

A pathological study of ovarian tumours in dogs

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ABSTRACT

Ovarian tumours reflect a unique and complex challenge in oncology, distinguishing themselves from other forms of abnormal cellular growth such as malformation growth, reparative growth and hyperplastic growth. While these latter processes involved cellular proliferation that is typically regulated and reversible, ovarian tumours exhibit uncontrolled, often irreversible growth with distinct biological behaviours. The present study aimed to assess occurrence and histopathology of different neoplasms of ovary of dogs in Jaipur city of Rajasthan, India. In the present study, tissue samples of genital tract from 121 female dogs were collected from different Animal Birth Control (ABC) programme and different clinics in Jaipur. Gross examinations of these samples showed 141 various lesions in different parts of genital tract out of which 15 cases of neoplasms of ovaries (15/141) with occurrence (15/141) 10.64 percent. Most commonly recorded neoplasm of ovary was granulosa cell tumour followed by cystadenoma, cystadenocarcinoma, dysgerminoma and luteoma. Histopathologically, granulosa cell tumour showed pathognomonic Call-Exner bodies consisting of a small central round, to oval space with eosinophilic follicular fluid. Cystadenoma showed papillary projections lined by single layer of cuboidal epithelium and at some places tightly packed tall columnar epithelium. Cystadenocarcinoma showed acini formation with proliferating cells having hyperchromatic and more pleomorphic nucleus and mitotic figures. Dysgerminoma showed polyhedral cells which had a moderate quantity of transparent eosinophilic cytoplasm. Luteoma showed proliferation of luteal neoplastic polyhedral cells with abundant, vacuolated cytoplasm and round nuclei forming multi lobulation. Study of canine ovarian tumours provides better understanding, diagnosis and treatment aspect of these tumours which is crucial for improving the overall health and wellbeing of canines.

Keywords: Dog, genital tract, ovary, pathology, tumours

INTRODUCTION

Dogs holds a significant position in the society by its multi fascinating roles such as guide for the disabled persons, in nursing homes and hospitals therapy to encourage patients toward recovery, sniffers or police work, in searching for drugs and explosives, locating missing people, finding crime scene evidence and to provide friendship, companionship, unconditional love and affection because of the impersonal suburban lifestyle brought on by nuclear families.

Ovarian tumours and cystic ovaries seem to be the most prevalent ovarian disorders¹. Study of canine tumours is essential to provide timely diagnosis, prognosis and treatment of neoplasms by veterinarians. Early detection and treatments are challenging since these illnesses are frequently asymptomatic until they reach severe stages². An ovarian tumour is one kind of tumour that arises from the ovary's cells multiplying uncontrollably and disorderly³. In neoplasm, cellular multiplication is limited in amount and duration by more or less clearly specifiable factors⁴. Present study will help in better understanding of canine ovarian neoplasms to provide timely diagnosis, in research to develop effective treatment strategy and to improve survival rates. Canine ovarian tumours are important because these tumours can affect a dog's health and fertility and while not common, they can be aggressive and may require prompt diagnosis and treatment. Canine ovarian tumours are classified into different types based on their origin (epithelial, germ cell, etc.) and understanding these differences is crucial for accurate diagnosis and treatment. Research into canine ovarian tumours can help improve early detection, treatment strategies and

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understanding of the disease's underlying mechanisms, ultimately benefiting dog owners and veterinarians. This research work was undertaken with the objectives to study the gross and histopathology of various ovarian tumours along with their classification and occurrence.

MATERIALS AND METHODS

In the present study, tissue samples of the genital tract from 121 female dogs (*Canis familiaris*) irrespective of age and breed were collected from different animal birth control (ABC) program

hospitals and different clinics in Jaipur from September to December, 2024. Gross examinations of these samples showed 141 lesions in different parts of the genital tract out of which 15 cases of neoplasms of ovaries with an occurrence 10.64 percent were recorded. Tissue samples were also collected from the ovario hysterectomized mass and submitted to the Department of Veterinary Pathology, Postgraduate Institute of Veterinary Education and Research, Jaipur. The samples showing frank macroscopic lesions were collected for further histopathological examination in 10 per cent neutral buffered formalin. The histopathological examination was done after processing by acetone and benzene technique^{5,6}. The tissue sections of 4-6 micron thickness were cut and further processed for routine staining by H&E method^{7,8} for histopathological examination.

RESULTS

Granulosa cell tumour

This condition was recorded in 6 (4.25 percent) cases out of total 141 samples. Grossly, the tumour had both solid and cystic areas. They were large, lobulated, ovoid or spherical and usually encapsulated (Fig. 1). Microscopically, there was proliferation in neoplastic granulosa cells of the ovary in various patterns like follicular pattern, Sertoli cell-like pattern and sheets of cells forming cystic spaces. A pathognomonic Call-

Exner bodies consisting of a small central round, to oval space with eosinophilic follicular fluid surrounded by a collar of radially arranged granulosa cells were observed (Fig. 2). The neoplastic cells were polyhedral with foamy cytoplasm and round hyperchromatic nucleus resembling normal granulosa cells with mitotic figures. Tumour cells showed papillary infoldings simulating papillary cystadenocarcinoma.

Cystadenoma

This condition was found in 4 (2.84 percent) cases out of 141 samples. Grossly, cauliflower-like masses and several thin-walled cysts containing clear, watery fluid in ovaries were observed. Ovarian surface showed the presence of dark reddish areas. Microscopically, cyst wall consisted of variably sized fibrovascular papillary projections producing a labyrinth of slit like space. Papillary projections lined by a single layer of cuboidal epithelium and in some places, by tightly packed tall columnar epithelium were recorded. The ovarian tissue consisted of tumour cells with acini formation (Fig. 3). The stroma was sparse and composed of a vascular framework. The section showed the presence of severe congestion too. Tumour cells exhibited hyperchromatic nuclei.

Cystadenocarcinoma

This condition was recorded in 2 (1.42 percent) cases out of 141 samples. Grossly, it had a cauliflower-like

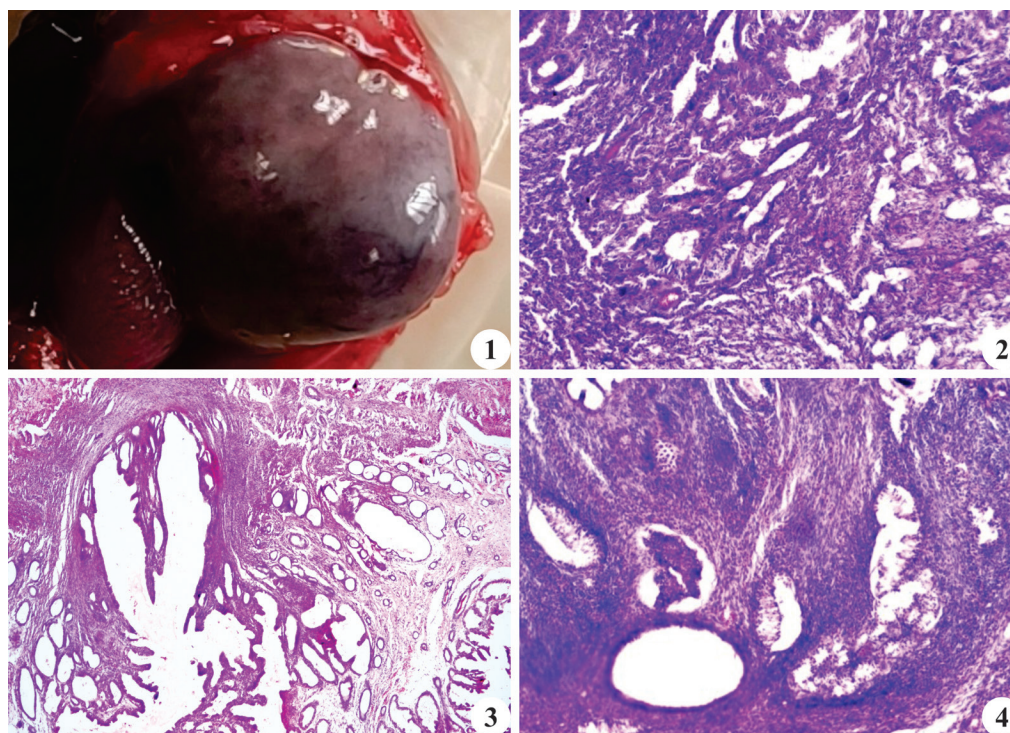


Fig. 1. Gross photograph of ovary having granulosa cell tumour; **Fig. 2.** Microphotograph of section of ovary having granulosa cell tumour showing neoplastic granulosa cells forming Call Exner bodies with eosinophilic follicular fluid (H&E 100X); **Fig. 3.** Section of ovary having cystadenoma showing papillary projections with cystic spaces (H&E 40X); **Fig. 4.** Microphotograph of cystadenocarcinoma of ovary showing multibranched papillary projections in cystic lumen proliferating cells replacing ovarian tissue (H&E 100X).

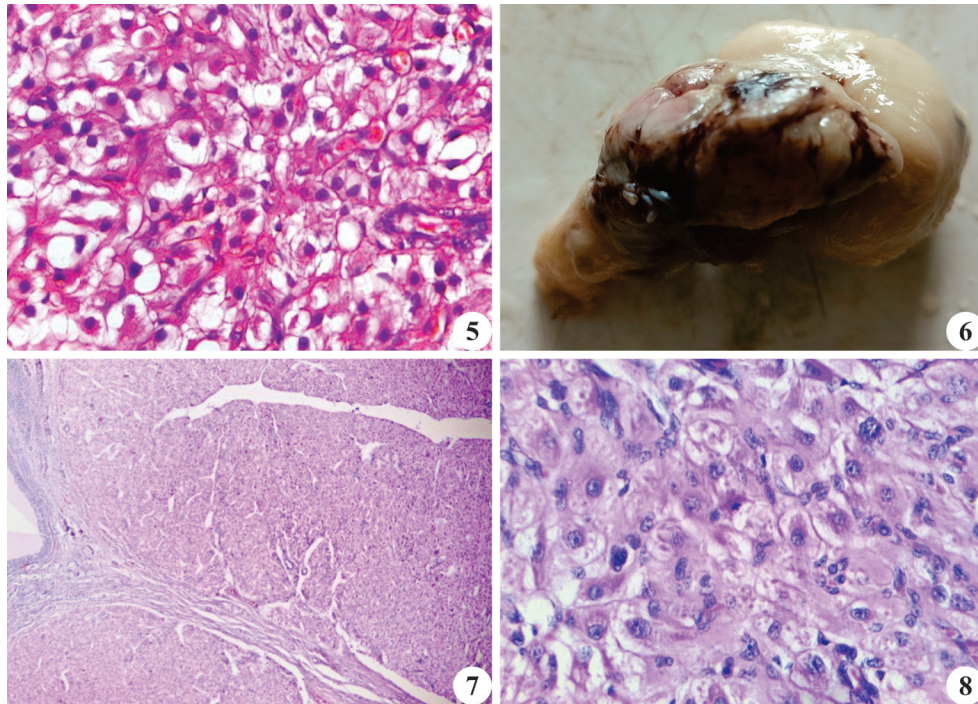


Fig. 5. Microphotograph of ovary having dysgerminoma showing polyhedral cells with markedly vacuolar cytoplasm (H&E 400X); **Fig. 6.** Gross photograph of ovary having luteoma; **Fig. 7.** Microphotograph of ovary having luteoma showing lobules of large polyhedral luteal cells (H&E 40X); **Fig. 8.** Microphotograph of ovary having luteoma showing delineated border of neoplastic luteal cells with hyperchromatic nuclei (H&E 400X).

appearance, with transparent fluid and dark haemorrhagic patches. Microscopically, long multibranching papillary projections were present in cystic lumen. At some places, the cystic lumen tightly filled with proliferating papillae. A shaggy, spongy mass of tumour tissue had largely replaced the ovarian tissue. The stroma was infiltrated by neutrophils, macrophages and plasma cells. Larger portion of the tumour consisted of sheets of tumour cells with acini formation. The tumour tissue showed hyperchromatic and more pleomorphic nucleus with mitotic figures in some places (Fig. 4). Congestion in thin-walled newly formed blood vessels was present.

Dysgerminoma

This condition was found in 2 (1.42 percent) cases out of 141 samples. Grossly, ovary had lobulations and uneven surfaces. Microscopic findings revealed a non-encapsulated, ill-defined neoformation consisting of lobules separated by strands of connective tissue. Polyhedral cells had a moderate quantity of transparent eosinophilic cytoplasm, with some cells having a markedly vacuolar cytoplasm (Fig. 5). Such cells revealed an eosinophilic cytoplasm, a high nucleus to cytoplasm ratio, a central big nucleus, sometimes multiples, with pronounced anisokaryosis and mild pleomorphism, granular chromatin and one or more conspicuous nucleoli.

Luteoma

This condition was found in 1 (0.71%) case out of 141 samples. Grossly, a nodular structure, a neoplastic mass was present on the surface of the ovary (Fig. 6). Microscopically, proliferation of luteal neoplastic polyhedral cells was observed along with abundant, vacuolated cytoplasm and round nuclei forming multilobulations. The tumour lobules were separated by the well-vascularized connective tissue stroma. The ovary was full of tumour cells obliteration and compression on cortex remaining in thin layer (Fig. 7 & 8).

DISCUSSION

In this study, the frequencies of histopathological findings in ovarian neoplasms obtained from ABC program hospitals and different clinics undergoing elective OHE were examined. Granulosa cell tumour, cystadenoma, cystadenocarcinoma, dysgerminoma and luteoma were recorded in 4.25%, 2.84%, 1.42%, 1.42% and 0.71% of cases respectively.

Granulosa cell tumour (GCT) was recorded in 6 (4.25 percent) cases out of 141 samples and almost similar incidence was recorded as 5.88 percent⁹. Much higher incidence was reported as 18.75 percent¹⁰. Presence of large, lobulated, ovoid or spherical and usually encapsulated masses in close approximation was recorded as salient gross findings^{11,13}. A pathognomonic Call-Exner bodies consisting of a small central round, to

oval space with eosinophilic follicular fluid surrounded by a collar of radially arranged granulosa cells were observed^{12,14,15}. There was presence of polyhedral neoplastic cells with foamy cytoplasm and round hyperchromatic nucleus resemble normal granulosa cells with mitotic figures^{4,10,13,16}. Granulosa cell tumours are the most frequently diagnosed ovarian tumour in bitches, representing up to 50% of tumour in female dogs and arise from the granulosa cells in the tertiary follicles¹⁷.

Cystadenoma was found in 4 (2.84 percent) cases but a much higher incidence was recorded as 29.41 percent in dogs in Alexandria, Egypt⁹ and 9.37 percent in dogs in Rajasthan¹⁰ respectively. Microscopically, cyst wall consists of variably sized fibrovascular papillary projections, lined by single layer of cuboidal epithelium producing a labyrinth of slit like space. The ovarian tissue consisted of tumour cells with acini formation^{9,10,18}.

Cystadenocarcinoma was recorded in 2 (1.42 percent) cases. Almost similar incidence was recorded as 1.10 percent¹⁹. Higher incidence was reported as 6.25 percent in dogs in Rajasthan during study undertaken in 2004¹⁰. Microscopically, the cystic lumen showed long multi-branching papillary projections and ovarian tissue was replaced by a shaggy, spongy mass of tumour tissue. The tumour tissue showed hyperchromatic and more pleomorphic nuclei with mitotic figures at some places^{10,19,20}.

Dysgerminoma was found in 2 (1.42 percent) cases. Higher incidence was recorded as 6-12 percent²¹. Gross findings of lobulations on the ovary and an uneven surface were recorded in this study conducted at Jaipur in the 2024-25²². Microscopic findings recorded in dysgerminoma were ill-defined neof ormation consisting of lobules separated by strands of connective tissue²². Polyhedral cells revealed an eosinophilic vacuolar cytoplasm, a high nucleus to cytoplasm ratio, a central big nucleus, sometimes multiples, with pronounced anisokaryosis and mild pleomorphism, granular chromatin and one or more conspicuous nucleoli^{4,14,22,23}.

Luteoma was found in 1 (0.71%) case^{24,26}. Microscopically, proliferation of luteal neoplastic polyhedral cells with abundant, vacuolated cytoplasm and round nuclei forming multi lobulation were described in present study. The ovary was full of tumour cells obliteration and compression on cortex remaining in thin layer. The tumour lobules separated by the well vascularized connective tissue stroma^{24,25,26,27}.

CONCLUSION

The present study provides valuable insight into the occurrence and histopathological characteristics of ovarian tumours and also as an important reproductive pathology in bitches. Through gross and histopathological

examination, various types of ovarian neoplasms were identified, with granulosa cell tumours and cystadenomas being the most common whereas luteoma as the rare tumour. Histopathological examination is an inexpensive and efficient method for diagnosing ovarian tumours in dogs. The findings revealed that ovarian tumours, although relatively infrequent, often remaining asymptomatic until advanced stages. Histopathology proved essential for definitive diagnosis, allowing differentiation between different type of neoplasms and identifying associated degenerative or proliferative changes. These results underscore the importance of routine reproductive examination and histopathological evaluation in suspected cases to aid early diagnosis and appropriate clinical management. To enhance diagnostic accuracy and better understand tumour origin, behaviour and differentiation, further studies incorporating immunohistochemical (IHC) markers are strongly recommended.

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