Subdural empyema caused by *Morganella morganii*

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**ABSTRACT**

**Background:** *Morganella morganii* is a species of Gram-negative enteric rod found in normal human gut flora. Pathologically, this most often presents as urinary tract infections, wound infections, and bacteremia. It is highly uncommon for *M. morganii* to be implicated in a central nervous system infection, with only 12 reported cases of parenchymal abscesses or meningitis.

**Case Description:** A previously healthy 13-month-old female presented with fever of unknown origin and had a witnessed seizure during evaluation. A large left subdural fluid collection was identified, and the patient underwent emergent burr hole drainage and subdural drain placement. Cultures demonstrated *M. morganii* empyema, and she subsequently completed a course of directed antibiotics. Six months following surgery, she has no further clinical or radiographic evidence of infection, seizures, or neurological sequelae.

**Conclusion:** We describe the first reported case of isolated subdural empyema caused by *M. morganii*. The child was successfully treated with the evacuation of the empyema and direct antibiotics with no lasting neurological injury.

**Keywords:** Infection, *Morganella morganii*, Pediatric neurosurgery, Subdural empyema

**INTRODUCTION**

Subdural empyema (SE) is a pyogenic fluid collection that can result in rapid and significant cerebral compression, while rare, these infections represent neurosurgical emergencies.[3] In the pediatric population, SE often develops as a complication of bacterial meningitis, sinusitis, and otitis media infections, with meningitis being more common among infants compared to older children.[9] The most common bacterial agents responsible for SEs are anaerobic and microaerobic streptococci, with *Staphylococcus aureus* as the next most common.[4] Therefore, it is especially notable when an uncommon agent is identified in these subdural collections. One such uncommon agent is the Gram-negative rod, *Morganella morganii*. *Morganella* species are frequently found in normal human and mammal gut flora.[6] Its infectious potential most often presents as urinary tract infections, wound infections, and bacteremia.[6] This bacterial species is only rarely associated with central nervous system infections, with only 12 documented cases of brain abscesses and meningitis caused by *M. morganii*.[1,2,7,8,10-17] Two of these reported patients had coexistent SE secondary to the primary infection, but isolated SE caused by *M. morganii* has not been previously reported [Table 1]. Here, we present a case of an isolated SE caused by *M. morganii* in a previously healthy, immunocompetent 13-month-old female.
CASE DESCRIPTION

A 13-month-old female with no significant prior medical history, prior significant infections, or developmental concerns presented with worsening fatigue and intermittent fevers. The initial evaluation demonstrated leukocytosis, anemia, and elevated inflammatory markers. Infectious evaluation, including chest X-ray, monospot test, rapid streptococcal screen, HSV testing, and UA, was unremarkable. A viral etiology was considered most likely and the patient was discharged home with return precautions. Over the following week, the patient had no significant improvement, and she was admitted to the hospital for further evaluation after repeated laboratory investigations yielded similar results.

On admission, her symptoms included intermittent fevers with concurrent irritability, fatigue, and decreased solid food intake; she appeared at her baseline when not febrile. No signs or symptoms of localized infection were present at that time, and her family denied sick contacts. On the morning following admission, the patient experienced a right upper extremity focal seizure requiring prompting immediate brain MRI. MRI demonstrated an extensive left subdural fluid collection consistent with a subdural hematoma and associated left to right midline shift [Figure 1]. Several posterior components of the fluid collection demonstrated diffusion restriction and raised suspicion for the superinfection of the hematoma. Blood cultures were sent, and the patient was taken for immediate surgical evacuation with ultrasound-assisted burr hole drainage and subdural drain placement. Intraoperatively, the drained fluid was consistent with chronic blood products with foul-smelling superimposed infection. The fluid was collected for microbial analysis, and the patient was started on empiric antimicrobial coverage. The fluid cultures demonstrated *M. morganii*, and the antibiotic regimen was subsequently converted to meropenem monotherapy. Blood cultures and subdural fungal cultures remained negative at 5 and 28 days, respectively.

Given the concern for a chronic subdural hematoma, the patient underwent further trauma evaluation, including retinal examination, skeletal survey, skin examination, and spine MRI which were all unremarkable. MR angiogram showed no evidence of underlying high flow vascular abnormality. Further, history revealed potential trauma 2 weeks before the onset of symptoms, when the patient tipped over in a toy car onto cement; no other history of trauma was identified. Repeat imaging the day after surgery demonstrated near-complete decompression of the left hemisphere [Figure 2]. Clinically, the patient returned to her behavioral baseline, and the fevers resolved after surgery. She was discharged from the hospital 8 days after surgery with a 6-week treatment course of intravenous meropenem. Six months after her surgery, she continues to do well with normal development, no further seizures, and no residual imaging abnormalities on MRI.

### Table 1: Summary of previously reported *Morganella morganii* CNS infections.

| Citation                  | Patient age | Primary CNS infection | Subdural empyema |
|---------------------------|-------------|-----------------------|------------------|
| Abdalla et al. (2006)     | 38 years    | Parenchymal abscess   | No               |
| Águeda et al. (2013)      | 9 years     | Parenchymal abscess   | Yes              |
| Mastroianni et al. (1994) | 45 years    | Meningitis            | No               |
| Milligan and Barenkamp (2013) | 3 weeks   | Meningitis            | No               |
| Ndiaye et al. (2010)      | 12 years    | Meningitis            | No               |
| Park et al. (2004)        | 7 months    | Meningitis            | Yes              |
| Patil et al. (2012)       | 12 years    | Parenchymal abscess   | No               |
| Rau et al. (2002)         | N/A         | Parenchymal abscess   | No               |
| Samonis et al. (2001)     | N/A         | Meningitis            | No               |
| Sinha et al. (2006)       | 6 days      | Meningitis            | No               |
| Thomas et al. (2007)      | 2 months    | Meningitis            | No               |
| Verboon-Macrolo D. et al. (1995) | 8 days | Parenchymal abscess   | No               |

CNS: Central nervous system

**Figure 1:** Preoperative MRI with coronal T1 postcontrast (a) and axial diffusion-weighted images (b) showing a large left subdural fluid collection concerning for hematoma with superimposed empyema and associated mass effect.
DISCUSSION

*Morganella* species is uncommon causes of disease in humans and is notably rare as intracranial pathogens. In a review of the literature, there are 12 prior reports of *M. morganii* intracranial infections, with all prior described cases being parenchymal abscesses or meningitis.[1,2,7,8,10-17] Here, we report the first case description of isolated SE caused by *M. morganii*.

While the underlying source for this infection remains unclear, the clinical and radiographic findings suggest a superimposed infection of a chronic subdural hematoma. Interestingly, blood is one of two agar media frequently used to culture *Morganella* species for diagnosis, with the other being MacConkey agar. Alternatively, given the novel presentation and uncertain premorbid trajectory, in this case, hemorrhagic expansion of the subdural space secondary to the infection itself remains possible. The etiology of this infection is even more obscured by the patient's immunocompetence and lack of extracranial infection.

The patient, in this case, responded well to traditional management of the SE with emergent surgical drainage and directed antibiotic therapy. Surgical approaches to SEs typically favor craniotomy to ensure complete evacuation of the infection, though, in this patient, the homogenous fluid signal on imaging and intraoperative ultrasound confirmation of appropriate resolution allowed burr hole drainage.[5]

CONCLUSION

We describe the first reported case of isolated SE caused by *M. morganii*. In this patient, the infection possibly represented a superinfection of a chronic subdural hematoma. This case description adds to the minimal literature regarding *M. morganii* as a rare intracranial pathogen and reports a novel presentation of this pathogen with isolated SE.

Declaration of patient consent

Patient's consent not required as patients identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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