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POPULAR ARTICLE

## Canine Pyometra: A Uterine Disorder of Clinical Importance

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### Abstract:

Commonly affecting intact female dogs during the diestrus phase, pyometra is a possibly fatal inflammatory uterine infection. It is frequently caused by hormonal imbalances, especially prolonged progesterone dominance after repeated estrous cycles, and is characterized by an accumulation of purulent material within the uterine lumen. The disorder is frequently preceded by cystic endometrial hyperplasia (CEH), which affects uterine defense, glandular production, and endometrial proliferation. The illness usually affects middle-aged to older bitches, and its symptoms can range from abdominal distension and vaginal discharge to systemic symptoms that include fever, lethargy, polyuria, and polydipsia. Clinical examination, hematological and biochemical profile, and imaging techniques including ultrasonography which shows intraluminal fluid accumulation and uterine enlargement are the basis for the diagnosis.

Other opportunistic bacteria may be involved; however, *Escherichia coli* is the most commonly isolated pathogen. Antibiotics, supportive therapy, and either medical or surgical management are all necessary components of treatment. Hormonal therapy involving antiprogestins (e.g., aglepristone), prostaglandins, and dopamine agonists (e.g., cabergoline or bromocriptine) have been used successfully in certain cases, although ovariohysterectomy is still the final treatment. When compared to monotherapy, combination protocols especially those that combine aglepristone and prostaglandin have demonstrated enhanced efficacy, with treatment success of varying extent. In order to lower mortality and maintain reproductive function when desirable, early diagnosis and suitable therapeutic intervention are crucial.

**Key words:** Pyometra, Uterine, Endometrium, Canine

### Introduction:

Pus accumulates inside the uterus as a result of pyometra, an inflammatory disease of the endometrium. It is the most prevalent serious reproductive condition that affects adult intact bitches

throughout the diestrus period (Johnston *et al.*, 2001; Kida *et al.*, 2006). Acute or chronic pyometra is characterized by genital and systemic sickness that leads to a loss of homeostasis, endometrial hyperplasia, inflammatory cell infiltration, and uterine exudate accumulation (Kempisty *et al.*, 2013). Cystic endometrial hyperplasia (CEH), a condition that reduces fertility by mechanisms like unsuccessful fertilization or early embryonic loss, frequently precedes pyometra. Canine pyometra frequently shows up clinically subtly, with nonspecific symptoms such as polydipsia, polyuria, and vulvar discharge at first. If treatment fails to be given, the illness may progress quickly and cause serious side effects like multi-organ dysfunction, systemic inflammatory response syndrome (SIRS), and peritonitis (Jitpean *et al.*, 2017; Hagman, 2022). Pyometra is considered as a significant, life-threatening reproductive condition in bitches because of its potential for rapid systemic progression (Agostinho *et al.*, 2014; Fieni *et al.*, 2014; Jitpean *et al.*, 2014).

### **Incidence:**

With an estimated prevalence of up to 25% among non-spayed individuals, pyometra, a common bacterial infection of the uterus, is the most commonly observed reproductive pathology in intact female dogs (Hagman, 2018). It is thought that the cumulative effects of several estrous cycles are responsible for the higher occurrence of pyometra in middle-aged to elderly bitches. Elevated progesterone levels during the diestrus phase inhibit myometrial contractility, induce cervical closure, promote endometrial glandular secretion, and enable endometrial hyperplasia (Pretzer, 2008).

### **Predisposing Factor:**

Breeds like the Golden Retriever, Spaniel, and Irish Terrier have been found to have a lower prevalence of pyometra in India than Spitz, Labrador Retriever, German Shepherd (Alsatian), Doberman Pinscher, Boxer, Dachshund, and Rottweiler (Ravishankar *et al.*, 2004; Simon *et al.*, 2011). Additionally, previous research has shown that this problem usually occurs 4 weeks to 4 months after estrus (Smith, 2006). The development of the endometritis-pyometra complex has been associated with a number of causes, such as the use of exogenous hormones for the suppression of estrous, uterine biopsies, scarification, and the introduction of intrauterine irritants etc. (Noakes *et al.*, 2001; De Cock *et al.*, 2002). Furthermore, it has been reported that young bitches are predisposed to the condition by congenital or acquired structural anomalies of the reproductive tract, such as vestibular or vaginal strictures and septa (Pretzer, 2008).

### **Etiology:**

The fact that pyometra typically appears during the diestrus phase emphasizes the significance that progesterone is to the pathophysiology of the disease (Fransson *et al.*, 1997). The decrease in progesterone levels seen in affected bitches after therapeutic measures meant to lower progesterone concentrations or counteract its effects further supports this association (Blendinger *et al.*, 1997). *Escherichia coli*,

*Staphylococcus aureus*, *Streptococcus spp.*, *Pseudomonas spp.*, and *Proteus spp.* are the most frequently detected bacterial pathogens that have been isolated from diseased patients (Fransson *et al.*, 1997; Nelson & Feldman, 1986). Furthermore, pyometra may also develop as a result of undetected UTIs caused on by opportunistic bacteria (Hagman and Kühn, 2002).

### Pathogenesis:

The uterus gets more susceptible to infection as a result of estrogen-mediated sensitization, which is part of the pathophysiology of pyometra. Excessive or abnormal estrogen levels cause the endometrial lining to proliferate excessively and increase the amount of time the cervix is open, which makes it easier for microorganisms to enter. An extended luteal phase, marked by persistent progesterone dominance during diestrus, follows this. According to Fieni *et al.*, (2014), progesterone reduces myometrial contractility, increases uterine glandular secretions, encourages further endometrial hyperplasia, and causes cervical closure. In the end, these hormonal changes contribute to the development of pyometra by supporting an intrauterine environment that is favorable for bacterial colonization and growth (Verstegen *et al.*, 2008; Kempisty *et al.*, 2013). Pyometra is frequently seen in middle-aged and older bitches due to the cumulative impact of consecutive estrous cycles (Pretzer, 2008). The uterine environment is gradually altered by repeated hormonal stimulation, making it more vulnerable to commensal bacteria from the vaginal microbiota that cause opportunistic infections. As the uterine lumen becomes more abundant in glandular secretions, these infections grow there. Microbial colonization and persistence are further facilitated by aspects such as bacterial adhesins, the development of cystic endometrial structures, and localized inhibition of immunological responses, especially leukocyte activity. These alterations intensify with each estrous cycle over time, which leads to uterine infection that worsens over time (Sugiura *et al.*, 2004; Smith, 2006).

### Clinical findings:

Pyometra usually appears two to four months after the estrous phase and usually exhibits as both localized and systemic clinical signs (Agostinho *et al.*, 2014; Fieni *et al.*, 2014; Müştak *et al.*, 2015). A vaginal discharge, which can range in consistency and appearance from mucopurulent to hemorrhagic, is the primary clinical sign of open-cervix pyometra (Pretzer, 2008). On the contrary, since there is no drainage outlet, bitches with closed-cervix pyometra commonly develop abdominal distension as a result of the accumulation of exudate inside the uterus (Jitpean *et al.*, 2017). Anorexia or decreased appetite, lethargy or feeling depressed, increased thirst and urination, and increased heart and respiratory rates are common symptoms, though individual clinical signs may vary (Pretzer, 2008; Jitpean *et al.*, 2014; Hagman, 2022). In addition to the potential for serious complications such as uterine rupture, acute renal injury, peritonitis, endotoxemia, and, most importantly, septicemia, pyometra poses a substantial risk to life (Santana *et al.*, 2020;).

## Diagnosis:

If a bitch appears with an open cervix, mostly because of vaginal discharge, the clinical diagnosis of pyometra is easier. However, because additional clinical findings are uncertain and variable, diagnosis becomes more difficult when discharge is absent (Hagman, 2022). A combination of the case history, clinical examination, and diagnostic imaging methods including abdominal radiography and ultrasound are usually utilized to make the diagnosis. Additional diagnostic data can be collected through complementary laboratory tests, such as complete blood counts, leukocyte differential counts, and assessments of liver function (Henriques *et al.*, 2014). In addition to a left shift and harmful structural alterations in neutrophils and monocytes, blood profiles in pyometra cases frequently indicate significant leukocytosis and neutrophilia (Johnston *et al.*, 2001;). A normocytic, normochromic anemia is often observed in chronic presentations, indicating that bone marrow involvement may be the cause of the decreased erythropoiesis (Sato *et al.*, 2002). About 50% to 75% of afflicted individuals have elevated alkaline phosphatase activity, the most consistent anomaly among serum biochemical parameters (Verstegen *et al.*, 2008). According to Fayer-Hosken *et al.* (1991) and Voges and Neuwirth (1996), ultrasound examination usually reveals uterine enlargement, which is characterized by thickened endometrial lining and larger, convoluted horns filled with anechoic or hypoechoic fluid. When purulent material builds up, the intraluminal content frequently appears homogenous and echo-dense (Nyland and Mattoon, 2002). Cystic endometrial hyperplasia (CEH), which can happen with or without concurrent pyometra, is diagnosed by observing cystic forms within a thicker endometrium (Pretzer, 2008).



## Treatment:

Systemic antibiotic therapy, supportive fluid administration, and, occasionally, additional oral antioxidant supplementation are the usual approaches used to treat pyometra. Sensitivity testing of bacterial isolates extracted from vaginal exudates should ideally lead the selection of antimicrobials, and broad-spectrum antibiotics should be started together with essential treatment strategies. However, clinical experience indicates that amoxicillin, cephalosporins, and potentiated sulfonamides are effective in treating pyometra patients, either alone or in combination with clavulanic acid (Verstegen *et al.*, 2008; Bassessaar *et al.*, 2013). Stabilization of the patient is needed before any kind of intervention, including intravenous fluid therapy to treat dehydration and reduce possible nephrotoxic effects (Ewald, 1961). Surgical procedure in the form of an ovariohysterectomy or, alternatively, therapeutic care with hormonal

treatments aimed to reduce progesterone activity and drain the uterus are the definitive treatment options.

### **Hormonal therapy:**

1. To enhance the efficacy of treatment, dopamine agonists such cabergoline (@5 µg/kg) or bromocriptine (@ 20 µg/kg) can be used either alone or in combination with prostaglandin (0.1-0.2mg/kgB.wt.S/C).
2. By binding itself to progesterone's receptors and inhibiting its physiological effects, aglepristone functions as a competitive antagonist of progesterone among antiprogestins. As long as the uterine lumen can still be seen on ultrasonographic imaging, a treatment plan that includes subcutaneous injections of aglepristone at a dose of 10 mg/kg on days 1, 2, and either day 8 or day 15 has proved successful in treating both open- and closed-cervix pyometra (Fieni et al., 2014).
3. Because of their luteolytic and uterotonic properties, prostaglandins are also used in the therapeutic management of pyometra. For a period of five to seven days, treatment regimens usually include intramuscular injections containing 100–250 µg/kg of natural prostaglandin or 10 µg/kg of a synthetic equivalent. After ten days, a second course of treatment may be begun if the ultrasonographic evaluation reveals insufficient reduction in uterine size or incomplete evacuation of purulent material. According to reports, 75 to 90% of patients respond effectively to prostaglandin-based therapy (Feldman and Nelson, 2004).
4. It has been reported that combination therapy involving hormones or medicine enhances its efficacy of treatment for canine pyometra. Two subcutaneous injections of 10 mg/kg aglepristone spaced 24 hours apart, a third injection on day 8, and, if necessary, a fourth dose on day 15 comprise a regularly recommended treatment. Treatment results significantly improvement when this regimen is combined with the injection of prostaglandin (PG) at a dose of 1 µg/kg per day for three to seven days in successive days. When used alongside PG, the success rate of aglepristone monotherapy, which is about 60%, increases to 84% by day 90 post-treatment (Fieni et al., 2014).

### **Conclusion:**

Unspayed female dogs are frequently affected by pyometra, a dangerous and potentially fatal condition that worsens with age. The uterus becomes more susceptible to bacterial infection as a result of hormonal changes which take place during the reproductive cycle. Pyometra can cause serious complications like kidney damage, peritonitis, and even death if it isn't detected and treated timely. Never neglect early warning symptoms, particularly in older or unspayed dogs, such as increased thirst, vaginal discharge, and lethargy. Ultrasound imaging, laboratory testing, and clinical examinations are usually used to make the diagnosis. Hormone-based medical treatments can be helpful in certain circumstances, particularly when fertility preservation is required, but surgical uterine removal (ovariohysterectomy) is

still the most successful and long-lasting treatment. When used properly, these treatments which frequently involve combinations of medications like prostaglandins and aglepristone have achieved success rates. Pyometra can be prevented. Spaying female dogs prior to their first or second heat cycle is the most effective method of removing the danger. Understanding the signs and getting veterinarian care as soon as possible are crucial for successful outcomes for pet owners who decide not to spay.

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