Dear Sir,

We have read with interest the controversy between Maduell and his group [1,2] and Basile [3] regarding the constancy of the urea distribution volume. In previous studies, our group has been concerned with the dialysate collection method for volume determination, and we would therefore like to point out some methodological and mathematical aspects of the question.

In our opinion, the formula used to calculate the urea distribution volume:

\[ V = \frac{U}{(C_0 - Q)} \]

where \( U \) = urea collected in the dialysate, \( C_0 \) = predialysis BUN and \( Q \) = postdialysis BUN, is not sufficiently accurate, because it disregards several factors that may influence the reliability of the result.

A more accurate equation has been suggested by our group [4-6]:

\[ V = \frac{V_0}{E_{uid}} - \frac{E_{uid} \cdot G \cdot (t + 30) - C_{pwo} \cdot Q_1}{E + E_{uid} - G(t + 30) - C_{pwo} \cdot Q_1} \]

where \( V_0 \) = pre-dialysis volume, subscript 2 = before next dialysis; \( E_{uid} \) = urinary inter-dialytic urea nitrogen extraction, \( \theta \) = inter-dialytic time.

Values of urea distribution volume obtained in this way take into account dialysis ultrafiltration, residual renal function, urea generation rate and postdialysis urea rebound. Although the urea generation rate and diuresis during dialysis may be considered negligible in most cases, the relevance of ultrafiltration and urea rebound is significant, and their variability might explain the discrepancy between the results obtained by Maduell [2] and Basile [3].

Furthermore, in our previous studies, we focused on the importance of urea rebound [7-10] and observed an exponential increase in urea distribution volume during the session and a further increase after 30 min of equilibration time (fig. 1). The paradoxically low volumes obtained in the first phase of dialysis may mainly be attributed to trans-compartmental disequilibrium, which during dialysis may explain the difference between measured urea and its corresponding theoretic exponential profile.
plasma water BUN, Qf = ultrafiltration coefficient, Cpwet = 30 min post-dialysis plasma water BUN.

The urea generation rate G is obtained using the following formula, by iteration with volume:

\[
G = \frac{\Delta [\text{BUN}]_{PW2}V_{PW2}^2}{t_i - t_{i-1}}
\]

0-30

(3)

Fig. 1. Urea distribution volume obtained by the dialysate collection method (see text) at various points of the dialysis (n = 6).

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