

Feasibility of high convection volumes in on-line haemodiafiltration (HDF)

A. Ficheux¹, N. Gayraud¹, F. Duranton¹, C. Guzman¹, I. Szwarc², J. Bismuth-Mondolfo², P. Brunet³, M-F. Serve² and À. Argilés^{1,2}.

¹, RD – Néphrologie and Université Montpellier 1, EA7288, Montpellier, France, ², Néphrologie Dialyse St Guilhem, Centre de dialyse de Sète, Sète, France, and ³, Service de Néphrologie, Hôpital de La Conception – Université Aix-Marseille, Marseille, France.

Introduction

Recent randomised controlled prospective trials (1,2) suggest that on-line haemodiafiltration (HDF) improves survival, provided that it reaches high convective volumes. However, while these results await confirmation, there is scant information on the consequences of modifying convection volumes in vivo.

Aim

We wanted to evaluate the consequences of increasing convection volumes in the feasibility of the prescribed treatment in on-line post-dilutional HDF.

Methods

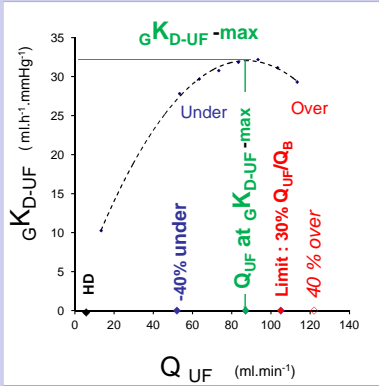


Fig1: Example of $G_{KD-UF-max}$ over Q_{UF} curve with the four Q_{UF} conditions. Q_{UF} Over condition is limited to 30% Q_{UF}/Q_B .

Twelve stable dialysis patients were treated with XEVONTA Hi 18 Amembris® dialysers, and increasing or decreasing convection flows (Q_{UF}) defined according to the values obtained in situ at the maximum global hydraulic permeability coefficient of the whole in vivo dialysis system ($G_{KD-UF-max}$)(3). For 1 week each four Q_{UF} conditions were assessed :

- In dialysis (HD),
- at 40% under Q_{UF} at $G_{KD-UF-max}$,
- at $G_{KD-UF-max}$
- and 40% over Q_{UF} at $G_{KD-UF-max}$

Convection was limited according to the European Best Practice Guidelines (EBPG) (<30% blood flow / 300 mmHg of TMP)

Transmembrane (TMP), venous and arterial pressures, infusion flow as well as alarms were continuously recorded. Total convection volume achieved, meanTMP, number of alarms/session were analyzed.

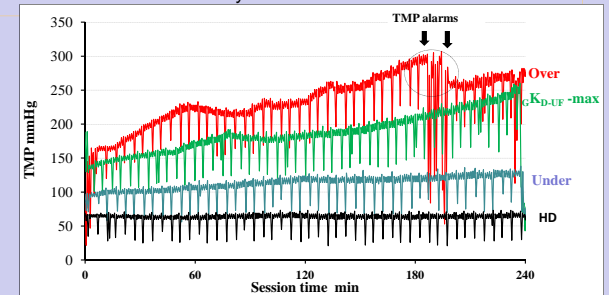


Fig 2: Example of TMP variations during dialysis, for one patient with the four different convection volumes

For Q_{UF} at $G_{KD-UF-max}$ condition, mean session time was 235 ± 3 min , mean blood flow was 368 ± 10 ml/min, mean dialysate flow was 602 ± 1 ml/min and weight loss was 2.9 ± 0.2 kg . For these parameters no significant differences were observed between the 4 conditions.

Results

The obtained convection volumes added to the dialysis setting (\pm S.E.) were 12.9 ± 0.2 (under), 20.6 ± 0.4 ($G_{KD-UF-max}$) and 24.5 ± 0.6 (over) L/session respectively ($p < 0.001$)(Fig 3).

Mean TMP of the recorded values during the session (~400 measurements) increased with convection (fig 4) and were 79 ± 2 , 121 ± 2 , 185 ± 4 and 242 ± 4 mmHg respectively ($p < 0.001$).

The mean number of infusion flow reductions for TMP alarms/session was 0, 0, 0.06 ± 0.04 and 0.97 ± 0.13 respectively ($p < 0.001$)(Fig 5).

The number of dialysis sessions achieving the prescribed convection volume was 100, 100, 94 and 33% respectively ($p < 0.001$)(Fig 6).

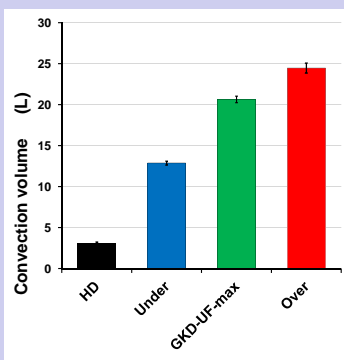


Fig 3: Mean convection volume by dialysis condition

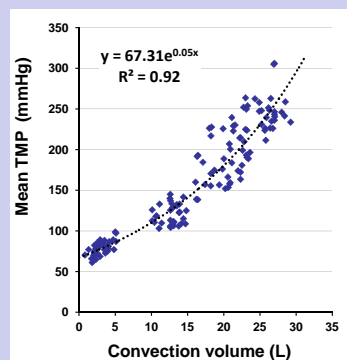


Fig 4: Mean TMP during session by convection volume

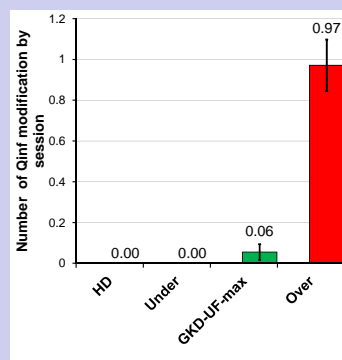


Fig 5: Number of infusion flow reductions by session and by dialysis condition

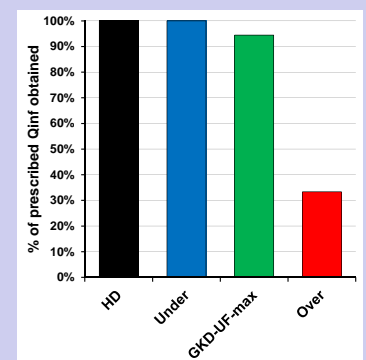


Fig 6: Percentage of dialysis session achieving the prescribed convection volume by dialysis condition

Conclusions

Setting an HDF system at the Q_{UF} of $G_{KD-UF-max}$ resulted in convection volumes in agreement with those recommended by the recent RCTs (> 20L). Higher convection volumes provoke alarms, and have an associated discomfort for the patient and nursing staff and more rarely achieve the prescribed convection volumes. Using on-line HDF at the $G_{KD-UF-max}$ allows achieving high convection volumes with no supplementary concern . Beyond $G_{KD-UF-max}$ the instability of the system makes the benefits of convection less clear.

References

- 1-Ok E, Ascig G, Toz H, et al On behalf of the Turkish Online : Haemodiafiltration Studyb.Mortality and cardiovascular events in online haemodiafiltration (OL-HDF) compared with high-flux dialysis: results from the Turkish OL-HDF Study. Nephrol Dial Transplant. 2013 Jan;28(1):192-202.
- 2-Maduell F, Moreso F, Pons M, et al or the ESHOL Study Group. High-Efficiency Postdilution Online Hemodiafiltration Reduces All-Cause Mortality in Hemodialysis Patients. J Am Soc Nephrol. 2013 Feb;24(3):487-97.
- 3- Ficheux A, Kerr PG, Brunet P, Argilés À: The ultrafiltration coefficient of a dialyser (KUF) is not a fixed value, and it follows a parabolic function: the new concept of KUF max.Nephrol Dial Transplant. 2011 Feb;26(2):636-40.