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Case of Metastatic Canine Transmissible Venereal Tumor in a Dog: Clinical and Cytological Evaluation

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Abstract

Canine transmissible venereal tumor (TVT) is a naturally occurring, transmissible neoplasm primarily affecting the genitalia in dogs. Though generally benign, it can rarely metastasize to other body parts. This report describes a rare case of metastatic TVT in a 2-year-old female Boerboel, presenting with a large, ulcerated vulvar mass and metastases to the popliteal lymph node and mammary glands. Clinical findings included progressive mass growth, emaciation, and systemic symptoms. Hematological tests revealed non-regenerative anemia and elevated white blood cell count, while cytological examination identified neoplastic round cells with high nucleus-to-cytoplasm ratios and mitotic figures. The dog was treated with vincristine chemotherapy, metronidazole, vitamin C, and a diet supplemented with crude sap extract of *Telfairia occidentalis* at 120 mg/kg once daily. Significant tumor regression and clinical improvement were observed after four weeks, although persistent anemia and borderline hypoproteinemia were noted. By the fifth week, the mass had notably reduced, and the dog's condition continued to improve, though some hemorrhage remained. This case highlights the rare occurrence of metastatic TVT and underscores the effectiveness of vincristine in treatment, emphasizing the need for prompt diagnosis and management despite its generally low metastatic rate.

Keywords

Canine transmissible venereal tumor (TVT), Cytology, Dog, Genitalia, Neoplasm.

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Introduction

Canine transmissible venereal tumor (TVT), also known as infectious sarcoma, transmissible lymphosarcoma, sticker tumor, or general granuloma, is a benign reticuloendothelial round cell neoplasm of the dog that primarily affects the external genitalia and occasionally the internal genitalia and has no breed or sex predilection and a low metastatic rate (Bendas *et al*., 2022).

It is the only known naturally occurring neoplasm that can be transplanted as an allograft across major histocompatibility barriers within the same species and even to other canine family members, such as coyotes, wolves, and foxes (Binli *et al*., 2021). In addition to often spreading by coitus, this horizontally transmitted infectious histiocytic tumor in dogs can also be disseminated by biting, licking, and smelling the tumor-affected area (Küçükbekir *et al*., 2021). TVT has a widespread distribution, and it is seen in regions with tropical and subtropical climates, often affecting stray, free-roaming, and sexually active dogs (Bulhosa *et al*., 2020).

Due to sexual transmission, TVT in male dogs occurs frequently on the glans, penis, and prepuce and may also involve the perineum and scrotum (Costa *et al*., 2023). In the female, the tumor mainly affects the vagina and may protrude from the lips of the vulva (Dameski *et al*., 2018). However, many cases of canine TVT have been reported with metastases to many organs and systems like skin and subdermal tissue, brain, eye, mammary glands, palpebral conjunctival tissue, soft palate, nasal mucosa, mediastinum, lungs, liver, spleen, and lymph nodes, and, to the best of our knowledge, the only metastasis of canine TVT in the reproductive system was to the uterus and ovaries (Den Otter *et al*., 2015).

Clinical signs seen in affected dogs include genital swelling, intermittent or persistent serum-sanguineous vaginal or preputial discharge, and excessive licking of the genital area. There may also be an unpleasant odor or visible neoplastic masses. In metastatic or extragenital occurrence, the clinical signs are related to the affected organ. When the eye is affected, the symptoms range from chemosis to episcleritis, corneal edema, severe uveitis, and glaucoma (Hantrakul *et al*., 2014).

The diagnosis of TVT is based on the anamnesis, clinical signs, gross examination, cytology, and histopathology. TVT diagnosis in the extragenital regions may be more difficult depending on the anatomical location of the tumors. The present study describes the history, clinical signs, and cytological findings of a case of TVT that metastasized to the mammary gland in a 2-year-old dog.

Materials and Method

History and Clinical Examination

A two-year-old female Boerboel was presented to the University of Ibadan Veterinary Teaching Hospital. The patient had excessive tissue growth in the vulvar area. According to the anamnesis, the dog was said to have been active and had a healthy appetite. The owner complained that a small mass had been noted shortly before mating approximately 15 weeks prior to presentation. The mass progressively increased in size after mating.

On presentation, the dog-weighed 34 kg and there was an ulcerated hemorrhagic mass approximately 10 cm by 5 cm in size on the vulva. The mass was well-defined and had rough edges with multiple single to three coalescent button-shaped ulcerations at the proximal edge of the growth (inguinal region).

A massive ulceration approximately 5 cm in size and 3 cm deep with rough edges was noted on the mass.

On close physical examination, the right popliteal lymph node was enlarged. On the left side of the mass, two mammary glands were enlarged and hyperemic. Palpation elicited a moderate pain response. The vulva growth was solid and appeared to be progressively spreading forward. The dog was also emaciated. A blood sample was collected from the cephalic vein for hematology and serum chemistry. A fine needle aspiration cytology was performed with samples collected from the vulva mass, the popliteal lymph node, and the affected mammary gland.

Laboratory Findings

Cytological examination revealed a moderately cellular smear consisting predominantly of round, single cells with nuclear and cytoplasmic vacuolation. The cells also showed a high nucleus-to-cytoplasm ratio, and a few were multinucleated. Characteristic mitotic figures were present (Figures 5-8). About 90% of the leukocytes were predominantly neutrophils. The remaining 10% consisted of band cells, monocytes, and lymphocytes in increasing order of abundance. Similar cytological findings were also observed in the popliteal lymph node and mammary gland. The clinical diagnosis was a locally invasive transmissible venereal tumor.

Hematology showed a persistent microcytic nonregenerative anemia with hypoproteinemia. The leukogram showed a high-normal white blood cell count and a regenerative neutrophilia with left shift-decreased segmented neutrophil, band neutrophil, and lymphocyte counts, which are suggestive of progressive bleeding and overwhelming inflammation.

The only abnormal finding in the serum chemistry was a slightly elevated serum AST, which could be due to muscle injury on the growth site.

Treatment

The patient was placed on intravenous vincristine chemotherapy at a weekly dose of 0.025 mg/kg (4/52), oral metronidazole 20 mg/kg bid (5/7), and vitamin C tablets 500 mg sid (4/52). The patient was also placed on a diet supplemented with crude sap of *Telfairia occidentalis* extract prepared as described by Omololu *et al*. (*2023*) to serve as hematinic.

Outcome

After four weeks of therapy, the patient was presented to the clinic for further examination. The patient was much more active, and body weight had increased from 34 kg recorded on the first day of presentation to 39 kg. There was a slight reduction in the size of the large vulvar mass. Hematology and cytology evaluations were repeated to evaluate recovery.

Follow-up serum chemistry (week 2) revealed a borderline hypoproteinemia and borderline hypoglobulinemia. Renal and hepatic functions were still normal. Hypoglobulinemia was due to the immunosuppressive action of the chemotherapeutic drugs being used. Immunosuppression might also be due to the tumor. There was a significant decrease in the size of the mass. The mass remained hemorrhagic yet the patient was active.

The hematology parameters such as total plasma protein (Fibrinogen), hemoglobin concentration, parked cell volume, red blood

cell count, platelet count, leucocyte count (segmented and band neutrophils, lymphocytes, monocytes, eosinophils), and serum chemistry were taken to confirm the hematological status of the animal before and during treatments.

On the fourth week of presentation, the hematology showed an improved PCV, and the leukogram showed reduced total WBC, the neutrophils, band neutrophils, and lymphocyte counts. The serum chemistry showed improvements in the serum proteins albumin and globulin, as the values were within the normal reference interval.

The patient was represented to the clinic on the fifth week. The size of the vulva mass had reduced significantly. Whole blood and serum samples were collected for hematology and serum chemistry, respectively. The hematology showed a persistent microcytic anemia with the leukogram showing unchanged segmented and band neutrophil counts but a significant reduction in lymphocyte count (lymphopenia). The serum chemistry showed a decrease in AST level (within the normal reference interval). The inference was chronic hemorrhage, and the leukogram had progressed to an overwhelming inflammation.

Result and Discussions

Canine transmissible venereal tumor (CTVT) is a potentially malignant neoplasm that is transmitted directly from dog to dog through the implantation of viable tumor cells on the surface of damaged mucous membranes (Figures 1-4).

The pathogenesis and etiology of metastatic TVT are complex and poorly understood. While auto-implantation and hetero-implantation remain important routes of TVT transmission, these modes of spread are not responsible for the rare cases of metastatic TVT, such as those present in this case.

In this case report, the diagnosis was made based on physical findings and clinical signs and confirmed by cytological examination of neoplastic cells from smears of tumor masses. The gross lesions observed in the presented patient were located primarily on the genitals and also had metastases to the mammary gland and popliteal lymph node. This dissemination suggested that the tumor may be spreading via hematogenous or lymphatic routes, facilitating migration to distant sites beyond the primary genital location.

On physical examination, the tumor mass of the vagina was approximately 10 cm in diameter, and the vulva appeared cauliflower-like, pedunculated, and inflamed with an ulcerated surface and bloody discharge (Figures 1 and 2). Smaller multinodular lesions measuring 0.5-1 cm in diameter surrounded the tumor mass. The consistency was firm (Figures 1 and 2). The physical examination result was consistent with a previous report by Ajayi *et al*. (2018).

Figure 1. Ulcerated hemorrhagic mass approximately 10 cm x 5 cm in size on the vulva.

Figure 2. Moderately enlarged right caudal mammary gland due to neoplastic infiltration. Note the ulcerated nodules on the main vulva mass.

Figure 3. Ulcerated hemorrhagic mass approximately 10 cm x 5 cm in size on the vulva.

Figure 4. Moderately enlarged right caudal mammary gland due to neoplastic infiltration. Note the ulcerated nodules on the main vulva mass.

Metastasis was observed in the mammary glands as an enlarged ulcerated mass, and the popliteal lymph node was visibly swollen, firm, warm, and up to 7 cm in diameter. Cytological examination revealed multiple homogeneous and discrete round or oval cells with basophilic cytoplasm; tumor cells had oval/round centrally placed nucleoli with anisocytosis (Figure 4). Nuclear and cytoplasmic vacuolization, as well as characteristic mitotic figures, were present (Figure 5). The cytopathological findings observed in this case are consistent with those reported by Ganguly *et al*. (2016). Differentiating this from histiocytomas, mastocytomas, or malignant lymphomas is important because canine transmissible venereal tumors are homogenous masses of tissue made of mesenchymal cells with imperceptible borders (Parikh and Panchal, 2023).

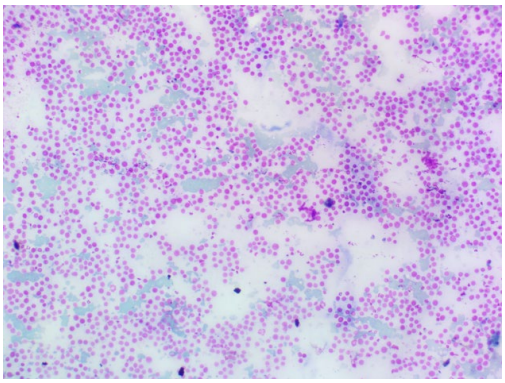

Figure 5. Fine needle aspiration cytology of the vulva mass, clear background with moderately cellular smear (Diff-quick x40)

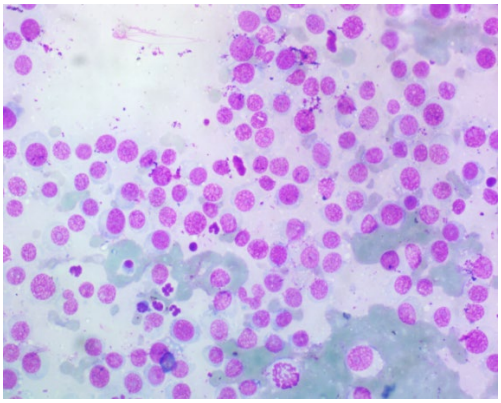

Figure 6. FNAC of the vulva mass is moderately cellular; the cells are round, discrete, and showing anisocytosis and anisokaryosis (Diff-quick x100)

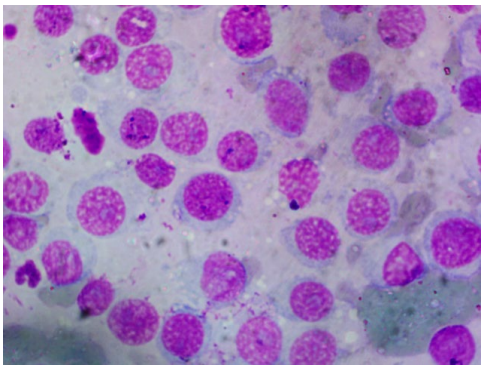

Figure 7. Similar uniform population of round cells from a moderately cellular smear with prominent nucleoli, round nucleus from the mammary gland. Note the high RBC population consistent with vulval hemorrhage due to the genital tumor (Diff-quick x100)

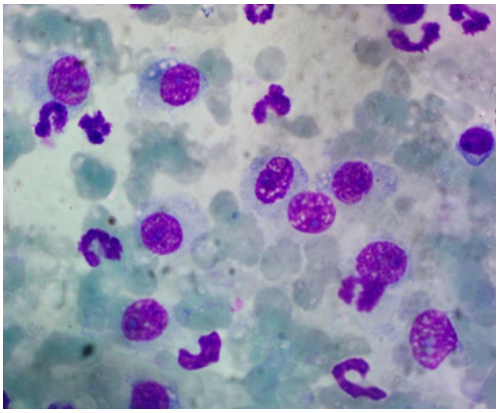

Figure 8. FNAC of the popliteal lymph node shows a few neoplastic round cells; there are also numerous neutrophils (degenerate and non-degenerate)

In this case, the metastasis involved the popliteal lymph node and the mammary gland, which is rare. The supplementary hematological test showed no significant

changes. The patient presented leukocytosis with neutrophilia and regenerative left shift, probably due to tumor ulceration and secondary bacterial infection, which in turn may have been aggravated by the owner's delay in seeking medical-veterinary attention.

Treatment in this case was aimed at reducing tumor mass and preventing secondary bacterial infection. In this case, vincristine chemotherapy at a dose of 0.025 mg/kg body weight once a week for four consecutive weeks was very effective. After the fourth week, there was a significant regression of the tumor. The success of these treatment results is consistent with previously published data that vincristine is the chemotherapy drug of choice in the treatment of TVT (Rezaei *et al*., 2016; Mingyuan *et al.,* 2018; Kumar *et al*., 2020). Crude sap of *T. occidentalis* at 120mg/kg once daily was incorporated into the treatment regimen to manage the anemia, thus there was improvement in the erythrogram parameters; PCV, Hb and RBC; this is in agreement with the report of Omololu *et al*. (2023).

Table 1. Erythrogram values observed during a four-week period (December 2023 - January 2024)

Parameter	Week 1	Week 2	Week 3	Week 4	Week 5
Color	Normal	Normal	Normal	Normal	Normal
Total Protein (g/dl)	6.6	6.7	5.8	6.5	6.6
Fibrinogen (mg/dl)	100	200	100	200	200
Hb (g/dl)	6.9	7.7	6.7	8.6	7.9
PCV (%)	23	24	21	25	24
RBC ($X10^6/\mu L$)	3.37	3.30	3.34	4.22	3.82
MCV (fl)	68	73	62	59	63
MCHC (g/dl)	30	32	31	34	33
Reticulocytes (%)	0	0	0	0	0
Platelets (/µL)	332,000	388,000	228,000	196,000	177,000

Table 2. Leukocyte values observed during a four-week period (December 2023 - January 2024)

Parameter	Week 1	Week 2	Week 3	Week 4	Week 5
Total WBC (/µL)	13,200	10,800	7,200	6,850	6,550
Segmented Neutrophils(/µL)	9,504	8,748	5,760	5,959	5,502
Band Neutrophils(/µL)	1,320	1,296	648	206	327
Lymphocytes (/µL)	1,452	432	432	411	196
Monocytes (/µL)	660	324	360	0	524
Eosinophils (/µL)	264	0	0	274	0

Table 3. Results of biochemical values obtained during the course of treatment (December 2023 - January 2024)

Parameter	Week 2	Week 3	Week 4	Week 5
Total Protein (g/dl)	6.6	5.8	6.1	6.2
Albumin (g/dl)	3.0	2.3	3.0	2.7
Globulin (g/dl)	3.2	2.2	3.1	3.5
AST (µL)	19	13	15	14
ALT(µL)	100	98	100	99
ALP(µL)	112	103	109	108
Blood Urea Nitrogen (mg/dl)	21	16	17	16
Creatinine (mg/dl)	1.5	0.9	0.7	0.8

Conclusion

Canine transmissible venereal tumor is a common round cell tumor of dogs, mostly affecting the skin (covering) of genitalia. It appears as multiple cauliflower-like growths. However, in this case, it has been established that cytology of fine needle aspiration and/or impression smears of the mass and or adjoining lymph nodes is an effective and reliable diagnostic technique for transmissible venereal tumors. As well vincristine sulfate is essential in the management (chemotherapeutic) of this tumor. Management of anemia by incorporating crude sap of *T. occidentalis* is an important component of the regimen.

Approval of Ethical Comission

Ethical approval was not needed for this case as the patient was presented to the clinic for medical intervention and amelioration of condition; however, the consent of the patient's owner was taken. Every ethical guideline was strictly adhered to during the case management, data collection, and reporting.

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Author's Contribution

Conceptualization; OSO, AAU, TKA Methodology; BNO, AO, FAA Software; Validation; OAA, TOS Formal analysis; OSO, AAU Investigation; TKA, BNO Resources; AO, FAA Data Curation; OSO, AAU Writing - Original Draft; OAA Writing - Review & Editing; REA, AAU Visualization; Supervision; REA, OSO Project Administration; AAU, OAA and Funding Acquisition: not applicable.

Conflict of Interest

There was no financial, personal, or professional conflicts of interest in this research.

Data Availability Statement

Data supporting this study are included within the article and supporting materials.

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