QUESTIONING A PARADIGM: SHOULD DIALYSIS MEMBRANES BE IMPERMEABLE FOR ALBUMIN.

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Introduction

Since longtime manufacturers of dialysis membranes are faced by requirements of the nephrological community that the cut-off of dialysis membranes should be below the molecular weight of albumin, i. below 66,000. Further, a loss of albumin per dialysis session should not exceed 4g/session. Maintenance of the vital colloid osmotic pressure as well as binding and transport of water insoluble substances and pharmaceutical drugs are arguments favoring the opinion that albumin levels should be kept in the normal range and not be deteriorated by filtration through dialysis membranes.
Here, the hypothesis will be tested whether an albumin-loss through dialysis membranes might not be a disadvantage. Support for this statement are provided by recent findings.

Findings

Albuminurea in PD and HD: Published investigations have shown that patients on PD exhibit a considerable protein loss per day. Losses are in the range of >6g/day. Thus, the term albuminurea in PD has been coined in this context [1]. A retrospective meta-analysis comparing patients treated with PD and HD further showed that serum **pre**-albumin levels are approximately 6mg/dl higher in PD- compared to HD-patients. It is presumed that hepatic synthesis of albumin by the healthy liver is stimulated by PD´s albumin loss [2]. Despite the fact, that serum albumin levels are about 0,3g/dl lower in PD- than in HD- patients, the liver is obviously able to compensate for theses losses. Further, no survival advantage of HD versus PD could be found after a completion of a 2-year treatment period [3], questioning the role of albumin in this context.

Strategies to develop dialysis membranes are determined by improving the molecular weight cut-off of membranes. A sieving coefficient (SC) for albumin far below SC=0,5 has become even a paradigm. With the recent advent of clinical high-volume hemodiafiltration, removal of only individual single uremic retention solutes has turned out to be insufficient. Current opinions preferentially address the removal of families of molecules with different molecular weights, because those might interact synergistically with the result of an increased toxic potential.
Consequently, membranes with a higher molecular weight cut-off would be needed to allow for this increased performance, possibly exceeding the cut-off range of albumin. Recent clinical trials on >690 HD-Patients in Japan were performed to prove the benefit of protein permeable membranes in terms of long-term survival. Patients were treated here in a 7 years follow-up with three subgroups of high-flux dialysis membranes differing in the capacity to show an albumin loss per session (albumin loss 3g or more, 1-3g and less than 3g). Albumin leakage of >3g or more per HD session provided a better prognosis and thus, showed highly beneficial effects on mortality in maintenance HD-patients.

Conclusion

Following these findings the paradigm of protein-impermeable dialysis membranes should be reconsidered. Results on patient mortality comparing HD and PD, and on membranes with high molecular weight cut-off prove the hypothesis that protein permeable dialysis membranes have beneficial effects on patient performance.

References

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