

Summary

Aims: A systematic approach to renal function monitoring using information taken by means of renal function tests calculated from serum and urine specimen has not been comprehensively explored. The application of analysis of natriuretic peptides and low molecular weight proteins in diagnosis of advanced renal failure has not been tested in critical ill patients. The performance of continuous renal replacement therapy depends on adequate anticoagulation of the extracorporeal circuit. Prostacyclin as one of the newer agents has not been compared to citrate which may be considered a standard agent in many intensive care units. Changes of distribution volume of antibiotics have been a matter of debate in terms of dosage alteration but have not been assessed clinically at the bedside using other tools than a pharmacokinetic model.

Methods: Establishing computer programme calculating various renal function tests allowed us to monitor the effects of diuretics, osmolality shifts, disorders of urine acidification and progression of renal insufficiency towards acute renal failure. Creating a functional model of acute renal failure serves as a tool for further studies on renal replacement therapy. A relationship between residual diuresis and levels of natriuretic peptides and cystatin C were studied before and during first 48 hours of continuous venovenous haemodiafiltration. Prostacycline circuit anticoagulation together with low dose unfractionated heparin was compared to regional citrate decalcification of the circuit. A distribution volume of the glycopeptide or aminoglycoside antibiotic estimated by the pharmacokinetic model was correlated with the volume of extracellular fluid taken by bioimpedance in septic patients.

Results: The study found possible ways of monitoring of the diuretic administration which seems to be rather invasive in terms of the impact on homeostasis. Renal function tests appeared as an available monitoring tool for a diagnosis of tonicity disorders in cerebral disease. Prevalence of urine acidification disorders is not negligible in intensive care patients and renal function monitoring allows quick differential diagnosis. Application of renal function tests for the diagnosis of acute renal failure in critically ill may clarify renal failure from other confounding effects of non renal factors. A hypothesis that natriuretic peptides may stimulate residual diuresis in acute renal failure was not confirmed. Their importance lays in the diagnosis of acute renal failure per se and differentiation of oliguric and non oliguric form with preserved residual diuresis. Cystatin C may also differentiate patients on renal replacement therapy in terms of preserved residual diuresis and prognosis. Prostacycline does not offer comparable filter survival to citrate and may interfere with platelet function in certain patients however, its application with low dose heparin is a safe option of circuit anticoagulation. An increased distribution volume of aminoglycoside and glycopeptide antibiotics in sepsis is not associated with requirement for dosage escalation.

Conclusion: This study is the result of clinical research performed on critically ill patients. It attempts to contribute medically and financially effective diagnostics at the departments which create only about 10% of hospital capacity but at the same time require inproportionally more medical resources. Homeostasis interpretation and prevention of renal failure in the form of renoprotective regimen including monitoring of nephrotoxic antibiotics together with correctly indicated and terminated renal replacement therapy goes hand in hand with effectivity of patient treatment.