



Abteilung Kardiologie  
Universitätsklinik für Innere Medizin  
Innsbruck



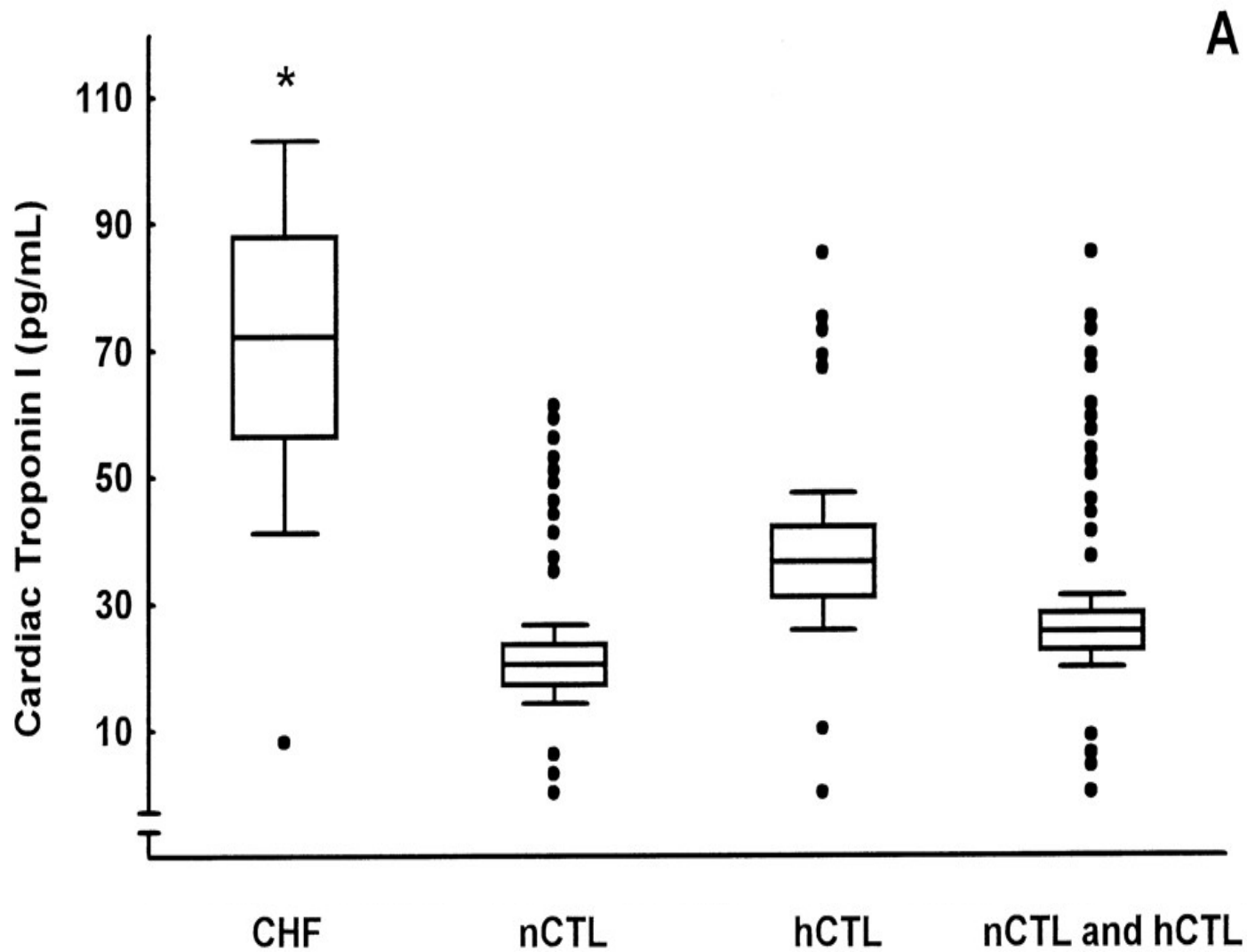
MEDIZINISCHE UNIVERSITÄT  
INNSBRUCK

# *Elevation of Troponins in Acute Heart Failure: Injury or Infarct?*

*Johannes Mair, M.D.*

*Clinical Division of Cardiology,  
Innsbruck Medical University,  
Innsbruck, AUSTRIA*

# Circulating Cardiac Troponin I in Severe Congestive Heart Failure



# A novel biochemical approach to congestive heart failure: Cardiac troponin T

Emil Missov, MD, PhD, and Johannes Mair, MD *Montpellier, France, and Innsbruck, Austria*

(Am Heart J 1999;138:95-9.)

**Table II.** Protein markers of cardiac injury in the study population

	<b>CHF (n = 33)</b>	<b>CTL (n = 47)</b>	<b>P value</b>
cTnT (ng/mL)	0.140 ± 0.439	0.0002 ± 0.001	.0001
CK-MB (ng/mL)	3.76 ± 3.65	2.62 ± 2.16	.0474

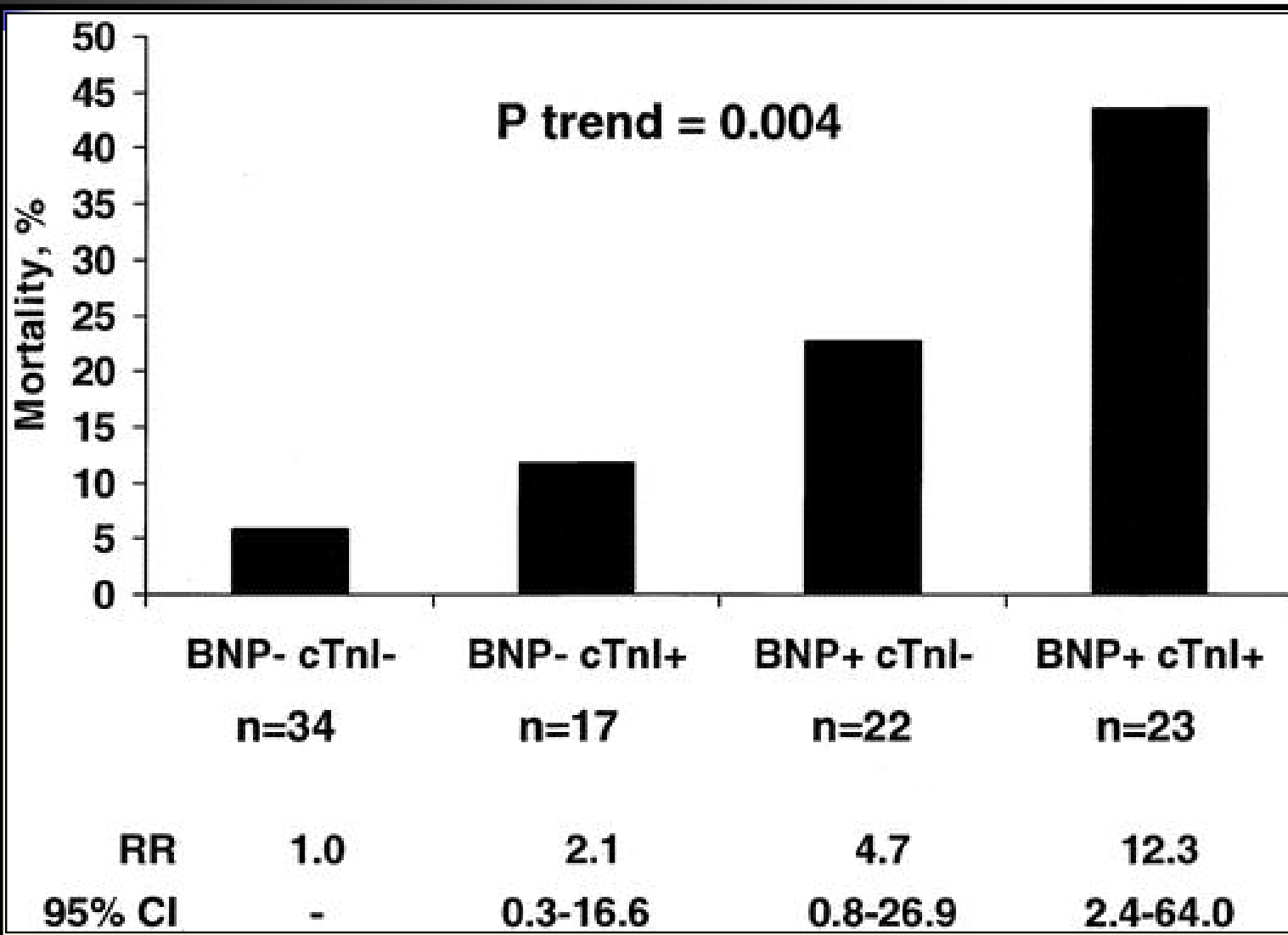
CHF, Congestive heart failure; CTL, healthy control subjects; cTnT, cardiac troponin T.

**Table IV.** Protein markers of cardiac injury in patients with congestive heart failure categorized according to functional impairment

	<b>LVEF ≤45% (n = 23)</b>	<b>LVEF &gt;45% (n = 10)</b>	<b>P value</b>
cTnT (ng/mL)	0.163 ± 0.50	0.007 ± 0.01	.04
CK-MB (ng/mL)	4.08 ± 4.18	2.97 ± 1.72	>.05

cTnT, Cardiac troponin T.

# *Combination of Troponin and BNP for Risk Stratification in HF*





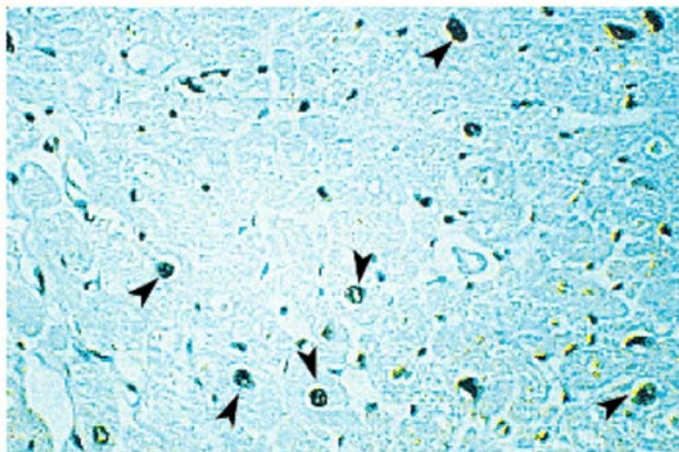
# *Mechanisms of Cell Death in HF*

---

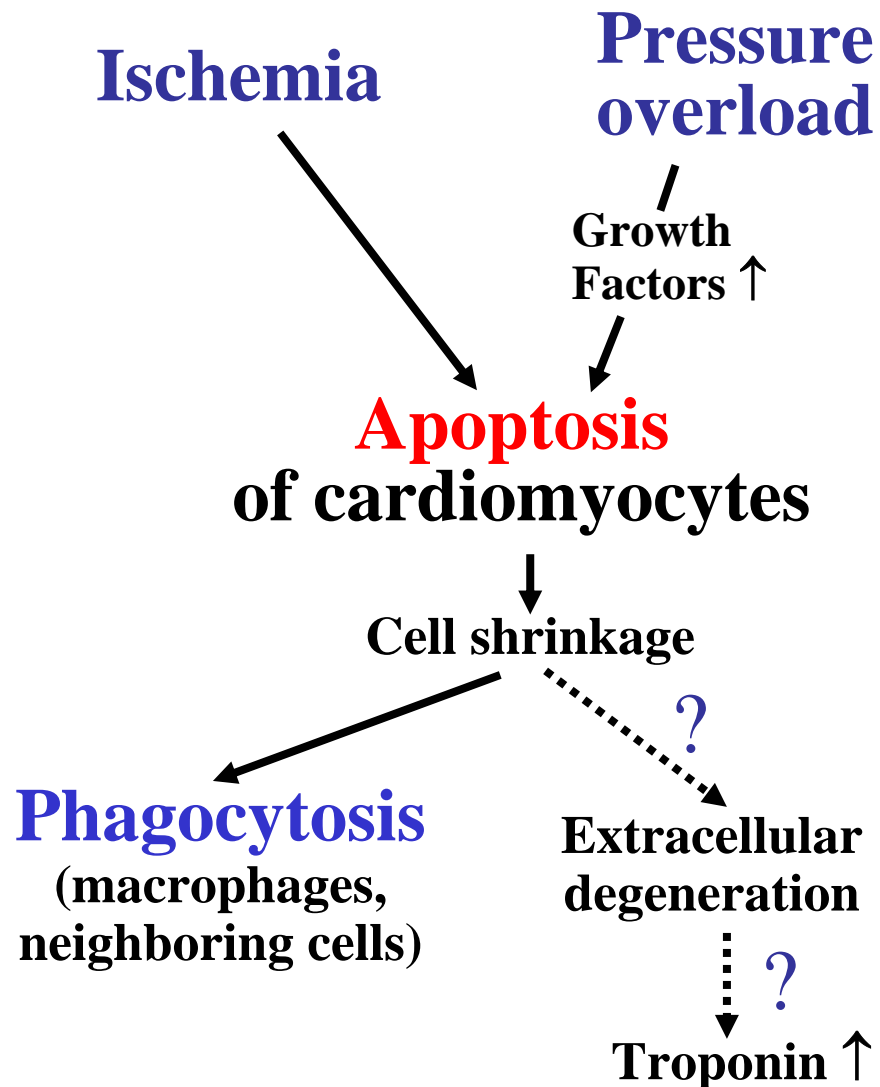
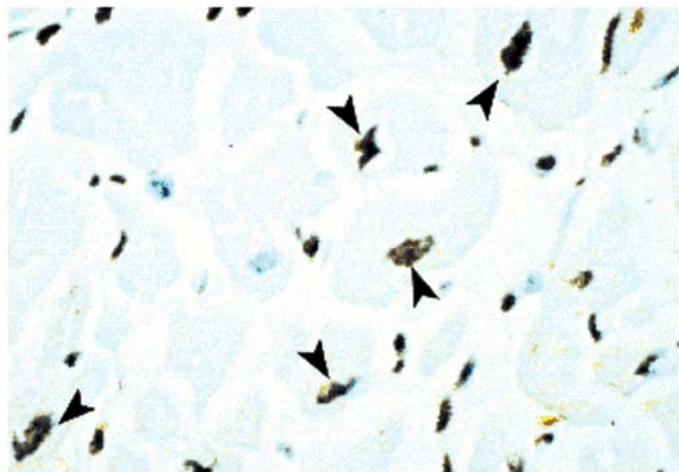
- *Apoptosis (Programmed Cell Death)*
- *Necrosis*

# Apoptosis in End-stage HF

Dilated CMP



Ischemic CMP



➤ apoptotic cardiomyocyte

Narula et al. NEJM 1996;335:1182-9.

# Possible Pathophysiological Pathways for Troponin Release in HF

**CAD  
(ischemic CMP)**

**Hypertrophy/  
Dilatation**

**Infiltration**  
(e.g. amyloidosis)

**Toxins**

(e.g. alcohol, drugs,  
neurohormonal factors)

**Myocardial strain ↑**

Plaque  
rupture

Stable,  
significant  
stenoses

**ACS**

**Recurrent  
ischemia**

Small vessel  
involvement

**Episodic supply/demand  
subendocardial ischemia**

Distal  
micro-  
embolization

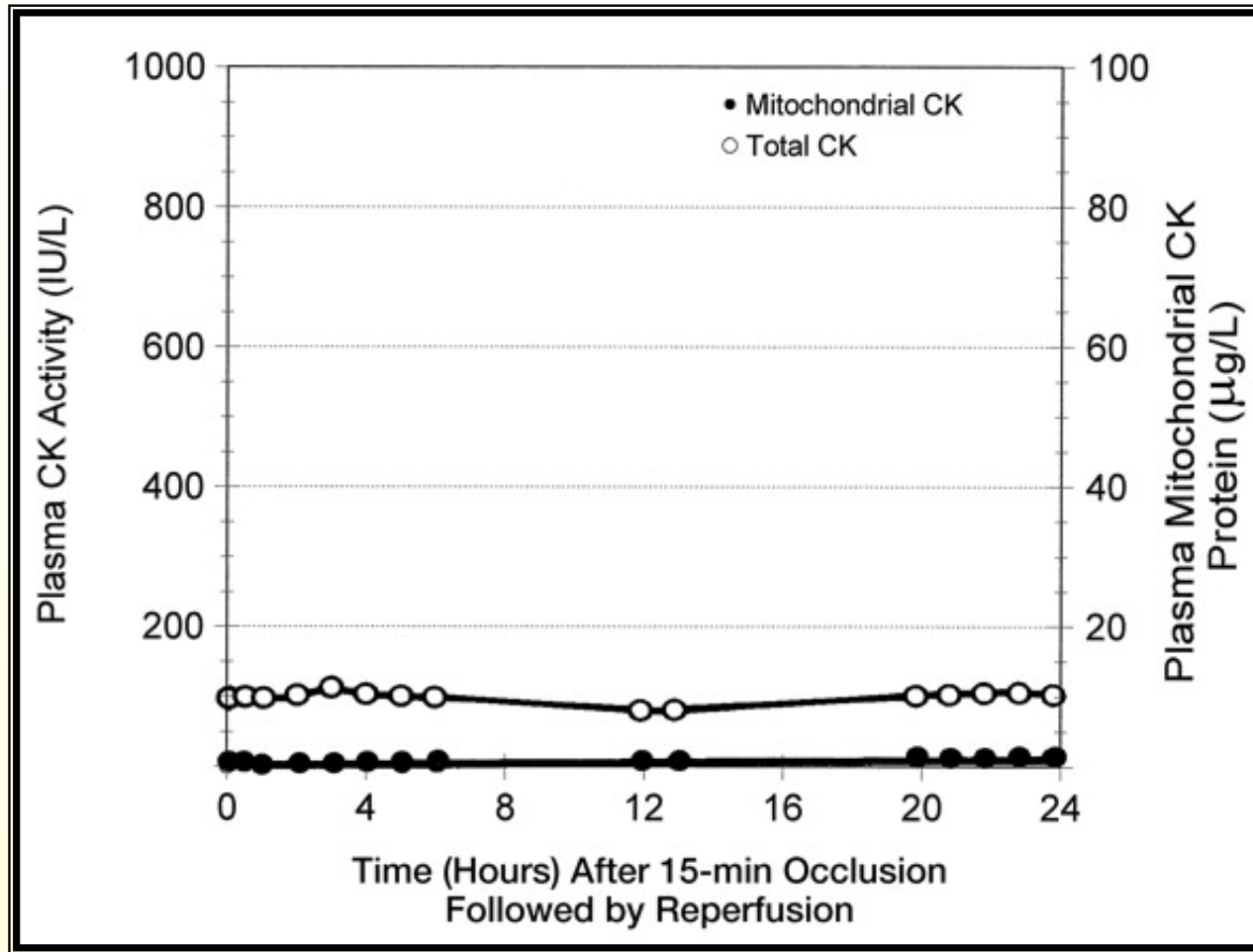
**Active  
myocarditis/  
inflammation**

**Typical  
infarction**

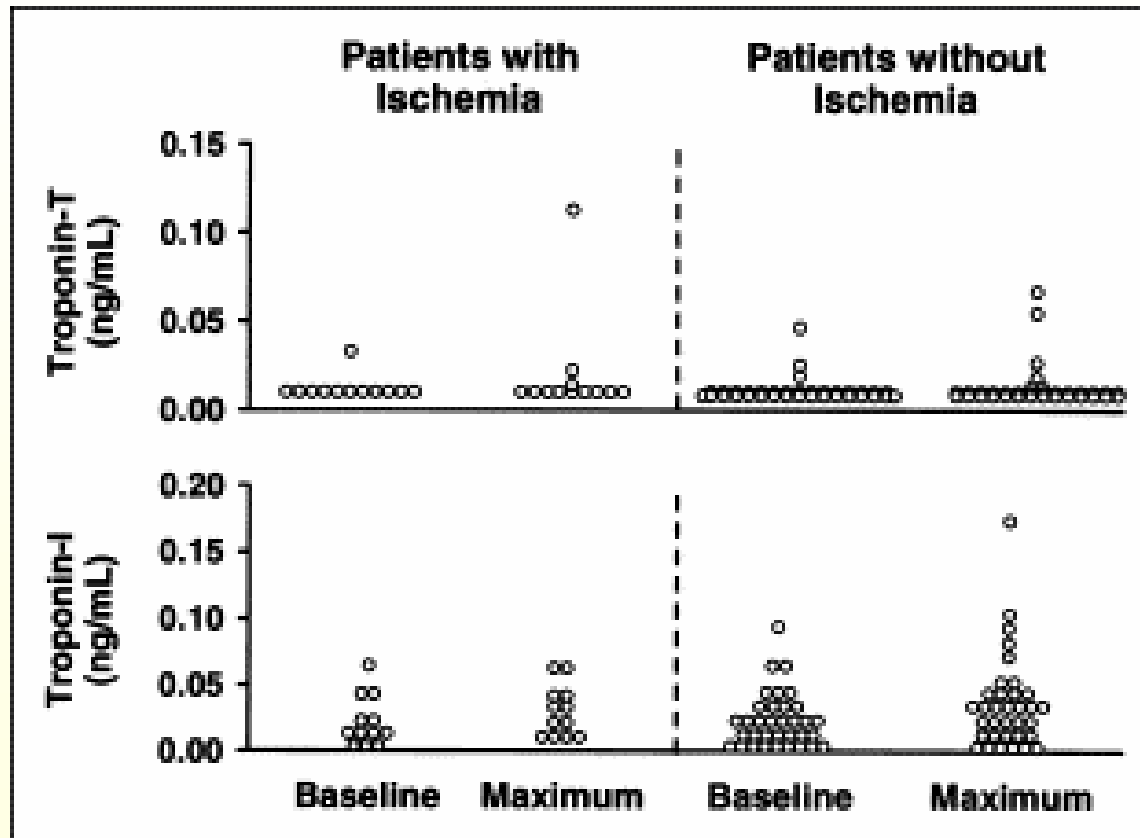
**Patchy myocardial necrosis**

**Troponin ↑ in peripheral blood**

# Reversible Myocardial Ischemia Does Not Induce CK Release in a Dog Model

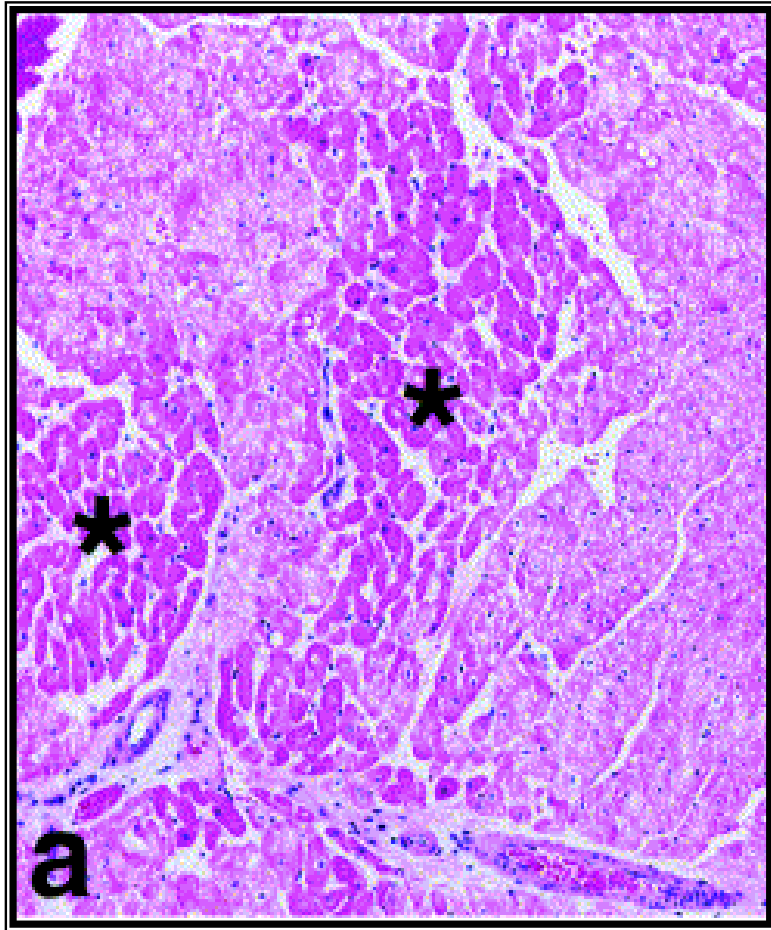


# *Troponin after Stress-Echocardiography*

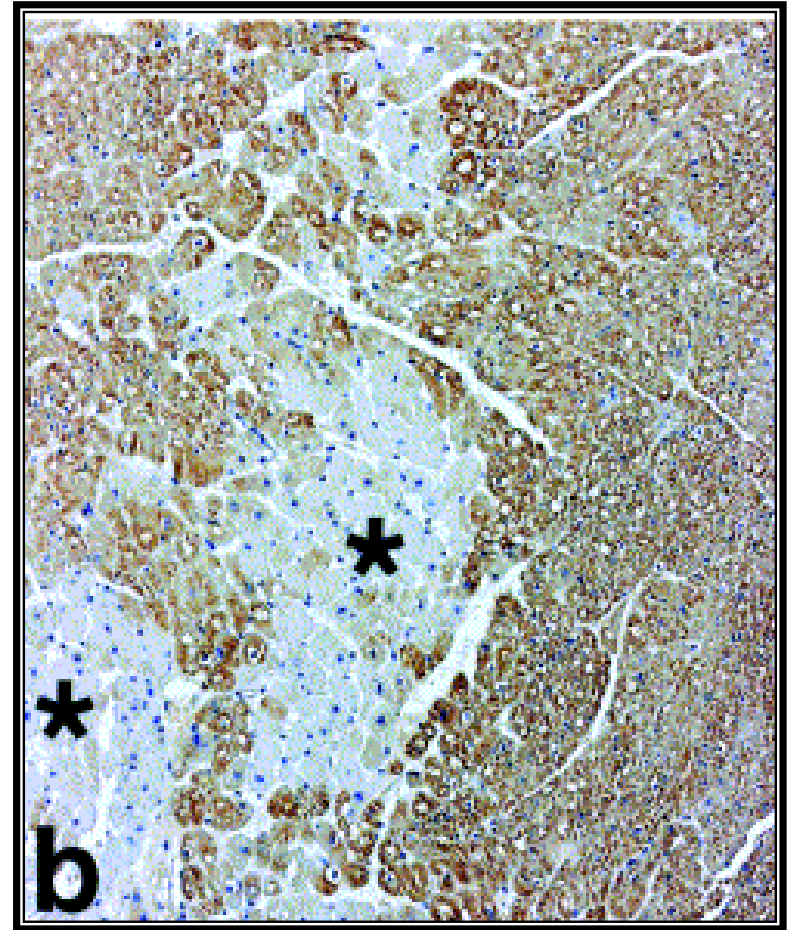


Crouse et al. Am J Cardiol 2002;89:224-6.

# Loss of Troponin is an Early Feature of Myocardial Necrosis



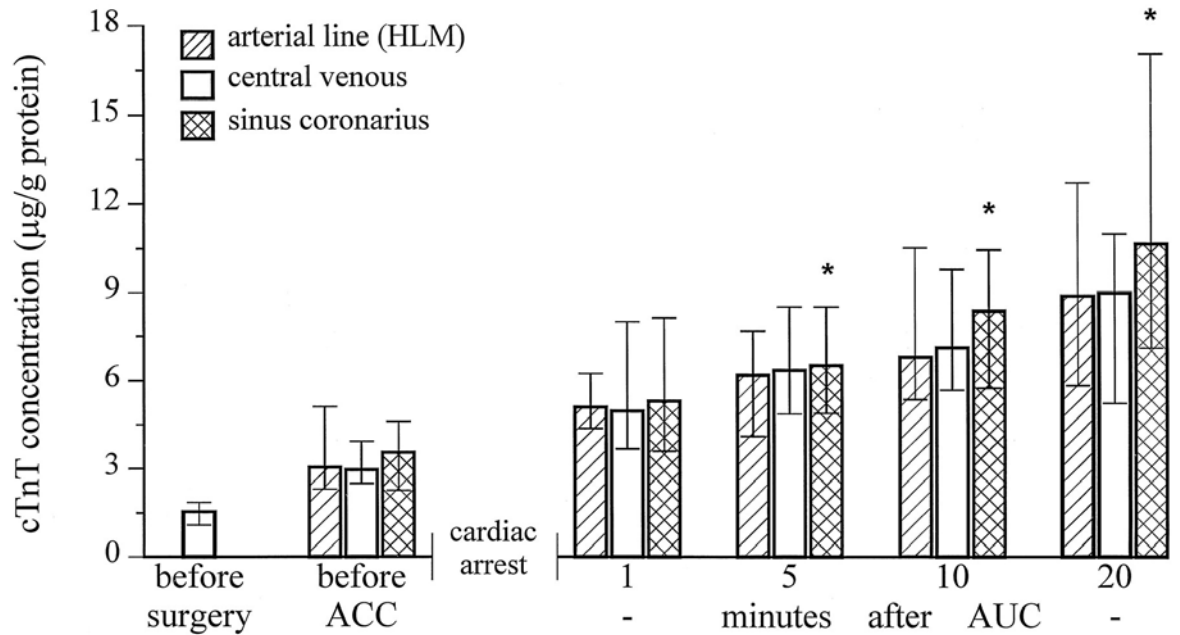
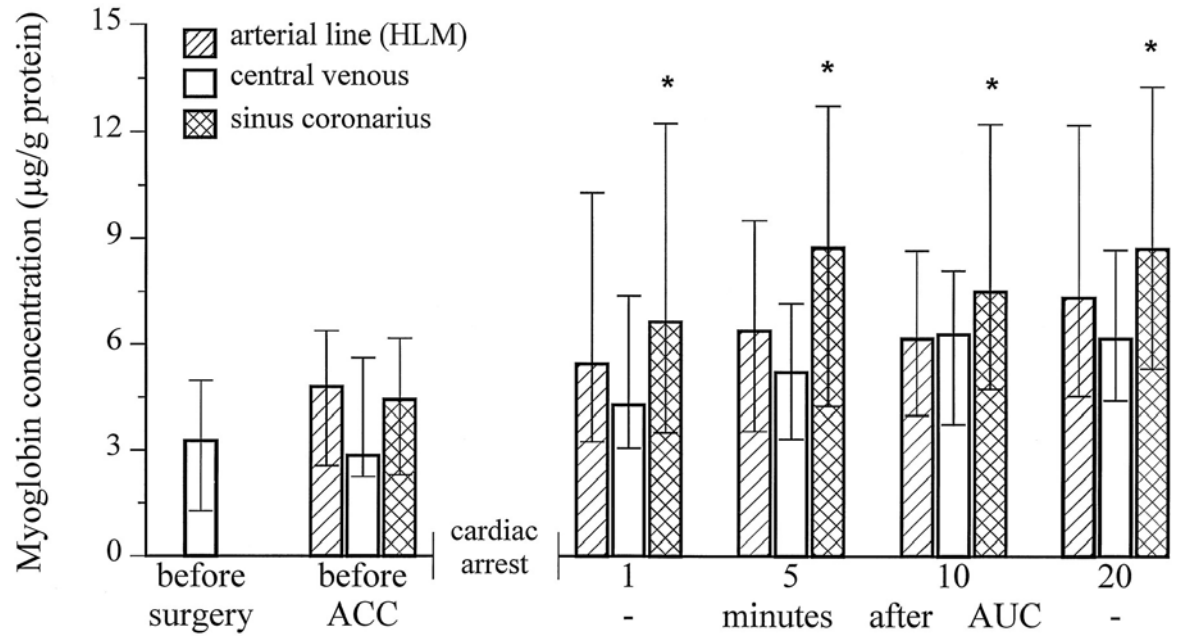
H&E Staining



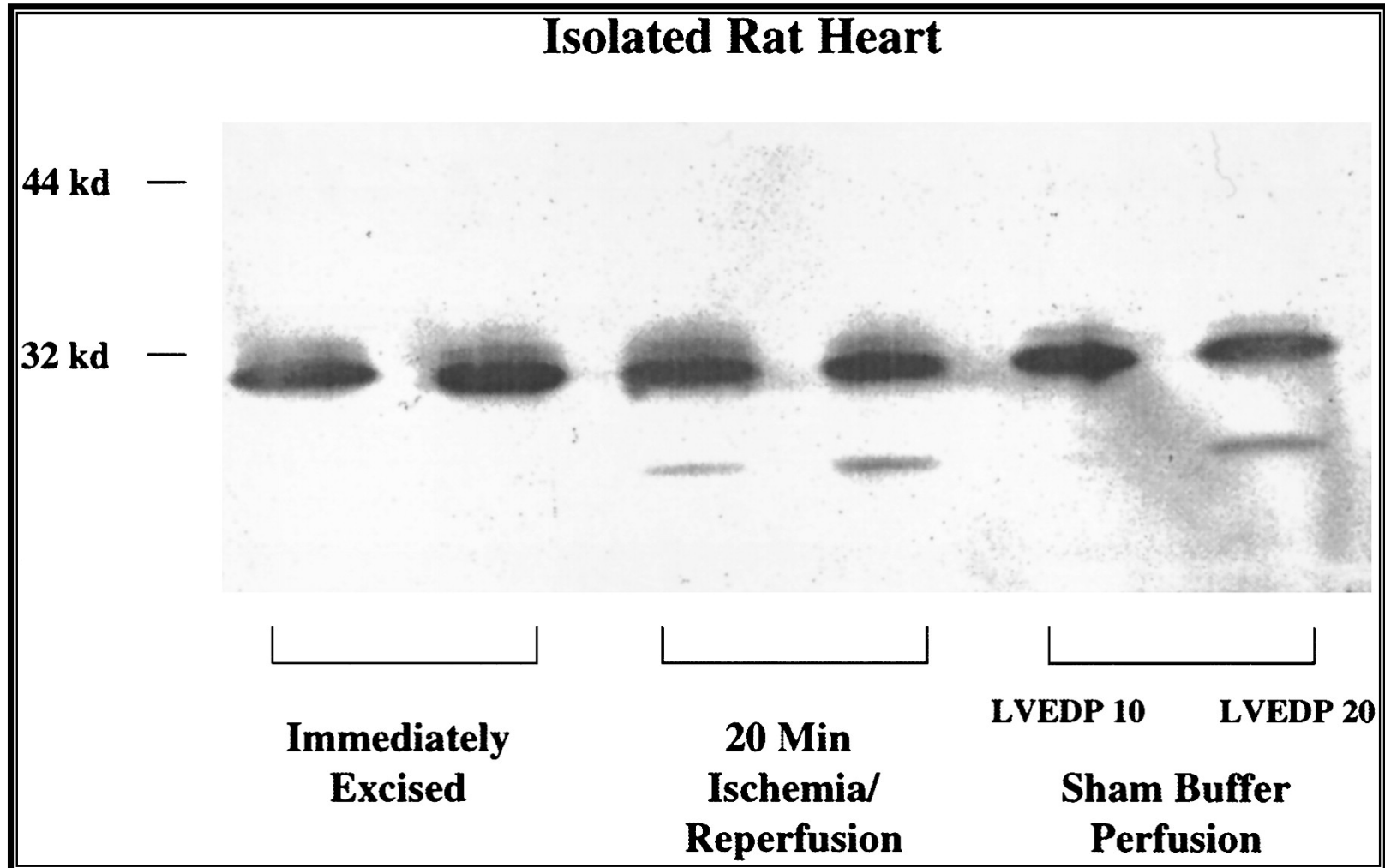
Immunostaining for troponin I

\* **necrotic cardiomyocytes**

“Cytosolic”,  
early releasable pools of  
cTnI and cTnT ~ 8%.



# Western Blot of TnI Degradation in Isolated Langendorff Hearts Perfused at Constant Flow





# *Troponin in HF - Conclusions*

---

- *Troponin<sup>↑</sup> does not necessarily reflect an ACS*
- *Troponin is a marker of necrosis*
- *Troponin is an independent risk marker*
- *In non-ACS therapeutic response?*



***Thank you!***

***Innsbruck, AUSTRIA***