

Unique presentation of an intramuscular abscess caused by *Bacteroides pyogenes* in the setting of a cat bite: A case report

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Abstract

Cat bites are a relatively common emergency department presentation. The most common species isolated from cat bite wounds is *Pasteurella multocida*. In this case report, we discuss a unique case of an intramuscular abscess caused by *Bacteroides pyogenes*. Antibiotic resistance in *Bacteroides* species is a growing concern and thus should be treated with caution. We present an 81-year-old female who presented to the emergency department with left calf pain that began 3 weeks prior to the emergency department presentation. She was initially seen by her primary care provider and was prescribed oral Trimethoprim/Sulfamethoxazole and Amoxicillin/Clavulanate. Despite oral antibiotics, she began to have worsening swelling, erythema, and fevers. In the emergency department, the patient's left calf was noticeably erythematous and tender to palpation. Lab work showed a C-reactive protein of 12.4 mg/dl, erythrocyte sedimentation rate of 38 mm/h, and white blood cell count of 15.1. Computed tomography imaging showed an irregularly shaped fluid collection at the junction of the calf musculature and upper aspect of the Achilles tendon. The decision was made to perform an operative incision and debridement on the evening of her presentation. On postoperative day 2, the wound cultures grew positive for both *Pasteurella multocida* and *Bacteroides pyogenes*. She was subsequently discharged with oral Amoxicillin/Clavulanate 875 mg twice daily for 4 weeks. Further studies can be performed to identify the most efficient ways to isolate and treat this species. This case report emphasizes the importance of ordering both aerobic and anaerobic cultures and aiming antimicrobial therapy against both *Pasteurella* and anaerobic bacteria.

Keywords

Abscess, intramuscular, *Bacteroides pyogenes*, cat bite

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Introduction

Animal bites account for 1% of all emergency department visits each year, of which cat bites make up approximately 5%–20%.¹ The nuances of managing cat bites are derived from the fact that these injuries occur as a small puncture wound, causing many patients to avoid seeking immediate medical care. However, cat bites can lead to local wound complications or more severe systemic manifestations. Even so, many patients who suffer cat bites only seek medical attention once the bite wound has progressed beyond a simple puncture wound.¹

Cat bites that progress to more severe infections are the result of polymicrobial.² A study by Talan et al.² found that 75% of cultures from cat bite wounds grew *Pasteurella multocida*, the most common species isolated from the feline oropharynx. This study also showed that cat bites can also be

infected with aerobic bacteria such as streptococci, staphylococci, Moraxella, and Neisseria, or anaerobic pathogens such as fusobacterium, *Bacteroides*, Porphyromonas, and Prevotella.² Isolation of the correct pathogen and appropriate antimicrobial therapy is vital to help minimize the progression of bite wounds. Bite wounds can cause local infections such as cellulitis, abscess formation, and tenosynovitis. If not appropriately treated, local infections can lead to more

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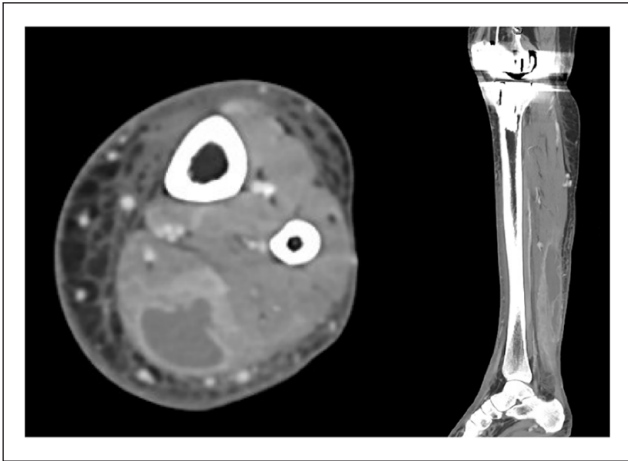


Figure 1. CT images showing left calf abscess.

severe manifestations such as bacteremia, osteomyelitis, meningitis, and endocarditis.¹

In this case report, we discuss a unique case of an intramuscular abscess caused by *Bacteroides pyogenes*. While *B. pyogenes* has been shown to be part of the polymicrobial flora in the animal oropharynx, the first report of *B. pyogenes* causing infection from a cat bite was relatively recent in 2011.³ Since then, the orthopedic literature has shown to be lacking in reporting an intramuscular abscess formation secondary to animal bites with this bacteria. We present a case of an intramuscular calf abscess caused by a cat bite with *B. pyogenes* positive cultures to highlight the importance of maintaining a broad differential for bacterial possibilities, appropriate culture techniques, and treatment approach.

Case presentation

An 81-year-old female with a medical history of deep vein thrombosis, pulmonary embolism, and ischemic stroke without residual deficit who presented with left calf pain after being bitten by her cat 3 weeks prior. A few days after the incident, she was seen by her primary care provider who prescribed a course of oral Trimethoprim/Sulfamethoxazole and Amoxicillin/Clavulanate. However, she began to have worsening swelling, erythema, and fevers, in which she decided to present to the emergency department.

On initial evaluation, the patient had noticeable erythema to the left calf with tenderness to palpation. Lab work showed a C-reactive protein of 12.4 mg/dl, erythrocyte sedimentation rate of 38 mm/h, lactic acid of 1.0 mmol/l, and white blood cell count of 15.1. Blood cultures were obtained and the patient was placed on intravenous (IV) vancomycin and cefepime by the primary team. Computed tomography imaging (CT) showed an irregularly shaped fluid collection at the junction of the calf musculature and upper aspect of the Achilles tendon measuring 10.8 cm × 2.1 cm × 2.0 cm (Figure 1).

Given this finding, the decision was made to perform an operative incision and debridement on the evening of her presentation. An incision was made at the medial border of the gastrocnemius muscle, and once the deep fascia was incised, frank purulence was encountered. The area was then copiously irrigated and thoroughly debrided, and closed loosely with drain placement. The drain remained until postoperative day 2 in which there was no drainage. During this time, the operative cultures grew *Pasturella multocida* on postoperative day 2, and the patient's blood cultures grew Coagulase negative staphylococcus in one out of two bottles, which was deemed a contaminant by the infectious disease team. The patient was discharged on postoperative day 4 with oral Amoxicillin/Clavulanate 875 mg twice daily for 4 weeks. On postoperative day 7, the patient's operative cultures grew *Bacteroides pyogenes*. She followed up with the infectious disease doctor who recommended she continue Amoxicillin/Clavulanate in for the full 4 weeks course based on updated sensitivities. At most recent follow-up, her pain was much improved and her left calf incision had healed. She has experienced no residual symptoms from her treatment.

Patient has given informed consent for this case report to be published.

Discussion

This unique case of an intramuscular abscess displays the importance of appropriate diagnostic studies based on suspected pathogenic organisms. Orthopedic literature has limited content regarding intramuscular abscess caused by *B. pyogenes* after a cat bite. Typically, *P. multocida* is considered the most common pathogen following a cat bite. A 1995 prospective study indicated that 75% of cat bites were infected with *P. multocida*.² However, most animal bites are polybacterial.² *P. multocida* is a facultative anaerobic, fermentative Gram-negative coccobacillus that is found in the oral cavities of many healthy animals.⁴ Standard first-line treatment following a cat bite is Amoxicillin/Clavulanate.⁴ The preferred culture medium to grow *P. multocida* is 5% of sheep blood. The 5% sheep blood can be added to various agars such as tryptic soy yeast extract, dextrose starch, casein sucrose yeast, chocolate, Mueller–Hinton, or brain heart infusion agars.^{5,6} Ferreira et al.⁵ achieved culture growth in 24 h by using tryptic soy yeast extract agar with 5% defibrinated sheep blood and incubated the specimen at 37°C. Blood agar provides a culture medium that can grow various organisms, so further serotyping or ribotyping is necessary for precise identification. Polymerase chain reaction (PCR) amplification of 16S ribosomal ribonucleic acid (rRNA) genes is the predominant and most reliable method to taxonomically identify *P. multocida* isolates down to the genus and species.⁶ Madsen et al.⁷ had a similar patient scenario of a cat bite wound on the wrist that progressed after being treated with oral dicloxacillin. In this study, initial local

wound cultures grew *P multocida*. The patient's condition worsened after development of bacteremia at their second presentation to the emergency room and blood cultures were obtained grown under aerobic and anaerobic conditions. 16S rRNA gene sequencing was used to identify anaerobic culture growth and identified *B. pyogenes*. In this report, the wound swab that originally cultured *P multocida* was re-cultured under anaerobic conditions and grew an isolate identical to the *B pyogenes* found in the anaerobic blood culture. The patient required multiple debridement and vacuum-assisted wound healing. While inpatient, they received IV benzylpenicillin for 9 days. After discharge on day 9, the patient was prescribed oral phenoxymethylpenicillin for 11 days. At a follow-up appointment 3 weeks after discharge, the patient's condition had resolved.³ Although this patient did not present with abscess formation, it is an example of selecting appropriate culture techniques to identify specific pathogens.

Patients presenting with late complications of cat bites should cue clinicians to consider secondary pathogens. Repeat presentation warrants further consideration into appropriate diagnostic laboratory techniques. Informing the laboratory that *B pyogenes* is a possible suspect of infection can help direct time efficient and effective culturing. *B pyogenes* has excellent aerotolerance compared to most anaerobes and simple nutritional requirements.⁷ Most *Bacteroides* species (spp.) have innate resistance to aminoglycosides and vancomycin, leading to the development that selective media should be used.⁷ The Brain Heart Infusion Medium is a culture media used for fastidious organisms like *Bacteroides*, and with additional care to maximize anaerobic conditions, visible growth can occur within 36–48 h.⁷ After growth is obtained, advanced testing can be used to specifically identify *B pyogenes*. Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry and 16S rRNA gene sequencing have previously been used for this species.^{3,8,9} These ideal techniques may not have been considered in the case of our patient because *B pyogenes* has not been encountered in this form previously. The lack of specific culture techniques could explain why culture growth only appeared on day 7 as opposed to 36–48 h. As mentioned previously, Ferreira et al.⁵ achieved culture growth of *P multocida* on a nonselective agar within 24 h. The shorter timeline for growth and the use of a nonselective agar provide more ease of identification compared to the selective agar that requires anaerobic care and a longer timeline for *B pyogenes*. The additional care required to achieve culture growth of *B pyogenes* may explain the delayed growth at 7 days compared to the growth of *P multocida* at 2 days. This delay emphasizes the importance of choosing appropriate culture techniques based on suspected pathogens. A wide range of culture techniques, including the use of aerobic versus anaerobic techniques, nonselective versus selective agars, and additional time for growth should be considered following animal bite wounds.

Antibiotic resistance in *Bacteroides* spp. is a growing concern, as mentioned in the study by Majewska et al.⁸ Among anaerobes, *Bacteroides* spp. have had the highest growth of resistance over the past decade. Most *Bacteroides* spp. are known for innate resistance to aminoglycosides and vancomycin.⁷ Fortunately, *B pyogenes* is known to have increased susceptibility to penicillins, attributed to its lack of beta-lactamase production.⁸ Despite this feature, Majewska et al.⁸ encountered multiple *B pyogenes* species that displayed resistance to penicillin, one species also displaying resistance to clindamycin. In this study, all of the species displayed sensitivity to Amoxicillin with Clavulanate. Future encounters of *B pyogenes* should be treated with caution based on the concern of further antibiotic resistance. Current literature supports that Amoxicillin with Clavulanate should be considered a first-line treatment for cat bites with its ability to cover both *P multocida* and *B pyogenes*.^{4,8}

Clinical message

An intramuscular abscess caused by *B. pyogenes* is a unique clinical presentation. It is important to maintain a broad differential for bacterial possibilities and to obtain appropriate culture techniques, as this guides proper patient treatment. A wide range of culture techniques should be considered following animal bite wound and the current literature supports that Amoxicillin with Clavulanate should be considered a first-line treatment for cat bites with its ability to cover both *P multocida* and *B pyogenes*. However, with the growing antibiotic resistance of *Bacteroides* species, it is imperative to use appropriate laboratory technique to isolate this species to treat properly according to antibiotic susceptibility.

Conclusion

In this case report, we have described an intramuscular abscess caused by *B. pyogenes* that, to our knowledge, has not been discussed in previous literature. We have emphasized the importance of maintaining a high clinical suspicion for less commonly isolated bacteria such as *Bacteroides* species in cat bite wounds with delayed presentation. This case report also emphasizes the importance of ordering both aerobic and anaerobic cultures and aiming antimicrobial therapy against both *Pasteurella* and anaerobic bacteria. Further studies can be performed to identify the most efficient ways to isolate and treat *Bacteroides* species related to animal bite wounds.

Author contributions

SS assisted in literature review in addition to contributing to writing the discussion section. DD performed chart review and was able to write the case presentation section. In addition, DD was able to assist writing the discussion section with SS. MB assisted with literature review in addition to writing the conclusion, abstract, and learning point. CF assisted in writing the case presentation and introduction sections. NA is the attending orthopedic surgeon who assisted in

literature review in addition to writing the introduction and providing a framework on which the remainder of the article was able to elaborate. All authors read and approved the final article.

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Ethics approval

Our institution does not require ethical approval for reporting individual cases or case series.

Informed consent

Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article.

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