Utility of urea kinetic modelling for prescription of adequate intermittent dialysis in critically ill maintenance dialysis patients

Sir, Critical illness is not uncommon in the aged maintenance dialysis population, who is often severely burdened with comorbidity. The diagnosis of end-stage renal disease (ESRD) requiring renal replacement therapy confers a more than 4-fold annual risk of intensive care admission (ICU) [1]. In this patient population major surgical procedures, aggressive medical interventions and acute complications or acute disorders of other compromised organ systems lead to an increased need of ICU treatment and is associated with a high in-hospital mortality, ranging from 14 to 38% [1–4].

When acute illness superimposes ESRD, there may be a need to adapt various aspects of dialysis prescription derived from ESRD. However, no established guidelines exist for intermittent haemodialysis (IHD) adequacy in ICU maintenance dialysis patients. This observational study analysed data of 240 IHD sessions performed in 60 ESRD patients receiving regular haemodialysis (20 ICU ESRD patients matched to 40 ESRD patients regarding to age, gender, body weight, anuria, major comorbid diseases) to evaluate prescription and adequacy of IHD estimated from urea kinetic modelling (UKM). The causes of ICU admission were sepsis in 12, major cardiovascular surgery in 6 and respiratory failure in 2 patients.

The median APACHE III score at the first IHD session was 68, the mean number of failing organs was 4 and in-hospital mortality rate was 35%. IHD was performed with volumetrically controlled machines, high-flux synthetic membranes, blood flow rates between 250 and 350 ml/min. The vascular access was either a functioning fistula or two catheters placed in two large veins. None of the patients had a contraindication for anticoagulation at the time of the investigation. IHD was performed on alternate days or as required. The desired target single pool SpKt/V urea was 1.2 or more. The prescription of the dialysis dose was based on the dialysate clearance, the desired blood flow rate, the dialysate flow rate, the desired dialysis session length, and an anthropometric estimate of urea distribution volume (V) calculated by the Watson equation incorporating height, weight, age and gender [5]. Calculation of the delivered dialysis dose was computed by the Daugirdas equation [6]. Informed consent was obtained from all participants or their next of kin.

Mean blood flow rates and IHD duration matched prescription in all analysed patients. There was no statistically significant difference between prescribed and delivered IHD doses in outclinic patients, who reached the desired target IHD dose. However, in ICU ESRD patients delivered IHD doses were substantially lower than prescribed IHD doses and no patient received the target dose (Table 1). The degree of delivery failure correlated with the number of failed organs.

Our data show that disease severity violates the fundamental assumptions of UKM not only in critically ill ARF patients [7] but also in ESRD patients treated with intensive care. In the absence of prescription or treatment failure, delivery failure may be related primarily to the use of anthropometric estimates of the urea distribution volume for dialysis prescription.

Critical illness is inherently a non-steady state which may render blood-based simplified IHD quantification formulae of little use in critically ill patients with renal failure necessitating dialytic support.

Conflict of interest statement. None declared.

KfH Nierenzentrum
München Laim Elenheimerstr 63, D80687 Munich, Germany
Email: hschi@tina.com


Letters

Advance Access publication 27 April 2007

doi:10.1093/ndt/gfm026