Pathological and Microbiological Diagnosis of Cutaneous Blastomycosis in a Four Months Old Dog in Zambia

John Yabe[1,2]*, Caesar Luswili[2], Bernard Hang'ombe[1], Katendi Changula[1], Daniel Ndambasia[1], Mutinta Mweemba-Muwowo[1], Maron Mubanga[1], Evans Mulenga[1]

[1] **School of Veterinary Medicine, University of Namibia, Windhoek, Namibia**

[2] **School of Veterinary Medicine, The University of Zambia, Lusaka, Zambia**

[3] **Cornerstone Veterinary Clinic, Plot 11086. Great North Road, Emmasdale, Lusaka**

Corresponding Authors:
Dr. John Yabe, The University of Namibia, School of Veterinary Medicine
P/B 13188. Windhoek, Namibia
Tel: +264-61-206-4001
Email address: mjyabe@yahoo.co.uk

DOI: *https://doi.org/10.53974/unza.jabs.5.4.755*

Abstract

Background: Blastomycosis is usually a systemic fungal disease, most commonly diagnosed in dogs and humans. Cutaneous involvement primarily results from hematogenous spread, but in rare cases, direct inoculation can occur.

Case presentation: The current report describes a case of a four month old male dog presented with cutaneous lesions caused by *Blastomyces dermatitidis* without pulmonary or disseminated disease. Diagnosis was achieved through histopathology and culture. Surgical debulking associated with systemic therapy with oral itraconazole resulted in significant remission of the lesion.

Conclusions: To the authors' knowledge, this is the first case of cutaneous blastomycosis reported in an animal in Zambia, which was successfully treated using oral itraconazole. Accurate diagnosis and treatment of the disease in dogs is of public health importance as canine blastomycosis can be a presage of the disease in humans.

Keywords: *Blastomyces Dermatitidis*, Cutaneous, Dog, Zambia

Background

Blastomycosis is usually a systemic fungal disease that can result in severe disease and death in humans [1] and dogs [2]. The disease has also been reported in other animals [3, 4]. Blastomycosis is caused by *Blastomyces dermatitidis*, which is a thermally dimorphic fungus existing in mycelial and yeast forms. The infectious form in the environment is the mycelial phase and typical cases of blastomycosis are acquired by inhalation of aerosolized conidia into the lungs [5]. Disease transmission is common in areas of moist soil, especially near construction sites where soil disruption promotes aerosolization of conidia [6]. Cases of cutaneous blastomycosis usually originate from a pulmonary site after hematogenous dissemination. The

cutaneous manifestations of blastomycosis can be verrucous, deep pyogranulomatous masses or ulcerative and exudative [7]. Direct inoculation of the fungus via skin puncture wounds is rare [8].

The incubation period for cutaneous inoculation blastomycosis is 2 weeks whereas that for disease caused by pulmonary exposure takes about 45 days or longer [9]. Disease confirmation mainly involves cytological examination of impression smears, culture or histopathological examination of tissues [10]. Within the host's body, blastomyces appears as broad-based budding yeast with thick, double-contoured bodies and granular basophilic internal structures [11]. The disease is endemic in some regions of North America, India, Africa and Canada [12]. In Africa, confirmed cases of blastomycosis have mainly been reported in humans [13, 14]. Information about blastomycosis in Zambia is rare as only two human cases of the disease, which were not confirmed by laboratory culture, have been reported [15]. According to our knowledge, reports of the disease in animals in Africa are scarce. Therefore, the current study is the first report of cutaneous blastomycosis in an animal in Zambia.

Case Presentation

A four months old male Boerboel dog was first presented to a private veterinary clinic in Lusaka with a two months history of subcutaneous swelling on the left flank caudal to the scapula. The swelling started as a local pin-point nodule under the skin, at the age of two months, and was presented to the clinic two months later after the swelling had progressed. The puppy did not show additional clinical signs at home and other dogs in the premises were not affected.

On clinical examination at the veterinary clinic, there was a subcutaneous swelling of about 3 by 2 cm on the dorsal aspect of the left flank. The swelling, which was suspected to be a tumor was tender, multinodular and mobile with intact overlying skin. Except for the local cutaneous findings, systemic evaluation was non-productive. Surgical exploration of the swelling revealed a creamy, gelatinous and multinodular subcutaneous mass, which was removed. The dog was treated with 125mg amoxicillin + clavulanic acid for seven days but the swelling rapidly relapsed, enlarged to about 4 by 3 cm and became ulcerated as shown in Figure. 1a. A complete surgical removal of the mass including surrounding adipose tissue was done and submitted to the University of Zambia, School of Veterinary Medicine for laboratory diagnosis (Fig. 1b).

Samples of the subcutaneous lesion were fixed in 10 per cent buffered formalin, routinely processed and stained with haematoxylin and eosin for histopathology. Microscopic examination revealed a pyogranulomatous lesion with massive areas of necrosis, hemorrhages and infiltration of inflammatory cells predominated by macrophages. Other inflammatory cells included neutrophils, lymphocytes and plasma cells (Fig. 1c-d). In the core of the lesion, numerous round to oval yeast cells with thick, double refractile cell bodies and basophilic

granular central zones consistent with *B. dermatitidis* were present (Fig. 1e). Brownish melanin-like pigments were also seen.

Samples of the mass were also collected for culture. These were inoculated into brain-heart-infusion agar and onto a selective medium containing streptomycin and penicillin, to inhibit bacterial growth. On the third day after incubation at 36°C, smears were prepared and the growth of *B. dermatitidis* was apparent on gram stain. Microscopically, oval yeasts and occasional broad-based budding forms were visible (Fig. 1f). After diagnosis, the dog was successfully treated with oral itraconazole (100mg) for 21 days.

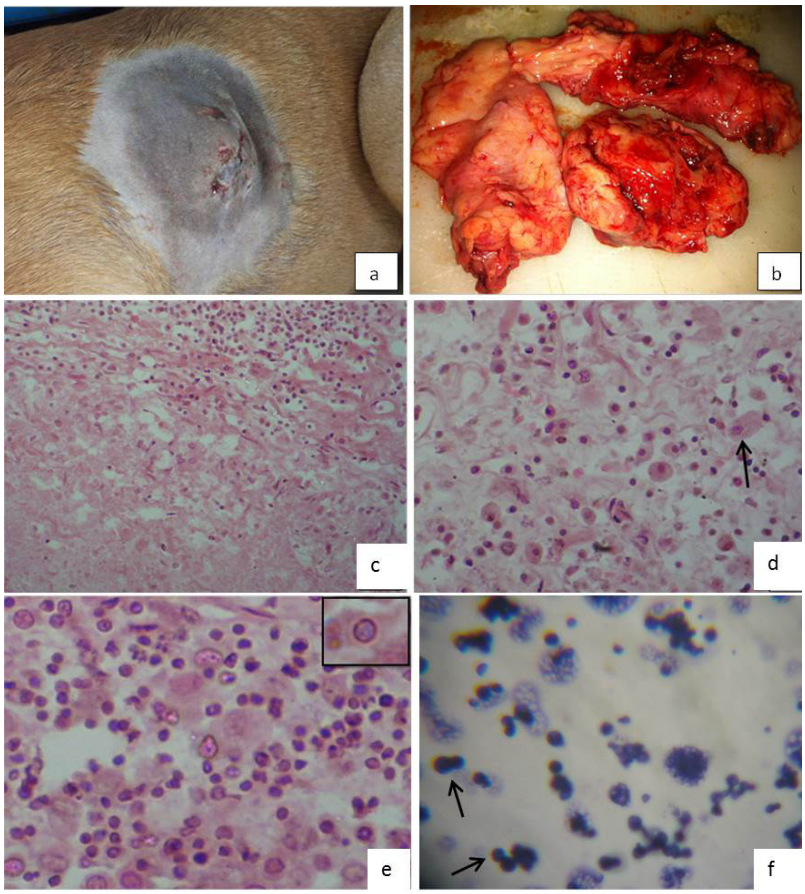

Fig. 1 Boerboel dog: **a -** relapsed subcutaneous swelling (4 x 3 cm) on the dorsal aspect of the left flank after first surgical excision; **b -** semi-soft mass with hemorrhagic and necrotic areas; **c -** subcutaneous mass with pyogranulomatous inflammation showing infiltrates of macrophages, neutrophils, lymphocytes and plasma cells with massive areas of necrosis and hemorrhages (H & E, x10); **d -** inflammatory cells predominated by macrophages (arrow). H & E x40; **e –** photomicrograph showing numerous round to oval yeast cells (arrows) with thick, refractile and double contoured cell bodies (insert) H & E x40; **f** - gram stain after fungal culture showing occasional broad-based budding yeast forms (arrows).

Discussion

We report a case of cutaneous blastomycosis in a four month old Boerboel dog in Lusaka, Zambia. Cutaneous blastomycosis is rare and can occur after direct inoculation of *B. dermatitidis* through a traumatic injury [8]. The diagnosis of cutaneous blastomycosis in the current case was based on identification of organisms from specimens of skin lesions by culture and histopathology. Systemic blastomycosis was ruled out based on the lack of evidence of systemic involvement (before, during and after presentation). The source of infection in the current case was not clear. However, the attending veterinarian suspected fungal exposure from soil at the site of needle puncture for vaccination two weeks before the pin-point skin lesion was seen. To the authors' knowledge, this is the first case of cutaneous blastomycosis reported in an animal in Zambia. As in the current study, the highest-risk group for blastomycosis in dogs consists of young dogs from large breeds [16].

Confirmatory diagnosis of blastomycosis is important for successful treatment, which depends on the tissues involved, the degree of dissemination, the condition of the patient and the treatment regimen. However, misdiagnoses and delayed diagnoses are common because blastomycosis may be mistaken for other diseases or tumors [1]. In the current study, the subcutaneous mass swelling relapsed after initial surgical resection and systemic antibiotic therapy. However, after disease confirmation, the dog was treated with itraconazole, which is the treatment of choice in dogs as it has a higher response rate, lower toxicity and relapse rates than other anti-fungal drugs [10]. Other treatments include amphotericin B although melanized *B. dermatitidis* yeast cells as seen on histopathological sections in the current case are less susceptible to amphotericin B, but not to itraconazole [17]. In dogs, the prognosis for full recovery is good except in cases with severe pulmonary involvement [2].

Confirmatory diagnosis of canine blastomycosis is also of public health importance. Although blastomycosis is not a zoonotic disease, canine blastomycosis can be a presage of the disease in humans. In an endemic region where six cases of human blastomycosis were reported in five households in Canada, it was observed that canine blastomycosis was diagnosed in at least one of their dogs, mostly, during six months before symptoms began in the human cases [18]. This could be attributed to disease outbreaks following exposure to a common outdoor source as documented in other studies [6, 19]. Cutaneous blastomycosis is also an occupational hazard, where cases of the disease have been reported in veterinary personnel following accidental laceration during necropsy, puncture with a needle containing an aspirate as well as via a dog bite [10]. Accidental inhalation of *B. dermatitidis* during microbial culture of infected material should also be avoided to prevent subsequent pulmonary blastomycosis, which may be fatal [7].

To the authors' knowledge, this is the first case of cutaneous blastomycosis reported in an animal in Zambia, which was successfully treated using oral itraconazole. Accurate diagnosis and

treatment of the disease in dogs is of public health importance as canine blastomycosis can be a presage of the disease in humans. Therefore, there is need for increased awareness of blastomycosis among medical and veterinary personnel, especially in regions where the disease is endemic. This is important due to the increasing populations of people at risk for disseminated endemic fungal infections, especially among the elderly and patients with AIDS.

Acknowledgements

We thank the staff at Cornerstone Veterinary Clinic, Lusaka, for their collaboration.

Competing Interests

The authors declare that they have no competing interests.

Funding

No financial disclosures.

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