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Comparative analysis of closed and open cervix pyometra: Research article

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Abstract

Pyometra is a prevalent and deadly condition that affects mainly bitches and is marked by a bacterial infection in the uterus that progresses to a systemic sickness. Based on the patency of the cervix, the condition is usually categorised as either open or closed type. The purpose of the study was to compare the alterations in hem biochemical and clinical parameters in pyometras with an open and closed cervix. The clinical cases were split up into three groups. The open cervix, closed cervix and control (healthy) group. Clinical symptoms included vomiting, abdominal distension, sadness, vaginal discharge, anorexia, and polyuria/polydipsia. BUN (blood urea nitrogen) and creatinine activity were substantially greater in dogs with closed cervix pyometra compared to those with open cervix pyometra ($p < 0.05$). In dogs with closed cervix pyometra, the number of white blood cells and neutrophils were significantly higher than in dogs with open cervix pyometra ($p < 0.05$). An ultrasonographic study revealed that the luminal cavity in open cervix pyometra had less anechoic fluid than in closed cervix pyometra.

Keywords: Pyometra, closed cervix pyometra, open cervix pyometra, PgF2 α

Introduction

Bitches are monoestrous and ovulate spontaneously because they only have one oestrous cycle throughout a breeding season (Concannon, 2009) ^[5]. Nearly one-fourth of all female dogs experience pyometra (chronic purulent inflammation of the uterus), a common reproductive condition, before they turn 10 years old. According to Hardy and Osborne (1974) ^[11], canine pyometra is a reproductive disorder distinguished by bacterial infection, inflammation, and pus accumulating in the uterus along with systemic sickness. High serum progesterone levels during diestrus will encourage bacterial adhesion and proliferation in the endometrial epithelium, leading to the most severe end stage disease known as pyometra (Hagman and Kuhn, 2002) ^[10].

According to Bigliardi *et al.* (2004) ^[3], hormonal therapy intended to avoid pregnancy can potentially cause an imbalance in hormones that can lead to pyometra. After estrus, Cystic Endometrial Hyperplasia (CEH) usually occurs next. The uterus can harbour vaginal commensal microorganisms as a result of CEH. When endotoxins are released into circulation, as the bacteria grow, or when the bacteria are destroyed, they are thought to be the cause of the systemic symptoms of pyometra and sepsis in dogs. Endotoxins are a lipopolysaccharide component of the outer membrane of the cell wall of *Escherichia coli* and other Gram-negative bacteria (Asheim, 1965) ^[2].

Depending on the patency of cervix, there are two different form of pyometra: open cervix and closed cervix. Inappetence, depression, polydipsia, lethargy, and abdominal distension are some of the clinical symptoms of the bitch with closed-cervix pyometra (Asheim 1965, DeSchepper *et al.* 1989) ^[2]. The bitch usually has an increased white blood cell count and is afebrile (DeSchepper *et al.* 1989, Smith 2006) ^[7, 13]. The bitch with an open cervix pyometra, on the other hand, exhibits vaginal discharge. Therefore, closed cervix pyometra is a medical emergency needing prompt care to prevent further sepsis and possibly patient mortality, even its clinical signs are less prominent than those of open cervix pyometra (Smith 2006) ^[13].

The aim of the study is to evaluate the animal presented for treatment of pyometra based on ultrasonography findings, affected age, blood chemistry, clinical signs of the open and closed

cervix bitch. In USG a fluid-filled organ with variable wall thickness and proliferative changes can be seen. Complete ovariohysterectomy is the preferred course of treatment for any elderly, systemically unwell bitch or one who has closed cervix pyometra. Prostaglandins may be administered to young bitches who exhibit an open cervix pyometra, normal organ function, and a cooperative, reasonable owner in an effort to preserve their reproduction.

Materials and Methods

Study population

This work was carried in Veterinary Clinical Complex Jaipur, PGIVER college. Total 30 animals were taken from October 2023 to May 2024. The animals were selected irrespective of their age, breed and weight. They were divided into groups based on their vaginal secretions. If vaginal secretion present then group I (open cervix pyometra), if vaginal secretions absent group II (closed cervix pyometra) and group III was having healthy animals in diestrus phase.

Diagnosis

Based on the history taken, the physical examination and the abdominal ultrasonographic results, pyometra was initially diagnosed. Intact female canines with vaginal discharge, polyuria, polydipsia, abdominal distension, and a palpably enlarged uterus were suspected of having pyometra based on the history-taking and physical examination. Pyometra was identified in dogs with aberrant ultrasonographic features, such as fluid-filled uterus or uterine horns.



Fig 1: Ultrasonographic image of fluid filled uterus which was diagnosed with pyometra

Blood analysis

Haemato-biochemical analysis including haemoglobin, Total Leukocyte Count, platelet, neutrophil, monocyte, lymphocyte, BUN and creatinine were done before treatment and after treatment (surgery or medical treatments).

Statistical analysis was done by ANOVA by doing comparison in the groups by different parameters such as haemato-biochemical parameters.

Result and Discussion

The majority of pyometra-affected dogs in groups I and II (64.29% each) were nulliparous animals. Pyometra was more common in nulliparous dogs, according to past reports. Repeated exposure to progesterone during each dioestrus in

nulliparous dogs may cause CEH which is gradually developed.

The clinical findings for dogs with pyometra are shown in Table 1. The most common symptoms were vaginal discharge, anorexia, dullness, dehydration, vomiting, polyuria and polydipsia. In the current investigation, dogs with open-cervical pyometra showed more severe clinical symptoms.

Table 2 provides information on the haemato-biochemical examination of Group I, II and III dogs.

Temperature, heart rate and respiration rate were not substantially different from control in dogs with open or closed cervix pyometra.

The Hb concentration was lowest in group I and highest in group III so Hb concentration is below normal range in pyometra condition due to deficiency of iron but after treatment it comes in normal range.

Pyometra-affected dogs showed leucocytosis; the value was highest in Group II and lowest in Group III; there was a significant difference between the groups. Values in dogs with pyometra were higher than typical physiological limits. The results point to an inflammatory response in pyometra-affected dogs and a higher level of inflammation was seen in dogs with closed-cervical pyometra.

The percentage of neutrophils was highest in Group II and lowest in Group III; group II had the most neutrophilia, which was also substantially greater than group III. The results point to an immunological response to infection in dogs with pyometra.

Creatinine, aspartate transaminase and blood urea nitrogen (BUN) were greater than usual physiological value. These indicators saw a considerable decline in the group after treatment.

Increased BUN and creatinine concentrations, hypoalbuminemia, and proteinuria in dogs with pyometra showed altered liver and renal functioning (Maddens *et al.*, 2011)^[12].

The treatment involves the combination of PgF₂α i.e cloprostenol @ 1 µg/kg body weight and Cabergoline i.e Cabagoline 0.25 mg @ 5 µg/kg body weight.

The serum of the group of bitches given the drug combination of cloprostenol and cabergoline showed a significant rise in the levels of haemoglobin, lymphocytes and decrease in alanine transaminase. The levels of biochemical parameters like blood urea nitrogen (BUN), creatinine as well as haematological parameters like neutrophils and monocytes, showed a significant decline in these parameters in the treated group of bitches. Tsumagari *et al.* (2005)^[14] said that immediately following the end of therapy with dinoprost tromethamine, a normal blood picture was discovered in all the treated bitches.

Table 1: Percent of dogs exhibiting different clinical signs, among dogs affected with open and closed -cervix pyometra

Clinical signs	Group I	Group II
Presence of vaginal discharge	84.32	0
Anorexia	80.04	100
Dullness	80.04	100
Dehydration	78.45	37.13
Vomiting	64.35	27.34
Polyuria	56.37	48.23
Pale mucus membrane	58.43	24.23
Congested mucous membrane	37.56	57.34
Polydipsia	15.23	0

Table 2: Haemato-biochemical parameters in different groups of bitches affected with pyometra and control dogs

Parameters	Group I (Open cervix)	Group II (closed cervix)	Control (Healthy)	F value	P value
TLC ($\times 10^3$ /mm ³)	40.623 \pm 0.50	48.24 \pm 0.97	10.41 \pm 0.18	0.27	<0.01
Neutrophil (%)	72.59 \pm 0.46	78.84 \pm 0.42	71.05 \pm 0.44	1.15	<0.01
Lymphocyte (%)	15.65 \pm 0.40	17.73 \pm 0.26	23.57 \pm 0.92	2.30	<0.01
Monocyte (%)	6.44 \pm 0.10	7.67 \pm 0.26	5.41 \pm 0.09	0.14	<0.01
Hb (g/dL)	9.21 \pm 0.19	9.99 \pm 0.14	12.48 \pm 0.12	2.01	0.02
PLT($\times 10^3$ /mm ³)	176.48 \pm 1.50	263.88 \pm 5.06	284.97 \pm 3.05	0.08	<0.01
BUN (ng/dL)	31.09 \pm 2.09	39.26 \pm 3.57	15.31 \pm 0.13	0.34	<0.01
Creatinine (ng/dL)	3.35 \pm 0.13	4.55 \pm 0.09	1.25 \pm 0.11	2.08	<0.01

Table 3: Physiological and Haemato-biochemical parameters in different groups of bitches affected with pyometra after treatment

Parameters	Group I (open cervix)	Group II (closed cervix)	Control (control)	F value	P value
TLC ($\times 10^3$ /mm ³)	15.08 \pm 0.37	16.70 \pm 0.40	10.41 \pm 0.18	0.89	<0.01
Neutrophil (%)	69.42 \pm 0.22	70.76 \pm 1.17	71.05 \pm 0.44	0.03	0.16
Lymphocyte (%)	22.70 \pm 0.13	21.40 \pm 0.26	23.57 \pm 0.92	0.26	<0.01
Monocyte (%)	5.62 \pm 0.09	5.44 \pm 0.09	5.41 \pm 0.09	0.94	0.06
Hb (g/dL)	12.22 \pm 0.21	12.40 \pm 0.11	12.48 \pm 0.12	3.20	0.27
PLT($\times 10^3$ /mm ³)	279.03 \pm 1.03	290.85 \pm 2.97	289.97 \pm 3.05	0.12	<0.01
BUN (ng/dL)	18.99 \pm 0.37	24.79 \pm 1.72	15.31 \pm 0.13	0.045	<0.01
Creatinine (ng/dL)	1.59 \pm 0.03	2.55 \pm 0.15	1.25 \pm 0.11	0.044	<0.01

Cloprostenol and cabergoline were combined to successfully treat bitches with pyometra in study. For the treatment of pyometra, Corrada *et al.* (2006) [6] reported an 83% recovery rate utilising a combination of cloprostenol and cabergoline. All of the treated pyometra-affected bitches had normal blood haematological profiles and serum biochemistry upon conclusion of treatment, according to England *et al.* (2007) [8]. Also some sides effects are noted which includes salivation, vomiting, panting, restlessness and hypernea.

Dogs with closed-cervix pyometra displayed more severe clinical symptoms. Additionally TLC, band cell percentage and TEC show that dogs with closed-cervix pyometra exhibit a greater inflammatory response than those with open cervix pyometra. When instances are presented later than they should be categorised as open cervix pyometra because the owner failed to detect the early indicators of closed-cervix pyometra, the cervix may have relaxed due to increased intrauterine pressure and would then be categorised as an open-cervix case (Anna *et al.*, 2014) [1].

Clear distinction between open and closed cervix pyometra could be made in the current study based on the number of white blood cells and neutrophil.

The levels of the serum creatinine, BUN differ between open and closed-cervix pyometra. Their value are more in closed cervix pyometra.

Conclusion

The closed cervix pyometra is more lethal than open cervix pyometra. As it's more inflammatory. The treatment of canine pyometra using a combination of a dopamine agonist prolactin inhibiting drug (Cabergoline) and a lower dose of synthetic PGF₂ α (Cloprostenol) was found to be the most effective method.

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