ISSN 2282-0930 • Epidemiology Biostatistics and Public Health - XIII^th SISMEC Congress - Vol. 20 Suppl. 1

Observational Retrospective Study On Dialytic Clearance Parameters Obtained During Hemodialitic Sessions in Condition of Normal and Suboptimal Blood Flow

Scarmignan Roberta[1], Iannuzzella Francesco[1], Solazzo Andrea[1], Camparini Luca[1,2], Donati Gabriele[3], Gregorini Mariacristina[1]

(1) Azienda USL - IRCCS di Reggio Emilia, Nephrology and Dialysis Unit
(2) Università di Pavia, Scuola di Specializzazione in Statistica Sanitaria e Biometria
(3) Nephrology dialysis and Kidney Transplant Unit, Azienda Ospedaliero – Universitaria di Modena

CORRESPONDING AUTHOR: *Camparini Luca, luca.camparini01@universitadipavia.it*

INTRODUCTION

Hemodialysis is a life-saving procedure that is required by patients with end-stage chronic kidney disease. This procedure, based on diffusive and convective mechanisms, uses a large amount of treated water (dialysate) to capture patient's blood toxins using a semi-permeable membrane (dialysis filter). The volume of blood cleared from toxins per minute of treatment is defined dialytic clearance and it is indicated by the letter K [1]. K is modulated by 3 different factors: patient blood flow (Qb), dialysate flow (Qd), filter-specific diffusive coefficient (KoA). During standard practice, these factors are adjusted in order to achieve an appropriate toxins clearance: KoA can be controlled by physician that uses different filter type, meanwhile the dialysis machine uses an autoflow mechanism (AF) to adjust Qd accordingly to Qb [2, 3]. However, in a real case scenario, some patients cannot withstand normal Qb (Qb < 300 ml/min) then AF need to increase Qd to achieve similar purification results but consequently leading to higher Qd usage.

Since most information on dialysis filter KoA is based on in vitro data, we decided to take advantage of a novel dialysis machine (Fresenius 5008®) capable of measuring real-time K value and we used this information to quantify in vivo KoA.

OBJECTIVES

Our study aimed to describe, in real case scenario, the clearance performance of five different dialytic filters working on subjects with suboptimal Qb and to measure how different Qd can influence in vivo KoA.

METHODS

We conducted a retrospective descriptive study on Nephrology and Dialysis Unit hemodialyzed population (AUSL-IRCCS di Reggio Emilia). A cohort of 70 subjects was screened for presence of at least 6 hemodialytic sessions (all of them with the same filter type) in a time span of 90 days and starting from a first session with suboptimal Qb. For each session, K values were collected for different combination of Qd (500, 300 ml/min) and Qb (300, 250, 200 ml/min). KoA in vivo was calculated according to Alayoud et al. work [4] and compared with manufacturer in vitro KoA using one sample Wilcoxon signed-rank test. Then, using only suboptimal Qb condition, it was investigated the effect of different Qd on in vivo KoA using a paired samples Wilcoxon signed-rank test. Finally, for each dialysis filter, in vivo KoA values were used to generate a nomogram to visualize the relation between K and Qb at the end of a standard dialytic session. Nomogram calculations were done according to already published method [4] and assuming a target of K=1.2V/t for the minimal adequate dialytic dose [5].

RESULTS

Our data showed that in vivo KoA of Fx80®, Fx100®, Fx1000®, Solacea 19H® and Filtryzer BG2.1® dialysis fil-

DOI: 10.54103/2282-0930/29301

ters are all significantly lower ($p<0.001$) than their respective in vitro KoA values reported in the manufacturer datasheet. Comparison between KoA values, among different dialysis filters, in condition of suboptimal Qb, showed a non-significant difference among groups, suggesting that usually higher Qd can only increase marginally in vivo KoA. Lastly, we produced a nomogram that compared dialysis filter performance side by side. From top performer to the lowest: Fx® filters groups showed similar in vivo K for all Qb modeled, followed by Solacea 19H® filter, then Filtryzer BG2.1®.

CONCLUSIONS

Our data confirmed the discrepancy between in vitro and in vivo KoA values for each dialysis filter analysis. Our results showed a percent decrease spanning from 48% to 61% among all filters, and these results are in line with the model developed by Daugirdas and colleagues [6] that estimates a 57% lower in vivo/in vitro KoA. Unfortunately, due to low patient enrollment and data availability, the statistical test comparing distinct filters in condition of suboptimal Qb was underpowered so it cannot be considered conclusive. Lastly, produced nomogram is helpful to visually describe the link between Qb and K among distinct dialysis filters. Understanding which are the real in vivo clearance performance of these filters, in both normal and suboptimal Qb, is an important knowledge to achieve and it can lead to further improvement in patient care and resources allocation for the health care system.

BIBLIOGRAPHY

1. Borah, M.F., Schoenfeld, P.Y., Gotch, F.A., et al, Nitrogen balance during intermittent dialysis therapy of uremia. Kidney International, 1978; 14, 491-500.
2. Kult, J., & Stapf, E., Changing emphasis in modern hemodialysis therapies: cost-effectiveness of delivering higher doses of dialysis. International Journal of Artificial Organs, 2007; 30, 577-582.
3. Albalate, M., Pérez-García, R., de Sequera, P., et al., Is it useful to increase dialysate flow rate to improve the delivered Kt? BMC Nephrology, 2015; 16, 30.
4. Alayoud, A., Benyahia, M., Montassir, D., et al.,. A model to predict optimal dialysate flow. Therapeutic Apheresis and Dialysis, 2012; 16, 152-158.
5. Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO Clinical Practice Guideline for Acute Kidney Injury. Kidney International Supplements, 2012, 2, 1-138.
6. Daugirdas, J.T., Depner, T.A., Greene, T., & Silisteanu, P. Solute-solver: a web-based tool for modeling urea kinetics for a broad range of hemodialysis schedules in multiple patients. American Journal of Kidney Diseases, 2009; 54, 798-809.

DOI: 10.54103/2282-0930/29301