

## Adrenal rest tissue in domestic cats: a case series

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### Summary

Paraovarian masses were identified in cats presented to a high-quality, high-volume spay and neuter clinic. The masses were defined histologically as ectopic adrenal tissue.

**Keywords:** Adrenal, paraovarian mass

### Background

The adrenal gland develops embryologically as two separate structures, with the adrenal medulla arising from the neural crest and the adrenal cortex arising from the urogenital ridge along with the differentiating gonad. Masses of tissue separate from the main adrenal gland, called adrenal rest tissue, are commonly identified in humans. Adrenal rest tissue most often is found near the adrenal gland or associated with the ovaries or testes and contains no medullary tissue, suggesting that these remnants are formed from cells misplaced during embryologic migration.<sup>1</sup> Adrenal rest tissue is usually of no clinical significance in humans. They are identified in as many as 50% of neonates but are only reported in 1% of adult humans.<sup>1</sup>

Ectopic adrenal tissue near the ovaries is common in mares. It is uncommon in cats and rare in other species.<sup>a</sup> This is a case series describing adrenal rest tissue identified in six domestic cats.

### Case presentation

A two-year-old female domestic longhair cat (DLH) weighing 6.7 pounds was presented to a high-quality, low-cost spay and neuter service by its owner for ovariohysterectomy (OHE). All surgeries described were performed by one of the authors (KC). The cat had no history of health concerns and was not noted by the owner to be in estrus at the time of presentation. Information about estrous cycles was not available. The cat was verified to be in good health based on a complete physical examination. She received hydromorphone pre-operatively and was anesthetized with a combination of medetomidine, ketamine, and butorphanol. Anesthesia was monitored by assessment of vital signs, pulse oximetry, and capnography. Ovariohysterectomy was routine but the cat was noted to have masses near both ovaries (Figure 1). In this cat and in all other cats described the masses were readily visible. They were oval, and tan, and were 1-2 mm in diameter. All were located in the suspensory ligament, about 5-10 mm away from the ovary, and did not appear to be encapsulated. No abnormalities of the ipsilateral ovary or uterine horn were noted. The masses were excised, placed in formalin, and submitted for histopathology. The ipsilateral ovary also was submitted, with each tissue submitted in its own jar of formalin. Removal of this tissue did not require use of additional suture for control of hemorrhage or otherwise complicate surgery. The linea alba and subcutaneous tissues were closed in a simple continuous pattern with 3/0 or 4/0 polydioxanone suture. Subcuticular closure of skin was performed using the same suture.

Two feral cats, one a female domestic medium hair (DMH) cat estimated to be six to eight months of age and weighing 3.8 pounds and the other a female domestic short hair (DSH) cat estimated to be ten weeks of age and weighing 2.7 pounds were presented for OHE to the same facility. Information about estrous cycles was not available. Health of the cats was assessed by visual inspection. Anesthetic management was as previously described. Ovariohysterectomy was routine but both cats were noted to have one paraovarian mass, which was removed, placed in formalin, and submitted for histopathology. Closure was as previously described.

Three cats were presented from rescue organizations for OHE at the same facility. One was a female DMH estimated to be three months of age and weighing 3.0 pounds. The second was a female domestic DSH estimated to be four months of age and weighing 4.6 pounds. The third was a female DSH estimated to be two years of age and weighing 8.7 pounds. The cats were verified to be in good health based on a complete physical examination. The two year old cat was palpably pregnant. Anesthetic

management was as previously described; the pregnant queen also received subcutaneous lactated Ringer's solution during surgical preparation. Ovariohysterectomy was routine but all cats were noted to have one paraovarian mass, which was removed, placed in formalin and submitted for histopathology. Closure was as previously described; 2/0 polydioxanone suture was used for the pregnant cat.

### Differential diagnosis

The most likely cause of a discrete, small mass near the ovary is accessory or ectopic adrenal tissue. Accessory ovarian tissue is a theoretical possibility. All of the masses were adrenocortical tissue within fibrovascular tissue (mesovarium, mesosalpinx, or mesometrium) (Figure 2).

### Outcome

All of the cats recovered from anesthesia with no complications and were discharged the same day after they were ambulatory and were judged to be capable of returning to their home environment based on assessment of mentation and normal appearance of the incision and surrounding skin. Long-term outcome was not known.

### Discussion

The equivalent of adrenal rest tissue has been identified in cats. Masses 2-5 mm in diameter and located in the broad ligament near the ovary were removed from 17 cats and submitted for histopathologic evaluation. All of those masses contained adrenal cortical tissue with no adrenal medulla.<sup>2</sup> Prevalence of adrenal rest tissue in that study was cited as 2.2%.<sup>2</sup> While overall uncommon in cats, ectopic adrenal tissue in cats is a finding still more common than in any other species except the mare.<sup>a</sup>

Clinical significance, if any, is unknown. The zona reticularis of the adrenal cortex produces and secretes a variety of androgens including dihydroepiandrosterone (DHEA), which is a precursor of naturally produced estrogens. There are individual case reports of cats with multiple ovaries,<sup>3</sup> but this is rare. It is hypothetically possible, therefore, that either accessory adrenal tissue or additional ovarian tissue could be a cause of estrus signs after ovariectomy or ovariohysterectomy, as is seen in ovarian remnant syndrome.

Ovarian remnant syndrome occurs more commonly in cats than in dogs.<sup>4</sup> Affected spayed cats will show signs of estrus anywhere from 17 days to nine years after OHE, with lordosis (behavioral posturing of estrus) the most common sign.<sup>5-7</sup> Presence of estrogen secretion can be verified by vaginal cytology, using cornification of vaginal cells as a bioassay for serum estrogen concentrations. Ovulation can be induced with gonadotropin releasing hormone (GnRH; 25 mcg/cat, IM) and blood drawn two to three weeks later to verify elevation in serum progesterone concentration. Other diagnostic methods include ovulation induction with human chorionic gonadotropin (hCG), assay of serum anti-Mullerian hormone (AMH) or luteinizing hormone (LH) concentrations, abdominal ultrasonography, and abdominal exploratory.<sup>5,6,8-11</sup> Because there are no safe products available for long-term estrus suppression in cats, surgery to remove ovarian remnants is recommended. Surgery is best performed when there are identifiable structures (either follicles or corpora lutea) on the remnant tissue. Remnants are occasionally found in the abdomen, often wrapped in omentum, but are most commonly found at one or both ovarian pedicles and should be submitted for histopathologic evaluation, as some will be neoplastic.<sup>4,6,12-14</sup>

While it appears clear that neither adrenal rest tissue nor accessory ovarian tissue is the usual cause of ovarian remnant syndrome, the true cause of behavioral estrus after ovariectomy or OHE often goes unidentified. Ovarian cortical tissue readily revascularizes in the abdomen and it has been suggested that because the feline ovary is not in a bursa, cortical cells are more easily knocked away or caught in a clamp and left behind.<sup>8,15</sup> Ovarian remnant syndrome is not associated with difficulty of the surgery, experience of the veterinarian, or age or breed of the cat.<sup>4</sup> Use of a left flank approach for OHE has been hypothesized as a cause of retention of ovarian tissue at the right pedicle.<sup>16</sup> Surgeon error is a reported cause.<sup>5</sup>

Removal of adrenal rest tissue in these cats was not associated with increased surgical time or increased complications of surgery. It is, therefore, probably not detrimental to cats for it to be removed

during routine OHE. However, since there are no reported cases of ovarian remnant syndrome in cats due to anything but retained pieces of ovary, it probably is of greatest value for surgeons noting such tissue to be aware that it is adrenal in origin and need not be removed.

### Learning points

- Paraovarian masses noted at the time of routine OHE in domestic cats are most likely adrenal rest tissue.
- Clinical significance of adrenal rest tissue in cats is unknown.

<sup>a</sup>Personal communication, Rob Foster, BVSc, PhD, MANZVCS, Diplomate ACVP

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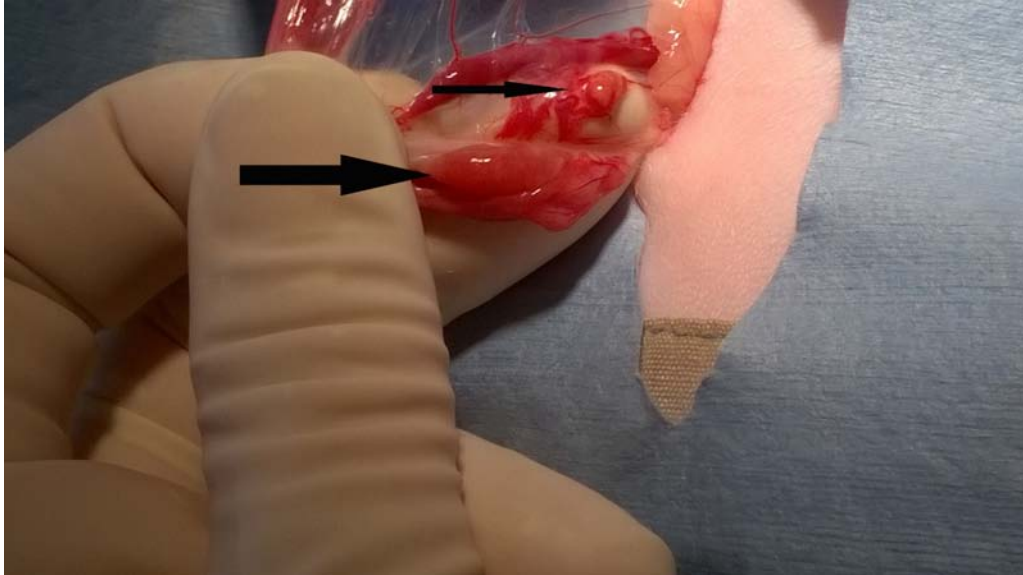


Figure 1. Normal ovary (large arrow) and extraovarian mass (small arrow).

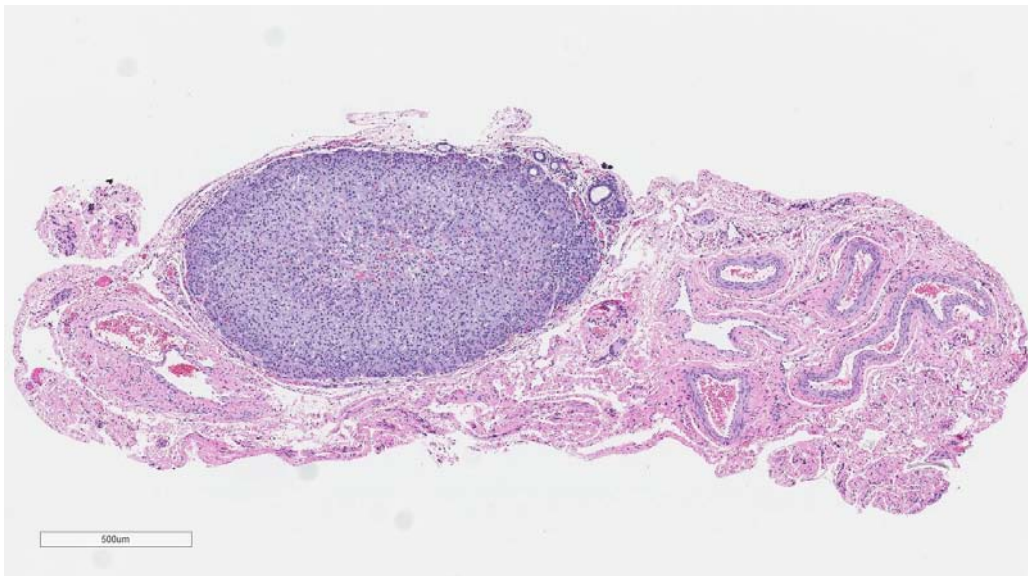


Figure 2. Histology of adrenal rest tissue composed of adrenocortical cells within the fibrovascular tissue of the mesovarium.

(Editor's Note: Photographs in this manuscript are available in color in the online edition of Clinical Theriogenology.)