Iatrogenic Ventriculitis Due to *Mycoplasma Hominis*: A Case Report and Review of the Literature

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Patient: Male, 25
Final Diagnosis: Iatrogenic ventriculitis due to *Mycoplasma hominis*
Symptoms: —
Medication: —
Clinical Procedure: Extraventricular drain
Specialty: Infectious Diseases

Objective: Rare disease
Background: *Mycoplasma hominis*, which rarely causes infection after neurosurgical procedures, is a small free-living organism, belonging to the genus *Mycoplasma*. *M. hominis* lacks a rigid cell wall and cannot be clearly visualized by routine light microscopy. Thus, it is challenging to diagnose infections caused by this pathogen. Here, we report a case of *Mycoplasma hominis* causing iatrogenic ventriculitis secondary to extraventricular drain.

Case Report: A 25-year-old man who was a victim of a road traffic accident developed *M. hominis* ventriculitis secondary to extraventricular drain. Despite a delay in the diagnosis due to the difficulty of identifying *M. hominis*, the patient was successfully treated with intravenous ciprofloxacin 400 mg for 14 days.

Conclusions: The findings of this case report, coupled with a thorough review of the literature, demonstrate the pathogenic potential of *M. hominis*. Particularly in developing countries, in which laboratories may have limited access to advanced technologies, such rare infectious diseases remain major diagnostic challenges.

MeSH Keywords: Central Nervous System Diseases • Cerebral Ventriculitis • Cross Infection • Meningitis • *Mycoplasma Hominis*

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Background

*Mycoplasma hominis* is a small free-living organism belonging to the genus *Mycoplasma* [1]. *Mycoplasma* lacks a rigid cell wall and therefore cannot be visualized by routine light microscopy [1]. Moreover, the lack of a cell wall prevents visualization of *Mycoplasma* species by Gram staining and makes the organism resistant to cell wall inhibitors such as beta-lactam antibiotics [1–3]. It is very challenging and resource- and time-consuming to diagnose infections caused by this organism because of the requirement for special selective medium and specific incubation conditions for culturing *M. hominis* [4]. Furthermore, there are few biochemical traits that are valuable for diagnosis [4]. Accordingly, matrix-assisted laser desorption ionization-time-of-flight mass spectrometry (MALDI-TOF MS) has been adopted as a cost-effective, rapid, reliable method for the diagnosis of *M. hominis* [5].

*M. hominis* generally colonizes the urogenital tracts of sexually active adults and is a causative organism of urogenital tract infections [1]. Central nervous system (CNS) infections due to *M. hominis* are rare. To best of our knowledge, only 21 cases of CNS infection caused by *M. hominis*, including our current case, have been reported in the literature.

Here, we present a successfully treated case of *M. hominis* ventriculitis secondary to extraventricular drain. This is the first case of *M. hominis* causing CNS infection reported in a country in the Middle East.

Case Report

A 25-year-old man was admitted to the emergency room as a victim of a motor vehicle crash. His Glasgow coma score was 8/15, and he was therefore electively intubated and attached to mechanical ventilation. Whole-body computed tomography (CT) was performed, yielding the following findings: CT of the spine showed a nondisplaced compression fracture at the ninth and 10th thoracic vertebrae; CT of the chest showed bilateral basal atelectasis/consolidation likely related to aspiration, with bilateral ground-glass opacities and nondisplaced manubrium sternal fracture; CT of the abdomen showed a small (0.5 cm) contusion over the spleen; CT of the head showed an acute left subdural hemorrhage with underlying mild brain edema and a right midline shift of approximately 1 cm.

Based on these findings, emergency decompressive craniectomy with extraventricular drain (EVD) insertion was performed. He was then admitted to the surgical intensive care unit (SICU) and maintained on mechanical ventilation. On day 5, he developed fever with leukocytosis; septic workup, including cerebral spinal fluid (CSF) analysis and culture, indicated EVD-related ventriculitis, and the patient was administered vancomycin and meropenem. However, the antibiotic regimen was adjusted based on culture results (Table 1), and the patient received a full course of lipid-formulated amphotericin B and vancomycin (for *Candida albicans* and *Staphylococcus hemolyticus*).

After 8 days, the EVD was removed. Four days later, he developed deterioration of consciousness, and a new CT scan of the brain showed active hydrocephalus (Figure 1) with a worsening midline shift. Hence, another EVD was inserted, and a full septic workup was performed (Table 1).

On day 18, he underwent debridement at the cephalic surgical site, and a full course of cefazidime was administered owing to wound infection. On day 25, the patient underwent tracheostomy placement. Postoperatively, he became febrile, and his Glasgow coma scale remained at 8/15. Leukocytosis (14.3 K/µL) was also observed, and another septic screening was performed; the results of CSF culture revealed *M. hominis* (Table 1). The same isolate regrew from a confirmatory sample on day 28. The next day, the second EVD was changed, and he was administered intravenous ciprofloxacin 400 mg every 8 h for a total duration of 14 days. On day 39, the patient was clinically improved and transferred to the general ward. The third EVD remained in place until day 45. He was maintained on nasogastric feeding and tracheostomy. A few days later, he was transferred to another health care facility upon his employer’s request. The patient did not follow up with our facility after that.

Microbiology laboratory findings

Yellowish clear CSF samples from EVD were inoculated on sheep blood agar, MacConkey agar, chocolate agar, anaerobic blood agar, and thioglycolate broth, incubated at 37°C according to the internal policies and procedures of the microbiology laboratory at King Fahd Hospital of the University. CSF analysis revealed a white blood cell count of 1430/µL mm, with 82% segmented cells, a protein value of 316 mg/dL, and a glucose level of 3.0 mg/dL. Direct Gram stain smears from samples showed few pus cells and no organisms. After 48 h of incubation, there was growth of nonhemolytic, translucent, pinpoint colonies on anaerobic blood agar only (Figure 2). Gram stain smears from colonies showed no evidence of bacteria. The isolate was identified as *M. hominis* using MALDI-TOF-MS (VITEK MS; bioMérieux) and Knowledge Base database (version 3.0), with a confidence value of 99.9. Subsequent CSF samples also grew colonies of *M. hominis*. Table 1 summarizes CSF laboratory results for the patient during admission.

Discussion

*M. hominis* primarily colonizes the respiratory tract and genitourinary tract. This organism is mainly transmitted to humans...
through obstruction of the urinary tract, sexual contact, and vertical transmission in utero or intrapartum [1,3]. Surface antigenic variation of *M. hominis* may be related to the persistence of these organisms at invasive sites [1]. Most infections caused by *M. hominis* are primarily related to genital tract colonization.
Table 2. Summary of the reported cases of CNS infection caused by *Mycoplasma hominis* (1950–2018).

| Case N | Author [reference] | Age/sex | Presentation | Treatment | Duration of treatment | Outcome |
|--------|---------------------|---------|--------------|-----------|----------------------|---------|
| 1      | Our case            | 25/Male | Fever and leukocytosis post EVD | Ciprofloxacin 400 milligrams every 8 hours | 14 days | NED |
| 2      | Sato M et al. (2017) [8] | 6/Female | Fever post ventriculoperitoneal shunt (VPS) | VPS Replacement and Ciprofloxacin 10 mg/kg every 12 hours plus clindamycin 13 mg/kg every 8 hours | 6 weeks | NED |
| 3      | Zhou M et al. (2016) [6] | 71/Male | Fever, anepia and right-sided weakness | Azithromycin 0.5 g qd and minocycline 100 mg q12h | 2 weeks | NED |
| 4      | Reissier S et al. (2016) [9] | 39/Male | Fever, loss of consciousness | Meropenem, vancomycin and moxifloxacin | Day 34 to day 49 of admission | Death at day 80 of admission |
| 5      | Hos N et al. (2015) [10] | 21/Female | Fever, neck pain, nausea, vomiting | Oral moxifloxacin at a daily dose of 400 mg | 4 weeks | NED |
| 6      | Whitson W et al. (2014) [11] | 17/Male | Fever, bicep and deltoid weakness | Initial with vancomycin, moxifloxacin, and doxycycline then changed to intravenous moxifloxacin finally to oral moxifloxacin | 6 months | NED |
| 7      | Pailhoriès H et al. (2014) [12] | 43/Male | Fever, delirium tremens | 1 g of levofloxacin IV daily and 400 mg of oral doxycycline daily | NA | NED |
| 8      | Henao-Martínez et al. (2012) [13] | 40/Male | Fever | Doxycycline 100 mg intravenously twice per day | 16 days | NED |
| 9      | Lee E et al. (2012) [6] | 48/Female | Fever | IV moxifloxacin at a daily dose of 400 mg | 14 days | NED |
| 10     | Al Masalma M et al. (2011) [14] | 41/Female | Vertigo, coma headache, hemiparesis | Doxycycline 200 mg/day | 12 weeks | NED |
| 11     | McCarthy KL and Looke DF (2008) [15] | 48/Male | Fever | Gatifloxacin 400 mg IV daily and clindamycin 450 mg IV tds (Gatifloxacin was ceased after two weeks of therapy and clindamycin was changed to the oral formulation to complete a three-month course) | 3 months | NED |
| 12     | McCarthy KL and Looke DF (2008) [15] | 17/Female | Fever | IV gatifloxacin 400 mg daily for 1 month, then changed to oral moxifloxacin to complete a six-week course | 10 weeks | NED |
| 13     | Kupila L et al. (2006) [16] | 40/Male | Hematuria, urine retention and confusion | Tetracycline | NA | NED |
| 14     | House P et al. (2003) [17] | 40/Male | Headache, left facial weakness, nausea, afebrile | Ciprofloxacin and metronidazole | 6 weeks | NED |
associated-empyema; peritonitis; intra-abdominal abscesses; and wound infections [1,3]. In the early 1980s, M. hominis infections were also reported following organ transplantation and immunosuppressive therapy. These infections most likely originated from the patient’s normal flora [4].

M. hominis has also been reported from brain abscesses and meningitis. Several cases of CNS infection by M. hominis have been described in premature infants with prolonged rupture of the membranes, probably owing to genital colonization of pregnant women. These neonates usually present with mild, subclinical meningitis without sequelae or neurological damage with permanent handicaps [1,3]. In adults, rare cases of M. hominis meningitis have been described mainly following neurosurgery manipulations [3,6,7]. Moreover, few cases of M. hominis infection following ventriculoperitoneal shunt insertion with central nervous system involvement have been reported [7,8]. In general, CNS infections with M. hominis usually resolve spontaneously [3]. Existing literature on patients with CNS infection caused by M. hominis is summarized in Table 2.

Isolation of M. hominis in any quantity from sterile body fluids is significantly associated with disease, and identification at the species level is necessary [1]. The optimal temperature for M. hominis growth is between 35 and 37°C, and these organisms grow best under anaerobic conditions, usually within 1–5 days of incubation [3]. M. hominis can be detected routinely in bacteriologic culture medium, such as chocolate agar or blood agar; accordingly, there have been many instances of incidental discovery when Mycoplasma species were not specifically sought [3]. MALDI-TOF MS is a rapid, reliable, cost-effective method and has been shown to accurately identify most Mycoplasma species, particularly M. hominis [1,5].

Mycoplasma species are innately resistant to all beta-lactams, sulfonamides, trimethoprim, and rifampin. M. hominis is usually susceptible to tetracycline, fluoroquinolone, clindamycin, chloramphenicol, streptomycin, and gentamicin [1,3]. Some strains of M. hominis have been reported to be resistant erythromycin, fluoroquinolone, and tetracycline. The extent to which tetracycline resistance occurs in M. hominis varies geographically and may

### Table 2 continued. Summary of the reported cases of CNS infection caused by Mycoplasma hominis (1950–2018).

| Case N | Author [reference] | Age/sex | Presentation | Treatment | Duration of treatment | Outcome |
|--------|--------------------|---------|--------------|-----------|-----------------------|---------|
| 15     | Douglas M et al. (2003) [18] | 17/Female | Fever, headache, photophobia, nausea, vomiting, right-sided hemiparesis and expressive dysphasia | Intravenous doxycycline 100 mg b.i.d. and clindamycin 800 mg t.i.d. then Doxycycline was changed to oral (100 mg b.i.d.) after 5 days, as was clindamycin (300 mg q.i.d.) after 7 days | 3 weeks | NED |
| 16     | Zheng X et al. (1997) [19] | 22/Female | Fever, left-sided weakness and numbness | NA | NA | NED |
| 17     | Cohen M and Kubak B (1997) [20] | 18/Female | Fever, altered mental status | Initially IV doxycycline, ciprofloxacin, and erythromycin. Then IV chloramphenicol was added and IV erythromycin discontinued | NA | NED |
| 18     | McMahon D et al. (1990) [21] | 76/Male | Fever, unresponsive | NA | NA | Death |
| 19     | Madoff S et al. (1988) [22] | 11/Female | Fever | Methacycline | 3 weeks | Death after 3 weeks of therapy |
| 20     | Payan D et al. (1981) [23] | 29/Male | Fever, loss of consciousness | 4 g of IV tetracycline then changed to 4 g of IV erythromycin per day | 2 weeks | NED |
| 21     | Paine T et al. (1950) [24] | 20/Male | Fever, headache, a stiff neck | Streptomycin | NA | NA |

NED – no evidence of disease; NA – not available.
reach 40–50% in some locations. Agar dilution is considered the reference method for antimicrobial testing for Mycoplasma [1].

Conclusions

The findings of this case report, coupled with a thorough review of the literature, demonstrated the pathogenic potential of M. hominis. Particularly in developing countries, in which laboratories may have limited access to advanced technologies, such rare infectious diseases remain major diagnostic challenges.

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Conflict of interest

None.