CLINICAL PROFILE OF CANINE TRANSMISSIBLE VENEREAL TUMOR CASES

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ABSTRACT

Fifty dogs, 1-8 years old, of both sexes and of various breeds presented to the Veterinary Teaching Hospital, College of Veterinary Medicine, University of the Philippines Los Baños from July 2002 to July 2011, were examined and diagnosed to have canine transmissible venereal tumor. Confirmation of the diagnosis was made through microscopic examination of the impression smears of the abnormal masses stained with Modified Wright Giemsa Stain and observation of individually exfoliating round cells with moderate nuclear to cytoplasmic ratio and prominent nucleoli and intracytoplasmic vacuoles. The study showed that TVT is most common in 3-year old intact female dogs that may be pure or mixed breed. The dogs were usually presented for veterinary attention due to abnormal growth and/or genital bleeding independent of urination and estrous cycle. Lesions are most commonly found in the vulvovagina of females and the penis of males.

Keywords: dog, canine transmissible venereal tumor, clinical profile

INTRODUCTION

Canine transmissible venereal tumor (TVT), also called Sticker's sarcoma, is a round cell tumor (Johnston, 1985) that is naturally-occurring, typically propagated and maintained among the dog population by coitus and the social behavioral trait of smelling and licking (Das and Das, 2000). This benign tumor in dogs is implanted on traumatized vaginal or penile mucosa membrane that may occur during coitus (Rogers, 1997; Gürel *et al.,* 2002). Repeated studies failed to find a specific etiologic agent for the condition. Viruses, bacteria and fungi were implicated but to no avail. However, cytogenetic studies on canine TVT show that these cells have 59±5 chromosomes in comparison with normal complement canine cells possessing

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78 chromosomes (Rogers, 1997). Also, a long interspersed nuclear element (LINE-1) has been found specifically and constantly inserted in the 5' end of the c-MYC protooncogene resulting to the formation of the neoplasm (Amariglio *et al.,* 1991).

The tumor begins as nodules in the submucosa or subcutis and grows to a mass that varies in size from a single polypoid growth with a peduncle to a broad-based multilobulated mass, oftentimes referred to as "cauliflower-like". It is usually well-circumscribed, unencapsulated and friable, and bleeds even with slight manipulation (Ogilvie and Moore, 1995).

Canine TVT is diagnosed based on gross lesion, anatomical location and environmental history (Brown, 1980) and confirmed by cytology of samples obtained by impression smear, aspiration or scraping of the lesion (Simoni and Knoll, 2008). The tumor cells may show moderate to marked variation in cell size, about 14-30 µm in diameter; round to oval nuclei with a prominent nucleolus and linear, cordlike chromatin. There is a lower nuclear to cytoplasmic ratio with distinct vacuoles that can be helpful in distinguishing this tumor from lymphoma, plamascytoma or histiocytoma (Simoni and Knoll, 2008). Mitotic activity is common (Batamuzi and Kessy, 1993) and, along with apoptotic indices, are actually useful in differentiation of TVT from canine cutaneous histiocytomas (Guvenç *et al.,* 2002).

Canine TVT is distinct due to the vacuolated cytoplasm, not found in the cytology of other tumors and it also follows a defined growth pattern (Mukaratirwa and Gruys, 2003). First, there is the progressive growth phase where round cells proliferate and, when examined under the scanning electron microscope, these cells exhibit microvilli (Yang, 1988). Then, it progresses to the steady state or static phase where the cells feature intermediate round cells and spindle shaped fibroblastic cells (Yang, 1988). These cells are called "transitional cells". Then the mass may undergo spontaneous regression in two to three weeks where the spindle shaped cells with abnormal intracellular collagen bundles in vacuoles suggest the differentiation of cells toward fibroblastic cells. The lymphokines secreted by infiltrating lymphocytes may be contributing in the regression process by diffusion through the tumor mass to induce the differentiation (Yang, 1988). The fourth and last phase would either be transplantation immunity (in immunocompetent adults) or metastasis (in puppies and immunosuppressed dogs) (Mukaratirwa and Gruys, 2003).

The metastases due to canine TVT are commonly reported to occur in the nasal cavity, oral cavity and skin, and less frequently in intraocular tissues, lymph nodes, brain, muscles, liver, spleen, tonsils, lung, pancreas and kidneys (Ayyapan *et al*., 1994; Barron and Saunders, 1963; Dhaliwal *et al.,* 1998; Ferreira *et al.,* 2000; Ginel *et al.,* 1995; Gürel *et al.,* 2002; Hanir, 1985; Kroger *et al*., 1991; Mohan *et al.,* 1994; Pandey *et al*., 1989; Papazoglou *et al*., 2001; Pereira *et al.,* 2000; Perez *et al*., 1994; Placke *et al.,* 1987; Theilen and Madewell, 1979).

The current study was conducted to determine the clinical profile of TVT in dogs presented to the Veterinary Teaching Hospital, College of Veterinary Medicine, University of the Philippines Los Baños (VTH-CVM-UPLB) for 9 years, from July 2002 to July 2011.

MATERIALS AND METHODS

Fifty (50) dogs, 1-8 years old, of both sexes and of various breeds presented to the VTH, CVM, UPLB from July 2002 to July 2011, which were diagnosed to have canine transmissible venereal tumor (TVT) through clinical examination were used in the study. To confirm the diagnosis, impression smears of the abnormal masses were obtained, stained with Modified Wright Giemsa Stain (Diff Quik®, Medic Diagnostics Laboratories, Pasay City, Philippines) and examined at the Animal Disease Diagnostic Laboratory, VTH, CVM, UPLB. Diagnosis of TVT was made when individually exfoliating round cells with moderate nuclear to cytoplasmic ratio and prominent nucleoli and intracytoplasmic vacuoles were observed under 1,000x magnification using oil immersion objective (Figure 1). The following information was summarized and qualitatively analyzed: a) chief complaint of the owners; b) signalment of the affected dogs; and c) anatomical location/s of the lesion/s.

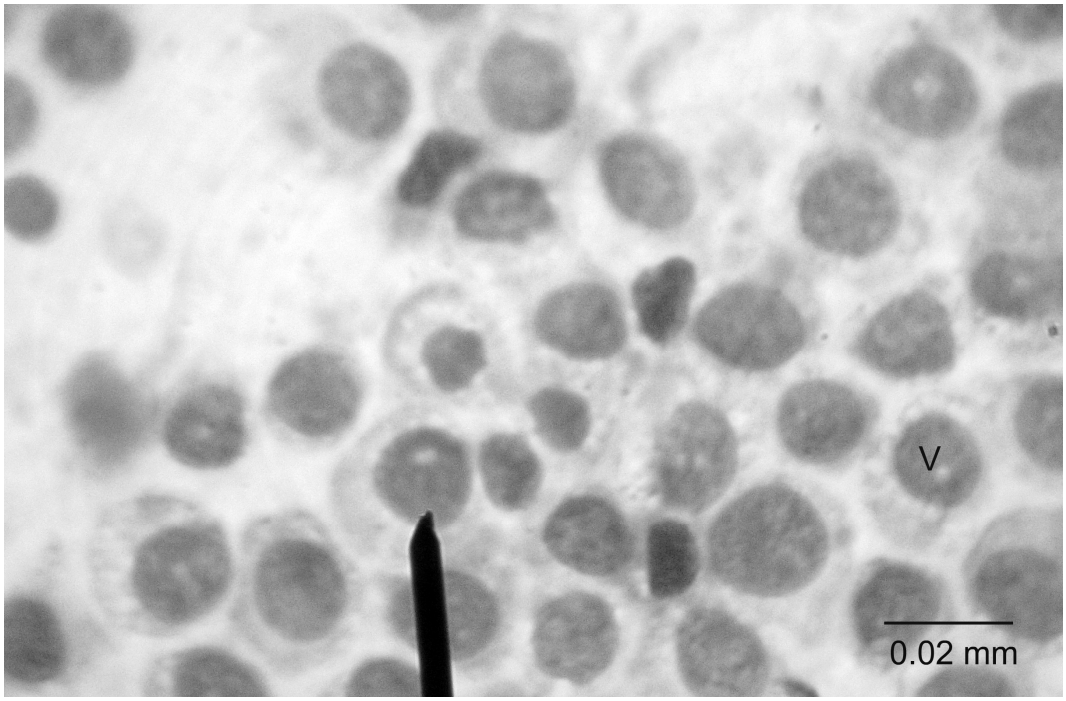

Figure 1. Photomicrograph from a vaginal smear of 4-year old female German Shepherd with transmissible venereal tumor showing multiple abnormally large, round, vacuolated cells. Multiple vacuoles can be observed in one of the large cells (V). Stain: Hematoxylin & Eosin.

RESULTS AND DISCUSSION

Pet owners usually bring their pets for veterinary attention for preventive medicine and when they observe an abnormality in their pets. For the current study, the main reason why clients bring their pets to the UPVTH, *i.e.* chief complaint upon presentation, was noted in 50 cases (Table 1). These include the presence of abnormal growth in the genitals (23/59) or the skin (8/59), presence of bloody or purulent genital discharge (27/59) and paraphimosis (1/59).

Table 1. Frequency distribution of chief complaints (n=59) of clients in dogs (n=50) diagnosed to have canine transmissible venereal tumor (TVT) cases at the University of the Philippines Veterinary Teaching Hospital-Los Baños (July 2002 -July 2011).

Chief complaint	Number of cases
Presence of abnormal growth in the genitals	23
Presence of abnormal growth In the skin	8
Presence of genital discharge	27
Paraphimosis	1
Total	59

Abnormal growth anywhere in the external body is usually a concern for pet owners. This is especially true when the venereal tumor protrudes from its point of attachment and not hidden by the prepuce or vulva. The growth seen varied in size from a small 3-cm to large palm-sized multi-lobulated mass that may be pedunculated or broad-based. The tumor growths were well circumscribed (Figure 2), unencapsulated, friable and bleed easily with slight manipulation (Figure 3), similar to the description of Ogilvie and Moore (1995).

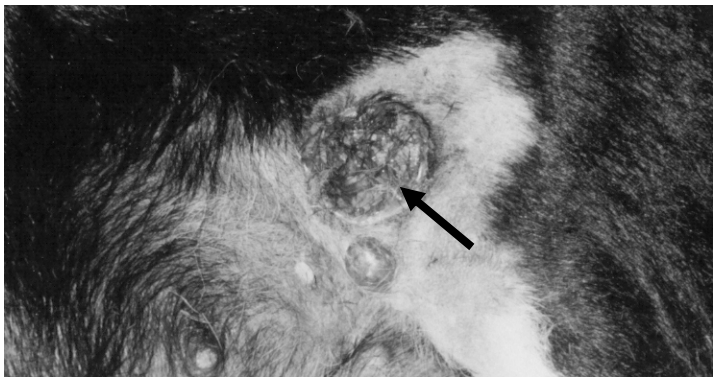

Figure 2. Transmissible venereal tumor lesion (arrow) on the skin of the left flank of a 6-year old female mixed breed dog. The lesion is round, well-circumscribed, raised above the surface, ulcerated and approximately 3.5 cm in diameter.

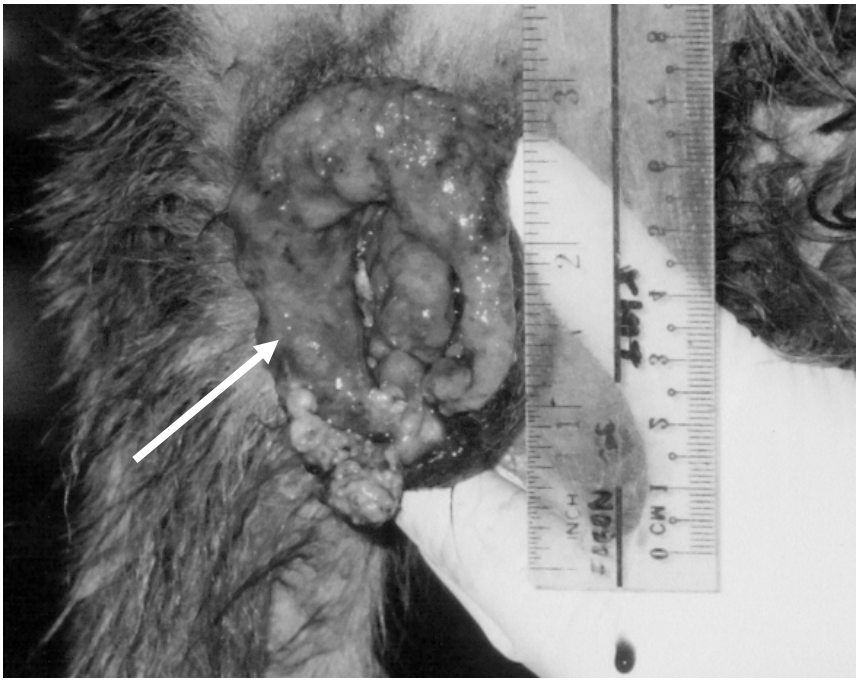

Figure 3. Transmissible venereal tumor lesion (arrow) on the vulvovagina of a 4-year old female mixed breed dog. The lesion is large (approximately 7 cm), multi-lobulated, broad-based, unencapsulated, and friable.

When the tumor is hidden, the case is usually presented with genital discharge that needs further clinical examination, usually via digital palpation (if female) or organ exposure (if male, Figure 4) to find the tumorous growth. One such case, as reported by the pet owner, was diagnosed as urinary tract infection (UTI) by the previous attending veterinarian from another hospital. Antibiotic prescription led to temporary cessation of the discharge only to resume again after a day or two. After two more repetitions of the same treatment, the owner decided to seek a second opinion with the VTH, CVM, UPLB where the TVT was diagnosed and appropriately treated. Batamuzi and Kristensen (1996) found that TVT is a predisposing factor for the development of UTI, due to the obliteration of the urethral orifice by the tumor that led to urine retention and consequently bacteriuria. The former may also explain the one case in this study, presented with dysuria.

In another case, a dog was presented with paraphimosis. The dog was sexually excited due to a bitch in heat in the neighborhood. The penis naturally protruded without difficulty, but the cauliflower-like tumor located in the penile shaft made the preputial opening relatively small; thus, there was a subsequent non-return of the penis into the prepuce.

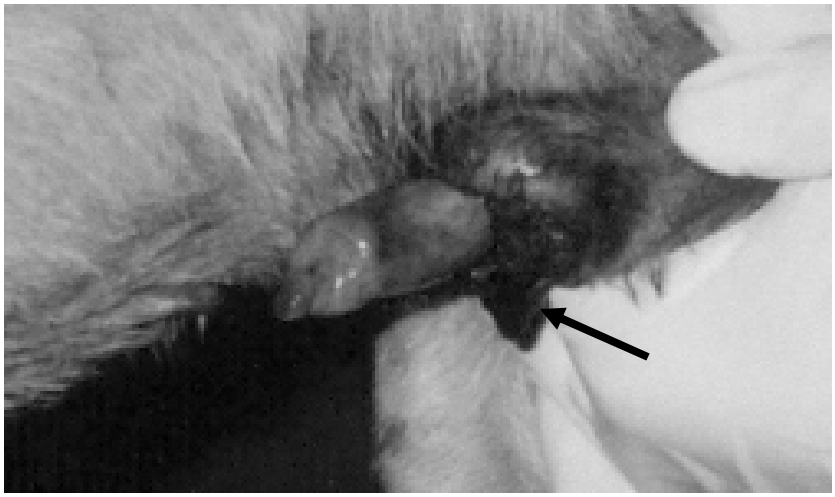

Figure 4. Transmissible venereal tumor lesion found on the ventral part of the penile shaft (arrow) of a 5-year old male Basset Hound. The lesion is exposed only when the organ is protruded.

Interestingly, half of the cases were mixed breed while the other half were pure breeds (Table 2). All were sexually intact at the time of presentation and diagnosis. Simoni and Knoll (2008) observed that intact dogs with access to the outdoors and stray animals are more likely to acquire the tumor.

Table 2. Frequency distribution of breeds of dogs (n=50) diagnosed to have canine transmissible venereal tumor (TVT) at the University of the Philippines Veterinary Teaching Hospital-Los Baños (July 2002-July 2011).

Breed	Number of cases
Mixed breed	25
German Shepherd	6
Boxer	5
Dalmatian	3
Labrador Retriever	3
Basset Hound	2
Japanese Spitz	2
Dachshund	1
English Bulldog	1
Golden Retriever	1
Samoyed	1
Total	50

The most number of cases occurred in dogs aged 3 years old, the age at which sexual activity is highest (Table 3). Other studies (Ayyapan *et al.*, 1994; Pandey *et al.*, 1989; Brown, 1980) also placed the age of affected dogs at this age group and most authors agree that affected canines were sexually active, except for two cases of pre-pubertal sexually immature dogs with TVT lesions found extra-genitally (Rogers, 1997). These cases suggest that the TVT cells can be inoculated into the puppy skin by the dam during social interactions such as grooming and mothering behavior; or through sniffing and occasional contacts during play.

Table 3. Frequency distribution of age and gender of dogs (n=50) diagnosed to have canine transmissible venereal tumor (TVT) at the University of the Philippines Veterinary Teaching Hospital-Los Baños (July 2002-July 2011).

Age (years)	Male	Female	Total
<1	0	0	0
1	3	2	5
2	5	4	9
3	5	6	11
4	0	5	5
5	0	5	5
6	0	2	2
7	0	4	4
8	1	4	5
No data	3	1	4
Total	17	33	50

It was noted that females were affected more than the males (33/50 vs. 17/50) (Table 3). This concurred with the results of other researchers (Ogilvie and Moore, 1995; Theilen and Madewell, 1979; Mohan *et al.*, 1994; Ganodtra *et al.*, 1993; Das *et al.*, 1990), although still other authors noted that there is no sex predilection (Pandey *et al.*, 1989). The 1 male:n female ratio, plus the male territoriality within a locality may explain this increased number of cases in females. Thus, with one male dog affected, the possibility of affecting the rest of the female canine population within that locality increases as mating may occur between that one male to several female dogs.

In the females, the lesions were observed in the vagina (18/33), vulvovagina (5/33), vulva (7/33) and skin away from the reproductive organs (5/33) (Table 4). In the males, they were found in the penis (11/17), prepuce (3/17) and skin away from the reproductive organs (3/17). Lesions on the skin that are away from the reproductive organs were found on the dorsum, left flank, forehead, and adjacent to the lower lip.

Table 4. Frequency distribution of anatomical location of canine transmissible venereal tumor (TVT) lesions (n=50) presented at the University of the Philippines Veterinary Teaching Hospital-Los Baños (July 2002-July 2011).

Anatomical location of lesion	Number
Female (n=33):	
Vagina	18
Vulva	7
Vulvovagina	5
Skin, away from reproductive organ	5
Male (n=17):	
Penis	11
Prepuce	3
Skin, away from reproductive organ	3
Total	52

Rogers (1997) reported that the most common sites for the tumor is in the posterior part of the vagina and the junction of the vestibule and vagina in the female dog, and the caudal part of the penis and glans penis of the male dog. Several authors have documented the occurrence of TVT lesions in the oral cavity and/or skin and/or subcutis, with or without the genital form (Theilen and Madewell , 1979; Dhaliwal *et al.*, 1998; Rogers *et al.*, 1998). Theilen and Madewell (1979) further described the skin lesion as well-circumscribed, 2-5 cm, raised above the surface, donut-shaped and the non-ulcerated portion has yellowish-white homogenous mass, surrounded by red or brown peripheral zone. This is the same description of the lesion found in the skin reviewed in the present study. Social behavior of licking and scratching could explain these cases of extra-genital TVT (Papazoglou *et al.*, 2001).

Cytologic examinations of the impression smears from both the oral cavity and skin presented have the same cytologic characteristics with that from the genital lesions, suggesting that extra-genital lesions could easily be diagnosed by the same simple microscopical examination.

CONCLUSION AND RECOMMENDATIONS

This study showed that transmissible venereal tumor is most common in 3-year old intact female dogs that may be pure or mixed breed. The dogs are usually presented for veterinary attention due to abnormal growth and/or genital discharge. Lesions are most commonly found in the vulvovagina and penis.

It is recommended that dogs must be presented by owners and breeders for annual examination. Also, veterinarians must include examination for TVT, including extrusion of penis and digital palpation of the vagina for any growths that may be suggestive of the disease. Stray dogs suspected to have TVT should be impounded for treatment to prevent the spread of the disease. Neutering of these dogs may also be beneficial to decrease the sexual activity among dogs in the locality, thus, further preventing the spread of the disease. For those owners with dogs diagnosed with TVT, client education should be highlighted for better compliance (return visit for treatment) and elimination of the tumor from the locality.

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