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T2 magnetic resonance technology in the diagnosis of sepsis and clinical impact in patient management

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Background: Rapid and effective antimicrobial therapy is crucial to improve septic patient outcome, while inappropriate empirical therapy is a well-known, strong, independent predictor of mortality. Multidrug resistant organisms (MDRO) have reached to a pandemic level during the last two decades. A delay of 3-5 days has been found for effective therapy of systemic infections by MDRO. Thus, a rapid identification of pathogens, especially of bacterial species known to be multi-drug resistant, is a major goal in the diagnosis of sepsis.

Differently from technologies applicable on positive blood culture, dependent on the time of positivization of the sample, molecular tests performed directly on whole blood samples allow rapid identification of the etiological agents and are supposed to dramatically impact on patient outcome. Recently, the T2 Magnetic Resonance technology (T2Dx®) has been approved by FDA for laboratory diagnosis of sepsis by ESKAPEc organisms, with high sensitivity and specificity.

Materials/methods: The aim of this study was to evaluate the accuracy and the clinical impact of T2Bacteria Panel of T2Dx® system in comParison with the standard blood culture protocol in the early detection of ESKAPEc pathogens in patients with sepsis. Blood samples for culture and T2 testing were collected from 61 patients and diagnostic accuracy was evaluated. Duration of empirical therapy, and switch to target therapy were compared in patient with positive or negative T2 results.

Results: T2Bacteria Panel sensitivity and specificity were 100% (panel targets) and 94.6%, respectively. Time to report of positive T2Bacteria results was significantly lower than that of positive blood cultures (4.24 h ± 3.4 h *vs* 24.2 h ± 33.4 h, $p < 0.001$). The percentage of patients in which antibiotic therapy was switched to target therapy the same day of sample collection was significantly higher in patients with positive T2 results (37.5% *vs* 11.4%, $p = 0.0312$). Duration of empirical therapy was shorter in these patients (34.11 h ± 23.87 h *vs* 80.48 h ± 73.40 h).

Conclusions: T2Bacteria Panel, allowing rapid detection of ESKAPEc pathogens, significantly impacts on the switch from empiric to target therapy, and represents a novel, valuable tool to improve the management of septic patients.

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