

Subcutaneous filariasis: Cytopathology of *Dirofilaria repens* associated neoplastic alterations in a Chippiparai dog

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ABSTRACT

A Chippiparai female dog of five years old was presented with nodular swellings in neck and leg at Veterinary Clinical Complex, Veterinary College and Research Institute, Tirunelveli. Grossly, slightly raised, firm masses were found subcutaneously over the neck, ear base, shoulder and leg. Fine-needle aspiration biopsy was performed from individual masses and examined microscopically. Cytological smears were composed of bloody background with clusters of epithelial cells and multiple filiform-shaped microfilaria. Morphology of microfilaria were identified as L1 of *Dirofilaria repens* whereas cellular clusters were identified as sebaceous adenoma. The present study records the incidence of subcutaneous filariasis in a Chippiparai dog with neoplastic changes in associated tissues.

Keywords: *Dirofilaria repens*, Dog, Microfilaria, Neoplasm, Subcutaneous nodule

Filariasis is a vector-borne disease caused by spirurid nematode of genus *Dirofilaria* spp. under the family *Onchocercidae*¹. It is composed of five nematode species includes, *D. immitis*, *D. repens*, *D. tenuis*, *D. ursi* and *D. striata* affecting dogs, raccoons, bears and wild felids and rarely humans². Culicine mosquitoes are the vectors, transmitting the disease causing microfilaria between the hosts. Among these, *D. immitis* is a most common filarid pathogen in dogs occupying heart/pulmonary arteries and causing the 'heartworm disease'³. Meanwhile, *D. repens* (Railliet & Henry, 1911) is the second most common filarid nematode causing subcutaneous nodules in dogs and occasionally in human beings. The nodular lesions induced by *D. repens* may resemble neoplastic lesions⁴. Evidence of inflammatory cells in cytology and histopathology of subcutaneous nodules indicates as inflammatory nodule by *D. repens*^{4,5}. Conversely, the present study describes the subcutaneous dirofilariasis by *D. repens* that was associated with sebaceous adenoma in Chippiparai dog.

A five year-old female Chippiparai dog was presented to Veterinary Clinical Complex, Veterinary College and Research Institute, Tirunelveli with the history of swelling over the face, neck and legs since two weeks. On physical examination the animal was dull and had slightly firm, wart-like, raised subcutaneous masses over the left ventral neck, base of the ear and the shoulder and leg region measuring 1x1 to 1.5 cm. Whole blood was collected and analyzed for routine hematology using an automated hematology analyzer Mindray VetBC 2800 cell counter. Fine needle aspiration biopsy (FNAB) was collected from masses of different location and processed for standard Leishman's staining protocol. Stained slides were examined under Nikon ES 200 microscope and images were analysed with VImage software.

Cytological examination of fine-needle aspiration biopsy (FNAB)

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smears revealed a background of smudged erythrocytes with clusters of epithelial cells and numerous microfilariae.

Epithelial cell clusters revealed nearly uniform cells exhibiting clear, complete cohesion. Cells were occasionally arranged as rosette (acini-like) pattern (Fig. 1). Cells had abundant cytoplasm containing discrete fine and coarse vacuoles. Cytoplasmic vacuoles were rarely single and distinct (Fig. 2) and mostly multiple, fine indistinct (foamy) structures (Fig. 3) contributing high cytoplasmic to nuclear ratio. Nuclei were large, vesicular and composed of coarse chromatin and inconspicuous

nucleolus (Fig. 4). Rarely, the cells were enlarged, showing coarse cytoplasmic vacuolation (Fig. 5) and binucleation (Fig. 6). Multinucleated giant cells were also observed. The cellular characteristics are suggestive of sebaceous adenoma.

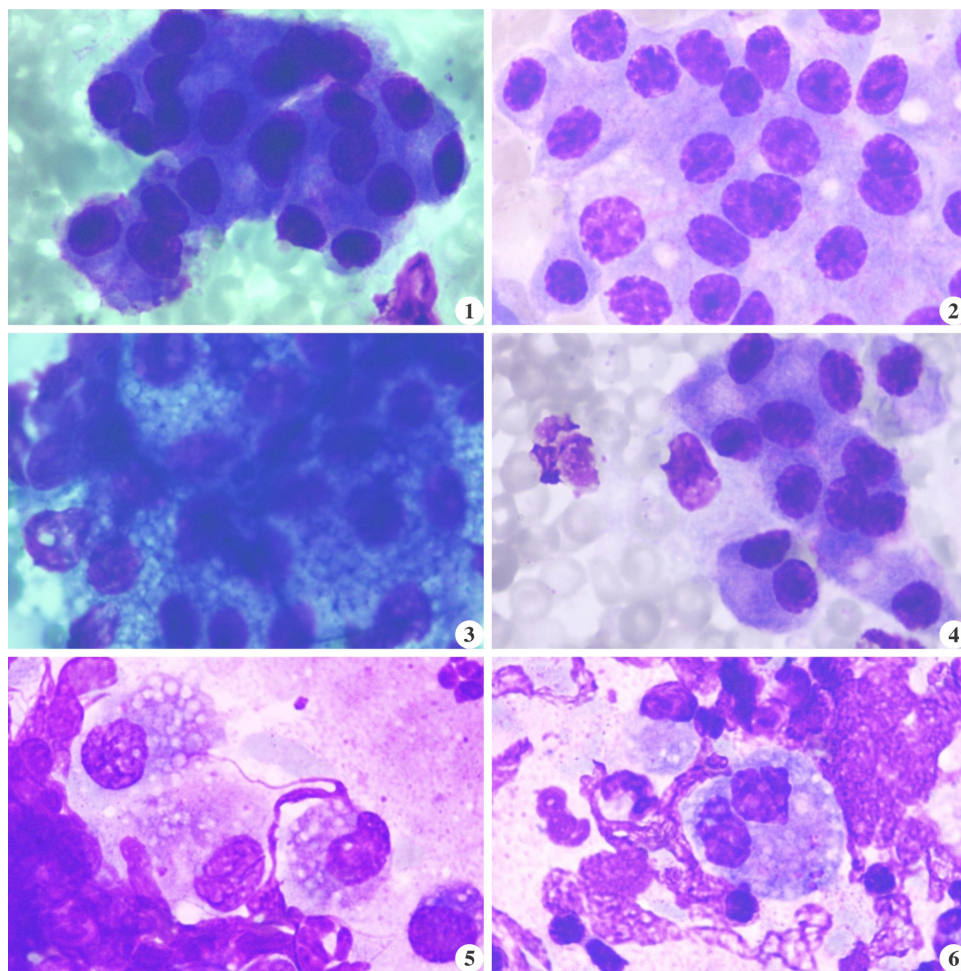
The epithelial clusters were intermingled with numerous filiform microfilaria (Fig. 7). Microfilaria were elongated, long and slender and had tapering end. They were unsheathed and showed distinct transverse cuticular striations. The body contained somatic nuclei that extended along the entire length, except at the tail tip. Cephalic end of the microfilaria was blunt and rounded. The cephalic end was blunt and rounded, with a short, clear cephalic space containing two to three prominent nuclei, which were anterior to and slightly separated from the first somatic nuclei (Fig. 8). The anterior region showed a distinct nerve ring and excretory pore, while the posterior region contained genital cells and an anal pore (Fig. 9). Body tapers and slightly curved like-a-hook (Fig. 10), ends sharply with a whip-like tail without nucleus (anucleate tail tip). The measurement of microfilaria was showed an average length of 360 μm (range 354–372 μm) and an average diameter of 8.4 μm (range 7.2–9.2 μm). The morphology and morphometric analysis of microfilaria were

consistent with *D. repens*⁶.

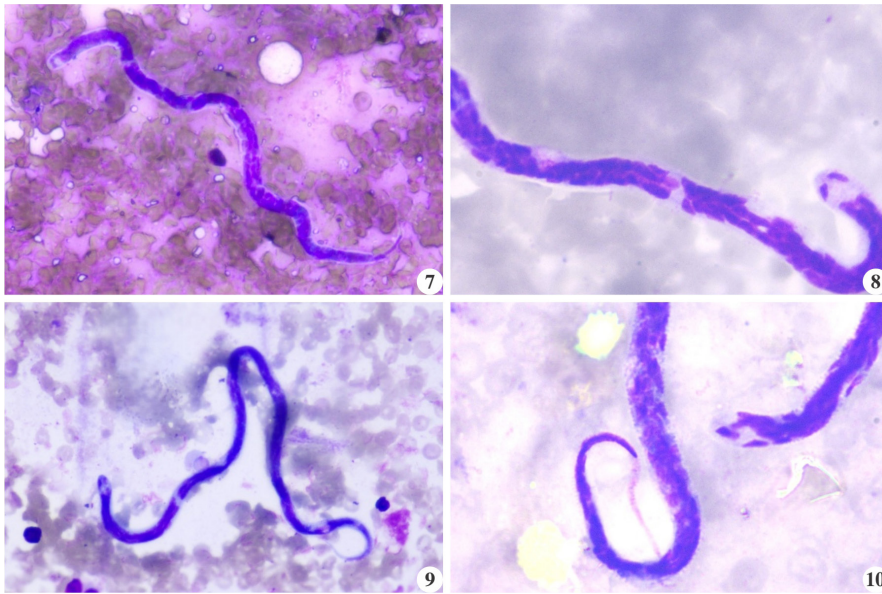
Filariasis is a mosquito-borne disease of carnivores⁷. *D. immitis* is the most common species infecting dogs, followed by *D. repens*. *D. repens* infects dogs, cats, and occasionally humans⁵. Infection occurs when female mosquitoes transmit infective third-stage (L3) larvae to the host. Migratory L1 larvae mature in the subcutaneous tissue and initiate various clinical conditions such as skin nodules, pruritus, alopecia, itching, and asthenia⁴. These parasites often migrate within the subcutaneous tissue, resulting in soft nodular swellings of variable inflammatory response throughout the body⁸. Rarely, they have been reported to induce inflammatory and painful nodules in distant areas such as the scrotum⁹. Occasionally, dead worms in the subcutaneous tissue may trigger a granulomatous reaction with fibrous encapsulation. Furthermore, *D. repens* has been reported to localize in the ocular conjunctiva, body cavity and mesentery, leading to inflammatory exudation¹⁰. Some of these lesions may develop into abscesses¹.

Human dirofilariasis caused by *D. repens* has been reported in dog-mosquito endemic areas due to the bite of infected mosquitoes¹¹. After deposition, wandering subcutaneous microfilariae mature and form nodules in the upper body regions, subconjunctival tissues of the eyes and rarely in the lungs, omentum, epididymis, spermatic cord and breast^{11,12}.

Dirofilarial reactive nodules in the subcutaneous tissue or other organs often



Subcutaneous filariasis and associated neoplastic alteration in Chippiparai dog. Fig. 1. Epithelial cell cluster with acinar arrangements – Sebaceous adenoma, Leishman stain x100; Fig. 2. Epithelial cell cluster with cytoplasmic vacuolation – Sebaceous adenoma, Leishman stain x400; Fig. 3. Epithelial cell cluster with fine cytoplasmic vacuolation – Sebaceous adenoma, Leishman stain x400; Fig. 4. Epithelial cell cluster with binucleation – Sebaceous adenoma, Leishman stain x100; Fig. 5. Individual cells with foamy cytoplasmic vacuolation – Sebaceous adenoma, Leishman stain x400; Fig. 6. Giant cell with binucleation and foamy cytoplasmic vacuolation – Sebaceous adenoma, Leishman stain x400.



Subcutaneous filariasis and associated neoplastic alteration in Chippiparai dog. Fig. 7. Filiform microfilaria of *D. repens*, Leishman stain x100; Fig. 8. Blunt, round cephalic end with two prominent nuclei – *D. repens*, Leishman stain x400; Fig. 9. Microfilaria showing nerve rings, excretory pore and anal pore – *D. repens*, Leishman stain x100; Fig. 10. Hook-like tail and anucleate tail tip – *D. repens*, Leishman stain x400.

appear ill-defined, raising suspicion of malignancy such as incipient sarcoma or carcinoma^{12,13}. In some instances, they mimic benign neoplastic lesions and are frequently confused with cutaneous epidermoid cysts, fibromas¹⁴, melanoma¹⁵, or pleural carcinomatosis⁸. Confirmation is usually based on cytology and histopathology. The presence of neutrophils, eosinophils, and scattered macrophages along with entire or fragmented microfilariae in cytology is regarded as indicative of inflammatory nodules¹⁶. Affected individuals may show elevated leukocyte counts, particularly eosinophils^{1,9,17}. In a human case, eosinophils accounted for more than 48% of the differential leukocyte count¹⁸. However, eosinophilia may be mild⁸ or even absent in some documented cases⁵. Histopathological analysis of these lesions has revealed multifocal purulent dermatitis, panniculitis, hyperpigmentation, and hyperkeratosis⁴. Eosinophilic necrotizing granulomatous or pyogranulomatous inflammation is the predominant histological lesion in most cases^{5,19}.

To date, studies on subcutaneous nodular masses in dogs and humans have suggested that these lesions represent host inflammatory reactions composed of inflammatory cells and exudates, as evidenced in cytological and histopathological findings¹⁸. The pathological changes are mostly associated with the migration of microfilariae and adult *D. repens*. The presence of the endosymbiotic bacterium *Wolbachia pipientis*, located in the hypodermal cords and germline of *D. repens*, has also been proposed to contribute to inflammatory tissue reactions by enhancing chemo-attraction through the release of the pro-inflammatory cytokine IL-8 at sites of parasitic migration²⁰.

The findings of the present study differ from the typical description of host inflammatory reactions. The smears revealed well-defined epithelial cell morphology with relatively uniform cellular clusters, abundant cytoplasm with distinct vacuolation, large nuclei, and rare mitotic figures. Additionally, some cellular groups exhibiting pleomorphism, clear and irregular cytoplasmic vacuolations, and occasional binucleation. Cytological

evaluation of the biopsied masses was suggestive of sebaceous adenoma. Furthermore, the scarcity or absence of inflammatory cells in the biopsy specimens, along with evidence of a normal haemogram, suggests that the tissue masses were non-inflammatory in nature.

The role of microfilariae as the primary cause of sebaceous adenoma in the present Chippiparai dog remains speculative. However, the presence of multiple microfilariae in and around the biopsy cellular clusters suggests that the neoplastic changes might have resulted from irritation caused by migrating microfilariae and/or secretory products of adult *D. repens*. Although this remains hypothetical, associations between filarial nematodes and neoplastic changes have previously been reported with lymphoma²¹, ovarian cystadenoma²², and plasma cell myeloma²³ in humans. In most cases, microfilariae were incidentally detected during cytological examination^{10,24}. Although often considered a chance association, some authors have suggested that microfilariae may play a role in tumorigenesis. In light of these reports, the authors speculate that the neoplastic changes observed in the present study may be associated with microfilarial infection. However, this hypothesis requires confirmation through excisional biopsy and detailed histopathological examination of the lesions. A limitation of the present study is that histopathology of the nodules was not performed, as the diagnosis was based only on FNAB and treatment was directed toward filariasis. Surgical removal of the subcutaneous masses was not undertaken because the patient was not presented for further follow-up.

The present study reports the microfilariasis of *D. repens* in Chippiparai dog causing subcutaneous nodules at various part of the body. Cytological evidence of

neoplastic alterations in subcutaneous nodules, along with the presence of microfilariae, raises suspicion that *D. repens* may be associated with tumorigenesis at the site of localization.

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REFERENCES

- Schatz C, Fuhr M, Caf Y, Schmitz K, Kresse D, Ludwig W, Walochnik J, Knabl L. 2025. A rare case report of a human *Dirofilaria repens* infection. *Microorganisms* **13**: 476.
- Adebayo OO, Akande FA, Adenubi OT. 2020. Canine dirofilariasis: A case report and review of the literature. *Folia Veterinaria* **64**(3): 75-81.
- Savic S, Stosic MZ, Marcic D, Hernandez I, Potkonjak A, Ota-sevic S, Ruzic M, Morchón R. 2020. Seroepidemiological study of canine and human dirofilariasis in the endemic region of Northern Serbia. *Front Vet Sci* **7**: 571.
- Albanese F, Abramo F, Braglia C, Caporali C, Venco L, Vercelli A, Ghibaud G, Leone F, Carrani F, Giannelli A, Otranto D. 2013. Nodular lesions due to infestation by *Dirofilaria repens* in dogs from Italy. *Vet Dermatol* **24**(2): 255-e56.
- Chisthi MM and Reghukumar A. 2015. Dirofilarial worms inside cutaneous nodules: A report with review of literature. *Int J Res Dermatol* **1**: 24-27.
- Liotta JL, Sandhu GK, Rishniw M, Bowman DD. 2013. Differentiation of the Microfilariae of *Dirofilaria immitis* and *Dirofilaria repens* in stained blood films. *J Parasitol* **99**(3): 421-425.
- Capelli G, Genchi C, Baneth G, Bourdeau P, Brianti E, Cardoso L, Danesi P, Fuehrer HP, Giannelli A, Ionica AM, Maia C. 2018. Recent advances on *Dirofilaria repens* in dogs and humans in Europe. *Parasit Vectors* **11**(1): 663.
- Biasizzo H, Soba B, Ilovski F, Harlander M, Lukin M, Blatnik O, Turel M, Srpcic M, Kern I, Beovic B. 2022. Severe and rare case of human *Dirofilaria repens* infection with pleural and subcutaneous manifestations, Slovenia. *Emerg Infect Dis* **28**(12): 2504.
- Barlozzari G, Felice T, Salvato L, Conti R, De Liberato C, Furzi F, Gabrielli S, Scarpulla M. 2021. Usual or unusual presentations of *Dirofilaria repens* in two sibling dogs: a case report. *Parasitol Res* **120**: 109-115.
- Pazdzior-Czapula K, Otrocka-Domagala I, Myrdek P, Mikiewicz M, Gesek M. 2018. *Dirofilaria repens* - An etiological factor or an incidental finding in cytologic and histopathologic biopsies from dogs. *Vet Clin Pathol* **47**(2): 307-311.
- Pampiglione S, Rivasi F, Angeli G, Boldorini R, Incensati RM, Pastormerlo M, Pavesi M, Ramponi A. 2001. Dirofilariasis due to *Dirofilaria repens* in Italy, an emergent zoonosis: report of 60 new cases. *Histopathol* **38**: 344-354.
- Bezic J, Vrbic B, Guberina P, Alfier V, Projic P, Marovic Z. 2006. DIAGNOSIS: Subcutaneous breast nodule due to *Dirofilaria repens* infestation. *Annals of Saudi Medicine* **26**(5): 414-416.
- Frouge C, Vanel D, Tristant H. 1992. Dirofilariasis of the breast mimicking carcinoma on mammography. *Am J Roentgenol* **159**: 220-221.
- Manzocchi S, Lendner M, Piseddu E, Sebastiani V, Morabito S, Daugschies A, Pantchev N. 2017. Nodular presentation of *Dirofilaria repens* infection in a cat mimicking a fibrosarcoma. *Vet Clin Pathol* **46**(1):158-163.
- Oliva A, Gabrielli S, Pernazza A, Pagini A, Daralioti T, Mantovani S, Mattiucci S, D' Amati G, Mastroianni CM. 2019. *Dirofilaria repens* infection mimicking lung melanoma metastasis. *Open Forum Infect Dis* **6**(3): ofz049.
- Dzimira, S and Przemyslaw P. 2020. Cytological diagnostics of subcutaneous dirofilariasis imitating proliferative lesions in dogs. *Veterinarni Medicina* **65**(12): 537-542.
- Wysmolek ME, Dobrzynski A, Dlugosz E, Czopowicz M, Wisniewski M, Jurka P, Klockiewicz M. 2020. Hematological and biochemical changes in dogs naturally infected with *Dirofilaria repens*. *Front Vet Sci* **7**: 590.
- Pupic-Bakrac, A, Pupic-Bakrac, J, Beck, A, Jurkovic, D, Polkinghorne A, Beck, R. 2021. *Dirofilaria repens* microfilaremia in humans: Case description and literature review. *One Health* **13**: 100306.
- Giudice E, Di Pietro S, Gaglio G, Di Giacomo L, Bazzano M, Mazzullo G. 2014. Adult of *Dirofilaria repens* in a dog with recurrent multiple subcutaneous nodular lesions. *Parasitol Res* **113**: 711-716.
- Bazzocchi C, Genchi C, Paltrinieri S, Lecchi C, Mortarino M, Bandi C. 2003. Immunological role of the endosymbionts of *Dirofilaria immitis*: the Wolbachia surface protein activates canine neutrophils with production of IL-8. *Vet Parasitol* **117**: 73-83.
- Jamal I, Raman RB, Choudhary VN. 2020. Chronic lymphocytic leukaemia with microfilaria: A rare coincidence with review of literature. *Indian J Pathol Oncol* **7**(3): 483-485.
- Vasantham V, Yadav SK, Sarin N, Singh S, Pruthi SK. 2020. Incidental detection of microfilaria in cyst fluid of mucinous cystadenocarcinoma of ovary: A rare case report. *Int J Surg Case Rep* **70**: 56-59.
- Kolte S and Mane P. 2015. Microfilaria of *Wuchereria bancrofti* in plasma cell myeloma: A case report. *J Vector Borne Dis* **52**(4): 342-343.
- Gupta S, Sodhani P, Jain S, Kumar N. 2001. Microfilariae in association with neoplastic lesions: Report of five cases. *Cytopathology* **12**(2):120-126.