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**Unusual case of uterine stump pyometra in a cat**

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**Summary**

*This report describes an unusual case of uterine stump pyometra in a cat, in which the main symptom at presentation was abdominal straining. At the time of ovariohysterectomy, the surgeon reported that uterine body had a purulent content. About one month after surgery the cat showed abdominal straining. The enlarged uterine stump, filled with purulent fluid, had caused compression of the rectum and secondary intestinal sub-occlusion. Surgical revision consisted in draining the purulent content of the remnant of the uterine body and ablating as much of it as possible; checking of the ovarian pedicles revealed the presence of a small fragment of whitish tissue on the right side, which was shown to contain, by means of histological observation and immunohistochemical staining, ovarian tissue. Four months after surgical revision the cat did not show any pathological sign and he is healthy after one year.*

41 At the end of July 2009 an 8-month-old spayed mixed breed queen, living indoors with free access  
42 to the outdoors, was taken to the Veterinary Teaching Hospital of The Faculty of Veterinary  
43 Medicine of Turin University because of worsening of abdominal straining, a condition that had  
44 appeared about three weeks after ovariectomy. The cat had also shown reduced appetite and  
45 activity. Ovariectomy had been performed about 6 weeks earlier and the practitioner had  
46 reported that uterus had a purulent content. Two weeks after surgery the queen had shown enlarged  
47 mammary glands and milk secretion, and cabergoline (5 µg/kg) had been administered for 5 days.  
48 The cat appeared in quite good condition, alert and not dehydrated. Abdominal palpation was not  
49 painful but revealed the presence of a highly distended colon with soft content. The hypothesis of  
50 an intestinal sub-occlusion, which was the cause of the straining reported by the owner was  
51 confirmed by a radiological exam (Fig. 1). Abdominal ultrasound revealed the presence of a fluid-  
52 filled structure referable to a uterine stump, measuring 3.7x2.6 cm, compressing the rectum  
53 dorsally. Cell blood count, biochemical parameters (aspartate aminotransferase, alanine  
54 aminotransferase, creatine kinase, γ-glutamyltransferase, creatinine, urea, glucose, total bilirubin,  
55 triglycerides, total cholesterol, alkaline phosphatase, amylase and lipase) and total serum protein  
56 were within normal limits. Feline leukaemia virus and feline immunodeficiency virus tests were  
57 negative. A surgical revision was suggested in order to eliminate the cause of the obstruction. After  
58 sedation, anaesthesia was induced with propofol and maintained with isoflurane in oxygen.  
59 A median ventral laparotomy revealed the presence of an enlarged uterine stump, with  
60 granulomatous tissue and adhesions to the bladder. Grossly, the uterine wall appeared thinned and  
61 the uterine lumen showed a conspicuous amount of purulent exudate, which was drained. A sample  
62 was taken for culture and sensitivity testing. The remnant of uterine tissue was removed as  
63 completely as possible. Bilateral exploration of the abdomen, from the caudal pole of each kidney  
64 to the uterine stump was performed and an increased vascularisation of the right ovarian pedicle  
65 was detected, together with the presence of a small fragment of whitish tissue which was removed  
66 for histological examination. At the end of the surgical procedure an enema consisting of warm  
67 water and mineral oil was administered. Two more enemas were administered during the following  
68 days, and the intestinal functionality was re-established. The cat was treated with amoxicillin-  
69 clavulanic acid (12.5 mg/kg BID), a therapy that was confirmed after culture results and  
70 antimicrobials susceptibility tests (β-haemolytic *Streptococcus* sp.). Recovery was uneventful.  
71 Histopathological examination of the fragment of tissue removed from the right ovarian pedicle  
72 showed a mild inflammatory process with presence of haemorrhagic areas and scar tissue with  
73 fibroblasts. Other areas were characterized by the presence of both small cells with uniform round  
74 or oval hyperchromatic nuclei with finely granular chromatin, resembling granulosa cells, and  
75 larger cells with *round* or oval nuclei and cytoplasmic vacuolization resembling luteal cells (Fig.  
76 2a).  
77 Histopathological examination of the uterine stump revealed a mild cystic endometrial hyperplasia ,  
78 meanwhile a diffuse chronic inflammatory infiltrate was present in all layers of uterine wall.  
79  
80 In order to confirm the hypothesis of ovarian remnant, 4µ-thick sections from the tissue fragment  
81 were subjected to immunohistochemistry with anti-progesterone receptor (PR) and anti-aromatase  
82 antibodies. PR expression is selectively induced in granulosa cells of preovulatory follicles by LH<sup>1-3</sup>  
83 and persists in the corpus luteum of the ovary.<sup>4,5</sup> Aromatase is a key enzyme in ovarian  
84 steroidogenesis and plays an important role in sexual differentiation, oestrogen biosynthesis,  
85 fertility and carcinogenesis. It is highly conserved amongst mammals and it is expressed in  
86 granulosa cells and participates in conversion of androgens to oestrogens.<sup>6</sup>  
87 The tissue fragment removed from the right ovarian pedicle showed a positive staining for both PR  
88 and aromatase. In particular, nuclei of putative granulosa cells stained strongly positive for PR,  
89 while putative luteal cells showed a mild cytoplasmic staining (Fig. 2b). Immunohistochemistry for  
90 aromatase showed a diffuse cytoplasmic immunoreactivity in several areas where both granulosa  
91 and luteal cells were detected (Fig. 2c).

92 The reported findings suggested the presence of ovarian tissue in the fragment.

93  
94 Four months after surgical revision, the cat had gained weight and the owner reported that no  
95 pathological signs had occurred since. At ultrasound the uterine stump was appreciable as a small  
96 (1x0.5 cm) hyperechoic area dorsal to the bladder which was interpreted as fibrosis. To this day (i.e.  
97 about one year later) the cat has been healthy.

98  
99 In cats uterine stump pyometra is reported to occur in neutered queens either in case of ovarian  
100 remnants or following administration of progestagens.<sup>7,8</sup> Ovarian remnant syndrome is usually  
101 diagnosed when a previously spayed queen shows recurrent behavioural signs of oestrous.<sup>9,10</sup> In our  
102 case, the cat had been in heat for the first time at about 6 months of age, but neither signs of oestrus  
103 were present after ovariohysterectomy, nor she had ever received progestagens. The interval  
104 between ovariohysterectomy and uterine stump pyometra diagnosis was around 40 days; our  
105 hypothesis is that uterine stump pyometra was sustained by the presence of functional ovarian luteal  
106 tissue. The duration of luteal function is about 40-50 days in the non pregnant queen,<sup>11</sup> and, in our  
107 case, the luteal tissue localized in the examined fragment could represent the remnant of old corpora  
108 lutea. We believe that ovarian luteal tissue maintained the conditions of endometrial hyperplasia  
109 and increase of the secretory activity of the endometrial glands,<sup>7,12</sup> which allowed the  
110 persistence/recurrence of the uterine infection. We did not measure serum progesterone  
111 concentration at the moment of surgical revision, but, according to our hypothesis, it could have  
112 been low or around basal. From the history of the queen, we know that she had been treated with  
113 cabergoline because of mammary secretion following ovariohysterectomy: the prolactin increase  
114 causing milk secretion is likely to have been induced by a sharp decline in progesterone  
115 concentration, and this means that the queen had ovulated and had corpora lutea on ovaries when  
116 she had undergone ovariohysterectomy. In cats cabergoline has an antiprolactinic action and  
117 induces abortion<sup>13</sup> by means of a slow (3-4 days) reduction in plasma progesterone concentration<sup>14</sup>.  
118 After the end of cabergoline effect, residual luteal tissue may have regained functionality. However,  
119 we can not exclude that the observed condition might have developed also in the absence of  
120 functional luteal tissue: in fact, although a correlation between pyometra and corpora lutea presence  
121 has been observed in cats,<sup>8</sup> cats with pyometra may also have low serum progesterone concentration  
122 because the effects of progesterone on uterine mucosa and glands may persist beyond the end of the  
123 luteal phase.<sup>7</sup>

## 124 125 **Acknowledgments**

126  
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## 129 130 **References**

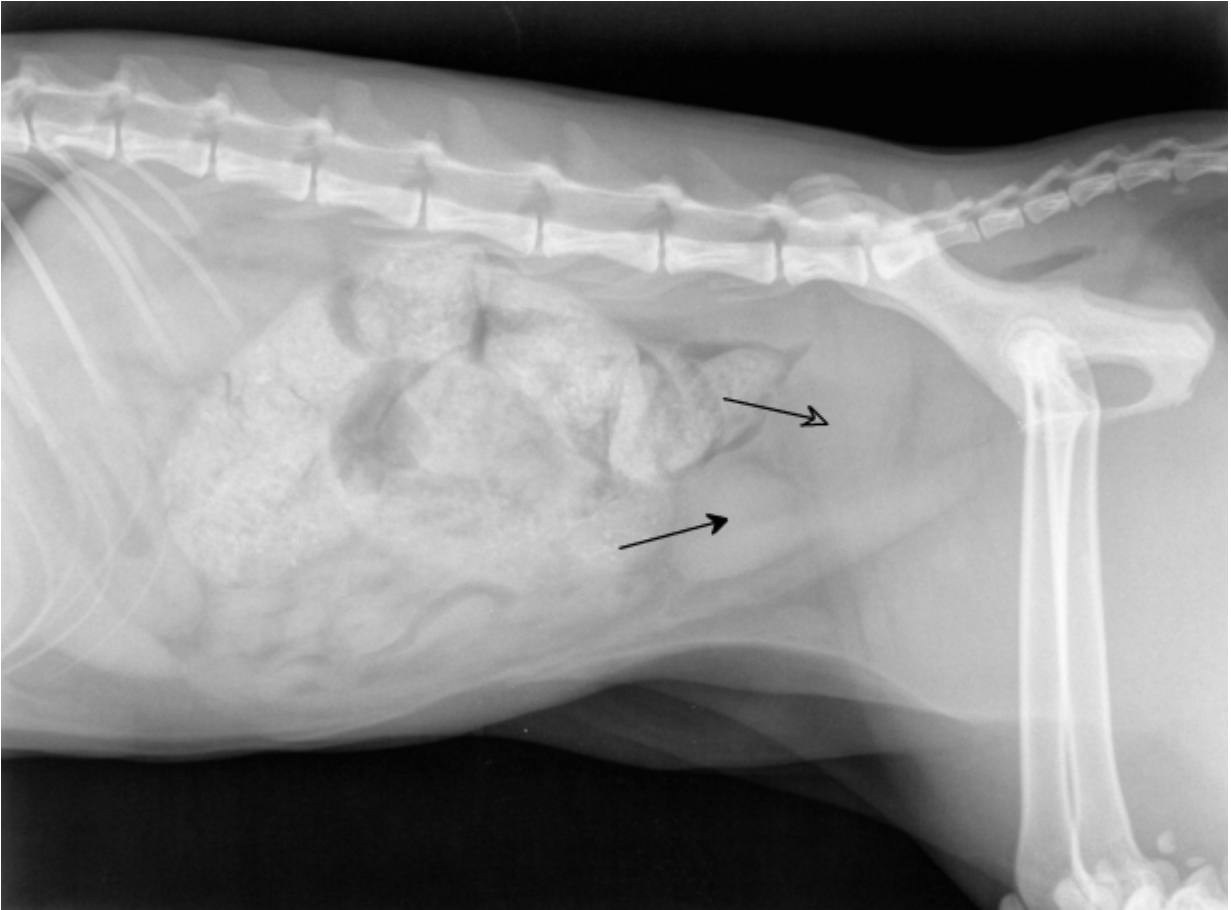
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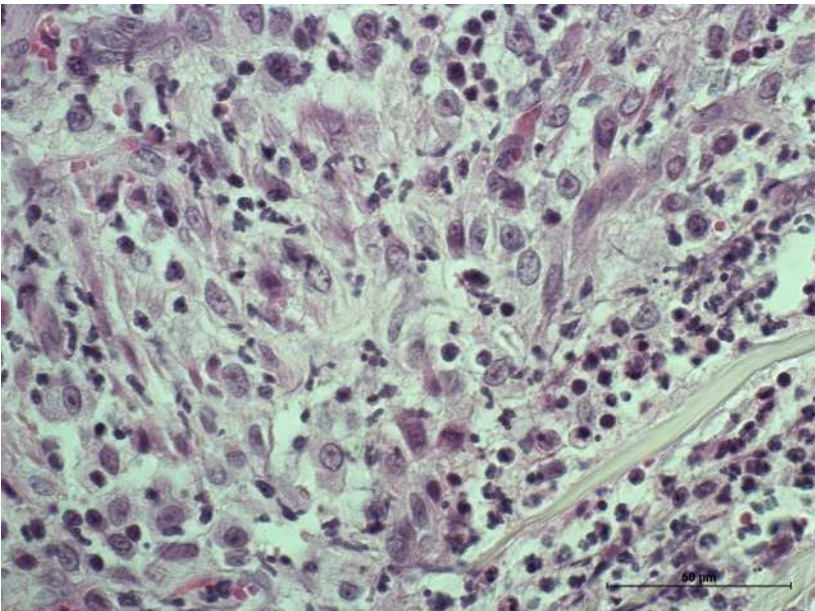
172 Fig 1. Right lateral radiographic projection showing distended colon and rectum and enlarged  
173 uterine stump (open arrow) dorsal to the bladder (closed arrow).

174 Fig. 2 a: Microphotograph of the fragment of tissue removed from the right ovarian pedicle showing  
175 the presence of both small cells with uniform round or oval hyperchromatic nuclei with finely  
176 granular chromatin, resembling granulosa cells, and larger cells with round or oval nuclei and  
177 cytoplasmic vacuolization resembling luteal cells (H.E. 60x); b: PR immunostaining in the tissue  
178 fragment, showing strongly positive nuclei of putative granulosa cells (60x); c: Aromatase  
179 immunostaining in the tissue fragment, showing a diffuse cytoplasmic immunoreactivity in both  
180 granulosa and luteal putative cells (40x)

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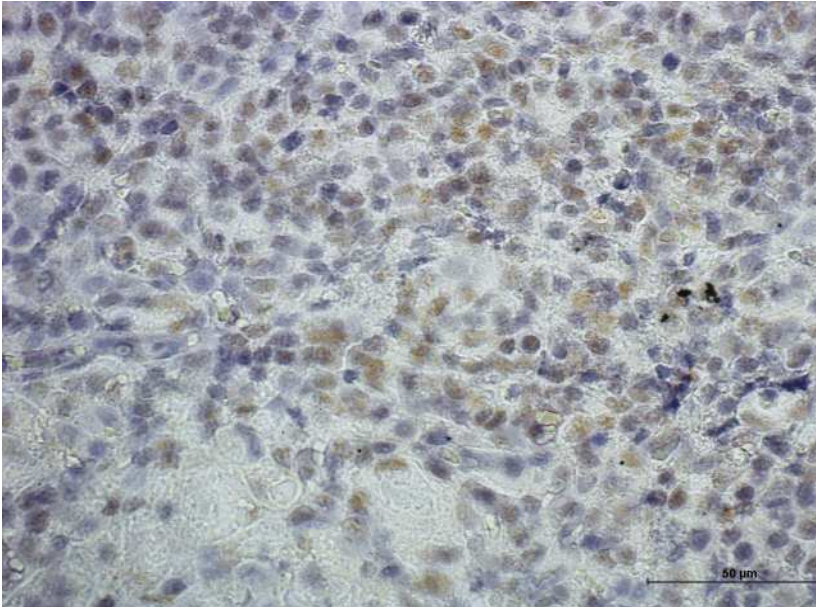
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