USING BEAR RESOURCES TO EVALUATE DIALYSIS CATHETER PERFORMANCE

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INTRODUCTION

Central venous catheters are placed in the right atrium (RA) and used in haemodialysis therapy, having to respect design requirements for good performance.

These catheters have several complications (e.g. high rates of infection and dysfunction).

There is no prior computational study assessing catheter performance while mimicking their native environment.

The aim of this study was to develop a CFD model of the RA and assess the performance of 4 dialysis catheter designs.

METHODS

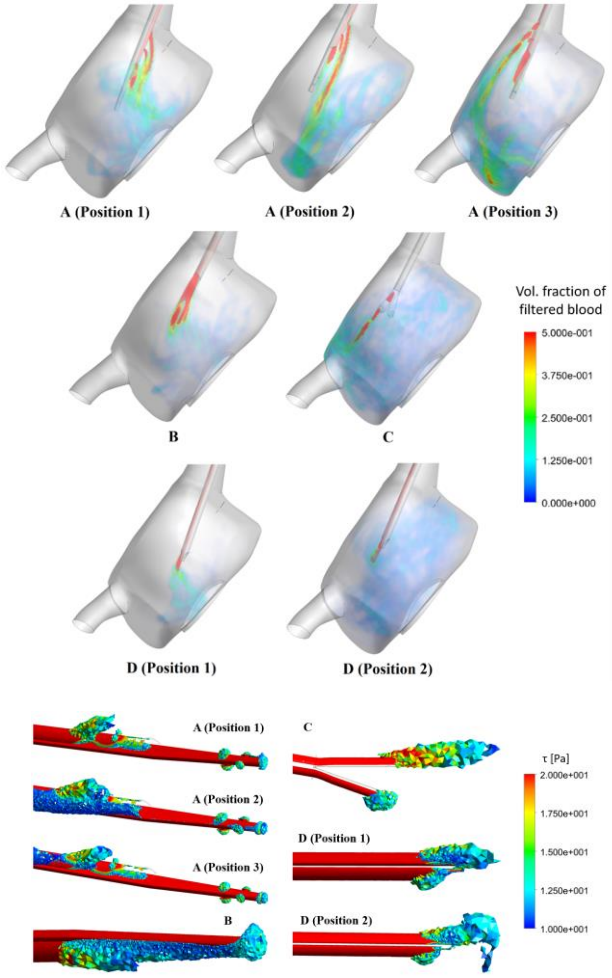
Development of realistic CFD RA model with application of physiological boundary conditions (BC).

Virtual insertion of 4 catheter designs (A, B, C, D) into the RA with appropriate BC and multiphase model.

Simulations ran over 7 cardiac cycles (60 cores / simulation and 5GB RAM / core).

Catheter performance was evaluated through prediction of flow vorticity, wall shear stress and quantification of recirculation and tip shear stress.

RESULTS AND DISCUSSION



Catheter placement increased flow vorticity.

All designs had recirculation and elevated shear stress at the tip, which can induce platelet activation and subsequently thrombosis.

Different tip placements yielded different performance outcomes.

Using a realistically anatomical RA model is crucial to study catheter performance and interaction with its haemodynamic environment.

Correct tip placement within the RA is needed to improve flow recirculation and decrease shear stress.