The Department of Bioengineering at
Clemson University
presents

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The Mechanics of Healing Myocardial Infarcts and Tissue-Engineered Analogs

Abstract: Stem cell therapy and tissue engineering will soon offer unprecedented power to remodel or replace infarcted myocardium. However, past interventions in the infarct healing process have often produced unexpected results. In some cases, such as angiotensin converting enzyme (ACE) inhibitors, the benefits were much greater than originally expected; in others, notably the post-infarction administration of steroids, the results were disastrous. In view of these past experiences, we believe it is essential that new interventions be grounded in an understanding of the structural determinants of the mechanical properties of infarcted myocardium at various stages during healing and of the effect of infarct mechanics on global ventricular function.

Over the past 10 years, we have studied infarct mechanics through a combination of in vivo, in vitro, and computational studies. We have shown that anisotropy in healing myocardial scar tissue appears to preserve function of the left ventricle, but that development of this anisotropy appears to depend on mechanical environment during healing. In order to better understand the development of scar anisotropy, we created a tissue-engineered in vitro analog of myocardial scar tissue. We have used this analog to develop structural constitutive models for mature scar tissue based on collagen fiber content and alignment, and to explore the impact of crosslinking in modifying anisotropy. We have also begun using our tissue-engineered scar analog to explore the mechanisms by which mechanical environment guides the development of scar anisotropy. The use of tissue-engineered constructs has proved invaluable in our overall effort to understand and develop strategies for therapeutically modifying infarct anisotropy; we believe such constructs may have similar value to many investigators as a bridge between cell-culture and in vivo studies.

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12:15 – 1:15 PM
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