










Hemodialysis catheter -associated infection by *Sphingobacterium Spiritivorum*: A case report in an intensive care unit in Colombia.

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Abstract

Introduction: *sphingobacterium spiritivorum* is a rare cause of human infections worldwide. It occurs in immunocompromised patients, and its treatment is a clinical challenge.

Clinical case: A 46-year-old woman was admitted to a hospital in Medellín with acute hypoxemic respiratory failure secondary to severe pneumonia due to SARS-CoV-2 and requiring mechanical ventilation. He developed acute renal failure, requiring hemodialysis through a right jugular catheter. At 48 hours after insertion, signs of a systemic inflammatory response were set, and *Sphingobacterium spirivorum* was cultured in all cultures.

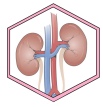
Evolution: Intravenous ciprofloxacin was started for seven days with favorable clinical evolution and control culture at 48 hours without microbiological isolation, so it did not require the removal of the hemodialysis catheter. After this, with improvement in her admission condition, for which she was transferred to the general hospitalization ward and later discharged.

Conclusion: In this case, severe SARS/CoV-2 was aggravated by acute renal failure and septicemia superadded by *S. Spiritivorum*.

Keywords:

MESH: *Sphingobacterium*; Kidney Dialysis; mortality; Case Reports.

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Healthcare-associated infections are a public health problem worldwide that are directly related to an increase in the burden of morbidity and mortality, an increase in days of hospital stay, the development of antibiotic resistance, and an increase in health costs [1].

After the advent of the COVID-19 pandemic and reinforcing policies for humanizing medical services in the intensive care unit (ICU), infection prevention protocols have become more flexible. This, in turn, is expected to change the epidemiology of these infections due to introducing new pathogens to the community [2, 3].

Uremic patients are susceptible to infectious diseases because uremia affects polymorphonuclear cell chemotaxis, phagocytosis, and cytotoxic activities [4]. Uremic retention solutes such as parathyroid hormone, polyamines, angiogenin, and complement factor D can alter neutrophil activity by causing inappropriate expression of cell adhesion molecules, resulting in transient leukopenia. Degranulation and release of reactive oxygen species can also lead to "cell depletion," impairing antimicrobial capacity [5]. Concomitantly, using temporary catheters for hemodialysis breaks the natural barrier for the defense of bacteria usually found on the skin.

Sphingobacterium spirivorum is a rare cause of human infections worldwide. After reviewing the literature, only eight case reports have been described: cellulitis and septicemia. Most of these patients were immunocompromised, and one patient had chronic renal failure [6-13]. We present the case of a woman in the context of acute renal failure.

Clinical case

A 46-year-old woman with no significant pathological history was admitted to the intensive care unit of a tertiary care hospital in Medellín in the context of hypoxemic acute respiratory failure secondary to severe SARS-CoV-2 pneumonia confirmed by molecular testing and the requirement for invasive mechanical ventilation.

During his evolution, she had acute renal failure with a KDIGO 3 classification, so he started renal replacement therapy with hemodialysis through a right jugular catheter. Forty-eight hours after insertion, he developed signs of a systemic inflammatory response, with no apparent source of infection, for which peripheral blood cultures and two catheter lumens were taken. After 24 hours, growth of *Sphingobacterium spirivorum* was obtained in all the cultures, for which the colonies were transferred to media with blood agar and EMB agar and later analyzed in the MicroScan/autoSCAN-4® system, with a resistance profile reported in Table 1. Findings in hematology and blood biochemistry are summarized in Table 2.

Based on the resistance profile, targeted antibiotic therapy with intravenous ciprofloxacin was started for seven days with favorable clinical evolution and control culture at 48 hours without microbiological isolation, so removal of the hemodialysis catheter was not needed. After this, with improvement in her admission condition, she was transferred to the general hospitalization ward and later discharged to her home in subsequent days.

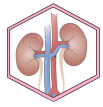
Discussion

The isolation of *Sphingobacterium spirivorum* as a human pathogen was first described by Holmes et al. in 1982, who initially included it within the genus *Flavobacterium*. It is a nonfermenting gram-negative bacillus frequently isolated in organic material from the environment, such as compost and water reservoirs, and, recently, in agricultural plantations, such as onion crops [5], with anecdotal reports of infection. At the time of this report, eleven other cases referenced in the literature had been identified since the publication of its reclassification by Yabuuchi et al. in 1983.

The genus *Sphingobacterium* gets its name from the high content of sphingophospholipids and ceramides in its cell wall. It has approximately 82 species identified to date, among which *S. multivorum*, *S. thalophilum*, and *S. spirivorum* stand out [7]. To date, *S. spirivorum* has been isolated on the Vitek 2 system for bacterial identification (Biomérieux, Marcy l'Etoile, France), Bact/ALERT, and MALDI-TOF. The most commonly used media for culture were blood agar, chocolate agar, and MacConkey agar, although the latter had a lower yield [8-10].

Table 1. Report of positive antibiogram for *S. Spirivorium* in 2 blood cultures and 1 retroculture from a Mahurkar-type hemodialysis catheter.

Antibiotic	MIC	Classification
Amikacin	>32	Resistant
Aztreonam	>16	Resistant
Ceftazidime	>16	Resistant
Ciprofloxacin	<1	Sensitive
Cefepime	>16	Resistant
Gentamicin	8	Intermediate
Imipenem	<1	Sensitive
Levofloxacin	<2	Sensitive
meropenem	<1	Sensitive
Piperacillin/Tazobactam	<1	Sensitive
Ticarcillin/Ac. clavulanic	<1	Sensitive
Tobramycin	>8	Resistant

**Table 2.** Report of laboratory studies carried out in the clinical case.

Variable/Day	0	2	3	5	8
Leukocytes (cell/ml)	27800	18720	15970	19650	6810
Neutrophils (cell/ml)	25048	16305	14341	17528	4998
Lymphocytes (cell/ml)	1974	1572	1006	1238	810
Hemoglobin (g/dL)	12.5	10.5	6.7	8.1	7.8
Hematocrit (%)	42.4	28.5	20.8	25.8	24.5
Platelets (Cel/ml)	242000	148000	204000	133000	305000
Urea nitrogen (mg/dl)	33	36.98	113	72	62
Creatinine (mg/dl)	1.82	4.86	8.12	4.87	2.8
Sodium (mMol/L)	130	140	136	140	146
Potassium (mMol/L)	4.2	3.8	3.3	3.5	4.1
Chlorine (mMol/L)	99	122	126	109	111
Magnesium (mMol/L)					2.2
Phosphorus (mg/dL)					4.1
Total bilirubin (mg/dl)	0.3			0.2	0.2
Direct bilirubin (mg/dl)	0.1			0.1	0.1
Indirect bilirubin (mg/dl)	0.1			0.1	0.1
AST (U/L)					33
ALT (U/L)					24
LDH (U/L)	250				2.99
C-reactive protein (mg/dl)					8.1
Glucose (mg/dL)	657				
pH	6.85	7.33			7.51
pCO ₂ (mmHg)	13.1	20.06			26.7
PO ₂ (mmHg)	165	111.5			106.7
HCO ₃ (mMol/L)	2.2	10.8			20.6
Base Excess (mMol/L)	-30.3	2			-1.9
Lactate (mmol/L)	4.1				1.39

Bacteremia is the most frequent infection, with a high association with foci in the skin and soft tissues (cellulitis, myonecrosis) [11, 12] and contamination of invasive devices (central venous catheter and dialysis catheter) [10], with cases reported in both immunocompromised and immunocompetent populations, the latter with high disease burdens and advanced age. Likewise, associated complications have been reported, ranging widely from endophthalmitis secondary to the procedure, disseminated intravascular coagulation with distal ischemia [16], to valvular endocarditis with multiple organ dysfunction and hemodynamic instability.

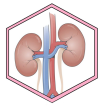
There are few records of infection by *S. spiritivorum* in Latin America, and to our knowledge, there are no reports in Colombia, much less of SARS-CoV-2 coinfection. Table 3 presents a summary of the cases reported to date.

In the present case, resistance to cefepime, ceftazidime, aztreonam, and aminoglycosides was recorded, similar to what has already been reported in different publications. Some reports documented resistance to colistin [10, 16]. In the present case, analyzing this antibiotic's resistance profile was impossible. The patient presented in this report had an excellent course toward complete clinical improvement, unlike other registries that have given fatal results, probably because the other cases occurred in elderly patients with high basal morbidity loads (decompensation of chronic diseases) and additional complications derived from prolonged hospital stay [16].



Table 3. Report of cases of infection by *S. Spiritivorum* in the literature currently available.

Author	Marinella, et al. [16]	Kampfer et al. [14]	Nunez, et al. [twenty].	Rae Koh, et al. [fifteen]	M. Anthony, et al. [2]	Zulficar, et al. [25]	Gupta et al. [10]	Hibi Kumanano [11]	Abenzur, et al.[1]	Naples, et al. [18]	Sajar et al. [22]
Year	2002	2005	2007	2013	2016	2016	2016	2017	2019	2019	2019
Country	USA	Germany	Cuba	Japan	USA	France	England	Japan	Brazil	Italy	USA
Age/Sex	72/M	34/F	62/M	68/F	89/M	89/M	80/F	80/M	61/M	83/M	72/M
Comorbidities	Parkinson's disease	-	-	AML	Parkinson's, Hypertension, AF, CKD 3,	FA	DM2, Hypertension, CKD 5	COPD, CHF, Tachybrady cardia	Nephrotic syndrome (GEFS), HTA.	narrow angle glaucoma	AHT, AF, BPH, CKD
Isolation	blood culture	-	Heme and myeloculture	Blood culture + retroculture	blood culture	blood culture	blood culture	blood culture	mitral valve culture	Vitreous humor culture	blood culture
Crop	-	TSA agar, Sherlock System.	Blood agar, MacConkey(<) agar	Blood agar, MacConkey(<) agar, Vitek 2 system	Blood agar, Chocolate agar, Bact/ALERT system, Vitek 2	-	CURSED system	Blood agar, BD System, BACTEC FX, MALDITOF system	Vitek 2 system, MALDITOF system	-	Bact/ALERT System, Microscan Walkaway System.
Endurance	Aminoglycosides, aztreonam.	-	Penicillin, carbapenem, cephalosporin 4ta, tetracycline, quinolan	MDR (Aminoglycosides, monobactam, colistin, piperacillin tazobactam, ticarcillin)	Aztreonam, aminoglycosides, fosfomicin, quinolones	Aztreonam, aminoglycosides, fosfomicin, quinolones.	Aminoglycosides, amoxicillin, piperacillin/tazobactam.	Latamoxef, aztreonam, aminoglycosides	Colistin, aminoglycosides	MDR	Aztreonam, aminoglycosides, tetracycline.
Treatment	ciprofloxacin	removal from exposure	trimetropin sulfamethoxazole	Cefepime, then ciprofloxacin	Vancomycin, then Pip/Tazobactam	Amoxicillin Ac clavulanic acid	Trimetropin sulfá, then meropenem	Cephalothin, then levofloxacin	Meropenem, vancomycin, then piperacillin/tazobactam	Vanco + intraocular Amika, then IV meropenem + TMP/SMX	Pip/tazo + vanco, then oral levofloxacin.
Outcome	Recovered	Recovered	Deceased	Deceased	Recovered	Deceased	Recovered	Recovery	Deceased	Recovery	Recovered



Conclusion

S. spiritivorum is rarely associated with human infections, especially in elderly patients with high disease burdens. As flexibility measures are established in ICUs, the epidemiological pattern of conditions will tend to change with the introduction of new germs acquired in the community.

Abbreviations

TMP/SMX: trimethoprim-sulfamethoxazole
COPD: chronic obstructive pulmonary disease.
HTA: arterial hypertension.
IV: intravenous.
TNF: tubular necrosis factor

Supplementary information

Supplementary materials have not been declared.

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Does not apply.

Author contributions

Correa –Guerrero J: Conceptualization, Data Curation, Formal Analysis, Fundraising, Research, Methodology, Project Management, Resources, Software, Writing – original draft.

Rico-Fontalvo J: Conceptualization, Supervision, Validation, Visualization, Writing: revision and edition.

Cabrales J: Conceptualization, Supervision, Validation, Visualization, Writing: review and edition.

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Daza-Arnedo Rodrigo: Conceptualization, Supervision, Validation, Visualization, Writing: review and edition.

Velez-Aguirre J: Conceptualization, Supervision, Validation, Visualization, Writing: review and edition.

Acosta D; Conceptualization, Supervision, Validation, Visualization, Writing: review and edition.

Riascos- Castillo S: Conceptualization, Supervision, Validation, Visualization, Writing: review and edition.

Mendoza-Paternina C: Conceptualization, Supervision, Validation, Visualization, Writing: review and edition.

Rodriguez-Yanez T: Methodology, supervision, writing: Review and edition.

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Availability of data or materials

The data sets generated and analyzed during the current study are not publicly available due to participant confidentiality but are available from the corresponding author upon reasonable scholarly request.

Statements

Ethics committee approval and consent to participate

Does not apply.

Consent for publication

The authors have written permission from the patient for publication.

Conflicts of interest

The authors report having no conflicts of interest.

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