

A geometrical optimization of a by-pass graft

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Blockages in the artery system are often treated by adding new tubes as a by-pass. Unfortunately, 30% to 40% of the by-passes occludes within one year. There are several indications that one of the main cause for this problem is the specific fluid mechanic situation at the down-stream anastomosis connecting the graft to the artery. There one can find spots with very low wall shear stress that is known to introduce scar tissue formation. By viewing this problem as a geometrical optimization problem, we have designed a new by-pass graft that in some sense maximize the local minima of the shear stress. This numerical construction has also been tested in vivo.