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INTRODUCTION AND AIMS: Coagulation in the haemodialysis (HD) circuit decreases treatment efficiency and can result in substantial blood loss. So far, multiple surrogate markers are used during or after haemodialysis, to estimate the activation of coagulation. None of these tools is able to quantify fiber patency in the entire dialyser, and validation against a gold standard is lacking. Being able to objectively determine the number of patent fibers would overcome this important barrier in comparative studies in different dialysers and different anticoagulation strategies. We therefore developed a novel technique based on micro-CT scanning to quantify coagulation in fibers of haemodialysers. To illustrate the potential of this technique, different machine parameters and visual scoring were evaluated during HD.

METHODS: Twenty stable HD patients were treated with post dilution haemodiafiltration for 245±20min with an FX600 haemodialyser on a 5008 dialysis machine (both Fresenius, Germany) using low molecular weight heparin anticoagulation according to body weight. Every 30min, ultrafiltration and substitution flows and volumes, venous and arterial pressure, transmembrane pressure, blood volume monitoring and online clearance monitoring, all as indicated by the machine, were registered. After dialysis, haemodialyser and venous chamber and line were scored with colour coding, and clot sizes were visually estimated. Next, in an *in vitro* setting, continuous mild positive pressure ventilation was applied in the dialyser for 24h after which dialyser dry mass was measured. The 20 used and 3 fresh non-used dialysers were, as a gold standard, scanned (resolution 25µm) in HECTOR (an in-house developed High-Energy CT scanner Optimised for Research). After image reconstruction, the open, non-coagulated fibers were counted in a representative cross-section at the dialyser outlet (ImageJ, Fiji).

RESULTS: In non-used *versus* used FX600 dialysers, 10748±2 *versus* 8930±2465 [range 534-10692] open fibers were counted, witnessing the very high accuracy of the method. In used dialysers, the number of open fibers did not correlate with any of the measured machine parameters. Furthermore, the associations with the visual scoring of the dialyser (R^2=0.41) and venous chamber (R^2=0.34), and with the post-dialysis dialyser dry mass (R^2=0.62) substantially suffered from disappointing point prevalence predictive power, making these parameters unreliable at the level of the individual patient.

CONCLUSIONS: Although an important issue in clinical practice, dialysis machines do not provide any online parameter to accurately predict fiber blocking in haemodialysis. The described micro-CT scanning technique is a feasible, objective, non-invasive, accurate and reproducible tool for quantification of the degree of fiber blocking in a haemodialyser after use, making it a potential gold standard for use in studies on fiber blocking during renal replacement therapy.