Usefulness of Blood Volume Monitoring during Haemodialysis

Inappropriate ultrafiltration (UF) during dialysis (HD) impacts on the patients' well being in opposing ways: excessive rates result in symptomatic hypotension, while insufficient UF results in chronic fluid overload. For objective guidance, continuous optical or ultrasonic measurements of haematocrit in the arterial line permit to follow changes of the patients' effective blood volume (BV) in response to UF. While excessive decline of BV can alert for impending hypotension (with sufficient time for prevention), alternatively a BV-curve that changes little may indicate chronic fluid overload (prompting an increase of UF). To assess the impact on clinical practice, we retrospectively (1999) analysed one month's HD treatments of 44 ESRD patients (19 F, 31% diabetics, age 58±14 y, weight 69±15 kg) in our unit. One Fresenius 4008H delivery system with a BVM-module and 3 Crit-Line III monitors (HemaMetrics, Kaysville, UT, USA) usable on any machine, were then available for this purpose. Of a total of 510 HD, 95 (19%) were done with BV-monitoring. Mean total UF was 2.5 (0.6-4.0) l for HD with-, and 2.6 (1.0-4.0) l for HD without BV-monitoring (n.s.).

Results: Patients' symptomatic hypotension, requiring substitution with 0.9% NaCl, occurred in 1% of HD with-, and 6% of HD without BV-monitoring ($p<.05$). Pre-emptive decrease of UF-rate (to prevent hypotension) occurred in 28% of HD with-, and 3% of HD without BV-monitoring ($p<.001$). A change of patients' target weight resulted from 23% of HD with-, and 7% of HD without BV-monitoring ($p<.001$).

Conclusions: The usefulness of blood volume monitoring during HD was demonstrated with more frequent adjustments of UF-rate by the nursing staff, resulting in fewer hypotensive episodes of the patients. Likewise, it led to more frequent changes of HD-prescription, predominantly to lower the patients' target weight. Currently, blood volume monitoring is used in over 50% of HD treatments in our unit.

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