Real-time Determination of Kt/V in Routine Hemodialysis: Ultraviolet-Adsorption of Solutes from Spent Dialysate

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Introduction and Aims

Two major drawbacks of the standard procedure for routine-determination of the hemodialysis (HD) dose or Kt/V are:

i) dependency on an error-prone pre- and post-dialysis blood sample which impacts on the accuracy of the method.
ii) availability of Kt/V results only post-dialysis.

True real-time determination of Kt/V can be provided by monitoring UV-absorption of solutes from spent dialysate [1, 2].This method circumvents the inaccuracies associated with the estimation of the urea distribution volume, while its high measurement frequency tightly reflects the course of dialysis.

The aim of this study was to compare the UV-based eKt/V with the most commonly used blood-based 'Daugirdas' eKt/V in routine hemodialysis.

Methods

18 uremic patients, 10 males and 8 females, on chronic thrice-weekly high-flux bicarbonate HD were included in the study.

The UV-absorbance at 280 nm of the spent dialysate was measured every three minutes by an built-in UV-spectrophotometer (Option Adimea) coupled with the water system of the dialysis machine (Dialog+, B.Braun Avitum AG).

Pre- and post-dialysis blood samples were obtained according to standard procedure (KDOQI). The equilibrated Daugirdas equation was applied to both the UV-absorption and blood-based method.

A total of 217 measurements were recorded.

Conclusions

The results show a close concordance between the blood- and UV-based eKt/V-values.

On-line monitoring of UV-absorption of spent dialysate is thus applicable in routine hemodialysis to allow:

i) continuous measurement of removed solutes from spent dialysate

ii) direct monitoring of treatment changes, i.e. blood and dialysate flow, etc. without disturbance of neither the patient nor the treatment session.

Results

Fig. 1: Correlation between Blood eKt/V and UV

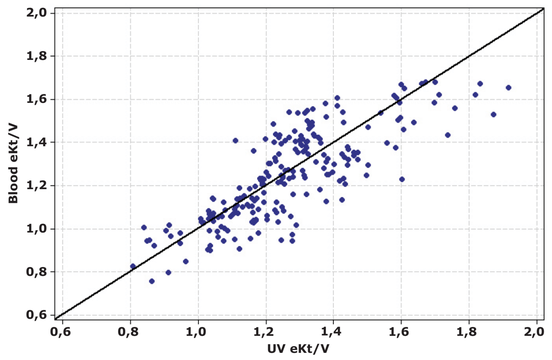
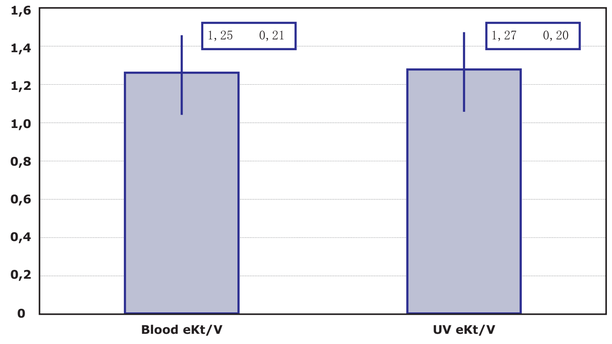
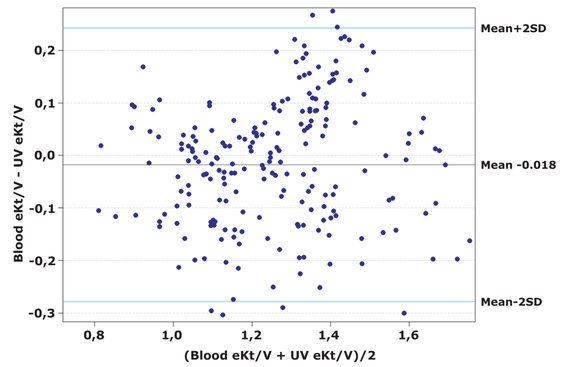


Fig. 2: Average Blood eKt/V vs average UV eKt/V



- The mean blood eKt/V was 1,25 ± 0,21 (Mean ± SD), whereas the mean UV-eKt/V was 1,27 ± 0,2.
- The mean deviation between blood eKt/V and UV eKt/V was -2,16 ± 10,6%.
- N.S., Mann-Whitney test (CI: 95%) did not reveal any significant difference between the two measuring methods.

Fig. 3: Bland-Altman plot Blood eKt/V vs UV eKt/V



- The Pearson correlation coefficient was 0,8 ($p<0,001$).
- The intra-class correlation coefficient (ICC) or concordance was 0,8.

References

1. Uhlin F, Fridolin I, Lindberg LG, Magnusson M. Estimation of delivered dialysis dose by on-line monitoring of the ultraviolet absorbance in the spent dialysate. Am J Kidney Dis. 2003 May;41(5):1026-36.

2. Fridolin I, Magnusson M, Lindberg LG. On-line monitoring of solutes in dialysate using absorption of ultraviolet radiation: technique description. Int J Artif Organs. 2002 Aug;25(8):748-61.