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Diagnosis and treatment of canine Pyometra: A Review

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Abstract

The objective of this review is to focus on the diagnosis and treatment of canine pyometra. Clinical pathological tests (altered hematological, biochemical and enzymatic profile), ultrasonography (lobulated or multiple pockets of black color fluid filled cavity with varying echogenicity) and radiographs (demonstrating the enlarged uterine horns) are the basis for diagnosing the case of Pyometra. This disease can be treated with antibiotics, PGF_{2α}, progesterone antagonist and uterine lavaging if diagnosed at its early course but ultimate treatment for canine pyometra is ovariohysterectomy in order to avoid its recurrence. Prognosis depends on severity and duration of the disease, proper diagnosis and response to the treatment.

Keywords: Pyometra, Progesterone, Treatment, Diagnosis, Canine

Introduction

Canine pyometra is the condition characterized with an accumulation of pus/purulent secretions in the uterine cavity of bitches generally during diestrus i.e. progesterone dominant phase [18, 6]. It may be with an open (open pyometra) or closed cervix (closed pyometra). Middle and old aged bitches that have not been spayed are commonly affected but younger females with a mean age of approximately 2 yrs may also be diseased [6]. Risk of pyometra is increased during diestrus phase as there is hyperplasia of endometrial glands and reduced myometrial contractions because of the increased progesterone level in the blood [29, 30]. If canine pyometra, especially closed cervix pyometra, is not diagnosed well in time it may cause infection, inflammation, septicemia, shock and in more severe cases multiple organ damage which may lead to the death of the diseased animal. Diagnosis of canine pyometra can be done by means of history, clinical symptoms, lab findings related to hematological and biochemical estimations, enzymatic profiling, ultrasonography, radiography and histopathology.

Diagnosis

Generally pyometra develops after estrus, in the luteal phase, 20–70 days after the end of oestrus [8], and was described to occur in 93% patients within 12 weeks post estrus [10]. Common clinical signs like mucopurulent vaginal discharge, letharginess, depression, polyuria, polydipsia, vomiting, diarrhea, hyperthermia followed by hypothermia, tachycardia and tachypnoe [7] with some variations which lead to reduced physiological activities is indicative of pyometra. In open pyometra, bitches are less systemically ill than closed cervix pyometra.

The hyperplastic uterine glands involve increased uterine secretion, which causes the voluminous uterine content [9]. In open pyometra the vulvar discharge is thick, purulent, and yellow to reddish brown in colour or blood tinged and may be with a fetid odour [5] because of which the hind quarters may be wet. Abdominal palpation may display resistance and pain reaction. The enlarged uterus can be palpated easily in case of closed cervix pyometra due to greater uterine distension which is not true always in cases of open cervix pyometra and fatty bitches. In chronic cases the conjunctival mucous membrane may be dry, pale and deeply congested indicative of toxemia and dehydration [31]. The “closed” form does not give any general signs initially; it appears only after severe intoxication with pathogens. Toxaemic condition due to *E. coli* impairs the renal collecting tubules resorption ability (poor reabsorption of sodium and chloride ions in the loop of Henle) with poor sensitivity to anti diuretic hormone resulting in loss of urinary concentrating ability which may explain polydipsia [24, 6]. Elevated body temperature due to toxemia and tense integument due to

abdominal distension are general features of closed pyometra.

Haematological findings

In cases of pyometra, haematology reveals a mild normocytic, normochromic no degenerative anemic condition [32] which indicates the chronicity of the disease and toxic suppression of bone marrow with packed cell volume (PCV) 30-35% [6] to 63% [11]. Elevated WBC-count (peripheral leukocytosis with neutrophilia) often exceeding 30,000 cells/mm³ and the degenerative left shift is common clinical finding [31, 11].

Biochemical parameters and urine analysis

In pyometra, liberated endotoxins lead to organ damage and alter haemato-biochemical and enzymatic profile due to which diseased animal displays a variety of clinical symptoms [19, 9]. In pyometric bitches, abnormal serum biochemistry includes increased BUN, hyperproteinemia and hyperglobulinemia with hypoalbuminemia found to be evident [34, 13, 21, 9, 2] which may be due to dehydration and chronic antigenic stimulation of the immune system [32]. Plasma cholesterol concentration remains greater in pyometric bitches than in healthy ones and it is higher in close pyometra than open Pyometra [19]. Altered clinical blood chemistry may also include mild to moderate elevation in Alanine aminotransferase (ALT) and Alkalinephosphatase (AP) concentration [6, 2].

There may be membrano glomerulo-nephropathy due to deposition of the immune complexes along the glomerular basement membrane [35] which allows leakage of plasma protein i.e. urine analysis may show isosthenuria and proteinuria without pyuria or hematuria [32]. These findings could be useful to judge the prognosis of pyometra, since the degree of damage to kidneys depends upon the level of toxemia and dehydration caused due to Pyometra [2, 3, 9].

Hormone profiling

The plasma progesterone concentration is found significantly higher but plasma oestradiol-17 β concentration is found lower in pyometric bitches than in normal ones and both the hormone levels are found slightly higher in close pyometra than the open pyometra cases [27, 14, 17, 2].

Thus elevated levels of plasma BUN, creatinine, proteins, ALT, AP, cholesterol and progesterone etc in pyometric bitches and returning to their normal values after removal of ovaries with uterus (reversal of toxemia and other pathologies) indicates that they may prove well of diagnostic and prognostic value [20, 21, 2] for pyometra cases.

Ultrasonography and radiography

The pyometra can be diagnosed easily with the aid of ultrasonography and X-ray as they can unmask well a fluid-filled uterine cavity in cases of closed pyometra [8]. Ultrasonographic findings show an enlarged uterus with tortuous and tubular horns filled with anechoic to hypo echoic fluid. In cases of open cervix pyometra, uterus may not be pictured radio graphically because of regular evacuation of uterine contents through vagina, but it does not rule out pyometra. Some time in cases of pyometra both CL as well as cyst may present on the ovaries i.e. progesterone and estrogen secretes simultaneously [9, 2].

Uterine histopathology

Because of the inflammation of myometrium and endometrium, the uterine horns become flabby with thick

endometrium having corrugations and profuse sanguinopurulent discharge filled within uterus with some sloughed off endometrial wall. Histopathology of affected uterus reveals erosions and ulcerations in superficial endometrial layer, hyperplastic epithelial linings, infiltration of degenerated neutrophils and tissue debris which can be correlated with the sanguinopurulent vaginal discharge [9].

Treatment

The treatment of pyometra should be focused on resolving shock, septicemia, dehydration and impaired metabolism. Closed cervix pyometra is comparatively more serious because of the development of toxemia more severely [31]. It needs early recognition and appropriate treatment in order to prevent any unwanted consequences e.g. death of the patient due to septicemia and toxemia [6].

Patient experiencing shock and septicemia may require fluid therapy with colloid and crystalloid for circulatory support [32]. Use of broad-spectrum antibiotics should be done for the inhibition of bacterial growth and development. Therapy can be made more effective if one can diagnose the type of microbes present in the uterine culture. Generally antibiotic therapy should be against *E. coli*. Primary antimicrobial choice includes ampicillin (10 to 20mg/kg bw), Amoxicillin/clavulanic acid (10 to 20 mg/kg bw) or second generation cephalosporins (cefotaxime, 10 to 30 mg/kg I/V) [32]. If culture yield growth of proteus species ciprofloxacin and streptomycin can be used [11].

The pharmacological (hormonal) treatment is generally recommended if the bitch is not older than six years [32]. The principle treatment with hormonal therapy is with the aim to decrease the concentration of serum progesterone by oestrogen, androgen, oxytocin, cabergoline and prostaglandin [5] along with induction of luteolysis and prevention of progesterone binding to its receptors to reduce the adverse effect of progesterone [6]. PGF2 α causes lysis of CL, cervical relaxation with myometrial contraction [32] which facilitates the drainage of uterine content. Prostaglandins should be used cautiously, in case of closed cervix pyometra, because it may cause salpingitis, uterine rupture and peritonitis [32]. Dose of natural prostaglandin was reported @ 10-50 mg, 3-5 times daily for 3-7 days [6] and it should be gradually increasing from lower dosage to higher dosage to avoid its side effects. Synthetic prostaglandin such as cloprostenol has less side effects with more potent activity. More precisely Robert *et al.* (2003) recommended, if Progesterone concentration > 1 ng/ml serum; dose of prostaglandin can be given on day 1 and 2 @ 0.1 mg/kg S/C three times daily; day 2 to 7 @ 0.2 mg/kg S/C once daily and if progesterone levels < 1 ng/ml serum @ <0.25 mg/kg S/C once to twice daily until the uterine size is normal. However, adverse side effects of PGF2 α ranging from simple allergy to anaphylactic reaction were reported [31] while canine open cervical pyometra was successfully treated with low dose prostaglandin without any adverse effects [33]. Initially, the bitch may show restlessness, hyper salivation, panting, vomiting, tachycardia and pain reaction but these reactions subside within 60 minutes after treatment [32]. Aglepristone (Progesterone receptor blocker) can also help in pyometra treatment as it not only blocks the progesterone receptors (hamper the endometrial adhesion of bacteria) but also causes the opening of the cervix [36]. But it has been proven more effective when used in combination with cloprostenol than Aglepristone alone [16]. If the last heat occurred more than 2.5 months ago, the bitches should be

treated with PGF_{2α} alone while if the bitch is presented within 2.5 months after the last heat a combination therapy of the progesterone antagonist (as Aglepristone) and PGF_{2α} should be given [36].

In bitch, prolactin is an important luteotropic hormone so prolactin inhibitors or dopamine agonists such as bromocriptine (10 @ mcg/kg) or cabergoline (5 @ mcg/kg) can be used along with prostaglandin to treat pyometra as this combination improve the luteolytic effects of drug [6]. But some time versatile regulation of corpus luteum activity may reduce the effectiveness of cabergoline [1, 28]. Prolongation of anestrus may allow the regeneration of endometrium and this can be done with the use of androgen receptor agonist as they postpone the estrus for 2-3 months [6].

Uterine drainage and lavaging with antiseptic solutions have been proven of good therapeutic value in pyometra cases. Antibiotics and antiseptics including povidone-iodine have been used successfully as intra-uterine lavag to treat uterine infections in bitches [26].

Even after medicinal treatment the underlying CEH (chronic endometrial hyperplasia) persists and recurrence rates for pyometra are high [4], suggesting that the infection persists subclinically. Ovariohysterectomy is the most widely used method for sterilization of pyometric bitches [12, 31]. The objective of ovariohysterectomy is to prevent the endotoxemia, renal failure and also prevention of venereal diseases such as CTVT, by cessation of cyclical activity. The main advantage of the surgical method is the quick resolution of clinical symptoms, such as anorexia, polydipsia and toxemia etc which enables quicker recovery of affected bitches. In some cases the sutures of the ovarian pedicle are put too close to the ovary so the small portion of functional tissue is left and this may causes the animal remains cyclic [12]. Remaining functional ovarian tissue (ovarian remnant syndrome) is considered to be an important evidence of hormonal influence, especially progesterone secretion which may develop stump Pyometra [25]. Sometime complications such as over-appetite and obesity have often been encountered after ovariohysterectomy so some veterinary surgeons advise the owner of the animal to leave at least one of the ovaries intact. Ultimately ovariohysterectomy is the choice of treatment [15] generally in case of closed cervix pyometra in bitches. Surgical risk and complications are low at early course of the disease with success rates upto 92% [6]. The ultimate advantage of ovariohysterectomy is the exclusion of any risk of disease reoccurrence. The success rate of medicinal and surgical treatment of closed pyometra is reported to be 60 and 80% respectively [27] and approximately 30 – 50% of bitches medically treated for pyometra can be successfully bred on subsequent cycles [11]. Following the treatment success rate in terms of pregnancy may vary from 40% to 82% [32, 28]. Despite modern treatment the mortality in dogs due to pyometra is recorded about 4% [6]. Canine pyometra must also need to be differentiated from gastroenteritis, renal disease (especially chronic interstitial nephritis), diabetes mellitus, diabetes insipidus and lymphosarcoma [22].

Conclusions

Canine pyometra is one of the bacterial infections potentially developing into the systemic inflammatory response syndrome (SIRS) [23] so it is recommended that any bitch which is not being used for future breeding should be spayed before six months of age to prevent occurrence of pyometra.

Quick diagnosis and treatment of canine pyometra is important because diseased animal may be markedly dehydrated, septicemic and may go under shock and death due to toxemia alone or may be associated with peritonitis due to rupture of uterus [31].

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