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Case Report

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Gardnerella vaginalis Is a Rare Cause of Ventilator-Associated Pneumonia: A Case Report and Literature Review

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Abstract

Gardnerella vaginalis (*G. vaginalis*) is a commensal bacterium of the vaginal flora, facultative anerobic with Gram-variable, frequently implicated in cases of vaginosis or even infections of the genitourinary tract, rarely responsible for systemic infections and very exceptionally isolated in bronchopulmonary damage. We report here a case of *G. vaginalis* pneumonia in a 45-year-old man admitted to the intensive care unit for cardiorespiratory arrest (CRA) by hanging, whose course was unfavorable following severe post-anoxic encephalopathy. During his hospitalization, the patient presented ventilator-associated pneumonia (VAP) with identification of *G. vaginalis* at a significant threshold on the protected distal bronchial sampling (PDBS). Antibiotic therapy with cefotaxime and metronidazole had a good response to this infection. In this observation, we discuss the pathogenic role and identification of *G. vaginalis* at the pulmonary level.

Keywords: Pneumonia; *Gardnerella vaginalis*; Bronchopneumopathy; Invasive infection

Introduction

Gardnerella vaginalis (*G. vaginalis*) is a commensal bacterium of the vaginal flora, facultative anaerobic with variable Gram, frequently responsible for vaginosis during dysbiosis, also implicated in genitourinary infections in both women and men [1, 2]. However, *G. vaginalis* has also been described as responsible for severe infections outside the urogenital tract such as bacteremia, endocarditis with cerebral and renal septic emboli, septic arthritis, and renal abscess [2-5]. Very exceptionally, it has been isolated at the bronchopulmonary level in adults, with only two cases published in the literature of bronchopneumopathy complicated by pulmonary abscess [6, 7]. Here we report a case ventilator-associated pneumonia (VAP) to *G. vaginalis* in a young patient admitted to intensive care for cardiorespiratory arrest (CRA) by hanging.

Case Report

The patient was a 45-year-old man with no known medical or psychiatric history. He was found hanged by his family following a marital conflict, using a wire at a low height. Delivered by firemen, he was in CRA and an external cardiac massage was immediately started, an injection of 1 mg of intravenous adrenaline as well as an orotracheal intubation was performed by the team of the emergency rapid response unit without difficulty. A 10-min cardiopulmonary resuscitation was necessary to recover spontaneous cardiac activity in sinus rhythm. The duration of no flow was estimated to be between 10 and 30 min. On arrival at the emergency room, under sedation, the patient presented a stable hemodynamic state without amines, in controlled ventilation with an oxygen inspired fraction (FiO_2) of one, and the pupils were intermediate and reactive. On the biological balance sheet we noted hyperlactatemic metabolic acidosis (pH 7.11; PaO_2 252 mm Hg; $PaCO_2$ 48 mm Hg; bicarbonates 15 mmol/L and lactates 8 mmol/L), hepatic cytolysis 10 times higher than normal, moderate acute renal failure. The rest of the biologic assessment was without particularities. The patient was transferred to the intensive care unit after ruling out secondary brain lesions, carotid dissection, and cervical fracture and so on by angioscanning supraortic and cerebral trunks associated with cervical spine slices. The initial management in the intensive care unit consisted of continued sedation, the introduction of curares with targeted temperature control at 34 °C and a decrease in FiO_2 to 0.4. A protected distal bronchial sampling (PDBS) for suspicion of inhalation pneumonia was returned sterile. Probabilistic antibiotic therapy with amoxicillin-clavulanic acid was then started.

The initial evolution was marked after the skin warmed up and the curarization stopped at a myoclonic status epilepticus requiring the resumption of sedation and the initiation of an anticomitial treatment. The first electroencephalogram (EEG)

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carried out showed a pattern compatible with post-anoxic encephalopathy and the plasma level of neuron specific enolase at 72 h, and ACR was elevated to 205 µg/L. The shock liver and kidney regressed rapidly within 48 h, and there was no post-CRA hemodynamic failure. At the respiratory level, while the patient was on inspiratory support from day 2, there was an increase in oxygen demand up to 0.7 from day 5, a subfebrile state, and a progressive rise in C-reactive protein up to 292 mg/L under probabilistic antibiotic therapy and the appearance of a radiological focus of the right base. A second PDBS was performed at day seven, this time we identified *G. vaginalis* at 10^4 CFU/mL by matrix assisted laser desorption/ionization time of flight (MALDI-TOF) mass spectrometry (Vitek MS, bioMerieux, Inc.) as well as 10^2 CFU/mL *Staphylococcus aureus* methicillin-sensitive and 10^2 CFU/mL *Hafnia alvei*. All the blood cultures taken during the stay returned sterile. The patient was put on cefotaxime and metronidazole. The FiO_2 decreased, the inflammatory syndrome and the radiological focus regressed.

The subsequent evolution was marked by the definitive cessation of sedation at day 10 after a last control EEG devoid of paroxysmal activity but with a very depressed background rhythm. Clinically, the patient showed no sign of awakening with disappearance of all brain stem reflexes at day 16, suggesting a state of brain death confirmed by cerebral angioscan. A multiple organ harvesting procedure was performed after verifying the absence of opposition during his lifetime and after informing the family. As part of this procedure, the chest computed tomography scan had shown a predominantly frosted glass area under the pleura of the right lower lobe. Given the epidemic context, the possibility of a severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection was ruled out by reverse transcriptase polymerase chain reaction (RT-PCR) and the realization of a third PDBS confirmed a sterile culture.

Discussion

G. vaginalis is a Gram-variable bacillus, whose wall has the structure of Gram-positive bacteria, formerly *Hemophilus vaginalis* or *Corynebacterium vaginale*. These are small polymorphic bacilli, more or less diphtheroids, with short, immobile, non-capsulated forms, partially clustered on cells at the vaginal level (clue-cells). Its culture requires enriched media incubated in anerobiosis or in CO_2 (blood agar, chocolate agar), with punctiform colonies in 24 h and 1 mm in 48 h, circular, convex, gray and shiny. Beta-hemolysis in CO_2 incubation is found in human or rabbit blood. This species ferments glucose, maltose and starch but not mannitol [8]. All these biochemical characteristics sometimes make it difficult to diagnose *G. vaginalis* by conventional methods. In our case, the sample was highly inflammatory, the germs on direct examination were not seen, which is not surprising despite a count of 10^4 CFU/mL, given a Gram stain offering to both less contrast than many other germs and a non-monomorphic heterogeneous morphology and therefore less "discriminating" on a Gram stain.

G. vaginalis is a commensal bacterium of the female genital mucosa found in 87% of women without bacterial vaginosis [9]. However, in an earlier study, it was reported that 7% to 11% of men had *G. vaginalis* in their urogenital or anorectal bacterial flora, leading to the possibility of colonization and urinary tract infection [10]. Several cases have been published in the literature of *G. vaginalis* infections in men such as urinary tract infections, balanitis, urethritis, prostatitis and sometimes invasive infections such as endocarditis, bacteremia, renal abscess, pulmonary empyema and hydronephrosis with pyonephrosis [1, 11]. However, in most of these cases, the gateway probably remains linked to the human urogenital tract or even locoregional or hematogenous diffusion in severe forms. In the literature, we found only two cases of *G. vaginalis* infections with a respiratory portal of entry. The characteristics of bronchopulmonary *G. vaginalis* infections are summarized in Table 1 including our case.

We note several common points in the three observations (Table 1): young immunocompetent male patient; an initial clinical context of inhalation pneumonia following consciousness disorders; isolation of *G. vaginalis* from quality respiratory samples (bronchoalveolar lavage or PDBS); identification of a mixed flora and finally a line or several lines of probabilistic antibiotic therapy started before the identification of *G. vaginalis*. On the other hand, our patient was intubated at the beginning of his treatment, and the pneumonia had all the criteria for VAP. A shorter delay between the onset of symptoms and microbiological identification was observed, which may explain the absence of complications such as bacteremia or pulmonary abscess. In the two previous cases, *G. vaginalis* was found to be responsible for pneumonia, and the notion of contamination was completely ruled out in the first case (isolation on three different sites by two different services and identification by two different laboratories). In our observation, the pathogenic role of *G. vaginalis* at the pulmonary level is certain: the respiratory specimen was protected, *G. vaginalis* is the only germ identified with a significant threshold and the identification was obtained by a reliable means (MALDI-TOF) with a high degree of confidence of 99.9%. However, the respiratory specimens from the three patients (Table 1) are polymicrobial with bacteria from the commensal flora, suggesting a probable oropharyngeal carriage of *G. vaginalis* in these patients. In a recent study of the nasal microbiota in asthma, *G. vaginalis* is one of the four bacteria that are found in differentially abundant quantities depending on the type of asthma (exacerbated versus non-exacerbated and control) [12]. With our patient having died, we could not rule out a probable prior nasal or oral colonization.

G. vaginalis is generally sensitive to the amoxicillin-clavulanic acid combination, but unfortunately our patient developed lung infection under this antibiotic therapy. There are no recommendations for antibiotic treatment of invasive *G. vaginalis* infections, although dual therapy was emphasized in several studies [6, 7, 10]. In our case, we observed a good clinico-biological and microbiological response with a sterile third PDBS after 7 days of treatment with cefotaxime and metronidazole.

Conclusion

We report a third case of *G. vaginalis* pneumonia with a definite pathogenic role of this bacterium despite a mixed flora on

Table 1. Characteristics of Bronchopulmonary Infections Caused by *Gardnerella vaginalis*

Year/ reference	Age	Sex	Clinical context	Clinical presentation	Culture sites	Means of microbiological diagnosis	Culture results	Antibiotics
1989 [6]	41 years old	M	Clouding of consciousness following a brawl; inhalation pneumonia	Bronchopneumopathy complicated by bacteremia and pulmonary abscess	Bronchoscopy aspirations; blood; pleural fluid	BACTEC automated incubator and hemoline diphasic medium	*Gardnerella vaginalis*; *Streptococcus milleri*; *Neisseria sicca*; *Hemophilus parainfluenzae* and other anerobic germs	Ceftazidime; penicillin; minocycline + metronidazole; clindamycine + ampicilline + minocycline; chloramphenicol in the pleural space
2019 [7]	20 years old	M	Multiple gunshot wounds; posterior fossa intracerebral hemorrhage and hydrocephalus; suboccipital craniectomy; postoperative stridor	Bronchopneumopathy complicated by pulmonary abscess	Min-BAL	NA	*Gardnerella vaginalis*; coagulase-negative staphylococcus; *Hemophilus influenzae*	Vancomycin + piperacillin/ tazobactam; ampicillin-sulbactam + fluconazole; vancomycin + cefepime; ceftriaxone + metronidazole
2020	45 years old	M	Cardiorespiratory arrest; post-anoxic encephalopathy; inhalation pneumonia.	VAP	PDBS	MALDI-TOF	*G. vaginalis* 10^4 CFU/ mL; *Staphylococcus aureus* and *Hafnia alvei* 10^2 CFU/mL	Amoxicillin-clavulanic acid; cefotaxime + metronidazole

BAL: bronchoalveolar lavage; MALDI-TOF: matrix assisted laser desorption/ionization time of flight; NA: data not available; PDBS: protected distal bronchial sampling; VAP: ventilator-associated pneumonia.

the respiratory specimen. The clinical history of inhalation in the three observations suggests a nasal or oropharyngeal reservoir in some patients which constitutes a niche for a low respiratory infection but further work is needed to confirm this hypothesis and determine the factors favoring the passage from colonizing status to pathogenic germ at the pulmonary level.

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Conflict of Interest

The authors have declared that no competing interests exist.

Informed Consent

Not applicable.

Authors Contributions

AY drafted the manuscript. APF, LG and VJ carried out the critical analysis of article. APF and VJ performed laboratory analysis. All authors read and approved the final manuscript.

Data Availability

The authors declare that data supporting the findings of this study are available within the article.

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