Functional Vasodilation is Impaired in Arterialized Capillaries Following Ischemia

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Introduction

• Stimulating the growth of collateral vessels could be an efficacious therapy for ischemic disease.
• Patients with natural collateral vessels have improved prognosis but animal studies suggest that not all patients have pre-existing collaterals.
• A possible therapeutic target for these patients could be the stimulation of the growth of collaterals.
• Patients with ischemic diseases are asymptomatic at rest but experience their worst symptoms when under stress or exercising, which suggests an impaired ability for vessels to vasodilate.
• In order for a treatment to stimulate the growth of arterialized capillaries to be the most effective, stimulated vessels must be able to vasodilate.
• Capillaries arteritalize in response to feed artery ligation to resupply the ischemic region with blood flow.

Intravital Microscopy with Functional Vasodilation

• Reactivity of arterialized capillaries was assessed at 7 and 21 days following surgical ligation. The intravital imaging station used is shown in Figure 4A.
• Electrical stimulation was used to cause muscle contraction in the spinotrapezius to assess the endogenous vasodilation pathway of arterialized capillaries. Experimental setup is shown below in Figure 4.

Figure 4: Intravital Microscopy with Functional Vasodilation

Set up. A. Intravital microscope set up. B. Microelectrode Placement

Functional Vasodilation is Impaired at Day 7 but Restored by Day 21

Figure 5: Vascular reactivity of arterialized capillaries after 7 days. A) Representative image of arterialized capillaries stained with iSM (red) and lectin perfused (green). B) Diameter in microns of terminal arterioles in sham-operated and arterialized capillaries in operated animals pre- and post-10μM nitroprusside. C) Percent change of vessels, n=5. * indicates p<0.05 using a paired students t-test.

Figure 6: Vascular reactivity of arterialized capillaries after 7 days. A) Representative image of arterialized capillaries stained with iSM (red) and lectin perfused (green). B) Diameter in microns of terminal arterioles in sham-operated and arterialized capillaries in operated animals pre- and post-10μM nitroprusside. C) Percent change of vessels, n=5. * indicates p<0.05 using a paired students t-test.

Conclusions

• Dilation in arterialized capillaries is impaired at day 7 but restored by day 21.
• A trend towards increased dilation was observed in arterIALIZED capillaries at day 21.

Future Work

• Stimulate the growth/reactivity of arterialized capillaries

References


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