

Within-patient relationships between ultrafiltration and fluid gains in haemodialysis patients

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Background

Despite the now-widespread use of haemodialysis treatment, optimal fluid management in long-term dialysis patients remains challenging. Whilst the between-patient factors affecting target weight and ultrafiltration have been well studied, little is known regarding the within-patient factors affecting these relationships.

Methods

Dialysis data for a group of stable haemodialysis patients, from 4 dialysis units, were analysed over a period of one year. All weights and volumes are expressed as percentage of target weight.

Results

From 100 patients (aged 28–89, mean 65.4, 54% male) observed over a year, complete data were available for 15530 dialysis sessions, and 13027 combinations of dialysis session plus the following inter-dialytic interval.

Mean arterial pressure dropped by 3.5(+/-14.6)mmHg during dialysis, with a significant correlation ($p<0.05$) between pressure drop and ultrafiltration volume in 26 patients (mean $R=0.09$, mean regression gradient 3.2).

In 87 patients, inter-dialytic fluid gain correlated strongly ($p<0.05$) with the previous dialysis session's ultrafiltration volume (mean $R=0.37$, mean regression gradient 0.20) suggesting a significant role of ultrafiltration volume in driving subsequent fluid intake behaviour (thirst).

Unsurprisingly, more fluid was gained over longer inter-dialytic intervals: mean(sd) weight at the start of dialysis was 103.2(1.0)% after a 3-day gap and 102.5(1.0)% after a 2-day gap, with this difference being significant ($p<0.05$) in 87 patients. However, fluid gain was non-linear, diminishing during longer inter-dialytic intervals: mean(sd) daily inter-dialytic fluid gain was 1.13(0.38)% during the 3-day gap vs 1.21(0.53)% during the 2-day gap ($p<0.05$ in 36 patients), implying that at least a third of patients consume less fluid during the 3rd post-dialysis day.

Conclusion

Inter-dialytic fluid gain is strongly dependent on ultrafiltration during the previous dialysis session, and diminishes during the inter-dialytic interval. Large ultrafiltration volumes, which have historically been perceived as the inevitable result of large fluid intakes, are actually a cause of thirst and large fluid intakes in haemodialysis patients. These data, derived from within-patient analyses, strongly challenge our conventional understanding of dialytic fluid management.