Mystery or *Mycobacterium*? Lessons learned from a challenging incision site infection

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**SUMMARY**

An eight-month-old female domestic short hair cat underwent routine ovariohysterectomy and was adopted from a shelter nine days later. A refractory infection associated with the abdominal incision site proved unresponsive to surgical debridement and multiple courses of oral antibiotic treatment over 10 weeks, resulting in relinquishment of the cat. Initial diagnostic test samples submitted by the shelter veterinarian failed to identify a causative agent for a deep pyogranulomatous dermatitis and panniculitis. The lesions resolved following treatment with oral pradofloxacin, and the cat was adopted but subsequently lost to follow-up. This case highlights the importance of generating a differential diagnoses list and outlines difficulties obtaining appropriate and timely diagnostic testing and treatment, especially in cases involving multiple practitioners and financial constraints. The report also emphasises how a challenging and potentially zoonotic infection might be overlooked and under-reported, specifically in low-income and shelter settings.

**BACKGROUND**

In an ideal clinical setting best practices are followed, especially with regard to diagnostic testing, treatment plans and postoperative follow-up. This is not always the case in many shelter settings, low-cost clinics and high-volume spay and neuter facilities where the relationship between client, patient and veterinarian is lacking. In addition, many pet owners as well as rescue and shelter organisations have limited access to veterinary care and face financial constraints, making diagnosis and treatment of disease difficult. Chronic infections can be particularly challenging when multiple treatment options fail prior to definitive diagnosis and the causative agents are potentially zoonotic or antibiotic-resistant.

Panniculitis is an uncommon inflammatory response of the subcutis. Eventually, the inflammatory response also affects the deep dermis, resulting in thickened lesions with draining tracts. Patients may be febrile and hyporexic in association with development of these deep skin lesions. One of several infectious organisms that can cause this response in cats is *Mycobacterium* species, an opportunistic cutaneous infection that is infrequently reported in the USA. Atypical mycobacteria (rapidly growing mycobacteria) implicated in skin disease are usually facultative pathogens found ubiquitously in the environment with varying prevalence worldwide. Infection in cats often follows trauma or wound contamination and adipose tissue, especially the inguinal fat pad, provides an environment favouring growth and protection from host immunity. Presentation often includes pyogranulomatous panniculitis with draining tracts that can combine to form non-healing ulcerative lesions.

Diagnosis of mycobacterial infections can be challenging; acid-fast staining is required for efficient microscopic detection, the bacteria can be difficult to culture and molecular methods may be expensive or unavailable. Furthermore, despite evidential appearance of skin lesions, the presentation may be unfamiliar to many veterinary practitioners. Initial lesions observed by the clinician may resemble those of a typical anaerobic cat bite abscess, delaying diagnosis and treatment. For these reasons, the disease may go unrecognised and improperly treated, especially in shelter settings or in the case of animals owned by people without affordable access to veterinary care, as was the case here. While skin infections from a variety of aerobic and non-aerobic pathogens can present similarly, mycobacterium (feline tuberculosis, feline leprosy syndrome and pathogenic, non-tuberculous mycobacterium) can be of zoonotic concern. Practitioners are advised to be alert to the distinct features of disease presentation, aware of the proper diagnostic approach and inherent diagnostic challenges and observe universal precautions.

The case presented here describes a patient with ongoing incision site complications most likely caused by an opportunistic organism not considered as a potential differential diagnosis. The patient’s symptoms had been poorly responsive to standard treatment, therefore additional diagnostic tests were performed, but with inconclusive results. While attempts were made to identify a cause, multiple opportunities for definitive diagnosis and treatment were missed. This case highlights the importance of an initial differential diagnoses list to rule in or rule out more common conditions, especially when presented with persistent and treatment-insensitive disease in otherwise healthy animals.

**CASE PRESENTATION**

An unowned eight-month-old female domestic short hair cat underwent routine ovariohysterectomy at a high-quality high-volume spay-neuter clinic. The cat was returned to the shelter following surgical recovery and was adopted nine days postoperatively without known complications. At the time of surgery, the cat was fully vaccinated (Fel-O-Vax++ Calicivax/Rabvax 3, Ingerheim, St Joseph, MO) and tested negative for feline leukaemia virus (FeLV).
and feline immunodeficiency virus (FIV) on a in-house blood test (IDEXX Laboratories, Westbrook, ME). One month later, the cat presented to a primary care veterinarian with a swollen incision open to the body wall, increased respiratory sounds and gingivitis, and rectal temperature was 39.5°C. The veterinarian administered 0.26 cm³ (8 mg/kg) cefovecin sodium (Convenia; Zoetis, Parsippany, NJ, USA) and discussed surgical debridement. One month later, the owner returned to the local veterinarian, at which time the skin at the incision site was described as thin, swollen and painful with purple discoloration and purulent discharge. A second FeLV/FIV SNAP test was negative and abdominal radiographs revealed no significant findings. The following day, the site was surgically debrided with wide margins. The body wall was intact and the patient prescribed 62.5 mg amoxicillin/clavulanic acid suspension, twice daily (Clavamox; Zoetis). Nine days later, the owner presented the cat with suture removal but fever (104.1) and symptoms of infection in the incision site persisted. In addition, the owner reported the cat had developed diarrhoea and soon thereafter relinquished the cat to the shelter due to financial constraints. Figure 1 shows the cat had developed diarrhea and soon thereafter relinquished to the shelter.

Figure 1 Non-healing ulcerative lesions on the ventral abdomen of the patient on relinquishment to the shelter.

Differential diagnosis

While panniculitis is an uncommon skin disease in cats, the differential diagnoses list for any patient with nodular or draining cutaneous lesions must include infectious causes, sterile inflammatory causes and neoplastic causes. Representative bacterial causes include both aerobic and anaerobic bacteria, such as *Actinomyces* species, *Actinobacillus lignieresii*, *Nocardia* species and *Mycobacterium* species. Fungal agents include *Sporothrix* species, *Pythium* species, * Blastomyces* species, *Cryptococcus* species, *Coccidioides* species, *Histoplasma* species and phaeohyphomycosis. This postoperative infection may also have been caused by one or more aetiological agents in tandem. While the site of infection, clinical presentation, progression of disease and response to treatment placed *Mycobacterium* species high on the differential list from the perspective of the consulting clinician, the primary shelter veterinarian did not obtain diagnostic samples necessary to rule in or rule out other differential diagnoses, resulting in failure to make a definitive diagnosis.

Treatment

Following readmittance to the shelter, the cat was sedated for vigorous lavage, blue light laser treatments at 1000 Hz for 10 minutes, MediHoney (Derma Sciences, Plainsboro, NJ, USA) wound wrap and prescribed 1.5 ml (15 mg/kg) oral clindamycin hydrochloride liquid (ClinDrops; Henry Schein Animal Health, Dublin, OH, USA) pending aerobic and anaerobic culture results. Five minutes of laser therapy daily along with oral antibiotic treatment was continued for three weeks. Figure 2 shows the ventral abdomen one week following initiation of treatment and figure 3 shows signs of early resolution seven days later. The following week, the skin lesions resolved, and the veterinarian discontinued antibiotic therapy. Within two days, a small (2 mm) ulcerative lesion reappeared and within one week following discontinuation of antibiotic treatment, a second draining lesion...
was noted at the site of the incision line (figure 4). A sterile culturette swab sample from a draining tract of a new lesion was submitted for aerobic culture and susceptibility testing as well as Gram and acid-fast staining, but no organisms were detected or isolated. While this type of sample is not suitable for culture, an impression smear from the draining tract might have been useful. Macerated tissue culture samples are preferred to rule out deep cutaneous infections caused by staphylococcal or pseudomonal bacteria, which are the most common pathogens. Treatment with pradofloxacin was initiated without further diagnostic testing, the patient’s lesions resolved completely and the cat was adopted back to the original owners with a 60-day supply of pradofloxacin and instructions to continue oral administration every 24 hours. Despite multiple attempts to obtain follow-up information, no further contact with the owner or patient has occurred.

DISCUSSION

Panniculitis is an uncommon skin disease in cats and therefore should prompt a thorough investigation by clinicians. Because panniculitis is an inflammatory response primarily affecting the subcutis, biopsies for histopathology and sterile tissue biopsy for culture and susceptibility testing should include nodules or draining tracts originating from subcutaneous fat. In cats, subcutaneous infection of the inguinal region following trauma (bite wounds, foreign body, surgery) with circumscribed plaques or nodules and non-healing, suppurating draining tracts is highly suggestive of mycobacterial panniculitis. Further, adipose tissue aids in pathogenesis, survival and growth by protecting
the organism from host immune response and making surgical excision ineffective. According to Greene and Gunn-Moore, cytology should be performed on exudates or fluids using Diff-Quik, Burke’s modification of the Gram stain and modified acid-fast procedure, and in the case of mycobacterial panniculitis, cytological diagnosis may require ‘an exhaustive search of several smears.’ While cutaneous mycobacterial infections arising from a variety of species have been definitively diagnosed and reported in cats, species identification is impossible in some cases and makes treatment and management difficult. Due to the sporadic nature of disease and because this organism often goes undiagnosed or misidentified, the impact of non-tuberculous mycobacteria on human and animal health is thought to be largely underestimated.

Ultimately a mycobacterial organism was strongly suspected as the causative agent; however, a pathogen was not identified nor was mycobacterial infection confirmed using diagnostic test results or treatment trial. The patient was treated with classes of antibiotics that also treat common cutaneous pathogens, making interpretation of a treatment trial challenging. If a methicillin-resistant Staphylococcus species (MRS) contributed to the original pathology, for example, the symptoms would not resolve with cephalosporin antibiotics initially prescribed for this patient. Clindamycin was subsequently administered, and the lesions were reported to improve; however, MRS isolates may be susceptible to clindamycin initially. The lesions did recur once more and convincingly resolved following treatment with pradofloxacin, increasing suspicion for a mycobacterial organism, given the clinical appearance and history of skin lesions with waxing and waning severity. In addition, while pradofloxacin can be an effective treatment for staphylococcal infections, it was unlikely in this case since once a staphylococcal organism is resistant to methicillin, it is usually fluoroquinolone resistant also, and would have resulted in additional treatment failure.

Given the variety of potential aetiological agents, it is essential that tissue culture and susceptibility testing be performed for aerobic and anaerobic bacteria as well as fungal organisms. In this case, unfortunately, multiple classes of antibiotics were administered and surgical debridement was performed prior to any diagnostic testing. Also, a swab sample from a draining tract (as was submitted during recurrence of lesions) is unlikely to yield a reliable result and is considered contaminated by secondary organisms, further complicating management of this case. Cytology and tissue culture submission should ideally have been obtained during the initial biopsy procedure, especially for mycobacterial testing given their importance when making a diagnosis as well as a treatment plan.

Rapidly growing mycobacteria were not initially suspected as a potential aetiological agent of infection, therefore the diagnostic approach was inadequate for proper identification. Furthermore, the owner had limited means with which to diagnose and treat the newly acquired shelter pet. While the shelter veterinarian was able to successfully manage the case and pursue consultation with a dermatologist to attain a presumptive diagnosis, often times shelters do not have the time or resources for such efforts. These limitations may lead to inadequate case management that may result in chronic pain and suffering and/or euthanasia.

It is difficult to provide optimal treatment without identifying the causative agent of any chronic or refractory infection, as in this case. Antimicrobial susceptibilities vary widely between unrelated pathogens and between different species of Mycobacterium. Long-term multidrug regimens are recommended to reduce the risk of resistant strains, therefore long-term treatment with fluoroquinolones alone may not be sufficient. The prognosis for opportunistic mycobacterial infections in cats is guarded, even for cases with a definitive diagnosis. Furthermore, mycobacteria that cause feline tuberculosis and feline leprosy syndrome may present similarly to non-tuberculous disease, and the organisms can cause human disease especially in immune compromised individuals. These factors, along with owner compliance and financial constraints, should influence the decision to pursue treatment.

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REFERENCES
1. Home KS, Kunkle GA. Clinical outcome of cutaneous rapidly growing mycobacterial infections in cats in the south-eastern United States: a review of 10 cases (1996-2006). J Feline Med Surg 2009;11:627–32.
2. Gunn-Moore DA. Feline mycobacterial infections. Vet J 2014;201:230–8.
3. Greene CG-M DA. Infectious diseases of the dog and cat. 4th edn. St. Louis, Missouri: Elsevier, 2012.
4. Niederhausen S, Klauser L, Bolliger I, et al. First report of nodular skin lesions caused by Mycobacterium nebraskense in a 9-year-old cat. J FMS Open Rep 2018;4:2055116918792685.
5. Jassies-van der Lee A, Houwers DJ, Meertens N, et al. Localised pyogranulomatous dermatitis due to Mycobacterium abscessus in a cat: a case report. Vet J 2009;179:304–6.
6. Youssef S, Archambault M, Parker W, et al. Pyogranulomatous panniculitis in a cat associated with infection by the Mycobacterium fortuitum/peregrinum group. Can Vet J 2002;43:285–7.
7. Tortoli E. Microbiological features and clinical relevance of new species of the genus Mycobacterium. Clin Microbiol Rev 2014;27:727–52.
8. Kizerwetter-Swida M, Chobiak-Chmiel D, Rzewska M, et al. Resistance of canine methicillin-resistant Staphylococcus pseudintermedius strains to pradofloxacin. J Vet Diagn Invest 2016;28:514–8.
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