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High-output pulmonary fistula with lobar cavitation and acute kidney injury in community-acquired methicillin-resistant *Staphylococcus aureus* infection *Stenotropas maltophilia* associated: A Case Report

Fístula pulmonar de alto gasto con cavitación lobar y lesión renal aguda en infección por *Staphylococcus aureus* resistente a la meticilina adquirida en la comunidad asociada a *Stenotropas maltophilia*: Informe de un caso

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SUMMARY

Community-acquired methicillin-resistant Staphylococcus aureus (CA-MRSA) causes pneumonia, septic shock, and renal dysfunction. We generally fail to find cases addressing uncommon strains in conjunction, like Stenotropas maltophilia. We described a young soldier transferred from a military hospital that treated a small calcaneus wound progressing to acute respiratory and renal failure. Upon arrival, a high-output pulmonary fistula with lobar cavitation was diagnosed. A video-assisted bilateral surgical decortication, intermittent renal replacement, and culture-guided antibiotics therapy were performed. After nutritional requirements, hemodynamic improvement, and complex extubation were met, the patient remained in the infirmary with subsequent transfer to the hospital of origin.

Keywords: *Methicillin-resistant Staphylococcus aureus; Stenotropas maltophilia, drug-resistant bacteria, mass gathering event.*

RESUMEN

El Staphylococcus aureus meticilino resistente adquirido en la comunidad (SARM-AC) causa neumonía, shock séptico y disfunción renal. Por lo general, no encontramos casos abordando conjuntamente cepas poco comunes, como Stenotropas maltophilia. Describimos a un joven soldado trasladado desde un hospital militar al que se le trató una herida del calcáneo evolucionando a insuficiencia

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respiratoria y renal aguda. A su llegada, se diagnosticó una fístula pulmonar de alto gasto con cavitación lobar, fue sometido a decorticación quirúrgica bilateral video asistida, sustitución renal intermitente y terapia antibiótica guiada por cultivo. Tras suplir los requisitos nutricionales, mejoría hemodinámica y una extubación compleja, el paciente permaneció en la enfermaría con posterior traslado al hospital de origen.

Palabras clave: *Staphylococcus aureus meticilino resistente; Stenotropas maltophilia, bacteria farmacorresistente, evento de reunión masiva*

INTRODUCTION

Community-acquired methicillin-resistant *Staphylococcus aureus* (*CA-MRSA)* pneumonia has been reported to have a severe clinical outcome requiring intensive care in 86.7 % of cases and up to 20 % for chronic hemodialysis (1). Bacterial co-infection can be observed with Vancomycin-Resistant Enterococci (2), and viral co-infection is more frequent in influenza and has recently been associated with SARS-CoV-2; however, new types of bacterial co-infection are a constant threat. One example is *Stenotrophomonas maltophilia*, an opportunistic pathogen with the capacity for extensive adaptation through its novel genogroups and spot for multidrug resistance in surveillance studies, especially in the Intensive Care Unit (ICU) settings with growing levels of immunosuppression (3). In this report, we describe the first known case to our knowledge of a combination of these two pathogens in a patient with complicated pneumonia and acute renal failure.

Case report

On June 19, a 19-year-old soldier was admitted to our ICU and transferred from the São Paulo Militar Hospital. As relevant prehospitalization was the history of a treated calcaneus infection and posterior severe difficult-to-control low back pain unfolding an acute respiratory and renal failure. At arrival, the patient was hemodynamically unstable and required escalating antibiotic therapy. He was anemic, with malnutrition signs (loss of muscle and subcutaneous fat, with anasarca). The chest X-ray and tomography (Figure 1) revealed a complicated lobar pneumonia manifested in pleural effusion and cavitations, which unfold into pulmonary incarceration, besides a large right pneumothorax. Following the initial hospitalization day, a video-assisted bilateral surgery decortication with chest drainage was performed in the event of an unexpandable lung to facilitate lung expansion and pleural apposition. The procedure included the removal of abnormal fibrous tissue from the pleural surfaces and evacuating fluid, pus, or debris from the pleural space. Concomitantly, the patient was maintained on long periods of renal replacement therapy or prima dialysis for electrolyte balance, metabolic, fluid removal, and acid/base control. Previous hospital serology for Dengue, Chikungunya, COVID-19, Influenza, VDRL, Leptospirosis, Rickettsia, Cryptococcus, Hepatitis, and HIV was all negative. The first laboratory report revealed a complete blood count of Hb: 7.2 g/dL, white blood cell counts 11 400 with 81 % neutrophils, 1 % myelocytes and 2 % metamyelocytes, urea: 67 mg/dL, creatinine: 1.5 mg/dL, Na: 130 mEq/mL, K: 4.2 mEql/L, Mg: 1.7 mg/dL procalcitonin: 1.95 ng/mL, TGP: 13 U/L, lipase: 77 U/L, GGT: 197 U/L. Protein and glucose in cerebrospinal fluid brought suspicious of brain tuberculosis, and a rifampicin-isoniazid-pyrazinamide-ethambutol (RIPE) protocol was initiated.

The patient had received antibiotic therapy with vancomycin and meropenem from day 6th of June, Micafungina from day 7th, and added amikacin and polymixin B from day 15th. The blood culture showed a CA-MRSA strain. Thanks to the bronchial alveolar lavage, *Stenotrophomonas maltophilia* was also identified (Sensibility: trimethoprim-sulfamethoxazole (high dose), levofloxacin, polimixin B, tigecilin). As a result, on days 21 and 24, linezolide and levofloxacin were included. Withdrawal was performed with polymyxin, micafungin, and amikacin. The Routing Information Protocol (RIPE) was also retired after a negative GeneXpert MTB/RIF assay or molecular test for tuberculosis. Although his cardiac function was preserved as assessed by 2D echocardiogram, his nutritional status was very poor, with an albumin level of 2 g/dL, which led to being supported with parenteral nutrition for two days while a Shiley dialysis catheter was replaced at the same time, and erythropoietin 4 000 IU once-a-day was added.

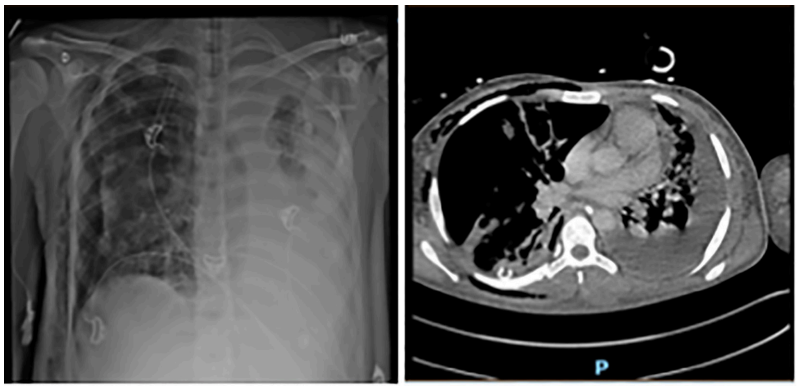

Figure 1. Initial Chest ray and tomography.

After the lung decortication, there was a significant reduction in the large pneumothorax on the right side without any mediastinal structures' deviation and a decrease in the moderate/voluminous pleural effusion on the left side, which was now laminar. The right side was left with a small pleural effusion with a loculated/septated aspect, thickening of the pleural planes, and discrete atelectatic components in the adjacent lung parenchyma as well as centrilobular opacities scattered throughout the lung (Figure 2). After that day, the patient gained renal output and the need for continuous renal replacement diminished. In the interval, an albumin replenishment for 72 h was applied, which helped to move the fluid overload from the interstitial space. Although ventilatory parameters were favorable, it faced an initial extubation failure that led to tracheostomy and subsequent further improvement, accompanied by the rescinding of vasoactive drugs, the appearance of hypertension controlled with oral medication, and better acceptance of enteral nutrition. After complete ventilatory support weaning, the patient had a recovery period in the hospital ward and was successfully transferred to the original hospital on June 29 without dialysis need, and later discharged to home with ambulatory physiotherapy, as the original hospital communicated to us.

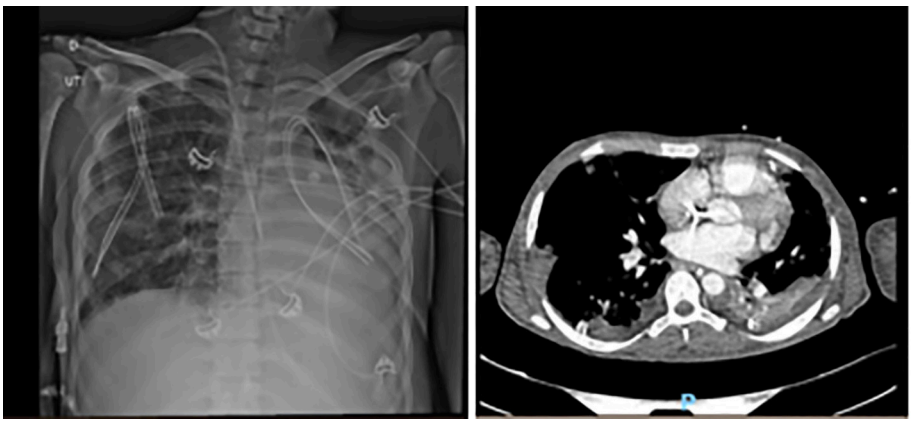

Figure 2. Control chest R-ray and tomography after the procedure.

DISCUSSION

Although CA-MRSA is often obtained via skin abscess or through hematogenic infections, some cases appear to behave in a rapid, aggressive onset, from small wounds to serious and injury in lung areas. In our case, a high-output fistula is a basal consolidation. Treatment of bronchial fistula is a challenge, requiring extended hospital stays and a frequent need for broad-spectrum antibiotics besides surgical approaches. The prognosis is highly diminished when the illness stems from an aggressive germ like CA-MRSA. Nowadays, a further complication is to deal with another urgent global threat represented by an *S. maltophilia* concomitant infection, with features of SMX-TMP resistance at some degree, but thankfully susceptible to levofloxacin, with promissory outcomes in some reports (4).

Because of the patient's need for vasoactive drugs, the best choice for the thoracic surgery team was early video-assisted surgery decortication, a technique recently reported to have benefits in cases of advanced empyema or treatment in failure of chest tube drainage (5). Furthermore, we believe that the lung capacity and functional residual capacity were altered to some degree using erythropoietin, which some authors report can help reduce the level of serum inflammatory markers and diminish the duration of mechanical ventilation (6) and, in conjunction with the possible benefits through Continuous Renal Replacement Therapy (CRRT) (7).

Both bacterial infections observed in this unusual case are associated with high mortality, especially when the organs affected are the lungs and kidneys requiring artificial support. It is worth pointing out that *S. maltophilia*, a multidrug-resistant organism, has also been listed as a top pathogen in US ICUs (8) and Latin American medical centers (9). Moreover, due to their distinctive structure, these bacteria are considered more resistant than gram-positive strains with virulence factors that include the use of motility, biofilm formation, iron acquisition mechanisms, outer membrane components, protein secretion systems, extracellular enzymes, and antimicrobial resistance mechanisms (3). Our hospital complex has a capacity of 256 ICU beds, a considerably mass-gathering scenario for critically ill cases resulting in the combination of the increased use of drugs and hospital overcrowding, which appears to have facilitated the spread of genes that allow bacteria to escape the action of the drugs. Likewise, the global incidence of hospital-associated infections resistant to antibiotics is a rising problem, and middle-income countries have shown millions of cases based on 474-point prevalence surveys (PPS) from 99 countries published between 2010 and 2020 (10). Fortunately, both strains described hereby were controlled with proper surveillance coupled with an advanced surgical and intensive support approach, which is a substantiated alert to prevent the incidence of this emerging situation.

CONCLUSION

One of the most significant risks to human health today is antimicrobial resistance, which poses a considerable threat on a global scale. Despite observing favorable outcomes in this report, there is a need to alert incoming complex situations, as two strains can show antibiotic resistance in a unique patient. Proper management is advisable with prompt disposal of complex resources like pulmonary decortication or continuous renal replacement therapy, plus aggressive nutritional support and culture guidance dependent on the regional susceptibility pattern of isolated CA-MRSA and *S. maltophilia* strains.

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