Impact of Nutritional Regimen on Urea Appearance Rate and Net Nitrogen Balance in Patients with Acute Renal Failure Receiving Continuous Venovenous Hemofiltration

by

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ABSTRACT

Patients with acute renal failure are in substantial negative nitrogen balance as a result of their extremely high urea appearance rates (UAR). A series of patients with acute renal failure managed with continuous venovenous hemofiltration were evaluated to determine which nutritional and non-nutritional variables might be predictive of the UAR. All data (including nutritional regimen, laboratory values, APACHE II score, administered blood products, hemofiltration parameters, and medications) were collected daily. Forty consecutive patients (age 52±20 yrs; mean ± sd) were monitored for a total of 357 treatment days (average duration 8.9±8.6 days). The mean UAR was 13.2±4.7 g nitrogen/day. The nutritional regimen provided 1440±903 kcal/day (21.4±12.7 kcal/kg/day) and 49.1±30.2 g protein/day (0.7±0.4 g protein/kg/day). The net nitrogen deficit was 7.1±5.9 g nitrogen/day. Using univariate regression analysis, the previous day's UAR, protein provision, energy provision, blood product nitrogen provision, presence or absence of infection, and APACHE II score were selected for use in multivariable analyses of UAR ($p<0.30$). The nonprotein calorie to nitrogen ratio and the use of steroids or vasopressors were not significant predictors. In a multivariable analysis (controlling for the previous day's UAR) the following variables were significantly predictive of the UAR ($p\leq0.05$): g protein/kg/day, kilocalories/kg/day, the interaction between kilocalorie and protein provision, presence or absence of infection, and the APACHE II score. Predicted values, using this regression equation, indicate that at lower protein administration rates (≤1.0 g/kg/day), increasing energy provision (from 10 to 40 kcal/kg/day) may reduce UAR but patients remain in negative nitrogen balance. At higher protein administration rates (1.5 to 2.0 g/kg/day), which

are necessary to reach positive nitrogen balance, UAR may increase and excessive energy provision (from 30 to 60 kcal/kg/day) may further elevate the UAR. Consequently, the optimal nutritional regimen in acute renal failure may require a higher protein (≈2 g/kg/day) and lower energy (30 to 35 kcal/kg/day) content than previously recommended (1.0-1.5 g protein/kg/day and 35-55 kcal/kg/day) for acute renal failure patients. The results of this study suggest that UAR is a complex phenomenon, yet predictors of UAR can be identified and possibly modified to reduce the UAR and improve nitrogen balance.

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