



Case report

Staphylococcus hominis cellulitis and bacteremia associated with surgical clips

O. Uddin^a, J. Hurst^b, T. Alkayali^c, S.A. Schmalzle^{a,b,c,d,*}^a University of Maryland School of Medicine, 655 W Baltimore Street, Baltimore, MD 21201, United States^b University of Maryland Medical Center, Department of Medicine, 22 South Greene St, Baltimore, MD 21201, United States^c University of Maryland Medical Center, Department of Medicine, Division of Infectious Disease, 22 South Greene St, Baltimore, MD 21201, United States^d Institute of Human Virology, University of Maryland School of Medicine, 725 West Lombard Street, Baltimore, MD 21201, United States

ARTICLE INFO

Article history:

Received 15 December 2021

Received in revised form 25 January 2022

Accepted 31 January 2022

Keywords:

Cellulitis

Foreign body

Coagulase negative Staphylococci

Staphylococcus hominis

Bacteremia

ABSTRACT

Streptococcus spp. and *Staphylococcus aureus* are the most common pathogens causing skin and soft tissue infections (SSTI). Guideline-recommended empiric antibiotics targeting these organisms would also treat coagulase negative Staphylococci, which are not typically considered skin and soft tissue pathogens. Coagulase negative Staphylococci are, however, well known for their propensity to cause indolent infections in the setting of prosthetic material. Here, we present a case of a patient with surgical clips from a femoral artery surgical repair one year prior, presenting with cellulitis at the prior surgical site, complicated by high-grade *Staphylococcus hominis* bacteremia. Signs of infection persisted after 4 days of appropriate antibiotic therapy and resolved rapidly upon non-steroidal anti-inflammatory administration. This case highlights the importance of recognizing coagulase negative Staphylococci as a possible etiology of cellulitis in patients with prosthetic material, and of considering anti-inflammatory medications as a supplement to antibiotic therapy to hasten resolution of cellulitis in appropriate patients.

© 2022 The Authors. Published by Elsevier Ltd.
CC-BY-NC-ND 4.0

Introduction

Cellulitis is a common condition, accounting for significant healthcare usage in the inpatient and outpatient settings. Beta-hemolytic Streptococci and *Staphylococcus aureus* are the most common etiologies of cellulitis, gaining access to deeper tissues through breaches in the skin [1].

Coagulase negative Staphylococcal species (CoNS) comprise normal skin flora, and are rarely pathogenic in normal hosts, with the exception of *Staphylococcus lugdunensis* which express unique virulence factors [2]. Though relatively avirulent, non-lugdunensis CoNS have a propensity to form biofilms, and thus are widely accepted as true pathogens in cases when patients have implanted hardware, lines, or other foreign bodies [3]. In the absence of prosthetic material, non-lugdunensis CoNS are often classified as contaminants in microbiological samples. *Staphylococcus hominis* has been isolated as a presumed pathogen in few reported skin and soft tissue infection (SSTI) cases without prosthetic material, including infected cysts, furunculosis, and vulvar infections [4]. Here, we

present a case of cellulitis at the site of a healed surgical incision with underlying surgical clips, with associated *Staphylococcus hominis* bacteremia.

Case presentation

A 26 year-old male with a history of right popliteal artery and femoral vein repair following a lower extremity gunshot wound (GSW) one year prior presented with sudden onset right leg pain, fevers, and rash at the site of the GSW (Fig. 1a, b). The patient was incarcerated and had no history of injection drug use, skin infections, or recent trauma to the area. The patient was tachycardic with a heart rate of 100 bpm, febrile with temperature of 38.2 °C, and had erythema, warmth, tenderness, and swelling along the medial and lateral aspects of the lower extremity (Fig. 1a,b) surrounding the prior GSW and surgical site. There was no drainage and exam findings were not consistent with abscess; cultures were not obtained from the site of cellulitis. Complete blood count and comprehensive metabolic panel were unremarkable and CT of the lower extremity showed soft tissue edema consistent with cellulitis and presence of surgical clips, likely related to vascular repair one year prior (Fig. 2). No venous thromboemboli were seen on venous duplex ultrasound. *Staphylococcus hominis* grew within 24 h in four out of four blood

* Correspondence to: 725 W Lombard St, N147, Baltimore, MD 21201, United States.
E-mail address: Sschmalzle@ihv.umaryland.edu (S.A. Schmalzle).

A



B



Fig. 1. Lateral (A) and medial (B) views of the patient's leg upon presentation. Erythema and swelling encompassed and extended beyond the site of the prior GSW and healed surgical incision. The GSW stemmed from a lateral bullet entry and medial exit.

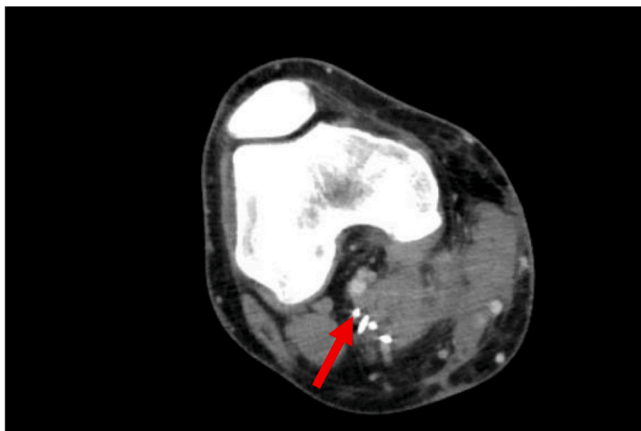


Fig. 2. Axial image from lower extremity CT scan. Red arrow indicates evidence of retained metal.

cultures from two different peripheral venous blood draws. Trans-thoracic echocardiography showed no valvular vegetations or signs of endocarditis.

The patient was treated with intravenous (IV) vancomycin for 2 days and switched to oral linezolid on day 3 due to difficulty obtaining vancomycin therapeutic drug monitoring. Blood cultures obtained on the third day of treatment were sterile. The leg remained beefy red, tender, and swollen, with no clear visual improvement or subjective relief by the fourth day of antibiotics. Initiation of IV ketorolac (day 3) and oral ibuprofen (day 4) resulted in subjective pain improvement and rapid resolution of erythema and swelling. The linezolid course was continued for an additional 7-days following clearance of bacteremia.

Given that the presumed source of infection was the remaining metallic surgical clips, options for prevention of future recurrent infections were considered. However, it was not feasible to remove the clips and indefinite suppressive antibiotics after a first infection did not seem warranted. The patient was advised to seek care if he noted signs of recurrence; at that time the benefits versus potential harms of a surgical procedure or long-term antibiotics could be re-considered.

Discussion

The patient presented in this case report had a CoNS bacteremia presumably linked to a cellulitis at the site of a prior trauma and vascular repair, with surgical clips present. Prompt clinical improvement occurred after the addition of non-steroidal anti-inflammatory drug (NSAID) to antibiotics.

CoNS are considered to be a less common cause of SSTI. It is not common practice to collect wound cultures from mild SSTI, as empiric treatment is typically directed at *Streptococcus pyogenes* and *Staphylococcus aureus*. The antibiotics that treat these common pathogens would also cover CoNS. Although a specific pathogen is not often identified in cases of SSTI, prior research shows that CoNS can be cultured from skin lesions in the absence of prosthetic material [5] and in SSTI closely associated with underlying foreign material [6]. Based on the limited available literature and the case presented here, it is possible that CoNS represent an under-identified etiology of cellulitis.

In this case, *Staphylococcus hominis* cellulitis presented approximately 10 months after surgical intervention and prosthetic material retention. This is in contrast to cases of CoNS prosthetic joint infections, in which bacterial contamination may progress for over a year before symptoms manifest [7]. While *Staphylococcus aureus* is a common cause of early prosthetic joint infections, the less virulent CoNS can colonize foreign material and lead to overt clinical presentation early (< 3 months since implantation), delayed (3–12 months post-implantation), or late (more than 12–24 months since implantation) [7]. The often indolent time-course is likely due to the molecular mechanisms by which CoNS colonize surfaces and form biofilms, and to their less virulent growth profile compared to organisms like *Staphylococcus aureus*.

Bacteremia does not accompany cellulitis in most cases; when bacteria are cultured from the blood, beta-hemolytic streptococci are the most commonly identified organism [8]. In this reported case, the patient's blood cultures yielded *Staphylococcus hominis* growth in four out of four bottles. While the presence of CoNS in blood cultures may suggest contamination, a consistent pattern of growth increases the likelihood of true CoNS bacteremia. One study showed that a four-out-of-four bottle blood culture positivity pattern represents true *Staphylococcus hominis* bacteremia, as opposed to contamination, with a high predictive value [9]. In this study, cases of true *Staphylococcus hominis* bacteremia were positive in less than 48 h.

Infectious Disease Society of America (IDSA) guidelines for management of SSTI give a weak recommendation, with moderate evidence, for use of systemic corticosteroids to hasten clinical resolution in non-diabetics with cellulitis [10]. A seminal trial showed significant benefit in healing time, length of stay, and IV antibiotic duration with adjunctive prednisolone for the treatment of erysipelas [11]. In a subsequent study of 64 patients with cellulitis, the use of adjunctive NSAIDs led to a significant reduction in the time to inflammation regression [12]. The only placebo-controlled, randomized trial also showed a trend towards more efficient inflammation resolution with adjunctive NSAID treatment [13]. There is concern that anti-inflammatory medications could mask worsening infection, blunt beneficial immune responses, and in the case of corticosteroids, worsen glycemic control in diabetics. This strategy should not be employed in diabetics [10], and clinicians should be aware of anecdotal reports of an association between NSAID use and necrotizing fasciitis [14]. In this case, ketorolac and ibuprofen administration correlated with clinical improvement.

Conclusions

CoNS can be a pathogen in SSTI, both in the absence and presence of prosthetic material, and is more likely to be a true bacteremia if growing quickly and in multiple bottles. In appropriate cases, NSAIDs or corticosteroids combined with antibiotic therapy may be an option to accelerate cellulitis regression.

Ethical approval

Written informed consent was not obtained from the patient for publication of this case report, as he was incarcerated. All identifying information was removed from this report.

Funding

None.

Authorship Statement

All authors had a role in writing and revising this case report. All authors reviewed and approved final manuscript prior to submission. Individual CRediT roles are noted below.

CRediT authorship contribution statement

Olivia Uddin: Writing – original draft, Writing – review & editing. **Jonathan Hurst:** Writing – original draft, Writing – review &

editing. **Talal Alkayali:** Writing – review & editing. **Sarah Schmalzle:** Writing – review & editing.

Consent

Written informed consent was not obtained from the patient for publication of this case report, as he was incarcerated. All identifying information was removed from this report.

Declarations of Interest

None.

Acknowledgements

None.

References

- [1] Raff AB, Kroshinsky D. Cellulitis: a review. *JAMA* 2016;316:325–37.
- [2] Heilbronner S, Foster TJ. *Staphylococcus lugdunensis*: a skin commensal with invasive pathogenic potential. *Clin Microbiol Rev* 2021;34:e00205–20.
- [3] Becker K, Heilmann C, Peters G. Coagulase-negative staphylococci. *Clin Microbiol Rev* 2014;27:870–926.
- [4] Natsis NE, Cohen PR. Coagulase-negative staphylococcus skin and soft tissue infections. *Am J Clin Dermatol* 2018;19:671–7.
- [5] Akiyama H, Kanzaki H, Tada J, Arata J. Coagulase-negative staphylococci isolated from various skin lesions. *J Dermatol* 1998;25:563–8.
- [6] Mustafa O, Althakafi S, Kattan S, Kattan M, AlHathal N. Scrotal abscess precipitating late infection of a malleable penile prosthesis: the risk never evanesces. *Case Rep Urol* 2016;2016:3280418.
- [7] Tande AJ, Patel R. Prosthetic joint infection. *Clin Microbiol Rev* 2014;27:302–45.
- [8] Gunderson CG, Martinello RA. A systematic review of bacteremias in cellulitis and erysipelas. *J Infect* 2012;64:148–55.
- [9] Osaki S, Kikuchi K, Moritoki Y, Motegi C, Ohyatsu S, Nariyama T, et al. Distinguishing coagulase-negative *Staphylococcus* bacteremia from contamination using blood-culture positive bottle detection pattern and time to positivity. *J Infect Chemother* 2020;26:672–5.
- [10] Stevens DL, Bisno AL, Chambers HF, Dellinger EP, Goldstein EJ, Gorbach SL, et al. Practice guidelines for the diagnosis and management of skin and soft tissue infections: 2014 update by the Infectious Diseases Society of America. *Clin Infect Dis* 2014;59:e10–52.
- [11] Bergkvist PI, Sjöbeck K. Antibiotic and prednisolone therapy of erysipelas: a randomized, double blind, placebo-controlled study. *Scand J Infect Dis* 1997;29:377–82.
- [12] Dall L, Peterson S, Simmons T, Dall A. Rapid resolution of cellulitis in patients managed with combination antibiotic and anti-inflammatory therapy. *Cutis* 2005;75:177–80.
- [13] Davis JS, Mackrow C, Binks P, Fletcher W, Dettwiller P, Marshall C, et al. A double-blind randomized controlled trial of ibuprofen compared to placebo for uncomplicated cellulitis of the upper or lower limb. *Clin Microbiol Infect* 2017;23:242–6.
- [14] Forbes N, Rankin AP. Necrotizing fasciitis and non steroidal anti-inflammatory drugs: a case series and review of the literature. *N Z Med J* 2001;114:3–6.