Computational simulation of pressure changes during embryo transfer

Mrugacz G.[1], Grygoruk C.[1], Kolodziejczyk M.[2], Gagan J.[2] , Ratomski K.[3], Grusza M.[1]

[1]Center for Reproductive Medicine BOCIAN, Akademicka 26, 15-267 Bialystok, Poland;
[2] Faculty of Mechanical Engineering, Bialystok Technical University, Bialystok, Poland.

ABSTRACT

Purpose: The embryo transfer into the uterus by a transcervical catheter is the final stage of in-vitro fertilization procedure. This study was designed to analyze the influence of injection speed on pressure fluctuation inside the transferred fluid.

Methods: Computational fluid dynamics was applied to calculate pressure changes in the transferred load for the following injection speeds: 0.01, 0.1, 1, 6, 12 and 20 m/s. A 3D geometrical model of the flow domain was created in ANSYS Modeler. The computations were carried out using the CFD code Parallel ANSYS Fluent 12.1 with the segregated solver SIMPLE (Semi-Implicit Method for Pressure-Linked Equations). The model was solved in double precision on a control volume unstructured 3D mesh made in ANSYS Mesher.

Results: The results of the present study indicate that the total, static and dynamic pressures rise with increase of the injection speed of the transferred load.

Conclusions: Taking these results into consideration, it is advised to transfer the embryos with minimal injection speed because the magnitude of the pressure changes rises with the injection speed of the transferred load.

Key words: Catheter, embryo, embryo transfer, fluid velocity, pressure based catheter