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Ultrasonographic diagnosis and surgical management of cystic endometrial hyperplasia-pyometra complex in female dogs

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Abstract
Cystic endometrial hyperplasia-pyometra complex (CEH-PC) is one of the multifactorial and common uteropathies of female dogs having signs like inappetence, depression, polydipsia, polyuria, vomiting and abdominal distension with or without vaginal discharge. Diagnosis of CEH-PC may pose challenges to clinician in many ways as sometimes the presenting signs are vague and nonspecific. If, it remains undiagnosed, it may lead to life threatening consequences. Ultrasound is an important and accurate diagnostic tool for the diagnosis of CEH-PC, having numerous benefits like non-invasive in nature, safety of the patient and operator and spontaneous availability of the information regarding disease process. In the present study, six female dogs aged between 4-6 years with CEH-PC were prospectively studied. These cases were diagnosed by using B-mode transabdominal uterine ultrasonography. Further, ultrasonographic and macroscopic studies were done. These cases were managed surgically by ovariohysterectomy (OH). This paper elaborates ultrasonographic and macroscopic findings and surgical management of CEH-PC.

Keywords: Cystic endometrial hyperplasia, pyometra, ultrasound and ovariohysterectomy

Introduction
Cystic endometrial hyperplasia-pyometra complex (CEH-PC) is a common genital disorder of noncastrated female dogs (Younis *et al*., 2014) [19]. The CEH-PC is characterized by an inflammatory, proliferative, vascular and cystic disorder of endometrium along with formation of pus in the uterine lumen. The determination of exact etiopathogenesis of the CEH-PC is undefined and very complex. (Veiga *et al*., 2017) [17]. A multifactorial etiopathogenesis of CEH-PC is widely accepted. It occurs as an exaggerated response of the uterus to chronic progestational stimulation during the luteal phase of the oestrous cycle, causing an abnormal accumulation of fluid within the endometrial glands and uterine lumen (De Bosschere *et al*., 2001) [3]. The resulting lesions of pyometra are due to the interaction between hormones and bacteria (Bigliardi *et. al*., 2004) [2]. Numerous factors such as joint action of progesterone and estrogen during successive reproductive cycles, the influence of endometrial proliferation factors such as Insulin-like Growth Factor 1 (IGF-1), bacteriological toxic factors (mainly *Escherichia coli*) and endometrial remodeling by matrix metalloproteinases, culminating in endometrial changes results in exudative and degenerative inflammatory reaction (Schlafer *et al*., 2008) [14]. Clinically, a bitch might be presented with inappetence, depression, polydipsia, polyuria, lethargy, vomiting and abdominal distension with or without vaginal discharge (Smith 2006 and Schlafer *et al*., 2008) [15, 14]. CEH-PC is a medical emergency requiring rapid intervention to prevent subsequent sepsis and potential patient death (Smith 2006) [15]. Diagnosis of CEH-PC may pose challenges to clinician in many ways as sometimes the presenting signs are vague and nonspecific. Ultrasound is an important diagnostic tool in the differential diagnosis of uteropathies in female dogs. It has numerous benefits like non-invasive in nature, safety of the patient and operator and spontaneous availability of the information regarding disease process (Nyland and Mattoon, 2002) [10]. In recent years, ultrasonography has gained lot of importance in clinical practice and ultrasound examinations are now a routine part of small animal disease diagnosis. The best option for the management of CEH-PC is ovariohysterectomy (OH). Present paper deals with ultrasonographic and macroscopic findings and surgical management of CEH-PC in six female dog cases.

Material and Methods

All the cases were treated and examined as per standard treatment and examination protocols so the ethical approval was not necessary for this study. Six female dogs with complaint of abdominal distension with vaginal discharge, inappetence, polydipsia, lethargy and vomiting were prospectively studied**.** These cases were presented to Veterinary Clinical Complex, College of Veterinary and Animal Sciences, SVPUA&T, Meerut from the adjoining areas. Detailed physical and clinical examinations including gentle abdominal palpation for evidence of uterine distension, rectal temperature, pulse and respiratory rate, presence or absence of vaginal discharges suggestive of pyometra were carried out. Thus, a tentative diagnosis of pyometra was done on the basis of medical history and clinical signs.

Further, female dogs were subjected to B-mode transabdominal uterine ultrasonographic examination to establish the confirmatory diagnosis and carry out ultrasonographic studies of CEH-PC. They were secured in right and left lateral recumbency. Ultrasonographic studies involved endometrial characteristics (hyperplastic and cystic changes endometrium) and presence of intraluminal contents.

All the animals diagnosed with CEH-PC were managed surgically by performing ovariohysterectomy. They were prepared aseptically for surgery and administered general anesthesia. The surgical interventions were done by keeping dogs in dorsal recumbency. Intravenous infusion of normal saline was maintained during surgery. An about 6-8 cm long mid line skin incision was made about 2 cm caudal to umbilicus for routine laparotomy followed by ovariohysterectomy (OH). The laparotomy wound were closed, dressed and protected in routine manner. The excised uterus was further studied macroscopically. Uterine horns were incised longitudinally to visualize the lumen and observations were recorded.

Postoperatively, amoxicillin-sulbactum antibiotic combination (15 mg/kg, IM) for 5 days, analgesic meloxicam (0.2 mg/kg, IM) for 3-5 days and antacid pantoprazole (1 mg/kg, PO) for 5 days were administered. The skin sutures were removed after healing of the wounds generally on 12th day.

Result and Discussion

All the animals showed moderate abdominal distention (evidence of moderate uterine distension), increase in rectal temperature, variable pulse and respiratory rate and presence of vaginal discharges on physical and clinical examinations. These findings were concurred with the findings of Jena *et al*., (2013) [8] and Younis *et al*., (2014) [19].

B-mode transabdominal uterine ultrasonographic examination revealed markedly enlarged uterine horns and thickened and irregular (hyperplastic) uterine walls containing multiple tiny anechoic cysts (Fig.1 A and B). The uterine horns contained hyperechoic or anechoic material that showed movement in real time. The uterine wall was variable in appearance, from thick and irregular to smooth and thin. Ultrasound examination was able to clearly evaluate endometrial integrity, variation of uterine wall thickness, uterine distension and cystic endometrial glands. These findings concurred with the findings of Verstegen *et al*., (2008) [18] and Manokaran *et al*., (2018) [11]. In our study, ultrasonographic examination was found immensely useful to diagnose CEH-PC and degree of the lesions. Bigliardi *et al*., (2004) [2] also reported the similar usefulness of ultrasonography.

Anesthesia and laparotomy followed by ovariohysterectomy procedures were performed without any difficulties. Majority of the female dogs showed uneventful recovery except few minor incidences of vomiting and mild pus formation at surgical sites. These minor incidences were managed with medical treatment immediately.

In macroscopic study, the uterus was increased in volume and asymmetry of the uterine horns was observed. The uterine lumens were found accumulated with moderate to severe pus (Fig. 2A). The endometrium was moderate to severely hyperplastic along with formation of cysts filled with transparent fluid (Fig. 2B). These findings were in concurrence with De Bosschere (2001) [3] and Quartuccio *et al*., (2020) [12]. It showed diffuse thickening and exaggerated nodularity. It is probable that CEH-PC in female dogs is associated with an abnormal response of the uterus to a prolonged progesterone phase (Egenvall *et al*., 2001 [4] and Hagman, 2004) [6]. Formation of moderate to severe pus in the uterus is most frequently associated with *E. coli* endotoxin as reported by Vandeplassche *et al*., (1991) [16] and Gilbert *et al*., (1992) [5].

Surgery (OH) was found safe and effective treatment for CEH-PC. Similar findings were reported by Hagman (2018) [7].

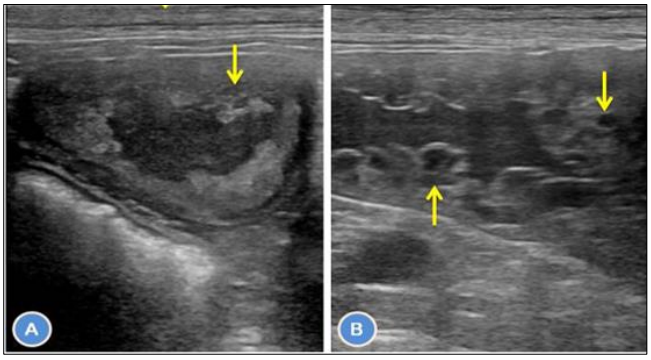

Fig 1: Thickened and irregular hyperplastic uterine walls containing multiple tiny anechoic cysts. Transverse (A) and longitudinal (B) views.

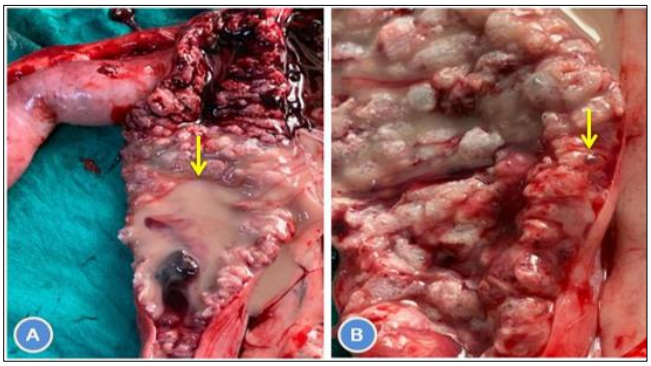

Fig 2: Accumulation pus in the uterine lumen (A) and hyperplastic endometrium along with formation of cysts filled with transparent fluid (B).

Conclusion

The CEH-PC is multifactorial and one of the common uteropathies of female dogs. Ultrasound was found as an important and accurate diagnostic tool for the diagnosis of CEH-PC. Ovariohysterectomy (OH) was found safe and effective treatment for CEH-PC. Ultrasonographic and macroscopic findings of the disease were studied. Further, an elaborative research focusing on histopathological and

hormonal changes is required for better understanding of CEH-PC and its prevention.

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Competing Interests
The authors declare no competing interests.

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