CASE REPORT

Stenotrophomonas maltophilia: an emerging multidrug-resistant opportunistic pathogen in the immunocompromised host

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SUMMARY

Stenotrophomonas maltophilia is a multidrug-resistant opportunistic pathogen with increasing prevalence and high morbidity and mortality. In addition to its classic association with pulmonary infections, *S. maltophilia* can cause skin and soft tissue infections with varying clinical presentations. We describe the case of a man in his 30s with B-cell acute lymphoblastic leukaemia who presented with a solitary patch of faint but tender purpura found to have rapidly progressive *S. maltophilia* infection diagnosed on skin biopsy. *S. maltophilia* infection should be considered in the cutaneous evaluation of the immunocompromised host.

BACKGROUND

Stenotrophomonas maltophilia is a non-fermentative Gram-negative bacillus that is joining its microbiological counterparts, *Pseudomonas aeruginosa* and *Acinetobacter baumannii*, as a multidrug-resistant opportunistic pathogen with high morbidity and mortality. Over the last 30 years, the prevalence of *S. maltophilia* infection has increased, likely

due to advances in cancer treatment, high rates of antibiotic use and increase in catheter and device placement, all of which serve as risk factors for infection.^{1,2} While *S. maltophilia* is most commonly implicated in ventilator-associated pneumonia, it can also cause bacteraemia, urinary tract infections and skin and soft tissue infections (SSTIs). *S. maltophilia* SSTIs are clinically heterogeneous and have presented as cellulitis, subcutaneous nodules, ulcers, ecthyma gangrenosum and multifocal purpura.^{3–5} These infections carry high mortality and require targeted treatment because of high antimicrobial resistance profiles. We describe herein an immunocompromised patient with *S. maltophilia* SSTI to highlight the importance of early diagnosis and treatment and to emphasise the consideration of this organism in the differential diagnosis of cutaneous lesions in at-risk hosts.

CASE PRESENTATION

A man in his 30s with refractory B-cell acute lymphoblastic leukaemia was admitted to the hospital for chimeric antigen receptor T cell therapy, a novel immunotherapy in the treatment of cancer. Prior to initiation of treatment, he had an episode of neutropenic fever with diffuse myalgias for which he was started on broad-spectrum antibiotics. He had ongoing culture-negative sepsis without localising signs, and therefore his antimicrobial coverage was broadened to meropenem, vancomycin and voriconazole. His fever and myalgias resolved. While continuing on the aforementioned antibiotic and antifungal agents, he again became febrile but this time with severe right shin pain. On examination, he had an exquisitely tender, poorly defined, pink-red purpuric patch on the right leg (figure 1).

INVESTIGATIONS

Skin biopsy demonstrated mild acute inflammation and haemorrhage in the deep dermis and subcutis with Gram-negative rods visible on gram stain (figure 2). Tissue culture grew *S. maltophilia*. High-dose intravenous trimethoprim-sulfamethoxazole (TMP-SMX) was initiated immediately. After 48 hours, blood cultures confirmed *S. maltophilia* bacteraemia. Susceptibility testing on blood cultures demonstrated sensitivity to TMP-SMX and minocycline and resistance to ticarcillin-clavulanic acid and levofloxacin. The organism was not tested against other antibiotic classes.

Figure 1 Pink-red purpuric patch on the right leg.

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Figure 2 Gram-negative organisms in the deep dermis visible on Gram stain (×1000).

The patient underwent removal of his Hickman catheter and the *S. maltophilia* bacteraemia resolved on surveillance blood cultures. The right leg pain continued to worsen and a CT scan of the limb was obtained, demonstrating myositis and fasciitis. The patient was taken for exploratory surgery, which did not show evidence of necrotising fasciitis.

DIFFERENTIAL DIAGNOSIS

- ▶ *Staphylococcal* and *streptococcal* cellulitis;
- ▶ Angioinvasive fungal infection (ie, aspergillosis or mucormycosis);
- ▶ *P. aeruginosa* ecthyma gangrenosum;
- ▶ Thrombocytopenic purpura due to minor trauma;
- ▶ Sweet's syndrome;
- ▶ Leukaemia cutis.

TREATMENT

The patient was continued on intravenous TMP-SMX 15 mg/kg/day divided into three doses daily for 14 days. He was discharged from the hospital on oral doxycycline 100 mg orally two times daily for 7 days given the organisms' susceptibility to minocycline on sensitivity testing.

OUTCOME AND FOLLOW-UP

The patient was readmitted 4 days after discharge with purulence and pain from the site of the SSTI. He was restarted on intravenous TMP-SMX as well as ceftazidime. He subsequently expired from recurrent *S. maltophilia* bacteraemia, sepsis and complications of bowel perforation.

DISCUSSION

S. maltophilia is an opportunistic multidrug-resistant pathogen that infects the immunocompromised host. The prevalence of *S. maltophilia* is increasing, with a recent surveillance report identifying it as the fifth most common nosocomial Gram-negative bacterial isolate.¹

Risk factors for *S. maltophilia* infection include prolonged hospitalisation, admission to the intensive care unit, neutropaenia, malignancy, central venous catheter and exposure to broad-spectrum antibiotics, particularly carbapenems, to which the bacteria is intrinsically resistant. Prior exposure to imipenem was found to be 10 times more likely in cases of *S.*

maltophilia infection than in controls.² Our patient's treatment with meropenem may have contributed to his uncontrolled *S. maltophilia* infection. His indwelling Hickman catheter, to which *S. maltophilia* tends to form biofilms, may have increased his risk of initial infection and ongoing bacteraemia prior to removal. *S. maltophilia* infection is also increasingly seen in patients without traditional risk factors and in the community setting.^{6–8}

S. maltophilia can cause a wide spectrum of disease, with pneumonia and bacteraemia the most common but SSTIs representing up to 15% of cases.⁹ SSTIs occur through primary inoculation or haematogenous spread and have varying presentations including solitary or metastatic cellulitis, subcutaneous nodules, ulcers, ecthyma gangrenosum and purpura. The patient herein presented with a solitary purpuric plaque resembling a bruise. There have been a total of 19 cases of SSTIs by *S. maltophilia* reported in the literature.^{3–5 8} Mortality in *S. maltophilia* infection is 25%; it approaches 80% in those with metastatic SSTIs.² Occasionally, *S. maltophilia* can be seen as a contaminant given its tendency to adhere to plastic inserts, but it must be taken seriously in the immunocompromised host due to its high mortality and antimicrobial resistance.

S. maltophilia exhibits resistance to all beta-lactams and aminoglycosides, making treatment difficult.⁹ Susceptibility to other antibiotic classes varies, but susceptibility testing for this organism is not yet standardised, such that interpretation for clinical use is problematic. Currently, high-dose TMP-SMX (>15 mg/kg/day) is first-line therapy and the standard of care for *S. maltophilia* infection, with the Sentry Antimicrobial Surveillance Programme reporting a susceptibility rate of 95.3%.¹⁰ The role of combination therapy in the treatment of *S. maltophilia* infection remains unclear with some authors preferring dual drug regimens in the immunocompromised host.¹ Ceftazidime, ticarcillin-clavulanate, minocycline, tigecycline, moxifloxacin and chloramphenicol have all been used in combination with TMP-SMX and with each other in patients intolerant of TMP-SMX therapy with varying results.¹ It is notable that our patient was treated with TMP-SMX monotherapy and transitioned to doxycycline, a tetracycline not previously reported in treating *S. maltophilia*. While *S. maltophilia* infection has high baseline mortality, this antimicrobial regimen and duration might have contributed to his treatment failure.

S. maltophilia SSTIs are an important addition to the differential of cutaneous lesions in the immunocompromised host given their increasing prevalence, antimicrobial resistance and high mortality. Our patient had many risk factors for *S. maltophilia* SSTI, including neutropenia, central venous catheter and treatment with broad-spectrum

Learning points

- ▶ *Stenotrophomonas maltophilia* infection is increasing in prevalence as a multidrug-resistant opportunistic pathogen.
- ▶ *S. maltophilia* skin and soft tissue infections should be considered in the differential diagnosis of new cutaneous lesions in the immunocompromised host.
- ▶ Early diagnosis and targeted treatment with high-dose trimethoprim-sulfamethoxazole is of paramount importance because of the high mortality rate associated with this infection.

antimicrobials. Presenting with fever, pain and non-specific purpura, a prompt diagnosis via skin biopsy allowed initiation of targeted antibiotic therapy 48 hours before positive blood culture results were available.

Many patients at risk for *S. maltophilia* infection receive broad-spectrum antibiotics for neutropenic infections and prophylaxis. These antibiotics fail to treat *S. maltophilia* and may select for it. In at-risk patients, initiation of high-dose TMP-SMX should be considered pending laboratory confirmation of the causative organism.

Contributors All of the authors warrant that they made substantial contributions to the study design, data acquisition and analysis/interpretation of data. EB drafted the manuscript primarily. Substantive edits were made by EWP and RGM. All authors have approved the final version of the manuscript and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Competing interests None declared.

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REFERENCES

- 1 Safdar A, Rolston KV. *Stenotrophomonas maltophilia*: changing spectrum of a serious bacterial pathogen in patients with cancer. *Clin Infect Dis* 2007;45:1602–9.
- 2 Senol E. *Stenotrophomonas maltophilia*: the significance and role as a nosocomial pathogen. *J Hosp Infect* 2004;57:1–7.
- 3 Teo WY, Chan MY, Lam CM, et al. Skin manifestation of *Stenotrophomonas maltophilia* infection: a case report and review article. *Ann Acad Med Singapore* 2006;35:897–900.
- 4 Bin Abdulhak AA, Zimmerman V, Al Beirouti BT, et al. *Stenotrophomonas maltophilia* infections of intact skin: a systematic review of the literature. *Diagn Microbiol Infect Dis* 2009;63:330–3.
- 5 Gao Y, Minca EC, Procop GW, et al. *Stenotrophomonas maltophilia* cellulitis in an immunocompromised patient presenting with purpura, diagnosed on skin biopsy. *J Cutan Pathol* 2016;43:1017–20.
- 6 Falagas ME, Kastoris AC, Vouloumanou EK, et al. Community-acquired *Stenotrophomonas maltophilia* infections: a systematic review. *Eur J Clin Microbiol Infect Dis* 2009;28:719–30.
- 7 Aisenberg G, Rolston KV, Dickey BF, et al. *Stenotrophomonas maltophilia* pneumonia in cancer patients without traditional risk factors for infection, 1997–2004. *Eur J Clin Microbiol Infect Dis* 2007;26:13–20.
- 8 Trignano E, Manzo MJ, Fallico N, et al. First report of digital skin ulcer with *Stenotrophomonas maltophilia* infection in an immunocompetent patient. *In Vivo* 2014;28:259–61.
- 9 Vartivarian SE, Papadakis KA, Palacios JA, et al. Mucocutaneous and soft tissue infections caused by *Xanthomonas maltophilia*. A new spectrum. *Ann Intern Med* 1994;121:969–73.
- 10 Nicodemo AC, Paez JJ. Antimicrobial therapy for *Stenotrophomonas maltophilia* infections. *Eur J Clin Microbiol Infect Dis* 2007;26:229–37.

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