J Mol Cell Cardiol 2002 Jul;34(7):775-87

Contribution of arteriogenesis and angiogenesis to postocclusive hindlimb perfusion in mice.

Scholz D, Ziegelhoeffer T, Helisch A, Wagner S, Friedrich C, Podzuweit T, Schaper W.

Department of Exp. Cardiology, Max-Planck-Institute, Bad Nauheim, Germany

D. Scholz, T. Ziegelhoeffer, A. Helisch, S. Wagner, C. Friedrich, T. Podzuweit and W. Schaper. Contribution of Arteriogenesis and Angiogenesis to Postocclusive Hindlimb Perfusion in Mice. Journal of Molecular and Cellular Cardiology (2002) 34, 775-787. The goal of this study was to examine the mechanisms of vascular growth that lead to the restoration of perfusion in a peripheral vascular disease model in mice. We monitored blood flow recovery and measured vascular growth in inbred strains of mice following femoral artery occlusion. Acute collateral blood flow to the hindlimb was lowest in Balb/C mice, causing intense ischemia, and showed a slower recovery (more than 21 days to 50% normal) than C57Bl/6 which had a 7-fold higher acute collateral
flow and a fast recovery (3 days). Collateral vessels were enlarged by proliferation of ECs and SMCs. Capillary density increased in the lower limbs of Balb/Cs (1.7-fold) and of sv129s. Tissue oxygen saturation recovered faster than flow in all strains. Morphometry of mature collaterals showed a diameter increase of 2.1-2.4 fold. The increase in total vessel wall area exceeded that of the femoral artery by 1.4-fold and the common lumenal area by 1.6-fold. Infusion of the growth factor peptide FGF-2 by osmotic minipump accelerated arteriogenesis but inhibited the angiogenic response probably because it prevented ischemia. Conclusion: the speed of arteriogenesis is inversely related to the intensity of ischemia, and arteriogenesis is by far the most efficient
mechanism to increase blood flow after femoral artery occlusion. De novo arteriogenesis was not observed.