ΑΡΘΡΟ ΣΥΝΤΑΞΗΣ

Biomarkers as Diagnostic Tools in Sepsis Care

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Severe sepsis is still a leading cause of morbidity and death globally, with a higher impact in environments with limited and intermediate resources. Sepsis as a modern concept has been validated by the importance of the inflammatory response in the development of illness. An immunosuppressive phase that appears as numerous organ failure and makes patients vulnerable to nosocomial infection follows a hyper-inflammatory reaction. Sepsis biomarkers might enable early action that lowers the chance of death, but mostly supportive measures.

Currently availability of extended-spectrum medicine and state-of-the-art medical care, sepsis remains one of the most important causes of mortality and morbidity. Biomarkers provide useful tools for early detection, identification of hyper-compatible patient populations, monitoring disease progression, selection of the best treatment method, and providing a crucial assessment for improving patient outcomes. A large number of biomarkers are currently available for clinical use in sepsis. However, their limited sensitivity and specificity in characterizing the presence of infection and the complexity of immune and inflammatory processes, as well as their inability to divide patients into homogeneous groups for targeted therapy, often limit their effectiveness. Recent advances in molecular technology have facilitated the identification of new biomarkers, from metabolites and compounds found in body fluids to genes and proteins in circulating blood cells (Faix, 2013).

According to databases, biomarkers for sepsis are a hot topic. About 5,000 studies on biomarkers in sepsis have been published in the last 10 years, revealing 178 biomarkers that were evaluated in sepsis settings, while fewer than 3,000 papers were published in total before 2007. Many medical specialties use biomarkers in clinical practice, including cardiology (troponin T in myocardial infarction), vascular medicine (D-dimer in patients with suspected pulmonary embolism), and especially oncology. Meanwhile, the use of biomarkers in sepsis care is relatively new (Barichello et al., 2022).

Nowadays, patients are enrolled in about 100 research studies to investigate the biomarkers of sepsis. Although there are several biomarkers for sepsis, the recently updated guidelines of the Survival Sepsis campaign envisage only a minor role for procalcitonin (PCT) as a biomarker in clinical practice (Purcarea and Sovaila, 2020). Even if patients are monitored frequently during hospitalization, there may not be a single biomarker that accurately reflects the rapidly changing nature of the potentially bacterial condition. This is an important point because PCT does not obtain meaningful data if it is used as the only biomarker in the TRANSITION study. Many researchers have documented attempts to adopt a biomarker panel to more accurately identify at-risk patients (Rello et al., 2017).

The Human Genome Project and other recent developments in omics technology show promise as a useful tool in the search for new and practical sepsis biomarkers. The therapeutic application of biomarkers in sepsis is still in its early stages, especially compared to other fields such as oncology and vascular medicine. Research on biomarkers in sepsis has so far focused primarily on distinguishing between infectious and non-infectious conditions. The cause of a serious illness and the prognosis of sepsis (Sims et al., 2016).

According to biochemical and/or immunological profiles, biomarkers can also be used to stratify sepsis patients. This could help identify key pathophysiological mechanisms and future therapeutic targets for each patient. By associating expression with specific challenges and consequences at the level of RNA, proteins, and metabolites, the new technology is quite useful. While it could be measured in readily available samples such as blood and urine, it is an array of these biomarkers that form biomarkers and mimic pathophysiological processes in various body parts (Cecconi et al., 2018; Sims et al., 2016).

Recurrence assessment and sepsis treatment of a

number of biomarkers showing deviations from the host response pathway, which have proven effective in potentially directing the registration of patients who may benefit from targeted therapy and monitoring the effects of therapy on this target, can be selectively modified by the targeted drug (Komorowski et al., 2022).

The important thing is the health professionals to be capable of using fast bedside tests that do not require a professional laboratory and require very little practical time. Individualized treatment will be given according to pathology-specific methodologies within the scope of this individualized medical approach, rather than relying solely on clinical presentation. Perhaps a panel of anti-inflammatory biomarkers will be the most useful for diagnosing sepsis or predicting the likelihood of developing severe sepsis. Immunosuppressive conditions due to sepsis caused by hyperinflammatory conditions undoubtedly account for a high rate of hospital infections due to the reactivation of opportunistic bacteria and/or potential viral infections in patients. But many organ dysfunctions are also caused by immunosuppression, and if so, what? The immune system is really trying to compensate for the previous overreaction by putting the body into an immunosuppressive state. Experimental and clinical data show that when the roots of downregulation of congenital and adaptive immunity are planted relatively early, the proinflammatory phase occurs (Pierrakos et al., 2020).

In recent years, improvements have been observed in the definition, such as early diagnosis, characterization, prognosis, and personalization of sepsis treatment through the application of data-based methodologies. Identifying or evaluating digital signatures or biomarkers of sepsis or sepsis sub-phenotypes is one of them. The identification of these is expected to increase the speed and accuracy of diagnosis, suggest physiological pathways and therapeutic goals, guide the registration of certain participants in clinical trials, and improve clinical care. A panel of biomarkers or models including biomarkers and clinical data is necessary due to the intricacy of the sepsis response. Specific data analysis techniques, which are mainly in machine learning, are also required (Komorowski et al., 2022; Pierrakos et al., 2020).

Sepsis biomarkers ought to be used as multi-marker panels comprising anti-inflammatory biomarkers. Finding the ideal combination would require major research. Even though current supporting treatments have been successful in lowering mortality. Robust methods to measure these biomarkers would be crucial to the success of the novel treatment options for sepsis, as most of them focus on specific biomarkers.

No conflict of interest

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