

Pyometra, cystic endometrial hyperplasia-pyometra complex

Uterine infection, pus-filled uterus

Affected Animals:

Pyometra is a common disease in female dogs. Older, intact female dogs that are one to two months beyond estrus are at high risk for pyometra. Intact females of all ages that receive progesterone or estrogen hormones for estrus synchronization or mismating are also at risk. Spayed animals are rarely affected.

Overview:

Pyometra, a serious infection of the uterus, is a well-recognized disease of female dogs. Pyometra often results from the animal's own bacteria within the genital tract. *Escherichia coli* is the most common bacteria identified in pyometra. Whenever levels of the reproductive hormone progesterone rise, the uterine lining becomes susceptible to bacterial infection.

Dogs with pyometra commonly have a vaginal discharge, fever, lethargy, and a loss of appetite. Affected dogs are often dehydrated; some may drink and urinate excessively. Some dogs will appear asymptomatic until after vaginal discharge begins. Others will go into shock. Laboratory tests often show dehydration-related abnormalities of electrolyte balance and kidney function. Changes in the white blood cell count are common. Most patients are diagnosed using history, clinical signs, physical examination, and abdominal x-rays.

Pyometra requires prompt treatment. Antibiotics to fight the infection, and intravenous fluids to correct dehydration-related abnormalities, are routinely administered. Supportive therapy is given to correct other organ system dysfunction and to stabilize the patient. Generally, surgical removal of the uterus and ovaries is the preferred treatment. However, owners of valuable breeding animals may elect an intensive medical approach instead of surgery.

Clinical Signs:

Signs of pyometra usually appear between one to two months after the female is in heat, or after the hormone progesterone has been administered. Common symptoms include vaginal discharge, anorexia, lethargy, pyrexia, depression, polyuria, and polydipsia. Some dogs remain asymptomatic except for a thick,

vaginal discharge. This discharge is usually purulent, or pus containing, but may occasionally be mixed with blood.

Physical examination reveals abdominal distention, an enlarged, palpable uterus, vaginal discharge if the cervix is open, and lethargy. A closed-cervix pyometra more likely will result in the animal showing signs of septicemia, including shock, hypothermia, dehydration, vomiting, and collapse.

Symptoms:

Common symptoms include foul or bloody discharge from the vulva, loss of appetite, inactivity, fever, depression, and increased water consumption and urination. The abdomen frequently enlarges. Severely affected animals may show signs of blood poisoning, with pale mucous membranes, cold extremities, reduced body temperature, vomiting or collapse. The presence of vaginal discharge is variable.

Description:

Pyometra refers to uterine infection that occurs when contaminating bacteria overcome the normal uterine protective mechanisms. This usually occurs when blood levels of progesterone are elevated. Progesterone increases may occur naturally, as part of diestrus or ovarian phase of reproduction, or iatrogenically, secondary to the administration of reproductive hormones.

As intact female dogs age the uterus may become progressively thickened and cystic from repeated hormonal stimulation. This condition called cystic endometrial hyperplasia. Uterine secretions are greatest during diestrus, the period following estrus, when blood levels of progesterone hormone are maximal. Some inflammatory cells are always present in the secretions. Despite frequent opportunities for bacterial contamination from the lower reproductive tract, the fluid accumulation in the thickening uterus remains free of bacterial infection in most dogs. Pyometra occurs when the excessive uterine secretions become infected with bacteria.

Escherichia coli is the most common bacteria isolated from the uterus of patients with pyometra. This bacterium has the ability to bind specifically to uterine lining cells changed by progesterone. External sources of estrogen hormone potentiate the effects of progesterone, increasing the risk for pyometra. Young dogs that are unlikely to have significant cystic endometrial hyperplasia may develop uterine infections if hormones are administered. Pyometra may occur one to eight weeks after an injection of estrogen.

Bacterial infection of the uterus causes increasing inflammation within the organ and leads to systemic effects. Bacteria or bacterial toxins may enter the blood stream from the diseased uterus, leading to the clinical signs described previously. The severity of the resulting illness is greatly influenced by the degree of drainage from the uterus. If the cervix is closed, then fluids and toxins accumulate, like an abscess, with potential for toxic effects. Rupture or slow leakage from one of the uterine horns can release inflammatory products into the abdominal cavity, causing peritonitis. If the cervix is patent, or open, then

drainage limits the accumulation of inflammatory products and bacterial toxins, and increases the likelihood of early recognition of the problem. Signs of increased thirst and urination have been linked to the direct influence of bacterial toxins on the kidneys' urine concentrating mechanisms. Bacterial infection and toxins may cause secondary damage to the liver as well. Endotoxic shock alters blood supply to all tissues and can disrupt normal blood clotting mechanisms. Microscopic blood clots or clumps of circulating bacteria can further impact upon the blood supply to vital organs such as the heart and brain, permitting seizures, cardiac rhythm disturbances and other grave consequences.

Diagnosis:

Diagnosis is based in part on the history, reproductive status, and clinical signs. Pyometra usually occurs one to two months after the heat cycle, or estrus. The clinical signs of vaginal discharge and a palpably enlarged, doughy-feeling uterus are helpful in establishing the diagnosis, especially if there are attendant signs of septicemia as well. Laboratory testing and imaging are frequently used to aid in the diagnosis.

The dog's complete blood count, or CBC, is influenced by the degree of drainage from the uterus. Patients with a closed cervix and limited uterine drainage are more likely to show significant elevations of, or reductions in, the white blood cell count. The white blood cells are also more likely to appear immature or unhealthy in those patients. Red blood cell counts are often reduced; patients with chronic disease frequently have low-grade anemia. Dehydration can mask this feature by reducing the amount of water in the bloodstream; consequently, the red blood count appears higher than it really is.

Blood urea nitrogen, or BUN, and creatinine reflect blood flow to the kidneys. The level of these nitrogenous waste products in the blood will frequently rise with dehydration and kidney dysfunction, which are common in patients with pyometra. Elevated blood protein levels and disturbed electrolytes will often reflect the state of dehydration.

The urine may be very dilute, reflecting toxic influences on the kidneys, or well concentrated as an appropriate response to dehydration. The urine may contain bacteria or inflammatory cells, if collected after voiding, due to contamination by the vaginal discharge. If pyometra is suspected, urine samples are rarely collected directly from the urinary bladder, via needle aspiration, because of worries about perforation of the distended, fluid-filled uterus. Urinary protein levels may be elevated if the kidneys have been damaged by the presence of chronic infection. The vaginal discharge can be examined microscopically for the presence of white blood cells and bacteria.

Diagnostic x-rays of the abdominal cavity may demonstrate a fluid-dense tubular structure. A ground-glass appearance on the x-ray may suggest fluid accumulation around the diseased uterus if leakage has contributed to peritonitis. Ultrasound imaging will help to detect or verify the uterine enlargement, to define uterine size and wall thickness, and to differentiate between pyometra-related uterine enlargement and that of pregnancy. Ultrasound imaging is especially helpful in detecting stump pyometra, which occurs in spayed females; this

condition consists of infected uterine remnants. Rarely, surgery is required for definitive diagnosis of a focal or stump pyometra.

Prognosis:

Prognosis following ovariohysterectomy, or spay, is good if there is no uterine rupture or other source of contamination. Mortality is less than 10 percent. If there is gross contamination of the abdomen, then open peritoneal drainage is indicated. These patients will certainly be hospitalized for longer periods of time, with a need for intensive care. The prognosis for such patients is guarded.

Dogs with an open cervix that are treated medically with prostaglandin generally have a good response to treatment, with complete resolution of infection in 75 to 90 percent of cases. In contrast, only 25 to 30 percent of dogs with closed cervix pyometra demonstrate complete resolution of signs. The majority of patients will require a second series of injections. Unfortunately, recurrence is common. Perhaps 80 percent of dogs treated medically will have a recurrence of pyometra. Ovariohysterectomy is then advised.

Following medical treatment of pyometra, to increase the chances of conception, the patient should be bred during the next estrus or heat. Pregnancy may also protect against recurrence of pyometra.

Transmission or Cause:

E. coli and other bacteria tend to overgrow in a hormone-sensitized uterus.

Pyometra may be a natural complication of degenerative and inflammatory changes that attend cystic endometrial hyperplasia in the aging intact female. In younger dogs, the problem is most often linked to progesterone administration for estrus synchronization or to estrogen given to aid in pregnancy prevention after inadvertent mating.

Treatment:

Pyometra usually necessitates immediate therapy. Those patients with a closed cervix may be more ill at the time of diagnosis. Intravenous fluids and antibiotics are routinely administered to patients that are severely ill, irrespective of the patency of the cervix. Potent antibiotics are given by injection, in combinations to target the most common bacterial pathogens. Supportive measures are customized for individual patient needs, according to the levels of shock, dehydration, electrolyte imbalance, organ dysfunction or cardiac arrhythmia. The patient is stabilized medically, if possible, to prepare for emergency ovariohysterectomy, or spay, to remove the infected uterus and the ovaries from the abdominal cavity. Most patients are released two to three days after uncomplicated surgery. Antibiotics are continued for seven to 10 days after most procedures.

While surgery is considered the treatment of choice for companion animals with pyometra, owners of valuable breeding animals may elect to treat pyometra medically. Stable patients may be given prostaglandin f2-alpha by injection for

several consecutive days to dilate the cervix, stimulate uterine contractions and to decrease the blood progesterone level. The dog remains hospitalized for observation, monitoring for side effects of the prostaglandin or for worsening condition, and for continued antibiotic administration. Clinical improvement is expected within the first 48 hours of medical treatment. Surgery should be considered for patients that deteriorate. If purulent vaginal discharge persists seven days after conclusion of treatment, or if other parameters indicate ongoing infection or uterine enlargement, then repeating the treatment may be advised, provided that the patient remains physiologically stable.

Some veterinarians reserve attempted medical evacuation of the uterus for those patients with an open cervix. Cervical dilation is inconsistent with prostaglandin f₂alpha, thus the drug may cause expulsion of infected materials into the abdominal cavity through the fallopian tubes, or direct uterine rupture if administered to patients with a closed cervix.

Prevention:

An elective ovariohysterectomy of the young dog will virtually eliminate the possibility of pyometra. Avoidance of estrogen or progesterone administration will decrease the risk of pyometra in both young and mature pets.