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Letter to the Editor

LETTER TO THE EDITOR

Evaluation of the efficacy of a very high permeability dialyser and comparison with another high-flux dialyser in online haemodiafiltration

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In recent decades, efforts in dialysis have focused on improving the clearance of larger middle molecular weight uraemic toxins, the retention of which has been associated with pathological features of uraemia [1]. Convective flow through haemodialysis membranes using online haemodiafiltration (OL-HDF) techniques has been introduced in recent years to enhance the removal of middle and large molecular weight uraemic toxins [2], resulting in better outcomes in terms of cardiovascular mortality in haemodialysis patients [3]. 'Super high-flux' (HF) dialysers are now commercially available, developed for the purpose of removing large amount of larger middle solutes. One of these high performance dialysers, XevontaHI23®Braun, with very high water permeability [*in vitro* ultrafiltration coefficient (K_{uf}) of 124 mL/h/mmHg] has recently been introduced, but there is still a lack of evidence on its use. We designed a transverse study to evaluate the efficacy of this very high permeability (VHP) dialyser and to compare it with another HF dialyser in OL-HDF.

A total of 14 prevalent OL-HDF patients were included. Dialysers were compared in two consecutive mid-week dialysis sessions. Treatments were based on current prescription with no restriction on blood flow. OL-HDF was performed in post-dilution mode with automatic pressure control of convection and no restriction on total convective ultrafiltration volume. The efficacy of each dialyser was analysed by measuring the reduction ratios (RRs) of substances with different molecular weights. We registered total convective volume as well as hourly transmembrane pressure (TMP) with each dialyser. For detailed methodology, see Supplementary Material.

Mean total convective volume per session was significantly higher with the VHP dialyser (33.5 ± 5.4 versus 30.9 ± 4.6 L/session; $P = 0.013$). There were no differences in *in vivo* K_{uf}, TMP or in the RR of the different molecules between the two dialysers (Table 1).

Despite higher convective volumes achieved with the VHP dialyser, we found no differences in minimum, maximum or mean TMP between the two dialysers. This could be explained by the method of TMP calculation, where only three pressure points are known and the fourth must be assumed, thus introducing great variability [4]. Secondly, it may be explained by differences between *in vitro* and *in vivo* K_{uf}. It is well described in the literature that *in vivo* K_{uf} is inferior to *in vitro* K_{uf}, and it progressively decreases during the dialysis session, mainly due to blood protein boundary effects and increased resistance to ultrafiltration [5]. In fact, Braun® sponsored a clinical trial in 2010 that was designed to evaluate the performance and safety profile of Xevonta high-flux dialyser with special focus on determination of *in vivo* K_{uf} (NCT01111266) but, unfortunately, no results have been posted for this study. Estimated *in vivo* K_{uf} for the different dialysers was very similar in our study, although it should be noted that estimated *in vivo* K_{uf} also includes estimated TMP, with its previously described limitations.

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Table 1. Comparison of dialysis parameters and RRs between the different dialysers

Dialysis parameters and RRs	VHP dialyser	HF dialyser	P-value
Mean convective volume per session (L/session)	33.5 ± 5.4	30.9 ± 4.6	0.01
Minimum TMP (mmHg)	155.9 ± 53.7	157.8 ± 34.6	0.68
Maximum TMP (mmHg)	244.85 ± 41.1	230.7 ± 38.1	0.09
Medium TMP (mmHg)	213.6 ± 47.2	205.5 ± 32	0.28
Mean K_t/V per session	1.8 ± 0.4	1.9 ± 0.6	0.31
Mean ionic dialisance per session (mL/min)	287 ± 25	284 ± 40	0.27
In vivo K_{uf} (mL/h/mmHg)	40.9 ± 10.8	38.2 ± 6.1	0.3
Reduction ratios (%)			
Urea	85.4 ± 5	84.4 ± 44	0.17
Creatinine	77.7 ± 6	77.5 ± 4	0.34
Phosphate	65.9 ± 11	62.9 ± 8	0.22
Myoglobin	72 ± 8	73.9 ± 6	0.33
Cystatin C	78.1 ± 6	79.1 ± 4	0.25
β2-microglobulin	76.2 ± 8	81.4 ± 2	0.11
Prolactin	71.1 ± 9	71 ± 8	0.73

Values are represented as mean ± SD.

Differences observed in total convective volume between the two dialysers did not result in significantly higher RR of different-sized uraemic toxins either. This could be explained not only by the differences between *in vitro* and *in vivo* K_{uf}, but also because hydraulic permeability is of utmost importance in HF convective techniques; however, it is not the only factor involved.

In light of the results of our study, we can say that the VHP dialyser achieves higher convective volumes than the HF dialyser with similar removal in middle molecules. We believe that there is an *in vivo* infra optimization of the VHP dialyser that may explain the similar results obtained in terms of RR of middle molecules despite the higher convective volumes achieved. Future studies should assess whether the optimization on the use of this type of dialysers could improve outcomes.

SUPPLEMENTARY DATA

Supplementary data are available at ckj online.

CONFLICT OF INTEREST STATEMENT

None declared.

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