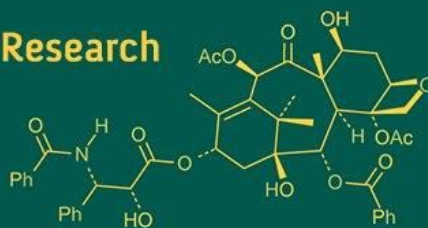


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693

ISSN Online: 2617-4707

NAAS Rating (2026): 5.29

IJABR 2026; 10(3): 526-531

www.biochemjournal.com

Received: 11-12-2025

Accepted: 15-01-2026

Tyson

Department of Biotechnology,
Jaypee University of Information
Technology (JUIT), Wanknaghat,
Solam, Himachal Pradesh, India

Amit Sharma

Department of Veterinary
Gynaecology and Obstetrics, Dr.
G.C. Negi College of Veterinary and
Animal Sciences, Chaudhary
Sarwan Kumar Himachal Pradesh
Krishi Vishvavidyalaya, Palampur,
Himachal Pradesh, India

Ankit Ahuja

Department of Veterinary Clinical
Complex, Dr. G.C. Negi College of
Veterinary and Animal Sciences,
Chaudhary Sarwan Kumar
Himachal Pradesh Krishi
Vishvavidyalaya, Palampur,
Himachal Pradesh, India

Vasu Sharma

Punjab Animal Husbandry
Department, Punjab, India

Pravesh Kumar

Department of Veterinary
Gynaecology and Obstetrics, Dr.
G.C. Negi College of Veterinary and
Animal Sciences, Chaudhary
Sarwan Kumar Himachal Pradesh
Krishi Vishvavidyalaya, Palampur,
Himachal Pradesh, India

Akshay Sharma

Department of Veterinary
Gynaecology and Obstetrics, Dr.
G.C. Negi College of Veterinary and
Animal Sciences, Chaudhary
Sarwan Kumar Himachal Pradesh
Krishi Vishvavidyalaya, Palampur,
Himachal Pradesh, India

Pankaj Sood

Department of Veterinary
Gynaecology and Obstetrics, Dr.
G.C. Negi College of Veterinary and
Animal Sciences, Chaudhary
Sarwan Kumar Himachal Pradesh
Krishi Vishvavidyalaya, Palampur,
Himachal Pradesh, India

Corresponding Author:**Tyson**

Department of Biotechnology,
Jaypee University of Information
Technology (JUIT), Wanknaghat,
Solam, Himachal Pradesh, India

Vincristine sulfate in canine TVT: Confirming efficacy and expanding safety evidence through haematological and biochemical profiling

Tyson, Amit Sharma, Ankit Ahuja, Vasu Sharma, Pravesh Kumar, Akshay Sharma and Pankaj Sood

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i3g.7911>

Abstract

Canine transmissible venereal tumour (CTVT) is one of the most common neoplasm in dogs, with vincristine sulfate established as the first-line chemotherapeutic agent. Thirty-eight dogs with cytologically confirmed CTVT received vincristine sulfate at weekly intervals for 4–6 weeks. Characteristic clinical signs included serosanguinous genital discharge (86.84%), genital deformation (52.63%), and systemic manifestations such as anorexia (47.36%). Complete remission was achieved in 81.6% of cases after four doses and in an additional 15.8% after six doses, yielding an overall success rate of 97.37%. Haematological monitoring revealed a significant decline in platelet count (198.4 ± 16.39 vs $140.7 \pm 18.61 \times 10^9/L$; $p < 0.05$) and modest yet significant increases in mean corpuscular volume; MCV (53.8 ± 1.63 vs 57.8 ± 0.54 fL; $p < 0.05$) and mean corpuscular haemoglobin concentration; MCHC (35.5 ± 0.25 vs 36.4 ± 0.27 g/dl; $p < 0.05$). Biochemically, total serum protein decreased significantly (6.3 ± 0.16 vs 5.7 ± 0.19 g/dl; $p < 0.05$), whereas alanine aminotransferase (ALT), aspartate aminotransferase (AST), bilirubin, and creatinine showed only non-significant variations, all remaining within established reference values. No clinically significant adverse effects were recorded. The present prospective study was designed to confirm the therapeutic efficacy of vincristine sulfate while expanding the safety evidence through detailed serial haematological and biochemical profiling.

Keywords: Transmissible venereal tumour, vincristine, haematochemical

Introduction

Canine Transmissible Venereal Tumour (CTVT), also known as Sticker's sarcoma, is a contagious neoplasm that primarily affects dogs and spreads through direct contact with viable tumour cells, most commonly during mating or close physical interaction, typically involving the external genitalia but also appearing in extra genital sites such as the skin, oral cavity, and nasal passages, especially in dogs with weakened immune function or prolonged exposure to infected animals (Abeka, 2019) [1]. Clinically, affected dogs typically present with characteristic cauliflower-like, friable masses, often accompanied by serosanguinous discharge, pain, and ulceration (Setthawongsin *et al.*, 2022) [28]. Diagnosis is generally based on a combination of clinical history, cytological examination, and histopathological findings (Abeka, 2019; Nazer *et al.*, 2023) [1, 24]. Cytological analysis commonly reveals round cells with vacuolated cytoplasm, prominent nucleoli, and frequent mitotic figures, whereas histopathological sections typically show sheets of pleomorphic round cells interspersed with fibrous stroma (Priyadarshini *et al.*, 2021) [25]. Chemotherapy remains the mainstay of treatment for CTVT, with vincristine sulfate being the most effective and widely used chemotherapeutic agent (Filho *et al.*, 2020) [14]. This is primarily due to its high efficacy (approximately 90% success rate), affordability, and relatively mild toxicity (Woods, 2020) [33].

Despite its effectiveness, vincristine therapies can influence haematological and biochemical parameters. Frequently observed haematological changes include normocytic-hypochromic anaemia, neutrophilic leukocytosis, and thrombocytopenia, which may result from tumour-related bleeding and secondary infections (Priyadarshini *et al.*, 2021) [25]. In addition to haematological alterations, biochemical changes such as elevated levels of aspartate

aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), hyperbilirubinemia, hypoproteinemia, and hypoalbuminemia suggest hepatic stress and systemic toxicity (Priyadarshini *et al.*, 2021; Nazer *et al.*, 2023) [25, 24]. Therefore, regular monitoring of these parameters is essential to evaluate the physiological impact of chemotherapy and optimise treatment strategies. This study focuses on CTVT treatment with vincristine sulfate to assess its therapeutic efficacy while monitoring associated haematological and biochemical changes.

Materials and Methods

The study was conducted at the Veterinary Gynaecology Unit of the Department of Veterinary Clinical Complex, Dr. G.C. Negi College of Veterinary and Animal Sciences, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya (CSKHPKV), Palampur. CTVT was definitively diagnosed in 38 canine patients based on physical examination, clinical history and vaginal cytological examination.

Vaginal Cytology

Vaginal cytology was performed using a sterile cotton-tipped swab moistened with normal saline, which was gently applied to the surface of the tumorous lesion, whether located on the external genitalia or within the vaginal canal in females, or on the penis/prepuce in males. The swab was carefully rotated over the lesion to collect tumour cells and then withdrawn. Smears were prepared by rolling the swab onto a clean, grease-free glass slide and air-dried for cytological examination. The smears were immediately fixed with alcohol, stained using the Giemsa method, and analysed under the microscope at 40X. For therapeutic evaluation, all affected animals were administered vincristine sulfate intravenously at a dose of 0.025 mg/kg body weight at weekly intervals for up to four to six weeks (Takariyanti *et al.*, 2021) [29].

Haematological and Biochemical Analysis

To assess the impact of vincristine sulfate treatment, blood samples were aseptically collected from the cephalic or saphenous vein. Samples were drawn into EDTA vials for complete blood count (CBC), plasma separation and plain vacutainer tubes for serum-based estimations. Haematological analysis was conducted using a BC-2800 Vet Auto Haematology Analyzer (Marketed by Fresenius Medical Care Private Limited, New Delhi). The parameters assessed included red blood cell count ($\times 10^{12}/L$), hemoglobin (g/dl), packed cell volume (%), white blood cell count (WBC; $\times 10^9/L$), lymphocyte count (%), eosinophils count (%), mean corpuscular volume (MCV; fL), mean corpuscular hemoglobin (MCH; pg), mean corpuscular hemoglobin concentration (MCHC; g/dl), and platelet count ($\times 10^9/L$). Biochemical estimations were performed using the MicroLab 300 clinical chemistry analyser (Merck Limited, Mumbai). The biochemical parameters evaluated included blood glucose (mg/dl), total plasma protein (g/dl), total bilirubin (mg/dl), alanine aminotransferase (ALT; U/L), aspartate aminotransferase (AST; U/L), alkaline phosphatase (ALP; U/L), and creatinine (mg/dl). Total plasma protein was estimated by the Biuret method, and total bilirubin by the DMSO/DIAZO methodology. Enzymatic activities of ALT and AST were determined using IFCC methodology, while ALP was assessed using

the ALP kit. Creatinine was estimated by the Modified Jaffe's method.

Statistical Analysis

All statistical analyses were performed using SPSS Statistics (Version 25.0). Comparison between the two groups was carried out using a paired t-test to determine statistical significance. Results were presented as Mean $\pm$ SEM, and differences were considered significant when $p < 0.05$.

Results

A total of 38 dogs were definitively diagnosed with canine transmissible venereal tumour (CTVT) through a combined evaluation of clinical presentation, gross lesion characteristics, and confirmatory vaginal cytology. The affected population comprised 20 females (52.63%) and 18 males (47.37%). The most frequently observed clinical signs were serosanguinous genital discharge in 33 animals (86.84%), excessive licking of the genital region in 30 animals (78.94%), and visible deformation of the external genitalia in 20 animals (52.63%). Systemic manifestations were also prominent and included anorexia in 18 dogs (47.36%), progressive weakness in 16 dogs (42.1%), dysuria in 11 dogs (28.94%), and noticeable weight loss in 9 dogs (23.68%). Gross examination of the lesions consistently revealed friable, hemorrhagic, cauliflower-like proliferative masses located primarily on the external genitalia.

Cytological and Therapeutic Evaluation

Cytological examination of vaginal smears demonstrated characteristic tumour cells that were predominantly round to oval in shape, possessing one or (less frequently) two prominent nucleoli, and exhibiting multiple distinct clear cytoplasmic vacuoles (Figure 1). All 38 confirmed CTVT cases were treated with vincristine sulfate administered intravenously at a standardised dose of 0.025 mg/kg body weight, given at weekly intervals for a maximum duration of four to six weeks, depending on clinical and cytological response. Post-treatment cytological monitoring showed that tumour cells were no longer detectable in vaginal smears in 31 animals (81.57%) after completion of the fourth weekly dose. By the end of the sixth dose, complete cytological clearance was achieved in all 37 animals (97.37%). Clinically, the overall treatment success rate reached 97.37%, with complete recovery (both clinical and cytological remission) documented in 31 dogs (81.57%) after four doses and in an additional 6 dogs (15.78%) after six doses. In one refractory case (2.63%), persistent tumour tissue required secondary intervention in the form of surgical excision using electrocautery (Figure 2).

Haemato-biochemical Profiles

Pre- and post-treatment haematological parameters were compared to assess the impact of vincristine therapy. Platelet counts demonstrated a statistically significant decrease following chemotherapy ($198.4 \pm 16.39 \times 10^9/L$; $140.7 \pm 18.61 \times 10^9/L$; $p < 0.05$). Mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) showed modest but statistically significant increases after treatment. Haemoglobin concentration exhibited a numerical decline (14.4 ± 0.55 g/dl; 12.9 ± 0.63 g/dl) that did not reach statistical significance, yet values remained within the reference interval. Similarly, lymphocyte percentage displayed a numerical reduction

($21.9 \pm 1.39\%$; $18.6 \pm 1.18\%$) without statistical significance, and remained within normal limits. Red blood cell count showed a slight numerical increase post-treatment ($6.6 \pm 0.26 \times 10^{12}/L$; $6.9 \pm 0.31 \times 10^{12}/L$; $p > 0.05$). Total white blood cell count exhibited a mild numerical decrease ($16.5 \pm 1.08 \times 10^9/L$; $15.7 \pm 0.99 \times 10^9/L$; $p > 0.05$), with all values staying within the normal physiological range.

Serum biochemical parameters were also evaluated before and after vincristine administration. A statistically significant reduction in total protein concentration was

recorded (6.3 ± 0.16 g/dl; 5.7 ± 0.19 g/dl; $p < 0.05$). Mild, non-significant elevations were observed in alanine aminotransferase (30.47 ± 6.20 U/L; 40.40 ± 2.69 U/L), aspartate aminotransferase (25 ± 2.41 U/L; 26.6 ± 2.61 U/L; $p > 0.05$), total bilirubin (0.33 ± 0.04 mg/dl; 0.38 ± 0.14 mg/dl; $p > 0.05$), and creatinine (0.80 ± 0.03 mg/dl; 0.92 ± 0.06 mg/dl; $p > 0.05$). All post-treatment biochemical values remained well within the established reference ranges for dogs.

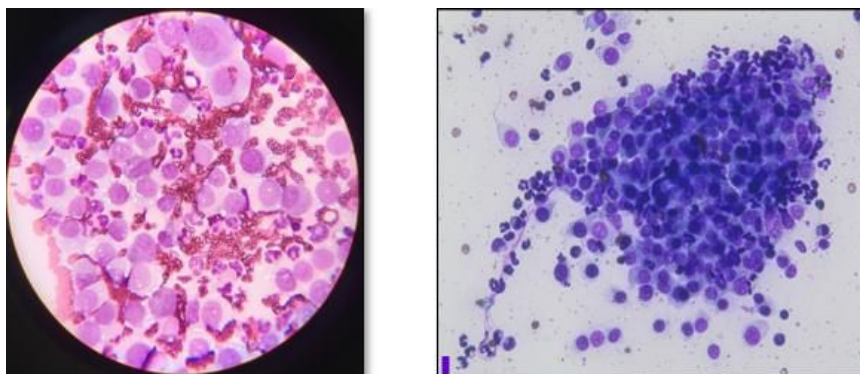


Fig 1: Vaginal cytology smears of canine TVT, composed of highly cellular population of discrete round to oval cells with distinct cell borders. The nuclei are round with coarse chromatin, and several cells exhibited characteristic intracytoplasmic vacuoles against a hemorrhagic background.

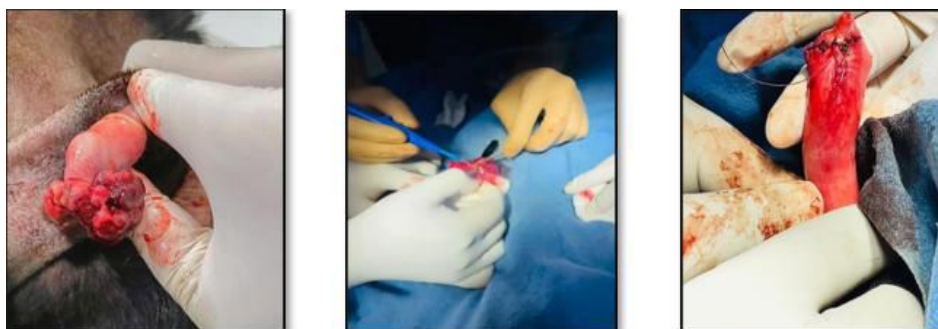


Fig 2: The sequential procedure for surgical excision of canine transmissible venereal tumour using electrocautery in a sole refractory case.

Table 1: Effect of therapeutic regimen on average (Mean $\pm$ SEM) haemato-biochemical profiles in TVT-affected canines (n=38)

Parameter	Pre-treatment (Mean $\pm$ SEM)	Post-treatment (Mean $\pm$ SEM)
WBC ($\times 10^9/L$)	16.5 ± 1.08	15.7 ± 0.99
Lymphocyte (%)	21.9 ± 1.39	18.6 ± 1.18
RBC ($\times 10^{12}/L$)	6.6 ± 0.31	6.9 ± 0.26
Haemoglobin (g/dl)	14.4 ± 0.55	12.9 ± 0.63
PCV (%)	36.5 ± 1.77	48.1 ± 8.12
MCV (fL)	53.8 ± 1.63	$57.8 \pm 0.54^*$
MCH (pg)	20.4 ± 1.01	21.0 ± 0.24
MCHC (g/dl)	35.5 ± 0.25	$36.4 \pm 0.27^*$
Platelets ($\times 10^9/L$)	198.4 ± 16.39	$140.7 \pm 18.61^*$
Eosinophils (%)	4.1 ± 1.27	3.8 ± 1.04
ALT (U/L)	25.0 ± 2.69	34.9 ± 6.20
ALP (U/L)	115.9 ± 10.0	104.8 ± 8.04
AST (U/L)	25 ± 2.41	26.6 ± 2.61
Total Protein (g/dl)	6.3 ± 0.16	$5.7 \pm 0.19^*$
Creatinine (mg/dl)	0.80 ± 0.03	0.92 ± 0.06
Bilirubin (mg/dl)	0.33 ± 0.04	0.38 ± 0.14

*values shows significant difference at $p < 0.05$

Discussion

The clinical presentation observed in the present study was characterised by serosanguinous genital discharge, excessive genital licking, and deformation of the external genitalia, which are considered classical manifestations of canine

transmissible venereal tumour. Similar clinical findings have previously been reported by Boscos and Ververidis (2004) [7], who documented haemorrhagic genital discharge in 94.6% of affected dogs and genital deformation in 30.4% of cases. However, the present investigation recorded

comparatively higher frequencies of systemic manifestations such as anorexia (47.36%), progressive weakness (42.1%), and dysuria (28.94%), suggesting a broader systemic impact of the disease in the studied population. The gross morphology of the lesions, characterised by friable, haemorrhagic, cauliflower-like masses, was consistent with the classical descriptions reported by Martins *et al.* (2005)^[21] and McEntee (2002)^[22].

Cytological examination remains one of the most reliable diagnostic tools for TVT due to the characteristic cellular morphology exhibited by tumour cells. These observations in our study are in agreement with the findings of (Gonzalez *et al.*, 2000; Tella *et al.*, 2004)^[17, 31], who described similar cytomorphological characteristics in canine TVT cases. Vincristine sulfate remains the chemotherapeutic agent of choice for the management of TVT due to its high efficacy, affordability, and relatively low toxicity. In the present study, a significant proportion of cases (81.57%) achieved complete remission after four doses, while a smaller proportion required six doses for full recovery. These findings are consistent with the observations of Erüal-Maral *et al.* (2000)^[13], who reported treatment durations ranging from three to six weeks until the disappearance of TVT cells in cytological smears. Similarly, Chikweto *et al.* (2013)^[8] documented successful vincristine therapy associated with the absence of tumour cells and the presence of inflammatory cell infiltration in post-treatment smears. The overall success rate of 97.37% observed in the present study further reinforces the role of vincristine sulfate as the gold standard treatment for TVT. Comparable therapeutic outcomes have been reported by Woods 2020; Biswas *et al.*, 2024)^[33, 6], who highlighted tumour regression rates approaching 90% following vincristine therapy. In cases where chemotherapy fails, or the tumour is localised and resectable, surgical intervention may be considered. In the present study, the single refractory case was successfully managed through electrosurgical excision. Although surgical treatment is generally discouraged for generalised TVT due to the risk of tumour cell transplantation during manipulation, electrocautery has been recommended as a safer alternative in selected cases (Martins *et al.*, 2005; Arias *et al.*, 2016)^[21, 2]. Conventional surgical techniques may inadvertently facilitate tumour transplantation to surgical wounds, as described by Das and Das (2000)^[10]. Furthermore, recurrence rates following traditional surgical excision have been reported to range from 18% to 68% (Gandotra *et al.*, 1993; Ganguly *et al.*, 2013)^[15, 16], further supporting the preference for chemotherapy as the primary treatment modality.

Haematological alterations observed in the present study were primarily characterised by a significant reduction in platelet count following vincristine administration. This finding is consistent with the thrombocytopenia previously documented by Milo and Snead (2014)^[23], who reported the lowest platelet counts during the sixth week of vincristine therapy. The observed thrombocytopenia may be attributed to the myelosuppressive effects of chemotherapeutic agents as well as the immunosuppressive influence associated with the disease itself, as reported by Behera *et al.* (2012)^[4] and Kose *et al.* (2013)^[19]. In contrast, Cizmeci *et al.* (2012)^[9] did not observe significant platelet alterations during doxorubicin therapy, highlighting the variation in haematological responses depending on the chemotherapeutic agent used. The modest increase observed

in MCV and MCHC following treatment may reflect subtle alterations in erythrocyte maturation associated with chemotherapeutic intervention. Bennett *et al.* (2023)^[5] similarly reported fluctuations in erythroid indices in dogs undergoing chemotherapy. These changes may also be associated with morphological alterations and normoblastemia documented by Weiss *et al.* (2010)^[32] in dogs treated with vincristine. The slight increase in red blood cell count observed in the present study also corresponds with the findings of Athar *et al.* (2001)^[3]. Reduced erythrocyte counts before treatment have previously been attributed to chronic blood loss from ulcerated tumour surfaces, as suggested by Maiti *et al.* (1995)^[20]. Priyadarshini *et al.* (2021)^[25] further reported significantly lower erythrocyte counts and haemoglobin concentrations in untreated TVT-affected dogs, indicating normocytic hypochromic anaemia associated with the disease. White blood cell counts exhibited a mild, non-significant decrease following chemotherapy but remained within normal physiological limits. Comparable reductions in total leukocyte counts have been reported by Athar *et al.* (2001)^[3] and Resmi (2012)^[26] during the post-chemotherapy period. Such changes are likely attributable to the myelosuppressive effects of cytotoxic agents on rapidly proliferating bone marrow precursors, as described by Dinesh *et al.* (1993)^[12] and Boscos and Ververidis (2004)^[7]. Biochemical analysis revealed a significant reduction in serum total protein concentration following vincristine administration. This decrease may be attributed to gastrointestinal disturbances and reduced nutrient absorption resulting from the drug's effects on rapidly dividing intestinal epithelial cells, as suggested by Dinesh *et al.* (1993)^[12]. However, Said *et al.* (2009)^[27] reported no significant changes in total protein concentrations following similar treatment protocols, indicating possible inter-individual variability in biochemical responses. The mild increases observed in ALT and AST levels remained within physiological limits and were consistent with the findings reported by Kadam *et al.* (2004)^[18] and Resmi (2012)^[26]. While AST may increase in response to both hepatic and muscular injury, ALT is considered more specific to hepatic tissue (Thrall *et al.*, 2012)^[31]. The absence of marked elevations in the present study indicates that the vincristine regimen employed did not induce clinically significant hepatotoxicity. Similarly, the minor elevation in serum bilirubin levels may reflect an increased hepatic metabolic workload associated with drug metabolism rather than overt hepatic dysfunction, as described by Stockham and Scott (2008)^[28]. Renal function parameters remained stable throughout the treatment period, with serum creatinine levels remaining within normal limits. These observations are consistent with the findings of Cizmeci *et al.* (2012)^[9] and De Souza *et al.* (2022)^[11], who reported that weekly vincristine administration does not significantly impair renal tubular integrity or alter creatinine and blood urea nitrogen levels in dogs with TVT. Nevertheless, continuous monitoring remains advisable in animals undergoing chemotherapy to ensure early detection of potential drug-induced alterations.

Conclusion

This study confirms the outstanding efficacy of vincristine sulfate for spontaneous CTVT, achieving complete remission in 97.37% of 38 dogs, with 81.6% responding by

the fourth weekly dose. Serial haemato-biochemical monitoring confirms mild thrombocytopenia, fluctuations in erythrocyte indices and a decrease in total protein; however, most parameters remained within physiological limits, supporting its continued recommendation as first-line therapy in spontaneous CTVT cases. The occurrence of a single refractory case requiring surgical excision emphasises the importance of individualised treatment planning in managing resistant forms of CTVT.

References

1. Abeka YT. Review on canine transmissible venereal tumor (CTVT). *Cancer Therapy & Oncology International Journal*. 2019;14(4):86-94.
2. Arias MVB, Valentim LG, Ishikawa B. Spinal TVT treated with surgical excision and chemotherapy in a dog. *Acta Scientiae Veterinariae*. 2016;44:1-6.
3. Athar M, Suhail A, Muhammad G, Shakoar A, Azim F. Clinico-therapeutic studies on canine transmissible venereal tumour. *Pakistan Veterinary Journal*. 2001;21(1):39-43.
4. Behera SK, Kurade NP, Monsang SW, Das DP, Mishra KK, Mohanta RK. Clinico-pathological findings in a case of canine cutaneous metastatic transmissible venereal tumor. *Veterinarski arhiv*. 2012;82(4):401-410.
5. Bennett P, W Peter, T Rosanne. Review of canine lymphoma treated with chemotherapy—outcomes and prognostic factors. *Veterinary Sciences*. 2023;10(5):342.
6. Biswas N, Singh K, Kumar S, Parmar S, Srivastava N, Khan MH. Therapeutics and management of persistent cases of canine transmissible venereal tumour: An update. *Animal Reproduction Update*. 2024;4(2).
7. Boscós CM, Ververidis HN. Canine TVT: Clinical findings, diagnosis and treatment. *Journal of the Hellenic Veterinary Medical Society*. 2004;55(1):20-28.
8. Chikweto A, K Sachin, L Hugh, D Claude, T Keshaw, NS Ravindra, IB Muhammad. Genital and extragenital canine transmissible venereal tumor in dogs in Grenada, West Indies. *Open Journal of Veterinary Medicine*. 2013;3(2):111-114.
9. Cizmeci SU, Kose AM, Aydin I, Dinc DA. Investigation of the efficiency of chemotherapy in bitches with transmissible venereal tumor. *Kafkas Universitesi Veteriner Fakültesi Dergisi*. 2012;18(2):231-236.
10. Das U, Das AK. Review of canine transmissible venereal sarcoma. *Veterinary Research Communications*. 2000;24:545-556.
11. De Souza JV, Gonçalves FDM, Lira-Junior ACOG, Escodro PB, Câmara DR, Notomi MK. Vincristine sulfate treatment influence on kidney function of female dogs with transmissible venereal tumor. *Brazilian Journal of Veterinary Research and Animal Science*. 2022;59:e192646.
12. Dinesh NM, Ranganath BN, Jayadevappa SM, Srinivas CL. Effect of vincristine sulphate on canine transmissible venereal tumours: Haematological and biochemical studies. *Indian Veterinary Journal*. 1993;70:741-744.
13. Erüal-Maral N, Findik M, Aslan S. Use of exfoliative cytology for diagnosis of transmissible venereal tumour and controlling the recovery period in the bitch. *Deutsche tierärztliche Wochenschrift*. 2000;107(5):175-180.
14. Filho NP, Torres AAA, Silva MPC, Ventura RFA, Basso KM, Ferreira MGPA, *et al.* Transmissible venereal tumor: Cell proliferation (AgNOR) and response to chemotherapy correlated with cytomorphological classification. *Ars Veterinaria*. 2020;36(2):140-147.
15. Gandotra VK, Chauhan FS, Sharma RD. Occurrence of canine transmissible venereal tumour and evaluation of two treatments. *Indian Veterinary Journal*. 1993;70:854-857.
16. Ganguly B, Das U, Das AK. Canine transmissible venereal tumour: A review. *Veterinary and Comparative Oncology*. 2016;14(1):1-12.
17. Gonzalez CM, Griffey SM, Naydan DK, Flores E, Cepeda R, Cattaneo G, *et al.* Canine transmissible venereal tumor: A morphological and immunohistochemical study of 11 tumors in growth phase and during regression after chemotherapy. *Journal of Comparative Pathology*. 2000;122(4):241-248.
18. Kadam DB, Panchbhai VS, Kulkarni DD, Digraaskar SU. Management of canine transmissible venereal tumour with submucosal resection and vincristine sulphate therapy. *Intas Polivet*. 2004;339-342.
19. Kose AM, Cizmeci SU, Aydin I, Dinc DA, Maden M, Kanat O. Disseminated metastatic transmissible venereal tumour in a bitch. *Eurasian Journal of Veterinary Sciences*. 2013;29(1):53-57.
20. Maiti SK, Roy S, Ali SL, Ghosh RC. Therapeutic management of transmissible venereal tumor with vincristine in a dog: A case report. 1995;614-615.
21. Martins MM, De Souza F, Ferreira F, Gobello C. The canine transmissible venereal tumor: Etiology, pathology, diagnosis and treatment. *Recent Advances in Small Animal Reproduction*. 2005;25(7):161-167.
22. McEntee MC. Reproductive oncology. In: Withrow SJ, MacEwen EG, editors. *Clinical Veterinary Oncology*. 2nd ed. Saunders; 2002. p. 133-149.
23. Milo J, Snead E. A case of ocular canine transmissible venereal tumor. *Canadian Veterinary Journal*. 2014;55(12):1171-1174.
24. Nazer AJ, Becha BB, Jayakumar C, Unnikrishnan MP, Devi SS. Successful management of extragenital transmissible venereal tumour in a non-descript dog. *Indian Journal of Veterinary and Animal Sciences Research*. 2023;52(3):111-117.
25. Priyadarshini N, Das DP, Panda SK, Samal L. Transmissible venereal tumours (TVT) in bitches: A haematological, biochemical and histopathological study. *Journal of Entomology and Zoology Studies*. 2021;9(1):490-493.
26. Resmi SN. Occurrence, Clinical Findings and Treatment of Canine Transmissible Venereal Tumour. M.V.Sc Thesis, Kerala Veterinary and Animal Sciences University, Kerala, India. 2012.
27. Said RA, Silva LF, Albuquerque AROL, Sousa-Neta EM, Lavinsky MO. Efficacy and side effects of vincristine sulphate treatment on canine transmissible venereal tumour. In: *Proceedings of the 34th World Small Animal Veterinary Association (WSAVA) Congress*; 2009 Jul 21-24; São Paulo, Brazil.

28. Stockham SL, Scott MA. Fundamentals of Veterinary Clinical Pathology. 2nd ed. Blackwell Publishing; 2008.
29. Takariyanti DN, Gorda IW, Sewoyo PS. Treatment of transmissible venereal tumor without metastasis in mixed local Balinese dog by surgery and vincristine sulfate: A case report. International Journal of Veterinary Science and Animal Husbandry. 2021;6(3):25-29.
30. Tella MA, Ajala OO, Taiwo VO. Complete regression of transmissible venereal tumor (TVT) in Nigerian mongrel dogs with vincristine sulphate chemotherapy. African Journal of Biomedical Research. 2004;7(3):133-138.
31. Thrall MA, Glade W, Campbell AW, Campbell TW. Veterinary hematology and clinical chemistry. 2nd ed. Hoboken, NJ: Wiley-Blackwell; 2012.
32. Weiss DJ, Wardrop KJ, Schalm OW. Schalm's veterinary haematology. 6th ed. Ames, IA: Wiley-Blackwell; 2010.
33. Woods JP. Canine venereal transmissible tumor. In: Withrow and MacEwen's Small Animal Clinical Oncology. 6th ed. Elsevier; 2020. p. 781-784.