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P6 CFD Modelling of Arterialized Venous Flap

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ABSTRACT

The knowledge about the required quantity of blood to irrigate an angiosome is important on ischemia (disruption on blood perfusion) prediction, diagnosis and treatment. An angiosome (or flap) is an anatomic unity (or flap) of tissue, it is constituted by skin, subcutaneous tissue and muscle, it is irrigated by an artery and drain by specific veins [1]. Since 70's, flaps have been used on clinical practice for reconstruction of complex anatomical structures. Different model configurations have been created, to find a flap's model that allows a better flap perfusion. In previous work [2] the four models with an average flap survival area of 76.86% ± 13.67% were tested in 53 male rats: I - conventional model of flap's blood supply formed by femoral and epigastric arteries; II – Arterialized Venous Flap (AVF) produced by femoral side-to-side anastomosis; III - AVF produced by femoral side-to-side anastomosis and proximal ligation of the femoral vein; IV - AVF produced by terminal lateral anastomosis of the epigastric vein to the femoral artery). The experimental results have shown that the AVFs in group IV represent an optimized model of unconventional perfusion flap. In the present work the Computational Fluid Dynamics (CFD) methods, an ANSYS*-Fluent code, were used for simulating a blood flow and flap perfusion in AVFs of group IV in order to find an optimum geometry for lateral anastomosis of the epigastric vein to the femoral artery with an angle variation from 90,0° to 45,0°. We find that the optimum angle is 86,5°. Three other models, conventional and unconventional, was also tested by CFD, finding that unconventional AVF of group III provides a greater blood flow through the epigastric vein, allowing a better perfusion of the flap.

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