

## CYSTADENOMA IN THE *RETE OVARII* IN A BITCH

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**SUMMARY:** The *rete ovarii* is the counterpart of the male *rete testis* that develops from the primary sex cords of female animals. Pathological conditions of the *rete ovarii* are rarely reported in dogs. This communication describes a cystadenoma of a *rete ovarii* in a 2-year-old, intact, crossbred bitch presented to the Veterinary Teaching Hospital, University of Peradeniya. The bitch was presented with complaints of hyporexia, constipation, purulent vaginal discharges and progressive abdominal distension for three weeks. Based on the clinical examination and imaging findings, a tentative diagnosis of pyometra with concurrent uterine cyst/neoplasia was arrived. An exploratory laparotomy revealed that the space of the right ovary is occupied by a large, 14 cm x 16 cm, smooth surfaced, spherical mass and ovariectomy was performed. Histopathology findings of the mass suggested a cystadenoma of *rete ovarii*. To the authors' knowledge, this is the first report of canine cystadenoma in *rete ovarii* in Sri Lanka.

**Keywords:** Cystadenoma, *rete ovarii*, rare tumours, uterine neoplasia, canine

### INTRODUCTION

The *rete ovarii* of female animals, which is homologous to *rete testis* of male animals, is formed by the mesonephric cells that migrate into the developing gonads of the embryo (Jiang *et al.*, 2004). The mature *rete ovarii* consists of three components including an intra-ovarian rete, an extra ovarian rete and a connecting rete located between them. The intraovarian rete is present within the ovarian medulla and it is lined by cuboidal epithelium. The intra-ovarian rete connects with the extra-ovarian rete through a reticular network consists of dilated tubules lined by ciliated columnar epithelium, known as connecting rete. The extra ovarian rete consists of tubules lined by ciliated columnar cells extending from the connecting rete and blindly ending in the periovarian tissue (Arlt and Haimerl, 2016; Jiang *et al.*, 2004). Secretory activity of the *rete ovarii* has been reported in various species including dogs. (Jiang *et al.*, 2004) The secretions from *rete ovarii* is controlled by hormones. Pathological conditions of *rete ovarii* in bitches are uncommon to rare. (Jiang *et al.*, 2004) The previously reported conditions include adenomatous hyperplasia, cysts and rete adenoma. This report describes the histological features and the successful surgical removal of a cystadenoma of the *rete ovarii* in a 2-year-old, mixed breed dog.

### Case Report

A 2-year-old, intact-female, mixed breed dog weighing 22 kg, was presented to the Veterinary Teaching Hospital, University of Peradeniya with complaints of hyporexia, constipation, purulent vaginal discharges and gradual abdominal distension for approximately 3 weeks. At the time of presentation, the dog was bright, alert, and responsive. The dog was allowed to free roam but nulliparous. The vaccination and deworming records were up to date. In the general clinical examination, all vital parameters were within the normal limits except mild tachypnoea (96 per minute). Although the abdomen had a doughy consistency, abdominal palpation was non-painful to the dog. The complete blood count revealed mild leukocytosis ( $22.44 \times 10^3 /\mu\text{l}$ , normal range  $5 \times 10^3 /\mu\text{l}$  -  $21.5 \times 10^3 /\mu\text{l}$ ), lymphocytosis ( $11.14 \times 10^3 /\mu\text{l}$ , normal range  $1 \times 10^3 /\mu\text{l}$  -  $4.9 \times 10^3 /\mu\text{l}$ ), anaemia (Hct = 24.8%, normal range 25 % - 47 % and Hb = 6.9 g/dl, normal range 9 g/dl - 19 g/dl). The blood urea nitrogen and creatinine were within the normal ranges. The differential diagnoses for the distended abdomen included pyometra, pregnancy/foetal death and abdominal neoplasia. Ultrasound scanning identified an approximately 15 cm, anechoic structure in the caudo-ventral abdomen, which was well demarcated from the surrounding tissues by a thick hyperechoic capsule. There were many, variably sized, hyperechoic, finger-like

projections apparently originating from the interior of the capsule, protruding into the lumen of the cystic structure. Both the right and left uterine horns were mildly dilated, (luminal diameter = 18 mm to 26 mm, normal range – 5mm-8 mm) and the uterine lumen was anechoic (England, Yeager and Concannon, 2003) The thickness of the uterine wall was 1.6-2.4 mm. A presumptive diagnosis of pyometra with an abdominal cyst and/ or neoplasia was made, and an exploratory laparotomy was performed under general anaesthesia.

The abdominal cavity contained about 250 mL of clear fluid. Evacuation of abdominal fluid revealed thickened but translucent, diffusely pink omentum and a 14cm x 16 cm, smooth-surfaced, spheroid, cystic, mobile and pliable mass which was exteriorised through the laparotomy incision. Focally attached to the capsule of the cyst, there was pink-red structure composed of tightly packed tubules (Figure 1). Both the structures were adherent

to the distal end of the right ipsilateral uterine horn. The left ovary and the uterine horn appeared relatively normal. An ovariohysterectomy was performed and the excised reproductive tract was thoroughly examined.

The thick capsule contained an opening at one point (ovarian bursa), through which the cyst was incised. The lumen of the cyst contained copious amount of white-yellow, viscous fluid. Immersed in the cystic fluid, there were numerous finger-like projections originating from the inner surface of the cyst wall (intra-ovarian *rete ovarii*) (Figure 1). No structure with gross morphological features consistent with the right ovary was identified. However, a small, atrophied structure attached to the depression of the capsule of the cyst was found that could be the atrophied ovary. The left ovary was normal and contained two *corpora lutea*. The uterus contained thick, yellow-green, viscous fluid (pyometra).

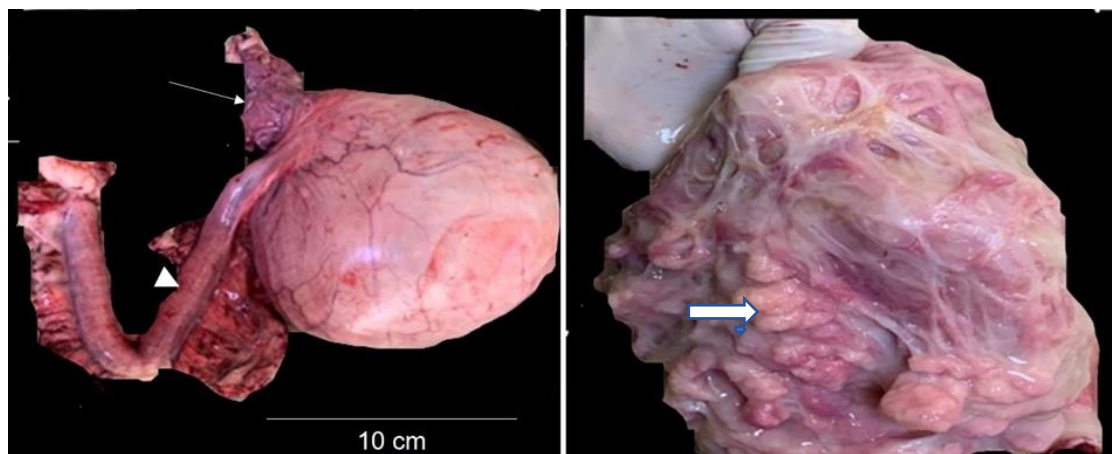


Figure 1: Left: Right uterine horn (arrowhead), ovarian cyst and the *rete ovarii* (arrow). Right: Dissected cyst revealing the interior. Note the variably sized finger-like projections. (Thick arrow)

Sections of the cyst wall and the structure resembled *rete ovarii* were submitted for histopathology (Figure 2). The cyst wall was composed of variably sized fibrovascular papillary projections lined by a single layer of low cuboidal epithelium (Figure 2B, thin arrows), producing a labyrinth of slit-like spaces. The cytoplasm of the cells was lightly basophilic, and the basally orientated, monomorphic, round to oval nuclei contained finely stippled chromatin and inconspicuous nucleoli. The basement membrane of the lining epithelium was visible only in some areas. The fibrovascular core of the papillary projections was frequently infiltrated by inflammatory cells including plasma cells, lymphocytes and neutrophils. The slit-like spaces in between the papillary projections contained

amorphous, granular, proteinaceous material. These sections of the cyst wall were consistent with a cyst originating from intra-ovarian *rete ovarii* that possibly almost completely compressed the right ovary. Histopathology of the other mass was consistent with a benign proliferation of extraovarian/ and or connecting *rete ovarii*. These sections revealed many small, cystic spaces lined by 1-3 layers of tall columnar epithelial cells (Figure 2C, thick arrows). In a few areas, the fibrovascular papillary cores contained spindle cells with cellular and nuclear morphology consistent with smooth muscle cells. The cellular and nuclear atypia of the columnar epithelial cells were mild to moderate and mitotic figures were rare.

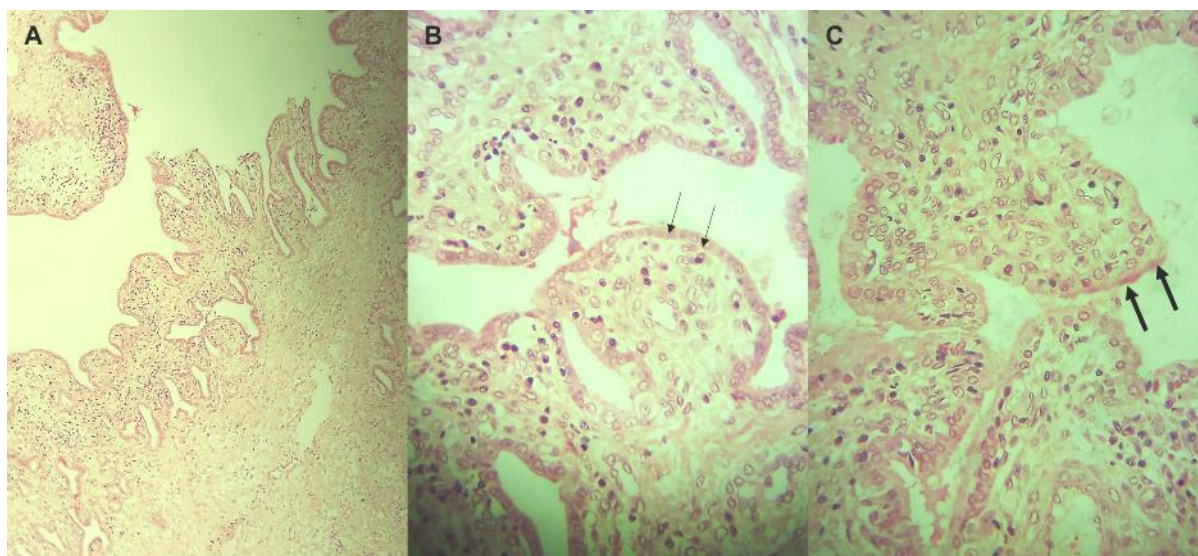


Figure 2: A: Cyst wall consists of variably sized fibrovascular papillary projections producing a labyrinth of slit-like space (x10). B: Papillary projections lined by single layer of cuboidal epithelium (thin arrows) (x40). C: Papillary projections lined by a single layer of tightly packed tall columnar epithelium (thick arrows) (x40). H & E.

The other possible differentials included ovarian cysts of the subsurface epithelial structures (SES). Cysts of SES are dilations of the normal subsurface epithelial structures of the ovary. They are not seen in young bitches but common in older dogs. The size of the cysts of SES are rarely larger than 5 mm. They are lined by a single layer of cuboidal cells (McEntee, 1990). The young age of this dog, large size of the cyst and the histopathology of the present case were more consistent with a cystadenoma of the *rete ovarii* than a cyst of a SES.

## DISCUSSION

This article describes a cystic ovarian neoplasm originated in the *rete ovarii* of a mixed breed bitch. Ovarian cysts are not uncommon in bitches, but cystic neoplasms of the *rete ovarii* are uncommon to rare. A cystic *rete ovarii* is defined as a dilation of the rete tubules, and not the mesonephric tubules. Therefore, cystic *rete ovarii* are lacking a smooth muscle wall (Wasnik *et al.*, 2016; McEntee, 1990). However, because the rete tubules communicate with the mesonephric tubules, both may dilate simultaneously. In the present case, the larger cyst was lined by a monolayer of cuboidal epithelium while the rest of the neoplasm was comprised of multiple cystic spaces lined by either cuboidal or columnar cells that formed papillary projections. The papillary projections lined by a columnar epithelium only occasionally contained smooth muscle cells within the core. This could be due to

the presence of dilated mesonephric ducts connected with *rete ovarii*. Cysts of the *rete ovarii* can grow up to several centimeters in diameter and when large, they compress the ovarian cortex (McEntee, 1990). The diameter of the largest cyst developed in the *rete ovarii* identified in the present case was about 16 cm. During the gross examination, the right ovary could not be identified and any of the multiple histology sections prepared from the cyst and the *rete ovarii* did not reveal any tissue consistent with ovarian tissues. It is possible that the size of the largest cyst could have severely pressurized the right ovary to an extent that it is extremely atrophied and not visible to the naked eye and in histology sections.

According to the previous reports of cystic *rete ovarii*, it is commonly encountered in older dogs (Andersen and Simpson, 1973). However, the bitch described in the present report was young and only 2 years old. The previous reports have described unilateral *rete ovarii* cysts and the present report is consistent with them. The recommended treatment option for cystic *rete ovarii* or neoplasms in *rete ovarii* is ovariectomy (McEntee, 1990; Arlt and Haimerl, 2016). In the present case, due to the concurrent pyometra condition, it was necessary to perform ovariohysterectomy. The bitch described in the present case was nulliparous and in addition to the cystadenoma of *rete ovarii* pyometra was also identified. It is uncertain whether the neoplasm in the *rete ovarii* is responsible for nulliparous status or pyometra in this bitch.

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