

## Perfusion Contrast Imaging: Is This the Year?



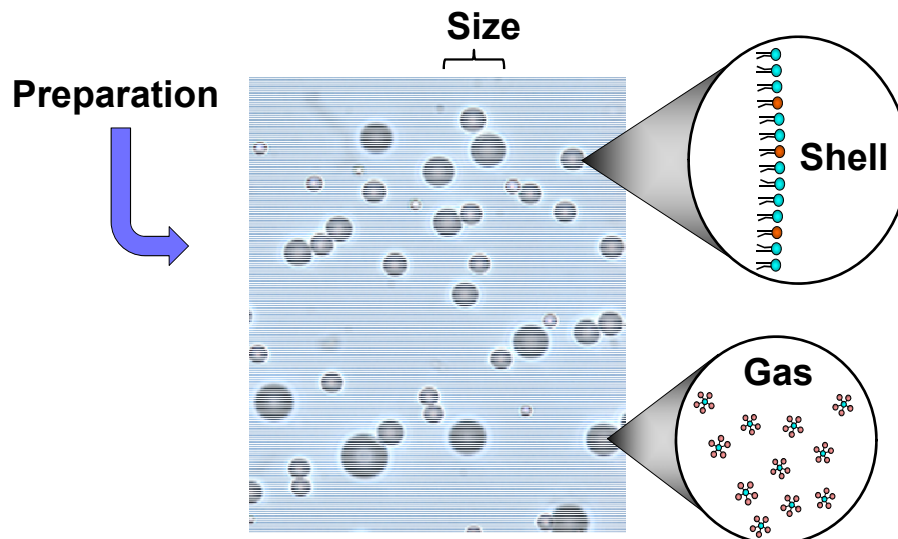
**Jonathan R. Lindner, M.D.**  
**Oregon Health & Science University**

Disclosures:

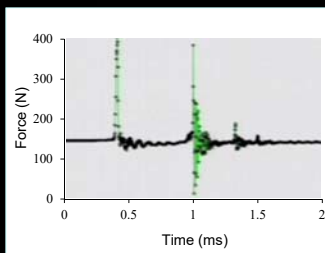
*Off-label use of contrast agents*

*Investigator-initiated Grant – GE Healthcare, Pfizer*

## ***Microbubble Characteristics***

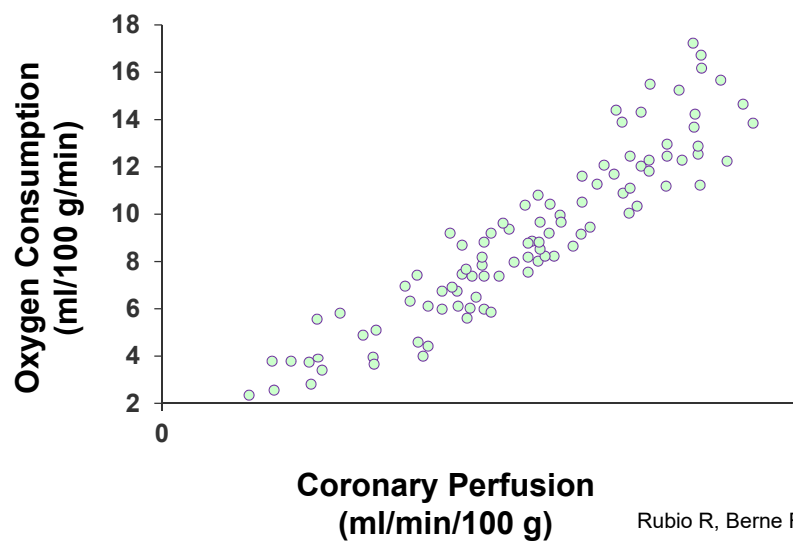


## The Power of Bubbles: The Mantis Shrimp



Shiela Patek U.Mass

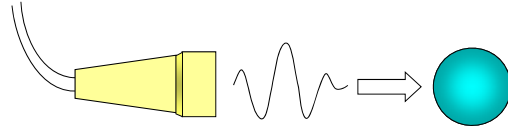
## Relation Between $MVO_2$ and Coronary Blood Flow



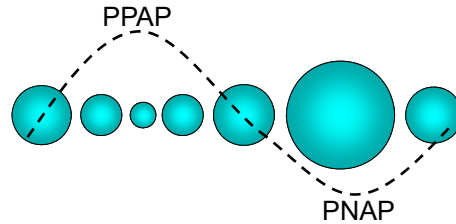
Rubio R, Berne RM.; 1975

## ***Acoustic Signal Generation During MCE***

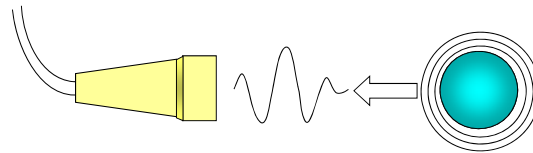
1. Ultrasound stimulation of microbubbles



2. Oscillation of microbubble diameter (volume) according to acoustic pressure

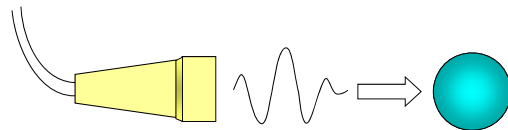


3. Ultrasound signal produced by oscillation

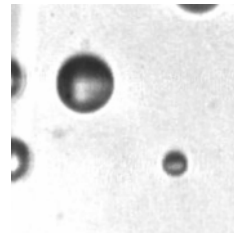


## ***Acoustic Signal Generation During MCE***

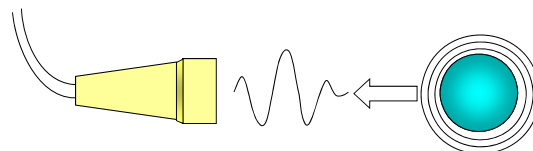
1. Ultrasound stimulation of microbubbles



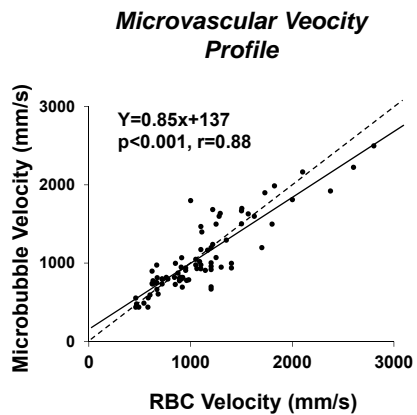
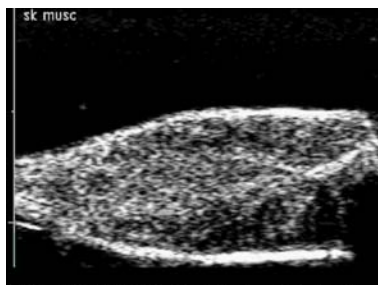
2. Oscillation of microbubble diameter (volume) according to acoustic pressure



3. Ultrasound signal produced by oscillation

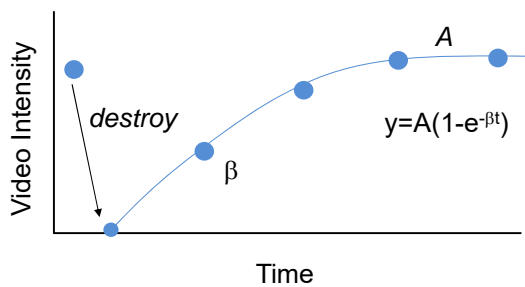
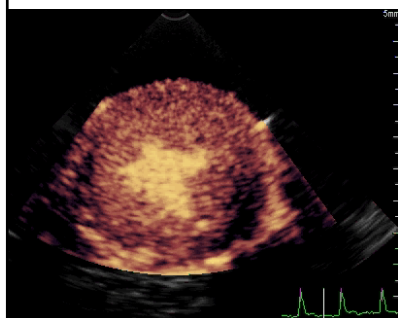
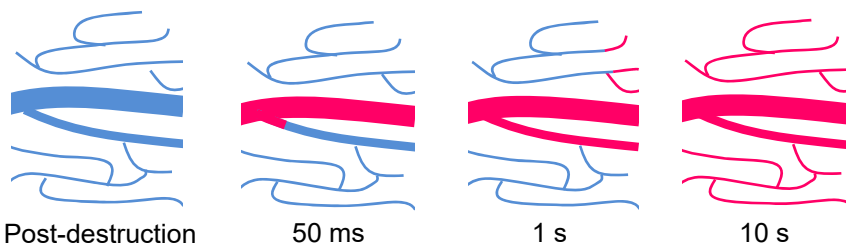


## Microbubbles for Perfusion Imaging



Lindner JR, et al. J Am Soc Echocardiogr 2002;15:396

## Assessing Perfusion with CEU



### ***Situations Where it is Useful to Evaluate Myocardial Capillary Integrity Alone***

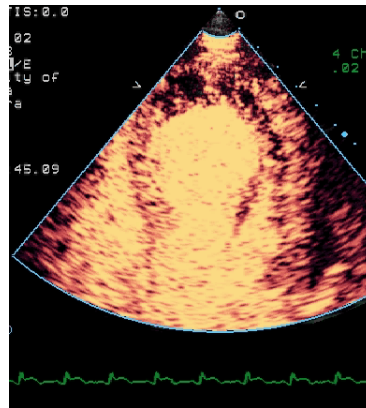
1. Myocardial viability
2. Evaluation of microvascular no-reflow after epicardial revascularization
3. Diagnosis and prognosis for stress-related cardiomyopathy
4. Vascularity of a mass (tumor versus thrombus)

### **Myocardial Contrast Echocardiography Role in Ischemic Heart Disease**

**Stress-induced  
Ischemia**

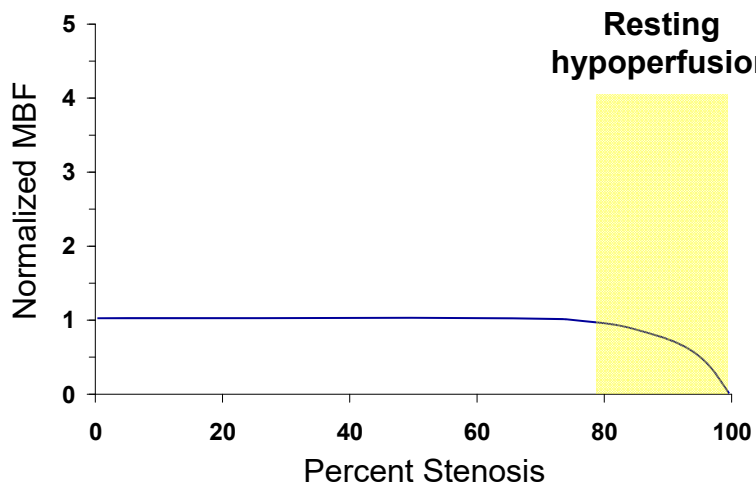


**Acute MI  
Myocardial Viability**

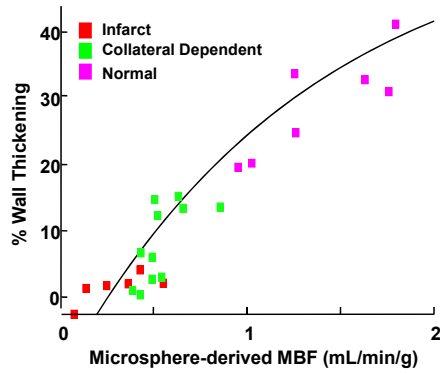


***For everything else:  
Full Perfusion Imaging***

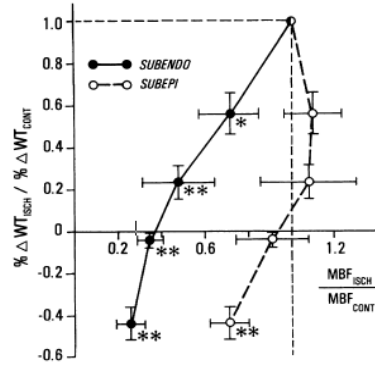
***Myocardial Blood Flow in Obstructive CAD***



## Flow-Function Relation at Rest

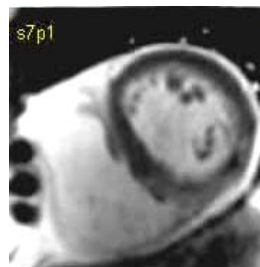
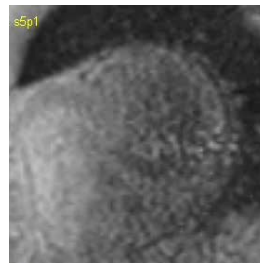


Leong-Poi H, et al., *J Am Coll Cardiol* 2005;45:565

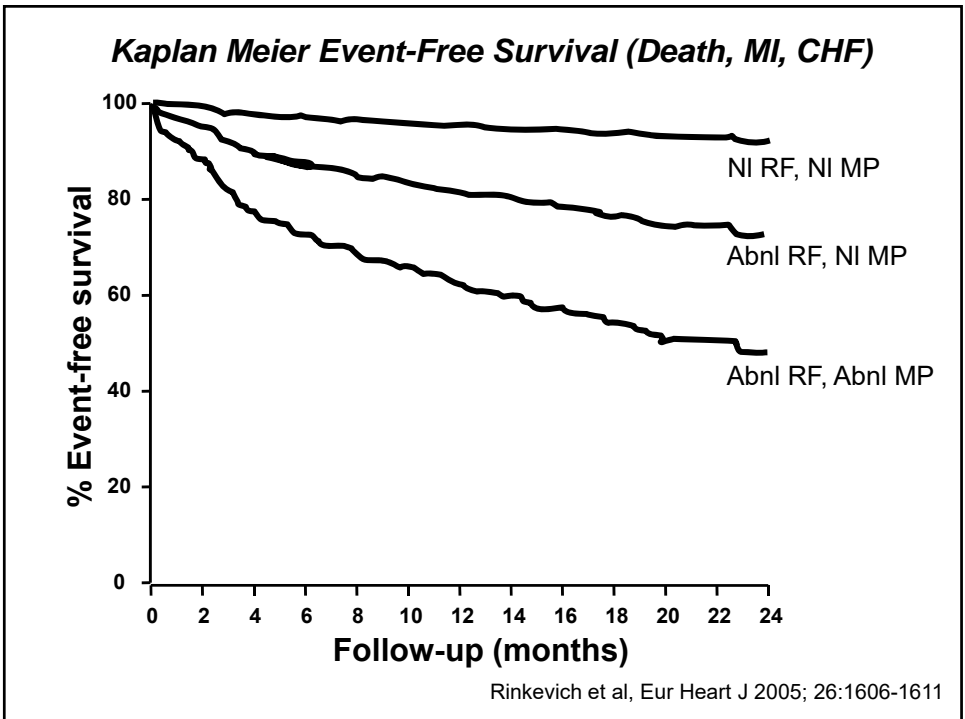
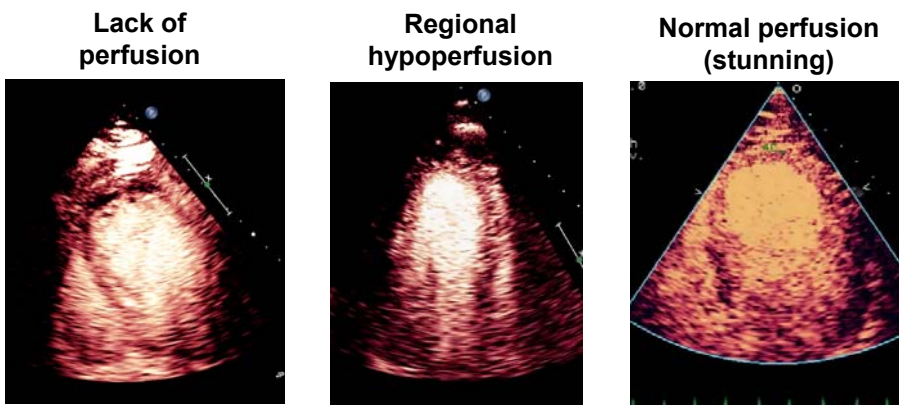


Gallagher G, *Circulation* 1980;62:1266

## Endocardial Hypoperfusion and Resting Myocardial Dysfunction

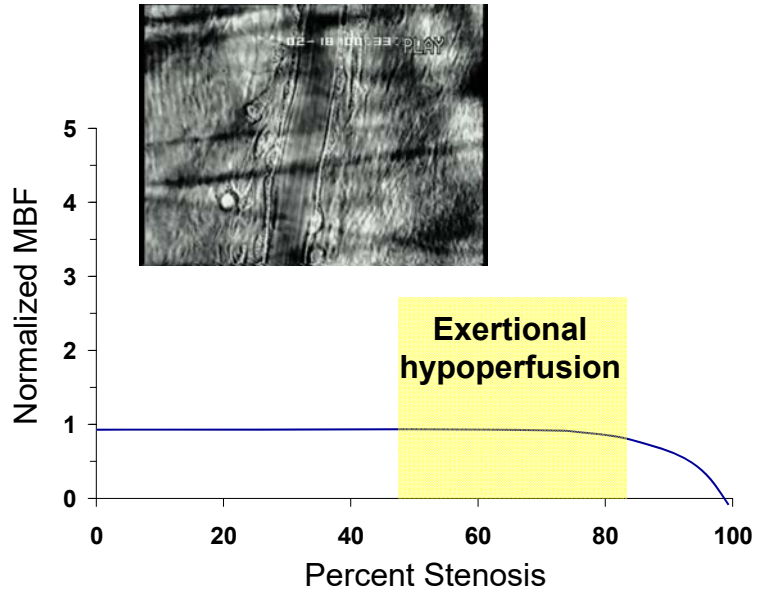


## ***Flow-Function in Patients with Wall Motion Abnormality at Rest***

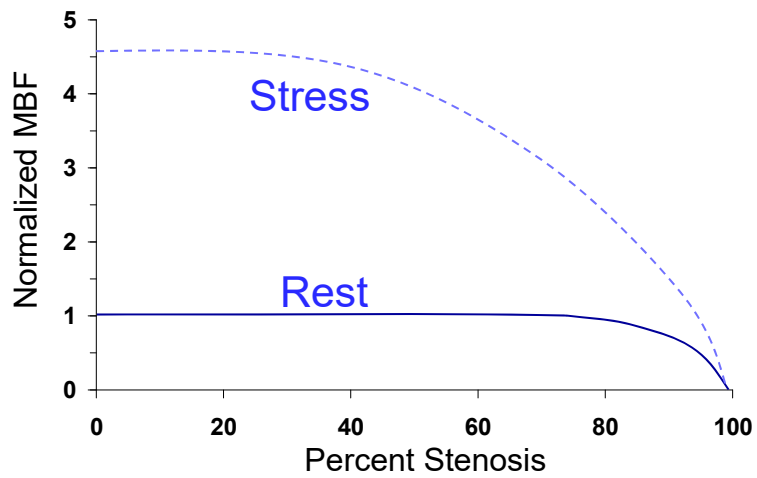




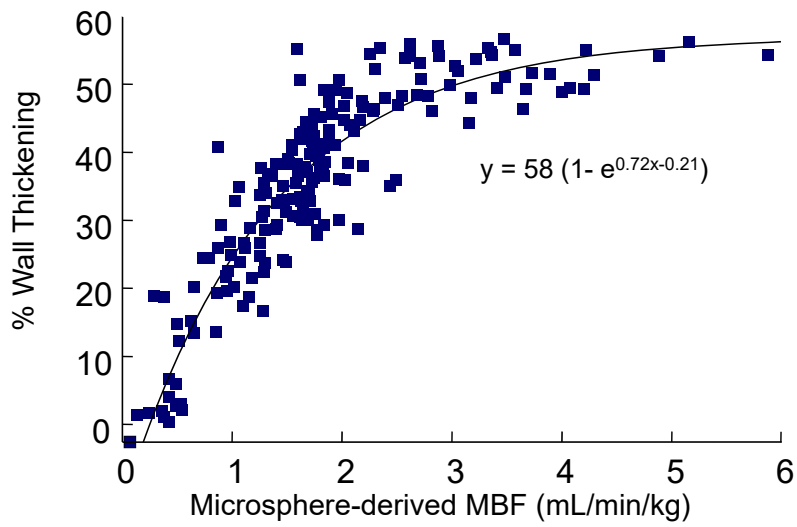
## Myocardial Blood Flow Reserve CAD



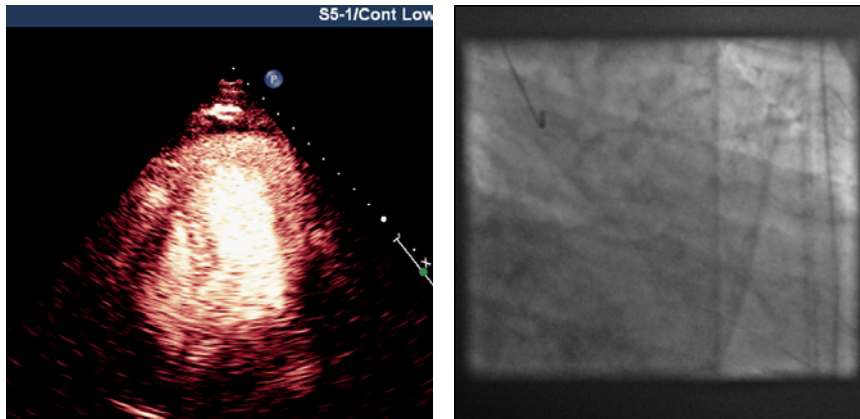
## Myocardial Blood Flow Reserve CAD



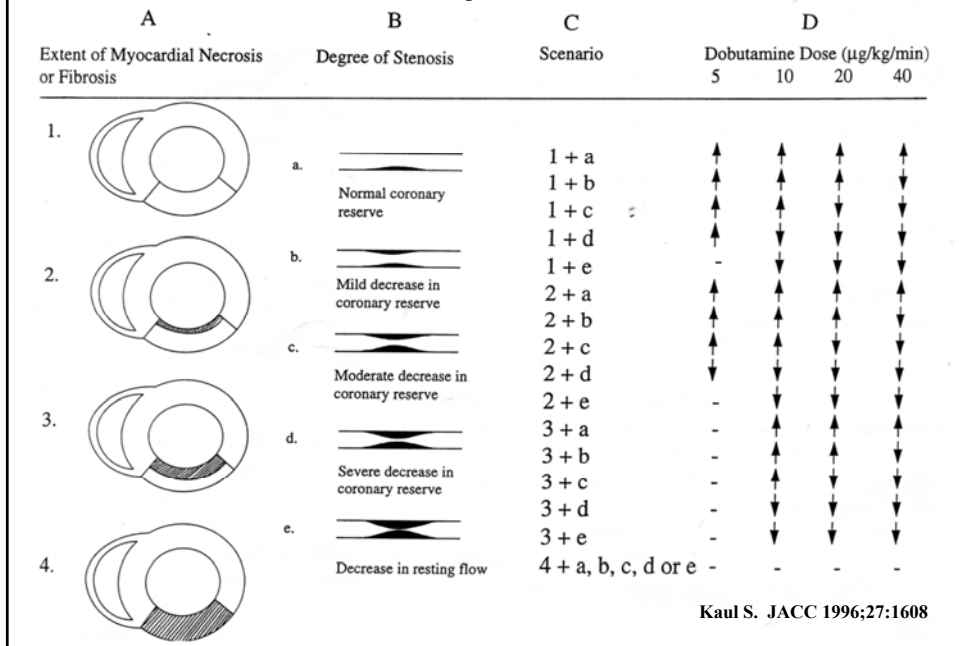
### Flow-Function Relation at Peak Dobutamine



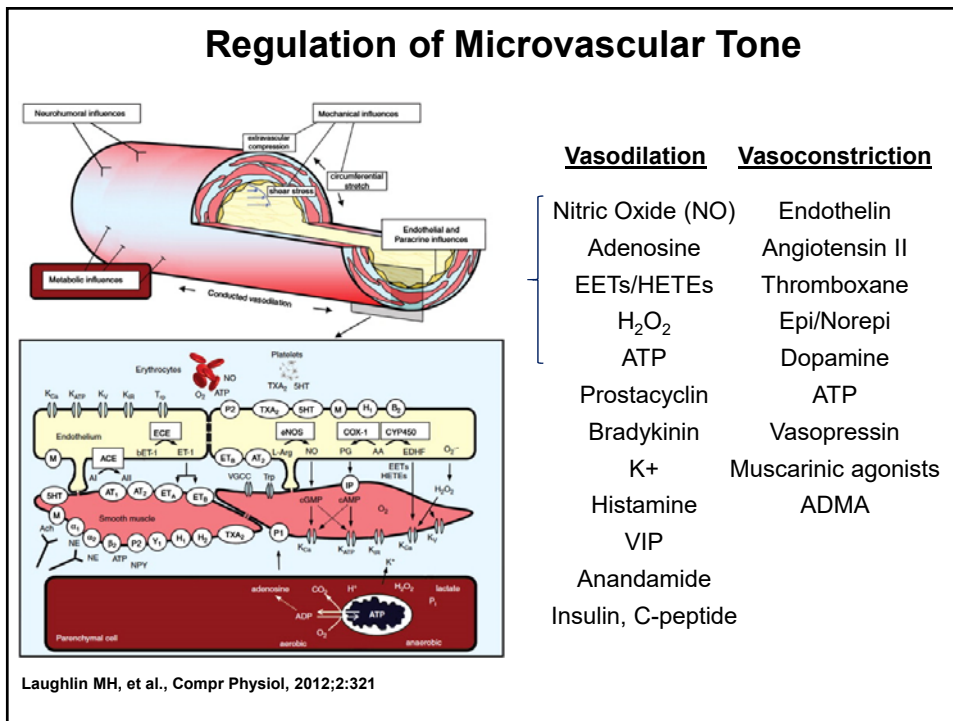
### Incremental Value of Perfusion for Identifying Ischemia During Stress



## Determinants of Response to Dobutamine

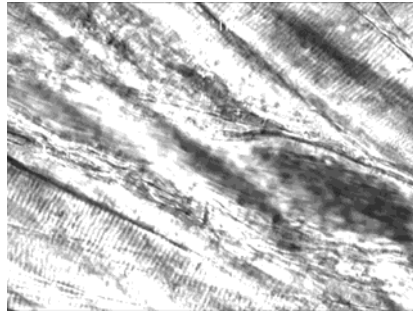


## Regulation of Microvascular Tone

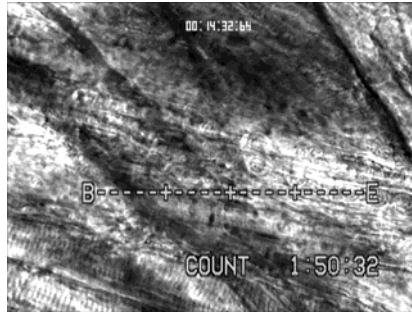


## Abnormal Microvascular Tone: Arterial Phenomenon Alone?

**Arteriole**



**Capillary**



## Immediate Improvement in Microvascular Function With Lipoprotein Apheresis in FH

