A Giant Parovarian Cyst in a Dog with a Granulosa Cell Tumor

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ABSTRACT. A 13-year old intact female poodle showed persistent signs of estrus. Ultrasonographically, a large cystic mass containing echogenic fluid with a thin wall was observed, and it was 8 cm in diameter. The cystic mass was located at the mesovarium between the left ovary and uterine horn, and it was identified as a giant parovarian cyst. A right ovarian mass was histologically diagnosed as a granulosa cell tumor. Persistent estrogen hormone secretion by the granulosa cell tumor was thought to cause a rapid increase in the size of the parovarian cyst. This rare cystic mass originated from the genital system and was differentiated from the uterus.

KEY WORDS: canine, giant parovarian cyst, granulosa cell tumor, ultrasonography, uterus.


The most frequently encountered lesions in canine ovaries are cysts and tumors. Ovarian tumors are derived from three main cell types: epithelial, germ, and sex-cord stromal cells. Granulosa cell tumors are a type of sex cord stromal tumors such as Sertoli-Leydig cell tumors and luteomas. Granulosa cell tumors are usually unilateral and the left ovary is more commonly affected. Ovarian tumors produce steroid hormones or estrogen that influence the clinical signs associated with ovarian tumors.

Ovarian follicular cysts are the most common cystic lesions. Parovarian cysts are rarely found in the ovarian region and arise from the mesovarium in dogs. These cysts are usually asymptomatic and often found incidentally during laparotomy or necropsy. However, a giant parovarian cyst may produce clinical signs due to its mass effect. Ultrasonographically, parovarian cysts can appear as a mass containing anechoic fluid and confined by a thin wall. Based on these findings, these cysts may be confused with uterine lesions which also contain fluid within the uterine lumen such as hydrometra, mucometra, or pyometra, or other ovarian masses such as tumors or follicular cysts. To the best of our knowledge, a parovarian cyst has been previously reported in only one dog. Here we described a dog with a giant parovarian cyst occurring simultaneously with a granulosa cell tumor originating from the ovary. We speculated that the development of the giant parovarian cyst was associated with a hormonal imbalance caused by the ovarian tumor.

A 13 year old, intact female poodle was referred to Haemaru Referral Animal Hospital with yellowish vaginal discharge, vulvar swelling, polyuria, polydipsia, and pollakiuria. These clinical signs had persisted for 4 months following estrus bleeding. On physical examination, bilateral alopecia on the trunk and severe swelling of vulva were observed. Vaginal swabs contained keratinized epithelial cells, which were evidence of persistent estrogen secretion, but no inflammatory cells. On radiography, a tubular mass with soft tissue density was observed extending from the left middle abdomen to the pelvic canal (Fig. 1). The mass was 18 cm × 8.7 cm in size. Ultrasonography revealed that the mass was a cystic structure containing a large amount of hyperechoic fluid (Fig. 2). The cystic structure was identified as a separate structure located lateral to the left ovary. The left ovary was enlarged (0.98 × 0.80 cm) and contained small cysts within the parenchyma. The right ovary presented as a solid mass (2.58 cm × 1.67 cm) with a single cyst. The left and right uterine horns contained small amounts of anechoic fluid within hyperplastic walls. The right kidney was hypoplastic in contrast to the normal left kidney. Complete blood count and serum chemistry were normal except for a mildly elevated white blood cell count (25.0 K/μl; reference range, 6.0–17.0 K/μl).

On laparotomy, a 20 cm × 10 cm cyst was found at the mesovarium between the left ovary and uterine horn in the middle abdomen (Fig. 3). The cyst contained dark brown fluid and it was not connected to the uterine lumen. About 50 cc of cystic fluid was removed. Analysis showed that the cystic fluid was modified transudate (total nucleated cell count, 14.9 K/μl; specific gravity, 1.020; total protein, 3.1 g/dl). No infectious organisms were observed with bacterial culturing. The mass was identified as a giant parovarian cyst.

The right ovary appeared as a firm mass with a cyst. Ovariohysterectomy and histologic examination were performed (Fig. 4). The uterus was unremarkable except for endometrial edema and congestion. There were no significant inflammatory cell infiltrates, neoplastic cells, or infectious organisms. The mass in the right ovary was composed of cells arranged in lobules, perivascular rows, cysts, and packets on a small amount of fibrovascular stroma. Neoplastic cells were columnar to angular and had a variable amount of foamy to vacuolated eosinophilic cytoplasm.

NOTE Theriogenology

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The nuclei were oval with some mitotic figures (4/10 hpf). Diffuse congestion and focal hemorrhage was observed. A diagnosis of cystic endometrial hyperplasia, ovarian granulosa cell tumor and giant parovarian cyst was made. The dog recovered uneventfully after surgery and the clinical signs resolved.

Ovarian follicular cysts are the most common cystic lesions observed in the ovarian region. Among these cystic lesions, parovarian cysts develop from mesothelium, paramesonephric (Mullerian duct), or mesonephric (Wolfian duct) remnants. Therefore, these cysts are found in a part of the broad ligament between the ovary and uterine tube [9]. Paraovarian cysts constitute 10–20% of all ovarian tumor-like lesions in humans. To the best of our knowledge, only one case of a canine parovarian cyst (occurring in a West Highland white terrier dog) has been reported in the literature [1, 3, 7]. Parovarian cysts do not usually produce any clinical signs. However, abdominal distention or acute abdominal pain can be observed when the cyst is enough large, and complications such as hemorrhage, torsion, and rupture of the cyst have been reported in humans. Although rare, benign or malignant neoplasms such as papillary serous cystadenoma, endometroid cystadenocarcinoma, serous cystadenocarcinoma, or mucinous cystadenocarcinoma may occasionally develop in conjunction with parovarian cysts [2, 6, 8, 10]. The clinical features of parovarian cysts, however, have not been evaluated in dogs because the occurrence of these lesions is extremely rare.

Parovarian cysts have been reported to grow rapidly during pregnancy in humans due to the influence of hormones [11]. In the present case, the parovarian cyst was very large with a maximum size of 20 cm × 10 cm, and also a granulosa cell tumor was found in the opposite ovary. Granulosa cell tumors are ovarian tumors in the canines that arise from granulosa cells [17]. These tumors are typically benign, however have been reported to metastasize [16]. Clinical signs of ovarian tumors are variable according to the hormones produced [15]. In a previous study of the pituitary-ovarian axis in dogs with granulosa cell tumors, plasma luteinizing hormone concentrations were higher than those in anestrous and ovariectomized animals [4]. Granulosa cell tumors continuously produced estrogen, and vulvar bleeding was commonly observed in cases of these tumors [5, 17]. The dog in our case showed vaginal discharge and vulvar swelling, bilateral alopecia on the trunk, and persistent estrus on the vaginal swab. Therefore, it was assumed that a functional granulosa cell tumor had developed in this dog, and the estrogen produced by the tumor may have promoted the growth of the parovarian cyst.

Ultrasonographically, parovarian cysts have a thin wall and smooth margins; they are usually unilocular and contain anechoic fluid [9, 11]. Ovarian cysts, such as ones arising from follicles or the corpus luteum, may have a similar appearance and can thus be misdiagnosed sonographically. When an ovarian cyst arises in the margin of the ovary, the remaining ovarian tissue can usually be observed along one margin of the cyst [12]. The remaining ovarian tissue near ovarian cysts with this location is crescentic in shape [12]. However, in parovarian cyst the ipsilateral ovary is not affected and maintains its normal configuration, ovoid

Fig. 1. Abdominal radiography of the dog. On the lateral view (A), a mass (m) with soft tissue density was observed in the middle and caudal abdomen. The mass was located from the ventral region to colon (c) and extended to pelvic canal (arrow). On the ventrodorsal view (B), the cranial margin (arrows) of the mass was found caudal to the spleen head (s) and left kidney (k), and occupied the left middle and caudal abdomen. The descending colon (c) was superimposed on the mass.
shape, because paraovarian cysts arise from the broad ligament between the uterine tube and ovary [3, 8]. Therefore, sonographic detection of ipsilateral ovaries separate from the cyst may be helpful for diagnosing paraovarian cysts [3, 9, 12]. A giant parovarian cyst can be confused with uterine lesions such as hydrometra, mucometra or pyometra because these lesions may appear as thin-walled tubular structures containing anechoic or echogenic fluid. The uterine horns and body should be carefully scanned when a unilateral cystic lesion is found for differentiating between a parovarian cyst and unilateral uterine dilation. In the present case, endometrial hyperplasia caused thickening of

Fig. 2. Ultrasonography of the genital system of the dog. A cystic lesion (m) with a thin wall and hyperechoic fluid was observed in the left cranial abdomen (A). The left and right uterine horns contained anechoic fluid and had wall structures (B and C). The left ovary (D), measuring 0.98 cm × 0.80 cm, contained hypoechoic parenchyma and cysts (*). The right ovary appeared as a hypoechoic mass (#) and was 2.58 cm × 1.67 cm in size (E). An anechoic cyst (*), 0.78 cm × 0.62 cm in size, was found within the mass.
the uterine wall, and thus, a parovarian cyst was easily differentiated from other uterine lesions.

The size of the parovarian cyst might increase due to estrogen produced by a concurrent ovarian granulosa cell tumor. This dog had clinical evidence of a hormonal disturbance. Although the parovarian cyst was large, clinical signs caused by a mass effect of the cystic lesions were not observed. When a cystic lesion containing fluid separate from the ipsilateral ovary is observed, parovarian cysts should be included in the differential diagnosis. Moreover, when a giant parovarian cyst is identified, underlying factors which may influence the production of sex hormones should be investigated.

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