Pasteurella multocida ecthyma complicated by necrotizing fasciitis

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Abstract

Necrotizing fasciitis is a serious infection of the skin and soft tissues. Pasteurella multocida is rarely reported to cause necrotizing fasciitis and is associated with high mortality. We describe a female patient with a past medical history of diabetes mellitus and myeloproliferative disorder presenting with bullae and erythema of the right forearm secondary to P. multocida infection after possible cat bite. Despite adequate antibiotic coverage she developed necrotizing fasciitis diagnosed clinically and on diagnostic imaging. Patient was taken to the operating room emergently and underwent irrigation and debridement with subsequent split-skin graft. She recovered well after the surgeries and was discharge on intravenous antibiotics. At clinic follow-up, her wounds were healing well without any significant new symptoms.

Keywords: infectious diseases of the skin, bacterial, immunodeficiency

Introduction

Pasteurella multocida, a gram-negative bacteria, is a common inhabitant of the oral mucosa of domestic animals [1]. Both animal bites and scratches typically cause cutaneous infections, such as cellulitis [2, 3], which tend to have favorable outcomes with prompt medical treatment. Necrotizing fasciitis, caused by these bacteria, is a life-threatening complication that is rarely reported in the literature [4-7]. Herein we discuss a neutropenic patient presenting with P. multocida ecthyma bacteremia, which then progressed to necrotizing fasciitis.

Case Synopsis

A 73-year-old woman presented with altered mental status and right forearm rash. She had a medical history of myelodysplastic syndrome, which was treated with one cycle of azacitidine, and diabetes mellitus. Physical examination revealed a temperature of 103 ºF, pulse of 104 beats per minute, respiratory rate of 30 breaths per minute, and blood pressure of 111/46 mmHg. Laboratory results showed reduced white blood cells (600 cells/µl), reduced absolute neutrophil count (132 of cells/µl), reduced hemoglobin (8.3 g/dL), normal platelets (23.5 x 103 cells/µl), elevated lactate (2.35mmol/L), and reduced bicarbonate (21mmol/L). Sepsis work up was initiated and the patient was treated empirically with vancomycin and cefepime.

On the second day of hospitalization, physical examination of the skin showed red macules and two tender bullae, with one draining serous fluid and the other exhibiting a central eschar on the right forearm (**Figure 1A**). Wound and blood cultures, taken at the time of admission, showed growth of P. multocida. Metronidazole was added on hospital day two for additional coverage. Tzanck preparation, Zoster direct fluorescence antibody, and Aspergillus antigen were negative. Ultrasound of the right forearm showed the presence of subcutaneous edema; however, there was no abscess or fluid collection.

On day four of hospitalization, the patient's altered mental status improved. She recalled that she owns a cat that "nips" and sometimes breaks the skin. The patient continued to be treated with antibiotics (vancomycin, cefepime, metronidzole) for a

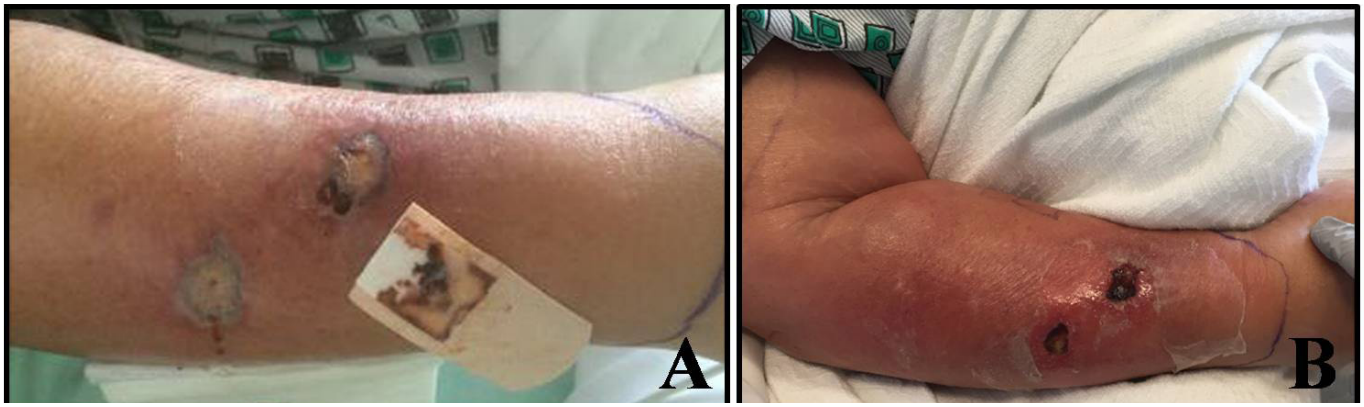

Figure 1. *A) Two tender bullae on erythematous base of the right forearm on initial evaluation. B) Increased erythema and edema of the right forearm on day six of hospitalization.*

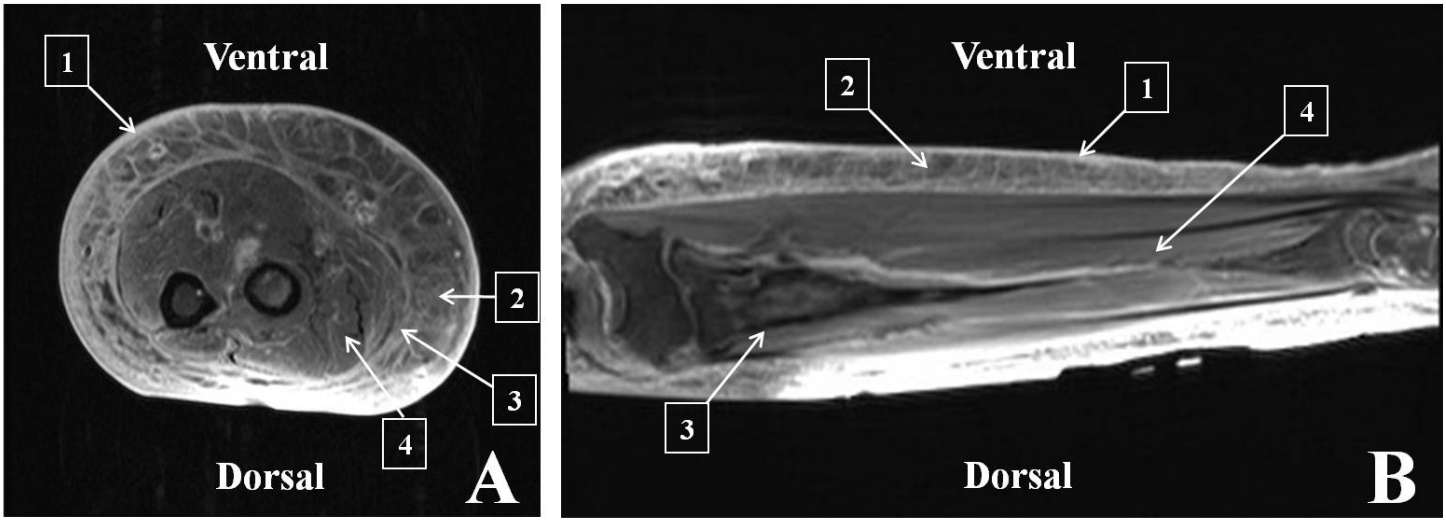

Figure 2. *A) Axial, and B) sagittal T1-weighted fat-saturated IV gadolinium-enhanced magnetic resonance images of the patient's right forearm demonstrate pathological hyperenhancement within the: 1) markedly-thickening skin 2) superficial fascial compartment, indicating superficial fasciitis, 3) deep fascial compartment, indicating deep fasciitis and 4) muscle tissue, indicating myositis.*

diagnosis of P. multocida ecthyma. Despite antibiotic treatment, the patient continued to have severe pain in her arm. Magnetic resonance imaging (MRI) was performed on hospital day four for suspicion of myositis and/or abscess. MRI study (final report available on hospital day 5) showed presence of cellulitis, circumferential superficial fasciitis, medial and posterior compartment deep fasciitis, and infectious myositis (**Figure 2**). There was no evidence of abscess.

The patient reported worsening of pain. The physical examination showed increased edema and erythema on day six of hospitalization (**Figure 1B**). C-reactive protein was found to be elevated (93.3mg/L) on this day. Owing to the worsening of symptoms, physical examination findings, elevated C-reactive protein, and clinical suspicion of necrotizing fasciitis, the patient was emergently taken to the operating room on hospital day six for decompression fasciotomy, irrigation and debridement, and open carpal tunnel release. Clindamycin was added to the antibiotic regimen for additional coverage.

Cultures acquired during the surgery were all negative and the antibiotic regimen was gradually de-escalated, with vancoymcin discontinuation on hospital day eight. On day nine, the patient continued to have edema and tenderness to palpation of the right forearm. She was taken back to the operating room for repeat irrigation and debridement and wound closure with split-thickness skin graft. Antibiotics continued to be de-escalated with metronidazole discontinuation on hospital day ten. The remaining antibiotics, cefepime and clindamycin, were continued, pending the susceptibility results.

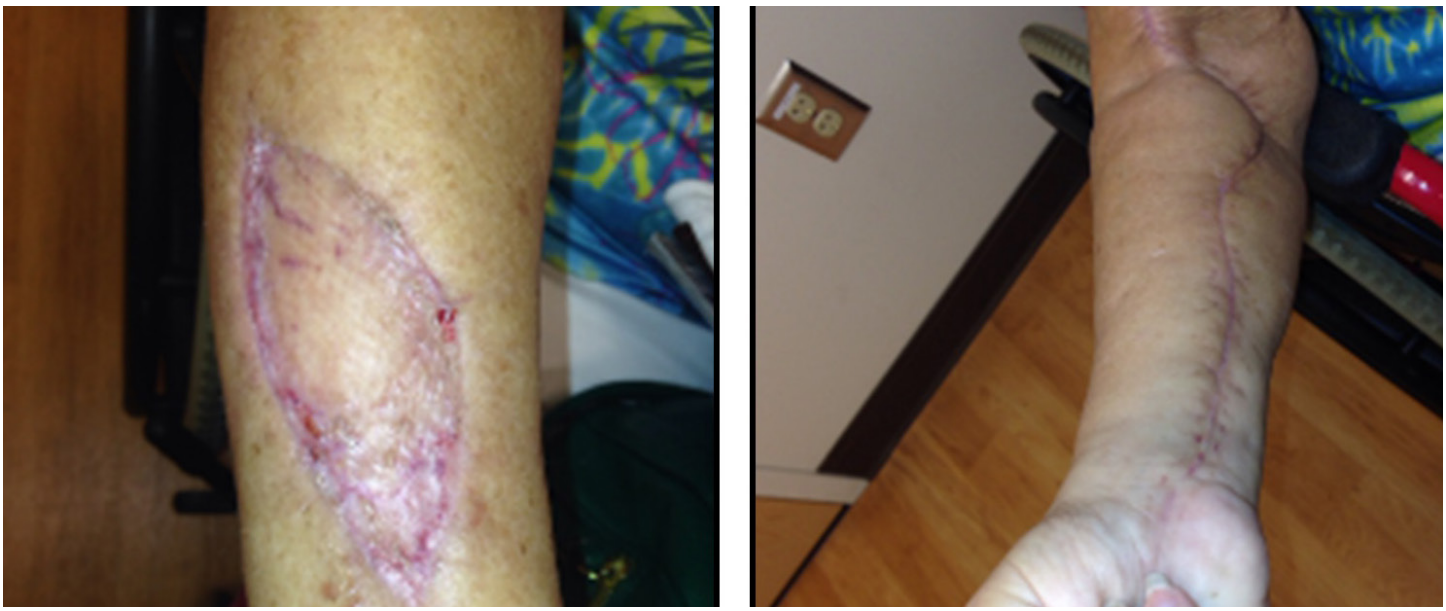

Figure 3. *Healing of wounds at 8 weeks post-operation.*

Her symptoms continued to improve following surgery. On day 15, after susceptibility testing, all antibiotics were switched to a two week course of ceftriaxone. She continued to improve and was discharged on hospital day 18. The patient was evaluated 8 weeks post-operation with no significant symptoms and adequate wound healing (**Figure 3**).

Case Discussion

Pasteurella is a gram negative organism that is found in the oropharynx of animals. It is reported that 70-90% of domestic cats and 20-50% of domestic dogs are carriers of this organism [1]. Pasteurella multocida typically infects humans after contact with animals; however, infections without animal contact have also been reported [2]. The most common sites for animal bites are the hands (50-63%), arms/forearms (12-23%), and thighs/legs (9%-16%) [8].

Pasteurella infections can have a wide spectrum of presentations, affecting multiple organs and systems, including the skin, lungs, nervous system, joints, and bone [3]. Cutaneous infections are by far the most common presentation of P. multocida infections after bites and scratches [2, 3]. The classical cutaneous infection presents with very rapid onset of symptoms, sometimes within several hours, including pain, erythema, warmth, and edema at the site [3]. This can be followed by drainage, either purulent or serosanguinous, from the site within the next two to three days [9, 10]. Complications include arthritis, abscess, tenosynovitis [3] and bacteremia [11]. Bacteremia is a serious complication of cellulitis, and skin infections account for 11-36% of Pasteurella bacteremia cases [3, 11]. Immunocompromised status, as seen in our patient, is a significant risk factor for Pasteurella bacteremia and is associated with 28-37% mortality [11, 12]. The severe neutropenia, secondary to myelodysplastic disorder and chemotherapy in our patient, was a risk factor for development of P. multocida sepsis. However, with prompt antibiotic therapy, the bacteria were successfully cleared from the blood.

Necrotizing fasciitis, infection and necrosis of skin and soft tissue along the fascial planes [13], is another serious and deadly complication of P. multocida infections. Co-morbidities such as diabetes mellitus, cirrhosis, heart failure, immunodeficiency, and peripheral vascular disease have been reported in necrotizing fasciitis [13]. The patient described here had two significant risk factors, diabetes mellitus and immunodeficiency, which are likely contributors to the progression of necrotizing fasciitis.

P. multocida is rarely believed to cause necrotizing fasciitis. The PubMed database was used in order to review previous cases of Pasteurella necrotizing fasciitis in the English literature up to October 1, 2015. **Table 1** provides a summary of the patient in this case-report and the four previously reported cases [4-7]. The majority of patients, including

Table 1. *Summary of Reports of Pasteurella Multocida Necrotizing Fasciitis.*

Age	Sex	Past Medical History	Animal	Location	Treatment	Outcome	
53	Female	Diabetes Mellitus, obesity	Cat/dog	Abdomen	Antibiotics, debridement	Death	6
68	Male	CRI, gouty arthritis, CS on steroids	Dogs	Hand	Antibiotics, debridement	Death	7
69	Male	Alcohol abuse, hepatitis, pancreatitis	Cat/dog	Leg	Antibiotics, debridement, AMP	Death	4
58	Male	Hepatitis C	None	Leg	Antibiotics	Death	5
74	Female	Diabetes mellitus, Myelodysplastic Syndrome	Cat	Forearm	Antibiotics, debridement	Alive	

Abbreviations: CRI: ch*ronic renal insufficiency, CS: Cushing's syndrome, AMP: amputation of the affected limb . The last row is the patient presented in this case.*

the one described here, had co-morbidities that contributed to an immunocompromised status. With the exception of one patient, all of the patients had reported contact with cats and/or dogs.

All patients outlined in **Table 1** received antibiotics, and 4 out of 5 underwent surgical interventions. The treatment for necrotizing fasciitis relies primarily on prompt surgical debridement, sometimes multiple, and adequate antibiotics [13]. One report showed that the mortality rate is increased 9.4 times when surgical debridement is delayed by 24 hours [14]. Appropriate antibiotics include penicillin, second and third generation cephalosporins (first generations should be avoided due to poor activity), quinolones, tetracyclines, chloramphenicol, and trimethoprim-sulfamethoxazole [6, 11]. Since some Pasteurella strains can be resistance to penicillin and express β-lactamase [15], susceptibility testing is warranted in order to insure adequate coverage.

The mortality rate from these published reports of P. multocida necrotizing fasciits was approximately 80% (**Table 1**). This rate is considerably higher than that the ~32% mortality rate of necrotizing fasciitis overall [13]. One possible factor is that Pasteurella is typically not thought of as the classic organism to cause necrotizing fasciitis. Delay in diagnosis and prompt surgical debridement of necrotizing fasciitis is associated with increased mortality [13]. The co-morbidities of patients in **Table 1** are also important factors in increasing mortality. Caution is still warranted with regard to making any definitive conclusions due to the limited number of reported cases.

In summary, P. multocida typically causes infection of cutaneous tissue after contact with domestic animals. Necrotizing fasciitis, although rare, is a very serious and lethal complication. Clinicians should be aware and assess for signs and symptoms of P. multocida necrotizing fasciitis in the context of ecthyma and provide emergent interventions for improved outcomes.

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