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A rare radiographic appearance of a calcified uterus in a queen with pyometra: a case report

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ABSTRACT: This report describes the clinical presentation, diagnosis and treatment of a queen with open pyometra. Lethargy, anorexia and previous treatment failure were the main reasons resulting in referral for diagnostic evaluation. The history, haematological and biochemical profiles and abdominal radiographs revealed open pyometra. Following ovariohysterectomy and antibiotic therapy there was total resolution of clinical signs. Histopathology of the uterus showed severe calcification. The unique part of this report was the rare appearance of multiple opacities in the radiographs. To the authors' knowledge, this is the first report of radiographic opacities in a domestic short-haired queen with open pyometra.

Keywords: queen; pyometra; radiology; uterus; calcification

Pyometra is the most frequent and important endometrial disorder in intact, sexually mature queens and is characterised by uterine infection by ascending vaginal bacteria as a consequence of progesterone stimulation of the endometrium. It may involve diffuse or segmental enlargement of the uterus. Histological lesions range from simple cystic endometrial hyperplasia to endometrial atrophy (Nak et al. 2009).

Pyometra is classified as open-cervix or closed-cervix based on cervical patency for drainage of purulent uterine fluid. Although medical management may be attempted, surgical intervention to prevent uterine rupture and septicaemia is the treatment of choice for any open-cervix pyometra where the bitch is systemically ill, or any case of closed-cervix pyometra (Adamovich-Rippe et al. 2013).

In this paper, we describe an unusual feature of open pyometra in a queen, and its radiographic and histopathological change.

Case description

A 4.3 kg, approximately six-year-old sexually intact female Domestic short-haired cat was presented to the Small Animal Hospital, University of Tehran, Tehran, Iran because of a history of anorexia and lethargy. The cat had lived indoors for approximately five years and had not been bred during this period of time. Two weeks prior to presentation she had the same clinical signs (lethargy and anorexia) and the owner referred her to a private pet clinic. The veterinarian prescribed antibiotics and intravenous lactated Ringer's solution, which initially resulted in improvement before a subsequent return of the clinical symptoms.

On initial physical examination, the cat was mildly dehydrated and lethargic. Rectal temperature was normal (38.1 °C) and no abnormalities in mucous membrane colour were noted. Heart and respiratory sounds and rates were normal. Vaginal discharge was not observed and abdominal palpation revealed no abnormal organs. Polyuria and polydipsia were noted by the owner.

Diagnostic procedures included a complete blood count (CBC), serum biochemical profile and abdominal radiographs. The CBC showed mild non-regenerative normocytic normochromic anaemia, leucocytosis with neutrophilia and the presence of immature WBCs in a peripheral blood sample.

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Table 1. CBC and serum biochemical parameters of the queen with open pyometra

	Patient value	Ref. value
Erythrocyte (× 10^{12}/l)	4.1	5–10
Haemoglobin (g/l)	72	80–150
PCV (%)	21	24–45
MCV (fl)	43	39–55
MCH (pg)	15.8	12.5–17.5
MCHC (%)	27.2	30–36
Reticulocyte (× 10^9/l)	40000	
WBC (× 10^9/l)	82.7	5.5–19.5
Neutrophil (× 10^9/l)	47.14 (57%)	2.5–12.5
Band (× 10^9/l)	13.23 (16%)	0–0.3
Metamyelocyte (× 10^9/l)	6.62 (8%)	
Myelocyte (× 10^9/l)	1.65 (2%)	
Lymphocyte (× 10^9/l)	5.78 (7%)	1.5–7
Monocyte (× 10^9/l)	7.44 (9%)	0–0.85
Eosinophil (× 10^9/l)	0.82 (1%)	0–1.5
Basophil (× 10^9/l)	0.0	rare
Platelet (× 10^9/l)	350	300–800
Total Protein (g/l)	83	55–77
Albumin (g/l)	30	30–46
Globulin (g/l)	52	21–40
Calculated A : G ratio	0.57	0.8–1.68
BUN (mmol/l)	20.3	5.4–12.5
Creatinine (μmol/l)	194	71–159

Measurement of biochemical parameters revealed hyperproteinaemia and azotaemia (Table 1).

Right lateral and ventrodorsal radiographs were taken. The high amount of fat in the peritoneal cavity was sufficient to reveal serosal details as well as to allow visualisation of the uterus. In the lateral view, the body and horns of the uterus were seen as soft tissue opacity containing multiple small nodules with mineral density. In the ventrodorsal view, both horns of the uterus could be seen separately (Figures 1 and 2).

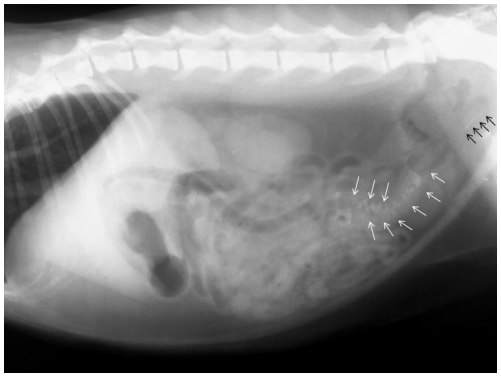

Figure 1. Lateral radiograph of the abdominal cavity. Uterine body (black arrows) and horns (white arrows) could be seen due to the high amount of fat in the peritoneal cavity. Note the body and horns of the uterus containing multiple small nodules with mineral density

Figure 2. Ventrodorsal radiograph of the abdominal cavity. Both horns of the uterus could be clearly seen to habour multiple small nodules with mineral density (arrows). Also note transitional vertebrae at L1

To help rehydration and prevent septicaemia from the suspected pyometra, initial treatment consisted of an *i.v.* bolus of lactated Ringers solution, 20 ml/kg body weight (BW), followed by 10 ml/kg/h BW as a constant rate infusion and ceftriaxone, 25 mg/kg BW, *i.v.*, q12 h.

Based on the high suspicion of pyometra, the cat was referred for surgery. She was pre-medicated with atropine 0.005 mg/kg BW, *s.c.* Anaesthesia was induced with ketamine, 10 mg/kg BW, *i.v.*, and diazepam, 0.2 mg/kg BW, *i.v.*, and subsequently maintained on isoflurane (1.5%) in oxygen. A regular ovariohysterectomy was performed using a midline approach. The uterus and ovaries were carefully isolated from the surrounding tissues and removed completely. The abdomen was closed routinely in a three-layer closure. After surgery the cat recovered fully. The uterus was dissected and weighed. Tissue samples of the organ were fixed in 10% (v/v) buffered formalin for histopathological investigation. The cat was maintained on lactated Ringer solution for one day and was administered ceftriaxone, 25 mg/kg BW, *i.v.*, q12 h, for a week and tramadol, 5 mg/kg BW, *p.o.*, q12 h for three days.

For histopathological examination after fixation, the tissue samples were embedded in paraffin, sectioned at about 5 μm, stained with haematoxylin and

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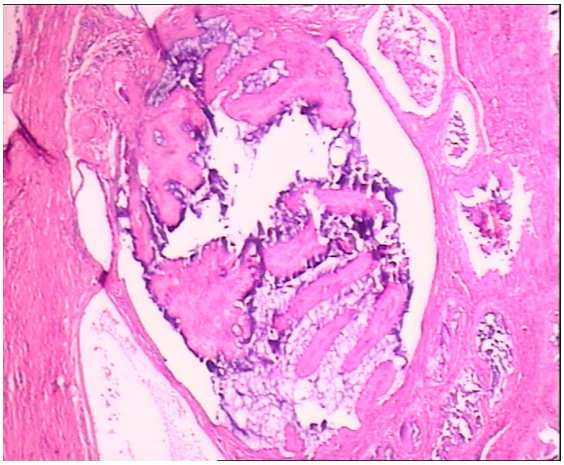

Figure 3. Uterus. Severe multifocal calcification (+++) in the uterus mucus membrane (H&E, × 100)

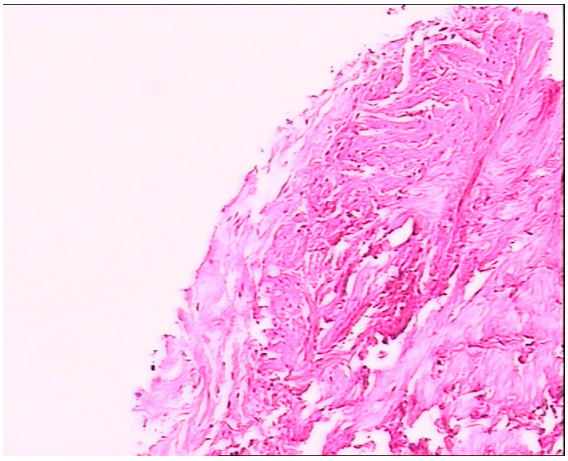

Figure 4. Uterus. Moderate mucosal and submucosal mononuclear cell (macrophage and lymphocyte) infiltration (++) (H&E, ×100)

eosin and studied microscopically. The intensity and distribution of the histopathological lesions were graded as follows: (+++) severe lesions (severe calcification and granulomatous inflammation), (++) moderate calcification and inflammation (+) mild lesions, either focal or multifocal. As shown in Figure 3, the histopathological evaluation revealed severe lesions including pronounced calcification in the uterus mucus membrane. There was also severe granulomatous inflammation in association with mucosal and submucosal mononuclear inflammatory cells (macrophages and lymphocytes) (Figure 4).

The cat was re-evaluated in the second and fourth weeks postoperatively and was determined to have recovered without any complications.

DISCUSSION AND CONCLUSIONS

Cystic endometrial hyperplasia is a disease which is mainly characterised by progesterone-induced hyperplasia of the uterine endometrium and cyclic dilatation of endometrial glands as well as inflammation of the uterus with the presence of purulent material within the uterine lumen (Stanley and Pacchiana 2008). The queen is an induced ovulation species, which requires coitus or mechanical stimulus of the cervix or the vagina for the release of luteinising hormone (LH) and subsequent ovulation (Agudelo 2005). It has been noted that some queens were in the luteal phase even though they had been separated from males and did not receive any drugs. This shows that the luteal phase can be induced by diverse stimuli such as visual or tactile factors, etc. (Lawler et al. 1993). The corpus luteum starts to produce progesterone 24–48 h after ovulation (Agudelo 2005). Progesterone causes hyperplasia of the endometrium, especially the epithelium and endometrial glands, cervix closure, increase in endometrial gland secretion and a decrease in myometrial contractibility (Lucas et al. 2000; von Reitzeinstein et al. 2000; Romagnoli and Concannon 2003; Agudelo 2005). Although most articles emphasise the role of progesterone in pyometra, recent information have shown that oestrogens increase progesterone receptors in the endometrium, dilate the uterine cervix, allow bacterial ascent and can influence endometrial changes (Agudelo 2005). Changes in the uterine microenvironment and decreased contractility would favour ascendant bacterial infection; *E. coli* are the most frequently isolated microorganisms from feline pyometra (Holt et al. 2003).

Pyometra is more common in nulliparous queens older than three years and in other queens older than five years; the described cat was within this age range (Agudelo 2005). Pyometra almost always causes clinical signs. In about 75% of the cases vaginal discharge is obvious. However, this symptom can also be absent due to the careful cleaning habits of the queen (Kenney et al. 1987; MacIntire 1994; Agudelo 2005). Palpation of the abdomen revealed no uterine distention due to prolonged open pyometra (Agudelo 2005). Although polyuria and polydipsia do not occur as frequently as in dogs (in about 9% of cases), these symptoms were noted by the owner. The role of *E. coli* endotoxins in the occurrence of these symptoms was described in detail in previous articles (MacIntire 1994; Agudelo

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2005). Suppression of erythropoiesis in the bone marrow due to chronic inflammation and diapedesis of erythrocytes towards the uterus could cause anaemia. Chronic infection can cause leucocytosis with neutrophilia and left shift. Hyperglobulinaemia, which was observed in the queen described here, can be found in about half of the cases. Hyperproteinaemia developed because of inflammation. The serum biochemical values revealed azotaemia with a BUN value of 20.3 (mmol/l) and a creatinine value of 194 (μmol/l). Although some medical approaches (Hildebrandt et al. 2006) have been suggested to treat pyometra, ovariohysterectomy has been considered to be the treatment of choice (Agudelo 2005).

The unique aspect of the queen was the multiple radiographic opacities. Munson et al. described a case of a tiger with severe endometrial mineralisation revealed by radiographs (Munson et al. 2002). Guerrero et al. (2009) reported a case of an elderly woman with pyometra; she had noted a mass in her abdomen 20 years previously, but had at that point decided against any medical assessment. She was referred to a hospital with a painful mass and a simple abdominal x-ray showed a lower abdominal mass with multiple calcifications (Guerrero et al. 2009). We suggest that these radiographic opacities might have been due to the open condition of the cervix and the chronic process of the disease. To our knowledge, this is the first report of radiographic opacities in the uterus of a queen with pyometra.

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