Special issues in pneumonia 2021

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Top-ten papers in pneumonia (2020-2021)

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ABSTRACT

Despite the fact that the last year has been marked by the SARS-CoV-2 pandemic, there have been many articles published on non-COVID pneumonia. Making the selection has not been easy, having based on those articles that we think can bring us some novelty and help in clinical practice. We have divided the selection into seven sections: patient severity, diagnosis, treatment, ventilation, novelties in the guidelines, fungal infection and organ donation.

Keywords: severe community-acquired pneumonia, nosocomial pneumonia, mechanical ventilation–associated pneumonia

INTRODUCTION

In a year marked by the SARS-CoV-2 pandemic, we thought that publications on non-COVID-19 pneumonia would be scarce, however, after a first review on severe pneumonia, nosocomial pneumonia and ventilator associated pneumonia (VAP), we found more than 3000 articles. We have made the selection based on those articles that we think may provide us with something new and that may help us in our healthcare practice, and, obviously, it does not have to coincide with what any of our readers would have made.

We have structured the selection in 7 parts:

1) Patient severity
2) Diagnosis
3) Treatment
4) Ventilation
5) What´s new in the guides
6) Fungal infection
7) Organ donation

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PATIENT SEVERITY

We begin the review from the arrival of the patient to the emergency room, assessing the severity of the patient and the predictors of mortality, to decide where we admit the patient.

In the first article, Carmo et al. [1] assess whether pneumonia severity scores adequately predict mortality in critically ill patients admitted with pneumonia. To do this, they conduct a three-year prospective observational cohort study (2015-2018) in which they study both the intensive care unit (ICU) severity scores (SAPS 3, qSOFA) and the pneumonia severity scores (CURB-65 and CRB-65). With the variables related to mortality in the multivariate analysis, they elaborate a prognostic score, the pneumonia shock score (PSS) (table 1), so that a PSS ≥ 3 carries a mortality > 26%. They compare this score with SAPS 3, CURB-65, CRB-65 and qSOFA, and observe that it is the one with the best sensitivity, and a higher specificity than pneumonia severity scores. They then use an external validation cohort where they get the same results. The authors conclude that the PSS is a new tool that can help select pa-

Table 1	Pneumonia Shock Score	
Parameter		**Points**
Age > 75 years		2
Septic shock		2
Heart rate ≥ 110 bpm		1
Hematocrit ≤ 38%		1
Leukocytes > 15000/mm^3		1
Sodium ≥ 145 mEq/L		1
FiO2 ≥ 30%		1
Obnubilation (GCS < 15)		1

tients who should be admitted to the ICU, and offers an alternative prognostic tool with a great performance in predicting mortality.

In the letter to the editor about this article, Reyes et al [2] study this new score as a long-term predictor, and note that PSS is superior to SAPS-3, CURB-65, CRB-65 and qSOFA in predicting hospital mortality, but that as a long-term predictor its sensitivity and specificity decreases dramatically.

In the following article, Gautam et al [3] consider whether procalcitonin (PCT) should be used as a marker of bacterial co-infection during a viral respiratory infection. They conducted an 18-month retrospective cohort study comparing patients with pure viral respiratory infection with patients with bacterial co-infection observing that the latter have a higher PCT, greater severity, and higher mortality. However, when both cohorts are matched by severity, the specificity of PCT for bacterial coinfection decreases (from 72% to 61%). They then develop a murine model where they infect mice with influenza viruses and see that PCT rises in relation to markers of severity. The authors conclude that PCT is elevated during pure viral infection in proportion to disease severity. Data from the study suggest that PCT is a better indicator of disease severity than bacterial co-infection during viral respiratory infection.

DIAGNOSIS

On the basis that there is no gold standard for the diagnosis of nosocomial pneumonia, the authors of this review [4] review all the tools we have. They begin with imaging techniques, where the low sensitivity and specificity of the chest X-ray stands out, the greater sensitivity of the thoracic computed tomography (CT) and the fact that their findings are not specific, ending the section with lung ultrasound (LUS), which have a greater sensitivity (95%) and a high specificity (91,3%) when they are performed serially.

Within the microbiological techniques we have those based on culture (highlighting the importance of colony counting to distinguish between colonization and infection), and molecular diagnostic techniques, highlighting their speed and their high sensitivity and specificity, differentiating between the different existing platforms.

Finally, the authors comment on some biomarkers remarking that they are not recommended in the nosocomial pneumonia guidelines due to their lack of precision; and name metabolomics and artificial intelligence as the immediate future in diagnosis.

Given the current importance of LUS as a point-of-care, the following article is a study conducted by Haaksma et al. [5] whose objectives were to determine the diagnostic accuracy of dynamic air bronchogram and color Doppler imaging for the diagnosis of pneumonia in patients with consolidation on chest radiograph. This is a prospective diagnostic accuracy study carried out in two periods (September 2018 – January 2020 and September 2020 – December 2020) in which patients with chest X-ray with some consolidations are included,

performing a LUS within 24 hours of the X-ray, and another follow-up at 72h., and with the results obtained they elaborate a decision tree. They observe that the air bronchogram has a specificity of 99% and a positive predictive value (PPV) of 96%, with a low sensitivity, on the contrary, the color Doppler has a sensitivity of 90%, with a negative predictive value (NPV) of 90%, while the elaborate decision tree presents a sensitivity and specificity of 86%, and a NPV of 90%. When comparing their results with the BLUE protocol, and with the sCPIS and lusCPIS scores, they conclude that in ICU patients with pulmonary consolidation on chest X-ray, an extended lung ultrasound protocol based on the evaluation of air bronchograms and measurements of pulsatile flow is an accurate and directly bedside available tool to differentiate pneumonia and atelectasis. It outperforms standard lung ultrasound and clinical scores.

TREATAMENT

Within the section of treatment, the first work selected is that of Mahmood and Shorr [6] in which they review the pharmacokinetics and pharmacodynamics of antibiotics. Within the pharmacokinetics, the importance of the penetration of the drug into the lung in the case of pneumonia stands out, a fact that we lack in most antibiotics of routine use. Regarding pharmacodynamics, they emphasize the increased renal clearance, defined as GRF > 130 ml/min/ 1.73 m², which appears in more than 30% of critical patients, and in which the estimation of glomerular filtration rate may be underestimated. In patients with increased renal clearance, antibiotics with renal metabolism are eliminated more quickly, so we are underdosing antibiotics (especially β-lactams, carbapenems and vancomycin).

We are not yet clear whether we should use corticosteroids in the treatment of pneumonia. To try to shed some light on the subject we have chosen the article by Póvoa et al [7] whose objective is to evaluate the evidence and recommendations of the prescription of corticosteroids as an adjuvant treatment in severe community acquired pneumonia (CAP). They conclude that only in moderate-severe *Pneumocistys jiroveci* pneumonia in HIV patients have corticosteroids been shown to decrease mortality, and in varicella pneumonia they have a positive influence on prognosis. In the case of other pathogens, corticosteroids have been shown to increase mortality (influenza pneumonia), or a clear effect on prognosis has not been defined. With the available evidence its use in severe CAP is not recommended in the latest published guidelines. In addition, it is necessary to improve the characterization of corticosteroids in terms of type and efficacy, dose, route of administration, duration of treatment, and possible interactions with other treatments administered such as macrolides.

VENTILATION

In recent years, there has been a great development of both non-invasive ventilation and the use of high flow, in ICUs

and in hospitalization wards. Cutuli et al. [8] reviews these two types of oxygen therapy in CAP. In this work they make an interesting review about the pathophysiology of acute respiratory failure (hypoxemic and hypercapnic) indicating that they can provide us in each of them with these types of ventilation and when we should use each of them. Highlight the importance of early identification of treatment failure with non-invasive respiratory support, to prevent delayed orotracheal intubation and protective invasive mechanical ventilation.

WHAT'S NEW IN THE GUIDES

Although in the last year most management and treatment publications and guidelines have focused on SARS-CoV-2, some guidelines on CAP and nosocomial pneumonia have been published. In this paper, Martin-Loeches and Torres [9] highlight recent advances in guidelines for the treatment of severe CAP. Regarding the etiology, they emphasize the importance of their knowledge through molecular techniques with the main objective of adjusting antibiotic treatment in order to reduce treatment failure and overuse of antimicrobials. They emphasize the importance of prognostic scores to decide the location of the patient, so that the best score to decide hospital admission is the PSI, while for admission to the ICU the major and lower criteria of the IDSA/ATS should be used. Regarding the duration of antibiotic treatment, a balance should be made between clinical success and the need to avoid the development of antibiotic resistance. Finally, biomarkers should be a mainstay in the management of patients with CAP, especially in severe forms, to decrease treatment failure.

FUNGAL INFECTION

Within a review on severe pneumonia, we cannot forget about fungal pneumonias. In this section we highlight the work carried out by Loughlin et al. [10], whose objective was to estimate the prevalence of Aspergillus infection in ventilated patients, not neutropenic, with suspected pneumonia associated with mechanical ventilation. To this end, they carried out 2 multicenter prospective studies between February 2012 and September 2016, in patients from whom they obtained serum and BAL mycological samples, diagnosing them with probable aspergillosis according to clinical, radiological and mycological criteria. Of a total of 194 patients, they identified 12.4% who met criteria for probable aspergillosis, with higher mortality in the ICU than those who did not meet the diagnostic criteria, and with a longer stay in the ICU. As discussed in the editorial [11], aspergillus is a more frequent cause of VAP in non-immunosuppressed patients than we think, and by applying non-culture-based diagnostic methods such as galactomannan in BAL and serum, some additional cases can be diagnosed.

ORGAN DONATION

Initially, choosing one last article among the many that have been published this last year on other topics such as pneumonia in immunocompromised, prevention, microbiota, omics, artificial intelligence, etc. was not easy, until we found the next work because of the importance we consider it may have. The work of Poignant et al. [12] is the only one we have found on pneumonia and organ donation. This is a 4-year multicenter observational retrospective cohort study (January 2013 - December 2016) whose objectives were to describe the clinical and microbiological characteristics of bacterial pneumonia in brain-dead patients and to assess the impact of pneumonia on lung suitability for extraction in patients without initial contraindication to donation. The results show that among the patients proposed for lung donation, 27,4% presented aspiration pneumonia, and 8,2% had early VAP. In the multivariate analysis, the independent predictors of pneumonia in brain-dead patients were age, anoxic brain damage, aspiration before or during tracheal intubation, and no antimicrobial use at day 1. Among the authors' conclusions, it stands out that the initiation of antibiotic prophylaxis on the first day of stay in the ICU in comatose patients with severe brain damage could increase the current pool of lung donors.

CONFLICTS OF INTEREST

Authors declare no conflicts of interest

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