History

A 5-year-old spayed female domestic shorthair cat was evaluated because of an 8-month history of an extensive, nonhealing, nodular, slowly spreading dermal lesion with multiple draining tracts in the inguinal region, which developed after a cat fight. Microscopic examination of multiple punch biopsy specimens of affected tissue obtained 3 months prior to referral revealed severe pyogranulomatous dermatitis and panniculitis with intraleional gram-positive bacilli. Acid-fast staining was not performed at that time. Bacterial culture of a swab specimen from 1 draining tract yielded *Burkholderia cepacia*. The cat received several courses of oral antimicrobial treatment before and after the biopsy procedure, which had no influence on local spread of the lesion. At the time of the referral evaluation, reduced appetite and weight loss were evident but were attributed to the antimicrobial treatments.

Clinical and Gross Findings

At the evaluation, the cat was bright and alert and weighed 3.0 kg (6.6 lb). The skin and subcutis in the inguinal region had locally severe, irregular, nodular to firm thickening over an area that measured approximately 8 X 5 X 3 cm. Draining tracts with mild serosanguineous to hemorrhagic discharge were present (Figure 1). The inguinal lesion was not freely movable, and the overlying skin was largely alopecic. Both poplitel lymph nodes were mildly enlarged. No other abnormalities were detected via physical examination. Punch biopsy specimens (8 mm in diameter) were obtained for histologic examination as well as for bacterial and fungal cultures.

Formulate differential diagnoses from the history, clinical findings, and Figure 1—then turn the page→
Histopathologic and Microbiological Findings

Punch biopsy specimens of the inguinal lesion were routinely processed and sectioned. Histologically, the deep dermis and subcutis were replaced and expanded by multinodular to coalescing areas of pyogranulomatous inflammation (Figure 2). The pyogranulomas were composed of epithelioid macrophages admixed with neutrophils, plasma cells (occasionally containing Russell bodies), and small lymphocytes. Foci of pyogranulomatous inflammation contained variably sized rounded clear zones (indicative of lipid accumulation; Figure 3) surrounded by a rim of neutrophils; these occasionally contained filamentous bacilli. The bacilli appeared red following modified Ziehl-Neelsen acid-fast staining (Figure 4). Hair follicles were atrophic, and numerous mast cells were present within the superficial dermis. The epidermis had mild orthokeratotic hyperkeratosis. Examination of Giemsa and Gomori methenamine silver-stained sections revealed no other bacteria or fungi. Microbiological cultures were performed from biopsy tissue, and a fast-growing mycobacterium with phenotypic characteristics of the Mycobacterium fortuitum group was cultured; aerobic culture also yielded light growth of Staphylococcus intermedius. Results of anaerobic and mycotic cultures were negative.

Morphologic Diagnosis

Severe, nodular, pyogranulomatous dermatitis and cellulitis with filamentous acid-fast bacteria (Mycobacterium sp) in an area of haired skin.

Comments

In the cat of this report, the filamentous acid-fast organism detected in specimens of the inguinal lesion was definitively identified as M. fortuitum via PCR analysis and amplicon sequencing. Mycobacteria are classified by their growth rate. The slow-growing mycobacteria include the tuberculosis species and Mycobacterium avium complex, whereas the rapidly growing mycobacteria include Ruynon Group IV organisms that grow on culture media in <7 days (also known as atypical mycobacteria). Mycobacterium fortuitum is classified in the latter group, and bacterial growth is usually apparent in culture in <3 days. This organism is ubiquitous in the environment, where it is found in soil, dust, rivers, lakes, tap water, and decaying vegetation with presumably worldwide distribution. Atypical mycobacterial infections in cats most commonly appear as skin lesions; however, such infections are uncommon in cats and reported less frequently for other species. Various atypical mycobacteria have been cultured from skin lesions of cats. Mycobacterium fortuitum and Mycobacterium chelonae are isolated most commonly, but Mycobacterium phlei, Mycobacterium smegmatis, Mycobacterium abscessus, Mycobacterium vaccae, Mycobacterium thermoresistible, and Mycobacterium xenopi also have been identified. Nonhealing skin wounds in cats that do not respond to surgical drainage or appropriate antimicrobial treatment warrant further diagnostic investigation, and
mycobacterial infection should be considered as a differential diagnosis. Cutaneous mycobacteriosis frequently forms multiple nodules in the dermis and subcutis with variable necrosis. In cats, common sites of lesion development include the dorsal aspect of the lumbosacral area, the ventral aspect of the abdomen, and the inguinal region. These are also the areas where bite wounds are frequently acquired. It is thought that atypical mycobacteria are introduced by a bite or via a puncture wound, and patients often have a history of trauma. It has been hypothesized that cats with atypical mycobacteriosis are immunocompromised, but most affected cats are negative for circulating FeLV antigen and anti-FIV antibody and have no medical history of treatment with corticosteroids. The cat of this report had a bite wound prior to development of the lesion; however, testing for FeLV antigen and anti-FIV antibody was not performed.

The proposed pathogenesis of *M. fortuitum* infection involves glycolipids in the bacterial cell wall. A lipid-rich environment activates virulent mycolic acids in the bacterial cell walls, resulting in granulomatous inflammation. Retrospective studies of cutaneous, rapidly progressing, mycobacterial infections in cats have included an overrepresentation of spayed females. Because spayed female cats are more likely to become obese, it has been hypothesized that fat deposits may serve as a potential growth medium. The predilection for bacterial proliferation in lipid-rich environments such as fat may also explain the tendency for mycobacterial infection to develop in the inguinal region and ventral aspect of the abdomen. In human patients and 1 cat with pneumonia caused by *M. fortuitum*, lipid pneumonia was present. An excessive amount of lipid also acts as a mechanical barrier to protect mycobacteria from phagocytic cells and antibodies.

Diagnosis of atypical cutaneous mycobacteriosis may be challenging. Although the clinical signs are often quite distinct, the infective mycobacterium may be difficult to culture, and repeated cultures may be necessary to yield a positive result. Ideally, the culture specimens should be derived from needle aspirates of affected tissue or exudate and not from superficial swabs of lesions. Histologic examination of specimens, including the use of modified Ziehl-Neelsen acid-fast staining, is essential for diagnosis. The acid-fast bacteria may be few in number and difficult to identify histologically; in those instances, other diagnoses, such as mycoses (including blastomycosis and sporotrichosis), sterile nodular panniculitis, nocardiosis, infection with other higher bacteria, and foreign body, would need to be considered.

Treatment of atypical mycobacteriosis usually includes radical surgical debridement followed by long-term treatment with concurrent administration of multiple antimicrobial agents. However, prognosis is guarded because treatment of cutaneous mycobacteriosis is often challenging, especially in cases of longstanding lesions. In a retrospective study of 10 cats with cutaneous mycobacteriosis, surgical debulking and long-term antimicrobial administration (median duration, 12 months) resulted in clinical resolution in only 5 cats. Although *M. fortuitum* is often susceptible to fluoroquinolones, gentamicin, doxycycline, and clarithromycin, a susceptibility profile should be done to identify the most effective combination of antimicrobials for each patient. In the cat of this report, the owner elected to pursue surgical treatment with the referring veterinarian. Because of the size of the lesion, it was planned to perform surgery in 2 phases; however, further medical or surgical treatment was declined after the first phase of surgery. Subsequently, the cat was lost to follow-up.

References