EFFECTS OF ADRENORECEPTOR ACTIVATION AND AGING ON SKELETAL MUSCLE ARTERIOLES AT REST AND DURING RAPID ONSET VASODILATION

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ABSTRACT

Sympathetic nerve activity (SNA) induces arteriolar vasoconstriction via α-adrenoreceptor (αAR) activation. Whether αAR activation affects the spread of rapid onset vasodilation (ROV) in contracting muscle is unknown. Differential αAR distribution in vascular smooth muscle has been proposed to mediate functional sympatholysis, however the αAR subtype distribution in locomotor muscle is undefined. This dissertation determined: 1) the effects of constitutive αAR activation on the spread of ROV within contracting muscle, 2) the functional αAR distribution in locomotor muscle of the mouse, and 3) the influence of αAR on ROV during aging. In arterioles of the gluteus maximus muscle (GM), I tested the hypotheses that: 1) adrenoreceptor subtype distribution is heterogeneous and 2) adrenoreceptor activation modulates the spread of ROV. The left GM of young (3-month) anesthetized C57BL/6 mice were studied using intravital microscopy. Distinct anastomotic, 1A, 2A, and 3A arterioles were studied at rest and following single muscle contraction in the presence or absence of topical αAR agonists and antagonists. Functional αAR distribution differed between proximal and distal arterioles. Constitutive αAR activation inhibited the spread of ROV between regions of the GM. It also reduced the amount of ROV seen in old (~20-month) versus young male mice. I conclude that functional αAR are heterogeneously distributed in arteriolar networks and serve to modulate regional vasodilation.