THE DAILY TOTAL DIALYSATE VOLUME NEEDED TO ACHIEVE THE SMALL SOLUTE CLEARANCE TARGET IN PERITONEAL DIALYSIS

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OBJECTIVES

Recent randomized control trials demonstrated an association between peritoneal dialysis (PD) outcomes and small solute clearances[1,2] which depended on the total daily dialysate volume (TV). This study aimed to identify the desired TV (dTV) required to achieve the small solute clearance targets in PD patients.

METHODS

Daily dialysate urea (Durea), creatinine (Dcr), urine urea (Uurea), urine cr (Ucr), blood urea (Purea), and cr (Pcr) were retrospectively analyzed for Durea/Purea, Dcr/Pcr, Uurea/Purea, and Ucr/Pcr during adequacy measurements. The targets[3,4] used to calculated the dTV were weekly total (t) Kt/Vurea = 1.7 (figure1) and normalized total cr clearance (ntCcr) = 45L/week/1.73m^2 of body surface area (BSA)(figure2). The V value was total body water (TBW) calculated by using Watson formula. Body surface area calculated by using Dubois and Dubois formula was also recorded. Standard peritoneal equilibration test (PET) and types of PD (4 cycles, 8 L, 24 hr for CAPD and 10 L, 10 hr for NIPD) also collected for subgroup analysis.

RESULTS

Table 1	CAPD (76)	APD (53)
24hr D/Purea	0.88±0.13	0.68±0.13
24hr D/Pcr	0.66±0.13	0.43±0.16
dTV → Kt/V = 1.7	0.25TBW – UcrV(L)/Pcr	0.4TBW – 1.5Ucrv(L)/Pcr
dTV → npCcr =45	5BSA – GFR(ml/min)	9BSA – 1.7GFR(ml/min)

Figure 1

Desired total volume/day → weekly Kt/Vurea 1.7

$$\frac{\text{Total weekly } K_{urea}t_{weekly}}{V_{urea}} = \frac{(V_{drain1day}D_{urea}}{V_{urea}}\frac{}{P_{urea}} + \frac{C_{renal\ urea})t(=7)}{V_{urea}}$$

$$\frac{1.7}{7}V_{urea} - \frac{V_{urine1day}U_{urea}}{P_{urea}} = \frac{V_{drain1day}D_{urea}}{P_{urea}}$$

0.8-1.0 for CAPD
0.5-0.6 for NIPD

V_{urea} = TBW = 0.56BW for male
0.52BW for female

Figure 2

Desired total volume/day → weekly total CCr 45 L/week/1.73m²

$$\text{Total weekly CCr} = \frac{(V_{drain1day}D_{Cr}}{P_{Cr}} + GFR_{L/day})\underline{t}(=7)\frac{1.73}{BSA}$$

$$\frac{45BSA}{7\times1.73} - \frac{GFR_{ml/min}1000}{1440} = \frac{V_{drain1day}D_{Cr}}{P_{Cr}}$$

0.55-0.81 for CAPD
0.27-0.59 for NIPD

The results of 24hr D/Purea and D/PCr in 76 CAPD and 53 NIPD patients were shown in table1. The dTV required to achieve the tKt/Vurea and ntCCr targets for CAPD patients were 0.25-3.0 time of TBW-Vu(Uurea/Purea) and 5 times of BSA-GFR(ml/min), respectively. The dTV needed to achieve the tKt/Vurea and ntCCR for NIPD patients were 0.4-0.5 time of TBW-1.5Vu (Uurea/Purea) and 9 times of BSA-1.7 of GFR (ml/min), respectively. CAPD patients having PET <0.7 needed 2% and 5% more dTV to achieve the tKt/Vurea and ntCCr targets than patient having PET >0.7, while NIPD patients required 10% and 20% more dTV to achieve the same targets, respectively. The male and female TBW were 0.56±0.035 and 0.52±0.052 per actual body weight, respectively

CONCLUSIONS

TBW and BSA can be used to estimate the desired daily total dialysate volume in PD patients. NIPD patients needed 1.5 times of dTV required by CAPD patients while the slow tranporters needed 5 - 20% more dTV than fast transporters to achieve the small solute clearances targets.

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