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Importance of Whole-Body Bioimpedance Spectroscopy for the Management of Fluid Balance

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Key Words
Fluid overload · Bioimpedance spectroscopy · Normohydration target · Haemodialysis

Abstract
Introduction: Achieving normohydration remains a non-trivial issue in haemodialysis therapy. Preventing the deleterious effects of fluid overload and dehydration is difficult to achieve. Objective and clinically applicable methods for the determination of a target representing normohydration are needed. ***Methods:*** Whole-body bioimpedance spectroscopy (50 frequencies, 5–1,000 kHz) in combination with a physiologic tissue model can provide an objective target for normohydration based on the concept of excess extracellular volume. We review the efficacy of this approach in a number of recent clinical applications. The accuracy to determine fluid volumes (e.g. extracellular water), body composition (e.g. fat mass) and fluid overload was evaluated in more than 1,000 healthy individuals and patients against available gold standard reference methods (e.g. bromide, deuterium, dual-energy X-ray absorptiometry, air displacement plethysmography, clinical assessment). ***Results:*** The comparison with gold standard methods showed excellent accordance [e.g. R^2 (total body water) = 0.88; median ± SD (total body water) = –0.17 ± 2.7 litres]. Agreement with high-quality clinical assessment of fluid status was demonstrated in several hundred patients (median ± SD = –0.23 ± 1.5 litres). The association between ultrafiltration volume and change in fluid overload was reflected well by the method (median ± SD = 0.015 ± 0.8 litres). The predictive value of fluid overload on mortality underlines forcefully the clinical relevance of the normohydration target, being secondary only to the presence of diabetes. The objective normohydration target could be achieved in prevalent haemodialysis patients leading to an improvement in hypertension and reduction of adverse events. ***Conclusion:*** Whole-body bioimpedance spectroscopy in combination with a physiologic tissue model provides for the first time an objective and relevant target for clinical dry weight assessment.

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