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Case Report

A new case of *Mycoplasma hominis* mediastinitis and sternal osteitis after cardiac surgery



Rémi Le Guern^{a,*}, Caroline Loïez^a, Valentin Loobuyck^b, Natacha Rousse^b, René Courcol^a, Frédéric Wallet^a

^a Institute of Microbiology, University Hospital Center, Lille, France

^b Department of Cardiovascular Surgery, University Hospital Center, Lille, France

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ABSTRACT

We report a case of nosocomial mediastinitis and sternal osteitis due to *M. hominis* after open-heart surgery in an immuno-competent patient. This infection has been diagnosed by incubating the culture media for an extended period of time, and sequencing 16S rDNA directly from the clinical samples.

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1. Introduction

Post-operative mediastinitis is a classic complication of open-heart surgery, occurring with an incidence of 1.3%.¹ Coagulase-negative staphylococci or *Staphylococcus aureus* are isolated from the majority of the patients (46% and 26%, respectively).¹ *Mycoplasma* spp. are exceptionally involved in post-operative mediastinitis. We report a case of nosocomial mediastinitis and sternal osteitis due to *M. hominis* after open-heart surgery in an immuno-competent patient.

2. Case Report

A 37 year-old man consulted for thoracic pain. His cardiovascular disease risk factors were uncontrolled hypertension and tobacco smoking. The electrocardiogram was normal, but the troponin was elevated (57 ng/mL). A grade II aortic regurgitation was diagnosed by echocardiography, associated with a 5 mm pericarditis. A chest CT scan confirmed a type A aortic dissection, according to the Stanford classification. The patient underwent emergency surgical replacement of the ascending aorta. On day

4 post-surgery, the patient suffered from aortic rupture with hemothorax. The aortic arch was replaced by an aortic prosthesis during open-heart surgery. Then, a thoracic endoprosthesis was deployed 24 hours later through endovascular means.

The patient developed a ventilator-associated pneumonia due to *Escherichia coli* on day 14 and was treated by ceftriaxone for one week. A purulent discharge from the sternotomy associated with fever (39.6 °C) was noticed on day 20. Nosocomial mediastinitis was suspected. Ceftriaxone was switched to piperacillin-tazobactam, daptomycin and caspofungin to cover a large spectrum of bacteria and fungi. However, the antimicrobial therapy did not seem effective. On day 23, an aggressive surgical drainage with debridement of the infected tissues was performed. Sternal bone and pre-sternal abscess biopsies were sent to the bacteriology laboratory. Direct examination showed no bacteria on the Gram-stain, but there were a high number of leukocytes. After 4 days of culture, pin-point colonies were visible on blood agar from the bone biopsy and abscess samples. No reliable identification could be obtained using MALDI-TOF mass spectrometry (Bruker Daltonics, Wissembourg, France). A Gram-stain performed on the colonies showed no bacteria. 16S rDNA was sequenced directly from the clinical samples and also from the bacterial colonies. *Mycoplasma hominis* was identified with 99% identity. To confirm this unusual result, we used *M. hominis* specific primers on the clinical samples,² and *M. hominis* DNA was also amplified. Our isolate was classified as susceptible to ofloxacin and tetracyclin,

* Corresponding author. Institute of Microbiology, University Hospital Center, Lille, France. Tel.: +33 3 20 44 54 80.

E-mail address: remi.leguern@gmail.com (R. Le Guern).

Table 1
Clinical characteristics of the reported cases of post-operative mediastinitis due to *M. hominis*.

Patient number	Age	Sex	Onset of disease (days)	Fever	Purulent discharge	Survival	Reference
1	62	Male	17	No	Yes	Yes	Sielaff
2	63	Male	90	No	Yes	Yes	Sielaff
3	48	Male	30	Yes	Yes	Yes	Sielaff
4	78	Male	4	Yes	Yes	Yes	Mattila
5	68	Male	12	Yes	Yes	No	Mattila
6	44	Male	6	Yes	Yes	Yes	Mattila
7	51	Male	2	Yes	Yes	Yes	Mattila
8	58	Male	9	Yes	Yes	Yes	Mattila
9	51	Male	1	Yes	No	Yes	Mattila
10	55	Male	8	Yes	Yes	Yes	Hopkins
11	52	Male	16	No	Yes	Yes	Hopkins
12	21	Male	14	No	Yes	Yes	Hopkins
13	17	Male	21	No	No	Yes	Hopkins
14	77	Male	4	Yes	No	No	Garcia
15	55	Male	22	Yes	Yes	Yes	Myers
16	56	Male	26	Yes	Yes	Yes	Karaca
17	37	Male	20	Yes	Yes	Yes	Le Guern

using the SIR Mycoplasma Kit (Bio-Rad). The antimicrobial therapy was switched to levofloxacin on day 27. The fever quickly subsided, and the purulent discharge from the sternotomy stopped. Finally, the patient made a complete recovery after 6 months of antimicrobial therapy with levofloxacin.

3. Discussion

This is the first case of sternal osteitis due to *M. hominis* reported in the literature. There is a lack of prospective studies evaluating the prevalence of *M. hominis* and *Ureaplasma* spp. in mediastinitis. Only 17 cases of post-operative mediastinitis due to *M. hominis* have been published during the last 20 years.^{3–8} The median onset of clinical symptoms was 14 days after surgery, with a minimum of 1 day and a maximum of 90 days (Table 1). The most frequent symptoms were the presence of a purulent discharge (14/17, 82%) and hyperthermia (12/17, 71%). The median age was 55 years old, and 88% (15/17) of the patients survived after appropriate antimicrobial treatment.

Interestingly, all the patients infected with *M. hominis* were males (17/17, 100%). This can be partly explained because the patients undergoing cardiac surgery are predominantly males (72%).⁹ Although the prevalence of *M. hominis* is higher in the genitourinary tract of women (393/2689, 14.6%) than males (78/2336, 3.3%),¹⁰ it could be hypothesized that post-operative *M. hominis* mediastinitis is linked with urinary catheterization. Indeed, urinary catheterization is more traumatic in males, and it

may lead to bloodstream invasion.³ *M. hominis* can also colonize the upper respiratory tract, but this is less frequent (3%).⁵

The diagnosis of extra-genital *Mycoplasma* infections is difficult because these bacteria do not possess a cell wall. Thus, they are not visible using a Gram-stain. *Mycoplasma* have fastidious growth requirements: a medium supplemented with nucleic acid precursors is needed, and the addition of serum enhance their growth.¹¹ However, *M. hominis* is less fastidious than other *Mycoplasma* spp., and blood agar contains nucleic acid precursors and cholesterol. Inoculating mediastinitis samples onto *Mycoplasma* specific medium is probably not necessary because *M. hominis* rarely causes mediastinitis, and generic medium like blood agar supports its growth if the incubation is prolonged. When blood agar medium is incubated in 5% CO₂ or under anaerobic conditions, tiny colonies of *M. hominis* (0.2 mm) can appear in 2 to 7 days.¹² *M. hominis* can also grow on anaerobic medium or chocolate agar. The median time needed for the growth of *M. hominis* from mediastinitis samples is 6 days (Table 2). Therefore, in the case of mediastinitis, a prolonged length of incubation of at least a week could improve the diagnosis of *M. hominis* infection. However, some cases of *M. hominis* infections and all the *Ureaplasma* spp. would be still missed by such an approach.

Molecular methods represent an attractive option to diagnose *M. hominis* infections. PCR techniques targeting *M. hominis* specific genes can detect as few as 7 x 10³ copies / mL.¹³ These techniques can be more sensitive than culture in clinical urogenital samples, with a 36% (55/153) positivity rate for the PCR assay against 29%

Table 2
Microbiological data of the reported cases of post-operative mediastinitis due to *M. hominis*.

Patient number	Growth Medium	Culture atmosphere	Time to positivity (days)	Reference
1	Brucella	Anaerobic	6	Sielaff
2	Brucella	Anaerobic	5	Sielaff
3	Brucella	Anaerobic	6	Sielaff
4	Fastidious Anaerobe	Anaerobic	6	Mattila
5	Fastidious Anaerobe	Anaerobic	5	Mattila
6	Fastidious Anaerobe	Anaerobic	6	Mattila
7	Fastidious Anaerobe	Anaerobic	21	Mattila
8	Fastidious Anaerobe	Anaerobic	10	Mattila
9	Fastidious Anaerobe	Anaerobic	9	Mattila
10	Chocolate	CO ₂	16	Hopkins
11	Chocolate	CO ₂	7	Hopkins
12	Chocolate	CO ₂	6	Hopkins
13	Chocolate	CO ₂	7	Hopkins
14	Blood, Chocolate	Air, CO ₂ , Anaerobic	5	Garcia
15	Not specified	Not specified	16	Myers
16	Not specified	Not specified	3	Karaca
17	Blood, Chocolate	Air, CO ₂	4	Le Guern

(45/153) for the culture on Hayflick or Shepard medium.¹³ Broad-range PCR by 16S rDNA sequencing can detect a large number of bacterial species (depending on the primer sequence) with no prior hypothesis. 16S rDNA sequencing is less sensitive than specific *M. hominis* PCR, principally due to the low level of contaminating bacterial DNA in PCR reagents.¹⁴ However, the sensitivity of 16S rDNA sequencing in clinical samples is still high enough: 97% (36/37) of spontaneous brain abscesses were positive using 16S rDNA sequencing with the Sanger method. 16S rDNA sequencing has already been used with success for the diagnosis of *M. hominis* infections.¹⁵ We suggest to amplify and sequence 16S rDNA in case of culture negative samples for patients presenting clinical symptoms of mediastinitis in order to be able to detect a broad-range of pathogenic bacteria, including *M. hominis*.

Cefazolin or cefuroxime are typically used for antimicrobial prophylaxis in cardiac surgery.¹⁶ These molecules are not active against *M. hominis*, because the lack of a cell wall renders *Mycoplasma* non-susceptible to the action of beta-lactam antibiotics. In this case report, the patient was treated with levofloxacin for 6 months. Minimal inhibitory concentrations of other quinolones can be lower: moxifloxacin CMI90 is 0.06 mg/L, compared to 0.25 mg/L for levofloxacin.¹⁷ However, moxifloxacin significantly increases the risk of ventricular arrhythmia, contrary to levofloxacin.¹⁸ It also would have been possible to associate doxycycline or clindamycin, due to the high risk of selecting resisting mutants during a prolonged quinolone monotherapy.

Although *M. hominis* mediastinitis is a rare disease, it should be evoked in culture-negative purulent discharges after cardiac surgery. *M. hominis* should be suspected especially if the per operatory samples show numerous leukocytes with no visible bacteria. Incubating the culture media for an extended period of time or amplification of 16S rDNA directly from the clinical samples followed by sequencing may help to obtain a definitive diagnosis and adapt the antimicrobial chemotherapy.

Conflict of interests: The authors declare that they have no conflict of interest.

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