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IN VITRO MEASUREMENT AND CALCULATION OF DRAG FORCE ON ILIAC LIMB STENTGRAFT IN A COMPLIANT ARTERIAL WALL MODEL

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Summary

Interventional treatment of aortic aneurysms using endovascular stentgrafting is a minimally invasive technique. Following device implantation, transient drag forces act on the stentgraft. When the drag force exceeds the fixation force, complications like stentgraft migration, endoleaks and stentgraft failure occur. In such a scenario the device becomes unstable, causing concern over the long-term durability of endovascular repairs. The objective of this study is: 1) to measure the drag force on iliac limb stentgraft, having a distal diameter that is half the size of the proximal end, in an in vitro experiment; 2) to calculate the drag force using blood flowa?"compliant arterial wall interaction model and compare it with the measured values on the stentgraft for the in vitro experiment; 3) to calculate drag force on the stentgraft using physiological flow conditions. Experimental data for a stentgraft within a silicon tubing, representing a compliant artery, shows a peak drag force of 2.79 N whereas the calculation predicts a peak drag force of 2.57 N; thus a percentage difference of 7.8 % is observed. When physiological flow and pressure pulse are used for the blood flow-compliant arterial wall computations, a peak drag force of 0.59 N is obtained for the same stentgraft that was used in the experiment. The outer cavity between the distal end of the iliac limb stentgraft and the arterial wall reduces the drag force. These forces can be used as design guideline for determining the fixation force needed for the stentgraft under physiological pulsatile flow.