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Mycobacterium fortuitum ventriculoperitoneal shunt infection in an immunocompromised patient: A case report

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ABSTRACT

We present a case of *Mycobacterium fortuitum* ventriculoperitoneal shunt infection in a 26-year-old immunocompromised woman. The patient was treated with revision and replacement of her peritoneal shunt and prolonged combination antimicrobial therapy. There are no established guidelines for the treatment of VP shunt infections due to *M. fortuitum.* We review the literature and provide treatment recommendations.

Introduction

Mycobacterium fortuitum is a bacterium commonly found in the environment, more specifically in water, soil and dust [3]. This bacterium is classified as a rapidly growing mycobacteria, as it can be isolated and identified within the first week of incubation [2]. Infections in the central nervous system (CNS) are usually secondary to surgical site, catheter or shunt contamination as this mycobacterium has the ability to form biofilms and colonize foreign bodies. Disseminated infection with *M. fortuitum* is most commonly seen in immunocompromised patients and this warrants an extended course of antimicrobial therapy. Currently, there are still no established guidelines for the treatment of *M. fortuitum,* as infections with nontuberculous mycobacterium are uncommon and difficult to treat [2]. We present a case of a ventriculoperitoneal (VP) shunt infection caused by *M. fortuitum* in a 26-year-old immunocompromised woman with reported allergies to several antimicrobial therapies. Recommendations regarding treatment are described based on this case and pertinent literature review.

Case

A 26-year-old woman with a past medical history of endometriosis with prior abdominal surgeries, Crohn's disease on prednisone and ustekinumab, and pseudotumor cerebri, initially presented with progressive loss of vision and headaches and subsequently underwent optic nerve fenestration and VP shunt placement. Her headaches dramatically improved but she developed abdominal pain with drainage from her incision site. Computed tomography (CT) of the abdomen showed the peritoneal catheter was in the subcutaneous tissue. She underwent two laparoscopic revisions and placement of a distal shunt catheter tip. Following surgery, she experienced significant improvement in her abdominal pain and had resolution of incision site drainage. Her headaches also improved. Ten days following surgery, she developed worsening headaches, erythema and swelling along the shunt on the right side of her neck and erythema of the abdomen over the operative scar. She subsequently presented to the emergency department for further evaluation.

At presentation, vitals were all within normal limits. Physical examination was significant for a right VP shunt incision scar with surrounding erythema, but no drainage or tenderness was appreciated. Laboratory findings were significant for leukocytosis of 14,400 cells/μL with a left shift. The patient reported anaphylactic reactions to azithromycin, trimethoprim-sulfamethoxazole, doxycycline and amoxicillin. Therefore, empiric therapy with intravenous (IV) cefepime 2gm every 8 h, vancomycin

Abbreviations: VP, ventriculoperitoneal shunt; CNS, central nervous system; CT, computed tomography.

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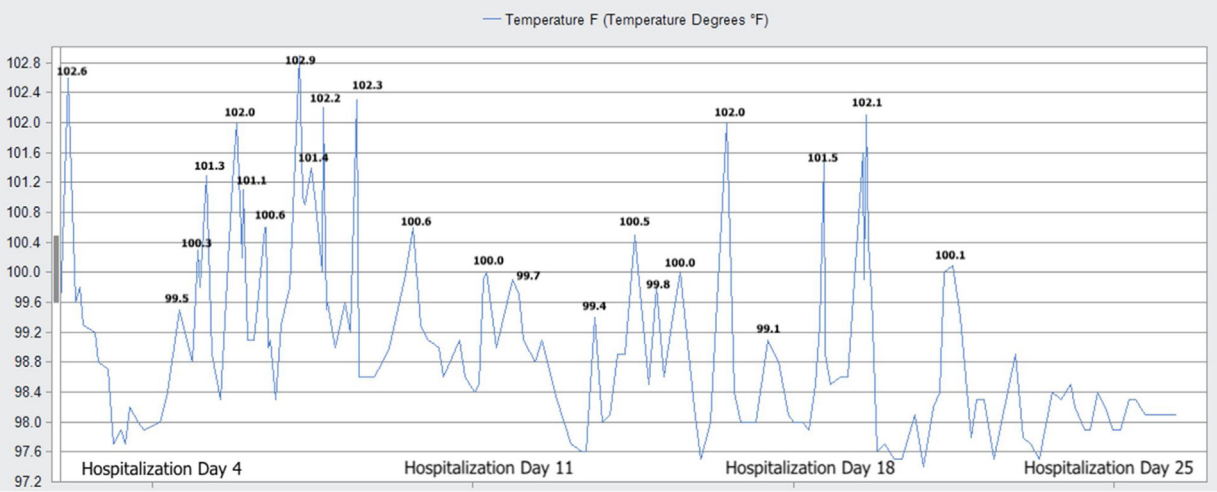

Fig. 1. Hospitalization temperature curve of the patient in °F.

1500 mg every 8 h and metronidazole 500 mg every 8 h were initiated. The patient started to experience worsening headaches and myalgias. Subsequent physical examination was significant for facial flushing and pain with flexion of the neck. The patient started to spike fevers (Fig. 1) and develop right neck tenderness along the shunt path. She underwent VP shunt removal. CT abdomen was obtained, which showed a small superficial fluid collection around her incision. She underwent lumbar puncture (Table 1) and percutaneous drainage of 20cc of cloudy abdominal fluid collection remarkable for 7475 cells/uL of white blood cells with 91 % neutrophils. At this stage, the patient had been treated with metronidazole 500 mg IV every 8 h, cefepime 2gm IV every 8 h, meropenem 1000 mg IV every 8 h, fluconazole 400 mg IV daily and vancomycin 1250 mg IV every 8 h. The patient was soon after started on imipenem 500 mg IV every 6 h, amikacin 1250 mg IV daily and tedizolid 200 mg orally daily as cultures from the abdominal fluid and the VP shunt itself were concerning for a rapid-growing mycobacterium.

M. fortuitum was identified from the VP shunt and abdominal fluid collection eleven days after shunt removal and five days following drainage. As a result of this, the patient underwent incision and drainage of the abdominal fluid collection. Surgical findings were significant for necrotic material with encapsulated pus. Surgical cultures were also positive for *M. fortuitum*. The patient underwent azithromycin desentization and completed twelve days of treatment intravenously. Antimicrobials were adjusted to imipenem 1000 mg IV every 8 h, amikacin 1250 mg IV once a day and levofloxacin 750 mg orally once a day after susceptibility profile returned and showed resistance to azithromycin. The patient was discharged home with a planned two month of intravenous combination antimicrobial therapy, followed by ten months of oral antimicrobial therapy with levofloxacin 750 mg once a day. Upon outpatient follow up, the patient complained of ringing of the ears, possibly secondary to amikacin. The patient was briefly hospitalized to undergo doxycycline desentization. Her planned course of therapy was ten months of antimicrobial therapy with imipenem 1 g IV every 8 h, levofloxacin 750 mg orally once a day and doxycycline 100 mg oral every 12 h.

Table 1
Spinal fluid analysis performed after lumbar puncture.

Spinal Fluid Analysis	
	Measure Values [Reference Value]
Total Volume	40 mL
Appearance	**Hazy** [Clear]
Red Cells	**22** [0 cells/uL]
White Cells	**284** [0–5 cells/uL]
Polys	**59** [0–5%]
Monos	41 [5–100%]
Total Cell Counted	100
Glucose	40 [40–76 mg/dL]
Protein	**65** [11–45 mg/dL]

Discussion

Infections of permanent shunts tend to be most commonly caused by gram-positive organisms [8]. Permanent shunt infections with atypical mycobacterium are rare but should be considered in immunocompromised patients given the high risk for dissemination and worse outcomes. *M. fortuitum* postoperative wound infections are uncommon [1]. The patients tend to present with non-specific symptoms which typically include fever, headache, signs concerning for meningitis, mental status changes, nausea and vomiting [8]. In order to correctly identify this organism as the cause of infection, it is crucial that acid-fast smear and cultures are sent on all samples including those obtained from removed hardware. Polymerase chain reaction may also aid in the diagnosis.

Treatment of *M. fortuitum* consists of source control via surgical debridement and removal of the foreign body as well as a combination of antimicrobial therapy aggressively dosed guided by in vitro sensitivity tests. This bacterium is known to be resistant to antituberculosis medications and macrolides but has been found to respond effectively to antimicrobials including amikacin, linezolid, imipenem, sulfonamides, cephalosporins, fluoroquinolones and tetracyclines [8]. Prolonged antimicrobial treatment is necessary in order to prevent relapse, which usually occurs within two months after discontinuation of treatment [7]. Failure to respond to treatment has been attributed to the failure to remove the foreign body, inadequate surgical drainage, a low serum antimicrobial level or poor penetration of antimicrobials [3]. In the case of CNS infections, the blood-brain barrier adds a challenge to the successful treatment of this bacterium.

We performed a literature review using MEDLINE with search terms including "ventriculoperitoneal shunt", "*Mycobacterium fortuitum*" and "treatment". Only four cases, excluding ours, have been reported pertaining to ventriculoperitoneal or ventriculoatrial shunt infection by *Mycobacterium fortuitum*.

Chan et al. reported a case of a 60-year-old who develop a ventriculoatrial shunt infection after insertion. Treatment included removal of the shunt as well as administration of IV amikacin with oral ofloxacin. Due to poor penetration of the blood brain barrier by amikacin, amikacin was administered intraventricularly via a Rickham reservoir. The patient underwent ten weeks of continuous intravenous and intrathecal treatment with no relapse seen during one year of follow up [3].

Midani and Rathore reported a case of VP shunt infection by *M. fortuitum* in a 13-year-old girl with spina bifida [4]. The patient continued to experience fevers with deterioration of her mental status despite completion of antimicrobial therapy. She underwent removal of her shunt and cultures became positive with *M. fortuitum* after 72 h. The patient was successfully treated with a six-week course of IV amikacin and oral trimethoprim-sulfamethoxazole followed by six months of trimethoprim-sulfamethoxazole monotherapy [5].

Viswanathan et al. describe a case of a 60-year-old man with traumatic brain injury complicated by hydrocephalus requiring placement of VP shunt. He presented with fever and signs concerning for pneumonia six weeks later. The pneumonia was initially treated with a combination of amoxycillin-clavulanic acid but despite clearance of the infection, fevers persisted. He underwent VP shunt removal, and shunt cultures on Lowenstein Jensen's medium eventually grew *M. fortuitum.* Sensitivity testing showed resistance to isoniazid, rifampin, streptomycin, ethambutol, pyrazinamide, ofloxacin, amikacin, and sparfloxacin, but susceptibility to kanamycin and ciprofloxacin. He was treated for two months with intramuscular kanamycin and for three weeks with ciprofloxacin IV followed by six weeks of oral ciprofloxacin [6].

Cadena et al. describe a case of a 14-year-old boy who developed postoperative VP shunt infection with *M. fortuitum.* The patient initially failed broad-spectrum antimicrobials consisting of ceftriaxone and vancomycin. Cultures obtained from the CSF and shunt eventually grew *M. fortuitum*. He underwent shunt removal and was treated with three months of IV meropenem and six months of oral moxifloxacin and trimethoprim-sulfamethoxazole. The patient was symptom free after nine months of antimicrobial therapy [2].

Based on our case and review of the related literature, we recommend that in the event of severe CNS infection or disseminated disease, specifically in an immunocompromised patient, initial treatment should consist of two or more IV antimicrobials for a minimum of two months. This should be followed by at least two to twelve months of oral antimicrobial therapy. Antimicrobials which have been found to be effective include amikacin, fluoroquinolones, sulfonamides, doxycycline and imipenem. Antimicrobial spectrum should be guided based on in vitro susceptibility studies.

Conclusion

In immunocompromised patient and in patients with VP shunts in place, clinicians should have a high index of suspicion for atypical mycobacteria infections, especially in the event of negative cultures. Typical signs and symptoms include unremitting fevers, headache, persistent signs of wound infection or signs concerning for meningeal irritation. Once identified, infection with *M. fortuitum* can be successfully managed with removal of the foreign body along with a prolonged course of combined antimicrobials.

Founding sources

The authors report no founding sources.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

All authors listed have contributed equally to the making of this manuscript.

Declaration of Competing Interest

The authors report no declarations of interest.

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