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Is the Final Outcome of severe COVID-19 a Sepsis, with Multi-Organ Dysfunction and Septic Shock of Bacterial Cause?

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ABSTRACT

Since the SARS-CoV-2 pandemic began, every effort has been made to understand severe COVI-19 disease, which progresses to sepsis, multiple organ dysfunction, and septic shock. Mortality from the disease is exceeding 5 million patients in the world, only 5% of patients have severe or severe viral sepsis and enter intensive care, requiring; ventilatory, hemodynamic, vasopressor, antibiotic support and monitoring of biomarkers to be able to predict evolution and prognosis; the fatality in this group of patients is 40%. Sepsis, multiple organ dysfunction, and septic shock have been observed in all patients who die, however, sepsis is not always related to bacteria or co-infection in microbiological studies in these patients. This suggests that SARS-CoV-2 is the causative agent of this systemic condition and not bacteria. The objective of this article is to carry out a bibliographic review that allows us to know the final outcome of severe COVI-19 disease, whether it is due to immunological hyperactivity or due to bacterial co-infection.

Keywords: Viral Sepsis; Bacterial sepsis; Mixed sepsis; COVID-19 Severe; SARS-CoV-2

INTRODUCTION

SARS-CoV-2 cause viral community associated pneumonia (CAP) and severe COVI-19 disease that has emerged as a complex disease, which shares pathophysiological characteristics with bacterial sepsis, and differentiates by immunological hyperactivation due to the exacerbated increase in pro-inflammatory cytokines. Patients with severe COVI-19 disease progress to sepsis, multiple organ dysfunction and septic shock and meet the diagnostic criteria established by the International Sepsis-3 Consensus. The unclear etiology of the outcome of sepsis in patients with severe COVI-19 disease and multiple organ dysfunction and septic shock has led to an increased request for blood cultures and the use of antibiotics in patients during the pandemic in ICU to establish the possible etiology and bacterial management of sepsis respectively. The 5% of patients experience severe or severe sepsis (severe COVID-19), require ventilatory, hemodynamic, vasopressor, antibiotic support and continuous monitoring of biomarkers to be able to predict their evolution and prognosis, being the lethality among these patients reported 40%. Another group of people 14% who have contracted the SARS-CoV-2 viral infection, evolve into mild to moderate SARS-CoV-2 viral pneumonia, requiring hospitalization for oxygen support without requiring ICU, the other 81% recover at home.

THEORETICAL FRAMEWORK

Bacterial sepsis as viral sepsis has in common at the beginning of the infection the action of the innate immune system (macrophages, dendrites, monocytes) that detect the pathogen through the recognition of pathogen-associated molecular patterns (PAMP, pathogen-associated molecular patterns) receptors that identify intrinsic molecules present in pathogens, bacteria or viruses. This recognition leads to rapid cytokine production, which provides a long-lasting adaptive response against the pathogen. Among the known PAMPs are mainly the “toll-like receptors” (TLR) which are type I transmembrane proteins. Also the release and activation of a variety of pro-inflammatory substances such as; Proinflammatory cytokines, cytotoxic proteases, oxygen free radicals, antibodies, activated complement and coagulation factors that contribute to generate the so-called “cytokine storm” that are related to the intensity of the pathogenesis of both viral and bacterial sepsis.They

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differ in the viral serological diagnosis "reverse transcriptase polymerase chain reaction" (RT-PCR), in the immune response and the presence of binding antibodies (IgG, IgA, IgM). As in the presence of anti-peak protein receptor binding domain (S-RBD) antibodies useful to estimate individual protection against SARS-CoV-2 and vaccine infection, other characteristics that have been observed to establish differences have been, that bacterial infection often quickly triggers a violent inflammatory response (bacteremia), early invasion of SARS-CoV-2 does not cause a violent inflammatory response initially because it conceals antigenicity , until it replicates within cells and is then released. The virus creates a different incubation period than the bacterial infection having a relatively chronic course. Also due to adaptive immunity and its response to CD4 + T and CD8 + T lymphocytes, which play a significant antiviral role in the maintenance of immune function and viral elimination and similarly, in the process of the SARS-CoV-2 viral infection, a depletion of lymphocytes due to apoptosis has been evidenced, contributing to the poor prognosis of these patients.

Although bacterial infection is the main cause of sepsis in ICUs, daily evaluation of the SOFA score and DOM assessment could early diagnose and prevent SARS-CoV-2 viral sepsis in ICU.

METHODOLOGY

The search for the present bibliographic review was done at http://askmedline.nlm.nih.gov/ask/pico.php, a search tool to find evidence of the current literature in MEDLINE (Medical Literature Analysis and Retrieval System Online)/PubMed, according to the PICO question posed.

PICO question: Is the Final Outcome of severe COVID-19 a Sepsis with Multiorgan Dysfunction and Septic Shock of Bacterial Cause?

A non-systematic bibliographic review related to viral and bacterial sepsis was carried out in order to establish the final outcome of severe COVID-19 and its final etiology.

RESULTS

Karakike E et al (2021) in a systematic review and meta-analysis of the literature to estimate the prevalence of viral sepsis analyzed 104 articles with a total of 157,063 patients. By calculating the SOFA score, he found that the prevalence of sepsis in coronavirus disease was 39.9% (95% CI, 35.9-44.1; I2, 99%). They reported that respiratory distress syndrome (ARDS) was the most common organ dysfunction, both in non-ICU and ICU patients. The prevalence of ARDS in wards outside the ICU was 27.6% (95% CI, 21.6-34.5; 12.99%) while in ICU it reached 88.3% (95% CI, 79.7-93.5; I2 97%; p <0.0001). Septic shock was the second most common dysfunction in ICU patients, followed by kidney and liver organ dysfunction. The endpoint used to determine the prevalence of sepsis was the Sepsis-3 criteria among patients with coronavirus disease. The authors concluded that a considerable proportion of patients with coronavirus disease have viral sepsis. This is the first study to address the burden of viral sepsis in hospitalized patients with Covi-19 disease.

Odabasi Z, et al (2020), consider that the development of coronavirus disease is a viral condition, taking into account clinical and autopsy findings, they considered that viral sepsis would be a more precise term to describe the complex clinical picture of coronavirus disease. In short they say; If mild to moderate coronavirus disease is considered a "severe infection" of viral origin, then severe COVID-19 disease is either "viral sepsis" or "severe viral sepsis," with viral sepsis being a more accurate term to describe the condition complex clinical presentation of these patients Liu H, et al (2020), in their observations and hypotheses on SARS-CoV-2 viral sepsis, mention that talking about viral sepsis is more appropriate to describe the clinical manifestations of patients with severe or critically ill COVID-19 with negative cultures for bacteria. Guan WJ et al (2020) report that blood and lower respiratory tract cultures that are negative for bacteria and fungi correspond to a SARS-CoV-2 viral infection as the sole cause of morbidity and mortality in most of these patients with negative culture. Hughes S, et al (2020) conducted a retrospective observational study to determine the incidence of bacterial and fungal co-infection in two London NHS hospitals, which included a total of 836 patients with ARDS. Respiratory samples for microbiological culture were obtained from 112 (13.3%) of 836 patients with SARS-CoV-2, only 39 (34.8%) of 112 identified bacterial pathogens. Among SARS-CoV-2 patients, true clinical pathogens were identified in 21 (3.2%) of 643 patients, in 39 (6.1%) of 643 patients they were classified as contaminants. They concluded that they found a low frequency of bacterial co-infection in early hospital presentation due to coronavirus disease and no evidence of concomitant fungal infection, at least in the early phase of Covid-19 disease. Pemán J, et al (2020) they consider that critical patients with Severe COVID-19 have higher levels of pro-inflammatory cytokines, fewer CD4, CD8 and interferon-gamma cells. And that this serious clinical situation increases the risk of serious fungal co-infection (opportunistic), such as invasive pulmonary aspergillosis, invasive candidiasis or Pneumocystis jirovecii pneumonia. They conclude that despite the severe disease caused by SARS-CoV-2 in many patients, the scarcity of invasive mycosis diagnoses is probably due to the few bronchoscopes and autopsies performed due to the high risk of aerosol generation.

Since the etiology of sepsis is not clear in patients with severe COVI-19 disease and multisystemic dysfunction and septic shock, a retrospective cohort study evaluated the use and diagnostic performance of blood cultures during the disease pandemic by coronavirus. The blood culture positivity rate was significantly lower for SARS-CoV-2 positive patients at 3.8% than for SARS-CoV-2 negative patients 8.0%. Patients with Covi-19 disease had a high proportion of organisms that reflected the skin microbiota (contamination), at 59.7%. They concluded that bloodstream infections are very rare for patients with coronavirus disease, supporting the rational indication for blood cultures in the absence of convincing evidence of bacterial co-infection. Haedo M.F, et al (2020), recommended that blood cultures be used only in the event of clinical deterioration or suspicion of hospital infection. Font MD et al (2020) in their publication sepsis and septic shock, note that bacteria are the most predominant pathogen in sepsis, detected by cultures in relation to sepsis caused by viruses that is underdiagnosed worldwide due to its diagnostic complexity in the absence of positive cultures for bacteria. Lansbury et al (2020) report in a multicenter study that in SARS-CoV-2 patients that the most frequent isolated microorganisms associated with co-infection are: Enterococcus faecium, Staphilococcus aureus, Mycoplas-

ma pneumoniae, Pseudomona aeruginosa, Klebsiella pneumoniae, Streptococcus pneumoniae. In the case of ICU isolates, most of them present extended spectrum beta-lactamases (ESBL), carbapenemases and multi-resistant forms of several of the microorganisms. Publications on fungal infections in patients with COVID-19 estimate that the most common fungal infection is invasive aspergilosis, reaching a rate in critical patients of 27.7%.

This infection has been been shown to influence the evolution of the disease and drastically increase mortality. Patel A, et al (2021) in a multicenter retrospective study conducted in India found that among 287 patients with mucormycosis (fungal infections), 187 (65.2%) had CAM (COVID-19 Associated Mucormycosis) with a prevalence of 0.27%. 78.7% of hospitalized patients with Covi-19 disease were treated with glucocorticoids, 60.4% had diabetes mellitus, 62.6% had rhino-orbital mucormycosis, and 23.5% had rhino-orbital-cerebral.

In the Surviving Sepsis Campaign study, it was estimated that the bacterial co-infection at diagnosis by SARS-CoV-2 was around 11%. In other studies, bacterial co-infection was reported in 5.9% and 8.1% in patients diagnosed with Covi-19 disease. In a review study on bacterial or fungal co-infections in patients with COVID-19, It was found that 62/806 (8%) of patients presented some type of co-infection during hospital admission. An analysis that assessed the use of antibiotics showed that 1450/2010 (72%) of patients received antibiotic therapy.

DISCUSSION

Coronavirus disease is a viral infection and therefore it is not treated or prevented with antibiotics or antifungals. At the present time, the treatment for the severe COVID-19 patient is eminently based on the control of the symptoms and the respiratory approach, according to the needs of each patient. Co-infection must be considered in critically ill and severely COVI-19 patients because they are vulnerable to bacteria and fungi. The excessive and inappropriate prescription of antibiotics in coronavirus disease without culture support can facilitate the development of resistant bacteria and in some patients increase the risk of developing fungal infections, this due to the weakness of cellular immunity, the use of glucocorticoids, parenteral nutrition, and broad-spectrum antibiotics. Additionally, having comorbidities such as diabetes, hypertension and coronary heart disease and factors such as age, that are associated with high mortality and influence evolution.

In patients with severe COVI-19 disease with documented bacterial sepsis that progress to sepsis, multiple organ dysfunction and septic shock, the WHO management recommendation is not different from the management of shock caused by bacteria, in terms of fluids, vasopressors, inotropic. The Sepsis Survival Campaign and WHO have published detailed guidelines on the treatment of septic shock in adults and children. Use in patients with severe COVI-19 disease who have prolonged invasive mechanical ventilation; Carbapenic drugs, ß-lactamase inhibitors, linezolid and vancomycin, according to the risk factors for each one of them.

The Surviving Sepsis campaigns suggests the use of the antiviral drug remdesivir (Veklury) in non-ventilated patients with severe COVI-19 disease and suggest not starting remdesivir outside of clinical trials in hospitalized patients. Likewise, the Spanish Agency for Medicines and Health Products (AEMPS) recommends prioritizing the use of remdesivir in hospitalized patients with COVID-19 who require supplemental oxygen but are not receiving ventilation. Tocilizumab, which inhibits the binding of IL-6, is the second drug recommended by the WHO for the treatment of COVID-19 after Dexamethasone.

CONCLUSION

It is important not to use broad-spectrum antibiotic therapy routinely when patients are admitted to the ICU. In case of being under empirical treatment with an antimicrobial the therapy with blood culture, urine culture, culture of tracheal exudate should be re-evaluated, in non-intubated and aspirated patients through a closed circuit in intubated patients. In severe COVI-19 disease the use of antimicrobial agent may help a patient with a blood culture-proven bacterial co-infection. Severe COVI-19 disease has a viral etiology caused by SARS-CoV-2. During evolution it can be co-infected with bacteria or fungi and be the final outcome, without changing the etiology of viral sepsis.

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CONFLICT OF INTEREST

The author has nothing to disclose and also state no conflict of interest in the submission of this manuscript.

REFERENCES

1. Mervyn Singer, Clifford S Deutschman, Christopher W S, Manu Shankar Hari, Djillali Annane, et al. (2016) The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA. 315: 801-810.
2. Mariana F Haedo, Santiago E Melendi, Marcela Lauko Mauri, Carlos Ujeda, Rocío Leis (2020) Usefulness of blood cultures in covid-19 pneumonia. Medicina. 80(6):44-47.
3. Wiersinga WJ, Rhodes A, Cheng AC, Peacock SJ, Prescott HC (2020) Pathophysiology, Transmission, Diagnosis, and Treatment of Coronavirus Disease 2019 (COVID-19): A Review. JAMA.
4. Colombian consensus on care, diagnosis and management of SARS-COV-2/ COVID-19 infection in health care facilities, third edition.
5. Astrid C Lessmann, Candido J R, V Plaza-Moral (2009) Role of toll-like receptors in respiratory diseases. Arch Bronconeumol.
6. Chousterman B G, Swirski F K, Weber G F (2017) Cytokine storm and sepsis disease pathogenesis. Semin Immunopathol. 39(5):517-528.
7. Lopez PGT, Ramírez SMLP, Torres AMS (2020) Participants of the immune response against SARS-CoV-2 infection. Alerg Asma Inmunol Pediatr. 29(1): 05-15.
8. Andrea P, LuigiDall' Olmo, Foscarina d Rocca, Francesco B, ChiaraCosma, et al. (2021) Antibody response to first and second dose of BNT162b2 in a cohort of characterized healthcare workers. 519: 60-63.
9. Lin HY (2020) The severe COVID-19: A sepsis induced by viral infection? And it's Immunomodulatory Therapy. Chin J Traumatol. 23(4):190-195.