Loss of Ultrafiltration Capacity in Infants

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Dear Sir,

Slingeneyer et al. [1] have noted an intriguing but frustrating problem in long-term peritoneal dialysis, loss of ultrafiltration capacity (UFC). Since CAPD is technically simple, it is admirably applicable for maintenance support of very young infants or children awaiting renal transplantation. In personal communications with other colleagues in pediatric nephrology, we also have noted an increased incidence in the fall-off of UFC in this population and especially in neonates, apparently after a time period similar to that noted in adult patients by Slingeneyer. Our Unit has employed a technique which has been successful in modifying the reduced UFC in infants and may bear a trial in a larger, adult-oriented patient population.

A 2-year-old female infant, on CAPD for the previous 18 months, had required both increased frequency and osmolality of dialysis cycles over a 4-month period. With 7-8 cycles/day of 4.25% glucose solutions, it was difficult to attain negative fluid balance and she progressively developed refractory hypertension and hyponatremia. Her overnight dwell period (6-7 h) always resulted on a positive fluid balance and her early morning blood sugars were noted to be higher than those at other times.

It was assumed that her peritoneal membrane was actually transporting glucose from the peritoneal cavity into the peritoneal capillary and that eventually net water movement reversed resulting in absorption. To circumvent this possibility, we discontinued her overnight dwell period instilling no fluid during this period. Over a period of 7-14 days she lost weight, developed easily attainable negative fluid balances, reduced the frequency of cycles to 4 or 5/day of mostly 2.5% glucose solution, hypertension became easily manageable, sodium normalized, and her parents noted a great improvement in her temperament.

After 1 month we again introduced night cycles with resultant weight gain, hypertension, irritability, and vomiting due to a decline in UFC.

The peritoneal membrane is more efficient in the infant and young child [2]. After prolonged dwell periods absorption of glucose from the peritoneal fluid to the peritoneal capillaries [3] would reduce both the osmolar gradient and UFC. Eventually, net water movement would cease and, in association with continued inward glucose transport, reverse such that positive water balance would ensue. We have recognized, as have Kohant and Alexander [4] that in neonates ultrafiltration is difficult to obtain. In 4 newborns we have noted that utilizing 4.25% glucose solutions, net glucose movement is inward (progressive increases in blood glucose) as is the net movement of water (increased weight, edema, and falling serum sodium). All of these features were noted in our patient. Since these problems developed after 1 year of CAPD we presumed the peritoneal

membrane had increased its capacity to transport glucose induced in part by prolonged exposure to high glucose-containing fluid. This was inferred by the frequently elevated early morning glucose levels and hyponatremia. By providing a shorter contact time, there would be a reduction in the net inward transport of glucose, maintenance of osmolar gradients and preservation of UFC [5]. Periods of overnight 'rest' would circumvent long dwell times and as well provide an opportunity for partial recovery.

It is known that glucose absorption during CAPD increases with increasing glucose concentrations [3]. There is a balance that must be achieved in long-term CAPD patients when UFC declines (possibly due to enhanced glucose transport) between the frequency and the duration of dwell time. We would recommend frequency at the expense of duration with overnight cessation of the dialysis procedure.

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