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# Status of Renal Denervation

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# Disclosures

- **None**

# Hypertension

- **It's 2027**
- **74-year-old man with average BP 163/86 on ABPM**
- **On 4 medications including MRA**
- **Scr 1.8mg/dL**
- **Struggling with side effects**
- **What to do?**

# Effects of Lifestyle Interventions for HTN

Risk Factor	Intervention	Duration/Type/Dose	$\Delta$ BP (mm Hg)
Physical activity	Aerobic	90-150 min/wk	-5/8
Diet	DASH	Fruits, grains, etc	-11
Weight	↓	1 kg	-5
Sodium	↓	<1500 mg/d	-5/6
Potassium	↑	3500-5000 mg/d	-4/5
Alcohol	↓	M $\leq$ 2, W $\leq$ 1 /d	-4
Sleep Apnea	CPAP	Nightly	2-3

# Hypertension

- **The great orphan of clinical medicine**
- **Genes and the environment**
- **Myriad reasons for inadequate control**
  - **Lifestyle factors**
  - **Clinician and patient inertia**
  - **Medication choice/dose**
  - **Adherence**

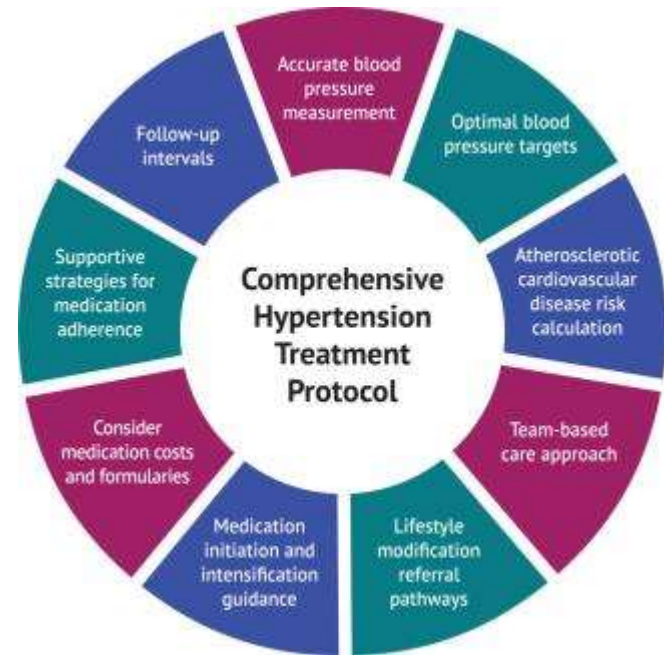


Figure adapted from Centers for Disease Control and Prevention. *Hypertension Control Change Package*. 2nd ed. Atlanta, GA: Centers for Disease Control and Prevention, U.S. Dept of Health and Human Services; 2020.

# Effects of Increased Sympathetic Activity

**Causes of increased afferent signaling from the kidney to central integrative structures**

*Factors that might contribute to increased renal afferent signaling:*

*Adenosine  
Acidosis  
Oxidative stress  
Inflammation  
Endothelial factors  
Angiotensin II  
ischemia*



**Consequences of increased efferent sympathetic outflow to the kidney and other organs**

**Renal denervation**

Renal injury /  
Renal ischemia



Na<sup>+</sup> / H<sub>2</sub>O retention  
Reduced renal blood flow  
Activation of the RAAS  
Proteinuria  
Glomerulosclerosis

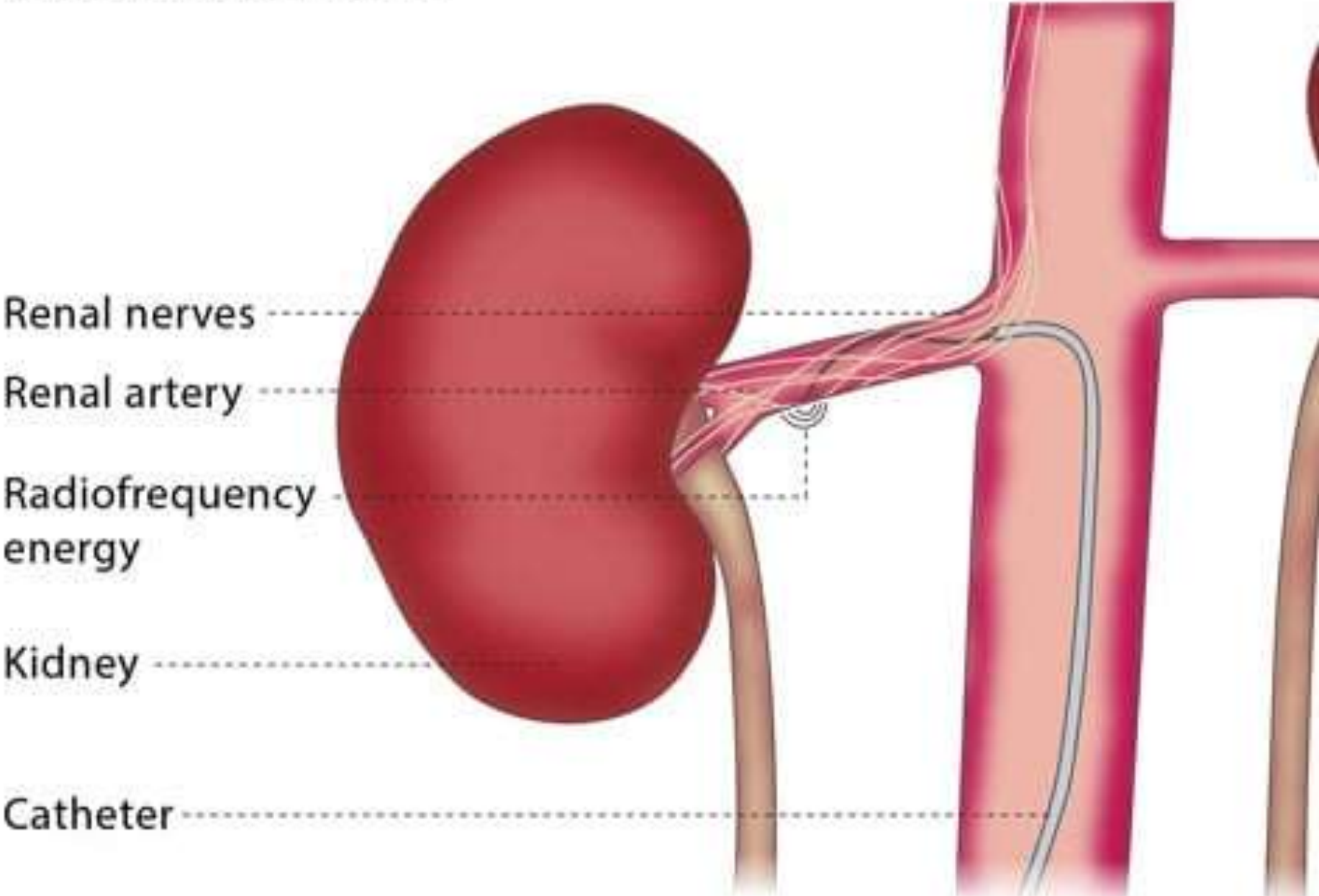


Remodeling  
Hypertrophy  
Arrhythmias  
Ischemia  
Apoptosis



Medial hyperplasia  
Arterial compliance ↓  
Endothelial dysfunction

# Renal denervation



Renal nerves

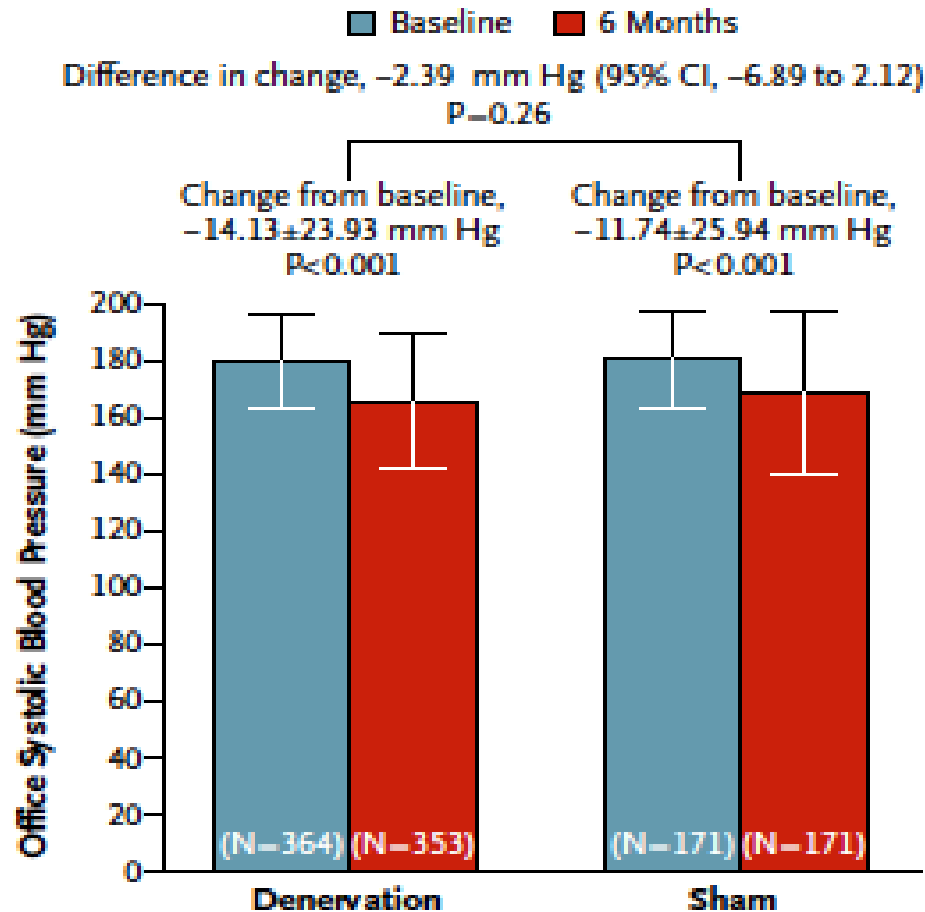
Renal artery

Radiofrequency energy

Kidney

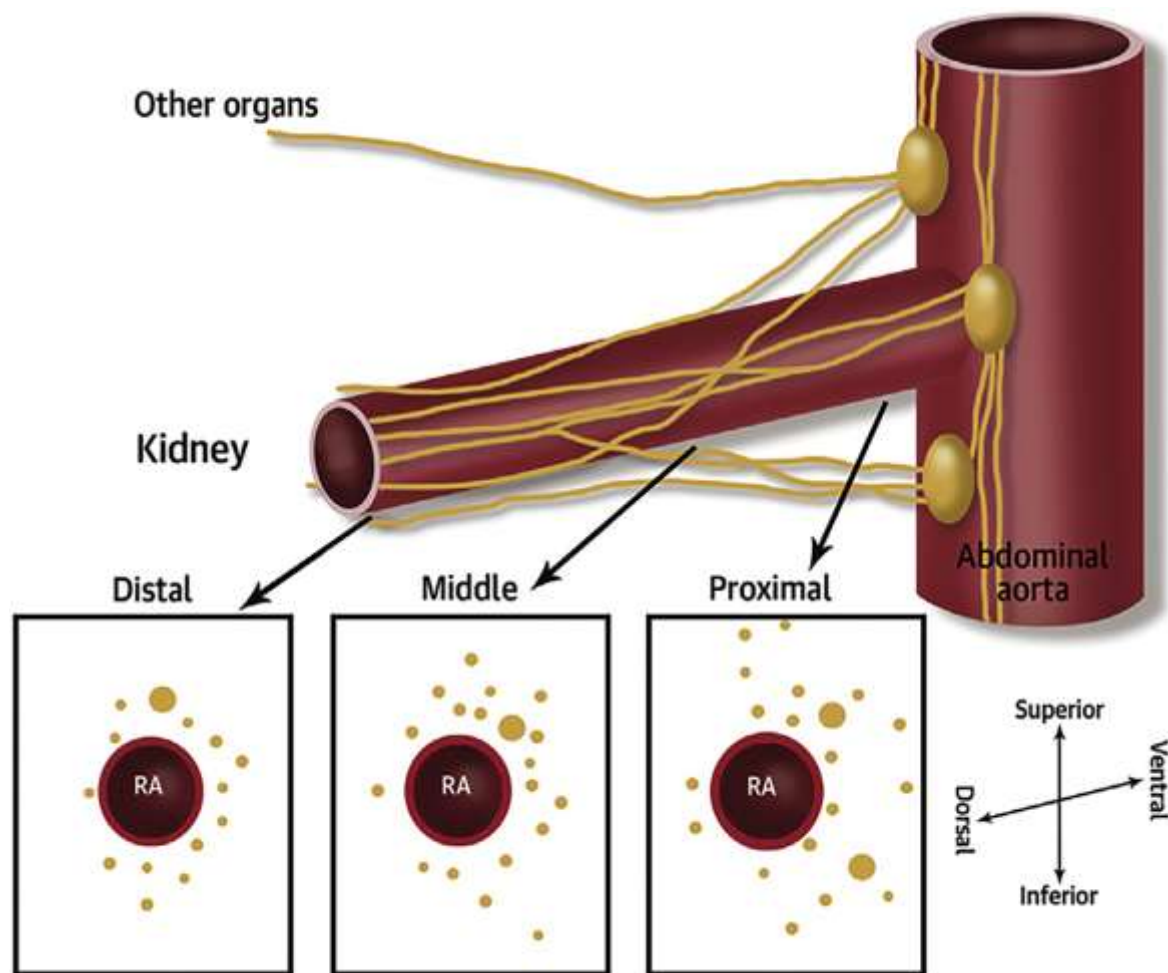
Catheter

# SIMPLICITY 3 Primary Outcome

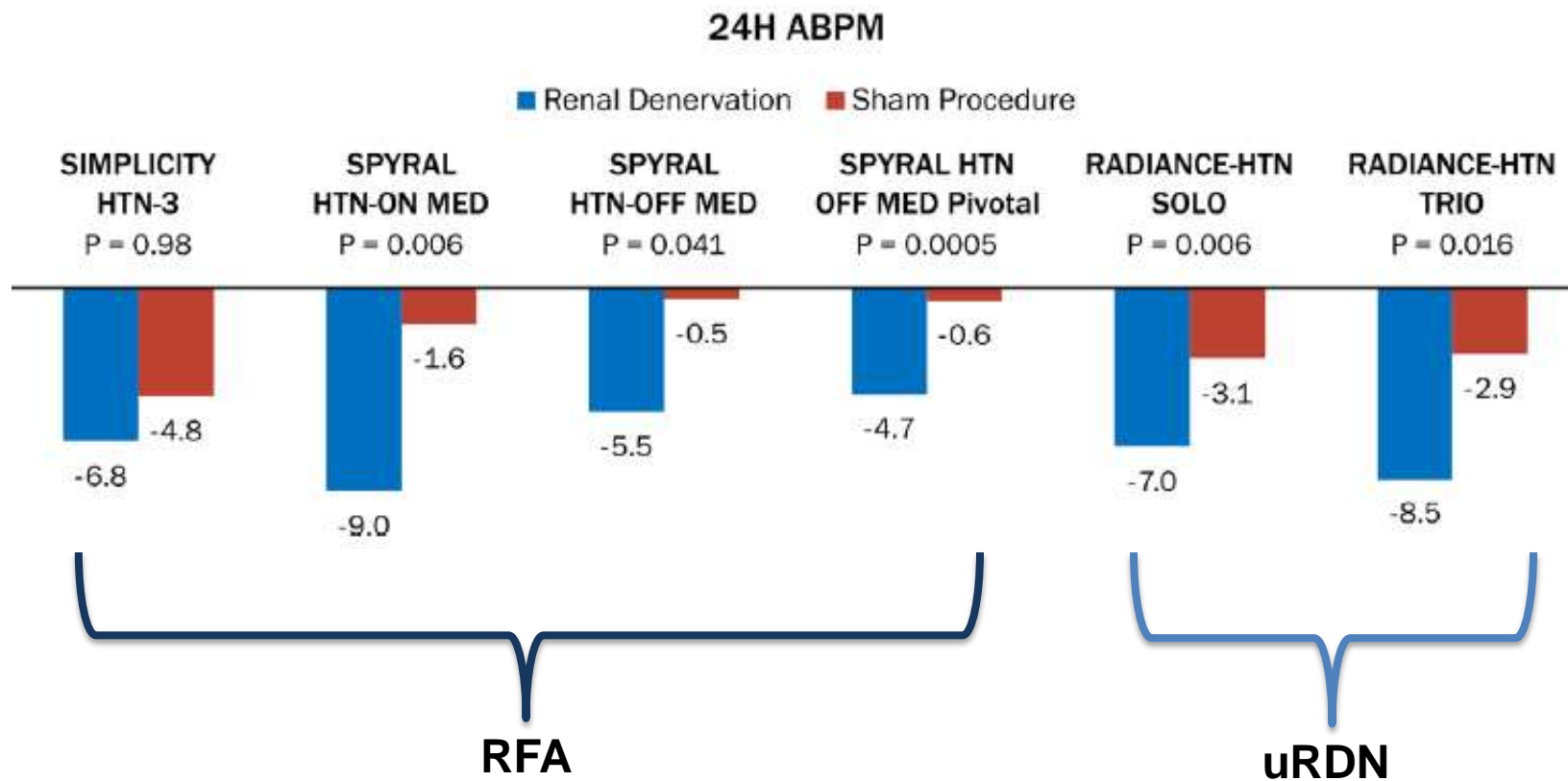




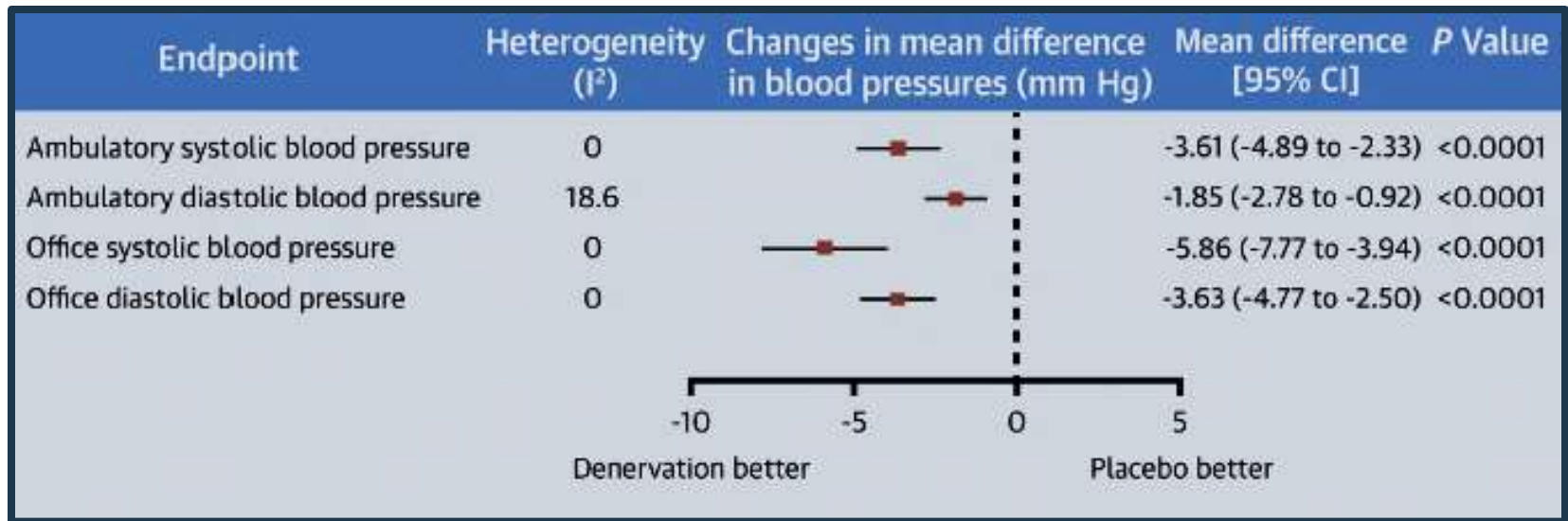
# Renal Artery Nerve Density



# Sham-Controlled Trials of RDN



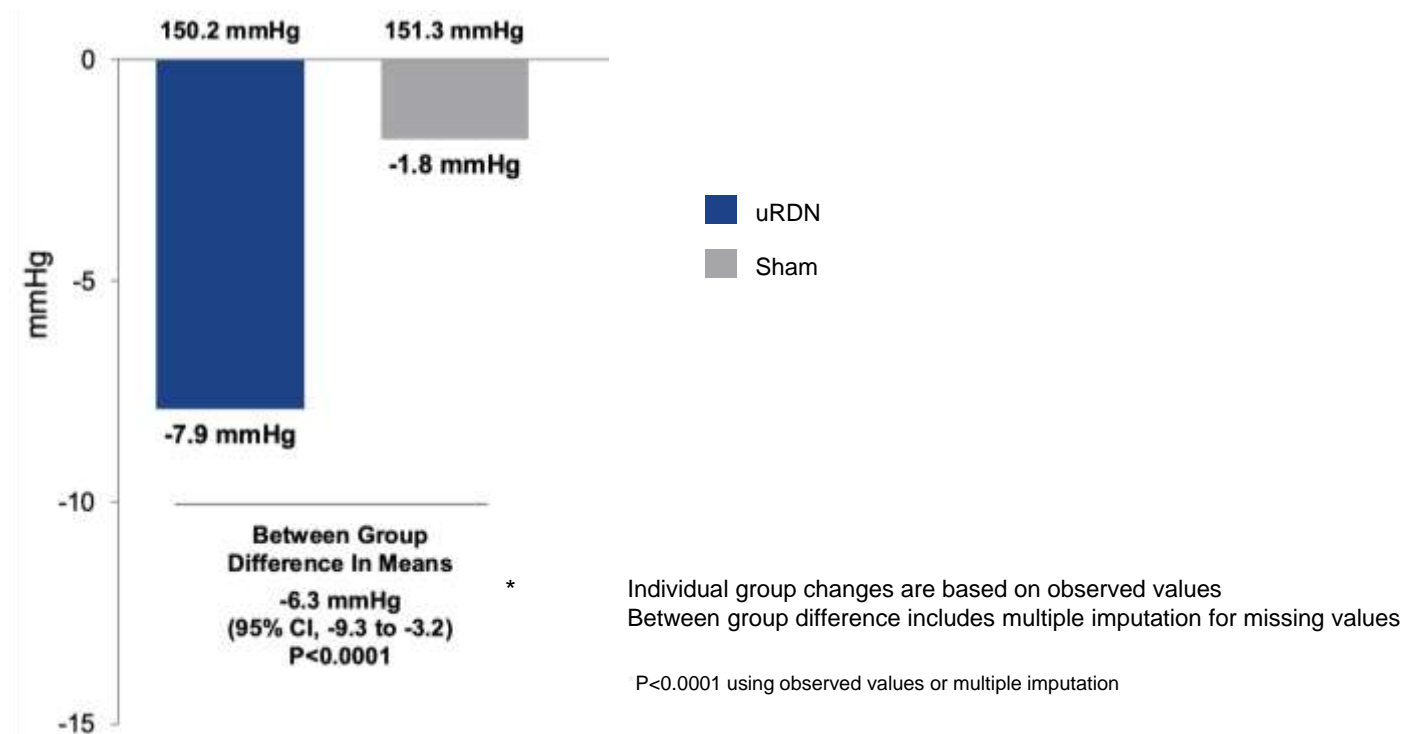
# RDN Meta-Analysis



Ahmad Y et al. JACC Intv 2021; 14:2614-24

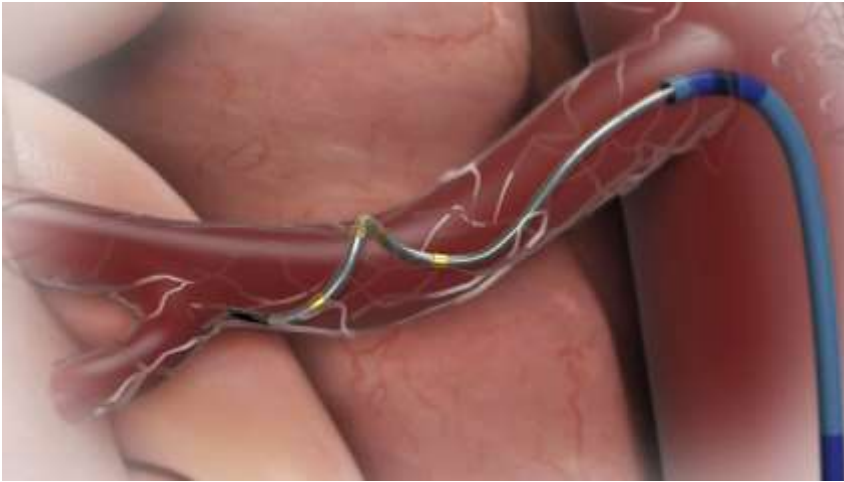
# RADIANCE II: Primary Efficacy Endpoint

$\Delta$  *Daytime Ambulatory SBP at 2 Months*

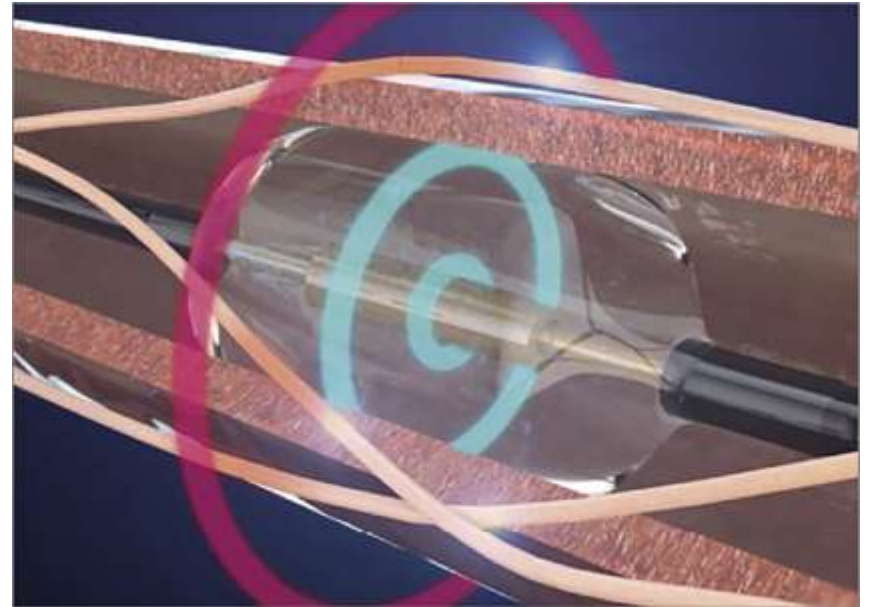


Kirtane A et al. TCT 2022

# Energy Sources

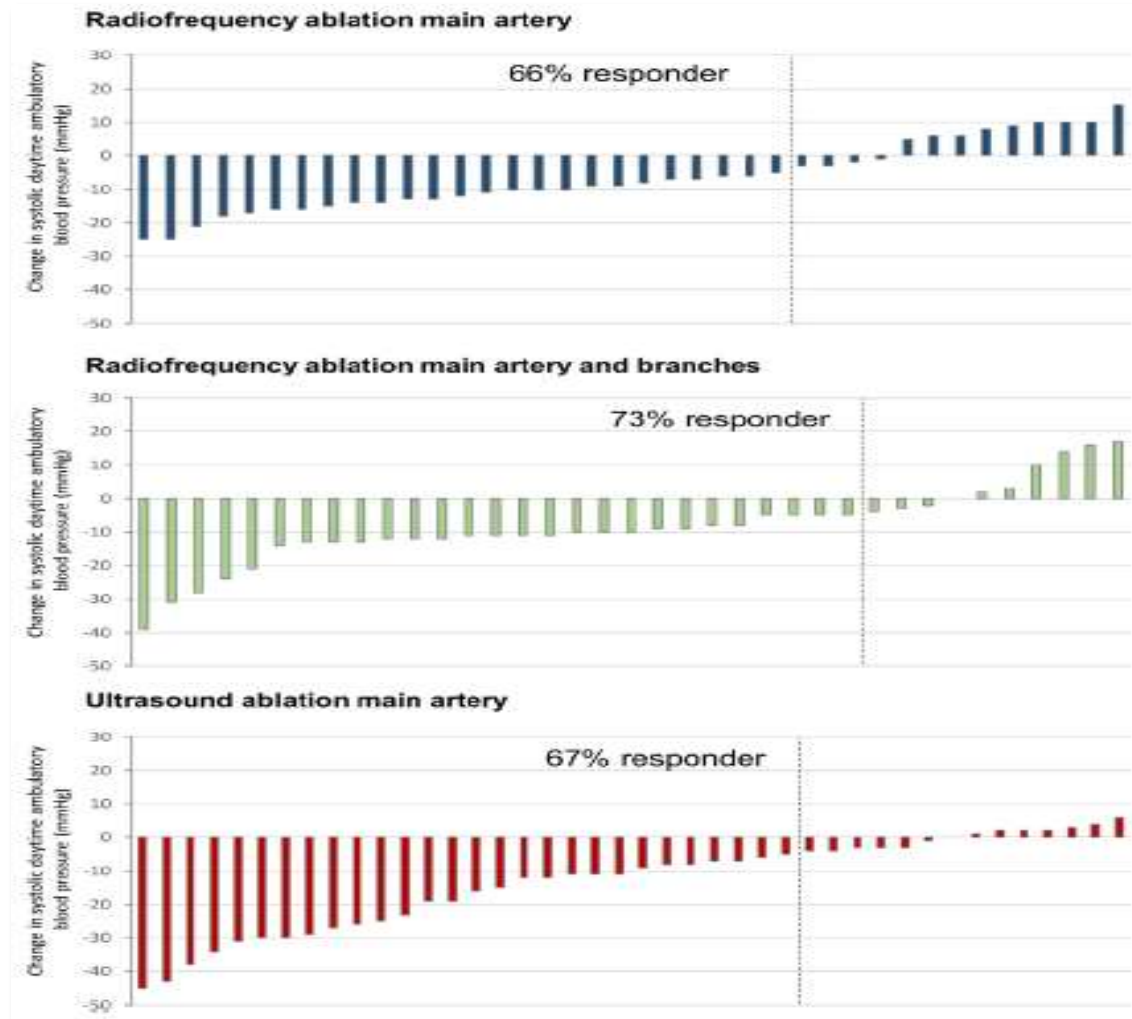


**RFA**



**uRDN**

# RFA or uRDN?



# Hypertension

- **It's 2027**
- **74-year-old man with average BP 163/86 on ABPM**
- **Will RDN be applicable?**

# RDN for HTN

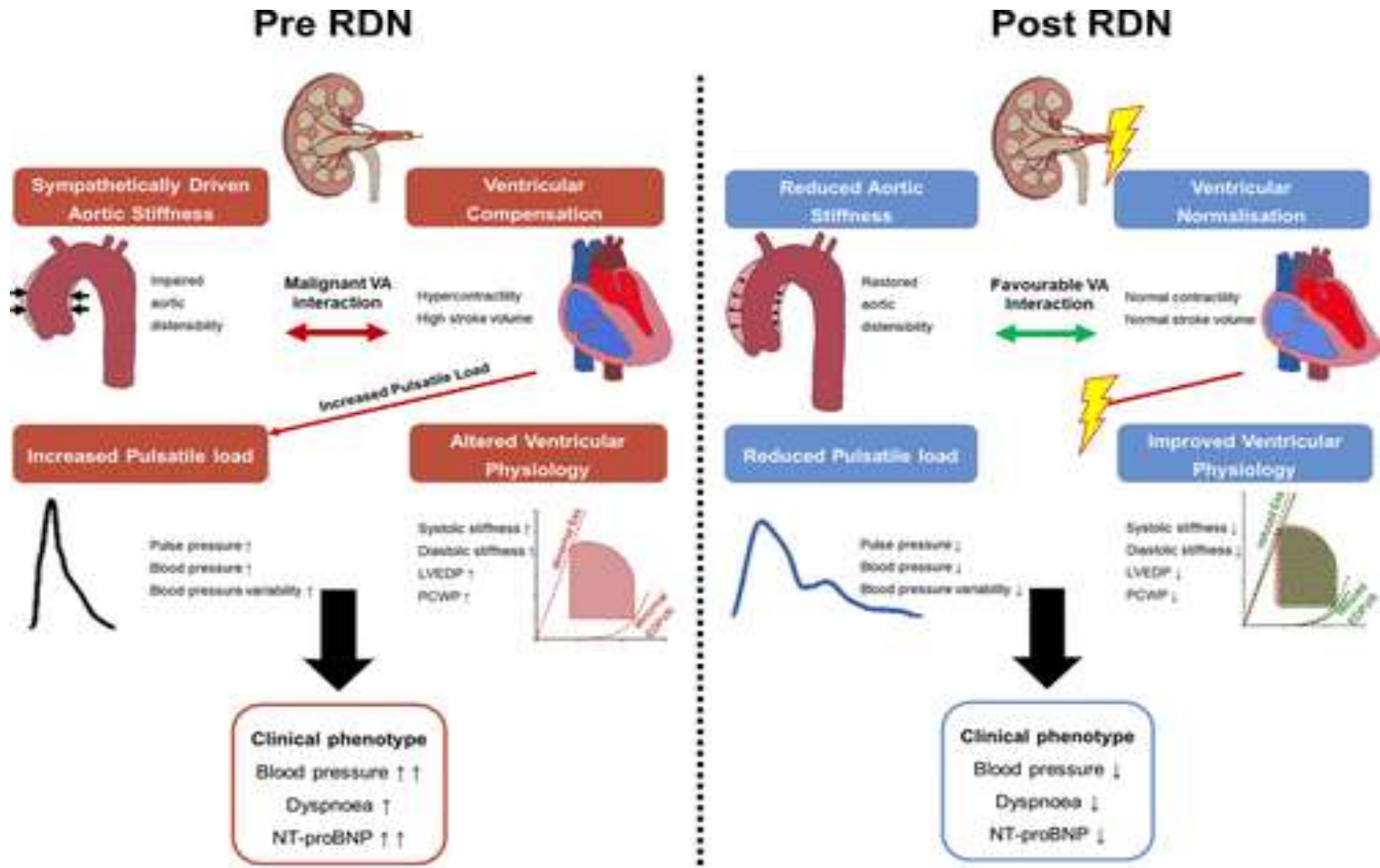
- **Who are patients?**
- **How do I identify a patient who's likely to respond?**
- **Is the BP lowering effect durable and will it translate into improved clinical outcomes?**
- **What are the long-term safety issues?**



# RDN for HTN

- **10+ years intense interest and investigation**
- **Rigorous sham-controlled trials**
- **BP reductions on the order of some lifestyle interventions**
- **Outcome data lacking**
- **Unclear where it will fit in a multi-modality approach, but may be a component of stepped therapy for some**

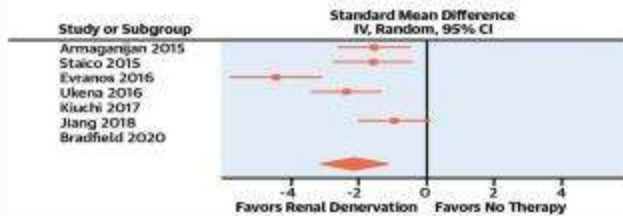
# RDN in HFpEF



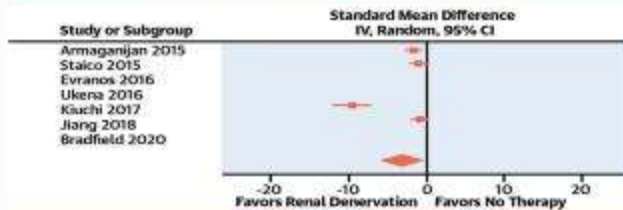
# RDN in Ventricular Arrhythmias

## CENTRAL ILLUSTRATION: Meta-Analysis Demonstrating Impact of Renal Denervation on Ventricular Arrhythmias

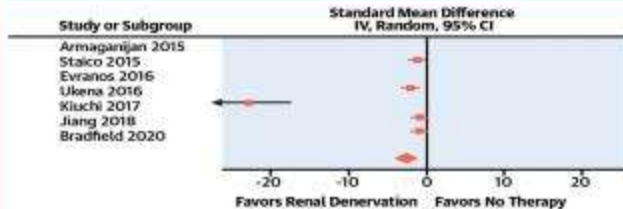
### A. Total Number of Ventricular Arrhythmia Episodes



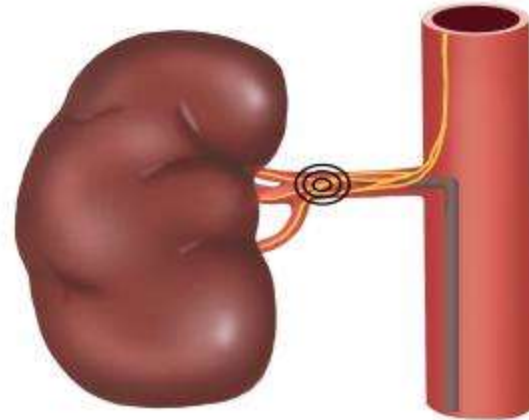
### B. Total Number of ATP Episodes



### C. Total Number of Shocks



### Renal Denervation



Hawson, J. et al. J Am Coll Cardiol EP. 2021;7(1):100-8.

# Summary

- **Recent sham-controlled studies suggest that RDN may play a limited role in the treatment of select patients with HTN.**
- **Extension of RDN therapy to HF and EP patients is experimental in nature, though neuromodulation is gaining traction.**

