

Renal Denervation

New Techniques, New Devices and Future Perspectives

Ian T. Meredith AM

MBBS, PhD FRACP, FCSANZ, FACC, FSCAI, FAPSIC, FAHA

Professor and Director of MonashHEART,
Monash Medical Centre, Monash Health

&

Professor of Medicine, Monash University Melbourne, Australia

TCTAP Seoul 24th April, 2014

Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

Affiliation/Financial Relationship

- Consulting Fees/Honoraria

Company

- Boston Scientific,

Renal Denervation

New Techniques, New Devices and Future Perspectives

Does it have a future?

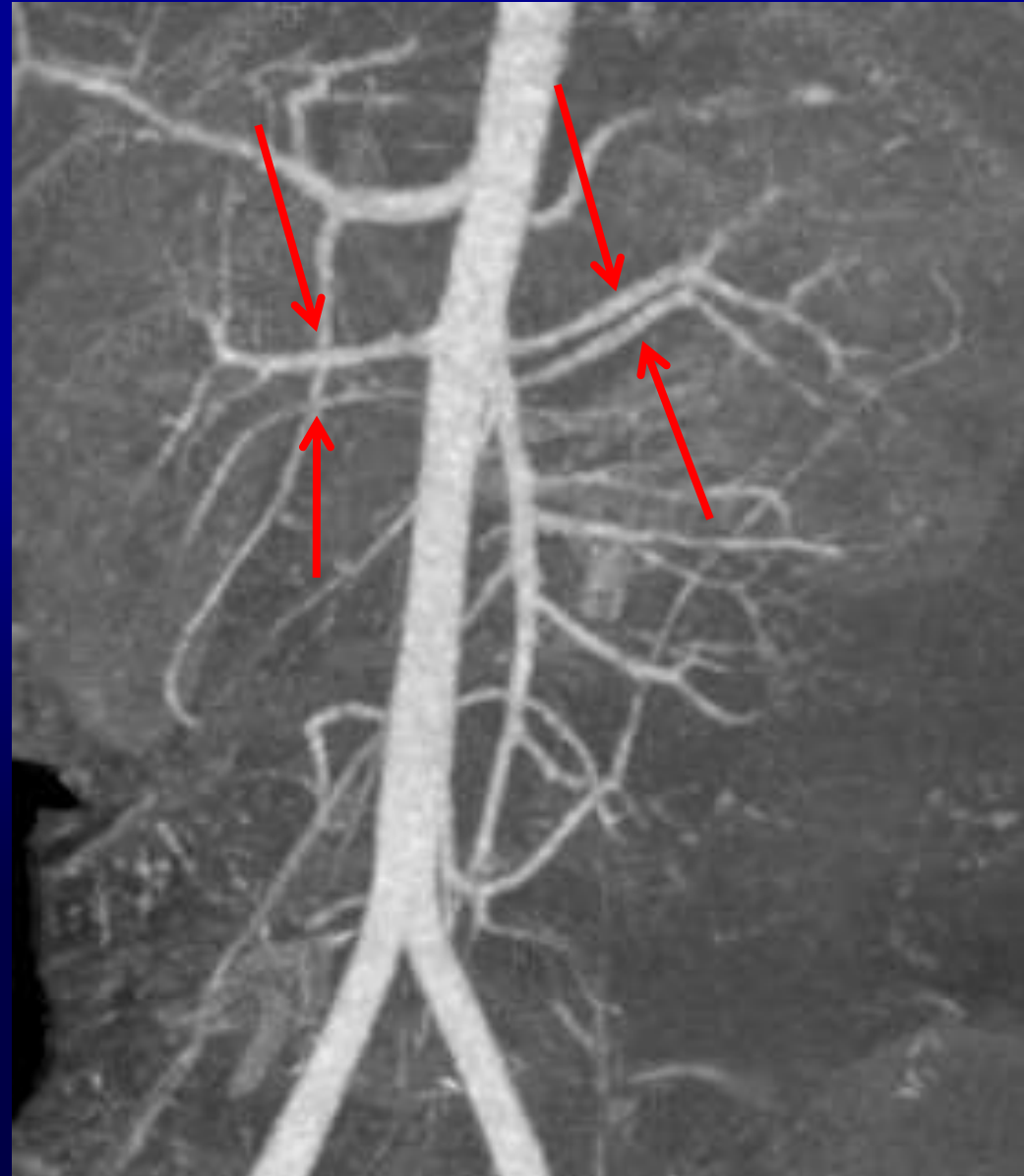
Absolutely



Medications

- Felodipine 10mg mane
- Prazosin 5mg tds
- Hydralazine 25 mg BD
- Aspirin 100 mg alternate days
- Phenytoin 75 mg BD, 50mg middi
- Zonisamide 100 mg bd
- Lamotrigine 200 mg bd
- Modafinil 200 mg BD
- Amitriptyline 50mg nocte
- Ferro liquid 7 mls BD
- NaHCO₃ i BD
- Nifedipine 10 mg BD
- Atenolol 75mg mane, 50mg nocte
- Frusemide 40 mg daily
- Neulactil 2.5 mg nocte
- Clobazam 10 mg bd
- Strattera 35 mg mane
- Aranesp 40 ug twice weekly
- Ostelin 1 tablet midday

CT Angiogram



Follow-up

- **At Baseline:**
 - 24hr ABP = average daytime BP 154/89 (15 records in 12/12)
 - Home BP >200/100 Frequently
- **At 3-months** – no home SBP > 180mmHg
- **At 6-months** – no home SBP > 160mmHg
- **At 12-months** – no home SBP > 140mmHg
 - 24hr ABP = average daytime BP 129/69
 - No seizures since 6-months
 - Dramatic reduction in poly-pharmacy
 - Markedly improved academic performance / behaviour

Targeting Sympathetic Nervous Activity in the Treatment of Hypertension

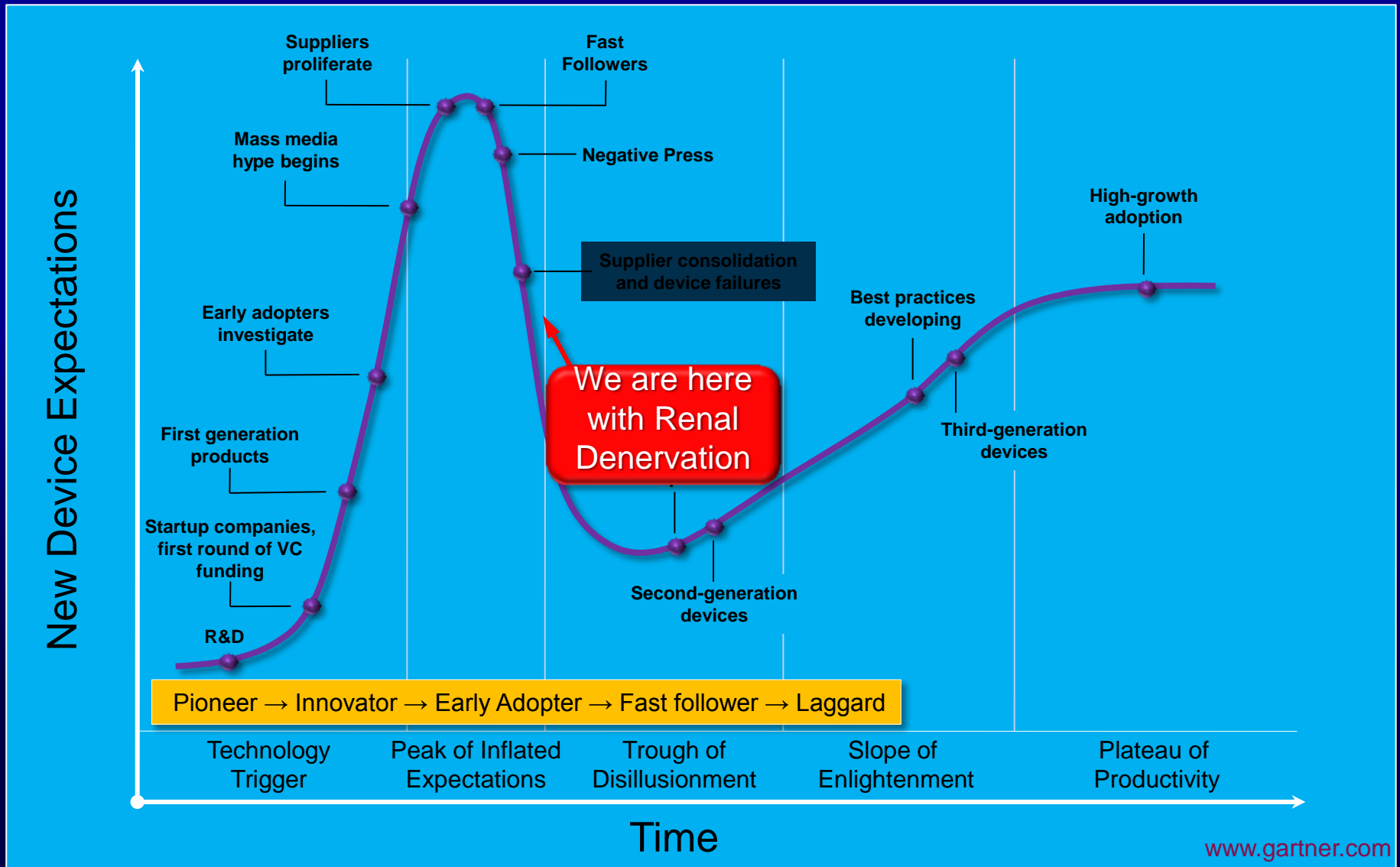
Greater than 100 years of accumulated evidence supporting the role of SNS in BP regulation and genesis and treatment of Hypertension

- Sophisticated experimental animal models
- Human physiological and pharmacological studies
- Surgical interventions - sympathectomies
- Renal denervation studies up to HTN IIII

But SNS is not the only or necessarily the predominate cause, facilitator or enabler of Essential Hypertension

This is just too simple

New Device Hype Cycle



The Law of the Instrument

Baruch's Observation

“ I suppose it is tempting ... if the only tool you have is a hammer to treat everything as if it were a nail ”

*Abraham Maslow
Toward a Psychology of Being, 1962*

Renal Sympathetic Denervation

Still Part of the Hypertension Armamentarium ?



Renal Sympathetic Denervation

Patient selection

- All hypertension, resistant, borderline, early?
- High absolute risk, ?
- Target organ damage LVH, Arterial stiffness, μ albuminuria, CIT ?

Trial Design & Methodologies

- Run in, medication control
- Sham , Placebo
- Hawthorne effect, Compounding factors, uncontrolled and unmeasured modifiers
- Endpoints – appropriate BP metrics

Technical, technique and procedural Considerations

- Learning curve, accessory vessels,
- Method, number, density and distribution of ablations

Renal Sympathetic Denervation

- **Increased Sympathetic Nervous Activity is not the only or necessarily the main cause of essential hypertension or resistant hypertension**
- **Modifying or attenuating regional sympathetic efferent or afferent outflow (even if successful) may not effectively control hypertension**
- **Identifying in whom the treatment might be successful and demonstrating the treatment (once delivered) is effective must be the next goal**

Regional NE Spillover in Human Hypertension

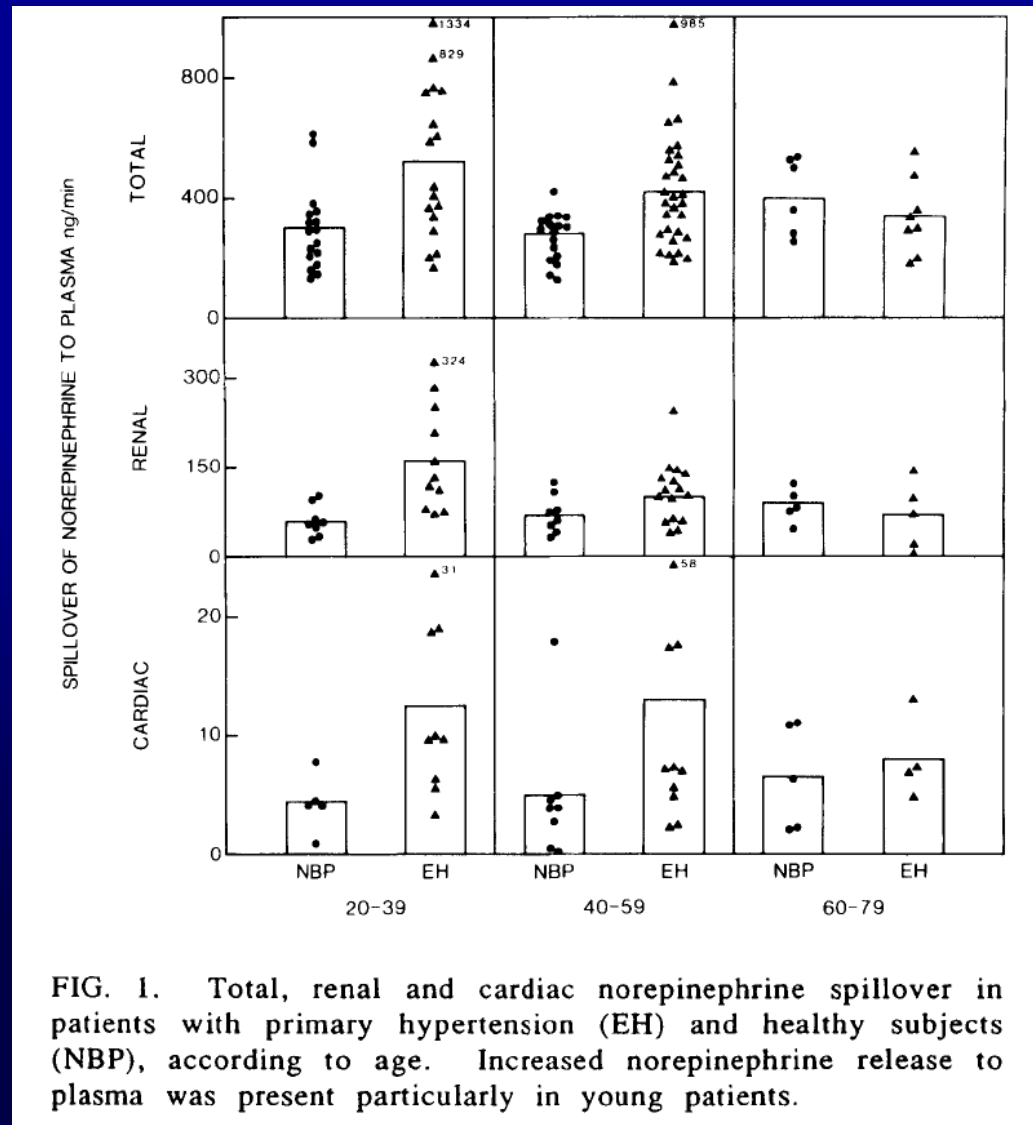


FIG. 1. Total, renal and cardiac norepinephrine spillover in patients with primary hypertension (EH) and healthy subjects (NBP), according to age. Increased norepinephrine release to plasma was present particularly in young patients.

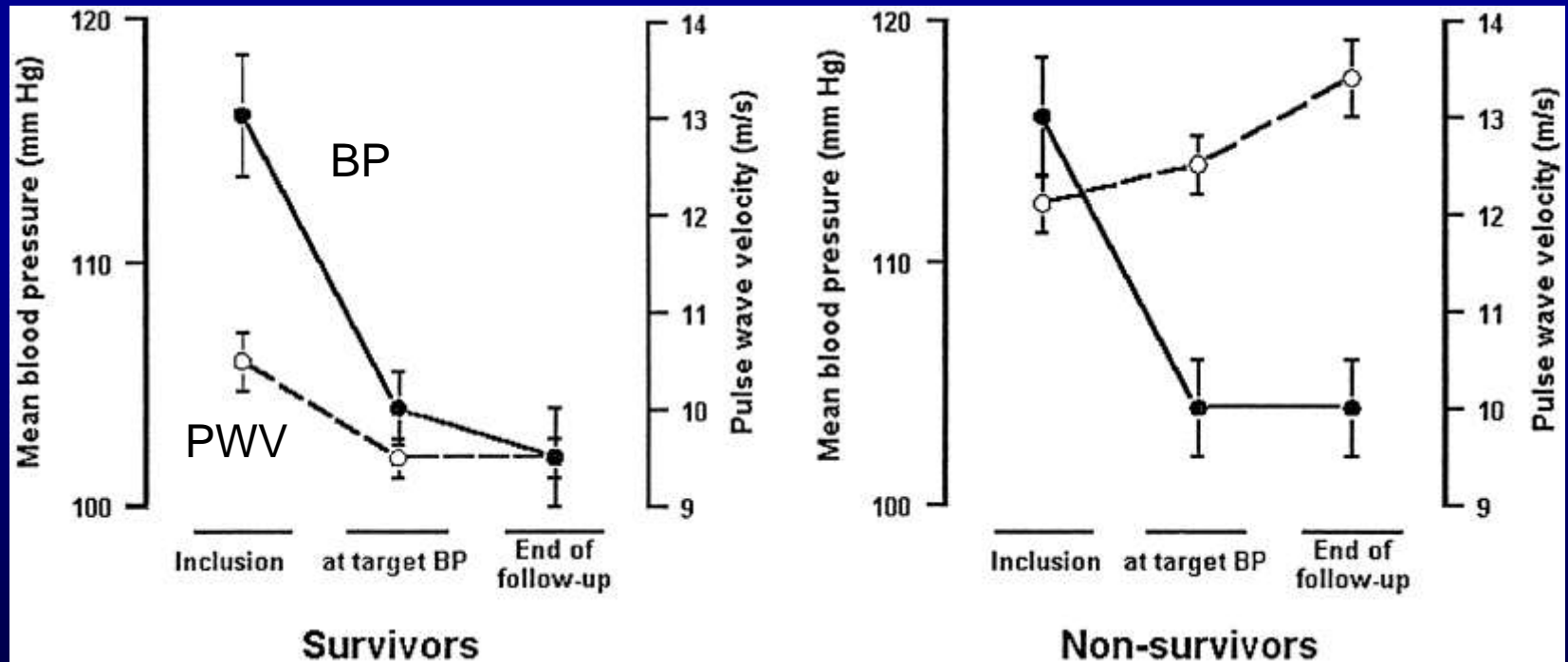
Autonomic NS Dysregulation in Human Hypertension

DECREASE OF SYMPATHETIC TONE IN THE COURSE OF HYPERTENSION

Decreased β -adrenergic responsiveness and decreased stroke volume, combined with the structurally increased vascular responsiveness, provide a plausible explanation for the transition from high cardiac output to elevated vascular resistance in the evolution of hypertension.

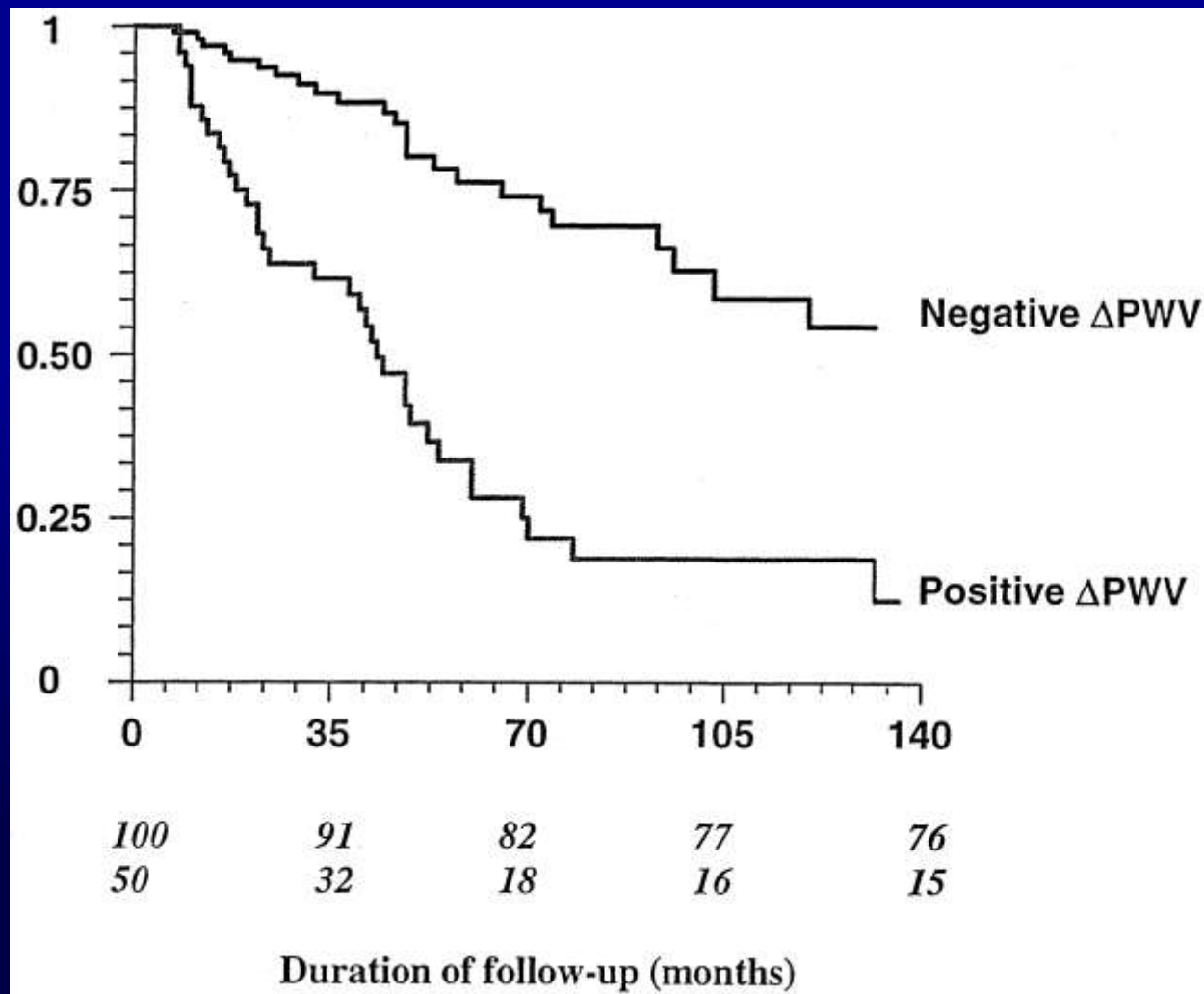
However, an explanation is also needed for the parallel decrease of sympathetic tone. As hypertension advances, sympathetic activity is less evident.

Impact of Aortic Stiffness Attenuation on Survival of Patients in End-Stage Renal Failure










Changes of MBP (solid circle) and aortic PWV (open circle) from inclusion to end of follow-up for survivors and nonsurvivors.

Probability of all-cause survival according to Δ PWV under antihypertensive therapy.

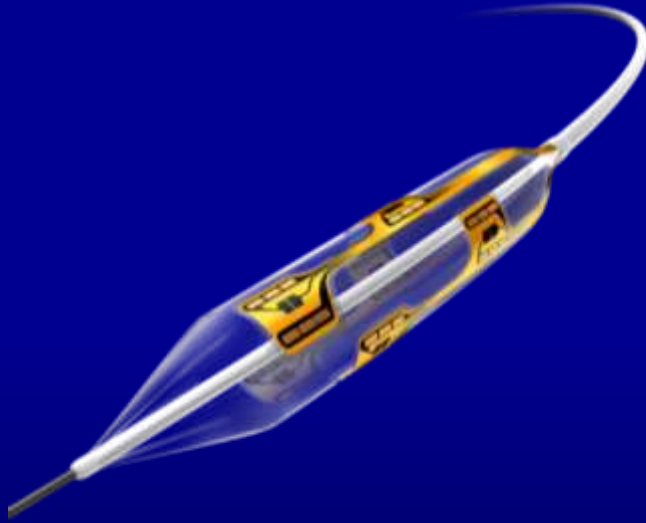


Renal Denervation Technologies

	MDT Symplicity	MDT Spyral	STJ EnligHTN	COV OneShot	ReCor Gen-2 Paradise	JNJ ThermoCool	BSC Vessix
							
CE Mark	✓	No	✓	✓	✓	No	✓
Catheter Design	Catheter with single electrode	Pigtail Catheter 4 electrodes	Basket with four electrodes	Balloon catheter helical electrode and cooling	Balloon catheter; internal cooling; <i>Circumferential treatment</i>	Pigtail catheter with 5 electrodes and cooling	Balloon catheter 4-8 electrodes
Balloon	No	No	No	✓	✓	No	✓
Guidewire	No	✓	No	✓	✓	No	✓
Energy	Monopolar RF	Monopolar RF	Monopolar RF	Monopolar RF	Ultrasound	Monopolar RF	Bipolar RF
Power	8W	Unknown	6W	25W	~12W	Unknown	~1W
Energy Delivery Time	2 min.	1 min.	1 min	2 min.	30 sec.	Unknown	30 sec.
Total Treatment Time	16-24 min.	4 min.	4 min.	4 min.	3 min.	Unknown	1-2 min.

Vessix™ Renal Denervation System

Technology Overview

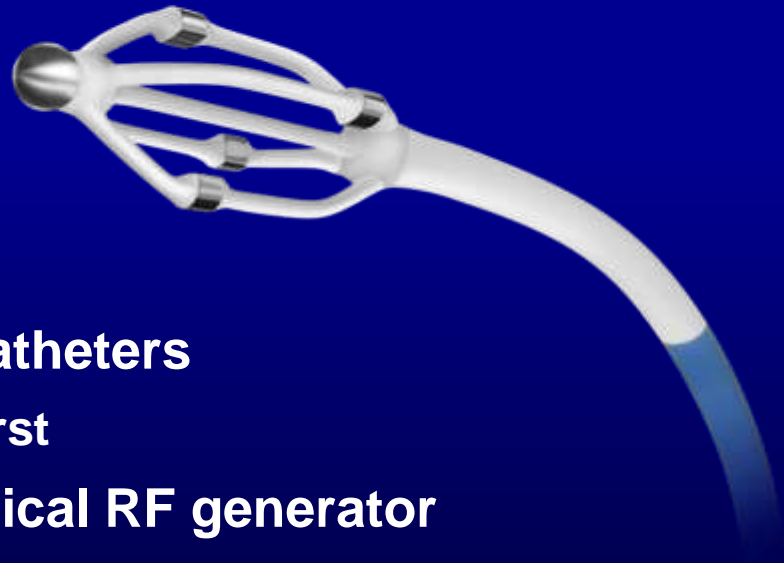


- ♥ Balloon-based technology (sizes 4 – 7 mm)
- ♥ Low pressure non-compliant balloon (3 atm/304 kPa)
- ♥ Helical pattern of RF electrodes enabling uniform treatment
- ♥ 30 sec treatment time with up to 8 RF electrodes activated simultaneously
- ♥ Electrodes that are un-apposed to vessel wall are automatically deactivated
- ♥ Bipolar energy delivery, using energy of $\sim 1\text{W}$
- ♥ Temperature control algorithm ensures energy delivery at precisely 68°C
- ♥ One button operation

EnligHTN™ Ablation Catheter

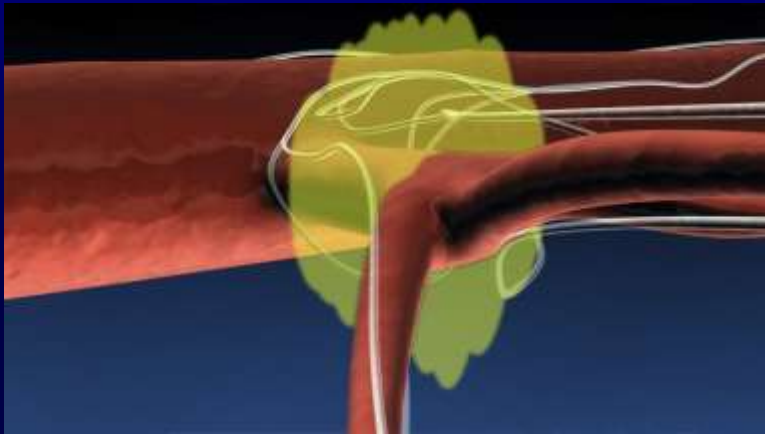
Key Features

- Multi-electrode
- 8 F compatible
- Deflectable , atraumatic tip
- Common femoral access
- Durable electrodes
- Easy insertion with guiding catheters
 - Hemostatic hub and Tuohy Borst
- Compatible with St. Jude Medical RF generator



External Ultrasound Surround Sound[®] Ablative Field

- Shape of ultrasound energy field designed to provide coverage of renal nerves
- Ablates nerves with minimal impact artery and surrounding tissues



Treatment with Renal Denervation?

