

Biomarkers and Ventilator-Associated Pneumonia

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Mortality related to ventilator-associated pneumonia (VAP) remains high, generally ranging from 24% to 50%, reaching 76% in specific settings [1]. Multiple organ dysfunction syndrome, multiresistant bacteria and inadequate antimicrobial therapy have been considered responsible for these mortality rates [2].

The Sequential Organ Failure Assessment (SOFA) score was originally developed to describe the morbidity of sepsis in ICU patients. Subsequently, the score was reassessed and used in other populations of severe patients and as a predictor of mortality [3].

Bacterial toxins can trigger a variable expression of different biomarkers. Changes in serum markers may indicate changes in clinical condition.

Laboratory markers that early indicate deterioration of the clinical status may be useful in serious diseases that present rapid unfavorable outcome. They may indicate the need to reassess the initial antimicrobial therapy.

Procalcitonin, midregional pro-atrial natriuretic peptide (MR-proANP), C-terminal provasopressin (copeptin), C-reactive protein (CRP) and other peptides have been indicated as biomarkers of clinical response to treatment and prognosis in patients with VAP.

Toxemia, inflammation, cardiovascular dysfunction and hypotension trigger the expression of different biomarkers in patients with VAP. As the severity of the infection increases, levels of biomarkers rise in parallel.

Several studies have demonstrated the association of increased procalcitonin, MR-proANP, copeptin and SOFA score with mortality [4-6].

Rise in biomarkers levels are has been noted as patient status worsens (from sepsis to severe sepsis and septic shock).

Procalcitonin levels are increased in severe bacterial infections accompanied by systemic manifestations, but not in viral infections, localized infections or non-infectious inflammatory reactions [7,8]. Prospective observational cohort studies demonstrated the prognostic value of procalcitonin kinetics in patients with VAP [4,9].

Copeptin is an arginine vasopressin (AVP) precursor. It is released following hypotension, hypoxia, acidosis, hyperosmolarity, and infection [10]. AVP restores vascular tone in vasodilatory hypotension by its vasoconstrictor and antidiuretic properties. Copeptin is elevated in sepsis and septic shock [11]. There is a strong correlation between copeptin values and disease severity In critically ill patients [12]. Copeptin levels progressively increase with the severity of sepsis, and are independent predictors of mortality in VAP. Patients with VAP who present septic shock express higher values of copeptin [5].

MR-proANP levels increase in proportion to the severity of sepsis and have also been demonstrated independent predictors of mortality in VAP [6].

ANP is mostly produced in the atrium. It regulates various physiological parameters, including diuresis and natriuresis, and reduction of systemic blood pressure [13]. The intrinsic myocardial depression seems to be the main trigger of ANP expression in sepsis. Acute lung injury and high right heart afterload caused by pulmonary hypertension can lead to cardiac dilatation and elevated ANP levels [14].

In patients with sepsis, serum MR-proANP levels has emerged as a valuable tool for individual risk assessment [15]. Elevated levels indicate the inflammatory cytokine response severity, but comorbidities such as renal and cardiac dysfunction might also increase MR-proANP levels [16].

Biomarkers help to identify high risk situations and might suggest the need to change treatment strategy. Based on the previous findings, it would be appropriate to search a strategy that aggregates biomarkers combined to current prognostic risk scores, aiming a desired reduction in VAP mortality.

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