. They are described elsewhere, and are beyond the goal of this paper.

Selective ovariection
The primary indication for selective ovariection is preventive neutering. The efficacy of ovariection alone to prevent uterine disease is controversial, and there are anecodal reports of both positive and negative outcomes. The author’s experience is overall positive.

The surgical approach is via laparotomy through a midline incision performed a few centimeters caudally to the umbilical scar. Ligation of the ovarian artery and excision of the ovary is straightforward, and can be performed using various techniques (e.g., ligation with absorbable suture material, application of hemoclips, cauterization with a radiosurgery unit).

When the mesovarium is filled with fat, ligation might be more challenging and hemostasis must be very accurate. Also, application of hemoclips is more difficult, because the ovarian vascular supply cannot be easily visualized.
Ovariohysterectomy
The ovaries and the mesovarium, the salpinges and the mesosalpinges, the uterine horns and the broad ligament, and the vagina are exteriorized. Ligation of the ovarian artery is performed as described above.

The uterine vascular supply is usually surrounded by fat, and visualization can be difficult. Therefore, the fat included in the broad ligament has to be gently moved or carefully dissected to visualize these important vessels before ligation. True hysterectomy is performed by ligation of the two single cervices. There are no specific advantages to this technique in the female rabbit. It just represents a variant of the hysterovaginectomy procedure described below.

Ovariohysterovaginectomy
Ovariohysterectomy does not allow removal of the long vaginal body, so a true ovariohysterovaginectomy is recommended for rabbits. Vaginectomy will be partial, and performed only on the portion proximal to the vestibulum and the urethral opening. Different suture techniques (e.g., continuous suture or transfixing suture) can be performed on the vaginal stump. With this technique, the physiologic retrograde flow of urine from the bladder into the vaginal body is significantly reduced which may have medical advantages.

ORCHIECTOMY OF SELECTED RODENT SPECIES
The basic principles of the surgical approach and techniques, as well as closure of the inguinal canal are not different in rodent species than that described for the pet rabbit. Nevertheless, two important anatomical differences with the rabbits must be noted. The penis is cranial to the hemiscrotal sacs; and the inguinal opening is actually much wider.

Prescrotal approach
The prescrotal approach is very useful in rodent species. In the guinea pig, the presence of the perianal pouch containing thick secretion and debris is often a predisposing factor to postsurgical infections when the scrotal approach is used. The prescrotal approach has the distinct advantage of avoiding the perianal pouch and allows more complete scrubbing and draping of the surgical field.

The prescrotal incision is performed bilaterally, a few millimeters lateral to the base of the prepuce. The vaginal process, which is much larger than in rabbits, is exposed. Both the open and the closed technique are reported. The open technique allows a better visualization of the blood vessels of the spermatic cord which are usually embedded in fat. Also, certain species such as rats have a well developed epididymis and related blood vessels, necessitating a separate ligation. Finally, the suture of the inguinal ring can be performed not only through a circumferential ligation of the wide vaginal process, but even with single transfixing sutures.

Abdominal approach
The abdominal approach is the best option for squirrel-like rodents, as these are true cryptorchids; but can also be an option for porcupine-like rodent species. Due to the higher risk of hypothermia due to laparotomy, it may not be considered the best option for smaller rat-like rodent species like hamsters and gerbils. The closure of the inguinal canal is performed by evertting the vaginal process through the laparotomic incision, and ligating it at its base.

FLANK APPROACH FOR ELECTIVE OVARIECTOMY IN RODENT SPECIES
Elective spay of porcupine-like rodents (guinea pig, chinchilla, degu) can be challenging due to certain anatomic features, such as long and thin uterine horns, fragile salpinges and the very short ovarian suspensory ligament. Also, the postoperative period after ventral midline laparotomy is usually more difficult in these species when compared with rabbits.

The lateral flank approach for elective ovariohysterectomy has been extensively described in dogs and
cats, but routine use is uncommon, likely because the ability to perform a complete explorative laparotomy is hampered. This approach has been reported both in literature and anecdotally in rabbits and rodents as well, but is likely under-utilized. Indications are related to elective ovariectomy or ovariohysterectomy. Contraindications are represented by suspected or diagnosed ovarian and/or uterine disease. The flank approach can be helpful also in case of treatment of ovarian cysts, if the cysts are not too big or if they are emptied draining the fluid with a syringe before ovariectomy.

Advantages are represented by:

- Shorter incisions
- Position of the suture: easier to check and medicate, if necessary
- Reduced manipulation of the abdominal viscera
- Reduced postoperative pain and self-trauma
- Reduced risk of dehiscence of the suture and potential evisceration

- Possibility for the dam to nurse young after surgery (this is not so important for hystricomorph rodent species, whose lactation period lasts only a few days)
- Easier exteriorization of ovaries
- Shorter procedure

Disadvantages are represented by:

- Impossibility to perform a complete exploratory laparotomy
- Two incisions are needed
- Contraindicated in cases of known of suspected uterine disease.
- In the author’s experience only partial hysterectomy is possible because it is very difficult or impossible to reach the uterine cervix through the flank incision.

The patient is clipped over the entire flank and the lateral abdominal wall, and scrubbed routinely. Another option in rats or other rodents with free movable skin is to clip a generous area of skin over the dorsum which is then moved to one flank for removal of the first ovary, and then slid to the other side to remove the contralateral ovary. The points of reference for incision of the skin and the abdominal wall are represented cranially by the edge of the last cartilaginous ribs, and dorsally by the line of the lateral vertebral processes. The incision line bisects the angle formed by these two lines, with a craniocaudal and dorsoventral direction, in order to match the direction of the incision of the muscular wall.

The initial skin incision can be slightly more difficult in this area, as the skin is relatively thick, and the lateral abdominal wall is relatively thin and delicate. For this reason, scissors may be preferred to a blade. The subcutaneous tissue is bluntly dissected until the external oblique abdominal muscle is exposed. The incision of the muscular wall is performed as described for the skin in order to match the direction of the muscular fibers of the external oblique abdominal muscle. The internal and the transverse laminar abdominal muscles are bluntly dissected with scissors, until the abdominal cavity is entered and fat tissue is exposed. Both the incision of the skin and the laparotomic incision are shorter when compared to the standard approach through the ventral midline. The ovary and the proximal tract of the uterine horn are easily exposed with gentle traction of the exposed fat. This is a clear advantage when compared to the approach through the ventral midline: much less traction is required to expose these fragile tissues.

Ligation of the ovarian artery is performed as routine. The use of Hemoclips is very quick and effective. The ovary is dissected free from the surrounding fat tissue; the fat tissue and the proximal end of the uterine horn are then repositioned into the abdominal cavity. The muscular wall is sutured in one layer using a single staple 3:0 adsorbable suture. The skin is sutured routinely.

The surgical approach is then repeated on the contralateral flank. While exteriorization of the contralateral ovary from through the same incision is reported in the cat, and anecdotally reported also in rabbit and guinea pig, the author performs two separated surgical approaches on both flanks.
Even though complete ovarioisterectomy via this technique has been anecdotally reported, in author’s opinion and experience is very difficult or impossible to perform a complete hysterectomy very close to or including the uterine cervix unless the incision of the muscular wall is extended much more caudally, which negates or reduces the advantages of the flank approach. Therefore only partial (ovario)hysterectomy is feasible through the approach from the flank.

References:


