SPAYS AND NEUTERS IN SMALL MAMMALS

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The concept of the spay or the neuter is not an unfamiliar one to the typical small animal practitioner. However, while the basic concept is the same, remove the entire or part of the reproductive tract, the actual procedures are typically radically different in small mammals. Furthermore, anesthesia and the patients’ response to postoperative pain tend to be different, resulting potentially in radically different pre-, intra-, and postsurgical plans. Despite this, the basic tenets of surgery remain valid: know the anatomy; handling tissue gently; control hemorrhage; and if you don’t know what it is, don’t cut it!

This discussion will attempt to provide a basic overview of “spays and neuters” in some of the most commonly encountered small companion mammals. Of particular importance are the idiosyncrasies that exist among this group of “exotic mammals.” Obviously, there are a number of differing techniques and approaches to these procedures. An attempt will be made to provide a relatively broad description of a variety of methods without creating a lengthy treatise on the subject. Notably absent will be discussions of presurgical work-ups, anesthesia, and postsurgical management. Readers are directed to other resources within the literature for this information.

One of the first differences between surgical sterilization in dogs and cats and in small mammals is the indication for the procedures. In some cases, control of reproduction is, in fact, a major justification for the procedure. In most cases, however, it is of secondary concern, as many of these pets are housed exclusively indoors, are not prone to “roaming,” and are solitary pets. The most commonly advocated justifications include:

- **Behavioral.** Small mammal pets develop inappropriate behaviors if left intact. Aggression, urine marking, and the charming “bunny-humping” are all examples of behavioral anomalies that are often controlled by gonadectomy.

- **Treatment of Reproductive Tract Disease.** Small mammals are frequently diagnosed with reproductive tract disease. Uterine neoplasia in rabbits, ovarian cysts in guinea pigs, and testicular neoplasia are all examples of conditions which are best addressed via the surgical manipulation of the reproductive tract.

- **Reproductive Tract Disease Prevention.** There is both anecdotal and statistical evidence that gonadectomy can reduce the incidence of both reproductive tract and other diseases. The high incidence of uterine neoplasia in the intact female rabbit and the reduction in occurrence of mammary neoplasia in ovarietomized rats are valid examples.

The generic terms, “spay” and “neuter” may be somewhat confusing when applied to the typical small mammals. In an effort to clarify these concepts, a brief discussion of terminology is applicable.

- **Orchiectomy.** Removal of the testicle, epididymis, and a portion of the vas deferens. This technique may be performed:
  - **Open Technique.** The vaginal tunic is opened and the spermatic cord (vessels and vas deferens) is directly ligated. The testicle/epididymis is removed through the incision in the vaginal tunic.
  - **Closed Technique.** The vaginal tunic is not opened. The spermatic cord and gonad are removed while still within the tunic. The distal aspect of the vaginal tunic, which is found within the hemiscrotum, is removed.
  - **Pre-scrotal Technique.** In the rabbit, access to the vaginal tunic, and hence the gonad, can be made through a midline incision cranial to the scrotum.
  - **Abdominal Technique.** As the inguinal ring is not closed in these species, they are essentially “functional cryptorchids.” Therefore, the testes can be retrieved via an abdominal approach and traction upon the spermatic cord.

- **Ovariectomy.** Removal of the ovaries without removing the uterus or cervix. Controversy remains as to the efficacy of ovarietomy in the prevention of uterine disease, particularly in rabbits.
  - **Dorsal Approach.** A single dorsal midline skin incision is made. The loose skin is then moved laterally to permit access to the ovary through a lateral body wall incision. This is first done on one side, then the other.
  - **Flank Approach.** Ovariectomy is performed through a lateral flank incision. Typically, two separate approaches, left and right sided, are required for bilateral ovarietomy.

- **Ovariohysterectomy.** Removal of both ovaries and the uterus to the level of the cervix. In most cases, the term includes those cases in which the cervix is also removed. This procedure is generally performed through a ventral midline approach.

**ORCHIECTOMY (CASTRATION)**

**Rabbits**

The anatomy of the male reproductive tract in the rabbit is quite unique. The penis is directed caudally, and the testes are found in a hemiscrotum cranial to the penis. The inguinal ring remains open throughout the rabbit’s life, and therefore must be closed to prevent postoperative herniation.

Rabbits may be castrated with a prescrotal approach. In this case, the vaginal tunics are approached in turn...
through a ventral midline incision located cranial to the scrotum. The vaginal tunic is bluntly isolated and elevated. Once the tunic is incised, the spermatic cord may be grasped, and with gentle traction the testicle and epididymis exposed. Once the ligament between the epididymis and the scrotum is broken down, the spermatic cord may then be doubled ligated, transected, and allowed to retract into the body cavity. It is important to recognize that any hemorrhage that may occur from the spermatic vessels will need to be approached through an abdominal approach. In order to prevent postoperative herniation, the vaginal tunic should be ligated as far cranially as possible. The skin is then closed with subcuticular sutures, surgical glue, traditional sutures, or staples.

Open or closed approaches are much more commonly employed. In these circumstances, two separate skin incisions are made over the left and right testes respectively. It is important that the shaving and surgical preparation of the scrotal skin be done gently in order to prevent an iatrogenic dermatitis which may influence the healing process. In the case of the open technique, the vaginal tunic is opened to permit extraction of the testicle and ligation of the spermatic cord. The tunic should then be ligated. In the closed technique, the testicle and associated spermatic cord are dissected free from the scrotum and removed en bloc. Again the vaginal tunic is ligated, however, in this case, the spermatic cord is incorporated within the ligatures. The skin need not be closed in either procedure.

**Guinea Pigs, Chinchillas, Rats, Hamsters, Mice**

The anatomy of the male reproductive tract in these rodents is quite similar. In these animals, the penis is directed forward, opening cranial to the scrotum. As in rabbits, the scrotum is typically not terribly well developed, and the inguinal rings remain open throughout the animal’s life. In these animals, there is typically a very well developed fat pad that is situated within the inguinal ring; however, it tends to be closely associated with the testicle, and is therefore generally removed during the orchiectomy. The opening of the inguinal ring is generally much larger than that found in the rabbit. As a result, several sutures may be required to close the inguinal ring. Regardless, it is imperative that the ring be closed to prevent catastrophic herniation postoperatively.

In most cases, an open technique is utilized. The procedure is relatively straightforward, excepting the need to be more deliberate in closing the inguinal ring. The skin is typically closed postoperatively, as well. In the author’s experience, the preferred technique is the use of surgical staples in the skin. Others prefer the use of subcuticular sutures or glue. Most of these rodents will remove traditional skin sutures, although stainless-steel sutures tend to be more readily tolerated (or perhaps more accurately described as more difficult to remove).

**OVARIOHYSTERECTOMY**

**Rabbits**

The rabbit has a truly bicornate uterus, each uterine horn terminating in a separate cervix without a common uterine body. The uterus is typically somewhat coiled in the abdominal cavity and is located ventral to the urinary bladder. The mesometrium is typically fat laden, thereby complicating the efforts to identify uterine blood vessels. The ovaries, while not located within a true ovarian bursa, are generally surrounded by ample quantities of fat. The entire rabbit reproductive tract is far more fragile than that of the commensurately sized dog or cat, and therefore a gentle touch and limited traction is advised. During micturition, urine typically pools into the proximal aspect of the vagina before being voided to the outside. A similar pooling may result when the urinary bladder is express with the rabbit in dorsal recumbency. As a result, caution should be exercised to prevent contamination of the abdominal cavity with urine intraoperatively in those cases.

As previously suggested, an ovariohysterectomy is more commonly performed than an ovarioectomy. There appears to be an increased incidence of uterine neoplasia in ovarioctomized rabbits, when the procedure is performed after sexual maturity is reached. It seems that the increased incidence is not noted in rabbits ovarioctomized pre-pubescence. These “statistics” are anecdotal in origin, and should be interpreted with caution. In the author’s experience, an ovariohysterectomy is nearly always recommended and, in fact, removal of both cervixes is typically performed.

The surgical approach is typical for a ventral midline entry into the body cavity. The author prefers to use an incision of adequate length to permit exteriorization of both ovaries without excessive traction. The large cecum is often intimately associated with the ventral midline, therefore surgeons are cautioned to adequately elevate the linea alba to prevent iatrogenic cecotomy. Additionally, rabbits are exceptionally prone to the development of abdominal adhesions. For that reason, it is important to rinse talc off surgical gloves, use moistened gauze sponges, and minimize digital manipulation of the gastrointestinal tract.

An appropriately laced abdominal incision permits exteriorization of both ovaries. The suspensory ligament may be gently digitally broken down to assist in the exteriorization process. The ovarian artery is located within the mesovarium and tends to approach the ovary from a more caudal direction. It is important to assure that the entire, coiled oviduct is removed with the ovary. The uterine artery and vein are located within the broad ligament, often imbedded within a large fat pad. They tend to be located several millimeters lateral to the uterus. As these vessels tend to be relatively large, double ligation and transfixation is recommended. It is critically important to assure that the caudal vesicular artery, a branch off the uterine artery, which supplies the bladder wall, is preserved and not incorporated in a ligature. The author prefers to double transfix ligate the proximal-most aspect of the vagina, just distal to the cervix. Again, contamination of the abdominal cavity
with vaginal fluid, urine, or material should be prevented. Closure in three layers is routine, skin staples being the preferred technique for skin closure.

**Guinea Pigs and Chinchillas**

The reproductive tract of these two rodents are quite similar. They have exceptionally short ovarian suspensory ligaments, which tend to preclude adequate exteriorization of the ovary. The two uterine horns fuse externally to form a uterine body; however, an internal separation remains to the level of the single cervix.

Ovariectomy in these hystricomorph rodents is far more difficult than in either rabbits or rats. The gastrointestinal tract seems to be impossible to pack off for good visualization. That, coupled with the very short and tight attachment of the mesovarium, tends to mandate the presence of at least four hands intraoperatively. Given these limitations, the surgical procedure itself is quite straightforward, and tends to be less complicated by adipose tissue.

**Rats, Mice, and Hamsters**

The reproductive tract of these rodents is quite similar to that of the dog and cat. The relatively short mesovarium attaches caudal to the kidneys. The two uterine horns fuse into a single uterine body, which opens through a single cervix into the vagina.

Again, ovariectomy is straightforward. Caution must be taken during exteriorization of the ovary, as exuberant traction may result in avulsion of the ovary or even the kidney.

**OVARIECTOMY**

**Rabbits**

This procedure is rarely performed in rabbits in North America. There is anecdotal evidence to suggest that simply removing the ovaries does not preclude subsequent development of uterine neoplasia. This may be related to the state of sexual maturity at the time of ovariectomy. Prepubescent ovariotomized rabbits may be less likely to develop uterine neoplasia than those ovariotomized postpubescently. Further research is necessary to evaluate this question.

**Guinea Pigs and Chinchillas**

The short mesovarium and abundant gastro-intestinal tract tend to make alternative surgical sterilization procedures more attractive in these species. Additionally, the incidence of uterine disease seems to be far less common than that seen in the rabbit, so an ovariectomy is typically indicated, except when pre-existing uterine disease is noted.

Bilateral flank approaches are recommended for ovariectomy in hystricomorph rodents. A skin incision is made caudal to the last rib in such a location as to enter the abdomen just caudal to the caudal pole of the kidney. Blunt dissection is used to breach the abdominal musculature and enter the abdominal cavity. The ovary is typically identified with ease, exteriorized, and ligated. The author prefers to ligate both the vascular supply and the proximal oviduct. The muscle defect is closed with a continuous suture pattern, and the skin closed routinely.

**Rats, Mice, and Hamsters**

While these rodents are not surgically sterilized as often as the other small mammals, there is documented justification to do so, at least in the rat. As previously stated, the incidence of mammary neoplasia is significantly reduced in ovarietomized rats.

Bilateral flank approaches are possible in the rat, but typically are not necessary. In most rats, a single dorsal skin incision is adequate. The skin defect may then be moved over the dorsolateral body wall just caudal to the kidney. Blunt dissection adequately opens the body wall and exposes the ovary. Once exteriorized, the vascular supply is easily ligated, and the ovary removed. One or two sutures in the muscle defect are adequate. The skin incision is then moved over to the contralateral side and the procedure repeated. Skin closure is routine.

Hopefully, one can appreciate that the surgical sterilization of the most commonly encountered small mammal pets is relatively straightforward; most assuredly within the capability of most clinicians. The most important aspects of the surgical procedures are to have an understanding of the anatomy. It is also prudent to remember that these are small animals, and the degree of force used in dogs and cats is excessive when applied to the small mammal. Additionally, while blood vessels in these animals seem small to us, they are, in fact, large to the patient, and therefore hemostasis is quite important. All that being said, however, there are real advantages to the pet realized by spaying or neutering. Clinicians should advocate for these procedures.

**References**