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Oral

MODEL-BASED INSULIN SENSITIVITY FOR EARLY DIAGNOSIS OF SEPSIS IN CRITICAL CARE

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Introduction: Currently, it is almost impossible to diagnose a patient at the onset of sepsis due to the lack of real-time metrics with high sensitivity and specificity. The purpose of the present study is to determine the diagnostic value of model-based insulin sensitivity (SI) as a new sepsis biomarker in critically ill patients, and compare its performance to classical inflammatory parameters.

Materials and method: We monitored hourly SI levels in septic (n=19) and non-septic (n=19) critically ill patients in a 24-hour follow-up study. Patients with type I or type II diabetes mellitus were excluded. SI levels were calculated by a validated glycemic control software, STAR TGC (Stochastic TARgeted Tight Glycemic Controller) (Christchurch, NZ). STAR TGC uses a physiological glucose-insulin system model coupled with stochastic models that capture SI variability in real time.

Results: The median SI levels were lower in the sepsis group than in the non-sepsis group (1.9×10^{-4} L/mU/min vs 3.7×10^{-4} L/mU/min, $P < 0.0001$). The areas under the receiver operating characteristic curve (AUROC) of the model-based SI for distinguishing non-sepsis from sepsis was 0.911, superior to white cells count (AUROC 0.611) and temperature (AUROC 0.618). The optimal cut-off value of the test was 2.9×10^{-4} L/mU/min. At this cut-off value, the sensitivity and specificity was 88.9% and 84.2%, respectively. The positive predictive value was 84.2%, while the negative predictive value was 88.9%.

Conclusion: The early and relevant decrease of SI in sepsis suggests that it might be a promising novel biomarker of sepsis in critical care. Low SI is diagnostic of sepsis, while high SI rules out sepsis, and these may be determined non-invasively in real-time from glycemic control protocol data.