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HIGHLIGHTED TOPIC | *Skeletal and Cardiac Muscle Blood Flow*

This issue of the *Journal* is the first in our third *Highlighted Topics* series for 2004, "Skeletal and Cardiac Muscle Blood Flow." Two of the articles featured in this issue deserve special comment for their important contributions to this highlighted area of research. In the first featured article, entitled "Role of nitric oxide in exercise sympatholysis," Dr. J. Buckwalter and colleagues (1) examine whether production of nitric oxide is responsible for the attenuated responsiveness of α_1- and α_2-adrenergic receptors in exercising skeletal muscle. Vascular tone in exercising muscle appears to be a balance between vasoconstriction, necessary for blood pressure regulation, and vasodilation, necessary for oxygen delivery. Although there is clearly sympathetic vasoconstriction in exercising muscle, the ability of the sympathetic nervous system to induce vasoconstriction in active skeletal muscle appears to be less than that at rest. The mechanism responsible for this attenuation has yet to be definitively established. In this study examining exercising canine skeletal muscle, these investigators found that nitric oxide plays a role in reducing α_1-adrenergic receptor responsiveness. However, α_2-adrenergic receptor responsiveness was unaffected by nitric oxide synthase inhibition. The results of this study provide insight into local control of skeletal muscle blood flow during exercise and suggest that nitric oxide production is not the sole mechanism for attenuation of sympathetic vasoconstriction in contracting skeletal muscle.

Approximately 30% of patients treated with stents develop restenosis at the site of stent implantation as a result of neointimal hyperplasia. Studies in recent years have extensively explored a putative relationship linking altered vascular geometry and indexes of wall shear stress to neointimal hyperplasia, reductions in cardiac blood flow, and regional myocardial ischemia. In the second featured article, entitled "Stent design properties and deployment ratio influence indexes of wall shear stress: a three-dimensional computational fluid dynamics investigation within a normal artery," Dr. J. LaDisa, Jr., and colleagues (2) used three-dimensional computational fluid dynamics modeling to test their hypothesis that the geometric parameters of an implanted stent influence acute distributions of wall shear stress. These investigators found that reducing the thickness of stent struts caused an appreciable reduction in the area of the vessel exposed to elevated spatial gradients of wall shear stress and also reduced the distributions of wall shear stress implicated in the development of neointimal hyperplasia. Increasing both the number of struts and the stent-to-artery deployment ratio also increased vascular exposure to low wall shear stress. These results, together with recent in vivo studies, suggest that local vascular geometry after stent implantation influences the distribution of wall shear stress, which, in turn, may mediate neointimal hyperplasia in response to vascular injury. The application of such findings to novel stent designs that limit adverse alterations in indexes of wall shear stress after implantation may reduce the risk of restenosis and may help maintain perfusion distal to vascular stenoses.

REFERENCES

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2. **LaDisa JF Jr, Olson LE, Guler I, Hettrick DA, Audi SH, Kersten JR, Warltier DC, and Pagel PS.** Stent design properties and deployment ratio influence indexes of wall shear stress: a three-dimensional computational fluid dynamics investigation within a normal artery. *J Appl Physiol* 97: 424–430, 2004.

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