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

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Conflict of interest: None declared

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 ceftazidime 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/cu 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

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Table 1. CSF results of the patient during admission.

Day of shunting	WBC (cu/mm)	% Segmented	% Lymphocytes	Protein (mg/dL)	Glucose (mg/dL)	Culture
Day 5	NA	NA	NA	NA	113	*Candida albicans* & *Staphylococcus haemolyticus*
Day 11	14	36	59	27.4	55	*Candida albicans*
Day 15	100	83	11	266.4	45	No growth
Day 17	135	81	14	410.8	49	No growth
Day 21	130	85	10	NA	NA	No growth
Day 25	1430	82	6	316.0	3	*Mycoplasma hominis*
Day 28	210	31	49	327.2	32	*Mycoplasma hominis*
Day 33	1892	40	53	176	33	No growth
Day 38	19	34	59	151.7	55	No growth
Day 39	315	20	78	149.3	43	No growth
Day 47	335	54	21	135.5	78	No growth
Day 52	25	8	79	152.5	55	No growth
Day 57	35	55	23	139.4	68	No growth

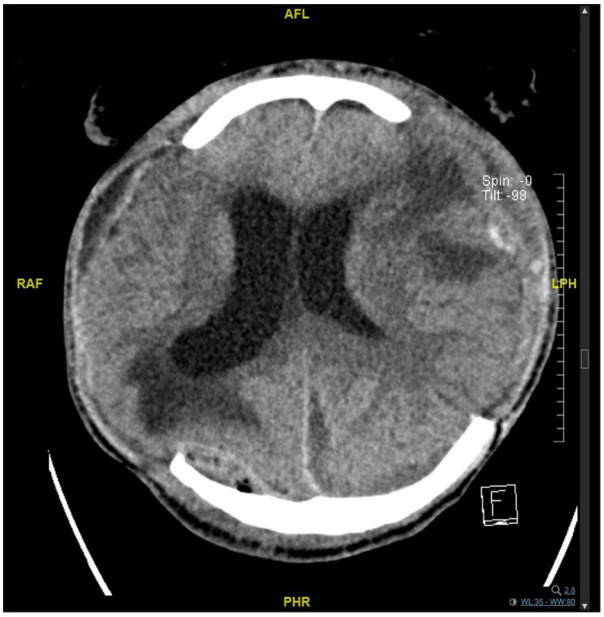

Figure 1. Computed tomography (CT) scan without contrast of the brain showing interparenchymal brain edema and active hydrocephalus with a midline shift.

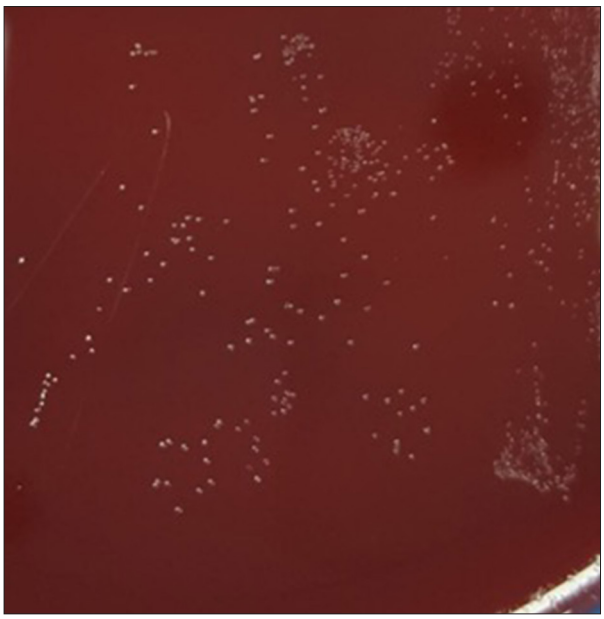

Figure 2. Nonhemolytic, translucent pinpoint colonies grew on Anaerobic Blood Agar.

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.

The infections caused by this organism include acute pyelonephritis, cervicitis, endometritis, tubal factor infertility, postabortion bacteremia, bacterial vaginosis, and other genital tract infections. Other reportable clinical conditions caused by *M. hominis* include bacteremia after renal transplantation, trauma, and genitourinary manipulations; osteomyelitis; septic arthritis; aspiration

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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

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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.

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

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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.

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