



Cryptorchidism

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ABSTRACT: Cryptorchidism is a common clinical problem in dogs and cats. Retained testes can be unilateral or bilateral, are usually small and atrophied, and vary in location. These factors make diagnosis and surgical removal challenging in some animals. Diagnosis is confirmed using a variety of modalities, including diagnostic imaging in difficult cases. Surgical removal of the affected and normal testes is the treatment of choice. The surgical approach and technique used depend on the location of the retained testis.

Cryptorchidism is one of the most common congenital defects seen in small animal practice. In dogs, the reported prevalence of cryptorchidism ranges from 0.8% to 10%.¹ The defect is a sex-linked autosomal recessive trait that is common in certain breeds,² such as Chihuahuas, miniature schnauzers, Pomeranians, poodles, Shetland sheepdogs, and Yorkshire terriers. Smaller breeds are 2.7 times more likely to be cryptorchid than larger breeds.³ In cats, one study found Persians to be predisposed to cryptorchidism.⁴ Due to the thermal suppression of sperm production, bilaterally cryptorchid animals are sterile, while unilaterally cryptorchid animals are usually fertile.⁵ Undescended testes are 13.6 times more likely to develop neoplasia (Figure 1) than normal testes and are at increased risk of torsion.^{6,7}

Undescended testes vary in their anatomic position. They may be located in the prescrotal area, inguinal region, or abdominal cavity. In a study of 240 cryptorchid dogs and 50 cryptorchid cats, retained testes were most commonly found in the right inguinal region in dogs and in the left or right inguinal region in cats.⁸ Locating an ectopic testis can be dif-

ficult in some animals. A thorough and systematic approach to patient evaluation is necessary to efficiently find and remove the abnormal testis. Although surgery for removal of cryptorchid testes is well described in the veterinary literature, approaches to diagnosis and localization of ectopic testes have not been extensively described. This lack, coupled with the increasing number of animals that present with an unknown neutering history (e.g., rescue animals), emphasizes the need for a discussion of a thorough clinical approach to cryptorchidism.

This article describes a systematic approach to the diagnosis and surgical treatment of cryptorchidism in dogs and cats, including the integration of the history; physical examination; blood tests, including hormone assays; and diagnostic imaging to make a definitive anatomic diagnosis. Various options for surgical removal of the retained testis are also described.

DIAGNOSIS

History

Most authors agree that if one or both testes are not present in the scrotum by 2 months of age, the animal is cryptorchid.² It is highly unlikely that the testes will descend into the scrotum after this age. The clinical signs of

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cryptorchidism are usually not recognized by the owner. Young affected animals generally do not show signs of illness unless the retained testis develops an associated pathology such as torsion or neoplasia. Routine physical examination reveals a lack of one or both testes in the scrotum. Older dogs may develop a neoplasm (e.g., Sertoli cell tumor [Figure 1]) in the retained testis. Dogs with a Sertoli cell tumor may present with feminization syndrome characterized by symmetric alopecia and gynecomastia (Figure 2). Other testicular neoplasms, such as seminoma, rarely cause signs other than a palpable mass in either the inguinal canal or abdomen. Animals with testicular torsion usually present with acute abdominal pain and lethargy (Figure 3).

Physical Examination

Because ectopic testes can be located in several different areas of the body, the physical examination must be thorough. Areas to focus on include the scrotum, prescrotal area, inguinal canals, and abdominal cavity. If one testis is present in the scrotum, pushing it dorsally and cranially into the inguinal canal can help determine whether it is the right or left testis. After determining which testis is retained, carefully palpate the prescrotal area and inguinal canal on the affected side. Palpation of the testis in the inguinal region may be difficult because it can be confused with inguinal fat or the inguinal lymph node. Ultrasonography may be helpful to identify the testis (see Diagnostic Imaging, below). Perform abdominal palpation, but unless the retained testis is affected with a tumor, it is likely to be atrophied and very difficult to palpate. Failure to palpate an abdominal testis does not rule it out.

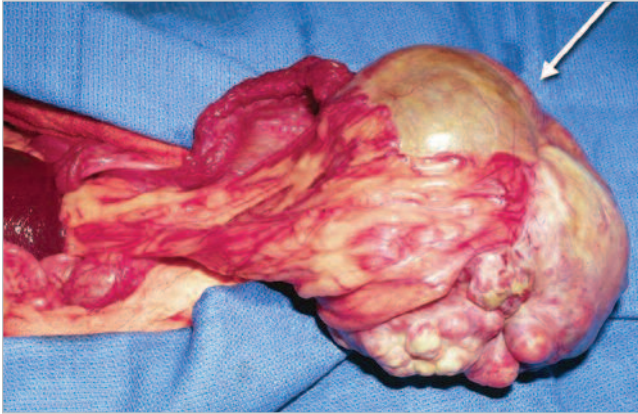


Figure 1. Sertoli cell tumor (arrow) of an abdominal testis in a cryptorchid dog.



Figure 2. Gynecomastia and alopecia secondary to a Sertoli cell tumor in a retained testis in the inguinal canal of a dog.

In addition to examining the animal to locate the retained testis, perform a general physical examination to rule out diseases associated with cryptorchidism. Examine the patient for alopecia and enlarged mammary glands caused by a Sertoli cell tumor, abdominal discomfort due to testicular torsion, and an inguinal or abdominal mass associated with testicular neoplasm (Figure 2).

Laboratory Evaluation

If indicated (e.g., in patients with advanced age or signs of other diseases), conduct a preoperative complete blood count and serum chemistry profile. The hyperestrogenism associated with Sertoli cell tumors can cause bone marrow suppression and aplastic anemia. In older animals, evaluate the chemistry profile for evidence of



Figure 3. Torsion of an abdominal testis in a cryptorchid dog.

unrelated chronic disease such as renal failure or liver disease. If these conditions are present, provide treatment to attempt to stabilize the animal before general anesthesia and surgery to remove the retained testis.

A testosterone assay can be conducted to determine whether the animal has functional testicular tissue. The testosterone level will be consistent with that of an uncastrated animal if testicular tissue is present. Serum testosterone assays can be conducted before and 2 hours after administration of human chorionic gonadotropin to verify the results of the testosterone assay. See Box 1 for the steps of this test.

Diagnostic Imaging

Plain film radiography of the abdomen may be useful if testicular neoplasia or torsion is suspected. Retained testes appear as intraabdominal soft tissue masses. Thoracic radiography should also be conducted in animals with suspected neoplasia to rule out metastasis.

Ultrasonography of the abdomen, inguinal canals, and prescrotal area can be helpful in definitively identifying testicular tissue (Figure 4). The testis has a characteristic ultrasonographic appearance, with the mediastinum testis appearing as an echogenic linear structure in the center of the echogenically homogeneous testis.⁹ Ultrasonography of the retained and normal testes can also help rule out a neoplasm in the parenchyma.¹⁰

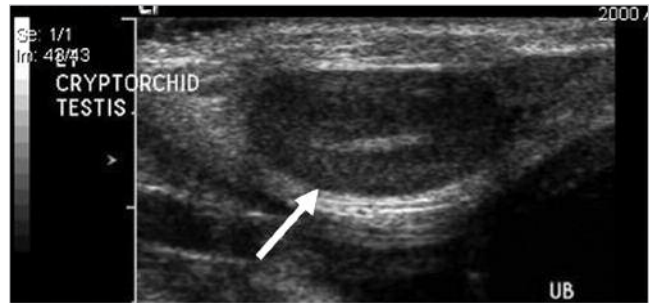


Figure 4. Ultrasound image of a retained testis (arrow) in the inguinal region in a dog.

SURGICAL TREATMENT

Because of the pathology that commonly affects ectopic testes, and because the condition is hereditary, we recommend surgical removal of both testes in affected animals. For cosmetic reasons, or to prevent disqualification of the animal in the show ring, some clients may ask their veterinarian to surgically pull the retained testicle down into the scrotum. Do not attempt to surgically move an inguinal or prescrotal testis into the scrotum. Because of the hereditary nature of the disorder, this cosmetic procedure is unethical and will encourage perpetuation of the defect in future generations of animals.

Prescrotal Testis

Prepare the prescrotal area for aseptic surgery. In dogs, testes located just cranial to the scrotum can be removed either by pushing the testis caudally and exposing it through a standard prescrotal midline incision or by simply incising directly over the testis. The testis is easily exposed and removed via either approach. The testis

Box 1. Human Chorionic Gonadotropin Stimulation Test for Assessment of Testosterone in Dogs and Cats^a

- Collect baseline serum sample (1.0 mL). Do not use polymer gel tubes.
- Administer 50 IU/kg of human chorionic gonadotropin (HCG) IM.
- Collect a second serum sample 2 hours after HCG administration.
- Centrifuge samples as soon as possible and separate serum.

^aAdapted from the University of Tennessee College of Veterinary Medicine Diagnostic Services Web site (vet.utk.edu/diagnostic/endocrinology/general.shtml).

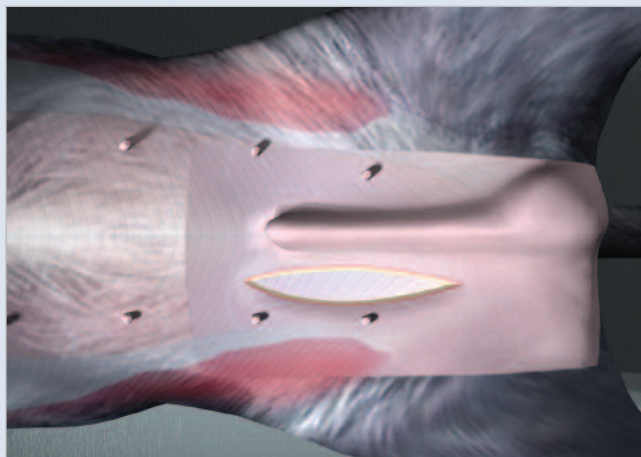
Box 2. Surgical Technique for the Paramedian Approach to Removal of an Abdominal Testis

Figure A. Place the anesthetized dog in dorsal recumbency and prepare the ventral abdomen for aseptic surgery. Depending on the size of the dog, make a 6- to 10-cm incision in the ventral abdomen, approximately 2 to 4 cm lateral to the prepuce but just medial to the nipples.

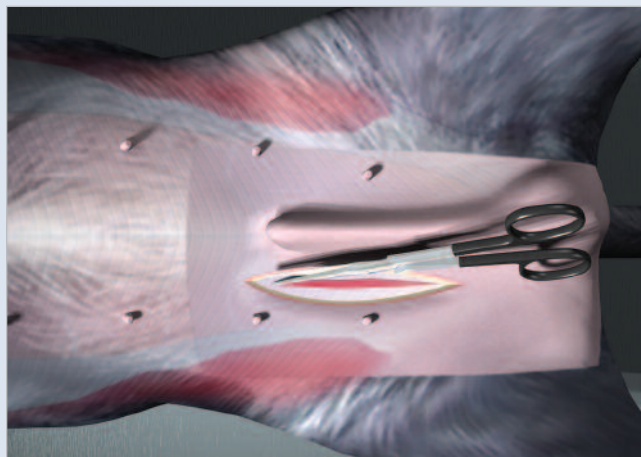


Figure B. Using a scalpel, incise the subcutaneous tissue to expose the fascia of the rectus abdominus muscle and make a nick incision in the fascia. Sharply incise the fascia (not the muscle) with Mayo scissors.

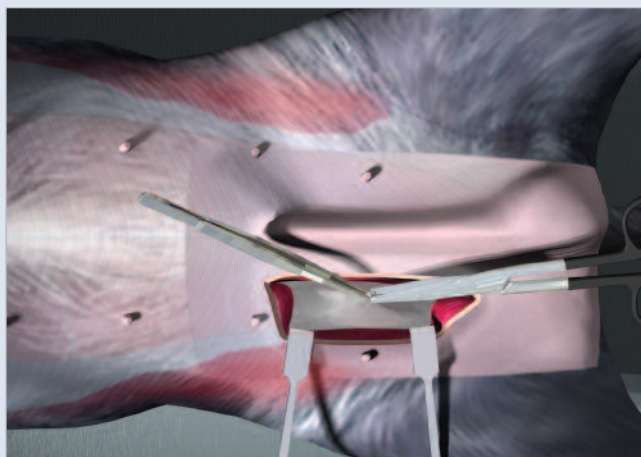


Figure D. Tent the peritoneum with thumb forceps and sharply incise it with scissors. Place moistened laparotomy sponges on both sides of the body wall, and place a Balfour retractor to retract the abdominal wall and allow exposure of the viscera.

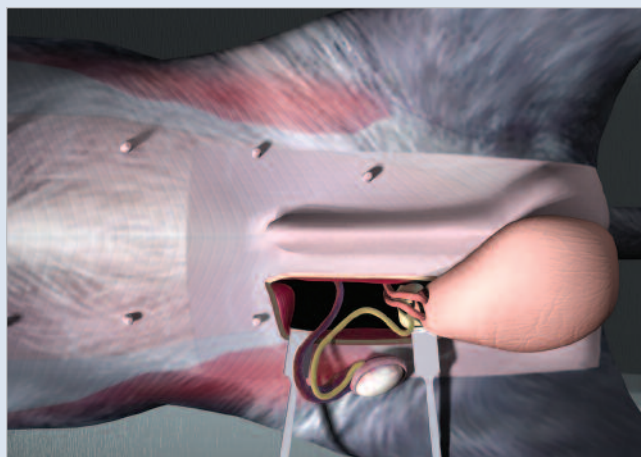


Figure E. If the retained testis is not immediately visible in the abdominal cavity, exteriorize the urinary bladder and retract it caudally. Identify the prostate gland and the vas deferens entering the prostate. Follow the vas deferens cranially to locate the testis. Alternatively, identify the gubernaculum as it exits the inguinal ring and follow it to the testis. Avoid trauma to the ureters, urinary bladder, and prostate gland. Triple ligate the vas deferens and the testicular artery and vein with absorbable suture, cut between the distal two ligatures, and remove the testis.

Illustrations by Tim Voit

can be removed in either an open (incise through the tunic) or a closed (leave the tunic intact) fashion. In cats, because scrotal testes are typically removed via bilateral scrotal incisions, testes in the prescrotal area will most likely require incision directly over the testis.

As with removal of a normal testis, expose the testis, vas deferens, and vessels. Triple ligate the vas deferens and vessels with absorbable suture, incise between the distal two ligatures, and remove the structure. Close the subcutaneous tissue and skin routinely.

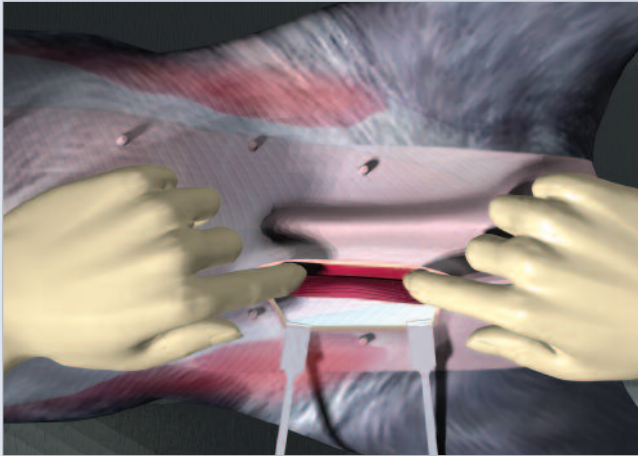


Figure C. Bluntly separate the fibers of the rectus abdominus muscle, beginning with Mayo scissors and continuing with both index fingers.

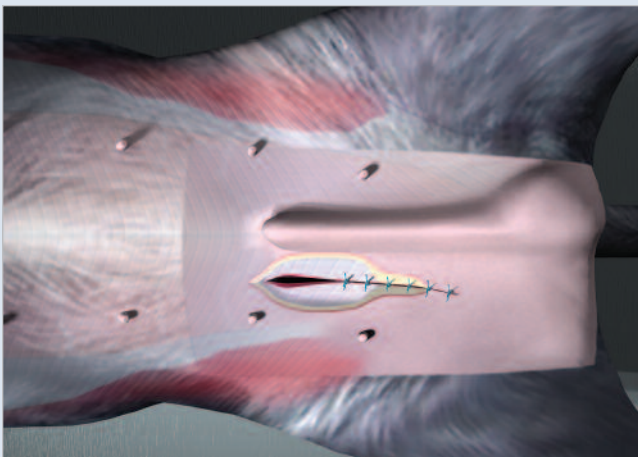


Figure F. Close the abdominal incision by first closing the external rectus fascia with absorbable suture (e.g., polydioxanone) in either a simple interrupted or a simple continuous pattern. It is not necessary to close the internal rectus fascia or the peritoneum. Close the subcutaneous tissue and skin routinely.

Inguinal Testis

Testes located in the inguinal area usually require incision directly over the inguinal canal. Meticulous and thorough dissection may be required to expose the testis. Be careful not to injure the pudendoepigastric artery and

Key Points

- Ultrasonography can be helpful in identifying undescended testes and determining whether neoplasia is present.
- If an animal is suspected to be cryptorchid but the retained testes have not been identified, hormonal assays can be used to confirm the diagnosis.
- Because cryptorchidism is hereditary and retained testes are prone to developing neoplasia or torsion, castration is the treatment of choice.
- A caudal paramedian abdominal approach can be used to easily find and remove unilateral abdominal retained testes in dogs.

vein or their branches. It is possible to confuse the inguinal lymph node with the testis. However, careful dissection and gross examination of the structure should allow differentiation before proceeding with the excision. Once the testis and associated structures are exposed, remove them as described for prescrotal or normal testes.

In rare cases, the testis may be found within the inguinal ring. Gentle traction on the gubernaculum may move the testis out of the ring and into the subcutaneous space. Careful dissection and incision into the external inguinal ring may be necessary to remove the testis. During this dissection and subsequent closure of the ring, be careful not to injure the external pudendal artery and vein. Once the testis and associated structures are exteriorized, remove them as described for prescrotal testes. If the inguinal ring fascia was incised to remove the testis, carefully close the tissue with simple interrupted absorbable sutures. Routinely close the subcutaneous tissue and skin. Meticulously close subcutaneous dead space to prevent seromas, which are common in this area.

If the ectopic testis is not in the inguinal area, extend the skin and subcutaneous incisions cranially and perform an abdominal approach.

Intraabdominal Testis

In cats, unilateral or bilateral intraabdominal testes are removed by a ventral midline approach. In dogs, intraabdominal testes can be removed either by a standard ventral midline approach or by a paramedian approach (see Box 2). Bilateral intraabdominal testes should be approached via the ventral midline. For unilateral abdominal testes in dogs, we prefer the paramedian approach. The advantage of the paramedian approach is that it avoids dissection around the prepuce and ligation of the caudal superficial epigastric artery and vein. The paramedian approach also avoids creating

dead space in the subcutaneous tissue adjacent to the prepuce. Seroma formation is very common in this area.

Although the paramedian approach can allow removal of the testis through a smaller incision than the ventral midline approach, the surgeon should sufficiently expose the intraabdominal structures to allow careful, accurate identification. Expose and remove the testis only after verifying that all other structures have been correctly identified. In one clinical study, the prostate gland was inadvertently removed in three dogs because of insufficient exposure while attempting to remove an abdominal testis.¹¹ If additional exposure is needed to identify key structures, enlarge the abdominal incision and use appropriate retractors to find the testis and surrounding organs.

Rarely, the abdominal approach reveals that the testis is in the inguinal canal. It may still be possible to remove the testis through this approach by enlarging the inguinal canal to allow moving the testis into the abdomen. Alternatively, remove the testis as described in the inguinal approach.

Recently, laparoscopy-assisted cryptorchidectomy has been described in dogs and cats.¹² The complications associated with this technique were minimal, and operative times decreased with experience. The disadvantages of this technique are the expense of the equipment and the expertise needed to operate it. Anesthetic concerns are related to decreased venous return secondary to insufflation of the abdomen with carbon dioxide and hypoventilation due to the head-down position of the animal during the procedure. However, these anesthetic issues were not seen in the animals in this study.

POSTOPERATIVE CARE AND COMPLICATIONS

We routinely submit all excised tissue for histopathology to ensure complete removal of testicular tissue and to examine for testicular neoplasia. Routine postoperative care after removal of retained testes involves monitoring of the incision for inflammation, seroma, or infection. Some animals may require an Elizabethan collar to prevent licking of the incision. Analgesic therapy is indicated. A local tissue block can be performed using bupivacaine on the body wall and skin before closure. We generally use intravenous opioid medications (e.g., hydromorphone) for the first 12 to 24 hours postoperatively, followed by an oral NSAID for 3 to 5 days.

Rare complications include incisional dehiscence, inadvertent prostatectomy during removal of abdominal testes, ureteral ligation, and hemorrhage due to inadequate ligation of testicular blood vessels. We retrospec-

tively evaluated 10 consecutive dogs that underwent the paramedian abdominal approach for removal of abdominal testes at The Ohio State University Veterinary Teaching Hospital. Only two dogs had complications; one had excessive incisional swelling and the other had an incisional infection. Both complications resolved with appropriate treatment, and no dogs had long-term problems.

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I. Which statement about cryptorchidism is true?

- a. Cryptorchidism is a genetically dominant trait.
- b. Smaller breeds of dogs are more likely to be affected.
- c. Siamese cats are predisposed to cryptorchidism.
- d. Undescended testes are about twice as likely to develop neoplasia.

- 2. In dogs, undescended testes are most likely to be found in the _____ region.**
- a. right inguinal
 - b. left inguinal
 - c. right abdominal
 - d. left abdominal
- 3. Dogs and cats are considered cryptorchid if the testes have not descended by _____ of age.**
- a. 1 month
 - b. 2 months
 - c. 4 months
 - d. 6 months
- 4. Sertoli cell tumors cause**
- a. a testicular mass.
 - b. alopecia.
 - c. male feminization syndrome.
 - d. all of the above
- 5. The imaging modality of choice for diagnosing an undescended testis is**
- a. plain film radiography.
 - b. ultrasonography.
 - c. contrast studies.
 - d. myelography.
- 6. _____ is a common complication of surgical removal of an inguinal testis.**
- a. Dehiscence
 - b. Infection
 - c. Seroma
 - d. Peritonitis
- 7. Which abdominal muscle fibers are bluntly divided in the paramedian approach for removal of an abdominal testis?**
- a. rectus abdominus
 - b. external abdominal oblique
 - c. internal abdominal oblique
 - d. transversus abdominus
- 8. Which is not a step in the paramedian abdominal approach to removal of a retained testis?**
- a. Exteriorize and retract the urinary bladder caudally.
 - b. Triple ligate the testicular artery and vein and the vas deferens.
 - c. Close the peritoneum.
 - d. Close the external rectus fascia.
- 9. If an abdominal testis is not immediately obvious, which structure(s) should be found first?**
- a. gubernaculum
 - b. testicular artery and vein
 - c. prostate and vas deferens
 - d. large intestine
- 10. In one study, the _____ was inadvertently removed from three dogs instead of an abdominal testis.**
- a. prostate gland
 - b. urinary bladder
 - c. large intestine
 - d. kidney