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(Case Report)

Bilateral Dysgerminoma in an 8-Month-Old Intact Female Mixed-Breed Dog

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Abstract

Background: Dysgerminoma is a rare malignant ovarian germ cell tumor in dogs, typically affecting intact bitches between 2 and 15 years of age, with bilateral presentation in young dogs being exceptionally uncommon. It represents a notable proportion of all canine ovarian tumors and carries a documented potential risk of metastasis. Clinically affected dogs present with signs of hyperestrogenism and abdominal distention, accompanied by non-specific signs such as lethargy and anorexia. Histopathology remains the definitive diagnostic tool, and ovariohysterectomy is the treatment of choice for preventing recurrence. This report describes a rare case of bilateral dysgerminoma in an 8-month-old intact female mixed-breed dog. **Methods:** The patient was presented to the veterinary hospital for an elective ovariohysterectomy. The client reported bloody vaginal discharge lasting 2-3 weeks and a swollen vulva since the onset of its first estrus prior to presentation. These were evident during the veterinarian's physical examination of the patient. A complete blood count was performed which showed lymphocytosis, leukocytosis, and thrombocytopenia. Intra-operatively, both ovaries displayed solid, whitish to gray lobulated mass measuring 0.5-1 cm in diameter. **Results:** Histopathological examination of the excised ovaries revealed sheets and nests of pleomorphic polygonal cells round to polygonal cells separated by delicate fibrovascular septa containing scattered lymphocytes and occasional epithelioid histiocytes. Immunohistochemistry confirmed dysgerminoma with widely diffuse cytoplasmic and membranous CD117 staining. **Conclusion:** Complete surgical excision via ovariohysterectomy resulted in a favorable prognosis. At three-month follow-up, the dog remained bright, alert, and responsive with no clinical abnormalities as reported by the client. This case underscores the importance of early surgical intervention and thorough histopathological evaluation in achieving accurate diagnosis and successful management of ovarian dysgerminoma in young dogs.

Keywords

CD117, Dysgerminoma, Immunohistochemistry, Ovarian neoplasm, Ovariohysterectomy

1. Introduction

Ovarian tumors in dogs are rare, accounting for 0.5-1.2% of all canine neoplasms [1,2]. Ovarian tumors can be classified based on their cell origin including germ cell, sex cord-stromal cells, and epithelial cells [3]. Among these, germ cell tumors, specifically dysgerminoma, originate from the undifferentiated germ cells in the ovary, and it is analogous to seminomas in males [4,5,6]. Dysgerminoma is considered a rare malignant tumor that accounts for 6-12% of canine ovarian neoplasm and typically occurs in intact bitch at 2 to 15 years of age with no known breed

predilection. Dysgerminomas are usually unilateral and hormonally inactive [7]. Affected dogs can be asymptomatic, although clinical signs such as persistent estrus, vulvar swelling and abnormal vaginal discharge can occur due to hormonal imbalances, particularly when the neoplasm involves sex cord-stromal cells that contribute to hyperestrogenism [6,8]. Surgical sterilization by ovariohysterectomy is one of the most effective treatments for this disease [9]. This report describes a clinical case of bilateral dysgerminoma in an 8-month-old intact female mixed-breed dog. The clinical signs, surgical procedure, histopathological and immunohisto chemical findings are presented. This case contributes to the limited literature on canine ovarian dysgerminomas particularly with bilateral presentation in a young dog.

2. Case Presentation

An 8-month-old intact female mixed-breed dog was brought to a veterinary teaching hospital on 23 January 2025 for a scheduled routine ovariohysterectomy (OHE). The dog has no updated vaccinations such as rabies vaccine and Distemper, Hepatitis, Leptospirosis, Parvovirus, and Parainfluenza (DHLPPi) vaccine. Deworming was last given four months before presentation and had not been updated. The dog had regular access outdoors with one female dog. The dog was fed commercial dry and wet dog food supplemented with rice and chicken meat. As described by the client, the dog had a good appetite and water intake, as well as normal stool and urine output. The client observed that the dog was in estrus in the first week of December with signs of bloody vaginal discharge which lasted for 2-3 weeks and a persistent swollen vulva that remained at presentation. On physical examination, the dog showed normal mucous membranes, an ideal body condition score of 4/9, normal rectal temperature of 39.1℃ [N = 37.5-39.2 ℃], heart rate of 116 beats per minute (bpm) [N = 70-120 bpm] and a mildly elevated respiratory rate of 44 breaths per minute [N = 18-34 breaths/min].

A complete blood count and direct fecal smear (DFS) were performed on 23 January 2025. The test results (Table 1) showed thrombocytopenia, leukocytosis, and lymphocytosis. The DFS was negative for ova and parasites.

Table 1. Hematological profile of the 8-month-old intact female mixed-breed dog presented with persistent swollen vulva and bloody vaginal discharge on 23 January 2025.

Parameter	Patient's Result	Normal Reference [*]
Total White Blood Cells (cells/μL)	14,300.00	5,000-14,100
Segmented neutrophils (%), abs	(61) 8,723.00	(58-85) 2,900-12,000
Lymphocytes (%), abs	(35) 5,005.00	(8-21) 400-2,900
Eosinophils (%), abs	(4) 572.00	(0-9) 0-1,300
Red blood cells ($\times 10^6$ cells/μL)	7.02	4.95-7.87
Hemoglobin (g/dL)	15.40	11.9-18.9
Packed cell volume (%)	42.80	35-57
Platelet ($\times 10^3$ cells/μL)	107.00	211-621

3. Surgery

3.1. Pre-Operative Management

Prior to the surgery, food and water were withheld from the dog for seven and six hours, respectively. The dog received pre-anesthetic medication with atropine sulfate (0.04 mg/kg) subcutaneously, followed 10 minutes later by xylazine (1 mg/kg) intramuscularly. Atropine sulfate is classified as an anticholinergic drug that prevents secretion in the respiratory tract, while xylazine is an alpha-2 adrenergic agonist and is classified as a sedative or analgesic with muscle relaxant properties. Anesthesia was induced intravenously using tiletamine-zolazepam (Zoletil®) at a dose of 2.5 mg/kg. After endotracheal intubation, the anesthesia was maintained with isoflurane at 2.5% (Table 2). Additionally, a lactated Ringer's solution was used for fluid therapy. It is an isotonic crystalloid that contains calcium, sodium, chloride, potassium, and lactate which is commonly used in conditions involving blood loss. A drop rate of 1 drop/ 5 seconds was used to maintain the fluid therapy throughout the surgery. The heart rate,

Table 2. Pre-operative drugs for the 8-month-old intact female mixed-breed dog. Preanesthetic and anesthetic drugs with dose and route before the ovariohysterectomy procedure.

Drug	Dose	Route
Atropine	0.04 mg/kg	Subcutaneous
Xylazine	1.00 mg/kg	Intramuscular
Tiletamine-zolazepam	2.50 mg/kg	Intravenous
Isoflurane	2.5%	Inhalation

respiratory rate, and palpebral reflexes were monitored every three minutes throughout the procedure. However, parameters that depend on a patient monitor could not be evaluated due to the absence of equipment in the facility.

The surgical site of the patient was clipped from the xiphoid to the pubis to reduce contamination during the surgery. The patient was placed in a dorsal recumbency, and the surgical site was aseptically prepared with three rounds of 10% povidone-iodine and 70% ethyl alcohol applied in a circular motion.

The standard protocol for ovariohysterectomy was followed based on Fossum [11], with some modifications in the ligation technique. A 2.5-centimeter incision was made just caudal to the umbilicus through the skin and subcutaneous tissue to expose the linea alba using a size 10 scalpel blade. A stab incision was made into the abdominal cavity while the linea alba was elevated using Adson forceps. The uterine horns were located by sliding the pointer finger and were gently elevated from the abdomen. Once the ovary was located, the suspensory ligament was torn to exteriorize it. Two modified Miller's knot ligatures were placed around the ovarian pedicle using a 2-0 polyglactin absorbable suture material to facilitate ligation and hemostasis. Two mosquito hemostatic forceps were then placed on the pedicle between the ovary and the ligatures, and the pedicle was transected between the forceps and the ligatures. The site was checked for hemostasis before the pedicle was gently returned into the abdominal cavity. The same procedure was applied to the other ovary. Both the left and right ovaries had a solid, whitish to gray, lobulated mass measuring 0.5-1 cm in diameter, which was evident after the excision (Fig. 1A-B).

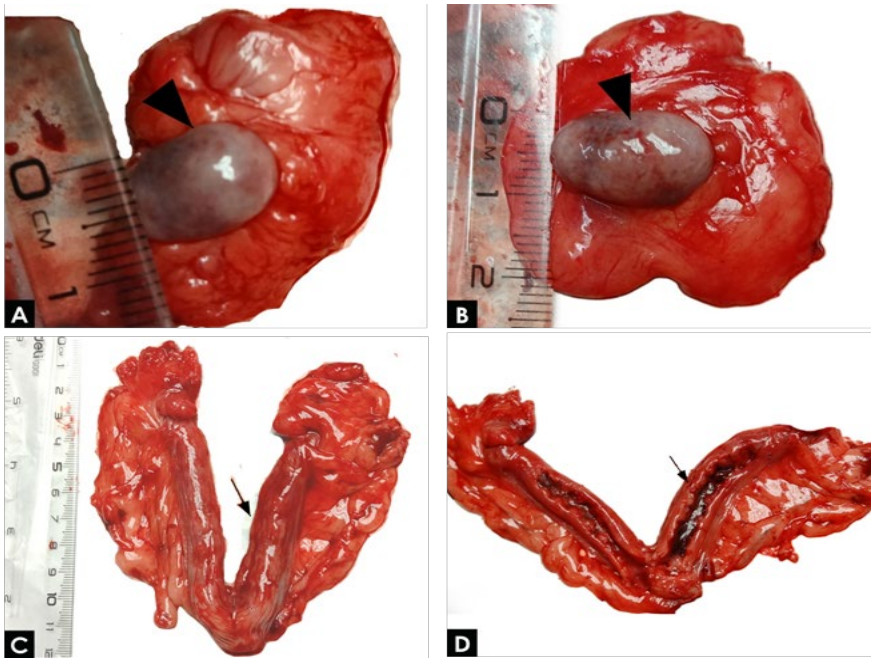


Figure 1. Ovariohysterectomy in an 8-month-old intact female mixed-breed dog. (A) Excised left ovary showing a solid, whitish to gray, lobulated mass (black arrowhead). (B) Excised right ovary showing a solid, whitish to gray, lobulated mass (black arrowhead). (C) Uterine horn showing jagged or curly appearance measuring around 1.5 cm in diameter. (D) Incised uterus showing the lumen, with thickened and hyperemic areas (black arrows).

The uterine body was located by tracing along the uterine horns, which displayed a jagged, curly appearance and measured approximately 1.5 cm in diameter (Fig. 1C). Two modified Miller's knot ligatures were placed on the uterine body using 2-0 polyglactin absorbable suture. Two mosquito hemostatic forceps were then placed distal to the ligatures, and the uterine body was transected between the forceps and the ligatures. A Cushing suture was placed at the cut edge of the uterine stump, which was then gently returned into the abdominal cavity. The abdominal wall in the fascia was closed using a 3-0 absorbable polyglactin suture in a simple interrupted suture pattern. The subcutaneous tissue was closed in a simple continuous pattern with a quilting technique and anchored with an Aberdeen knot. The skin was then closed with 3-0 absorbable polyglactin suture in an intradermal pattern, also anchored with an Aberdeen knot to bury the suture. Afterwards, the surgical site was cleansed using a wound cleanser. Additionally, the incised uterus revealed thickened and hyperemic areas within the lumen (Fig. 1D). The tissue samples from both ovaries were placed in a container filled with a fixative reagent of 10% neutral buffered formalin and sent for tissue processing for histopathology and immunohistochemistry.

3.2. Post-Operative Management

Routine post-operative medications were administered and prescribed (Table 3). Tolfenamic acid and tramadol were administered for post-operative pain and anti-inflammatory care. Meloxicam and co-amoxiclav were both prescribed for administration at home for pain management and antibiotic prophylaxis, respectively.

4. Histopathology and Immunohistochemistry Findings

Sections from the solid, whitish to gray lobulated mass in both ovaries were paraffin-embedded and processed for routine staining with hematoxylin and eosin (H&E). Microscopically, the ovarian architecture is effaced by an unencapsulated, moderately well-demarcated to focally infiltrative neoplasm composed of sheets and nests of pleomorphic round to polygonal cells separated by delicate fibrovascular septa containing scattered lymphocytes and occasional epithelioid histiocytes (Fig. 2A). The neoplastic cells have moderate amphophilic to variably vacuolated cytoplasm, round euchromatic nuclei with prominent nucleoli, and mild to moderate anisocytosis and anisokaryosis (Fig. 2B). Mitotic figures average 8-10 per 10 high-power fields. Multifocal necrosis and hemorrhage are present. The tumor exhibits predominantly expansile growth with focal capsular and vascular invasion.

To support the microscopic findings, an immunohistochemistry (IHC) protocol using antibody marker CD117 was done. Immunohistochemistry was performed on formalin-fixed paraffin embedded sections using an automated staining system (VENTANA Medical Systems, Tucson, AZ, USA). Sections were incubated with primary antibodies against c-KIT (CD117; clone YR145, dilution 1:100), octamer-binding transcription factor 3/4 (OCT3/4; clone C-10, dilution 1:50), and placental alkaline phosphatase (PLAP; clone 8A9, dilution 1:100) to support germ cell differentiation. Antigen retrieval was conducted using heat-induced epitope retrieval (HIER) with Cell Conditioning Solution 1 (CC1, Tris EDTA buffer, pH 8) for 32-64 minutes according to the manufacturer's recommendations. Detection was performed using the VENTANA OptiView DAB IHC Detection Kit with diaminobenzidine (DAB) as the chromogen and hematoxylin as the counterstain. The positive control consisted of a previously confirmed CD117-positive tissue, and the negative control was prepared by omitting the primary antibody. Immunoreactivity was interpreted as positive when ≥10% of neoplastic cells exhibited moderate to strong membranous and/or cytoplasmic staining.

Table 3. Post-operative drugs for the 8-month-old intact female mixed-breed dog. Administered drugs with dose and route after the surgery procedure.

Drug	Dose	Route
Tolfenamic acid	4.00 mg/kg	Intramuscular
Tramadol	2.00 mg/kg	Intramuscular
Meloxicam	0.10 mg/kg, SID	Per Orem
Co-amoxiclav	13.75 mg/kg, BID	Per Orem

In humans, CD117 immunoreactivity has been reported in approximately 87% of ovarian dysgerminomas [12], though c-kit expression in canine dysgerminomas appears more variable [7]. In this case, the ovarian sections showed diffuse cytoplasmic and membrane staining with CD117 (Fig. 2C), which was consistent with the staining pattern of the reference CD117-positive slide (Fig. 2D).

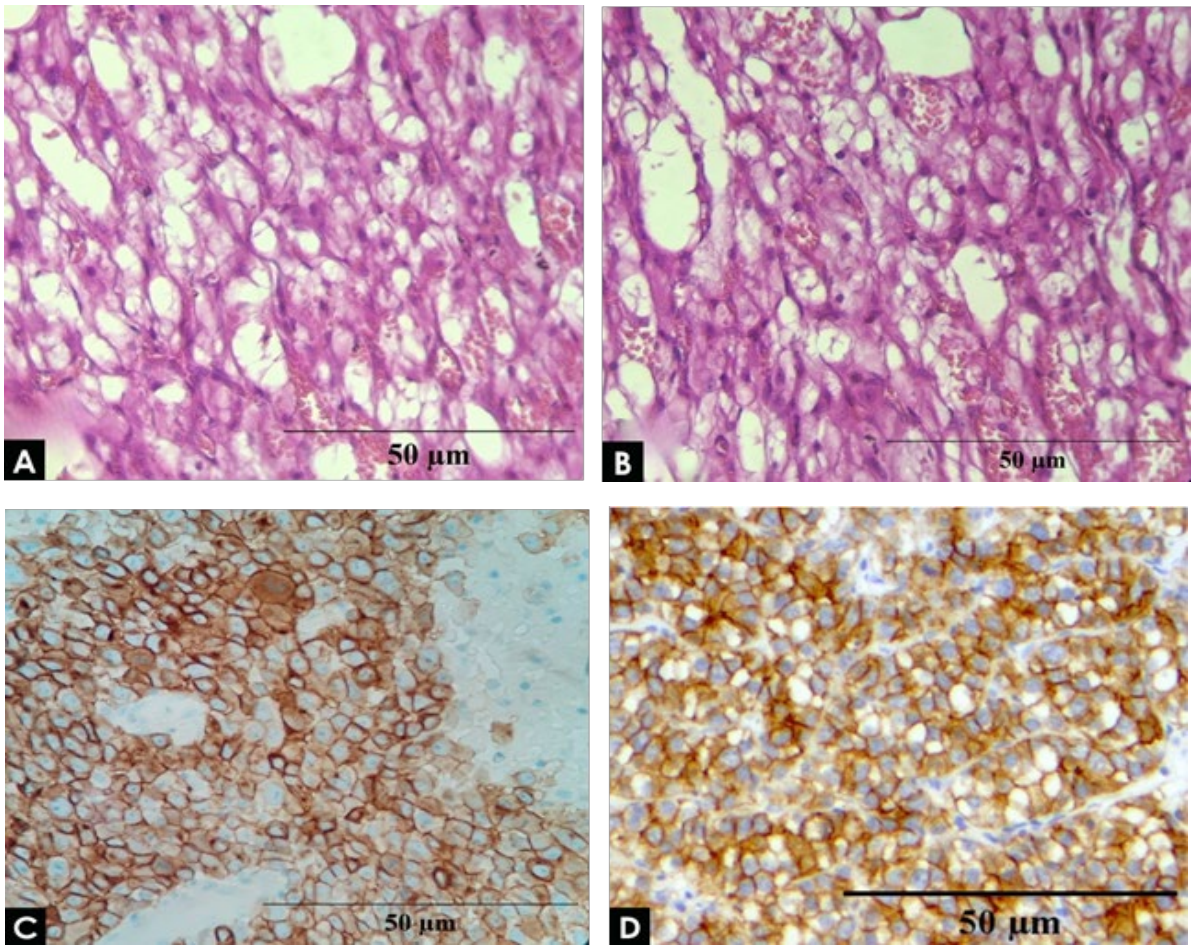


Figure 2. Histopathology and immunohistochemistry of the ovary obtained from an 8-month-old intact female mixed-breed dog. (A) The neoplastic cells are supported by fibrous septa sometimes admixed with epithelioid histiocytes. H&E stain (scale bar=50 µm). (B) Sheets of pleomorphic round cells with amphophilic, sometimes vacuolated cytoplasm and distinct cell membranes. H&E stain (scale bar=50 µm). (C) IHC for CD117 (diaminobenzidine chromogen, hematoxylin counterstain) showing widely diffuse, strong cytoplasmic and membrane staining (scale bar= 50 µm). (D) Reference CD117-positive tissue (IHC) showing cytoplasmic and membranous staining (scale bar= 50 µm). Abbreviations: H&E: hematoxylin and eosin; IHC: immunohistochemistry.

5. Discussion

Dysgerminoma typically occurs unilaterally with rare bilateral involvement [7,13,14]. In most cases, the neoplasm is confined to the ovary, remains asymptomatic for extended periods, and can be discovered incidentally during ovariohysterectomy, as in this case [2,5,13,14]. The tumor grows by expansion and may cause several complications in patients such as torsion, hemorrhage, rupture, and metastasis. The metastatic rate is 10-30%, with lymphatic spread as the earliest pathway, beginning at the common iliac nodes and progressing to the para-aortic nodes and mediastinal nodes. Visceral spread to the liver, kidney, omentum, pancreas, adrenal glands, lungs, and bones occur at a later stage [5,14]. The etiology of dysgerminoma remains unclear, but in humans, mutations in the c-KIT gene have been identified in more than one-third of dysgerminomas and are associated with

advanced tumor stage. Most mutations occur in unilateral tumors, which suggests that the mutation arises after primordial germ cells migrate to the gonads. Conversely, a mutation that occurs before migration may result in a risk for bilateral tumors. Activating mutations in the c-KIT gene result in receptor activation regardless of ligand binding. Mutations in early oogonia may stimulate their proliferation and delay meiotic entry, thus increasing the pool of immature germ cells and leading to dysgerminoma formation [15,16,17].

This report describes an 8-month-old intact female mixed-breed dog with bilateral dysgerminoma, which, to our knowledge, is a rare presentation of this tumor. The tumor was incidentally discovered during an elective ovariohysterectomy at a veterinary teaching hospital. Although the patient did not show systemic illness such as abdominal distention, ascites, or effusion, the history given by the client revealed that there were prolonged estrus and persistent vulvar swelling. The dog's first estrus began in the first week of December 2024, with bloody vaginal discharge that lasted for 2-3 weeks and persistent vulvar swelling that remained until the initial presentation. Although dysgerminomas do not typically produce hormones, the persistent estrus in this case suggests an ovarian dysfunction and a hormonal imbalance due to endogenous estrogen production as described with ovarian tumors arising from sex cord-stromal cells [8].

Prior to surgery, laboratory examinations were performed. The DFS is part of the routine practice for all patients with either no history of deworming or, as in this case, deworming was performed four months prior to presentation. In this case, it revealed no ova or parasites. The complete blood count showed lymphocytosis, leukocytosis, and thrombocytopenia, which may indicate the presence of a neoplastic process. These hematological changes suggest a possible paraneoplastic nature of the disease that causes reproductive system dysfunction of the patient. Lymphocytosis may reflect a reactive immune response to the neoplasm, consistent with lymphocytic infiltration observed histopathologically within the fibrovascular stroma. Thrombocytopenia may be attributed to platelet consumption secondary to intratumoral hemorrhage and necrosis or to immune-mediated mechanisms, which are recognized paraneoplastic phenomena in canine ovarian neoplasia [2,18], or to estrogen-associated bone marrow suppression, as described in dogs with estrogen-producing tumors [19]. It may similarly result from subclinical disseminated intravascular coagulation associated with neoplasia or uterine pathology, or from platelet sequestration secondary to splenomegaly, which was not assessed in this patient [10]. The observed lymphocytosis and thrombocytopenia, while suggestive of a paraneoplastic process, may also be attributed to other concurrent conditions relevant to this patient's history. Physiologic lymphocytosis is secondary to epinephrine release from the stress of hospital presentation is common in young dogs [20]. Estrus-associated hormonal fluctuations in progesterone and estrogen may also transiently alter lymphocyte counts [10]. Possible endometrial inflammation, suggested by the thickened and hyperemic uterus noted intraoperatively, may have further contributed to reactive lymphocytosis [21]. Additionally, vector-borne diseases such as *Ehrlichia canis* and *Anaplasma platys* —relevant given the patient's outdoor exposure, incomplete vaccination, and lapsed deworming history —are well-recognized causes thrombocytopenia in dogs [22]. Vector-borne disease serology and a full biochemistry panel would have been valuable in evaluating organ health (kidney and liver function), metabolic status, and fluid balance, as well as in excluding these differentials. However, these tests were not performed due to financial constraints, which is acknowledged as a limitation of this case.

During surgery, the left and right ovaries each contained a solid, whitish to gray, lobulated mass, measuring 0.5-1 cm in diameter. The findings were consistent with the reported macroscopic features of dysgerminoma, which are commonly solid, well encapsulated, and grayish to whitish in appearance [13]. However, the masses in this case were much smaller than the 5-15 cm reported for dysgerminomas in humans [14]. Moreover, the uterus was observed to be hyperemic, jagged, and enlarged which can indicate that the patient is in estrus during surgery. Notably, the mass in this case was smaller than the typical range of reported dysgerminoma cases in dogs. Despite their small size, identified masses were distinct from the normal parenchyma. This suggests that gross recognizability and clinical relevance of dysgerminoma are not strictly size-dependent.

Thus, minute lesions warrant a histopathological evaluation.

Histopathological examination of sections from both ovaries showed a poorly circumscribed neoplasm composed of sheets of neoplastic cells supported by fibrous septa sometimes admixed with epithelioid histiocytes. The neoplastic cells are round to polygonal with round euchromatic nuclei, single prominent nucleoli, and moderate amounts of amphophilic, sometimes vacuolated cytoplasm. The cell membranes are distinct and there is moderate anisocytosis and anisokaryosis. These histological characteristics are consistent with the features of dysgerminoma in the literature [1,6,23].

The IHC slide of the ovaries was positive for CD117 (c-KIT), confirming the histopathological diagnosis of dysgerminoma (Fig. 2C). The positive IHC section of the ovaries demonstrated diffuse cytoplasmic and membrane staining, a classic feature of dysgerminoma [7,12,24]. The proto-oncogene c-kit encodes CD117, a transmembrane receptor tyrosine kinase expressed in the primordial germ cells (PGC). During fetal development, it has a crucial role in the migration, proliferation, and survival of PGC. Its expression is maintained in the mast cells, germ cells, and hematopoietic stem cells. Although dysgerminoma may express immunohistochemical markers such OCT3/4, Sal-like protein (SALL4), and PLAP, CD117 is commonly expressed in canine dysgerminomas and may therefore serve as useful immunohistochemical marker for the diagnosis [25].

Dysgerminomas must be differentiated from other ovarian tumors such as gonadoblastoma, ovarian teratoma, granulosa-theca cell tumor, and ovarian adenocarcinoma through histopathology and immunohistochemistry. Among these, gonadoblastoma is immunoreactive for CD117; however, its microscopic features differ from those of the patient's ovaries. Dysgerminomas arise from primitive germ cells and are characterized by solid sheets of large, uniform polyhedral cells often partitioned by fibrovascular stroma containing lymphocytic infiltrates. These tumors are uniquely identified by the expression of c-kit (CD117), SALL4, and OCT3/4 [12,14,15,24]. In contrast, gonadoblastomas are mixed tumors composed of both germ cells and sex cord-stromal elements. Histologically, they present as nests of cells with characteristic hyaline bodies, requiring a dual IHC approach to identify both cellular components [1]. Ovarian teratomas, which also originate from germ cells, are defined by their disorganized differentiation into tissues from multiple embryonic germ layers, such as bone, hair, or neural tissue [26]. Meanwhile, granulosa-theca cell tumors belong to the sex cord-stromal category, which is the most common, and are histologically identified by features such as Call-Exner bodies and grooved nuclei. They typically stain positive for inhibin-alpha and calretinin but remain negative for germ cell markers such as c-kit. Finally, ovarian adenocarcinomas originate from the surface epithelium and are characterized by invasive papillary or tubular structures that express cytokeratin but lack the specific markers associated with germ cell or sex cord-stromal tumors [1,2,9,13,25,27]. In this case, dysgerminoma was established as the definitive diagnosis based on the characteristic histopathological features of the ovarian tumors and supported by CD117 immunoreactivity on IHC.

Diagnosis of dysgerminoma relies on a combination of clinical examination, complete blood count, exploratory laparotomy, ultrasonography, radiography, and histopathology [28]. Clinical findings include a palpable abdominal mass, bloody vaginal discharge, emesis, weight loss, and signs of persistent estrus [29]. A complete blood count in dogs with ovarian tumors can help estimate tumor progression, and exploratory laparotomy allows examination of the surrounding organs for possible metastases [2]. Ultrasonography findings are generally nonspecific, but the technique is widely available and inexpensive, localizes lesions, and evaluates the internal structure of the organs [30]. Certain neoplastic patterns have been observed in several studies of patients with dysgerminoma, which is often described as a well-differentiated, heterogeneous, hypoechoic mass located caudal to the kidneys [5,9]. Radiography may provide evidence that a mass is present and can be useful in detecting thoracic metastasis, but it provides little information about the architecture of the ovarian mass [30]. Other diagnostic tools, such as computed tomography (CT), can help confirm the tumor origin, and ovarian tumors in dogs appear as large, soft tissue-attenuating masses. Pleural and abdominal effusions in patients with ovarian dysgerminoma can also be detected with CT.

Furthermore, magnetic resonance imaging (MRI) provides excellent soft tissue resolution, and it is highly sensitive. It is also useful for investigating distant metastasis in specific organs. Color doppler ultrasound may help identify vascular components of ovarian tumors in general [30]. Nevertheless, histopathological evaluation remains the gold standard for the definitive diagnosis of dysgerminoma [7]. In the present case, the diagnosis was established based on clinical history, physical examination, characteristic histopathological findings, and immunohistochemistry.

The traditional and most effective treatment for ovarian dysgerminoma is through ovariohysterectomy, as recurrence can be prevented when the tumor is completely excised [5]. The prognosis of patients with dysgerminoma is good when the tumor is fully resected and poor when there is evidence of metastasis [5,28,31]. Chemotherapy is recommended in cases with metastasis; however, no standard protocols have been established. The literature cites the use of carboplatin (300 mg/ m^2) and vinblastine (2 mg/m^2), administered intravenously every 30 days for four applications. An immunostimulant medication was also provided orally [5]. In this case, ovariohysterectomy was the treatment, and no clinical signs of recurrence were noted after the surgery. However, no diagnostic tests were performed to confirm the absence of recurrence, which represents a limitation of this case. Regular monitoring is essential to check for any post-operative complications and signs of metastasis, such as ascites and abdominal distention [13]. Ultrasonography, radiography, complete blood count, and physical examination are recommended as part of patient monitoring [32].

Post-operative care of the dog included the administration and prescription of the routine post-operative medications. A non-steroidal anti-inflammatory drug (NSAID) and an opioid analgesic were administered after the surgical procedure, both adhering to the 2020 AAHA Anesthesia and Monitoring Guidelines for Dogs and Cats [33]. Tolfenamic acid and tramadol were administered intramuscularly. Tolfenamic acid is an NSAID that is useful for acute or chronic pain and inflammation. Meanwhile, tramadol is an opiate agonist, which, when used in combination with an NSAID can be helpful for chronic pain [34]. Meloxicam and co-amoxiclav were both prescribed for the patient. Meloxicam is an NSAID given for its analgesic, antipyretic, and anti-inflammatory action, and amoxicillin-clavulanate (co-amoxiclav) was used as an antibiotic. Amoxicillin-clavulanate is effective against gram-positive and gram-negative bacteria. Clavulanic acid prevents bacterial degradation of ß-lactams by binding and deactivating ß-lactamases, ensuring amoxicillin's antimicrobial action is maintained [34,35]. Brand names of these medications were not indicated as it is within the client's discretion on where to purchase the prescribed medications. Furthermore, supplements such as omega-3 fatty acids, vitamin C, vitamin D, selenium, and vitamin E are recommended because they play a role in modulating inflammation and have been associated with potential reduction of tumor growth, reduced cancer mortality, and anti-cancer properties [36].

This report has several limitations. The absence of comprehensive staging and diagnostic imaging limited the assessment of metastatic status and tumor extent. Furthermore, serum biochemical testing and hormonal assays were not performed due to financial constraints of the client. Consequently, the evaluation of organ function was limited, and the potential association between the tumor and the observed hematological changes could not be further investigated. Follow-up was limited with the dog's clinical status based solely on the client's report and no diagnostic testing was performed to assess the recurrence. Thus, the long-term prognosis of the dog remains undetermined.

6. Conclusion

This case presents a rare occurrence of bilateral dysgerminoma in a young dog and emphasizes the importance of routine histopathological evaluation following elective ovariohysterectomy. Ovariohysterectomy is among the most commonly performed abdominal surgeries in companion animals, and as demonstrated in this case, dysgerminoma can be an incidental finding with no obvious preceding clinical indicators beyond a prolonged estrus cycle. The intraoperative findings, including bilateral solid, whitish to gray lobulated ovarian masses, jagged and curly uterine horns with increased diameter, and thickened hyperemic areas within the uterine lumen, provided sufficient justification for submitting the excised tissues for

histopathological and immunohistochemical evaluation. It is emphasized, however, that such complementary diagnostic procedures should be guided by gross pathological findings, clinical history, and the overall clinical picture, rather than being routinely performed for all elective surgeries without indication.

The use of immunohistochemistry, particularly the CD117 antibody, was critical in confirming the diagnosis and distinguishing dysgerminoma from other ovarian germ cell tumors. As dysgerminoma carries a documented potential for metastatic spread, the evaluation of lymph nodes through gross examination and biopsy would have been valuable in assessing metastatic status, treatment decisions, and determining the definitive prognosis of the patient. As dysgerminoma was not suspected at the time of surgery in this case, the lymph node sampling was not performed. However, it is recommended that future cases incorporate lymph node assessment as part of the surgical and diagnostic workup. Moreover, a serum biochemistry panel is recommended as a standard component in evaluating renal and hepatic function and in ruling out other differentials. Although the dog remained clinically normal according to the client at the three-month follow-up, this short-term observation does not establish long-term disease-free survival. Further long-term follow-ups are recommended to monitor disease progressions and clinical outcomes. Overall, surgical intervention through ovariohysterectomy, complemented by comprehensive histopathological and immunohistochemical analysis, remains key to accurate diagnosis and effective management of ovarian dysgerminoma in dogs.

Availability of Data and Materials

All data are available in this study.

Author Contributions

Conceptualization, C.F.D.E., M.L.S.F., M.S.E.G.L., and D.A.M.; Methodology, C.F.D.E., M.L.S.F., M.S.E.G.L., and D.A.M; Investigation, C.F.D.E., M.L.S.F., M.S.E.G.L., and D.A.M.; Writing – Original Draft, C.F.D.E., M.L.S.F., M.S.E.G.L., and D.A.M.; Writing – Review & Editing, C.F.D.E., M.L.S.F., M.S.E.G.L., and D.A.M.

Ethics Approval and Consent to Participate

The current research has followed the accepted principles of ethical conduct by committee of the College of Veterinary Medicine, University of the Philippines Los Baños.

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Conflict of Interest

The authors declare no conflicts of interest.

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