RENAL DENERVATION 2025

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Introduction

- 6 million people with hypertension in Canada
- 30% of patients are non-compliant to medications
- Even with perfect adherence of medication, 10–20% of patients will have persistently elevated blood pressures

Leung AA, Williams JVA, McAlister FA, et al. Worsening hypertension awareness, treatment, and control rates in Canadian women between 2007 and 2017. Can J Cardiol 2020;36:732-9.

Noubiap JJ, Nansseu JR, Nyaga UF, Sime PS, Francis I, Bigna JJ. Global prevalence of resistant hypertension: a meta-analysis of data from 3.2 million patients. Heart. 2019;105(2):98–105.

Introduction

- 5mm Hg reduction in BP equates to 10% reduction in CV events

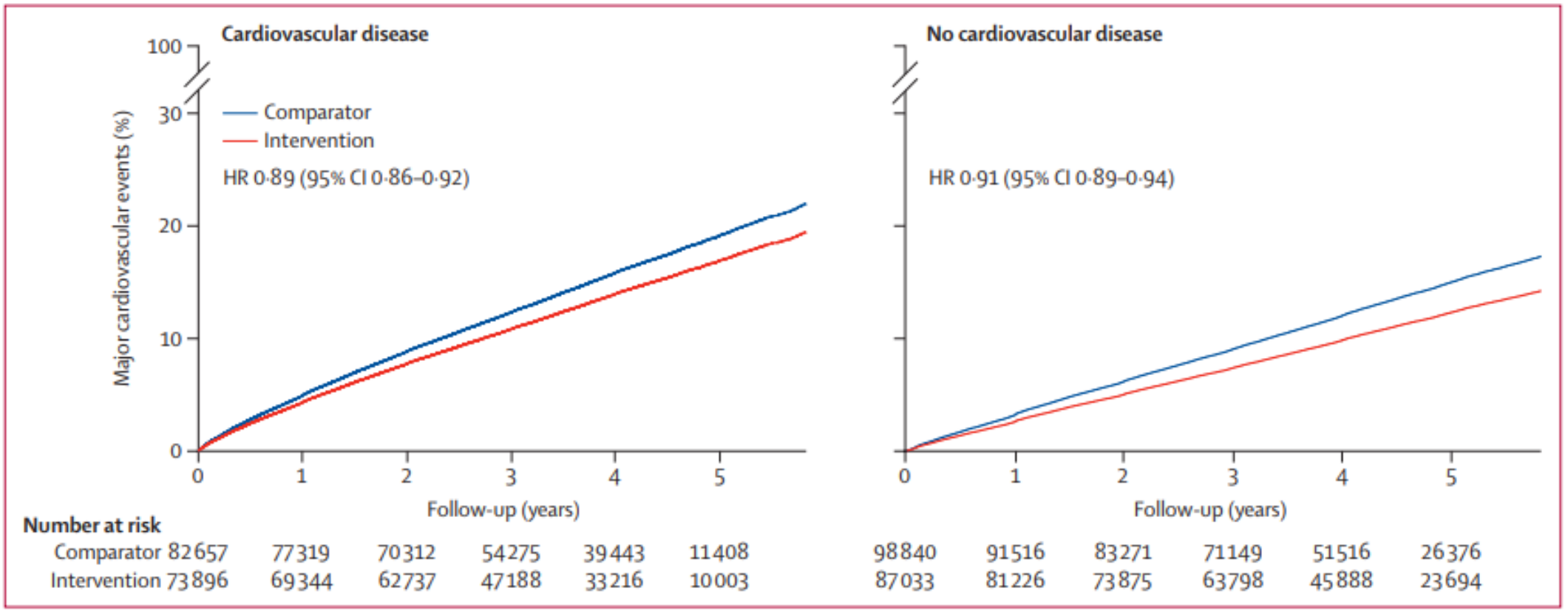
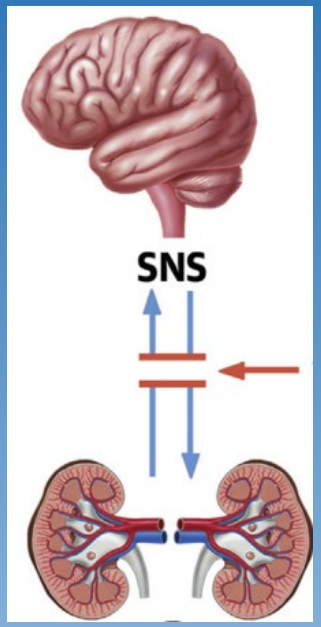


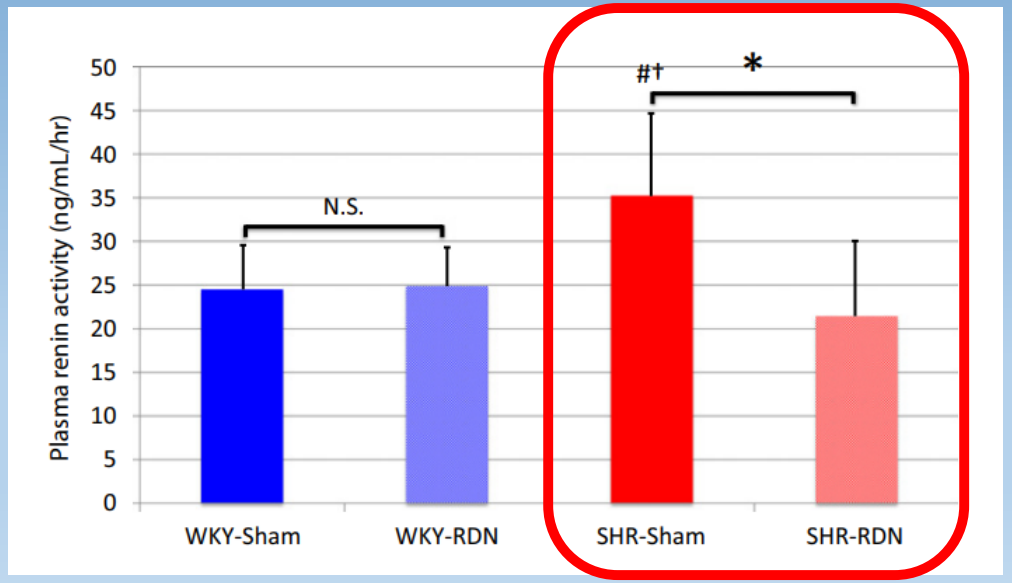
Figure 1: **Rates of major cardiovascular events per 5 mm Hg reduction in systolic blood pressure, stratified by treatment allocation and cardiovascular disease status at baseline**

Lancet 2021; 397: 1625–36

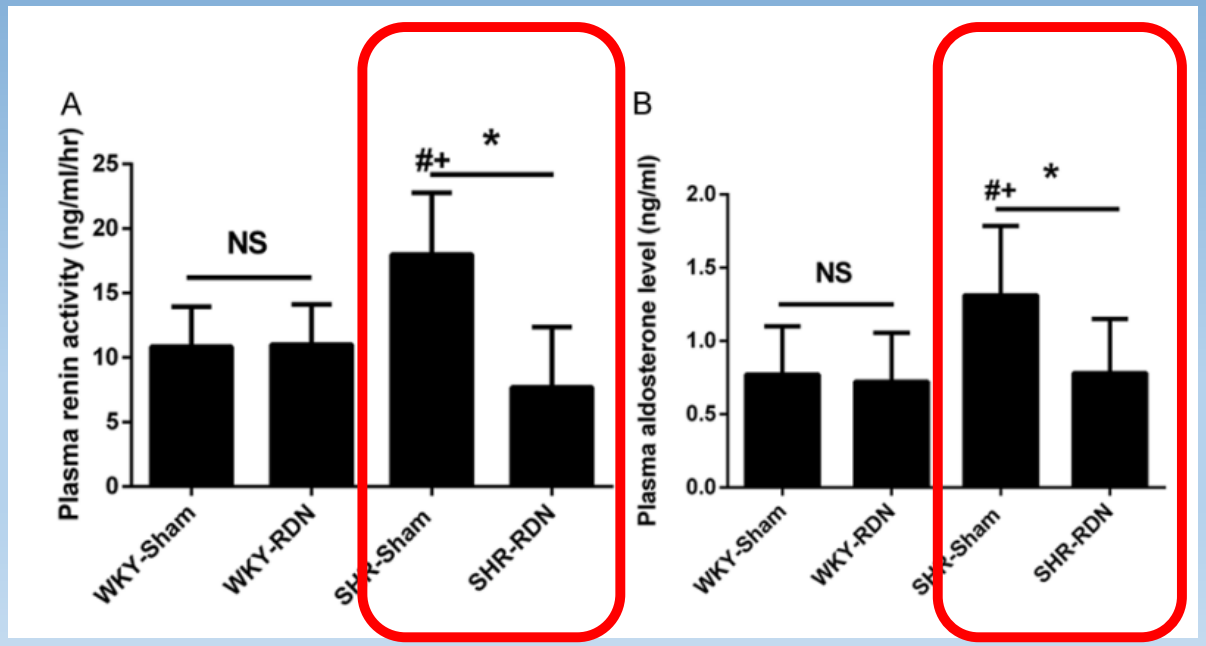
Principle of RDN

- To disrupt the communication between CNS and Kidney
- Reduction in renin and aldosterone excretion
- Animal studies showed significant reduction in renin/aldosterone level post RDN





Machino. Anti-hypertensive effect of RF renal denervation in rats. Life sciences. 2014

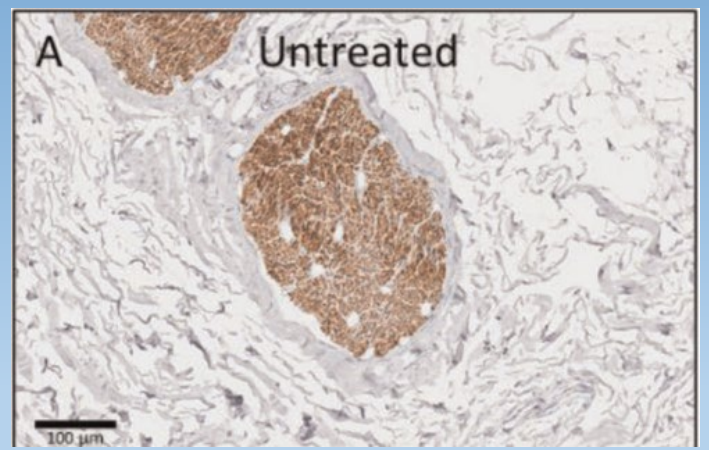


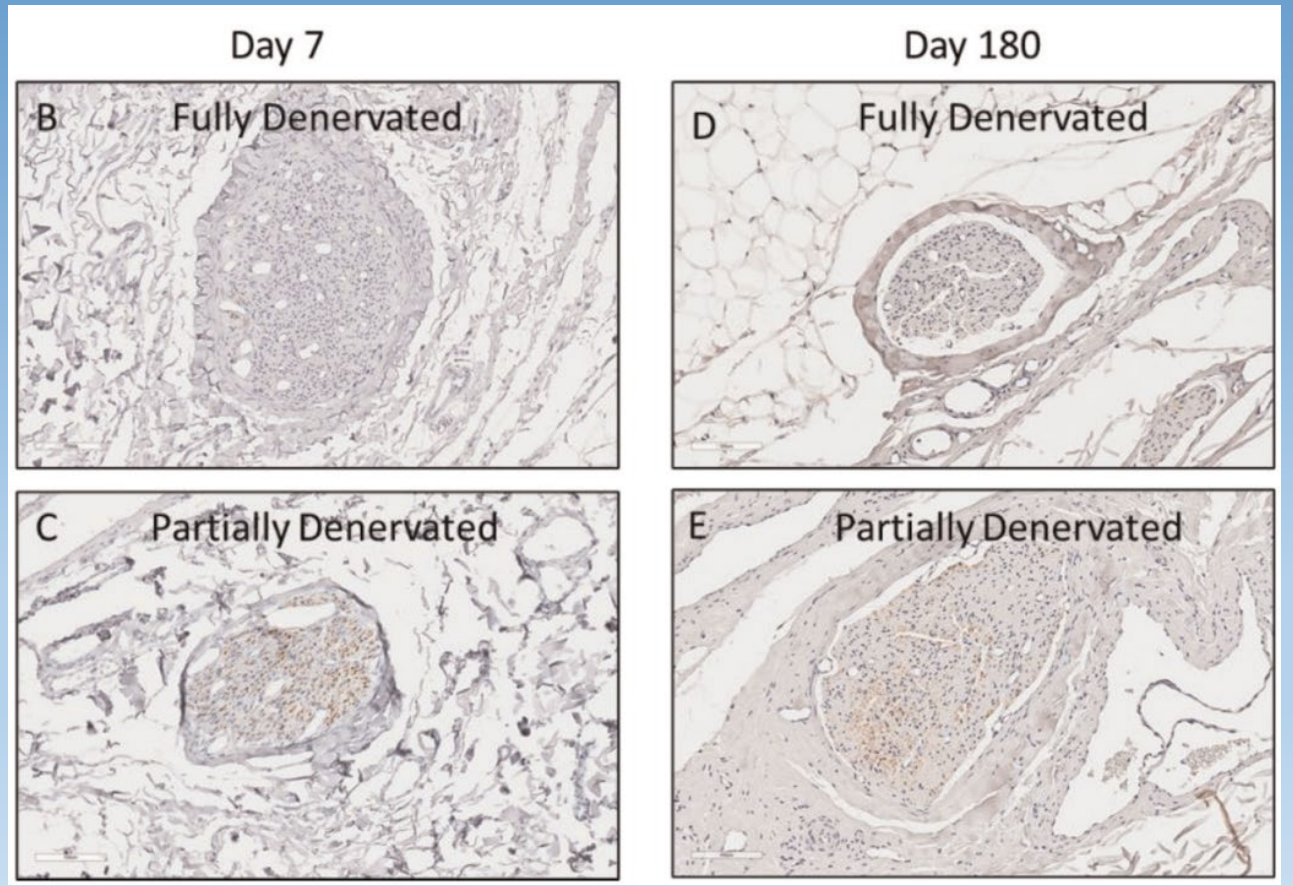
Wang. Long-term renal denervation. Am J Transl Res 2018

Histological evidence supporting the durability of successful radiofrequency renal denervation in a normotensive porcine model

Journal of Hypertension 2022, 40:2068–2075

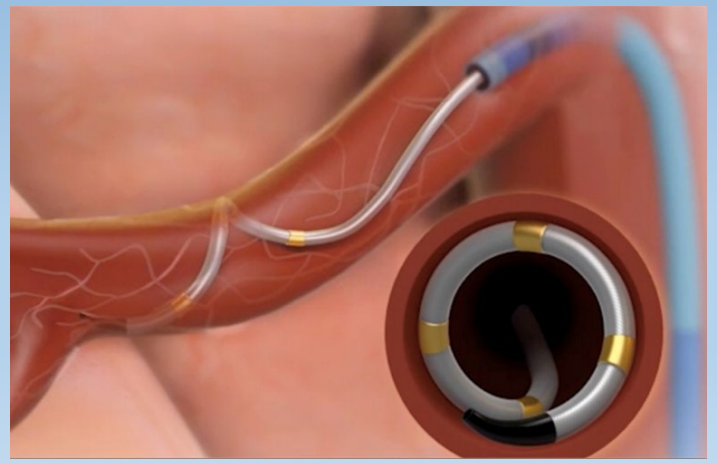
Andrew S.P. Sharp[a], Stefan Tunev[b], Markus Schlaich[c], David P. Lee[d], Aloke V. Finn[e], Julie Trudel[b], Douglas A. Hettrick[b], Felix Mahfoud[f], and David E. Kandzari[g]

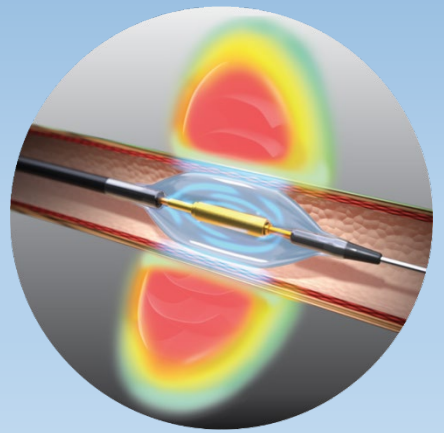


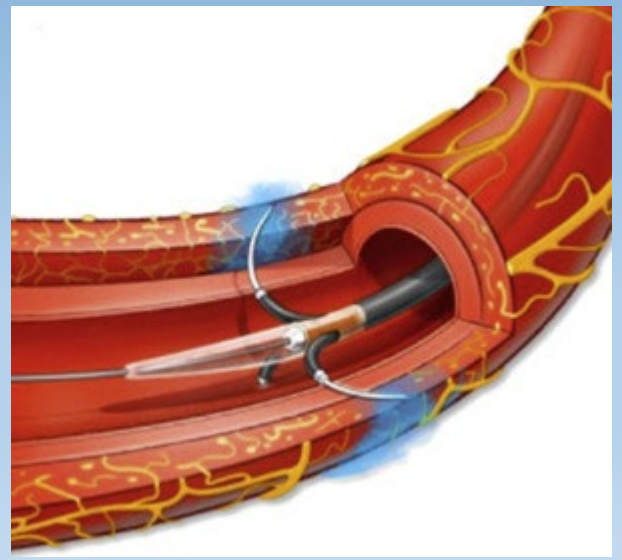


Renal Denervation (RDN)

- 2 catheter designs
  - Energy based – radiofrequency or ultrasound
  - Chemical based – alcohol injection







RDN History

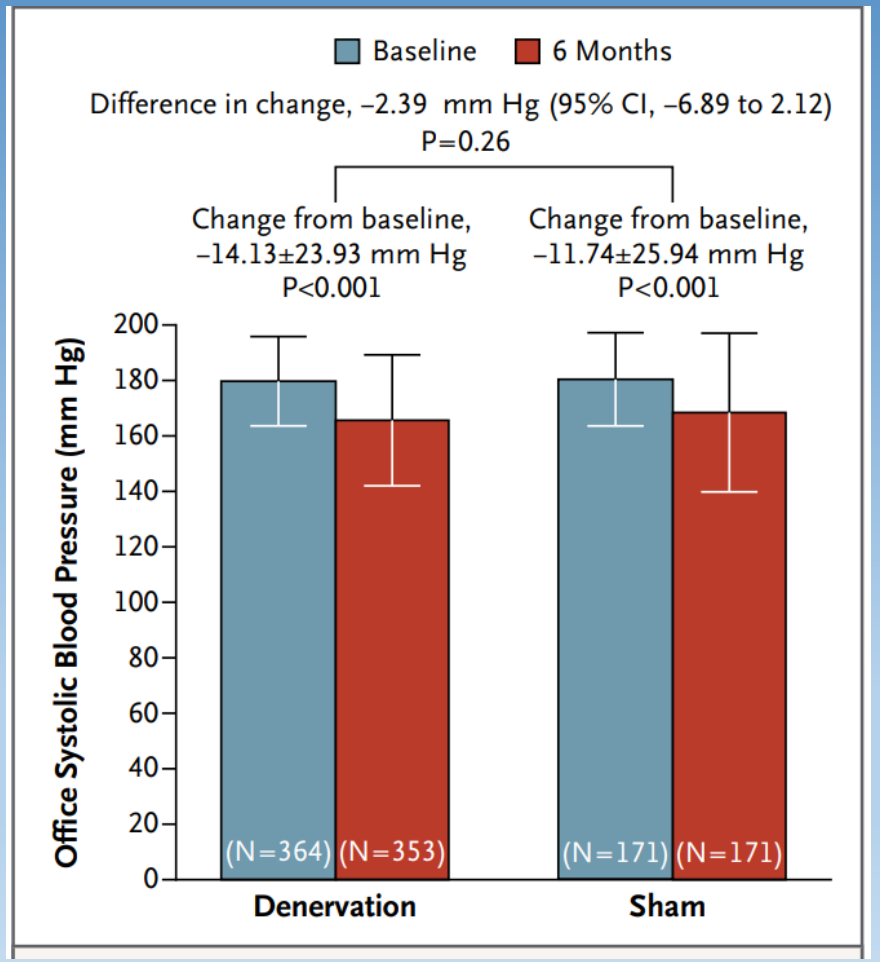
- 2010 – Medtronic acquired Ardian for $800m
- 2014 – Symplicity HTN 3 Randomized Trial vs Sham

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Controlled Trial of Renal Denervation for Resistant Hypertension

Deepak L. Bhatt, M.D., M.P.H., David E. Kandzari, M.D., William W. O'Neill, M.D., Ralph D'Agostino, Ph.D., John M. Flack, M.D., M.P.H., Barry T. Katzen, M.D., Martin B. Leon, M.D., Minglei Liu, Ph.D., Laura Mauri, M.D., Manuela Negoita, M.D., Sidney A. Cohen, M.D., Ph.D., Suzanne Oparil, M.D., Krishna Rocha-Singh, M.D., Raymond R. Townsend, M.D., and George L. Bakris, M.D., for the SYMPLICITY HTN-3 Investigators*



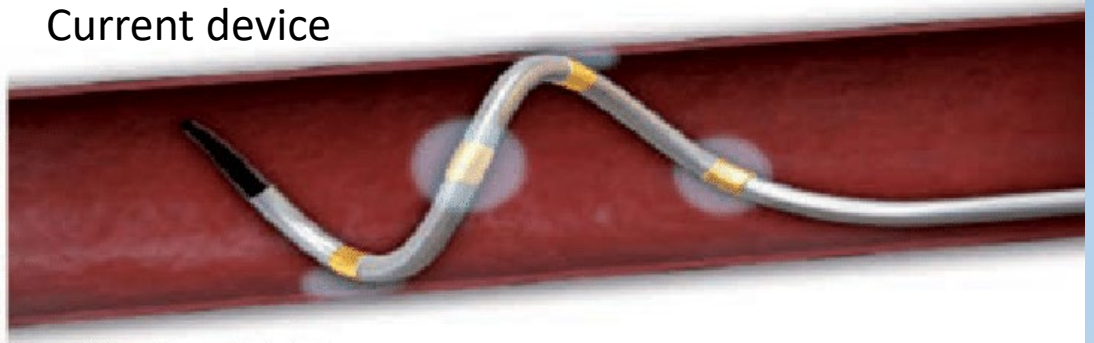
Current RDN technology (Medtronic)

March 2024 – Health Canada approval for management of hypertension

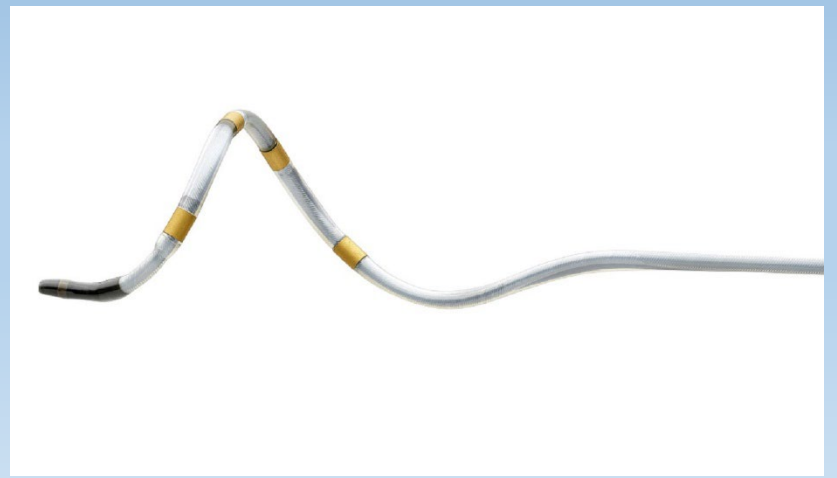
1st Gen

Symplicity Flex ablation pattern

Current device

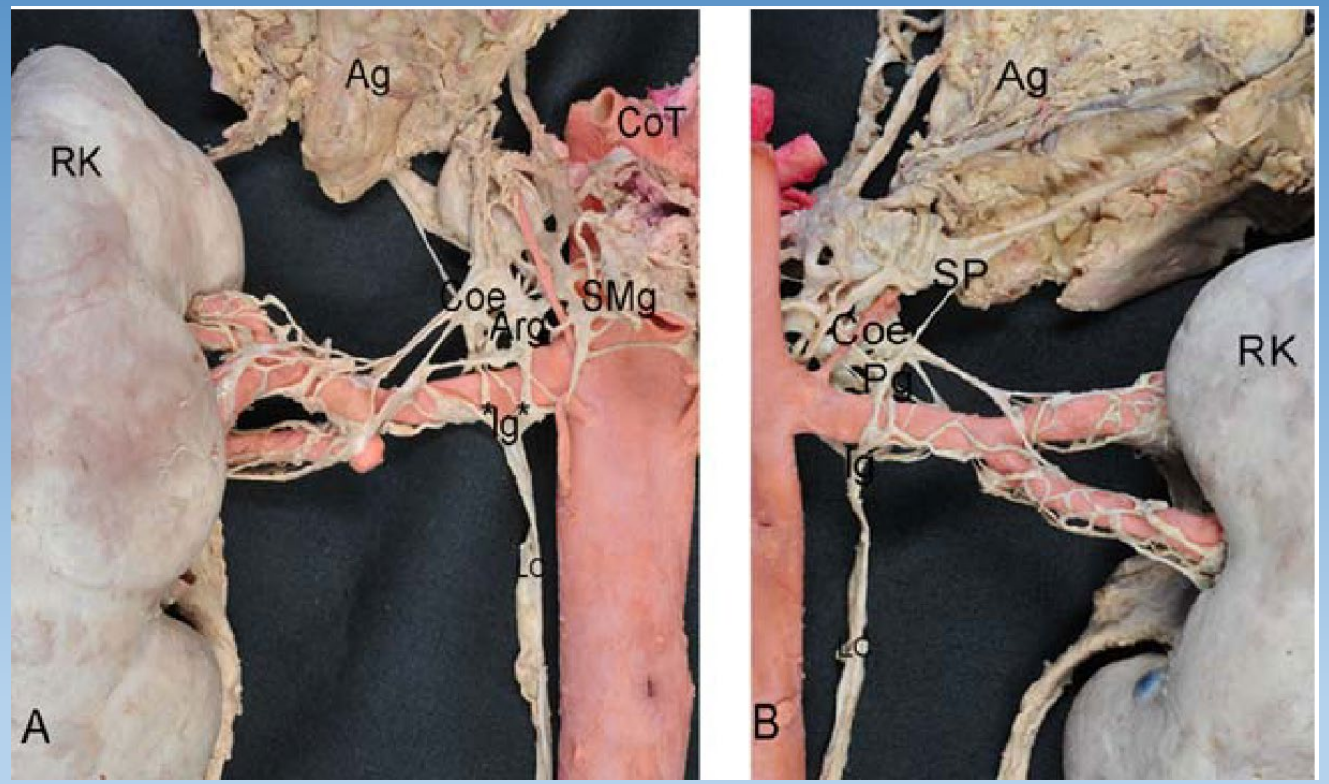


Symplicity Spyral ablation pattern



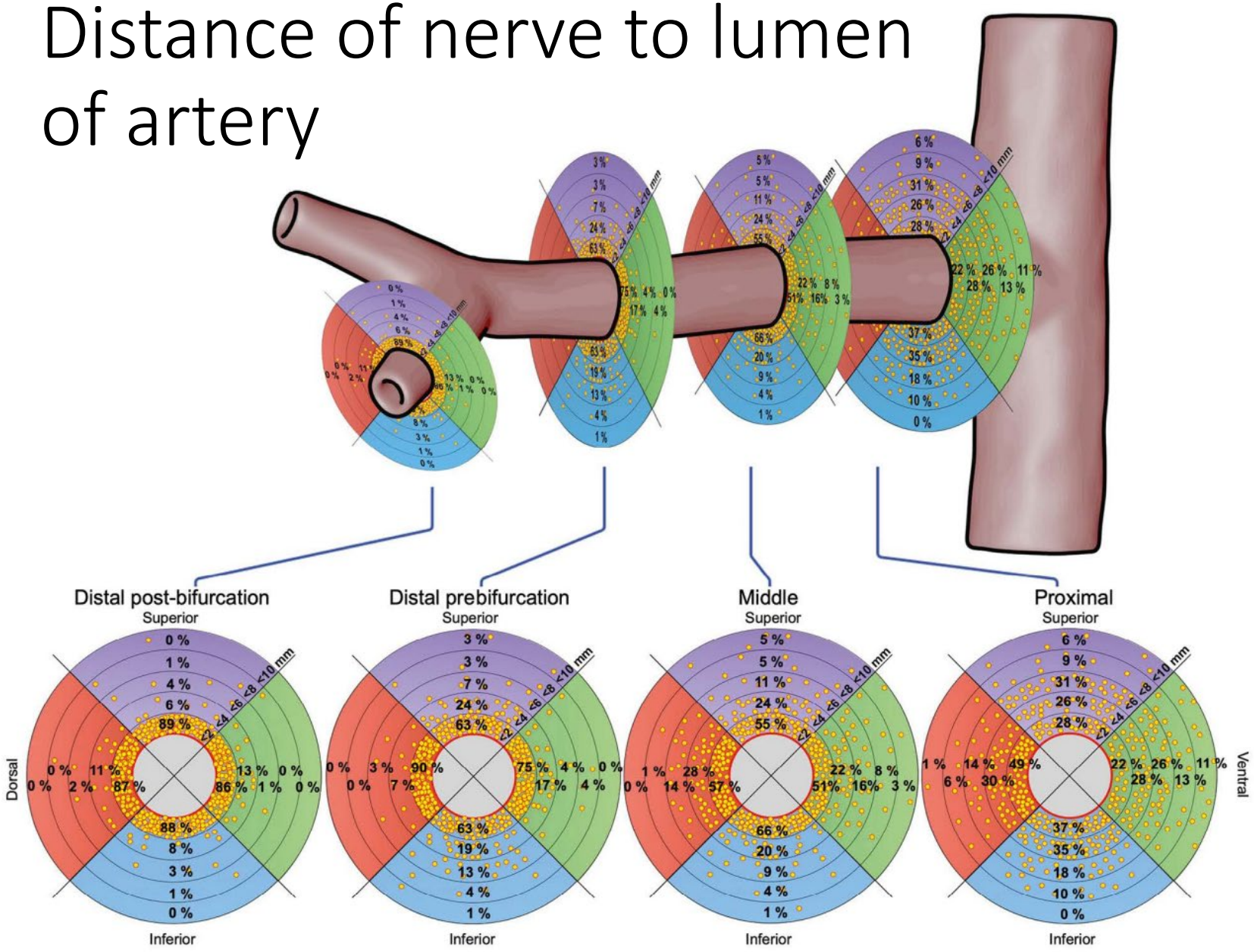
Anatomy of renal nervous system

- 63% of kidneys, nerves are located after the bifurcation
- >30% accessory renal arteries are innervated



Mompeo et al. The gross anatomy of the renal sympathetic nerves revisited. Clin Anat 2016

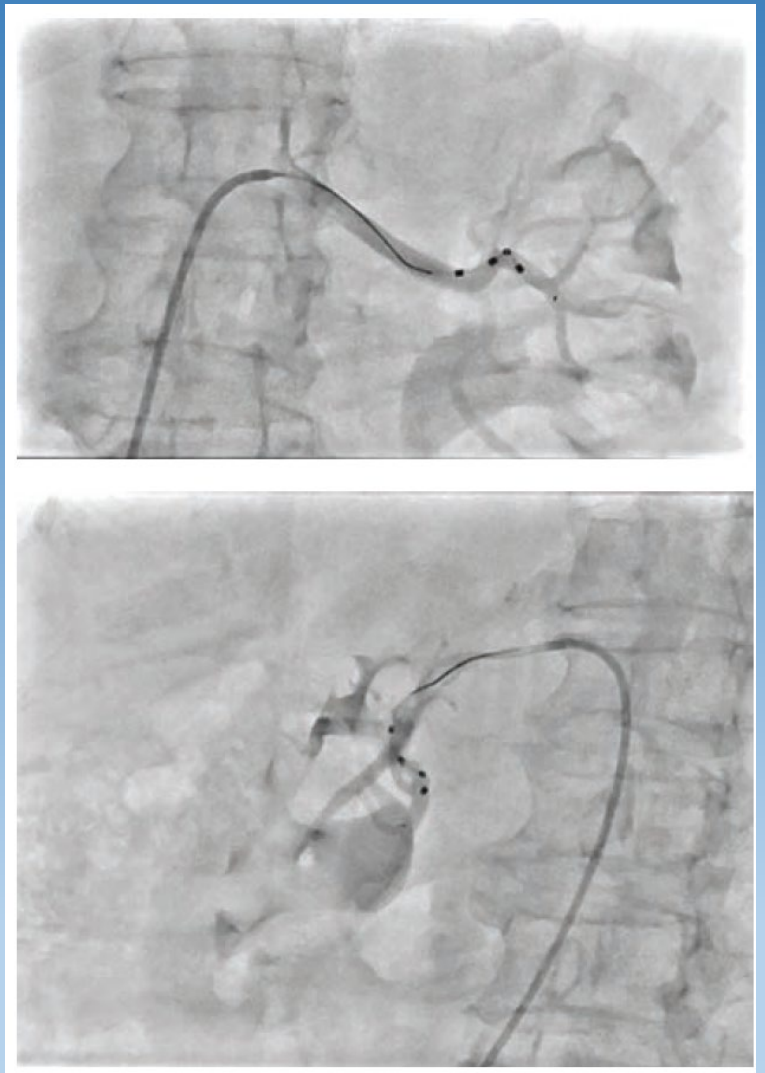
Distance of nerve to lumen of artery



The plots show the percentage of nerves in regions within <2, <4, <6, <8, and <10 mm from the renal arteries' lumen.

Technical changes in RDN

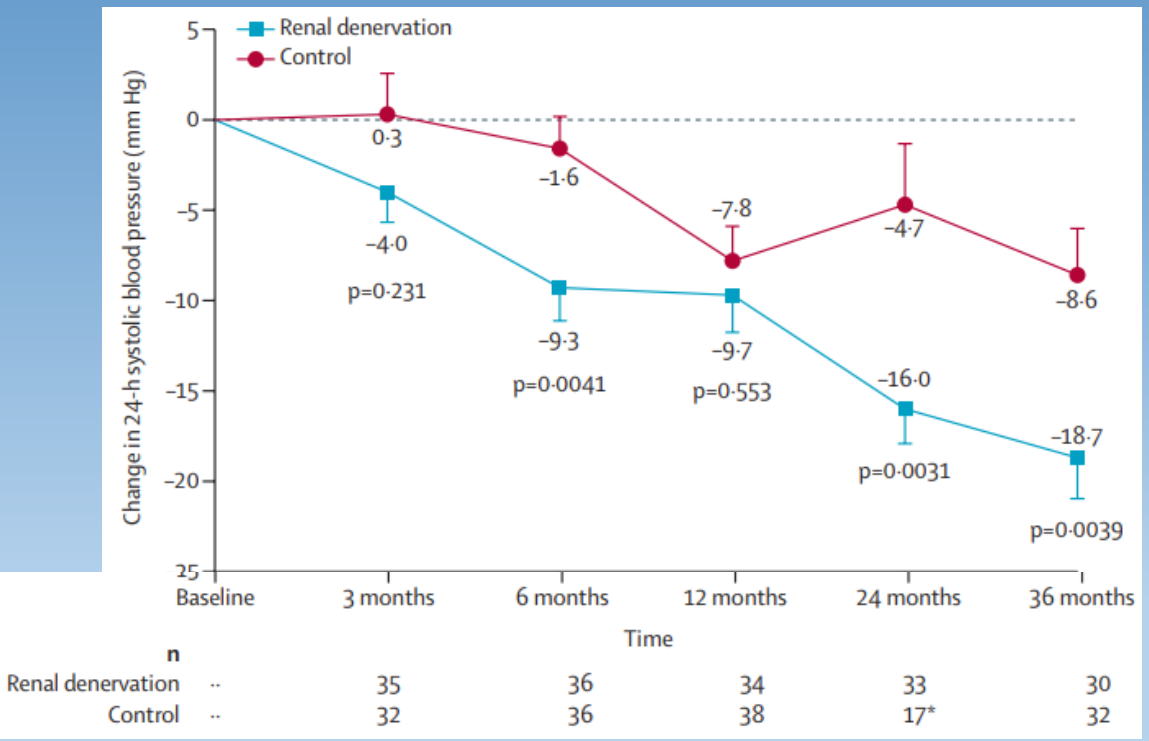
- 4F device 0.014 platform
- Catheter has 4 active zones 5mm apart and can be activated individually
- Ablation into primary branches in addition to main renal artery
- 3-8mm vessel
- Ablation of accessory renal arteries
- 10-12 ablation per kidney

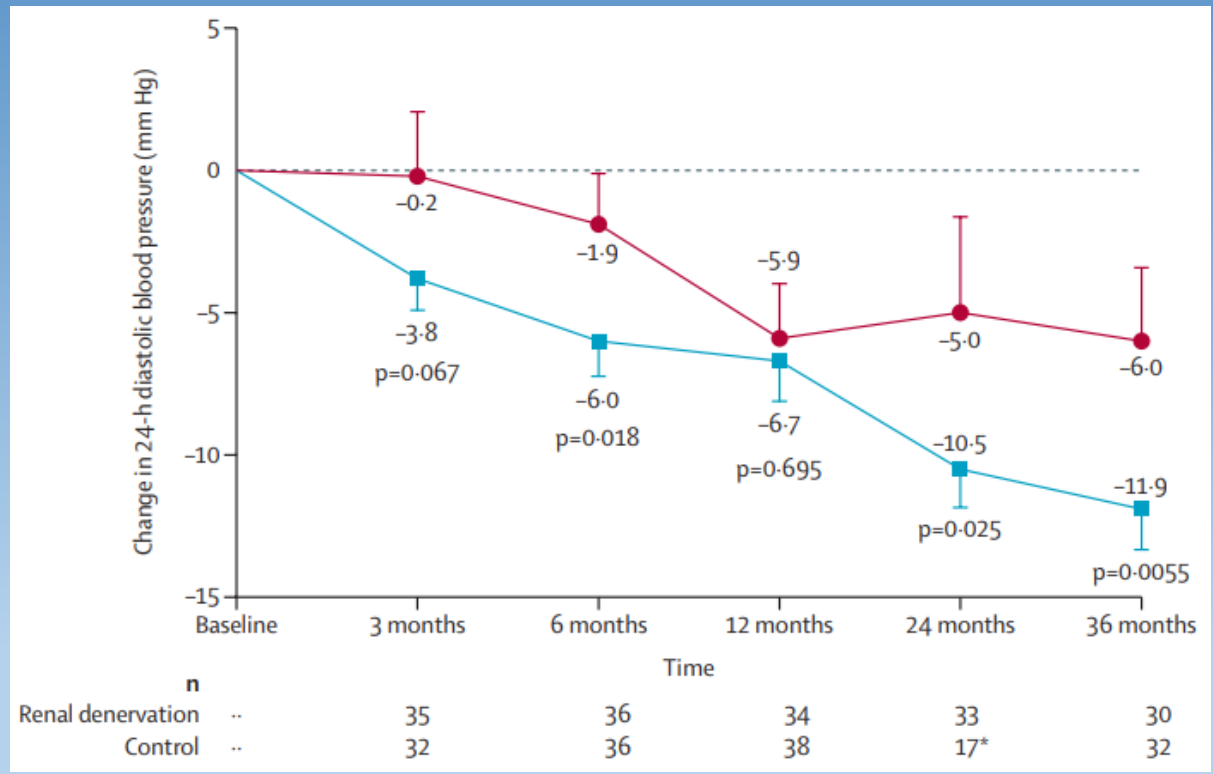


Data supporting the approval by Health Canada and FDA

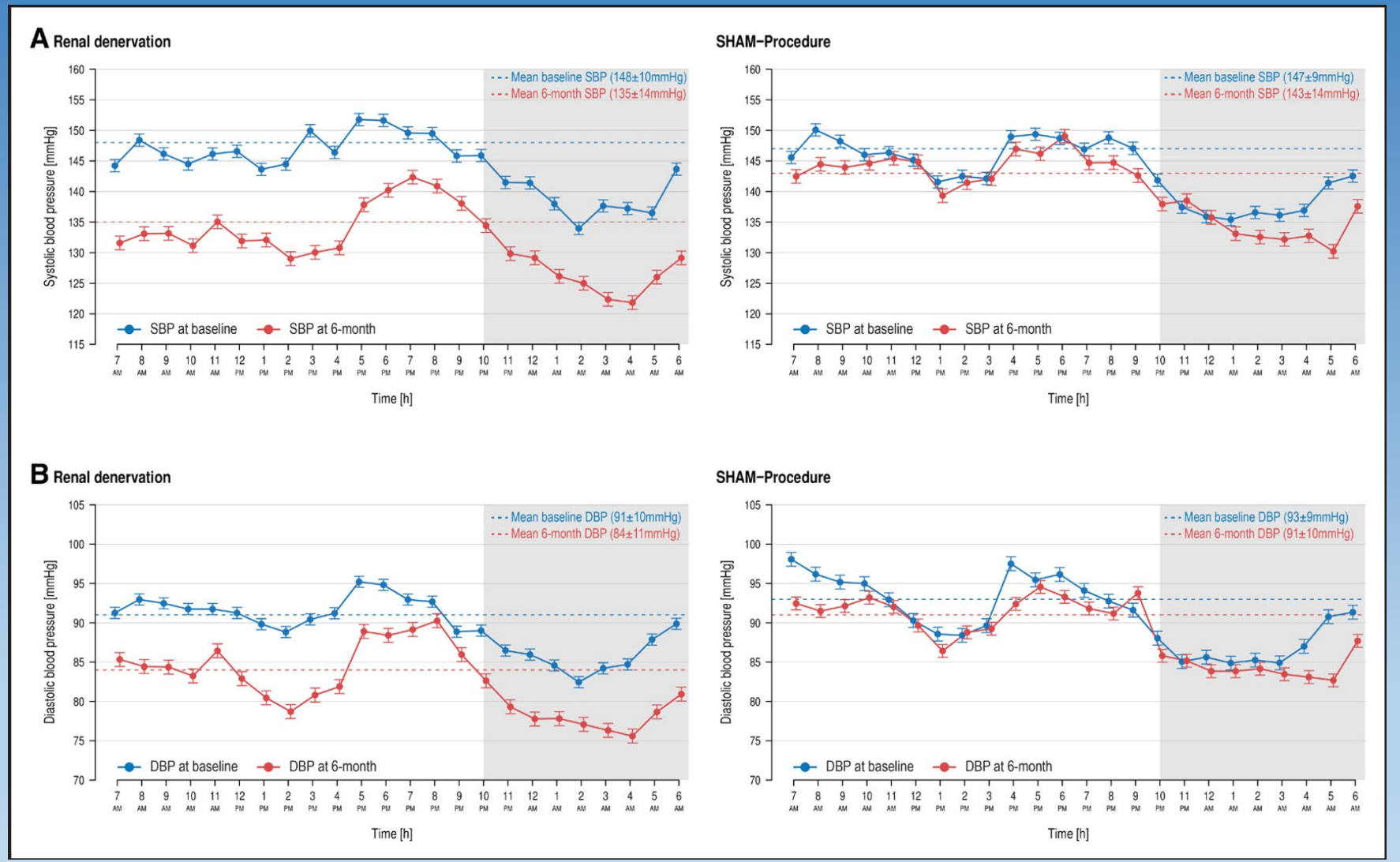
Trial, year published	Sample size, n	RDN system	Exclusion criteria*	Standardized medication	Sham control	MRA use (RDN vs control), %	Follow-up duration, mo	Δ24-h SBP RDN, mm Hg	Δ24-h SBP control, mm Hg	*P* value	Drug surveillance
Absence of medication											
SPYRAL OFF-MED pilot, 2017[4]	80	Spyral	eGFR <45 mL/min/1.73m^2, OH, secondary hypertension, recent vascular events	NA	Yes	NA	3	5.5	0.5	0.04	Yes
SPYRAL OFF-MED Pivotal, 2020[5]	331	Spyral	eGFR <45 mL/min/1.73m^2, OH, secondary hypertension, recent vascular events	NA	Yes	NA	3	4.7	0.6	<0.01	Yes
1–5 medications											
SPYRAL HTN-ON MED pilot, 2018[10]	80	Spyral	eGFR <45 mL/min/1.73m^2, OH, secondary hypertension, recent vascular events	No	Yes	Not allowed	6	9	1.6	<0.01	Yes
SPYRAL HTN-ON MED Expansion, 2023[11]	257	Spyral	eGFR <45 mL/min/1.73m^2, OH, night shift work, T1D, secondary hypertension, poorly controlled T2D	No	Yes	Not allowed	6	6.5	4.5	0.12	Yes

Long-term efficacy and safety of renal denervation in the presence of antihypertensive drugs (SPYRAL HTN-ON MED): a randomised, sham-controlled trial. Mahfoud. Lancet 2022





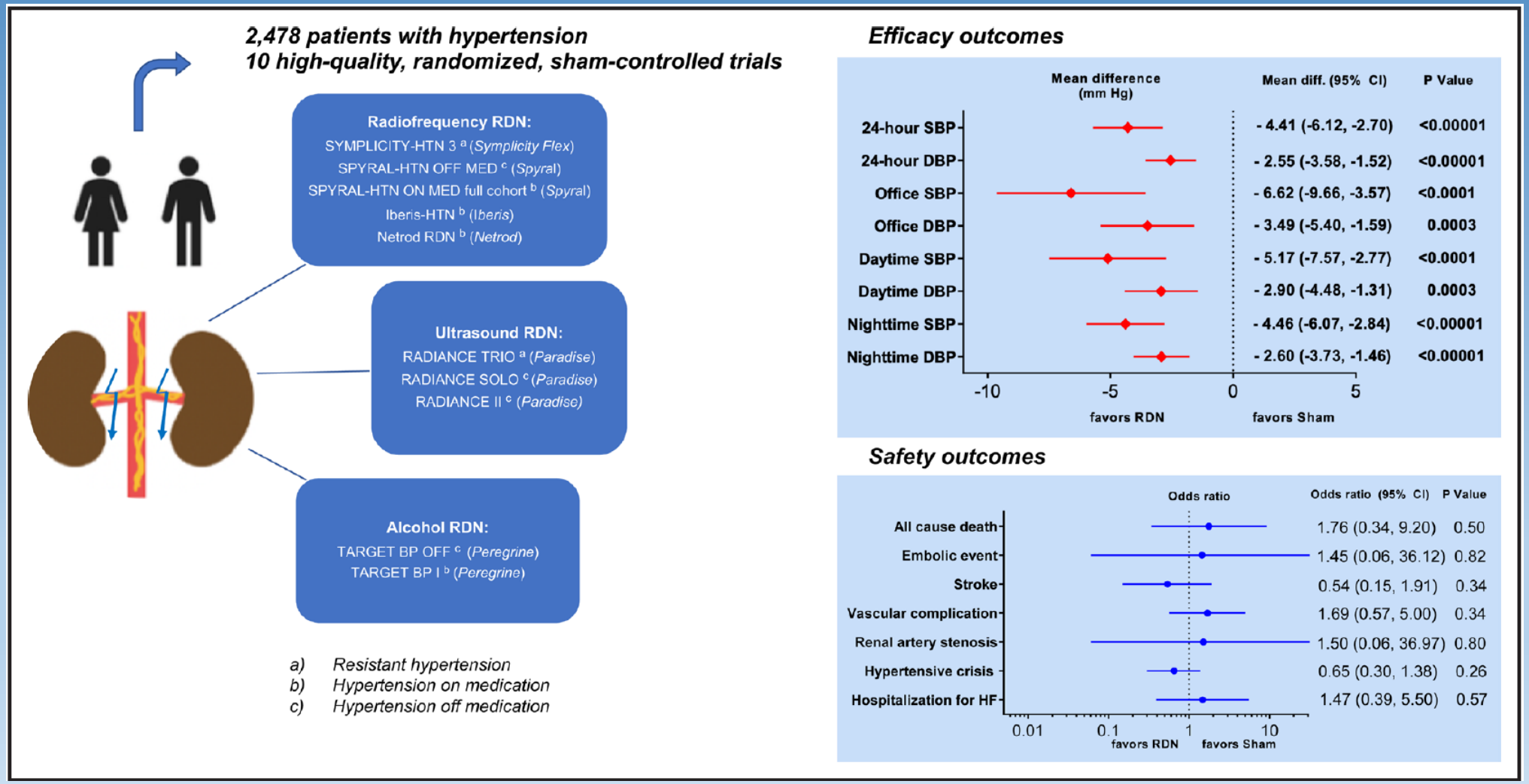
Iberis Device (Radiofrequency) -24hr BP



Circulation. 2024;150:1588–1598

Effects of Catheter-Based Renal Denervation in Hypertension: A Systematic Review and Meta-Analysis

Circulation. 2024;150:1599–1611

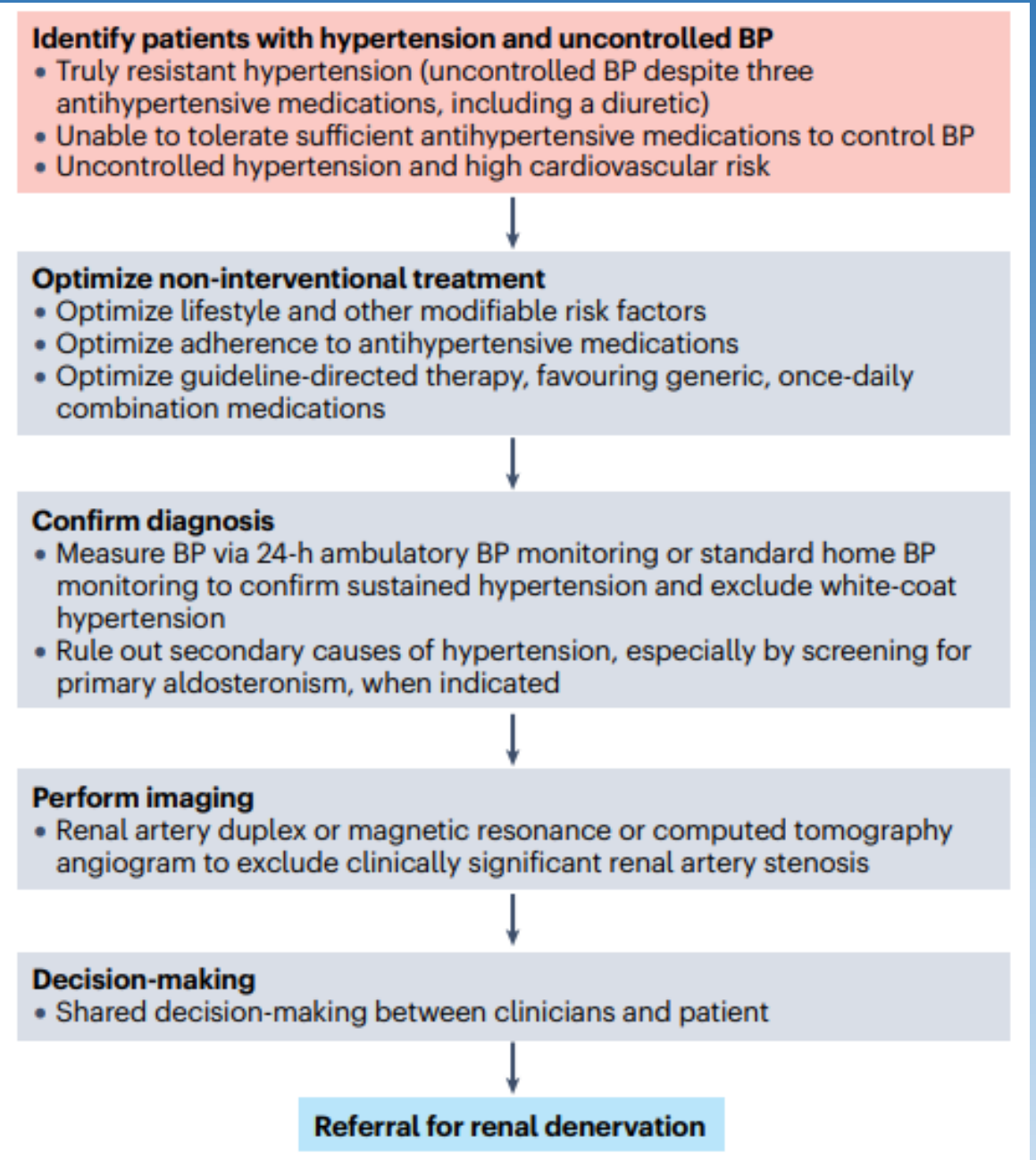


Adverse Events

- Access related
  - 6F guide catheter
- Contrast related
- Pain during procedure
  - 100% during procedure
  - Dull ache flank for few days
- No increase incidence of renal artery stenosis from the thermal energy
- No increase incidence of renal failure even in patients with CKD

Ideal Team for RDN

- Multidisciplinary team
  - HTN specialist (critical)
  - Interventionalist



Contraindication

- Hyperaldosteronism
- Systolic hypertension/arterial stiffening
- Advanced chronic renal failure
- Renal artery stenosis

Cost analysis/effectiveness

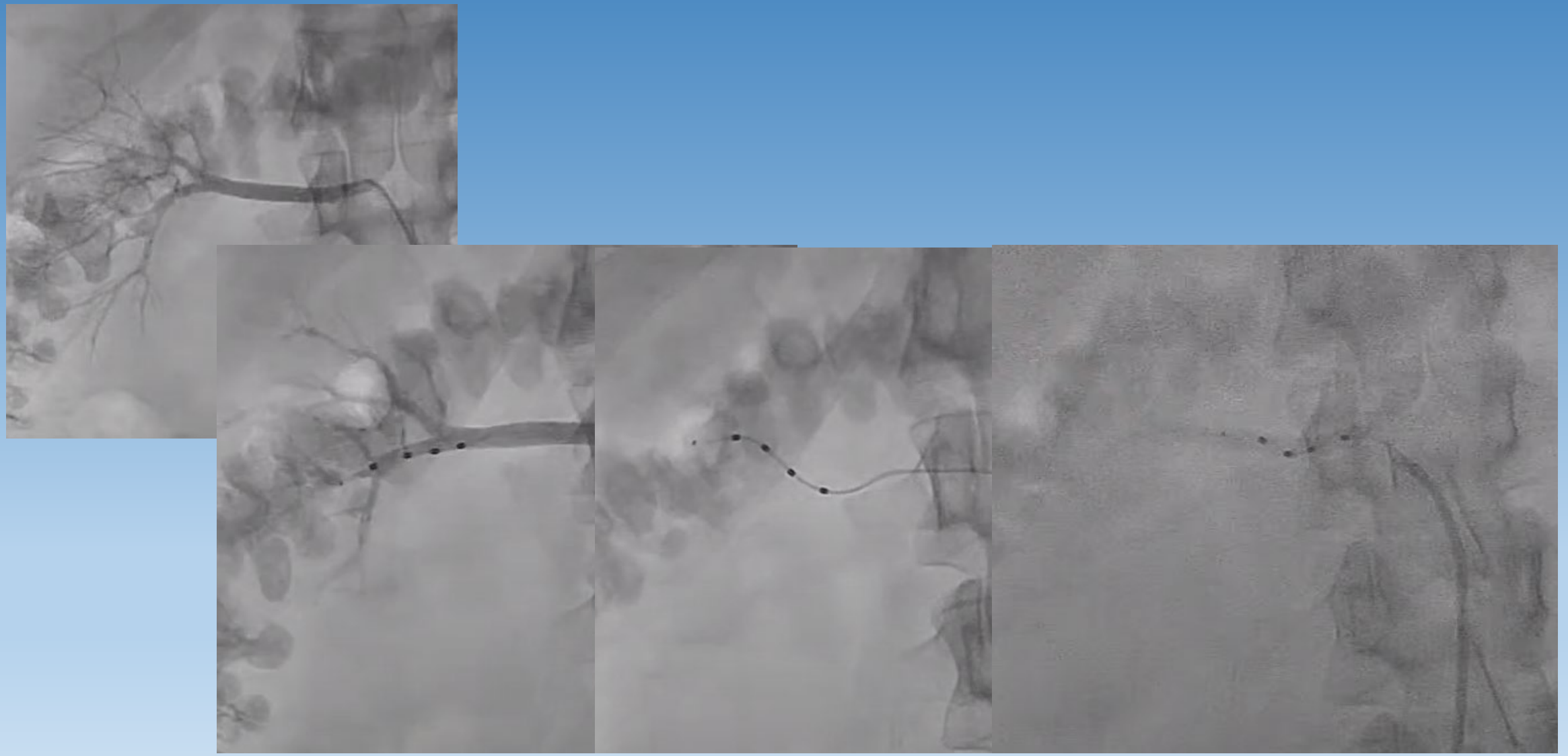
- UK
  - Incremental cost-effectiveness ratio (ICER) of £13 482 per QALY
  - Willingness-to-pay thresholds £20 000–30 000 per QALY gained
- Canada
  - ICER of $23,442 per QALY gained
  - Willingness-to-pay thresholds $50,000 per QALY gained
- USA
  - ICER of $15,923 per QALY gained
  - Willingness-to-pay thresholds $50,000 and $150,000 per QALY gained

J Soc Cardiovasc Angiogr Interv. 2024
Eur Heart J Qual Care Clin Outcomes. 2024
J Clin Hypertens. 2024
J Med Econ. 2025

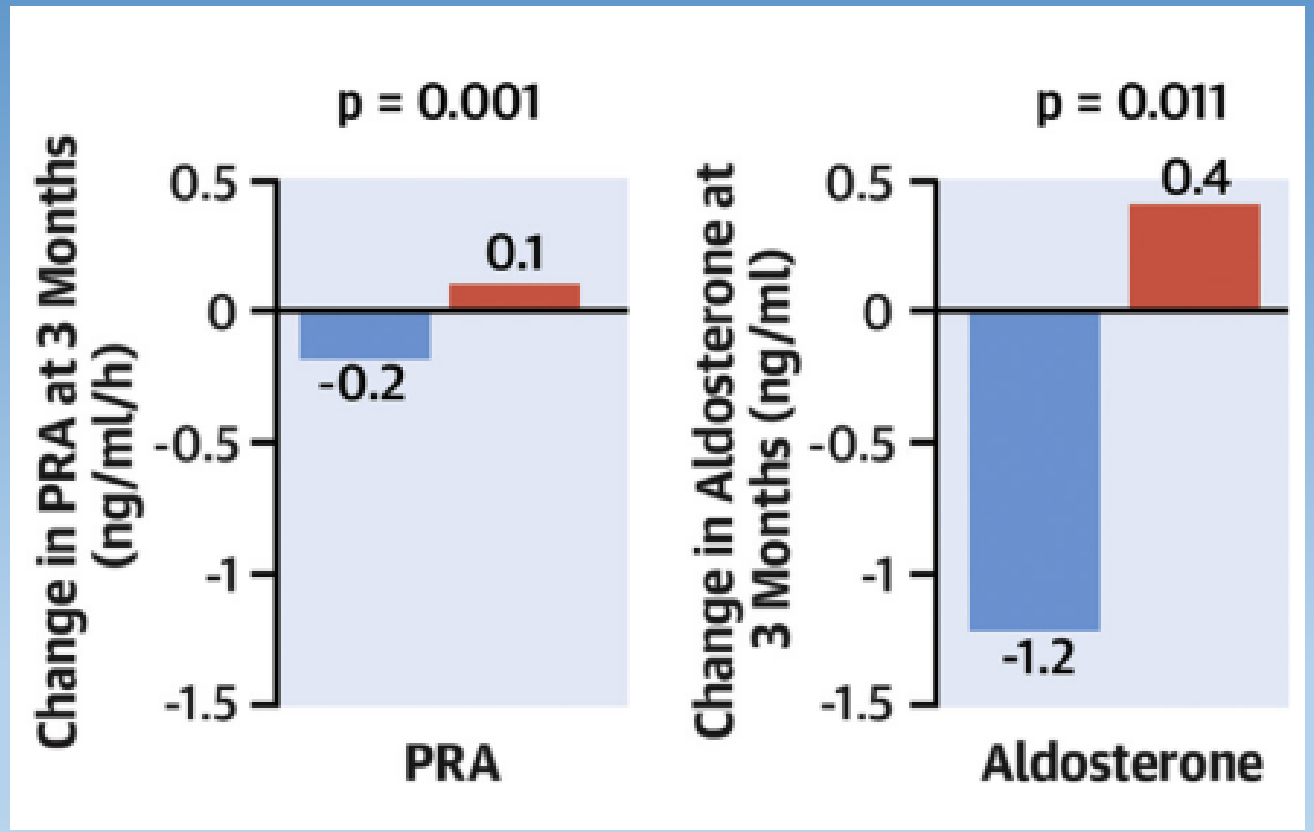
Summary

- Renal denervation technology and techniques have changed substantially from initial Symplicity device
- Short and long-term data are very promising although the initial reduction is BP is small
- Patients selection is critical, hence multidisciplinary team is imperative
- We have the skill to do this procedure!

Technical aspect



Renin and aldosterone level (Symplicity OffMed)



Cost-effectiveness analysis of radiofrequency renal denervation for uncontrolled hypertension in Canada

JOURNAL OF MEDICAL ECONOMICS
2025, VOL. 28, NO. 1, 70–80

Philip A. McFarlane, Mina Madan, Anne M. Ryschon, Sheldon Tobe, Ernesto L. Schiffrin, Raj S. Padwal, Ross Feldman, George Dresser, Lindsay Machan, Hamid Sadri, Khoa N. Cao & Jan B. Pietzsch

Is Radiofrequency Renal Denervation (RF RDN) a cost-effective treatment for uncontrolled hypertension in Canada?

METHODS

- **Markov model** used to project health events, costs, and quality-adjusted life years (QALYs)
- **Blood pressure reduction** derived from HTN-ON MED trial
- **Event risk reductions** informed by meta-analysis of hypertension trials
- Lifetime **ICER** evaluated against willingness-to-pay threshold of $50,000/QALY

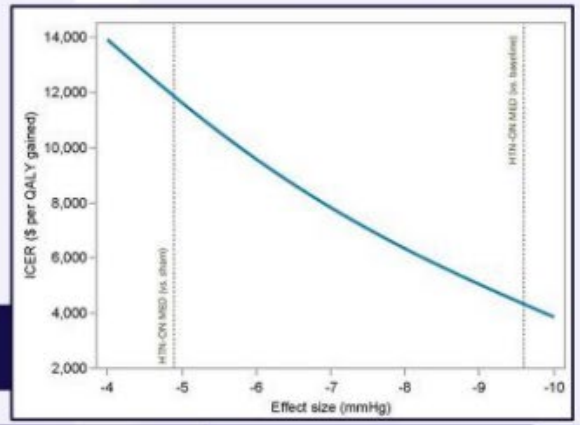
FINDINGS

Meaningful **clinical event reductions** (10-year relative risks reduced by 4-28%)

Over lifetime **0.51** QALYs gained

at incremental cost of **$6,031**

Resulting in **ICER** of **$11,809** per **QALY**



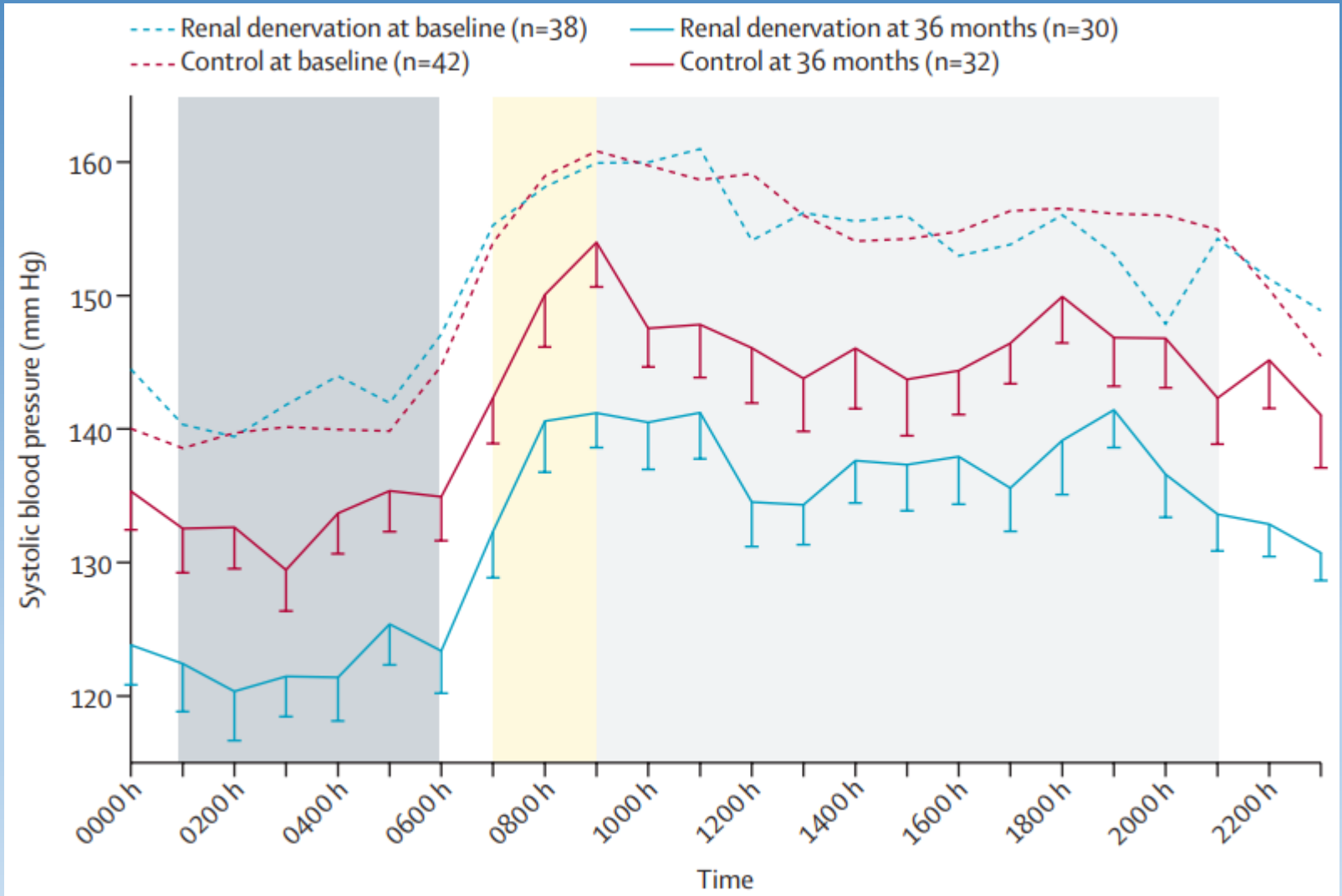
CONCLUSION

RF RDN is a cost-effective treatment in the Canadian healthcare system

JME Journal of Medical Economics

McFarlane PA, Madan M, Ryschon AM, et al. (2024) – *Complete reference to be added once available*

Ambulatory hourly systolic pressure chart at 36 mths



- Most benefits
  - High baseline BP
  - Pt with HTN related complication- left ventricular hypertrophy, CKD, cardiovascular disease

  - No data on obesity, sleep apnea, renal transplant, solitary kidney, impaired renal function