

Functional vasodilation following murine chronic hindlimb ischemia

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Functional hyperemia and arteriolar vasodilation are impaired with chronic ischemia. We sought to examine the impact of chronic ischemia on collateral artery function. For this we used two hindlimb ischemia models to dissect the impact of different repair processes on collateral function. Ligation of the femoral artery increases shear stress in the muscular branch and results in outward remodeling and arteriogenesis. In contrast, resection of the femoral artery proximal to the muscular branch induces blood flow divergence and neutral/inward remodeling along with greater hypoxia and inflammation. On day 14 after each surgery the diameter of the muscular branch was measured using sidestream dark field (SDF) imaging before and after gracilis muscle stimulation. A slight, but not statistically significant, impairment in functional vasodilation was observed in ligated mice (1.69 ± 0.10 fold diameter increase compared to 1.74 ± 0.04 fold diameter increase). Surprisingly, resected mice exhibited enhanced collateral artery functional vasodilation (2.04 ± 0.20 fold diameter increase) but were also refractory to the restoration of resting vascular tone following the cessation of stimulation. Outward remodeling did not significantly impair vascular function, whereas inward/neutral remodeling and tissue hypoxia induced enhanced vasodilation and impaired vascular tone.