

Evaluation of the clinical and histopathological findings of uterus and ovaries in ovari hysterectomized cats in Ahvaz district

Bahman Mosallanejad^a, Anahita Rezaie^b, Behrooz Mihandoost^a, Saad Gooraninejad^a, Shahrzad Gitijamal^c

^aDepartment of Clinical Sciences, Faculty of Veterinary Medicine, Shahid Chamran University of Ahvaz, Ahvaz, Iran

^bDepartment of Pathobiology, Faculty of Veterinary Medicine, Shahid Chamran University of Ahvaz, Ahvaz, Iran

^cGraduated of Faculty of Veterinary Medicine, Shahid Chamran University of Ahvaz, Ahvaz, Iran

Postal address: Ahvaz- Shahid Chamran University of Ahvaz- Veterinary Faculty- Department of Clinical Sciences- Dr Bahman Mosallanejad.

Corresponding author: Bahman Mosallanejad

University/organization **Email:** bmosallanejad@scu.ac.ir

ABSTRACT

The purpose of the present study was to evaluate the clinical findings, histopathological lesions of the uterus and ovaries and emphasizes the role of ovari hysterectomy in the population of ovari hysterectomy cats in Ahvaz region between October and February 2022. Fifty-four cats, referred to the Veterinary Hospital, underwent ovari hysterectomy surgery. The Mean±SD age of the cats was 10.94±0.74 months. In the macroscopic examination of the samples, except for three cases that were pregnant, all the other cases had normal structure and were not seen any specific clinical signs.

Histopathological findings showed that one case had endometrial cystic hyperplasia, one case granulosa cell tumor, one case uterine cyst and bleeding in the ovary, another case hyperemia and bleeding in the uterine and ovary; and the last case was affected to hemosiderosis in uterus. In cat with endometrial cystic hyperplasia, endometrial cells were proliferated and cysts located in the endometrial mucosa; also, several large follicles and corpora lutea were seen inside the ovary, which classified as first-degree cystic hyperplasia according to the Dow classification. In the

microscopic evaluation of the sample with granulosa cell tumor, a mass of proliferated cells was observed in the ovarian tissue. The mentioned cells were placed together in the form of a ladder. These cells had a large nucleus with one to two distinct nucleoli and a small amount of cytoplasm. The present study showed that ovariohysterectomy can play an important role to diagnose pathological lesions of the uterus and ovaries in cats; the importance of diagnosis, is much greater, especially in the cases of tumors.

Keywords: *Uterus, Ovary, Histopathology, Ovariohysterectomy, Cat, Ahvaz*

Abbreviations: CEH: Cystic Endometrial Hyperplasia

DLH: Domestic Long Hair

DSH: Domestic Short Hair

Introduction

The risks of pathological lesions of the uterus and ovaries, including endometrial/pyometrial cystic hyperplasia complex, have been seen mostly in older cats, however, some injuries cannot be identified due to their subclinical nature. Along with physical examination and diagnostic tests, histopathological evaluations are necessary following ovariohysterectomy in cats. Most of the subclinical injuries of the uterus such as pyometra, turn into life-threatening. Pyometra in dogs and cats may occur due to endometrial cystic hyperplasia. Under the influence of progesterone hormone, the contraction power of myometrium decreases and the growth of endometrial glands accelerate [1].

Histopathology evaluation, along with clinical findings, is a unique diagnostic supplement for veterinarians that can distinguish uterine infections from other uterine lesions. Removal of the uterus and ovaries for histopathological examination is of great importance in the diagnosis of various diseases of the female reproductive system [2]. It is probably influenced by repeated exposure of the endometrium to high concentrations of estrogen in the luteal phase, although the cause of cystic hyperplasia of the endometrium is not completely clear. The immobility of the uterus and the secretions of the endometrial glands provide a suitable environment for the growth

and proliferation of bacteria. The most common intrauterine bacterium isolated in pyometra is *Escherichia coli* [3].

Most cats with pyometra show clinical signs such as anorexia, lethargy, weight loss, or even infectious shock and peritonitis. In cats with pyometra with an open cervix, there is usually a wet perineal area and purulent secretions from the vagina; in addition, hyperuria and excessive drinking may also exist [4]. A reliable method to definitively diagnose pyometra is to evaluate the uterine by ultrasonography. In ultrasound evaluation, the diameter of healthy uterine horns is usually 0.4 to 0.7 cm, depending on the stage of the estrous cycle. Appropriate treatment is ovariohysterectomy; however, fluid therapy, administration of antibiotic, and appetite stimulants are required before surgery to stabilize the patient's body. Identifying ovarian damage is helpful in cases of ovarian cystic hyperplasia [5]. Using dopamine agonist in medical treatment may delay the recurrences of pyometra for a short term, however ovariohysterectomy whenever possible may be the best choice for treatment of pyometra [3].

Despite the many researches that have been done in recent years, in the field of diseases of the reproductive system and especially uterine infections in cats; however, the actual prevalence of infection and the involved mechanisms are not known precisely [6, 7]. In the USA and Europe, the proportion of privately owned cats reported to be neutered ranges from 27% to 93%. Regarding the frequency of histopathological lesions of the uterus and ovaries, there are relatively few reports in clinically healthy cats. By examining resources, most articles were in the form of case reports. It was reported the isolation of *Pasteurella multocida* by studying on a Persian cat 16-year-old with pyometra. In the history, symptoms were observed such as intermittent vomiting, loss of appetite and gradual expansion of the abdomen [9]. Several articles were also found in other countries, including in a survey on 44 cats with inflammatory diseases of the uterus, it was found that the ovaries of 19 cats had cystic or active follicles; while in the other 25 cases, the ovaries were in the luteal phase [10]. It was reported a higher prevalence of pyometra in Bengal cats. There was active corpus luteum on the ovaries, in connection with proliferative adenomatous changes, in the glandular and surface epithelium of uterus [11].

In another study on forty five cats with pyometra; it was showed that although the administration of dopamine agonist drugs may delay the occurrence of pyometra in the short term; but the best treatment is ovariohysterectomy [5].

Considering that ovariohysterectomy is not routinely performed in cats that are kept alone in Iran; therefore, we expect that the prevalence of uterine infections in the population of domestic cats is relatively high; besides, there was no comprehensive study in this field in our country. In connection with the innovation aspect of the present study, it seems that this research is being conducted for the first time in cats of Ahvaz district in Khuzestan province. The current survey is practical and the obtained results will be of great help to veterinary clinicians. The purpose of the present study was to evaluate the histopathological lesions of the uterus and ovaries (such as cystic hyperplasia of the uterus, pyometra, mucometra, neoplasias, etc.), also to investigate the clinical signs and emphasizes the role of ovariohysterectomy in the population of cats in Ahvaz district.

Results

Clinical findings

In the present study, out of fifty-four cat, three cases were pregnancy, two cases had blood-filled uterus and the rest of cases, all had normal structure. The mean $\pm$ SD of age of the studied cats were 10.94 $\pm$ 0.74 (range of six months until 2.5 years).

The factor of keeping cats indoors or going outside did not show a significant difference in terms of lesions ($p > 0.05$). Only a few had access to the outdoors (five cats). No history of uterine diseases and administration of different drugs, including corticosteroids, were not seen and clinical findings (condition of the vulva and vagina, discharge of purulent discharge from the vagina, breast tumors, breastfeeding, hyperuria and heavy drinking, as well as the condition of the skin and body hair) were normal at the time of registration.

Based on the microscopic characteristics of the uterus and ovaries, twenty-one cats were in the proestrous cycle (first group). In these samples, several large follicles were observed in the ovary and corpus luteum. Also, the uterine endometrium was thin and slightly hyperemic. Fourteen cats were observed in the estrus cycle (second group). In this cycle, the uterine mucosa was bloody and there was bleeding in the more superficial parts. A large number of erythrocytes were observed in the endometrial layer. A very large follicle could be seen inside the ovary. Eight cats were in

diestrous cycle (third group). A large yellow body was seen in the ovary of these samples. Also, inside the endometrial layer, the thickness of this layer had increased due to the proliferation of endometrial gland cells. Eleven cats were also in anestrus cycle (fourth group). In the ovaries of these samples, the follicles had the smallest diameter and the corpus luteum was severely depleted.

Out of thirteen Persian cat, five samples were in proestrus cycle, three cases were in estrus cycle and three other cats were in anestrus cycle, only one case was observed in proestrus cycle. Thirty-nine cases of cat's breed were DSH which fourteen cases were in proestrus cycle, ten cats in estrus cycle, eight another cats in diestrous cycle and seven cases in anestrus cycle. Only one cat of DLH (Domestic long hair) breed and one cat of Siamese were in the proestrus cycle. They were showing the irregularity of the estrous pattern, which can be due to induced ovulation or different living environment.

Based on histopathological findings, from the studied cats (fifty-four), one cat was suffering from endometrial cystic hyperplasia, one case with granulosa cell tumor, one sample with uterine cyst and bleeding in the ovary and another cat with hyperemia and bleeding in the uterine perimeter and ovary, as well as, one case was affected to uterine hemosiderosis.

Out of five cats with uterine and ovarian lesions, in four cases, there was involvement in the uterus area (80%), two cats (40%) in the ovary, and another two cats (40%) in both uterus and ovary. All uterine and ovarian lesions were seen only in DSH breed. By the statistical analysis for age in DSH cats, mean $\pm$ SD for this breed was 10.71 $\pm$ 0.95. The high standard deviation values could be due to the different age of ovariohysterectomy and the small number of observed patient samples (five cases).

In the present study, the thickness of the endometrium, myometrium, uterus, and the number of follicles were measured, as well as, the large and atrophied yellow bodies detected in uterus and ovaries. Fifty-four samples of uterus and ovary were classified into four groups in terms of estrous cycle. Groups one to four were classified to proestrus, estrus, diestrus and anestrus cycle. In the third group, a reduction in diameter was observed in the thickness of the endometrium, myometrium, uterus and the number of large corpus luteum. The highest amount in the thickness was recorded in the second group (estrus cycle) ($P < 0.01$; Table 1). According to the obtained results, the number of follicles gradually decreased in three groups (groups of 2-4) ($P < 0.05$). In the first group, the maximum of mean $\pm$ SD in number of follicles was 11.76 $\pm$ 0.95. The highest

number of follicles was 17 and the lowest number of follicles was related to the sample with CEH. There was a difference in the cat with uterine cyst and ovarian bleeding, but there was not observed a significant difference in the number of follicles. In the second group, the maximum of the thickness in the uterus was $15.11 \pm 0.78 \mu\text{m}$ and the lowest of thickness was calculated in the affected cat to granulosa cell tumor ($6.5 \mu\text{m}$), which may be due to the effect of the tumor on uterus ($P < 0.05$). There was no a significant difference in the number of yellow bodies, between four groups in the involved samples.

Table 1. Measurements of endometrium, myometrium, uterine thickness, number of follicles and ovarian corpus luteum (mean $\pm$ SD) in 54 cats in Ahvaz district (W.F x 10 graduated lenses)

Cycle	Proestrus	Estrus	Diestrus	Anestrus
Mean$\pm$SD				
Thickness of endometrium	9.33 $\pm$ 0.64	11.14 $\pm$ 0.61	11.00 $\pm$ 1.21	9.21 $\pm$ 0.93
Thickness of myometrium	1.49 $\pm$ 0.16	1.84 $\pm$ 0.16	1.55 $\pm$ 0.07	1.43 $\pm$ 0.25
Thickness of uterine	13.79 $\pm$ 0.59	15.11 $\pm$ 0.78	14.75 $\pm$ 0.99	13.48 $\pm$ 0.94
Number of follicles	11.76 $\pm$ 0.95	11.42 $\pm$ 0.97	7.00 $\pm$ 0.90	10.66 $\pm$ 0.66
Number of corpus luteum	2.66 $\pm$ 0.68	2.87 $\pm$ 0.58	2.42 $\pm$ 0.52	1.05 $\pm$ 0.34

Out of five cats affected to uterine and ovarian disease, corpus luteum was seen in four cats. Two cats were in proestrous cycle, one case in estrous and two another cats in diestrous. In the microscopic evaluation, the changes were seen in uterus and ovaries. Endometrial cystic hyperplasia was diagnosed in one cat. In this sample, endometrial cells were proliferated and cysts observed in the endometrial mucosa, as well as, several large follicles and corpora lutea were inside the ovary. It was categorized as first degree CEH, based on Dow classification (1962) [11] (Figures 1 and 2).

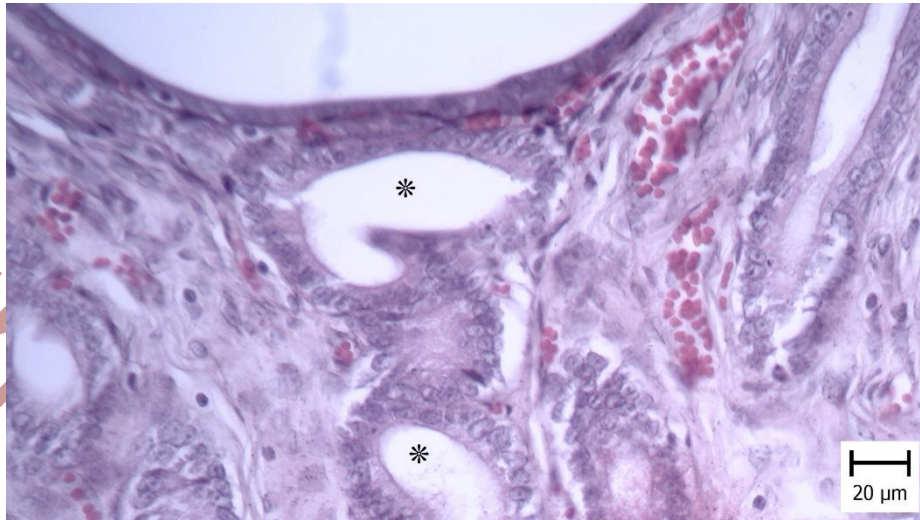


Figure 2: Higher magnification of the previous figure. Note proliferating columnar cells of the endometrial glands (asterisks) (Hematoxylin and Eosin).

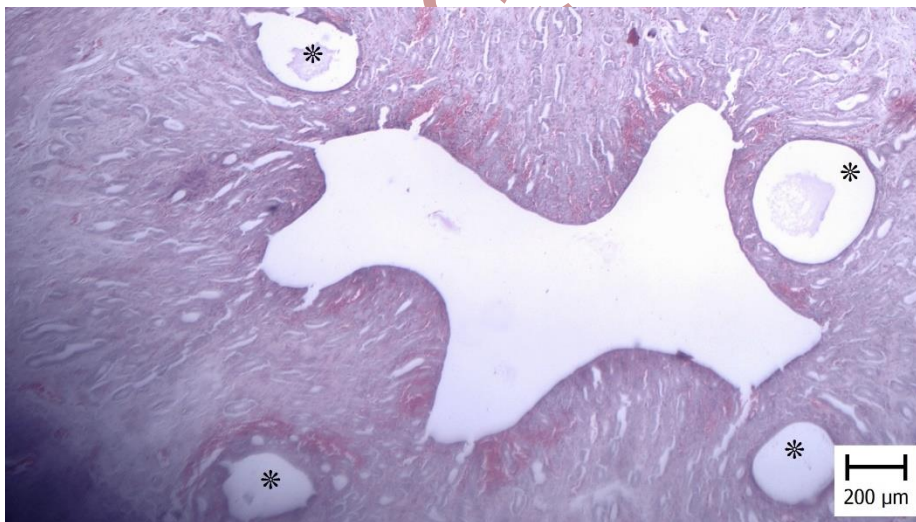


Figure 1: Cystic hyperplasia of the uterine endometrium.
Note on cysts of varying sizes (asterisks) (Hematoxylin and Eosin).

In another one sample, the uterus had severe bleeding in the perimeter of the uterus and ovary. A large hematoma was detected in ovary, which was accompanied by the accumulation of a large number of erythrocytes (Figures 3 and 4).

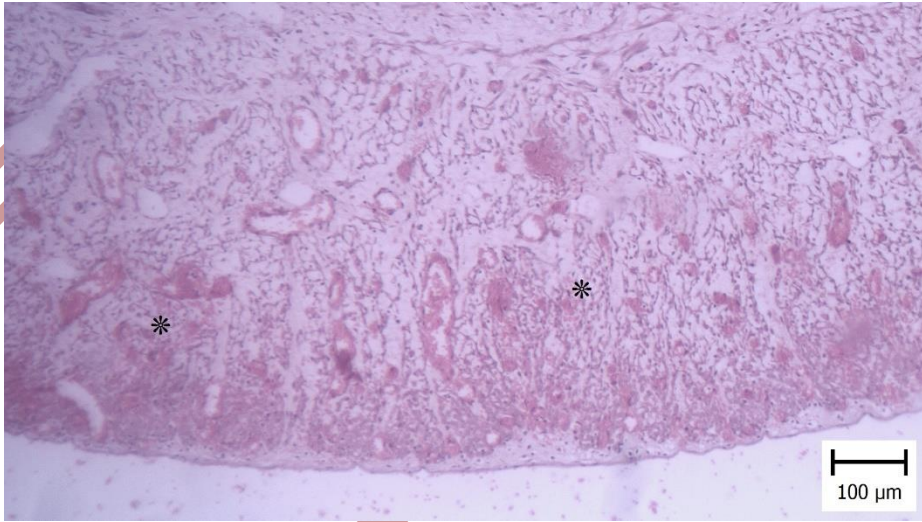


Figure 3: Hemorrhage (asterisks) in the uterine perimetrium (Hematoxylin and Eosin).

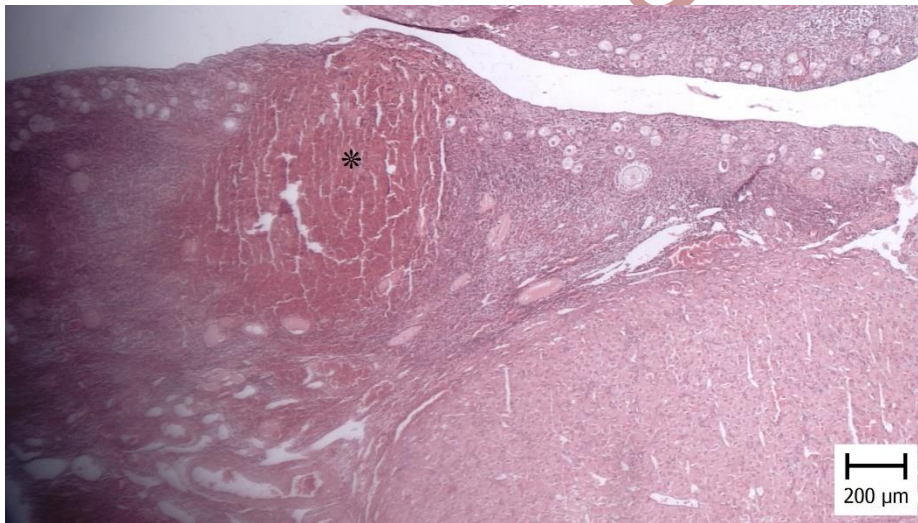


Figure 4: Hematoma in the ovary. Note to the accumulation of erythrocytes (asterisk) at the periphery of ovary (Hematoxylin and Eosin).

In another case with hemosiderosis, iron particles were observed in uterine cells. In uterine cyst and hyperemia in the ovary, hematoma was seen with the accumulation of a number of erythrocytes in the sample with severe bleeding in uterus and ovary. Microscopic evaluation in the affected sample to tumor, revealed a mass of the proliferated cells in ovarian tissue. The mentioned cells were placed together in the form of a ladder and ropes. A small amount of connective tissue and blood vessels were observed at the edge of the layer of proliferated cells. These cells had a large nucleus with one to two distinct nuclei and a small amount of cytoplasm was around them. According to the microscopic features, it was diagnosed granulosa cell tumor (Figures 5 and 6).

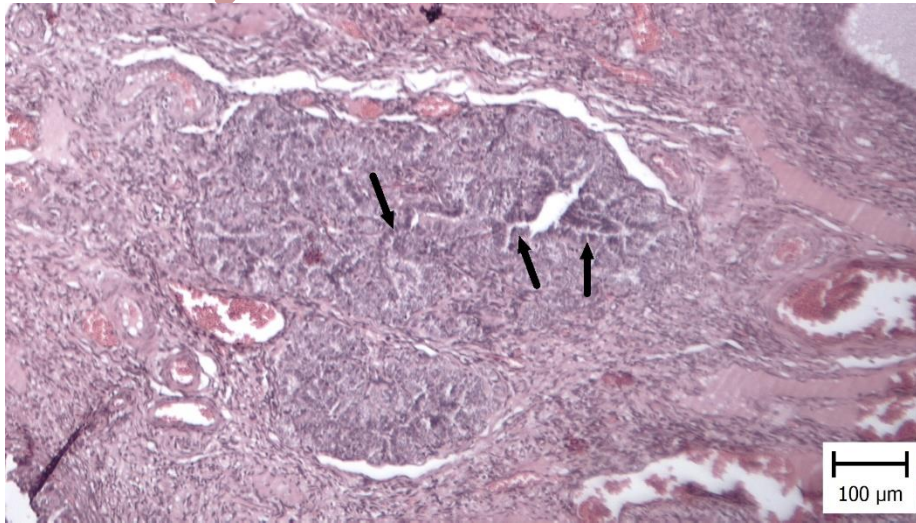


Figure 5: Granulosa cell tumor in the ovary. Note on foci of proliferated columnar cells (arrows) within the ovarian tissue (Hematoxylin and Eosin).

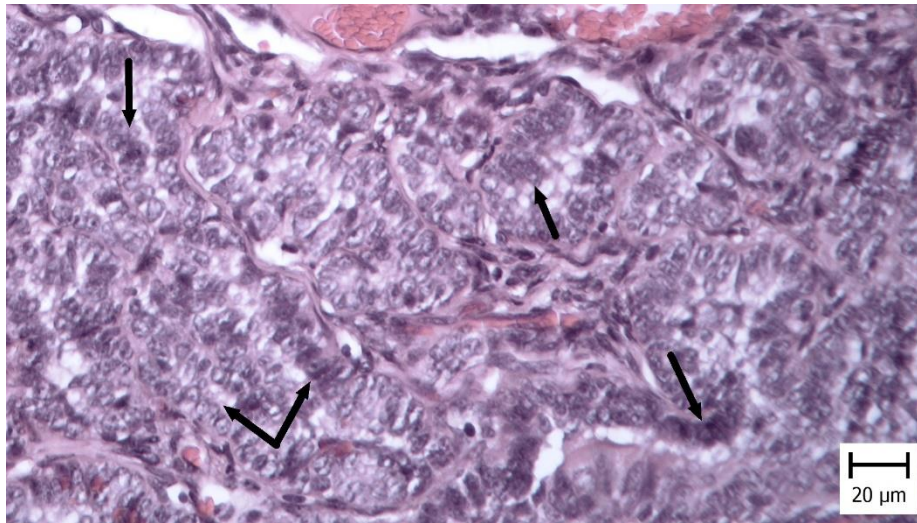


Figure 6: Granulosa cell tumor in the ovary. A higher magnification of the previous image. Note proliferating columnar with vesicular nuclei arranged in a palisading pattern (arrows) (Hematoxylin and Eosin).

Discussion

Regarding the frequency of histopathological lesions of the uterus and ovaries in cats, there is few relatively reports. By reviewing articles, most of them were as case report. In a study on a Persian cat 16-year-old that was affected to pyometra, isolated *Pasteurella multocida*. The disease was started from two years ago, with symptoms intermittent vomiting, loss of appetite and gradual expansion of the abdomen. In the clinical examination, signs such as paleness of the mucous membranes, tachycardia, tachypnea, loss of external coating status and excessive emaciation were observed in the affected cat [9]. In the present study, all fifty-four cats were clinically healthy and they had no special disease signs.

In another study, endometrial/pyometrial cystic hyperplasia was reported in sixty dogs. Eighteen cases were affected to open pyometra and three other cases had closed form. In the microscopic evaluation of the studied, it was reported hyperplasia of the cells covering the endometrial gland mucus along with numerous cysts [13]. In the present study, the affected cat with endometrial cystic hyperplasia had proliferated endometrial cells and cysts in the endometrial mucosa also, which was classified as first degree CEH (based on the Dow classification, 1962)

[12]. Pyometra was not reported in the present study. The difference between two studies can be due to the higher incidence of pyometra in dogs than cats.

CEH is not associated with any specific phase of the estrous cycle, but the diameter of the uterus is usually increased in patients with CEH [14]. According to the performed measurements in the present study and the calculation of the mean $\pm$ SD of thickness in uterus, there was no significant difference between the healthy species and suffering from CEH, which can be due to the brevity of disorder in the cat. Of course, the small number and young age of the studied samples cannot be a strong reason to reject or confirm the results of other researchers.

It was found that cystic endometrial hyperplasia is common in cats and occurs along with endometrial epithelium hyperplasia and cystic enlargement of endometrial glands. The uterus may be covered with translucent cysts. Cats with CEH usually have no clinical signs unless the disease is associated with infection. Vaginal bleeding rarely occurs as a result of torsion of the uterus and ovaries, which are polypoid in nature [14]. In the present study, the obtained evidence on fifty-four samples showed one case of the first grade CEH based on the Dow grading (1962) [12]. No cases of vaginal bleeding and uterine torsion were observed in this sample. In all samples, (except two another cases where the uterus was hyperemic), the uterus and ovaries were in normal status.

Pyometra is as the most important disease of the uterus of the cat, which often occurs after cystic endometrial disease. The incidence of CEH increases with age, possibly due to the cumulative nature of the disease. One of the definitive methods in the treatment of this disease is ovariohysterectomy. The cause of pyometra is complex and probably depends on various factors; one of these factors is the important role of hormones [15]. In the present study, the affected cat to CEH was two years and three months old, which indicates the possibility of this disease occurring at an age younger than three years.

In a case report, it was reported one the affected dog to pyometra. In this report, abdominal distension was observed due to the accumulation of purulent fluids which had led to pressure on the rectum and intestinal obstruction. In histopathological confirmation, the remaining white tissue was ovarian tissue remnants [16]. In the present study, none of the cats were referred over the next one to three months, after ovariohysterectomy. Based on the researchers' results, the relationship

between age, breed and the occurrence of pyometra was determined in cats. Siberian, Osikat, Kurat, Siamese, Ragdoll, Maine Coon and Bengal are susceptible to this disease. In a study, the average age of pyometra was four years. The mortality rate is reported 5.7% in cats which is slightly higher than in dogs (3-4%) [11]. In the present study, only uterine and ovarian involvement was observed in DSH cats, which can be due to the larger number of samples of this breed compared with other breeds.

In another study, seventy-nine female cats were examined for endometrial hyperplasia with or without pyometra. The prevalence of uterine lesions was higher in cats above five years. Reproduction and age of the first pregnancy had no significant relationship with pathological symptoms of the disease. Microscopic evidence of pyometra was observed in 71% of clinically symptomatic cats; whereas only 19% of asymptomatic cats had microscopic evidence of disease. It has been stated that with increasing age, increases the probability of disease [17]; but in the present study, the age of the affected cats was two years and three months, which indicates the risk of developing this disease at the age of less than three years.

A 12-year-old, sexually intact, female ans DSH breed was presented due to mild weight loss and recurring vaginal discharge. Data obtained during clinical examination, ultrasonography and basic blood tests suggested the presence of cystic endometrial hyperplasia with aseptic fluid accumulation in the uterine lumen. Macroscopic findings and light microscopic examination revealed complex uterine pathology, including: cystic endometrial hyperplasia in uterine horns, accumulation of mucoid fluid in lumen of uterine corpus, adenocarcinoma of the uterine corpus and leiomyoma of the uterine cervix. Additionally, immunohistochemistry of both neoplastic tissues was made [18].

The histopathological features of endometrial lesions were reviewed in six cats. In their study, one cat with papillomatous nodules and three cats with pyometra were identified. According to their results, the distribution of endometrial histopathological changes in cats was similar to humans [19]. In the present study, the affected cat to CEH showed the presence of irregularity in the proliferated endometrial cells.

Pathological alterations of the uterus and ovaries were evident in twenty-nine cats. Ovarian cysts were found in 15 cats. The incidence of CEH increased with the age of the cat. Six cats had purulent endometritis with or without distension of the uterine lumen. Hyperplastic lesions of the endometrium were detected in two cats. In one cat, a uterine horn malformation with duplication of one uterine horn lumen was diagnosed. Whereas the majority of ovarian cysts and slight-to-moderate CEH are unlikely to interfere with an animal's wellbeing, endometritis must be considered a serious health problem that requires veterinary attention. In their study, fifty percent of female cats older than 3 years of age and eighty-three percent of cats over 5 years of age showed more or less pronounced pathological alterations of the uterus or ovaries. In cats, prevalence increases with age. This may indicate a cumulative effect of repeated gonadal steroid hormone stimulation in subsequent oestrous cycles [8]. The greater diversity of pathological lesions compared with the present study is probably due to the larger number of samples (106 samples versus 54 cases).

In another survey, uterine samples that were collected from 50 cats undergoing PCR analysis revealed *Chlamydia felis* infection in 6% samples. Non-specific histopathological findings included varying degrees of edema, hyperemia, hemorrhage, inflammation, necrosis, fibrosis, cyst formation and endometrial hyperplasia, with lesions ranging from mild to severe. These results highlighted the potential role of *C. felis* in uterine pathology and underline the need for surveillance of this zoonotic agent in domestic cats [20]. The findings of the further study showed a significant level of fungal species in the reproductive systems of cats [21]. Gelberg and McEntee (1985) [22] detected hyperplastic endometrial polyps in fourteen cats. Ten out of fourteen cats showed diffuse or multifocal cystic endometrial hyperplasia. Their morphological evidence showed that endometrial polyps arise from focal areas of endometrial cystic hyperplasia. They claimed that no breed association was observed among cats. They concluded that polyps occur in adult animals. In the present study, considering the low age mean of the samples, no morphological evidence of polyps in the focal areas of cystic hyperplasia was seen in the affected cat to CEH, which can be due to the low relatively age of the affected cat.

It was conducted with the aim of investigating reproductive disorders in female cats. During sampling, twenty-eight female cats were collected with ages seven months to thirteen years. The results showed that the prevalence of ovarian neoplasms and theca granulosa cell tumor

were 35.29% and 5.88% respectively. According to the histopathological evidence in the present study, it was recorded only one cat the affected to granulosa cells tumor [23].

It was reported that one cat with signs of weakness, anorexia, vomiting, and estrous symptoms were referred with granulosa cell tumor despite ovariohysterectomy [24]. It was announced granulosa cell tumor in a Persian cat with clinical symptoms; loss of appetite, weight loss, imbalance and lethargy. It was pointed out that the Persian cat is susceptible to this tumor [25]. In the present study, the age of the affected cat to tumor was seven months and its breed was DSH which indicates the probability of occurrence of this tumor in other breeds and young ages. Also, the recent cat had no clinical signs, which can be due to the early stages of tumor development. Granulosa cell tumor was an incidental finding in the histopathology evaluation.

Granulosa cell tumors are the most common type of ovarian tumor in cats, which are malignant and can be led to metastasis [24]. In the microscopic examination of the another study by Tawfik et al., (2015) [23], uterine lesions were included congestion of blood vessels of the endometrium with several areas of bleeding and deposition of golden yellow to brown granules of tissue hemosiderosis. Uterine tumours are rare in cats and account for approximately 0.3% of all feline neoplasms, with endometrial adenocarcinoma and uterine leiomyoma being the most common tumours of the feline genital tract. Although uterine neoplasia cannot completely be ruled out, hyperplastic lesions potentially associated with hormonal stimulation are more likely [25]. In the present study, despite ovariohysterectomy at a young cat, it was not possible to make a definite diagnosis about the occurrence of metastasis. In the present sample, deposition of iron particles was also seen in uterine cells.

Ovarian hematoma is more common in mares, which can be caused by excessive bleeding in the follicular cavity after ovulation. Hematomas can be large (up to 10 cm) and resolve spontaneously, although rupture and drainage may result in death of the affected animal (3). In the present study, a large hematoma with the accumulation of a large number of erythrocytes (bleeding) was observed in the uterus and ovary. No comprehensive study has been conducted on hematoma in the ovary of cats. This article provides valuable information on the histopathological findings in the uterus and ovaries of cats undergoing ovariohysterectomy in the Ahvaz district. One of the limitations of the present study was the number of samples (fourty-four samples), which were selected from among cases referred to Ahvaz Veterinary Hospital during approximately six

months. Another limitation was the age of the cats, which suggests future surveys should include a wider age range and a larger number of samples.

Conclusion

According to the obtained results, that the affected cat to granulosa cell tumor was young, the possibility of metastasis in this type of tumor and the absence of clinical symptoms, histopathological evaluation is an important step in controlling, managing and providing appropriate diagnostic views for veterinarians. Also since no symptoms were seen in the macroscopic evaluation of the uterus and ovaries with CEH, so diagnosis of this lesion by histopathology can indicate the possibility of pyometra occurrence. More studies are needed regarding the pathogenesis of this lesion and the possibility of death. The present study showed that ovariohysterectomy in cats can play an important role in diagnosing pathological lesions of the uterus and ovaries, prevention and treatment of genital diseases.

Materials and Methods

In the present study, sampling was taken from fifty-four cat, which were referred for ovariohysterectomy. Out of fifty-four cat, 39 were domestic short hair (DSH), 13 Persian, one domestic long hair (DLH) and another one Siamese. The mean $\pm$ SE of the age of the studied cats was 10.94 $\pm$ 0.74 months (range of six months until two and a half years), and their body weight ranged from 2.1 to 4.2 kg (3.1 $\pm$ 0.45). The cats were referred to the Veterinary Hospital of Shahid Chamran University of Ahvaz or different clinics in Ahvaz city between October and February 1401.

All cats were in a healthy condition and was not recorded specific medication or underlying disease. One litter had more than one birth and three litters had a history of one birth. All four litters were DSH breeds and no history of pregnancy was recorded for other breeds. They were kept indoors, with only a few (five cats) had access to the outdoors. The ethical approval of this study was obtained from the Ethics Committee of Shahid Chamran University of Ahvaz (EE/1401.2.24.173448/scu.ac.ir).

Before performing the ovariohysterectomy, a detailed history of the studied cats were

recorded such as age, breed, number of births, status of uterine infections, administration of various drugs including corticosteroids, and clinical findings (such as the condition of the vulva and vagina, purulent discharge from the vagina), mammary tumors, lactating state, polyuria and polydipsia, as well as body covering status).

After the ovariectomy, the macroscopic evaluation of the ovary and uterus was performed for the presence and the type of secretions, macroscopic cysts, their number and sizes. Following, in order to investigate histopathology, a sample of uterine tissue was fixed in 10% buffered formalin. Then, smaller slices were prepared from the samples and placed under running water for tissue passage. The working steps were including dewatering, clarification and impregnation. The molding step was done, after these steps. For this purpose, first, special molds were prepared with a tweezer. The tissue sample was slowly placed inside the mold and melted paraffin was poured on it. Finally, the tissue was placed on ice to cool. A microtome machine was used for cutting and sections with a thickness of 2-3 microns. Prepared slides were stained with Hematoxylin and Eosin in the usual way. For dehydration, slides were placed in 80% alcohol for 10 seconds and twice in 96% alcohol in three steps. In the next step, in order to clarify of the tissues, the slides were placed in two different containers in Gezilol. Finally, the slides were mounted using Montalan glue and examined with an optical microscope. In the microscopic examination, they were evaluated for the detection of the estrus cycle. The thickness of uterine wall, endometrium and myometrium, number of mature follicles, corpus luteum and diameter of follicles were measured and then the lesions examined in the uterus and ovaries. In addition to, in all cases, they were counted using a graduated lens.

Grouping

After examining the prepared samples with a microscope based on the histological changes in the uterus (congestion and hyperemia) and ovary (follicle and corpus luteum condition), the samples were divided into four groups (proestrous, estrus, diestrus and anestrus stage).

Statistical Analysis

The current research is a descriptive analysis, and the data are expressed as percentages. The tables were drawn after calculating the Mean $\pm$ SD. The statistical analyses were performed using SPSS software, version 22 (SPSS Inc., IL, Chicago, USA).

References

1. Noakes DE, Parkinson TJ, England GCW. Infertility in the Bitch and Queen. In: Veterinary Reproduction and Obstetrics. 10th ed. Elsevier Co. Ltd; 2019. p. 593-612. DOI:10.1016/B978-0-7020-7233-8.00033-1.
2. Chatdarong K, Rungsipipat A, Axner E, Linde, FC. Hysterographic appearance and uterine histology at different stages of the reproductive cycle and after progestagen treatment in the domestic cat. *Theriogenology*. 2004;64(1):12-29. DOI: 10.1016/j.theriogenology.2004.10.018.
3. Ettinger SJ, Feldman EC. Textbook of Veterinary Internal Medicine. Diseases of the dog and cat. Vol. 2. Sixth ed. Saunders Elsevier, St. Louis, Missouri; 2017. P. 1646-90.
4. Johnston SD, Root-Kustritz MV, Olson PN. Canine and Feline Theriogenology. W.B. Saunders Company, Philadelphia; 2001. p. 389-474.
5. Misk TN, EL-sherry TM. Pyometra in Cats: Medical versus surgical treatment. *J Curr Vet Res*. 2020;2(1):82-8. DOI: 10.21608/jcivr.2020.90228.
6. Agudelo CF. Cystic Endometrial Hyperplasia – Pyometra Complex in Cats. A review. *Vet. Q*. 2005;27(4):173-83. PMID: 16402514.
7. Ortega-Pacheco A, Gutiérrez-Blanco E, Jiménez-Coello M. Common lesions in the female reproductive tract of dogs and cats. *Vet Clin North Am Small Anim Pract*. 2012;42:547-59. DOI: 10.1016/j.cvsm.2012.01.011.
8. Binder Cl, Reifinger M, Aurich J, Aurich Ch. Histopathological findings in the uteri and ovaries of clinically healthy cats presented for routine spaying. *J Feline Med Surg*. 2021;23(8):770-776. DOI: 10.1177/1098612X2097537.
9. Ashrafi Helan J, Hashemi Asal MM, Vajhi A, Shirani D, Fatahian HR, Mohit Mafi S, et al. (2002). Clinical report of a case of endometrial cystic hyperplasia/ pyometra grade III in a dog. *Iran J Vet Res*. 2002;4(1):94-101.
10. Lawler DF, Evans RH, Reimers TJ, Colby ED, Monti KL. Histopathologic features, environmental factors, and serum estrogen, progesterone, and prolactin values associated with ovarian phase and inflammatory uterine disease in cats. *Am J Vet Res*. 1991;52(10):1747-53. PMID: 1768001.
11. Hagman R, Holst BS, Moller L, Egenvall A. Incidence of pyometra in Swedish insured cats. *Theriogenology*. 2014; 82(1):114-20. DOI: 10.1016/j.theriogenology.2014.03.007.
12. Dow C. The cystic hyperplasia-pyometra complex in the bitch. *J Comp Pathol*. 1959; 74:141-7. DOI: 10.1016/s0368-1742(59)80023-0.

13. Khalaf Deris S, Mosallanejad B, Rezaei A, Razi Jalali M, Ronagh A, Gooraninejad S. Evaluation of the clinical, hematological, biochemical and histopathological finding in bitches suffering from cystic endometrial hyperplasia/pyometra. Iran Vet J. 2022;18(5):1-12.
14. Axner E. Clinical approach to conditions of the non-pregnant and neutered Queen. In: BSAVA Manual of Canine and Feline Reproduction and Neonatology, 2nd Ed, ed. England, G., & Von Heimendahl, A, British Small Animal Veterinary Association, Gloucester. 2010. P. 185-190. DOI: 10.22233/9781905319541.19.
15. dos Anjos Pires M, Vilhena H, Miranda S, Pereira MT, Seixas F, Saraiva AL. Proliferative endometrial lesions hidden behind the feline pyometra. Insights Anim Reprod. 2016; 227. DOI: 10.5772/62788.
16. Rota A, Pregel P, Cannizzo FT, Sereno A, Appino S. Unusual case of uterine stump pyometra in a cat. J Feline Med Surg. 2011; 13(6):448-50. DOI: 10.1016/j.jfms.2010.11.013.
17. Potter K, Hancock DH, Gallina AM. Clinical and pathologic features of endometrial hyperplasia, pyometra, and endometritis in cats: 79 cases (1980-1985). J Am Vet Med Assoc. 1991;198(8):1427-31. PMID: 2061164.
18. Sapierzynski RA, Dolka I, Cywinska A. Multiple pathologies of the feline uterus: a case report. Vet Med. 2009;54(7): 345-350. DOI: 10.17221/101/2009-VETMED.
19. Suzuki S, Kitamura H, Hayashi K, Nakashima T, Okamura M, Shirai K, et al. Endometrial Disease in Six Cats with Clinical and Histopathological Features Resembling Atypical Endometrial Hyperplasia in Humans. J Comp Pathol. 2021;189:45-51. DOI: 10.1016/j.jcpa.2021.09.003.
20. Khordadmehr M, Mousavi F, Nofouzi K, Laroucau K, Jigari Asl F, Zehtab Najafi M, Jarolmasjedi SH. Histopathological and Molecular Investigation of *Chlamydia felis* Infection in Cat Uterus Underwent Ovariohysterectomy Surgery. Iran J Vet Surg. 2025;20(2): 116-121. DOI: 10.30500/ivsa.2025.500762.1435.
21. Behboudi M, Asadpour R, Katiraei F, Kazemi-Darabadi S. Study of fungal species in the uterus of cats referred to the clinic for ovariohysterectomy during different estrus cycles. J Zoonotic Dis. 2025; 1-12. DOI: [10.22034/jzd.2025.20069](https://doi.org/10.22034/jzd.2025.20069).

22. Gelberg HB, McEntee K. Feline ovarian neoplasms. *Vet Pathol.* 1985;22(6):572-6. DOI: 10.1177/030098588502200610.
23. Tawfik MF, Oda SS, El-Neweshy M S, El-Manakhly ESM. Pathological Study on Female Reproductive Affections in Dogs and Cats at Alexandria Province, Egypt. *Alexander J Vet Sci.* 2015;46(1): 74-82. [https://doi: 10.5455/ajvs.187841](https://doi.org/10.5455/ajvs.187841).
24. Ucmak ZG, Ucmak M, Tek C, Koenhensi L, BAMAC OE, Gurel A. (2018). Granulosa cell tumor in a spayed young queen. *J Hellenic Vet Med Socie.* 69(2): 1010-15. DOI: Doi.org/10.12681/jhvms.18022. 2
25. Elbahi AM, Mahgiubi SA, Gaja AO. Ovarian granulosa cell tumor in a Persian cat: Case report from Tripoli, Libya. *Open Vet J.* 2022;12(4):519-24. DOI: 10.5455/OVJ.2022.v12.i4.15.

ارزیابی یافته‌های بالینی و هیستوپاتولوژی رحم و تخمدان در گربه‌های اواریهیسترکتومی شده در منطقه اهواز

بهمن مصلی‌نژاد¹، آناهیتا رضایی³، بهروز میهن دوست¹، سعد گورانی نژاد¹، شهرزاد گیتی جمال³

¹گروه علوم درمانگاهی، دانشکده دامپزشکی شهید چمران اهواز، اهواز، ایران

²گروه پاتوبیولوژی، دانشکده دامپزشکی شهید چمران اهواز، اهواز، ایران

³دانش آموخته دانشکده دامپزشکی شهید چمران اهواز، اهواز، ایران

نویسنده مسئول: دکتر بهمن مصلی نژاد

ایمیل سازمانی: bmosallanejad@scu.ac.ir

هدف از انجام مطالعه حاضر، ارزیابی یافته‌های بالینی، ضایعات هیستوپاتولوژیک رحم و تخمدان و تاکید بر اواریهیسترکتومی، در جمعیت گربه‌های اواریهیسترکتومی شده و در فاصله زمانی مهر تا اسفندماه 1401 در منطقه اهواز بود. تعداد 54 قلابه گربه، ارجاعی به بیمارستان دامپزشکی اهواز، تحت عمل اواریهیسترکتومی قرار گرفتند. میانگین $\pm$ انحراف معیار سنی گربه‌ها، $10/94 \pm 0/74$ ماه بود. در بررسی ماکروسکوپی از نمونه‌های اخذ شده، بجز سه مورد که آبستن بودند، مابقی دارای ساختار طبیعی بودند و علایم بالینی خاصی دیده نشد. نتایج هیستوپاتولوژی، نشان داد که یک قلابه مبتلا به هیپرپلازی کیستیک آندومتر، یک مورد مبتلا به تومور سلول‌های گرانولوزا، یک مورد مبتلا به کیست رحمی و خونریزی در تخمدان، یک قلابه مبتلا به پرخونی و خونریزی در پریومتر رحم و تخمدان و یک قلابه دیگر مبتلا به هموسیدروز رحم بودند. در گربه مبتلا به هیپرپلازی کیستیک آندومتر، سلول‌های آندومتر تکثیر یافته و در مخاط آندومتر، کیست‌هایی وجود داشتند؛ همچنین در داخل تخمدان چند فولیکول بزرگ و جسم زرد در حال تحلیل دیده شدند که بر اساس طبقه‌بندی داو، در دسته هیپرپلازی کیستیک درجه اول، طبقه‌بندی گردید. در ارزیابی میکروسکوپی یک از نمونه مبتلا به تومور سلول‌های گرانولوزا، توده‌ای از سلول‌های تکثیر یافته در بافت تخمدان مشاهده گردید. سلول‌های مذکور به صورت نردبانی در کنار هم قرار گرفته بودند. این سلول‌ها دارای هسته درشت با 1-2 هسته مشخص و میزان کمی سیتوپلاسم در اطراف آن‌ها بودند. مطالعه حاضر نشان داد که اواریهیسترکتومی در گربه‌ها می‌تواند نقش مهمی در تشخیص ضایعات پاتولوژیک بافت رحم و تخمدان داشته باشد؛ اهمیت تشخیص، به‌ویژه در مورد تومورها، به مراتب بیشتر است.

کلیدواژه‌ها: رحم، تخمدان، هیستوپاتولوژی، اواریهیسترکتومی، گربه، اهواز