

TCT AP
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Current Procedural Recommendations for Renal Denervation in 2016

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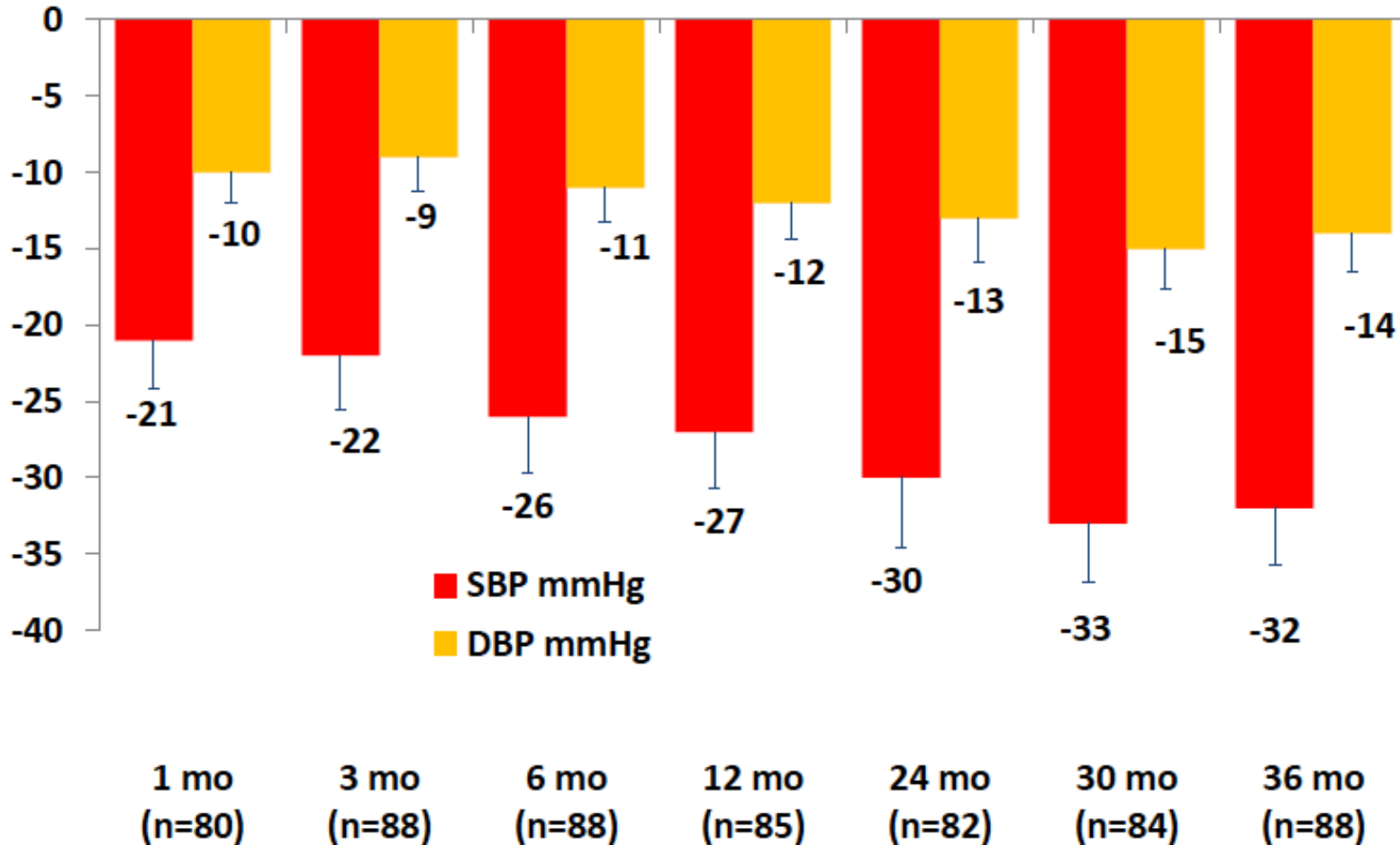
You know the story!

Transcatheter renal denervation did not come out of the Blue

- Histology findings
- Pathophysiological considerations
- Animal data
- Surgical experience
- Proof of concept studies
- Results from prospective controlled clinical trials
- Clinical experience

SYMPPLICITY HTN-1

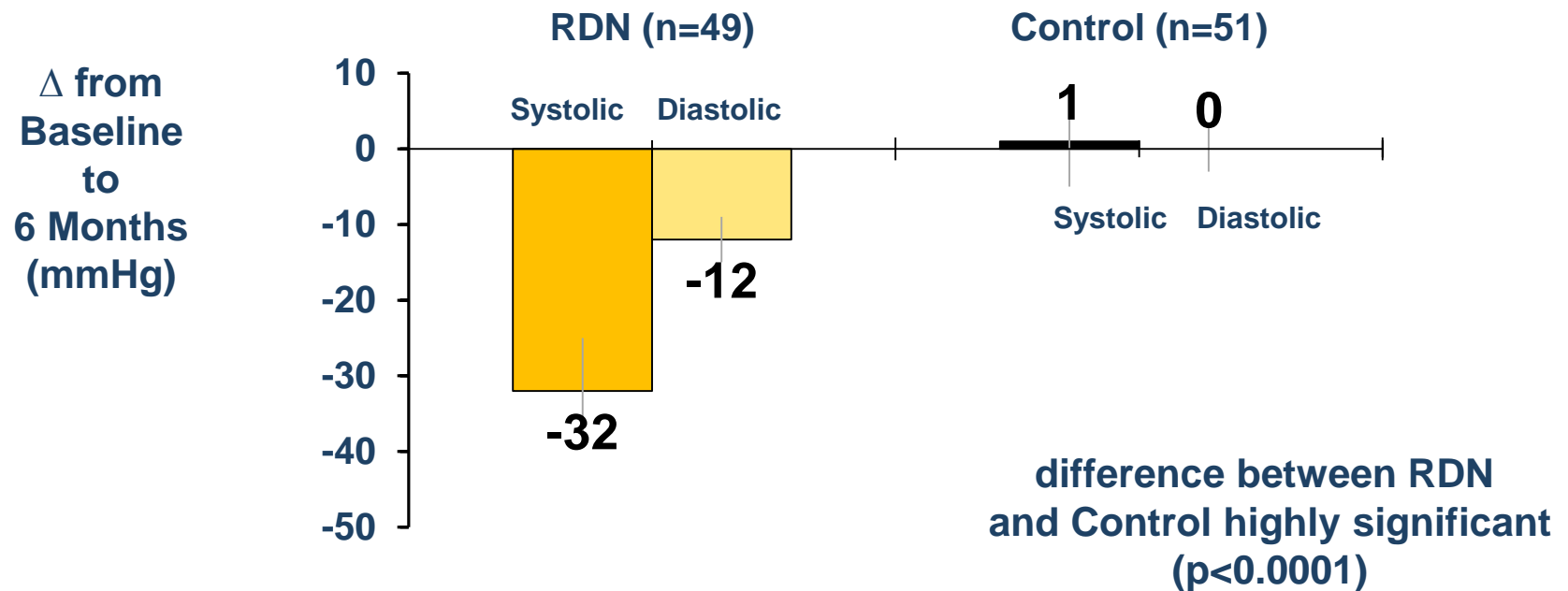
Shows Long-Lasting Changes in Office Blood Pressure
Mean BP decrease in 88 patients seen until 30 months



Krum ESC 2013

SYMPPLICITY HTN-2

Primary Endpoint: 6-Month Office BP



- 84% of RDN patients had ≥ 10 mmHg reduction in SBP
- Only 10% of RDN patients had no reduction in SBP

So there was no doubt
that renal denervation as
a concept is working

Renal denervation
was one of the most promising
new treatment options in
cardiovascular medicine



Medtronic

NEWS RELEASE

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FOR IMMEDIATE RELEASE

**MEDTRONIC ANNOUNCES U.S. RENAL DENERVATION
PIVOTAL TRIAL FAILS TO MEET PRIMARY EFFICACY ENDPOINT
WHILE MEETING PRIMARY SAFETY ENDPOINT**

MINNEAPOLIS – January 9, 2014 – Medtronic, Inc. (NYSE: MDT) today announced that its U.S. pivotal trial in renal denervation for treatment-resistant hypertension, SYMPPLICITY HTN-3, failed to meet its primary efficacy endpoint. The trial met its primary safety endpoint, and the trial's Data Safety Monitoring Board (DSMB) concluded that there were no safety concerns in the study.

So why a renal denervation talk in a
"Future Technology" Session

... and not in a "Past Technology" Session?

Because Dr. Seung-Jung Park strongly
believes that renal denervation has a
future ...

... and he is not the only one!

Over the last 2 years, multiple reasons have been identified why HTN-3 has failed

Procedural details played a major role

Other research discovered other procedural factors which are important for renal denervation

Renal denervation
in 2016
is very different
from 2014

In 2014

- Renal denervation is so great, that even if you
 - are missing accessory renal arteries
 - can do it only on one side
 - can do only a few ablations
 - are not really circumferential
 - and do not have optimal wall contact
- You will still be fine!

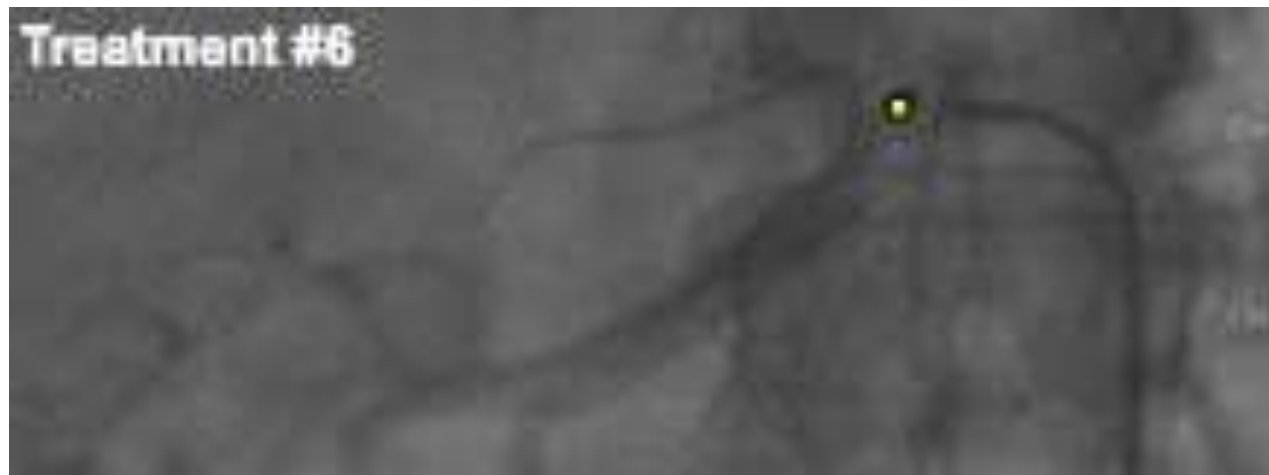
The Americans (in HTN-3)
followed this advice ...

- Mean number of ablations per renal artery < 4
- Circumferential ablation in only 25% of the arteries

... and where blamed by the
Europeans to be stupid operators

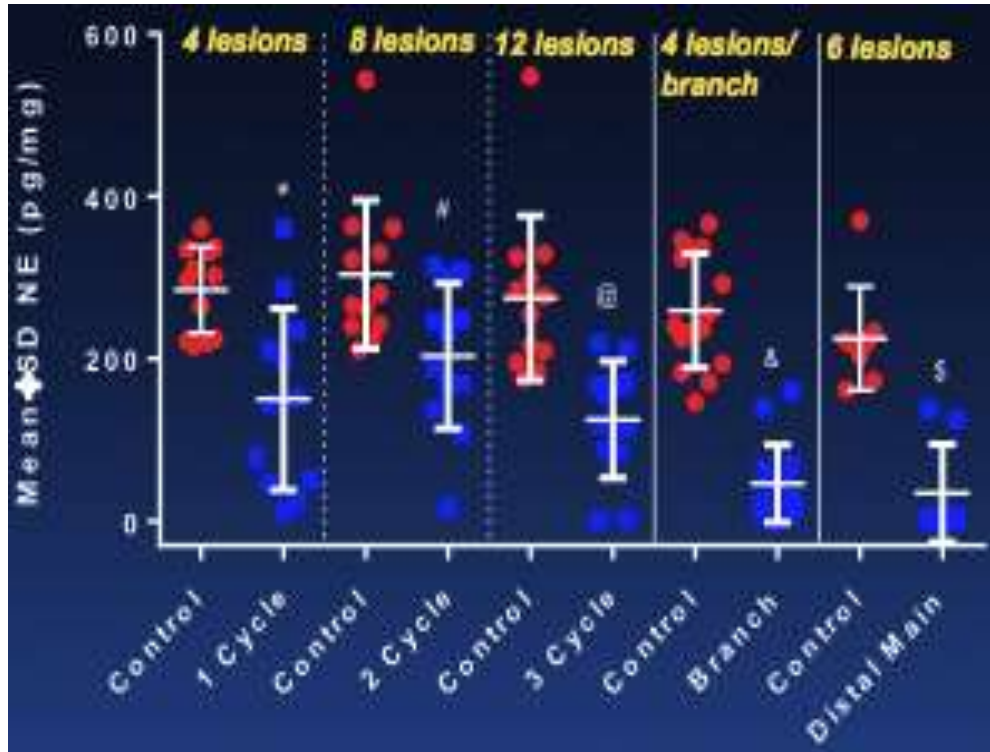
Other important tips and tricks in 2014

- Avoid distal branches if possible because that may be dangerous
- Proximal is most important



Today we know that the effect
of renal denervation
is dose dependend

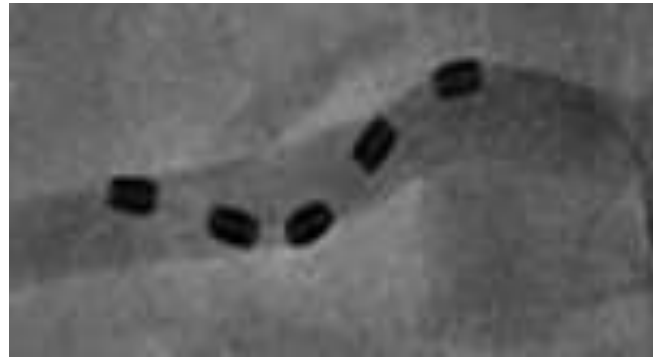
There is a dose response of renal denervation in animal tests



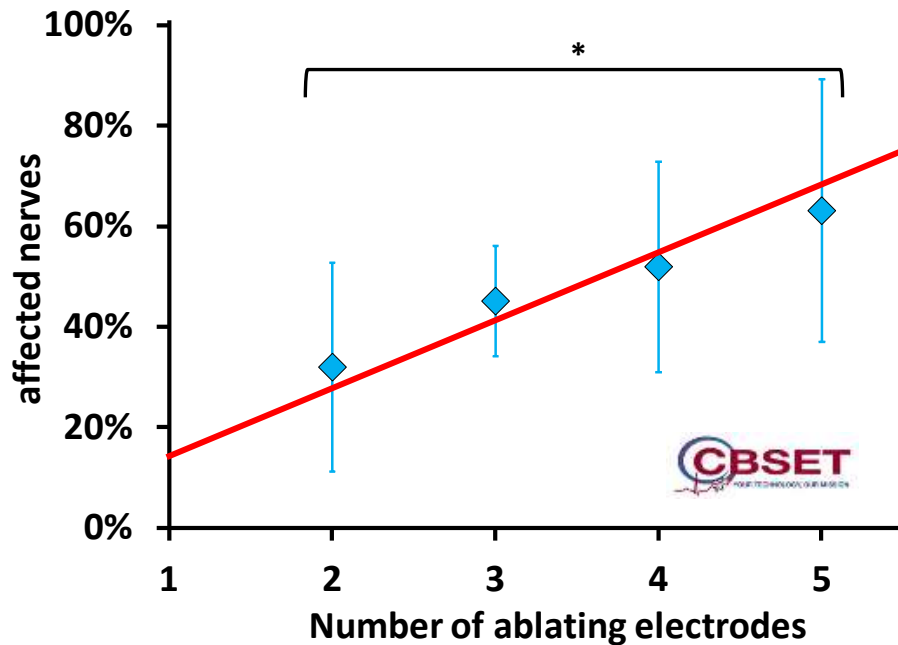
- With 12 ablations (compared to 4 or 8 ablations) in the main artery a more consistent decrease in tissue NE could be achieved
- Also, additional branch ablations are beneficial

● control
● treatment

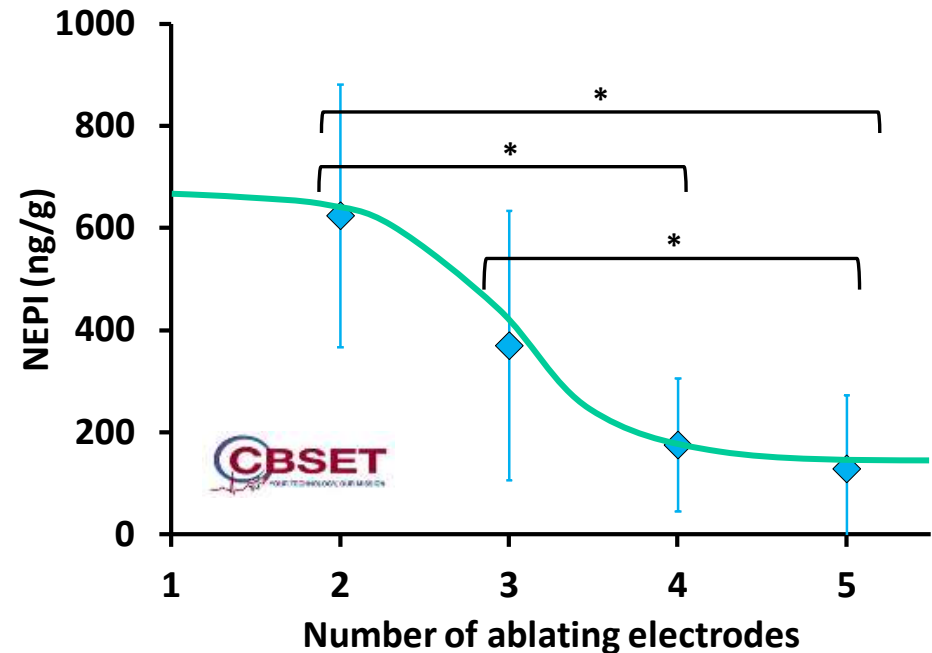
More helical electrodes cause more denervation and more Norepinephrine reduction



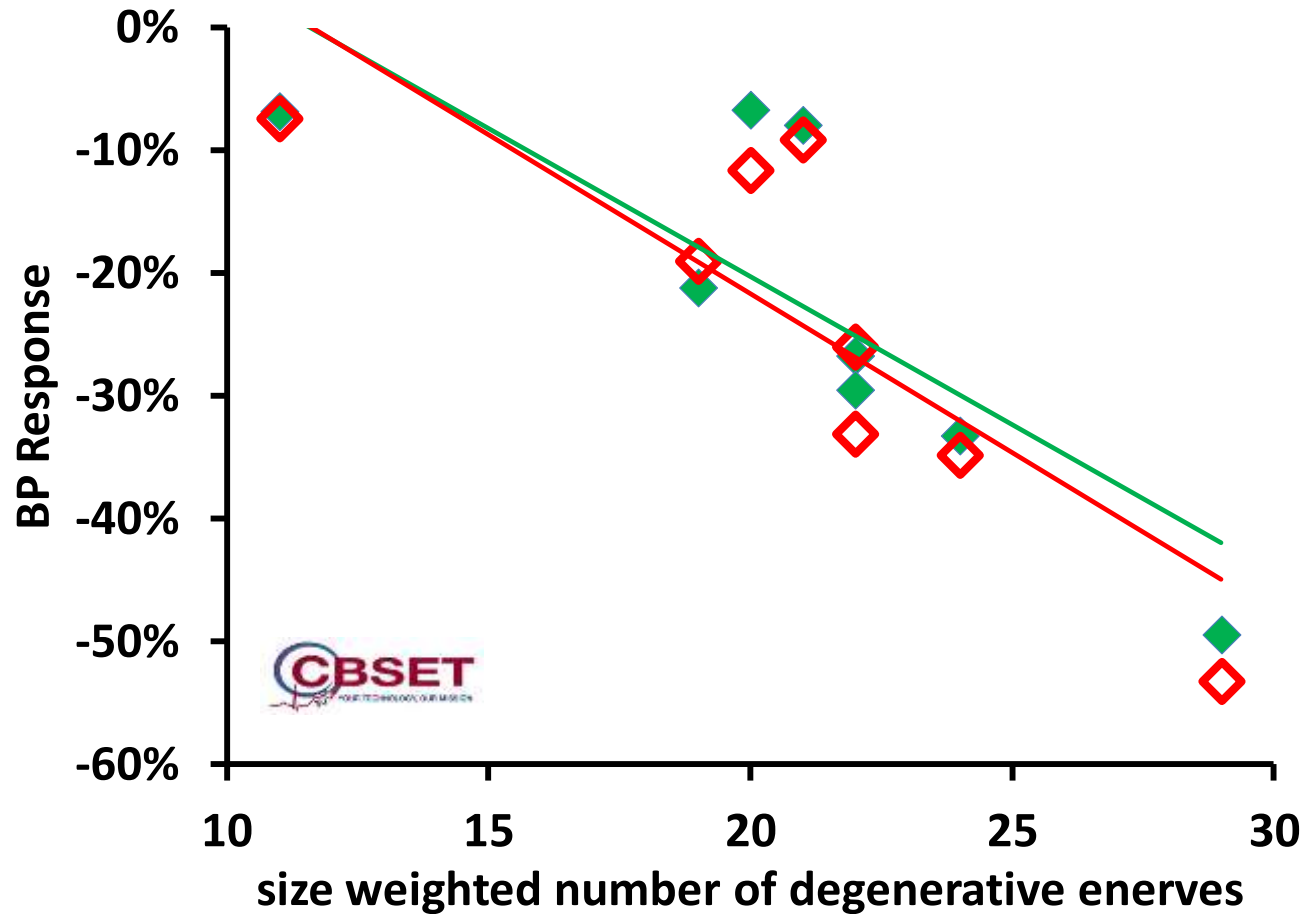
% Denervation



NEPI Reduction



More denervation causes more blood pressure reduction

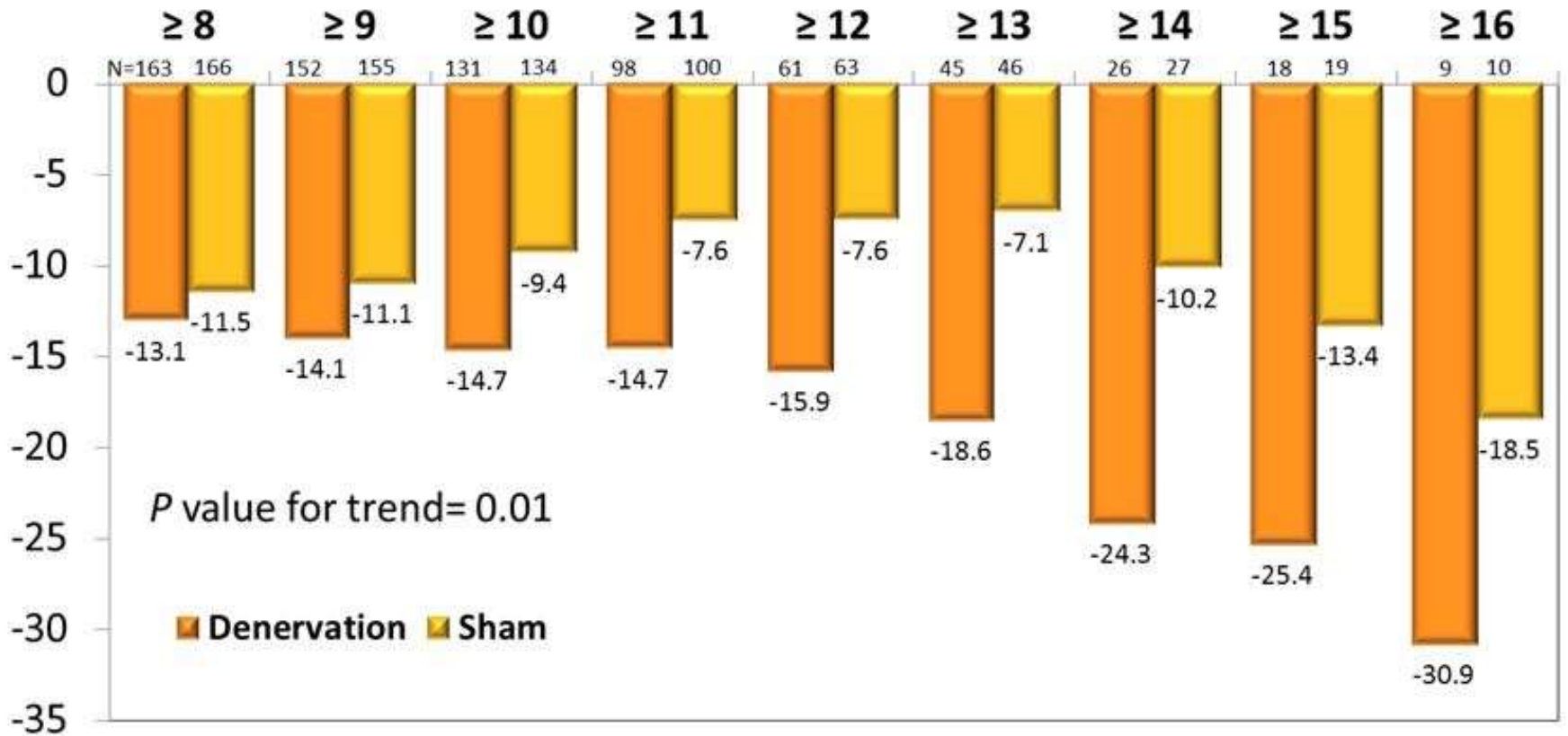


Unilateral Renal RDN

5-electrode treatments: 9 to 10W/60 sec

Post hoc analysis of HTN-3

HTN-3: Influence of number of ablations on blood pressure reduction



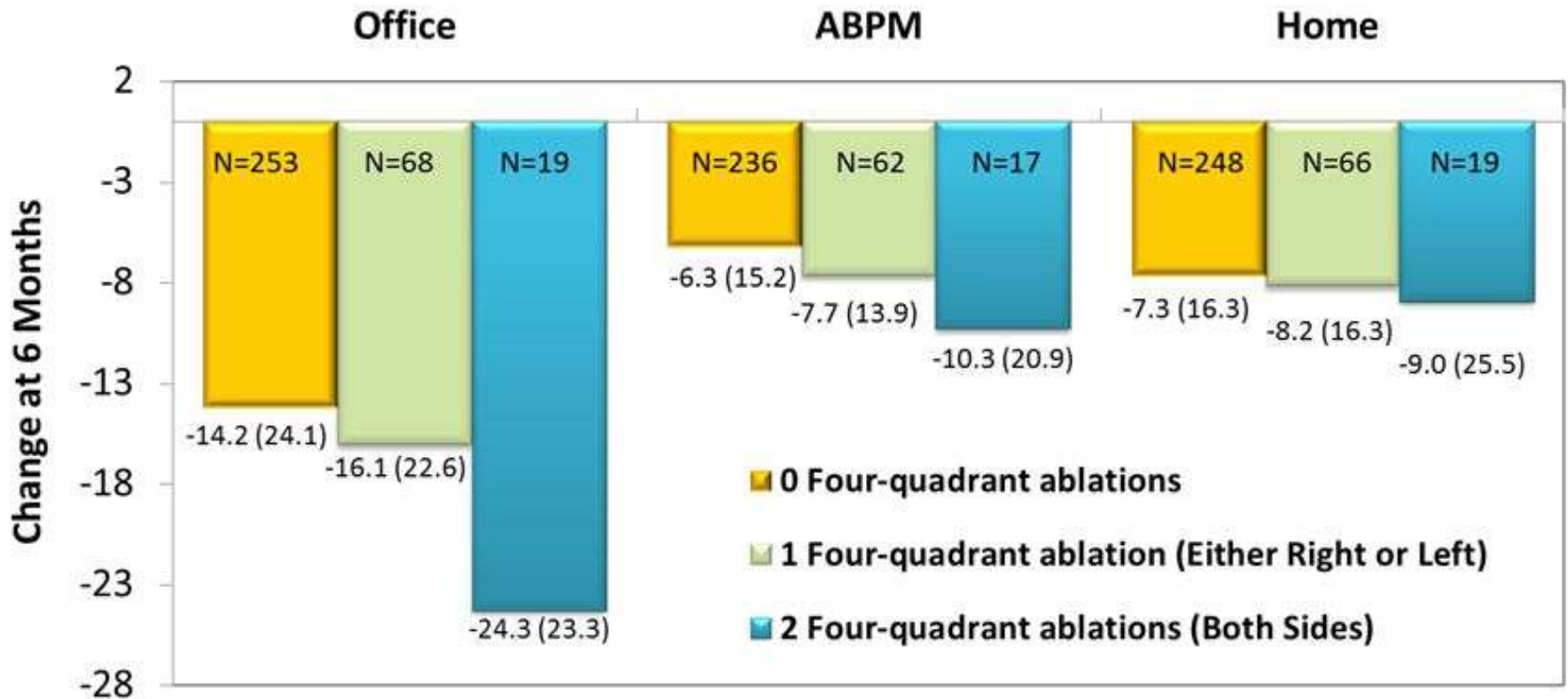
	≥ 8	≥ 9	≥ 10	≥ 11	≥ 12	≥ 13	≥ 14	≥ 15	≥ 16									
Baseline SBP	178.2	180.1	178.6	180.3	178.2	180.5	179.0	179.4	179.1	179.7	178.3	181.3	181.9	182.3	183.2	182.8	185.4	189.4
95% CI	-1.7(-7.1, 3.7)	-3.1(-8.6, 2.4)	-5.4(-11.3, 0.5)	-7.1(-13.9, -0.3)	-8.4(-17.4, 0.7)	-11.5(-21.8, -1.2)	-14.1(-28.8, 0.7)	-12.0(-30.0, 5.9)	-12.4(-44.6, 19.8)									
P*	0.54	0.27	0.07	0.04	0.07	0.03	0.06	0.18	0.43									

Propensity scores using baseline characteristics as covariates were used to match sham control and denervation patients

*P value change in SBP for RDN compared with sham

Data presented are mean (SD)

HTN-3: Influence of circumferential ablations on blood pressure reduction



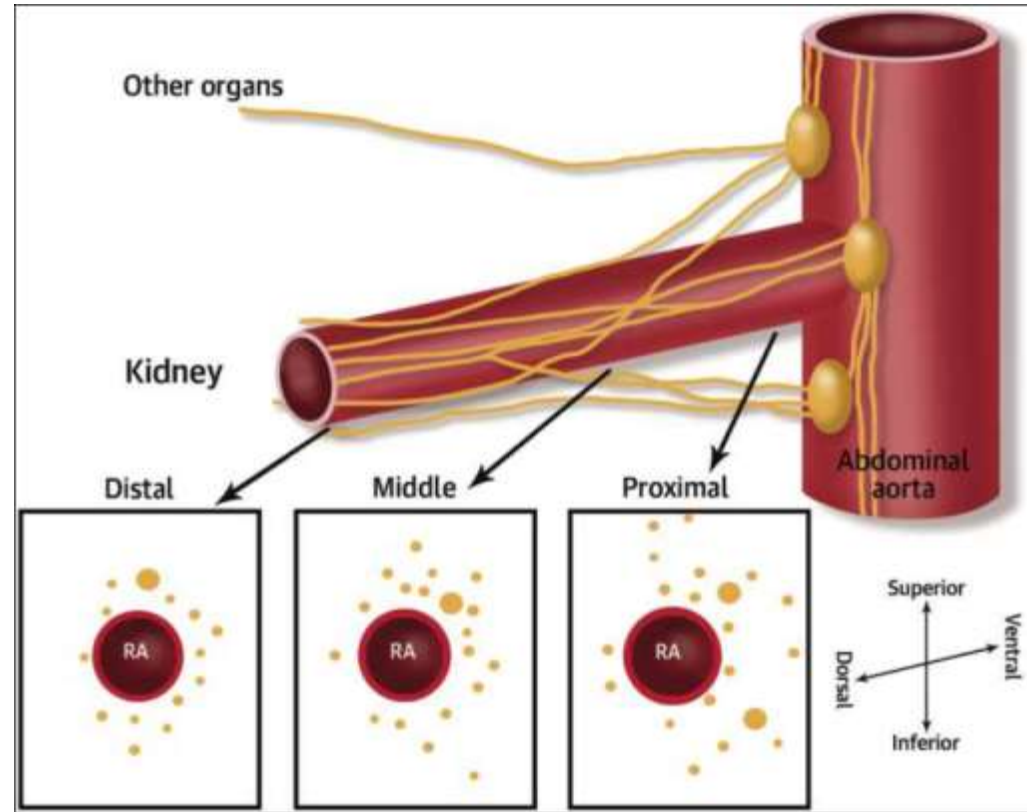
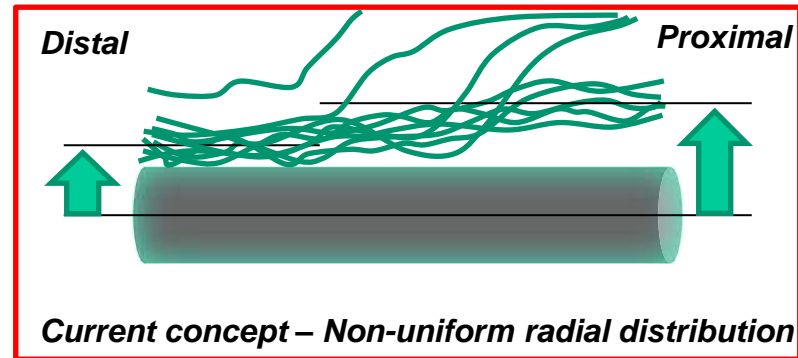
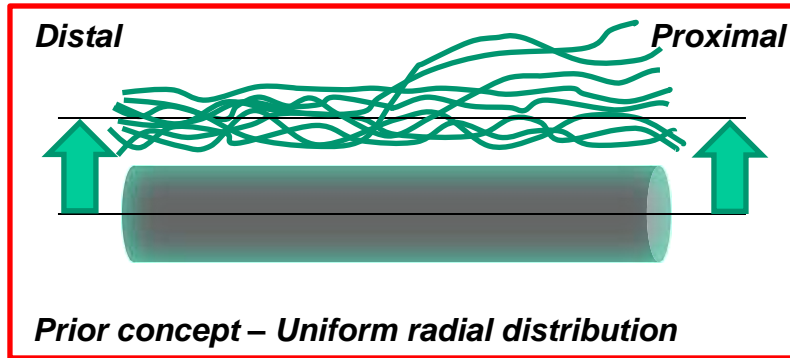
Baseline SBP Measurements (mm Hg)

Ablation Group	Office	ABPM	Home
0 four-quadrant tx*	179.6	158.7	168.5
1 Four-quadrant tx	178.8	161.2	171.3
2 four-quadrant tx	186.9	159.9	170.4

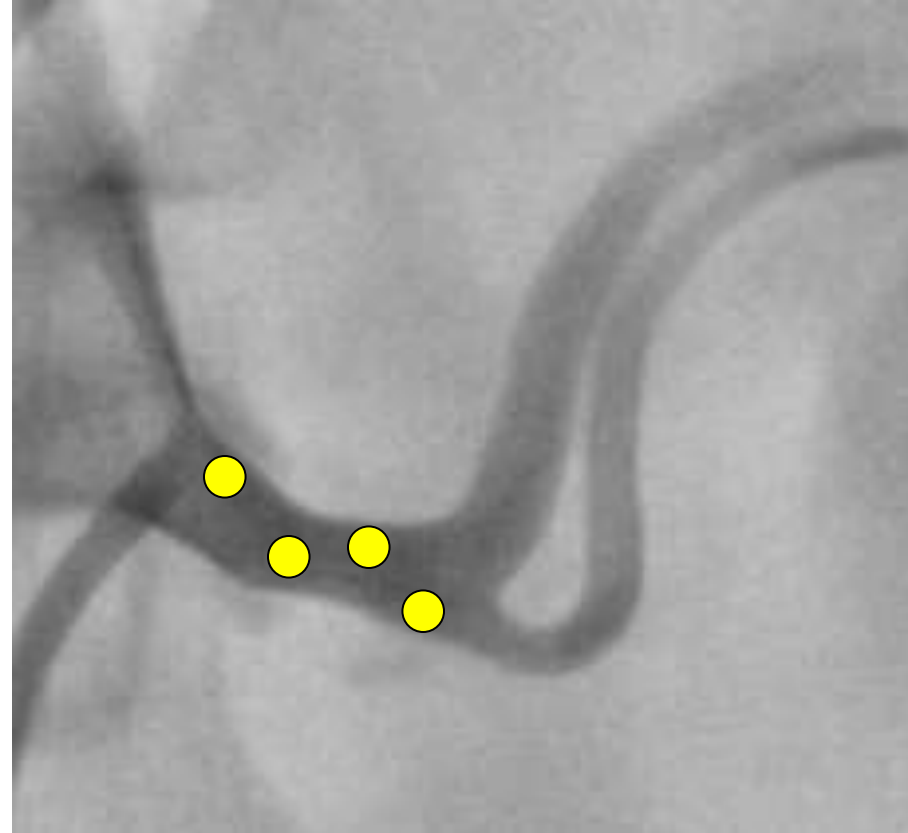
*1 superior, 1 inferior and 2 posterior

Today we believe
that the nerve distribution
around the renal arteries
is different

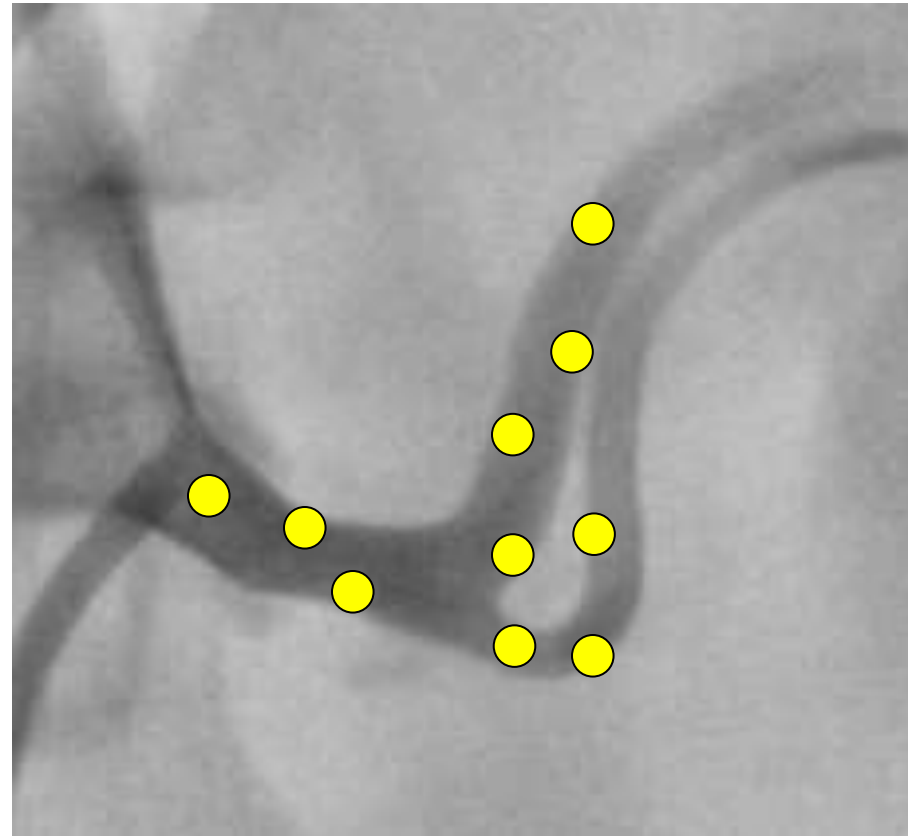
Distal nerves are closer



- 2014:
 - Ablation only in the main stem



- 2014:
 - Ablation only in the main stem
- 2016
 - More ablations
 - Also in branches



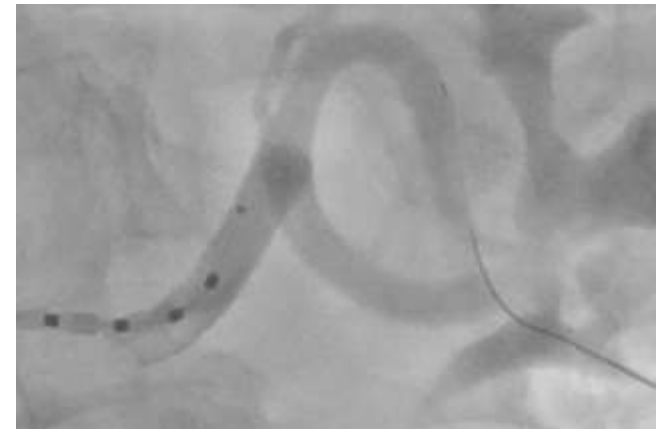
Spyral

- 4 electrodes
- 0.014" wire
- 6F guide
- 60 sec
- Vessel \varnothing 3-8mm



Spyral

- Facilitates multiple ablations (including side branches)



Renal denervation in 2016

- You should treat all renal arteries ...
 - ... on both sides
 - As many ablations as possible
 - Always really circumferential
 - With optimal wall contact
 - As distal as possible
 - Including side branches
- ... but there is still no guarantee that you will be fine!

Other techniques than single or multiple RF electrode catheters may have advantages

- RF balloons, cages
 - less operator dependent
 - always circumferential
- Other energy sources (ultrasound, microwave) or chemical ablation
 - always circumferential
 - with deeper penetration

Thank you!