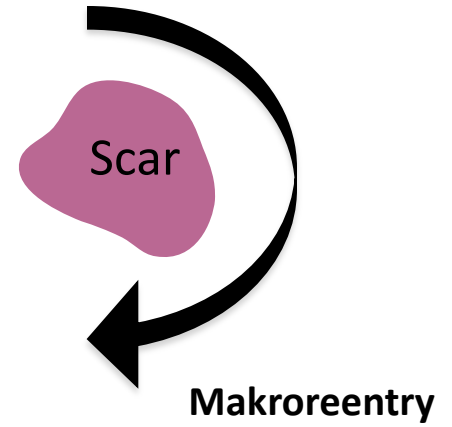
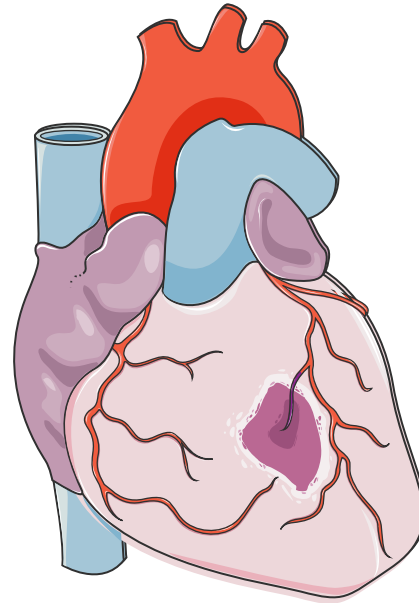


Advances in Cardiovascular Arrhythmias - Great innovations in cardiology

Modulation of the ANS to prevent VT/VF

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Klinik für Innere Medizin III
Kardiologie, Angiologie und Internistische Intensivmedizin
Universitätsklinikum des Saarlandes
Homburg/Saar



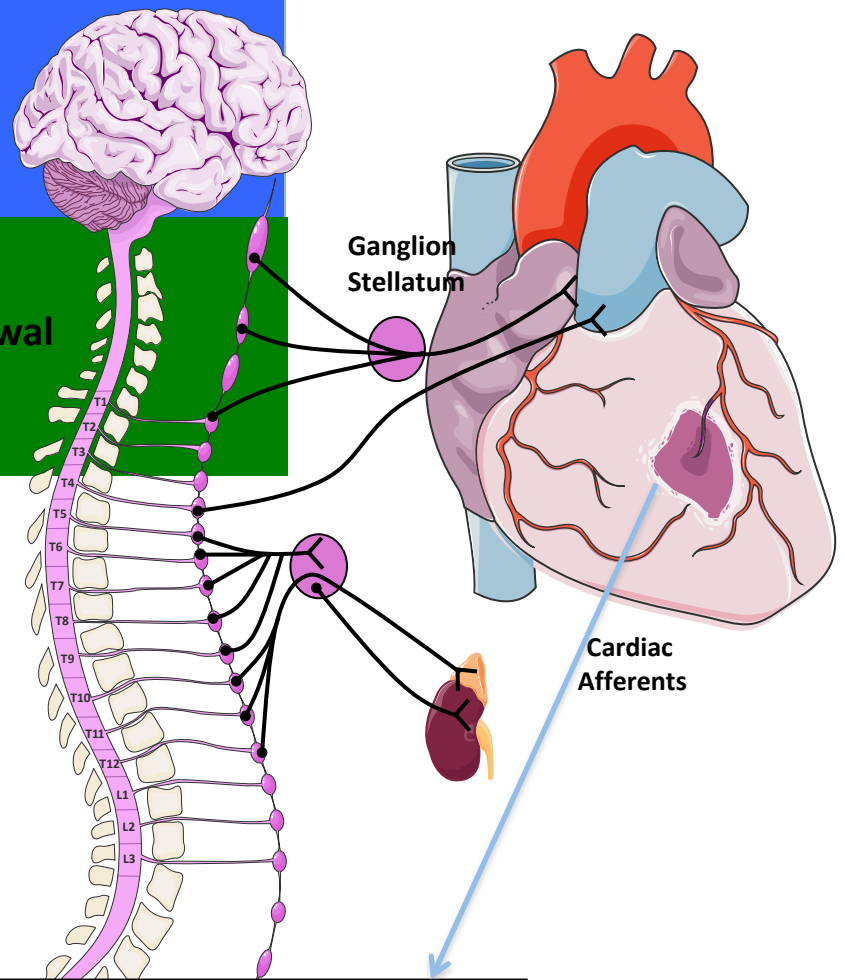
Structural Substrate



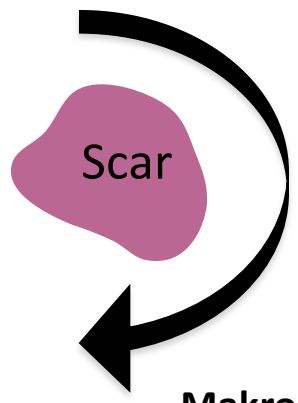
Arrhythmia

General Anesthesia

Modulation of Parasympathetic withdrawal
(Vagal Stimulation & Spinal Cord Stimulation)



Sympathetic dysregulation & Parasympathetic withdrawal

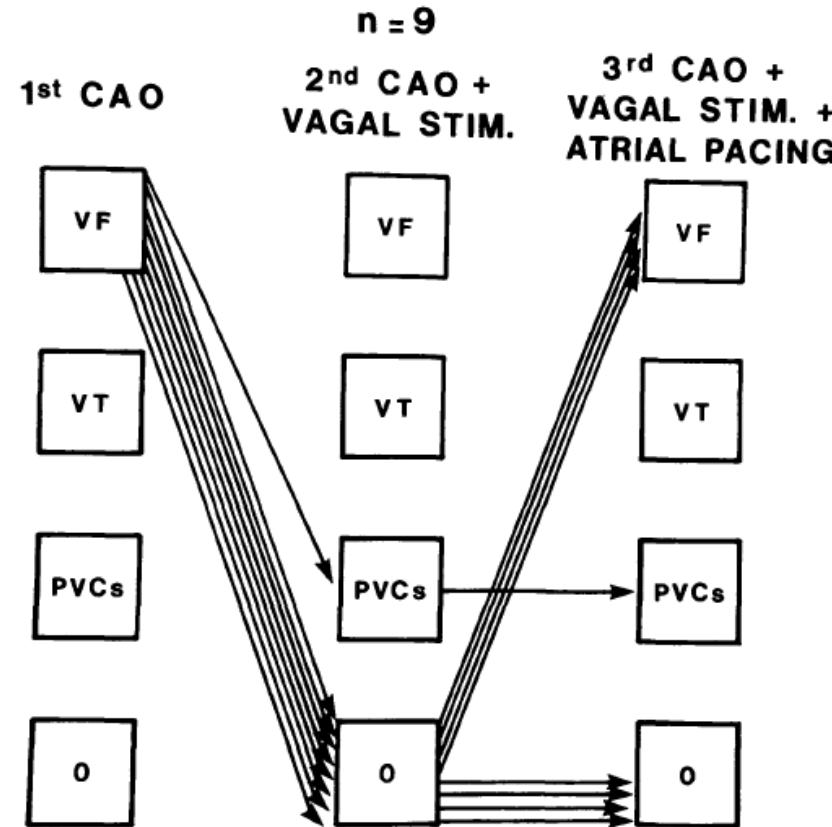
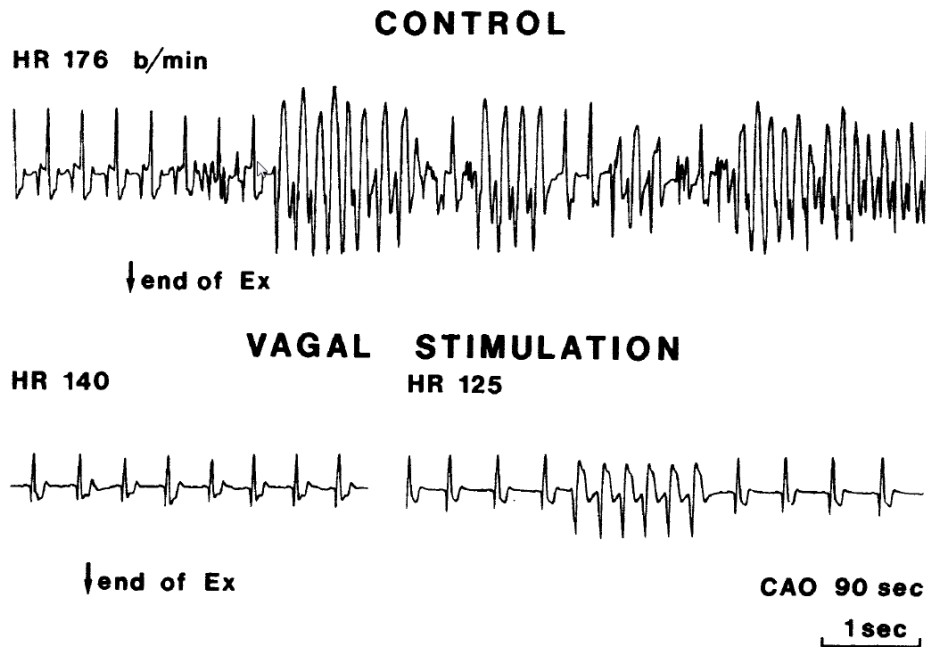


Structural Substrate



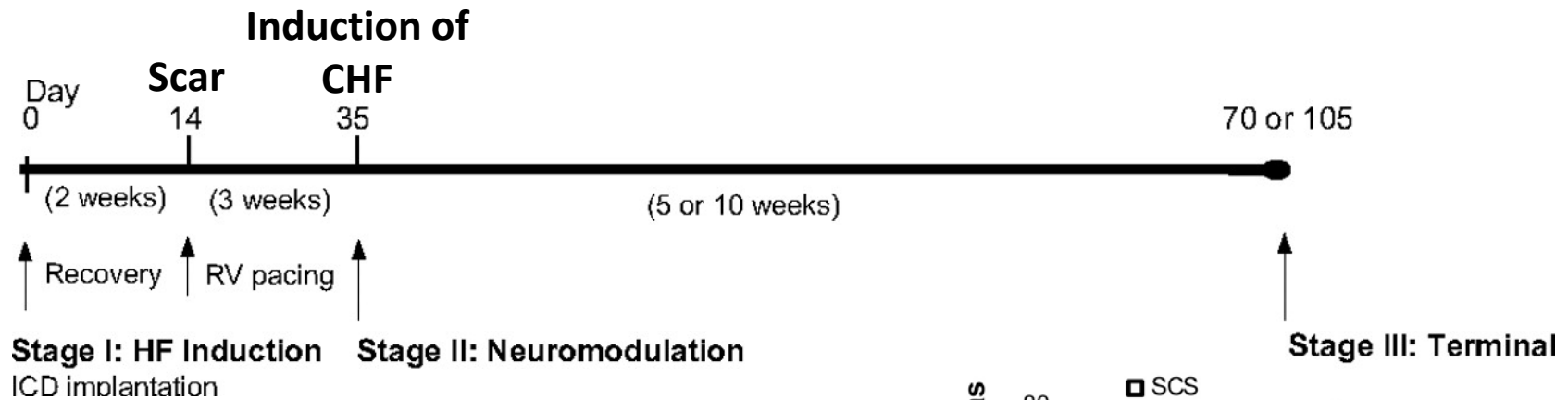
Arrhythmia

Stimulation of cervical pre-ganglionic parasympathetic fibres: Direct activation of overall cardiac vagal tone



CAO: Circumflex coronary Artery Occlusion

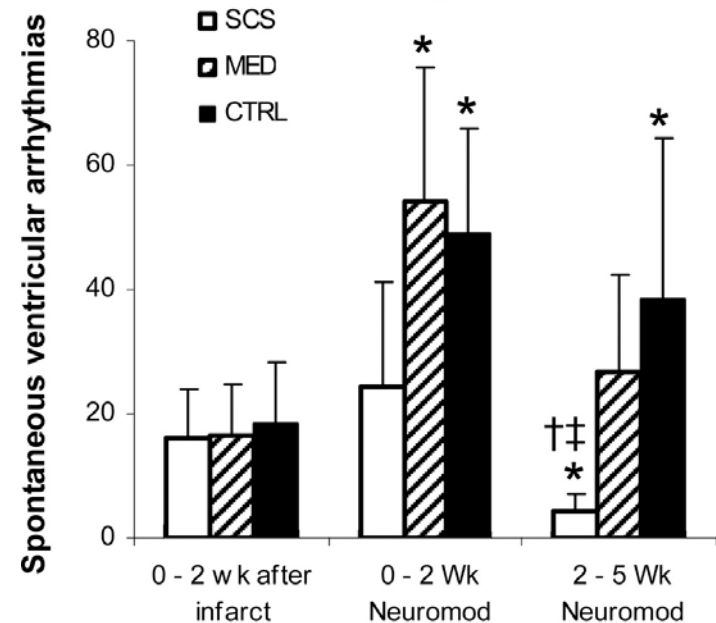
Stimulation of afferent spinal nerve fibres: Increase of central vagal tone and decrease of sympathetic tone (via central reflex activation)



Ctr: Control

SCS: Spinal Cord Stimulation

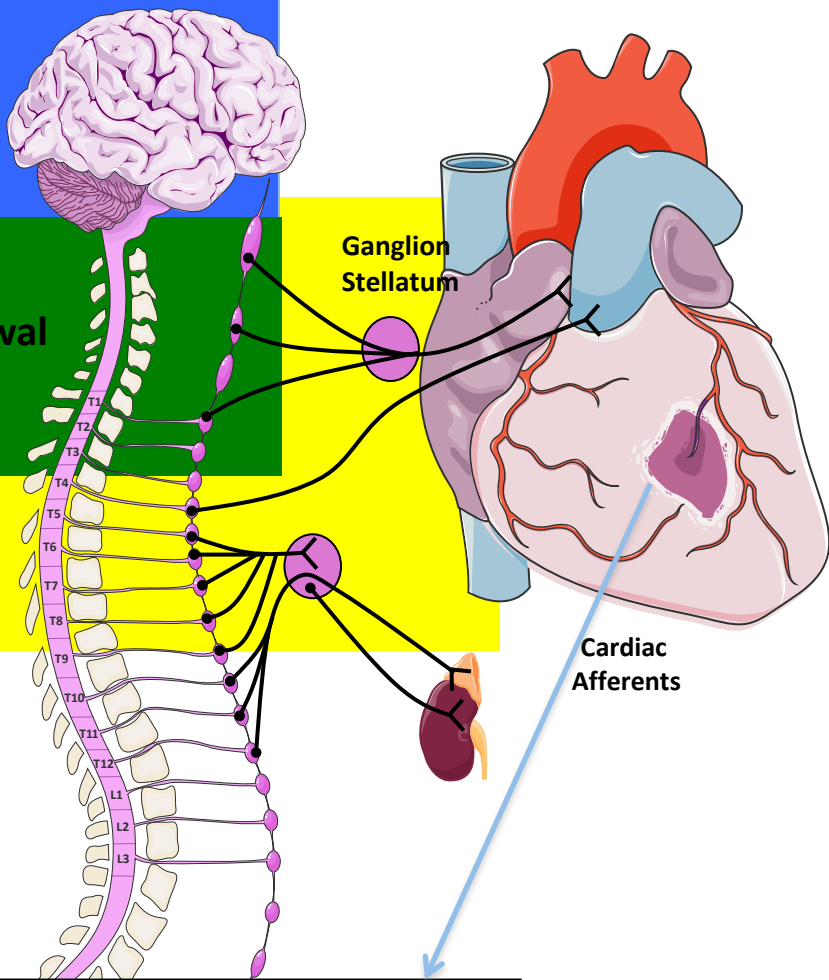
Med: Ramipril & Carvedilol



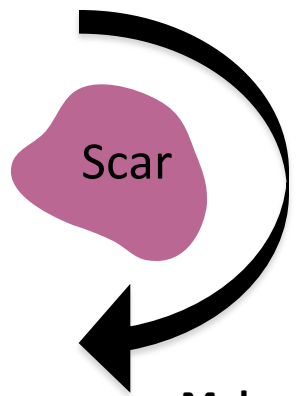
General Anesthesia

Modulation of Parasympathetic withdrawal
(Vagal Stimulation & Spinal Cord Stimulation)

Cervicothoracic Sympathectomy



Sympathetic dysregulation & Parasympathetic withdrawal

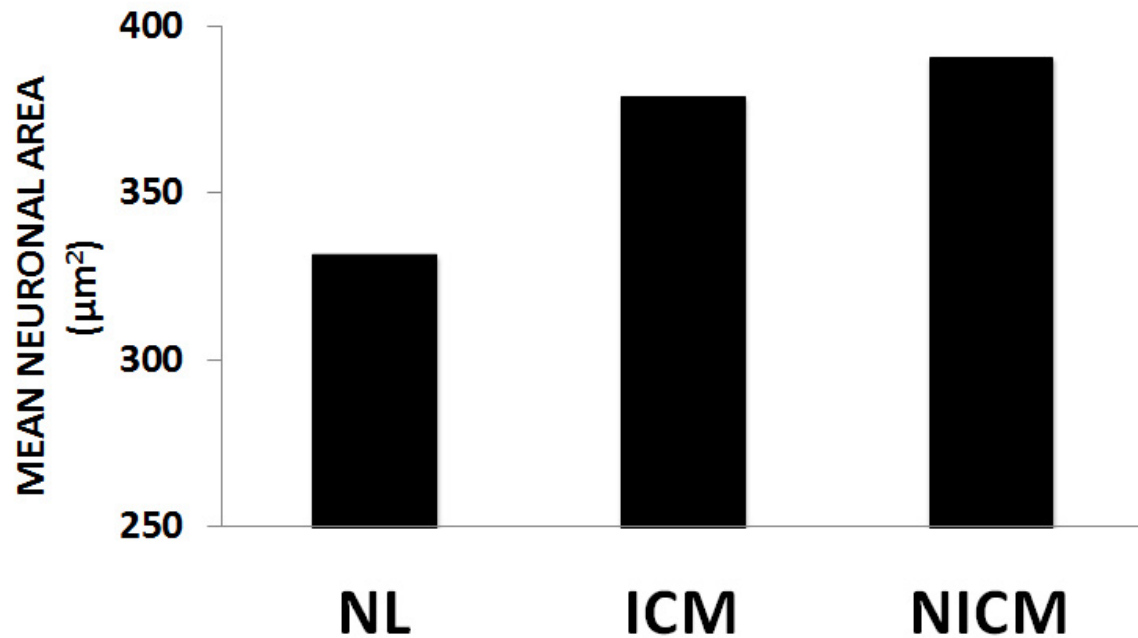
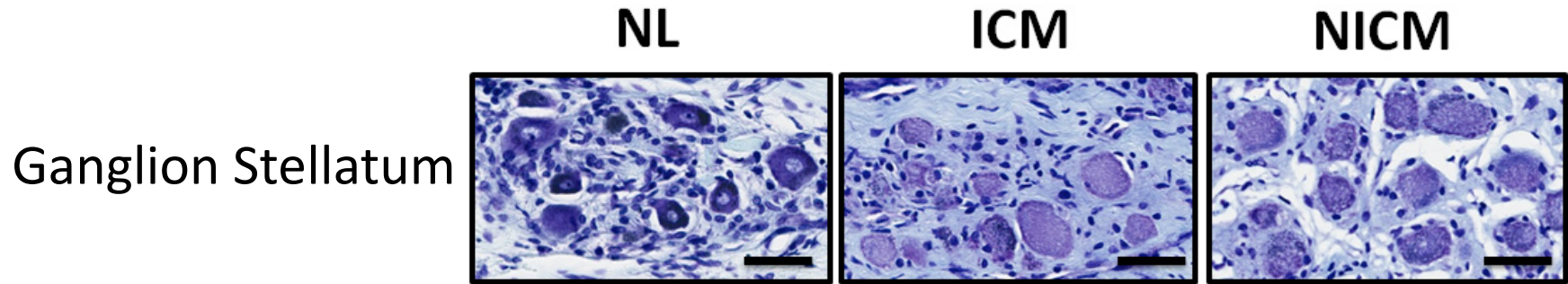


Structural Substrate



Arrhythmia

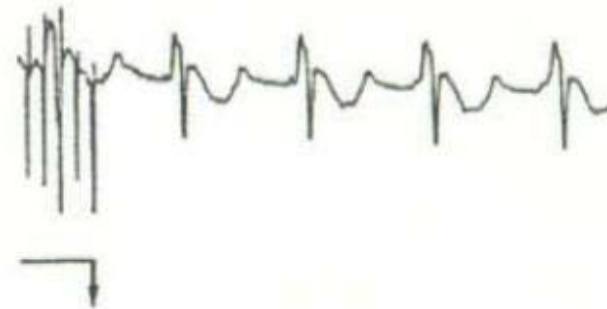
Response to cardiac injury involves neural remodeling beyond the heart



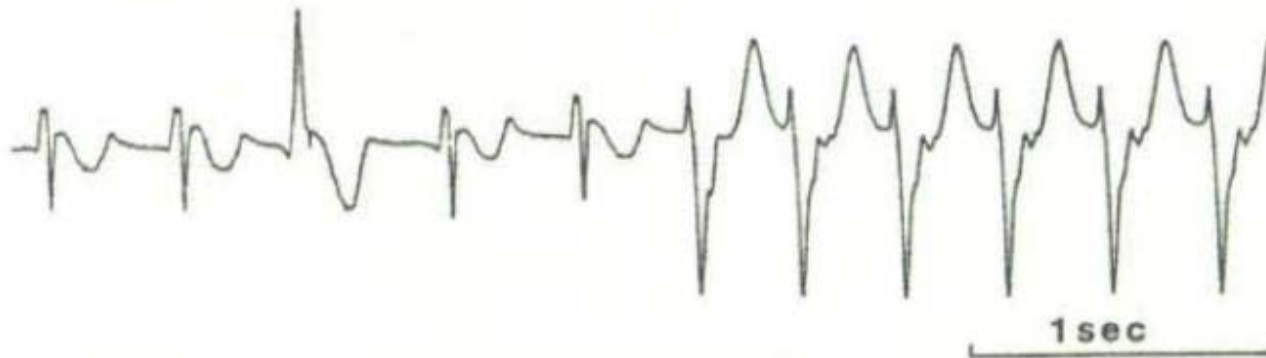
Control



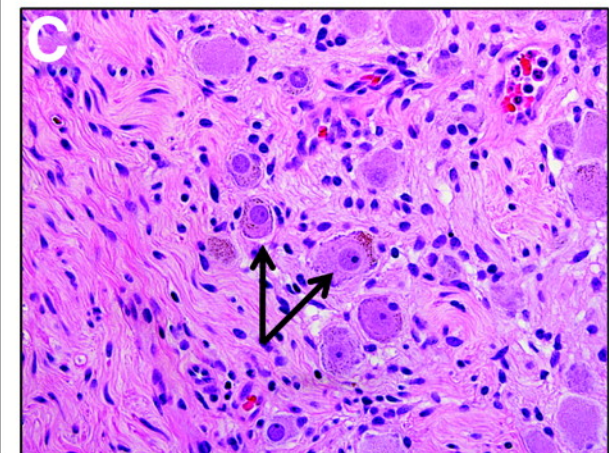
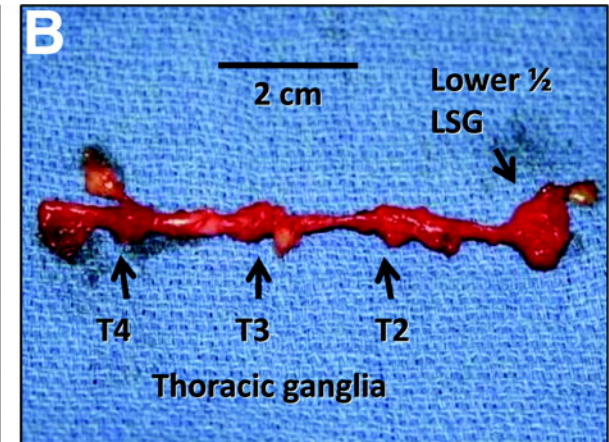
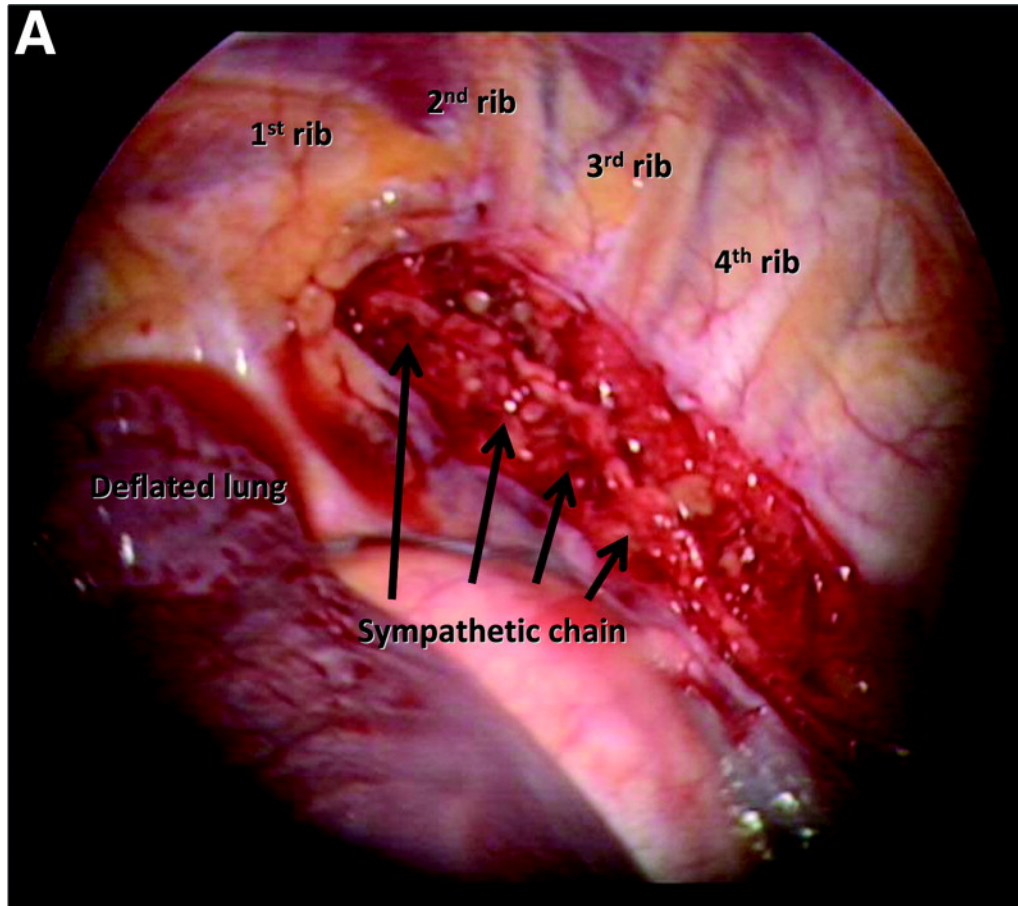
End of 30 sec LSG Stim



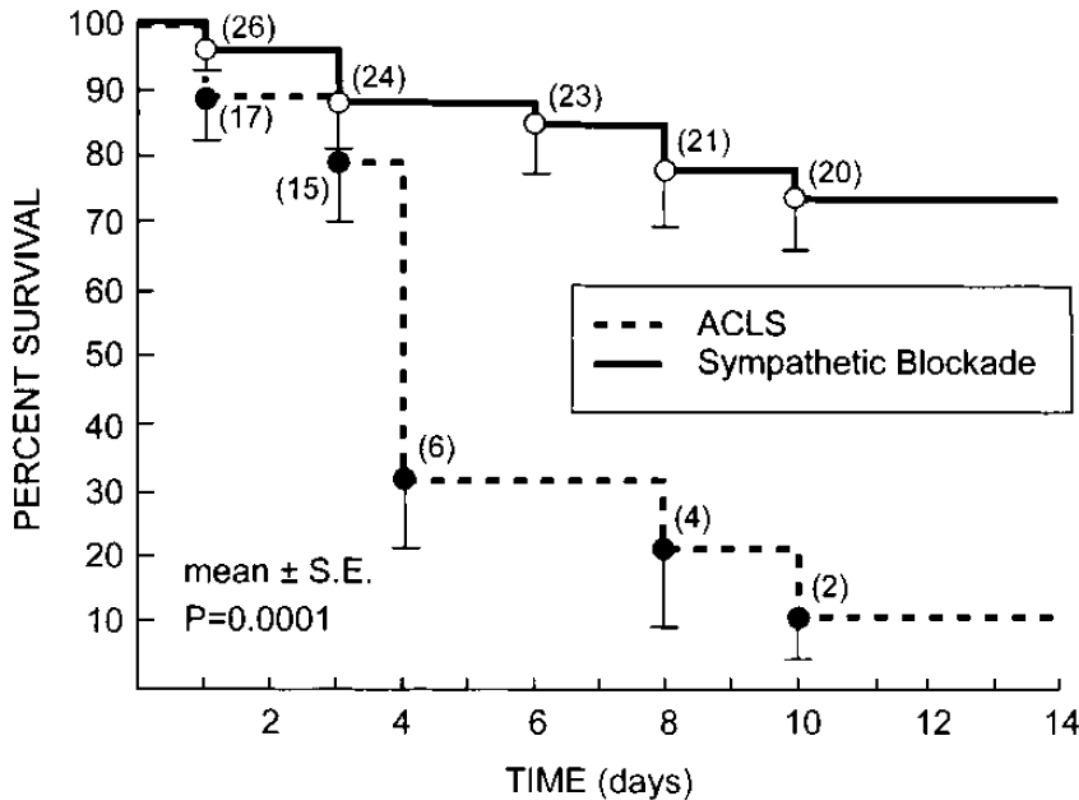
4 sec post LSG Stim



Anatomy and histology of left sympathetic chain



Sympathetic blockade for treatment of electrical storm



ACLS:

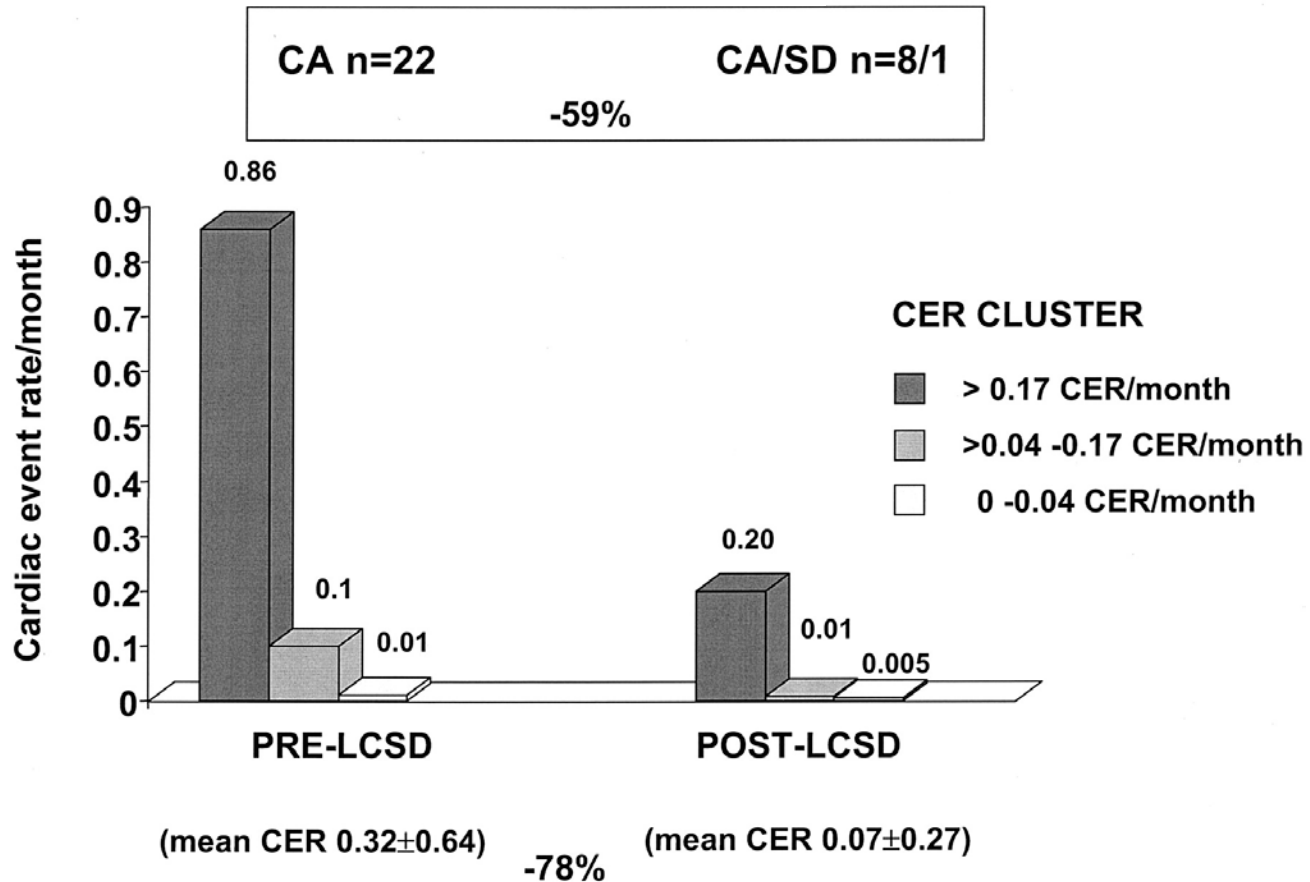
antiarrhythmic therapy e.g.
lidocaine, procainamide

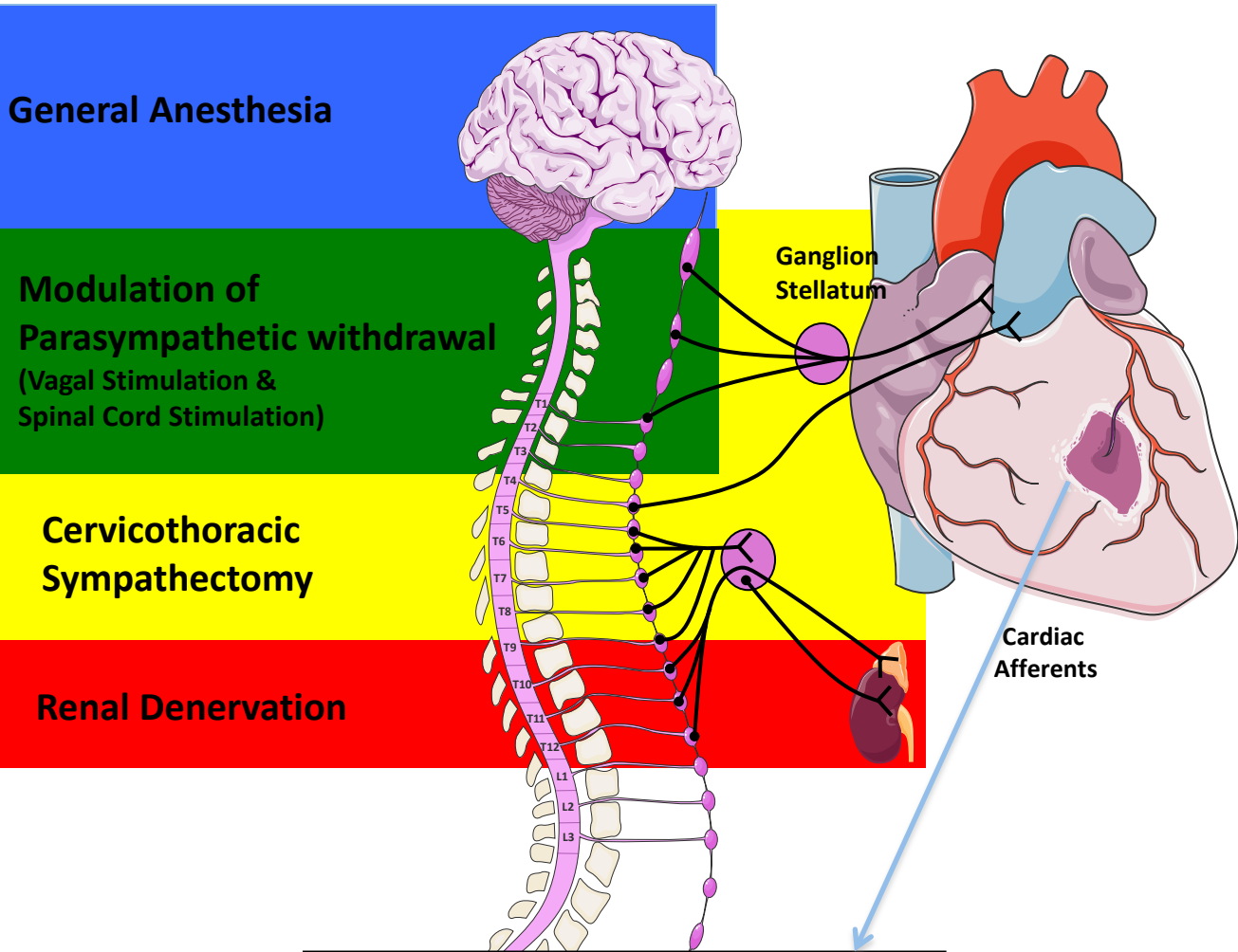
Sympathetic blockade:

- Left stellate ganglionic blockade n=6
- Esmolol n=7
- Propranolol n=14

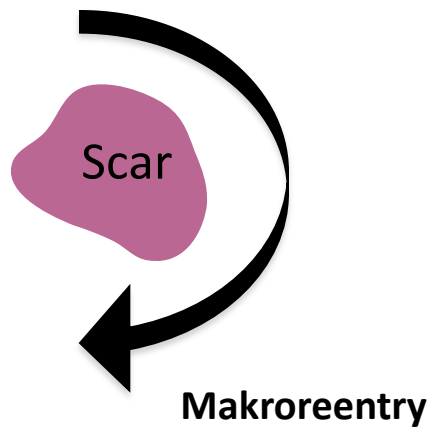
Left Cardiac Sympathetic Denervation in the Management of High-Risk Patients Affected by the Long-QT Syndrome

Peter J. Schwartz, Silvia G. Priori, Marina Cerrone, Carla Spazzolini, Attilio Odero, Carlo Napolitano, Raffaella Bloise, Gaetano M. De Ferrari, Catherine Klersy, Arthur J. Moss, Wojciech Zareba, Jennifer L. Robinson, W. Jackson Hall, Paul A. Brink, Lauri Toivonen, Andrew E. Epstein, Cuilan Li and Dayi Hu





**Sympathetic dysregulation
&
Parasympathetic withdrawal**

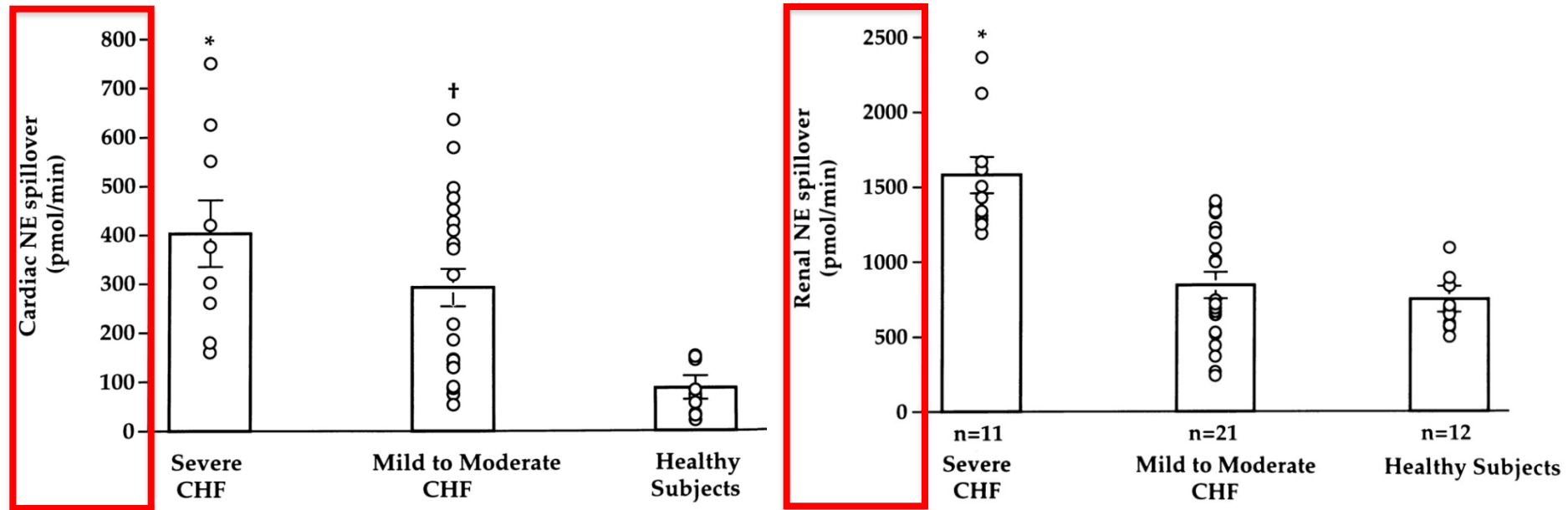


Structural Substrate

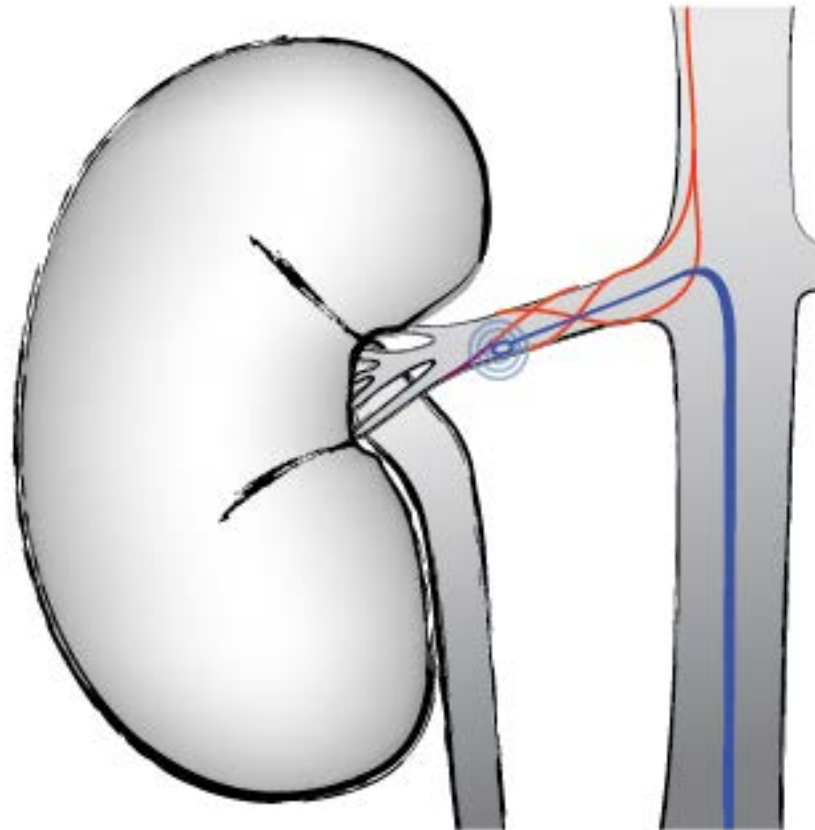


Arrhythmia

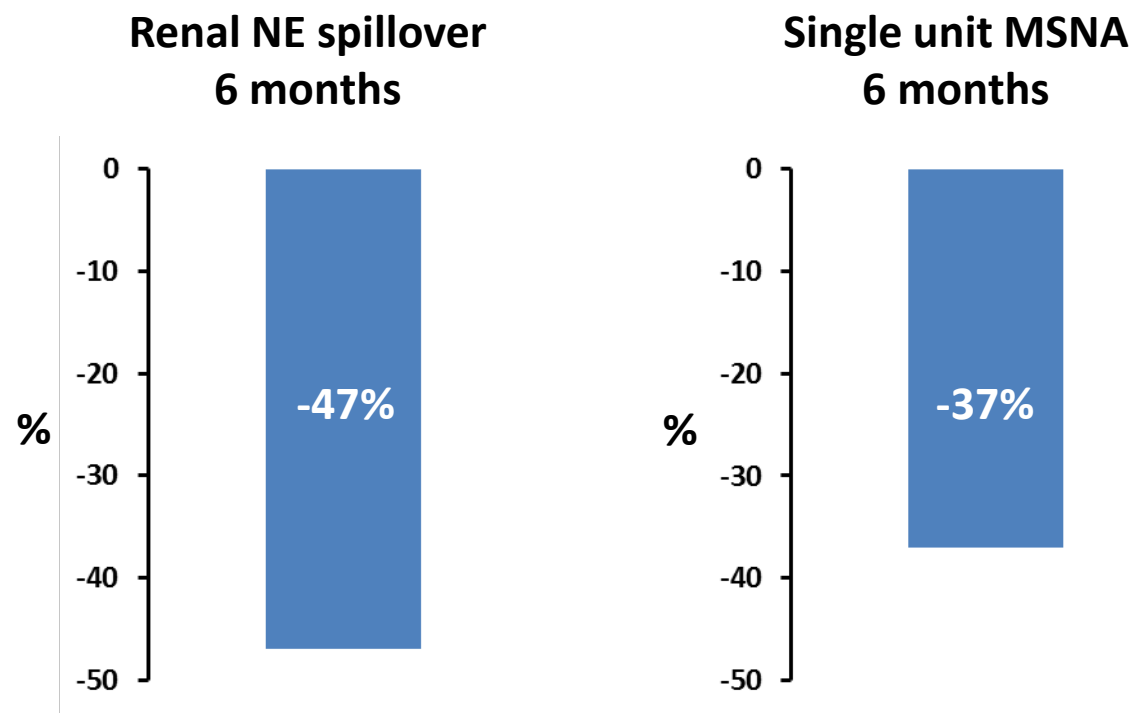
Cardiac and renal NE spillover in heart failure



Catheter-based renal denervation (RDN)

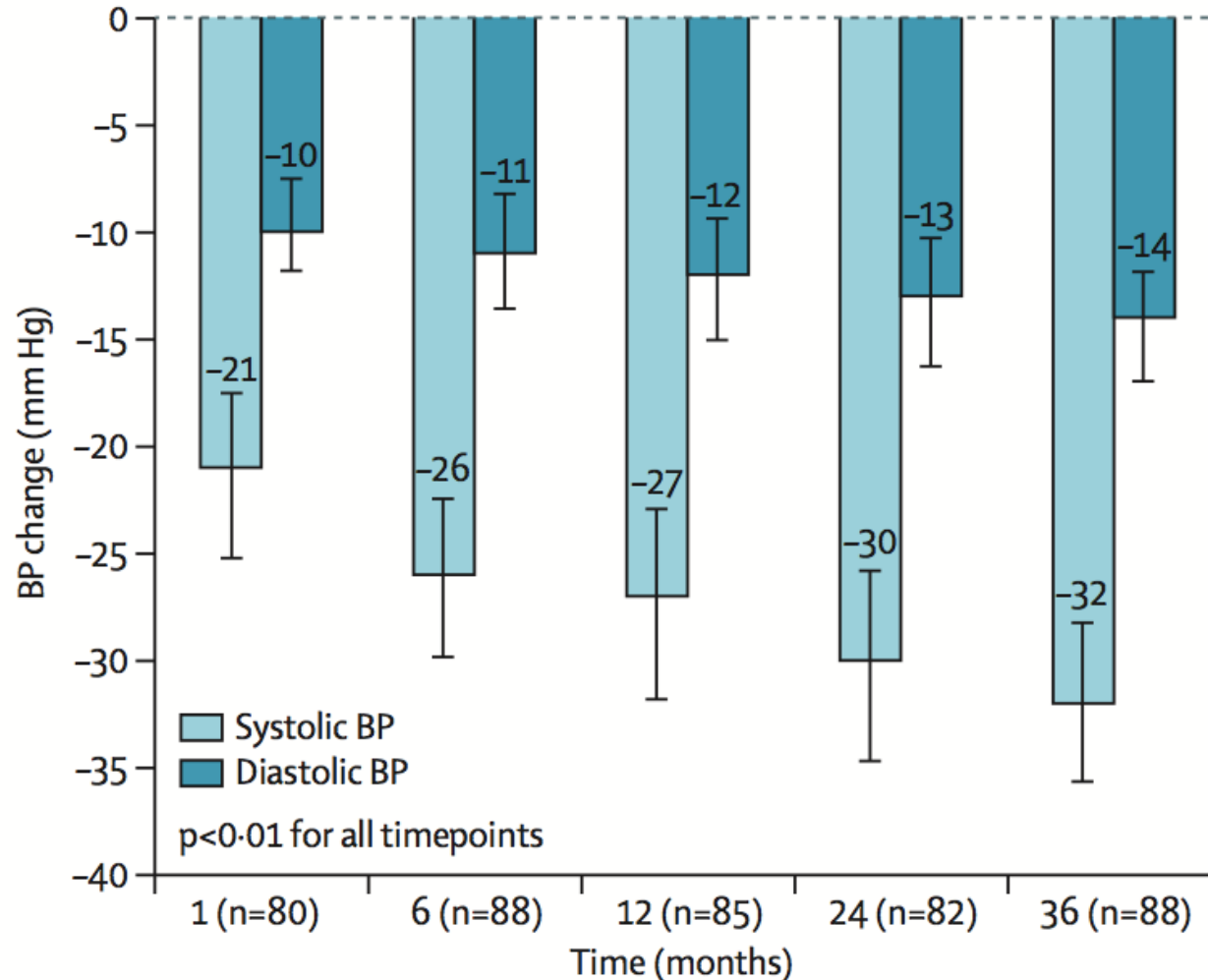


RDN reduces renal NE spillover and muscle sympathetic nerve activity



Percutaneous renal denervation in patients with treatment-resistant hypertension: final 3-year report of the Symplicity HTN-1 study

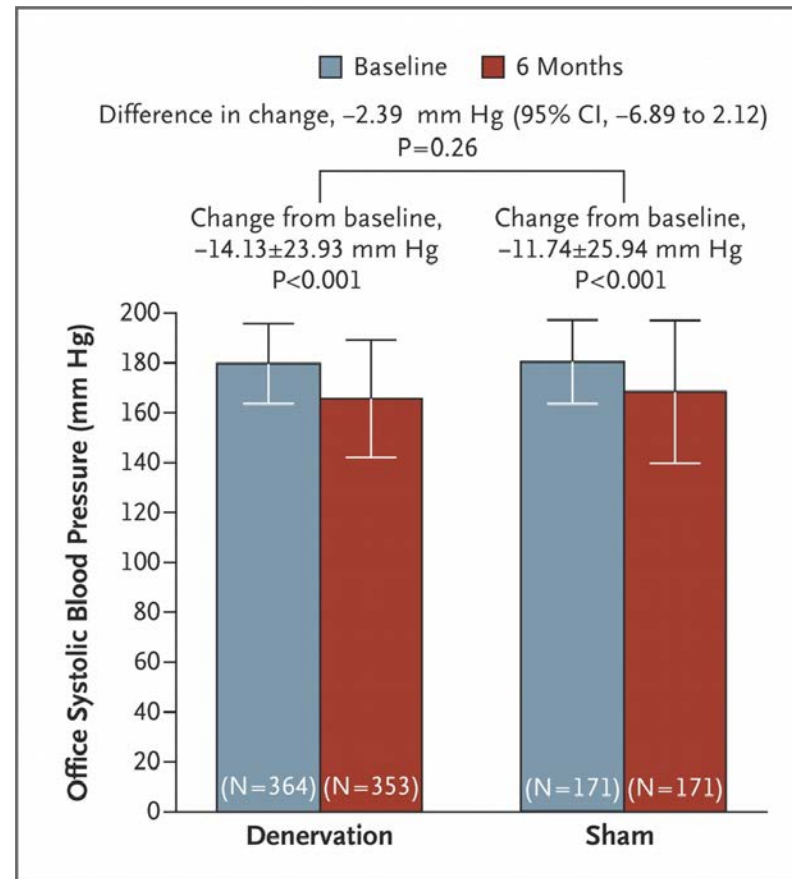
Henry Krum, Markus P Schlaich, Michael Böhm, Felix Mahfoud, Krishna Rocha-Singh, Richard Katholi, Murray D Esler



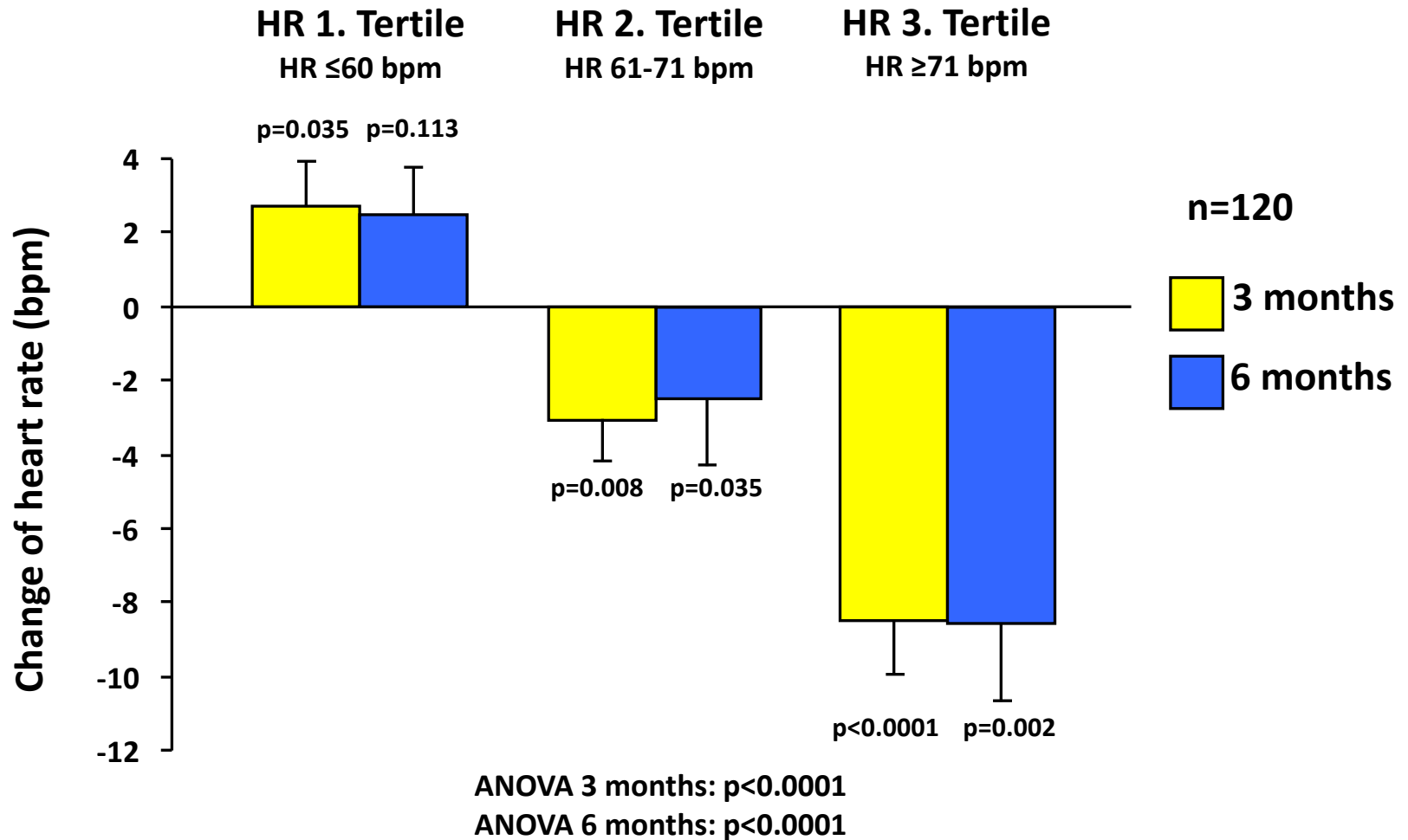
**Baseline BP
178/98 mmHg**

SYMPPLICITY HTN-3

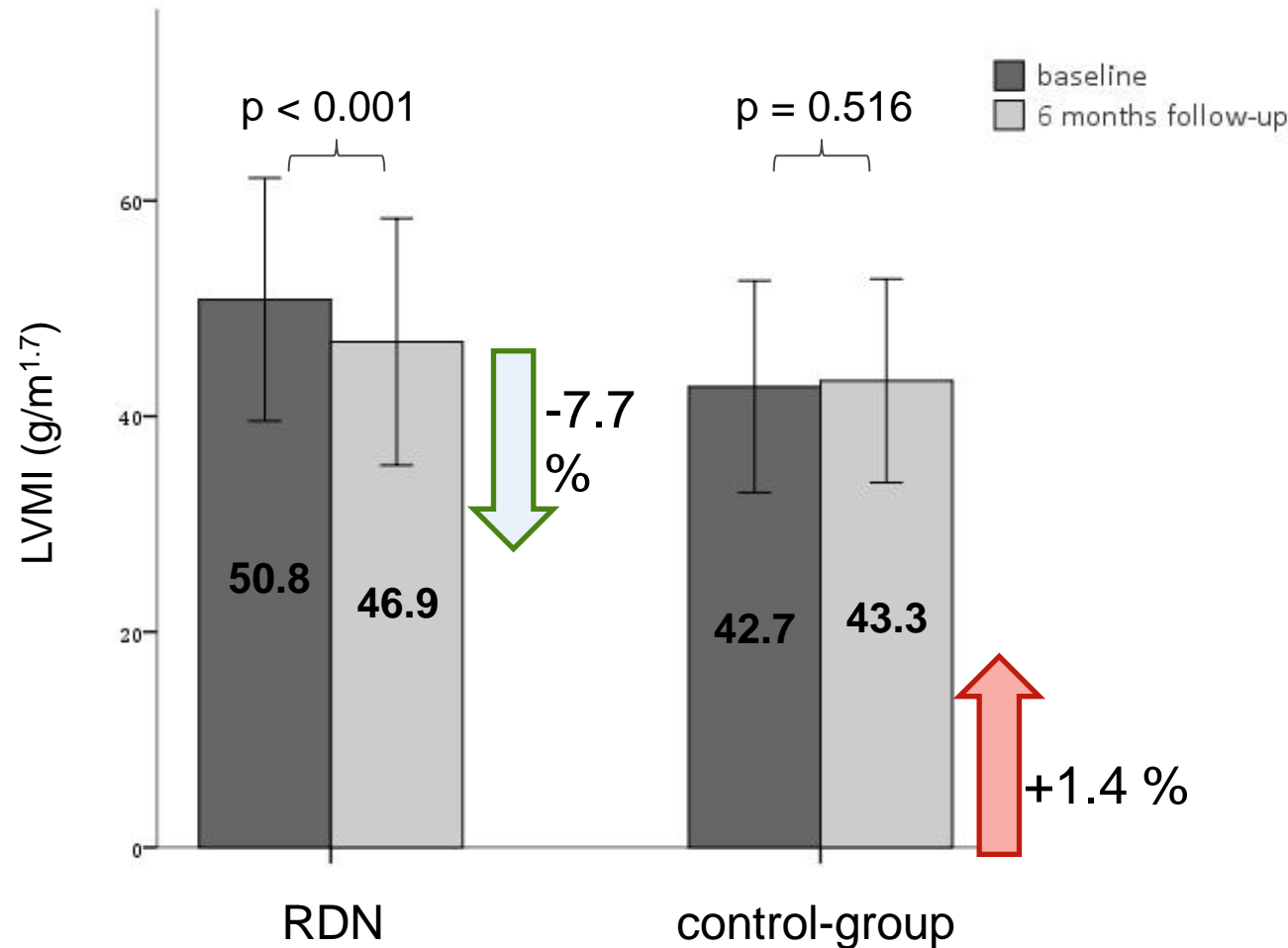
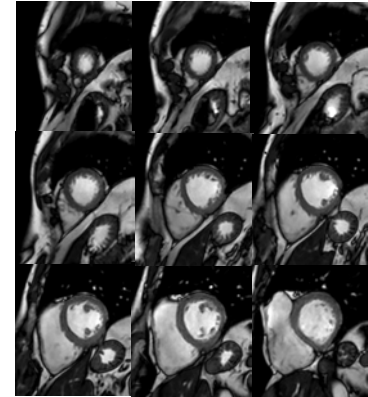
(Prospective, single-blind, randomized, sham-controlled)



RDN reduces heart rate in hypertensive patients



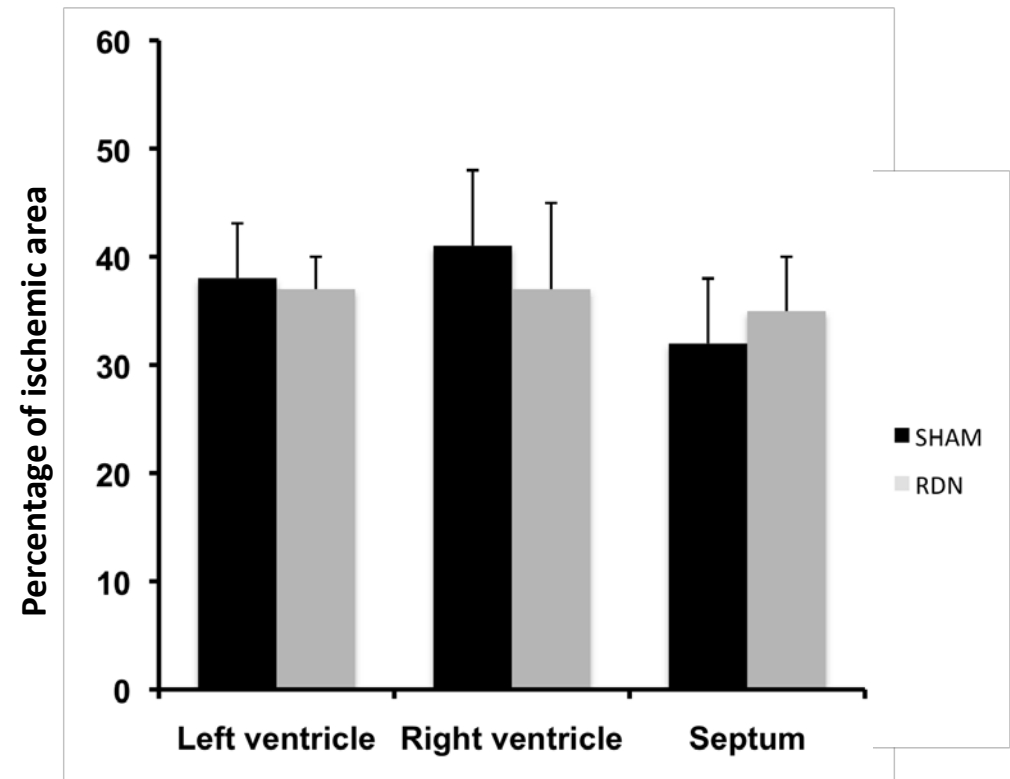
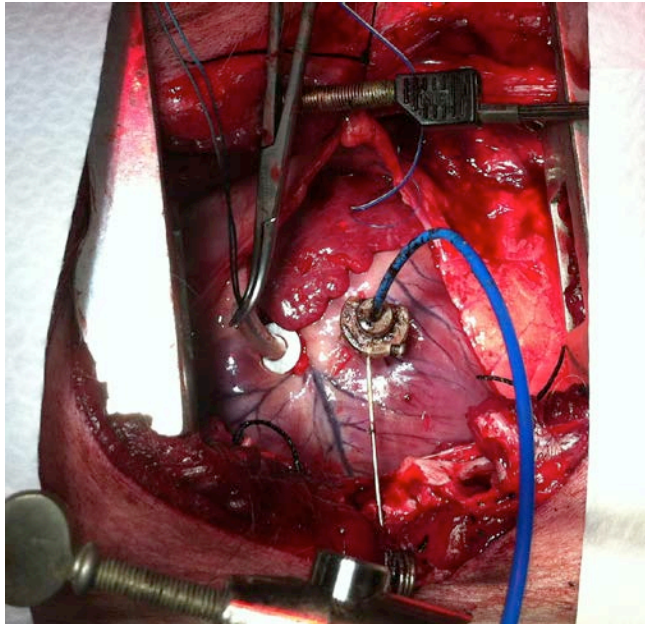
Reduction of LV-hypertrophy in hypertensive patients (MRI)



BP after RDN:
-19/-11 mmHg

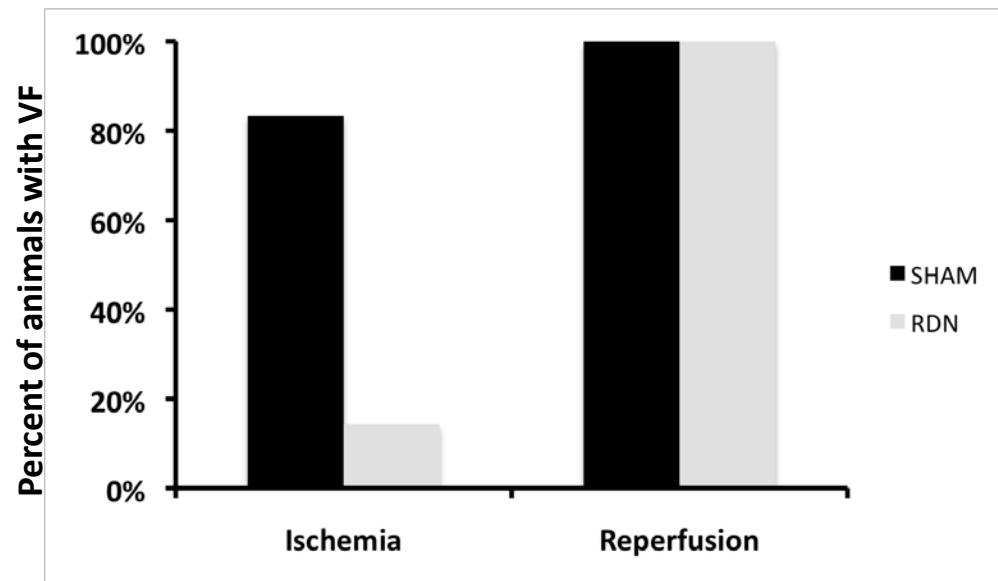
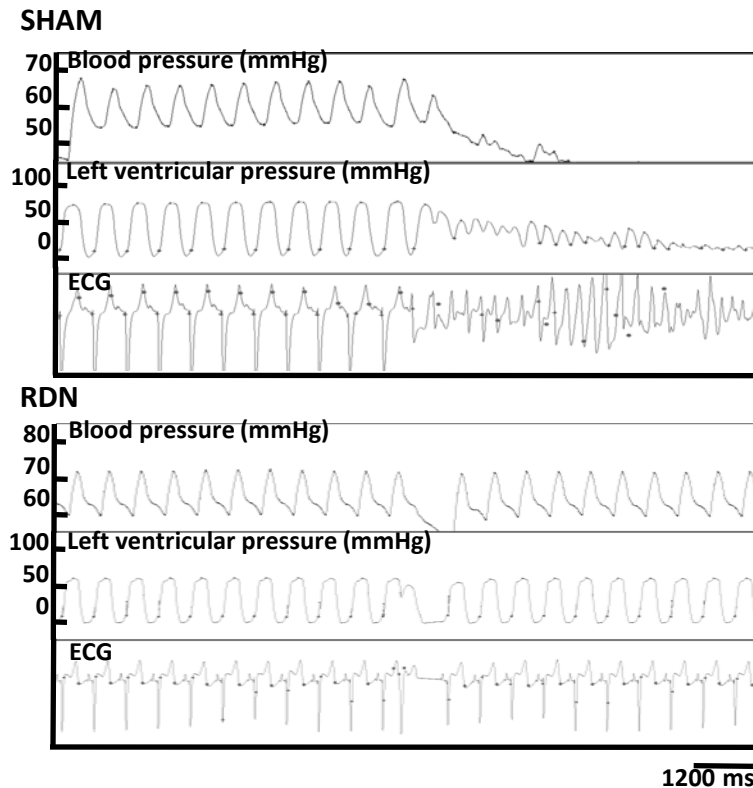
Effect of RDN on Ischemia-Related Arrhythmias

- Surgical RDN or Sham procedure in pigs
- Surgical ligation of the proximal LAD for 20 min → Reperfusion



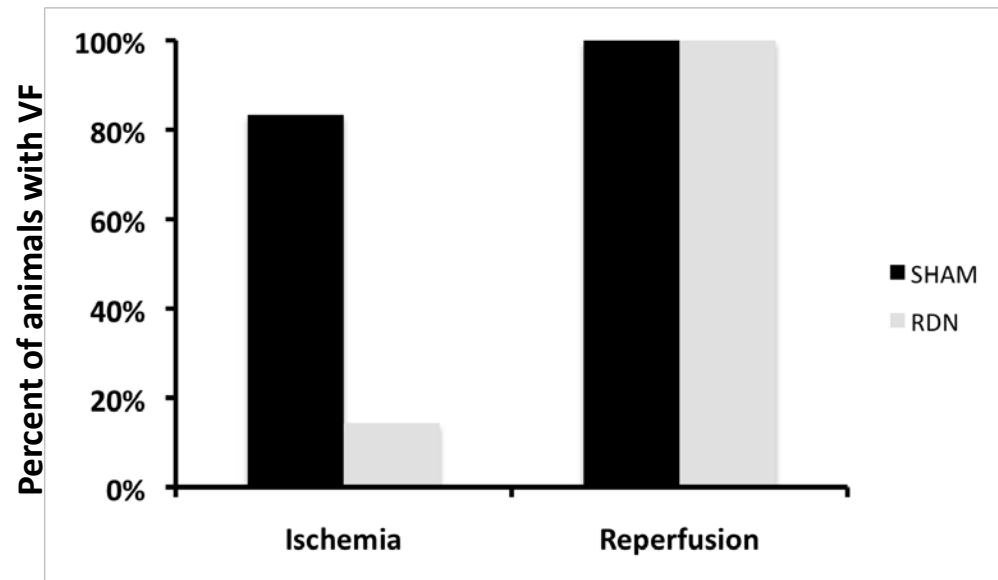
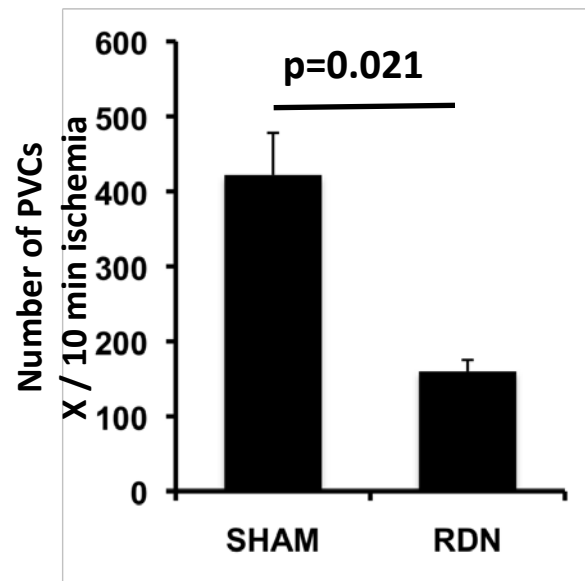
Effect of RDN on ischemia-related arrhythmias

- Surgical RDN or Sham procedure in pigs
- Surgical ligation of the proximal LAD for 20 min → Reperfusion



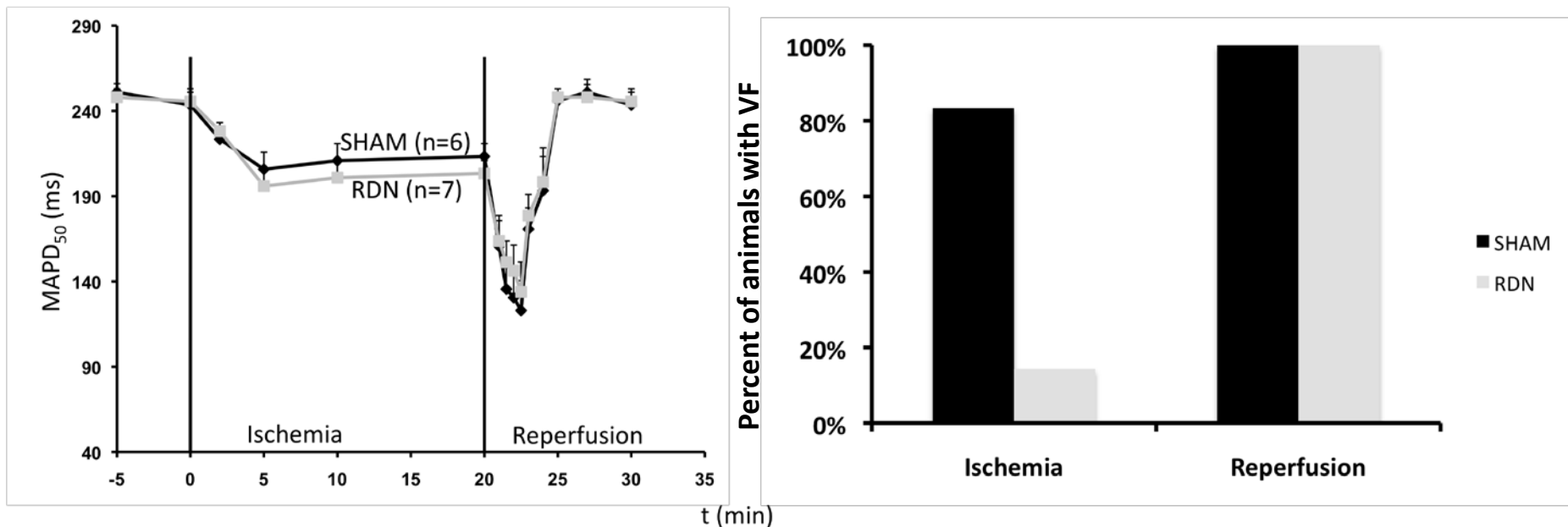
Effect of RDN on ischemia-related arrhythmias

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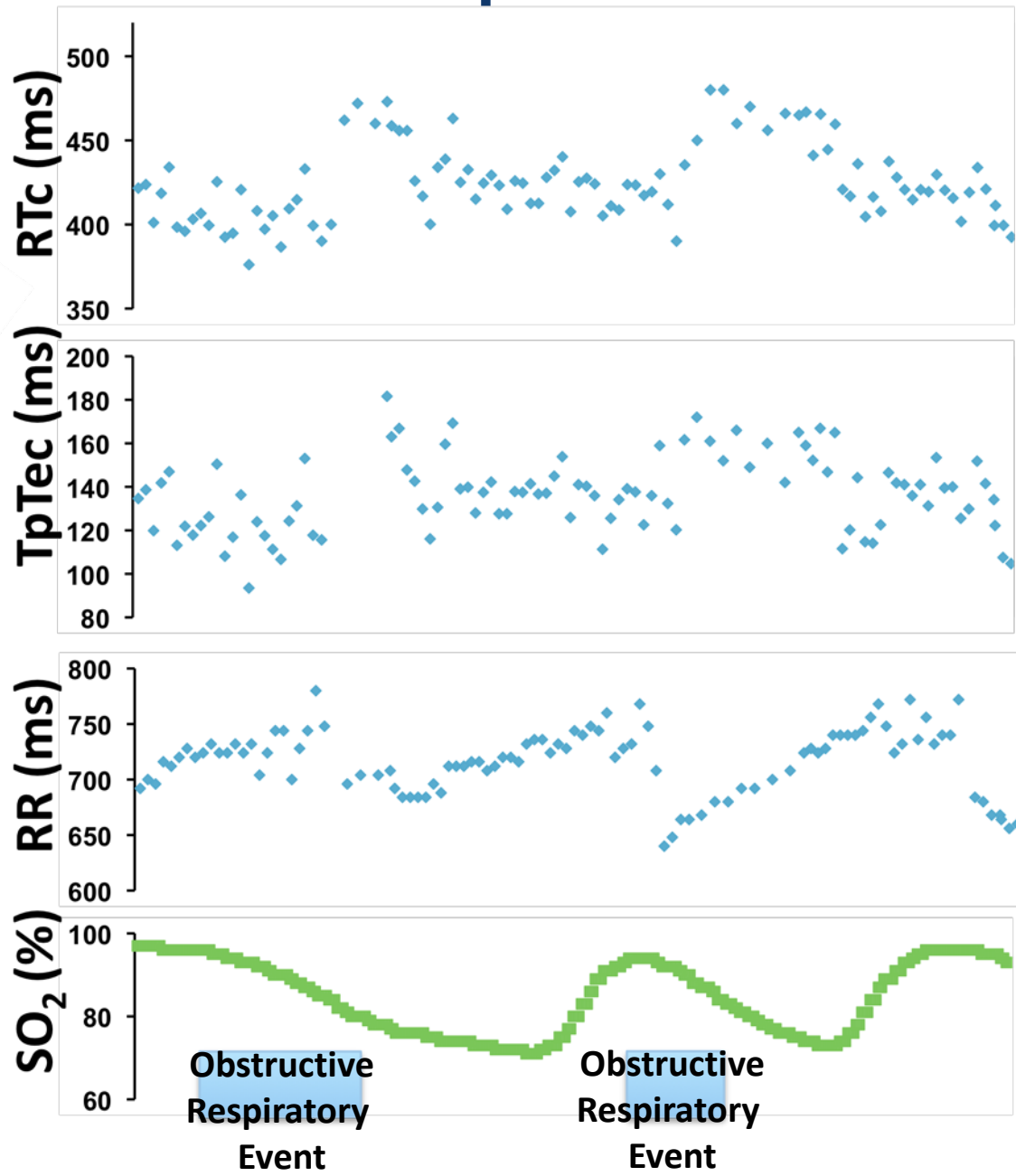
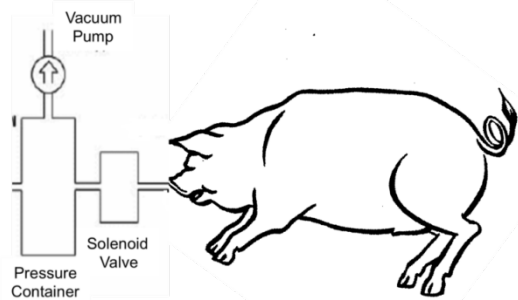


Effect of RDN on ischemia-related arrhythmias

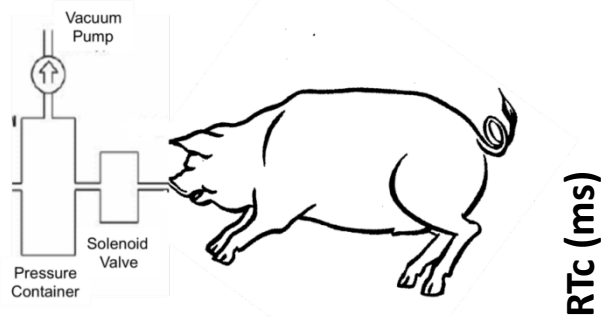
- Surgical RDN or Sham procedure in pigs
- Surgical ligation of the proximal LAD for 20 min → Reperfusion



Effect of RDN on ventricular repolarisation in sleep apnea



Effect of RDN on ventricular repolarisation in sleep apnea



Normal
Breathing

Obstructive
Respiratory
Event + SHAM

Obstructive
Respiratory
Event + RDN

0 min

2 min

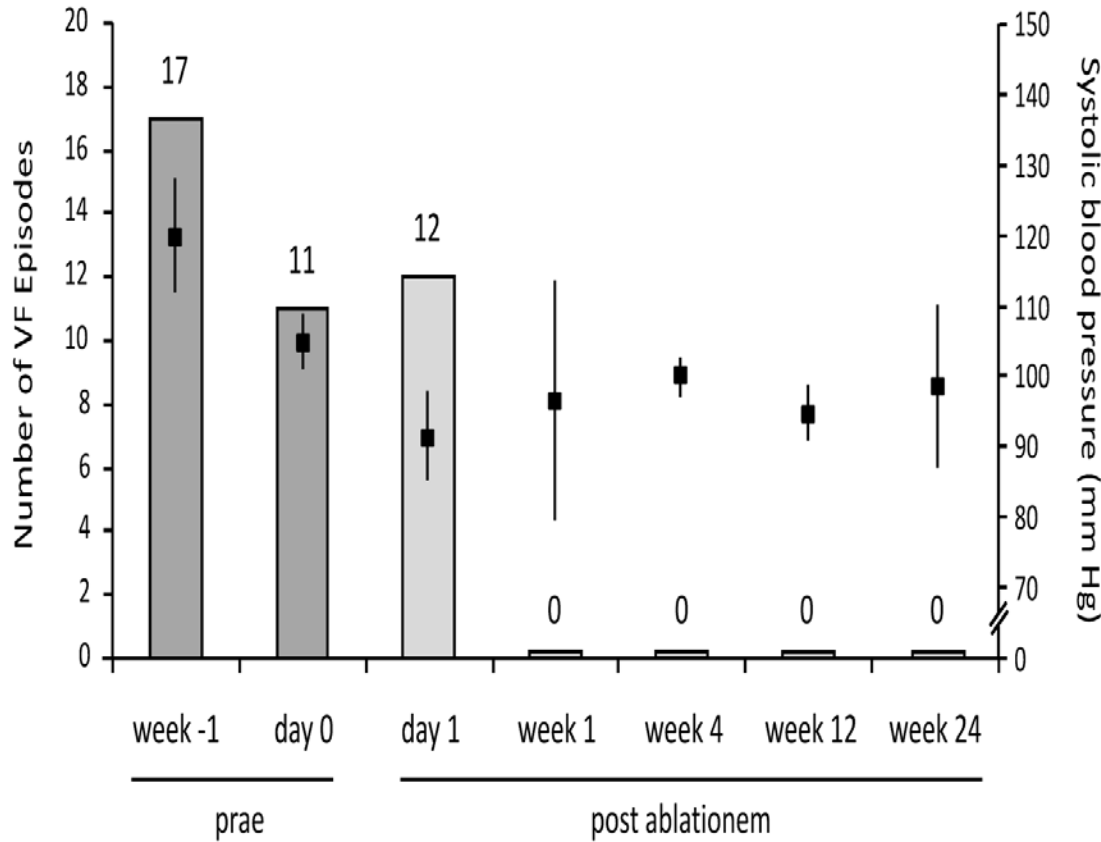
0 min

2 min

0 min

2 min

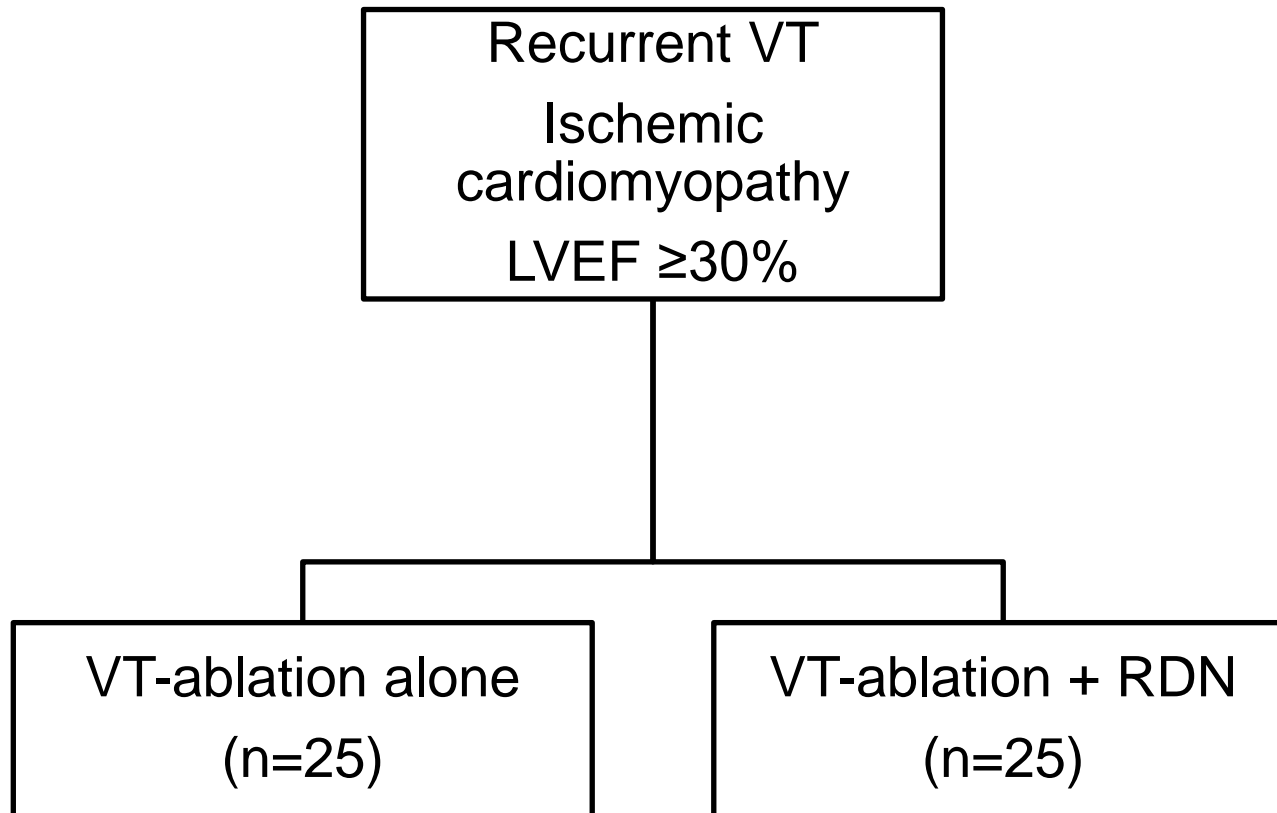
First-in-men: RDN in electric storm

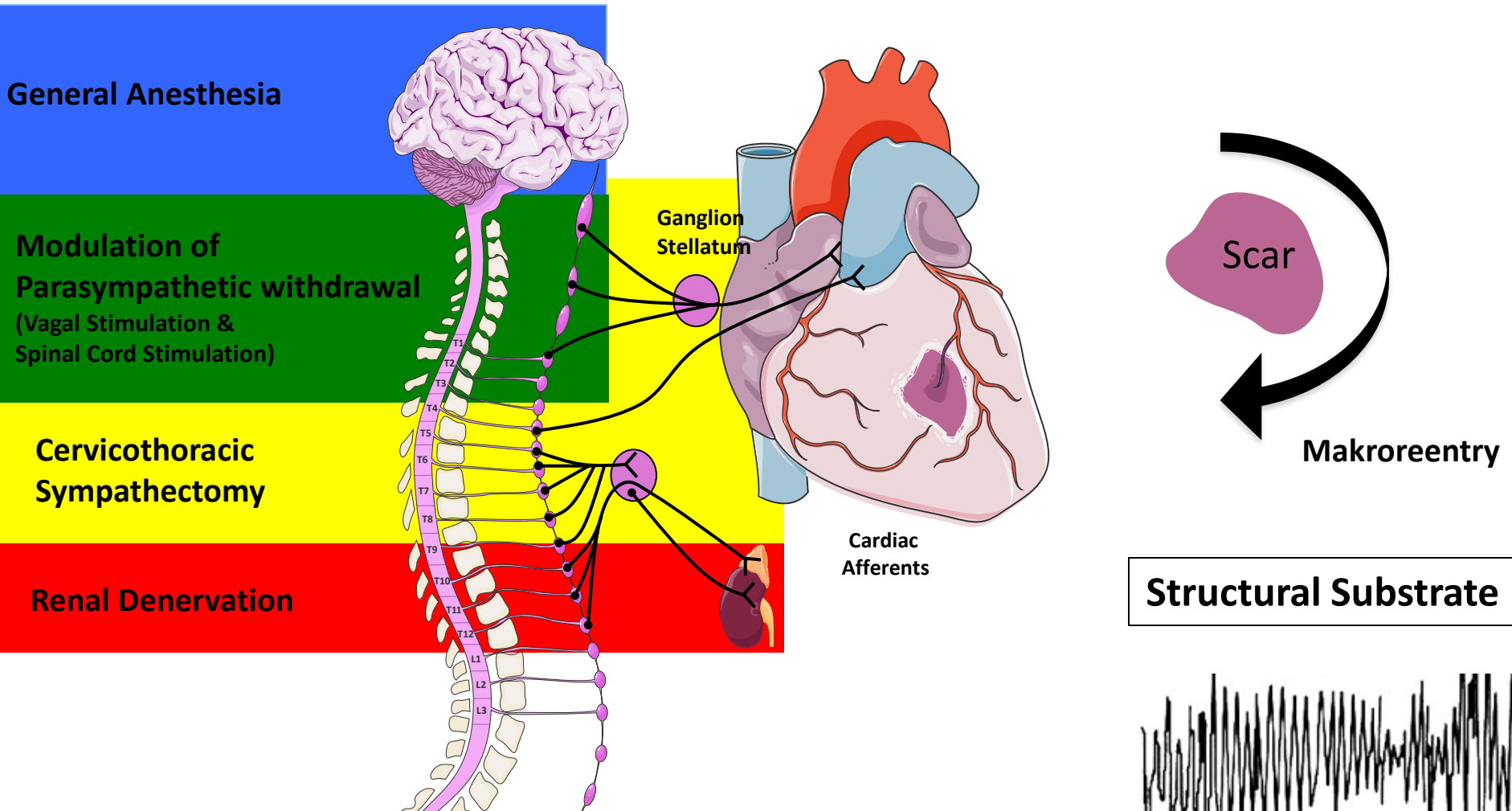


Case:

- 57 years old male
- Dilated cardiomyopathy, EF 28%
- Polymorphic VT's/VF
- Cardiac ablation declined

ADREVAT: Additional RDN to VT ablation





Modulation of autonomic nervous system provides an adjunctive treatment modality for treatment of VT by:

- decreased norepinephrine spillover
- reduction of the triggers
- prevention of the progression of ventricular remodeling
- heart rate reduction

Thank you!



Dominik Linz; MD, PhD.

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