

ORIGINAL ARTICLE

Complications

Polyvinylpyrrolidone in hemodialysis membranes: Impact on platelet loss during hemodialysis

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Abstract

Introduction: Hydrophilic modification with polyvinylpyrrolidone (PVP) increases the biocompatibility profile of synthetic dialysis membranes. However, PVP may be eluted into the patient's blood, which has been discussed as a possible cause for adverse reactions rarely occurring with synthetic membranes. We investigated the content of PVP and its elution from the blood-side surface from commercially available dialyzers, including the novel FX CorAL, with PVP-enriched and α -tocopherol-stabilized membrane, and link the results to the level of platelet loss during dialysis as a maker of biocompatibility.

Methods: Six synthetic, PVP containing, dialyzers (FX CorAL, FX CorDiax [Fresenius Medical Care]; Polyflux, THERANOVA [Baxter]; ELISIO [Nipro]; xevonta [B. Braun]) were investigated in the present study. The content of PVP on blood-side surface was determined with X-ray photoelectron spectroscopy (XPS). The amount of elutable PVP was measured photometrically after 5 h recirculation. The level of platelet loss was evaluated in an ex vivo recirculation model with human blood.

Findings: Highest PVP content on the blood-side surface was found for the polysulfone-based FX CorAL (26.3%), while the polyethersulfone-based THERANOVA (15.6%) had the lowest PVP content. Elution of PVP was highest for the autoclave steam-sterilized THERANOVA (9.1 mg/1.6 m² dialyzer) and Polyflux (9.0 mg/1.6 m² dialyzer), while the lowest PVP elution was found for the INLINE steam sterilized FX CorAL and FX CorDiax (<0.5 mg/1.6 m² dialyzer, for both). Highest platelet loss was found for xevonta (+164.4% compared to the reference) and the lowest for the FX CorAL (−225.2%) among the polysulfone-based dialyzers; among the polyethersulfone-based dialyzers, THERANOVA (+95.5%) had the highest and ELISIO (−52.1%) the lowest platelet loss.

Discussion: Polyvinylpyrrolidone content and elution differ between commercially available dialyzers and were found to be linked to the membrane material and sterilization method. The amount of non-eluted PVP on the blood-side surface may be an important determinant for the biocompatibility of dialyzers.

KEYWORDS

biocompatibility, dialysis membranes, platelet loss, polyethersulfone, polysulfone, polyvinylpyrrolidone