



Conoscere e Curare il Cuore 2015

## L'ABLAZIONE DELL'ARTERIA RENALE NELL'IPERTENSIONE RESISTENTE LUCI ED OMBRE

**Francesco Versaci**

*Unità Complesse di Cardiologia  
Ospedale "A. Cardarelli" di Campobasso e  
"F. Veneziale" di Isernia*

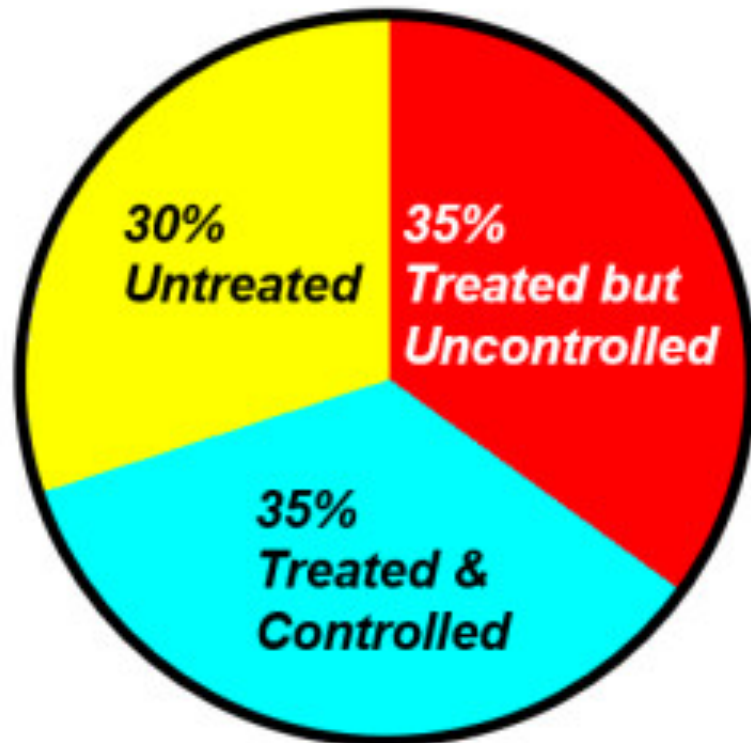


## Disclosure Statement of Financial Interest

I, Francesco Versaci DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.



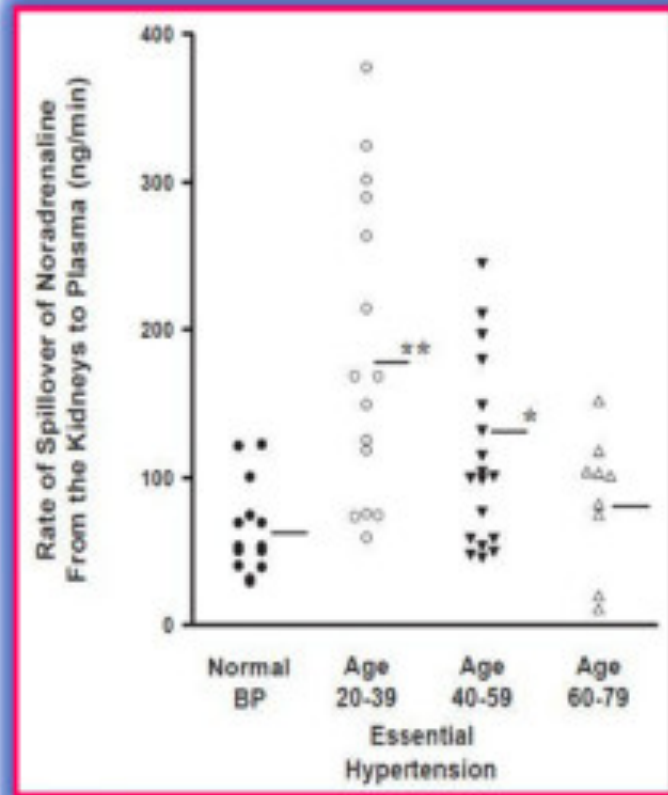
# Hypertension Epidemiology



- High prevalence:
  - Affects 1 in 3 adults
  - 1B people worldwide → 1.6 B by 2025
- Single largest contributor to death worldwide
- Every 20 mmHg increase in BP correlates with a doubling of 10-year cardiovascular mortality
- Dramatically increases risk of stroke, heart attack, heart failure, & kidney failure
- Only half of all treated hypertensives are controlled to established BP targets
- Resistant Hypertension ~ 10%



# Renal Sympathetic Activation in Patients with Hypertension

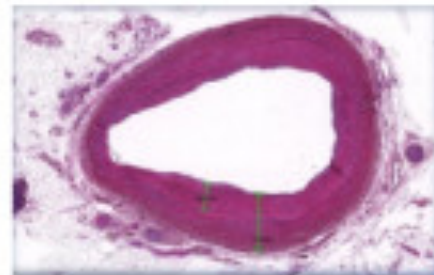


Esler et al. Clin Exp Hyper 1984

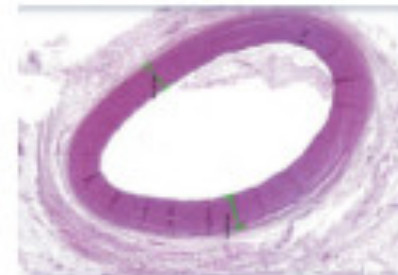


# Morphometric Evaluation of Renal aa

	Hypertensive RS = 120	Normotensive RS = 120	P
Maximum thickness of intima ( $\mu\text{m}$ )	333.0 $\pm$ 183.1	197.4 $\pm$ 135.1	0.01
Thickness of arterial wall ( $\mu\text{m}$ )	880.4 $\pm$ 209.9	970.4 $\pm$ 310.3	n.s.
Cross-sectional luminal stenosis (%)	23.5 $\pm$ 4.7	20.7 $\pm$ 3.2	0.01
Type of plaque:			n.s.
- DIT	32 (26.7%)	44 (36.7%)	
- stable (FA)	88 (73.3%)	76 (63.3%)	
- unstable	0	0	



Renal artery in Hypertensive pt

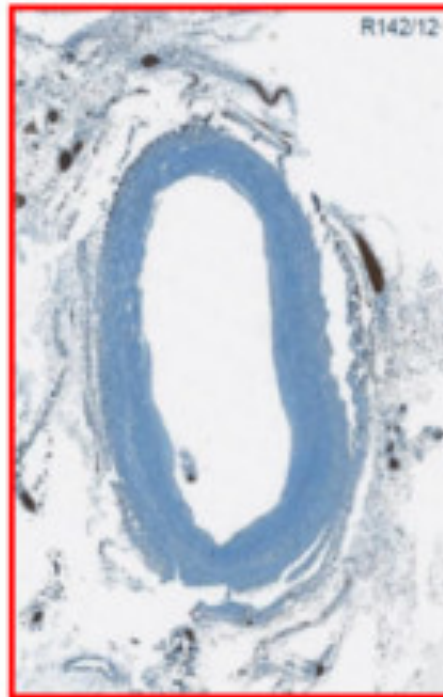


Renal artery in Normotensive pt

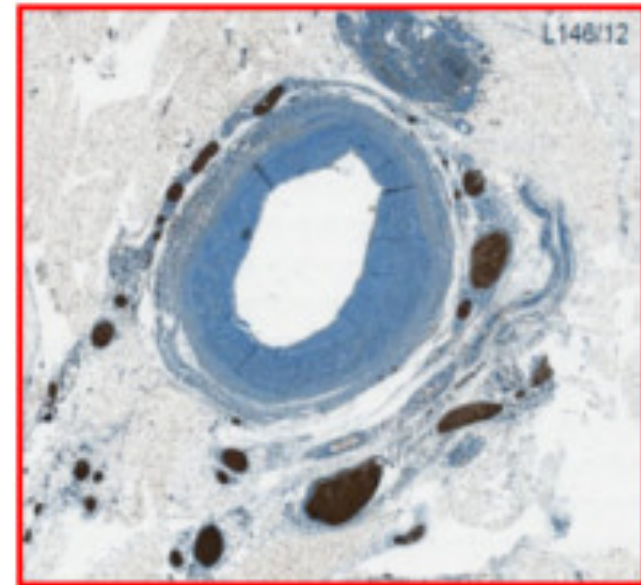
Sangiorgi G, et al. TCT 2012



# Case Example



**Normotensive**

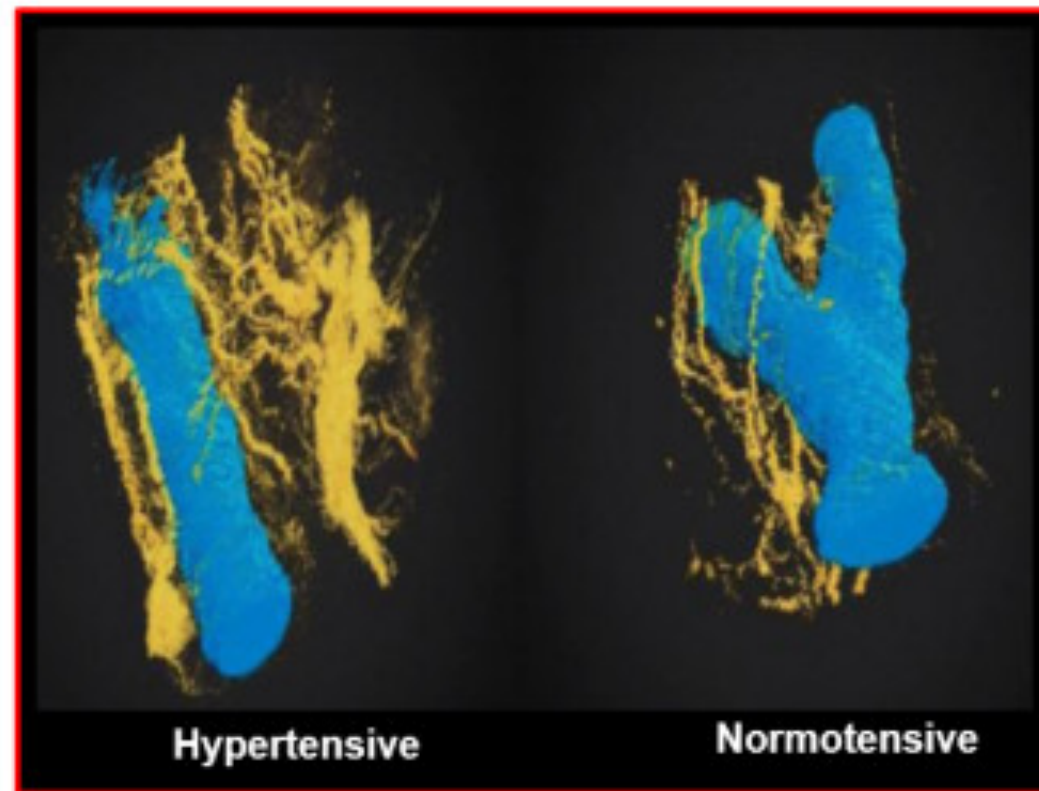


**Hypertensive**

Courtesy of A. Mauriello



# Three Dimensional Nerve Reconstruction in Hypertensive vs. Normotensive Pts



Courtesy of A. Mauriello



# Concept Validated by Surgical History

THE EFFECTS OF PROGRESSIVE SYMPATHECTOMY ON  
BLOOD PRESSURE

BRADFORD CANNON

*From the Laboratories of Physiology in the Harvard Medical School*

Received for publication March 24, 1931

THE BRITISH JOURNAL OF SURGERY

1952

SYMPATHECTOMY IN THE TREATMENT OF BENIGN  
AND MALIGNANT HYPERTENSION\*

A REVIEW OF 76 PATIENTS

By C. J. LONGLAND AND W. E. GIBB

The Journal

of the American Medical Association

*Published Under the Auspices of the Board of Trustees*

Vol. 152 NO. 16

CHICAGO, ILLINOIS  
PUBLISHED WEEKLY BY AMERICAN MEDICAL ASSOCIATION

AUGUST 15, 1953

SPLANCHNICECTOMY FOR ESSENTIAL HYPERTENSION

RESULTS IN 1,136 CASES

Reginald H. Smithwick, M.D.  
and  
Arce E. Thompson, M.D., Boston

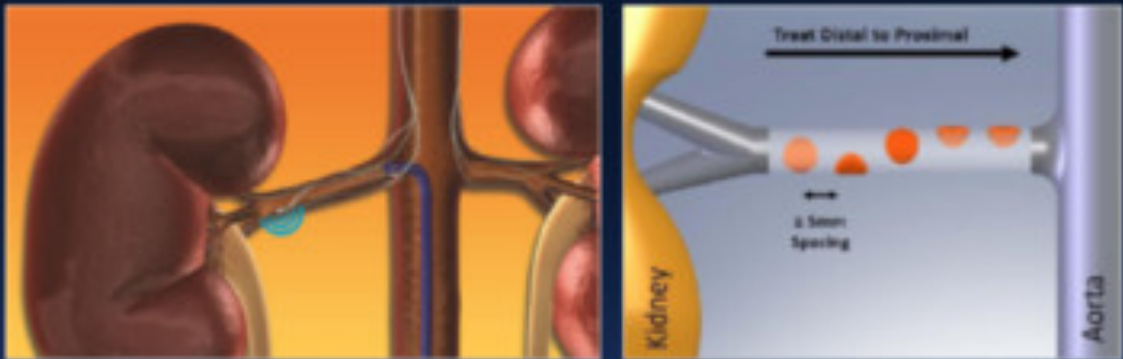
JAMA 1953

Effective, but significant morbidity






# Renal Nerve Anatomy Allows a Catheter-Based Approach



The diagram illustrates the renal nerve anatomy and the catheter-based approach. On the left, a 3D anatomical model shows the kidneys and the renal arteries branching from the aorta. On the right, a schematic diagram shows a catheter inserted into the renal artery, with an arrow indicating the direction of treatment from distal to proximal. The catheter is labeled 'Kidney' and 'Aorta'. A '2.5mm Spring' is shown at the tip of the catheter.

- Standard interventional technique
- 4-6 two-minute treatments per artery
- Proprietary RF Generator
  - Automated
  - Low-power
  - Built-in safety algorithms

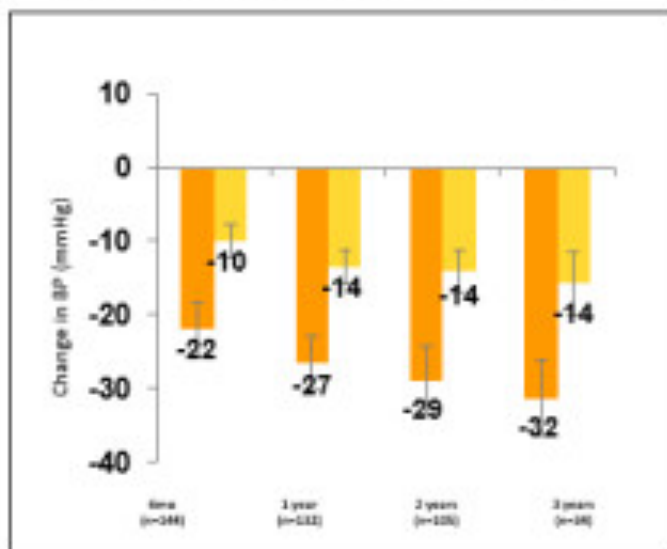


The image shows a white and yellow RF Generator with a digital display and a control knob. A long, thin catheter is connected to the generator, ending in a yellow and white catheter tip.

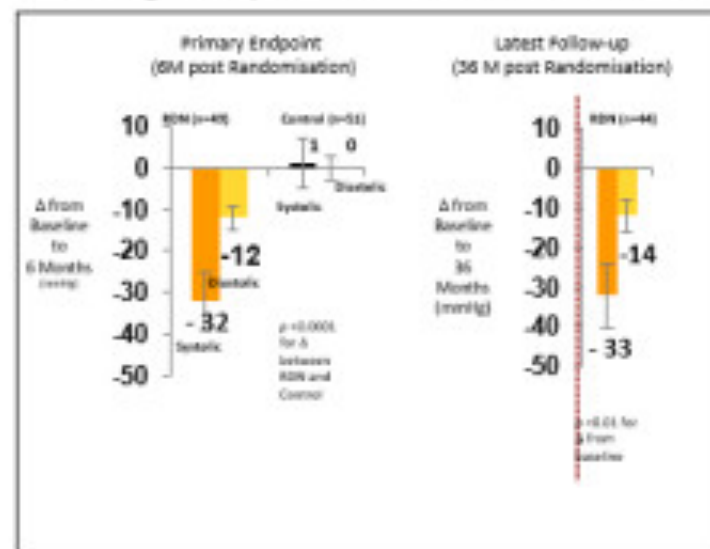


# Renal Denervation by Radiofrequency: Update

**Symplificity HTN-1: Significant, Sustained Blood Pressure Reductions to Least 3 Years**



**Symplificity HTN-2: RDN Superior to Medical Management, Reductions Sustained to 36M**



■ Systolic  
■ Diastolic

• p < 0.01 for Δ from baseline for all time points.  
Number of patients represents data available at time of data lock

Krum H, et al. Lancet 2014 Feb 15;383:622-9

Esler MD, et al. Eur Heart J 2014 Jul;35 (26):1752-9



# SYMPPLICITY HTN-3 results to be announced a mystery or a story foretold?

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

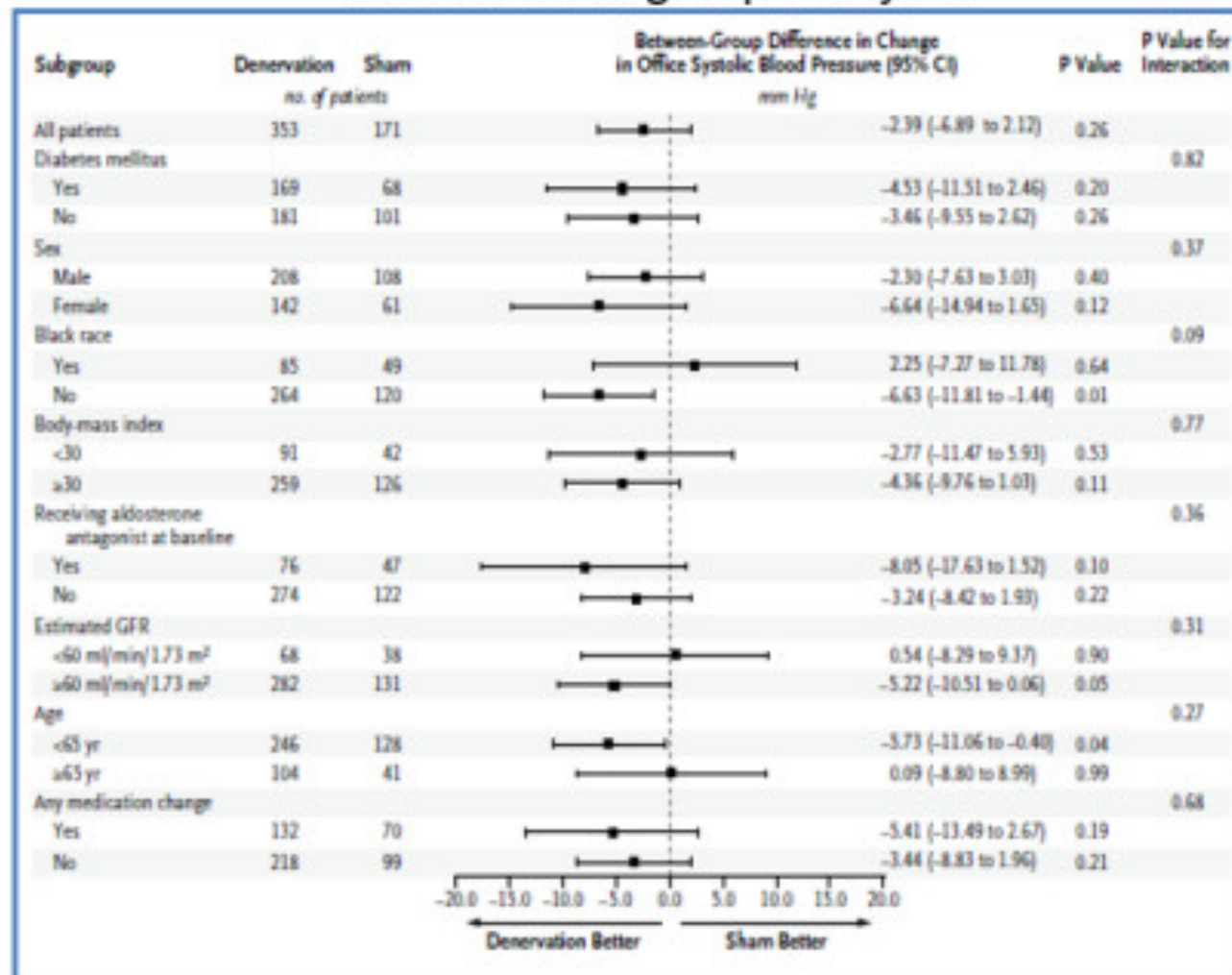
## A Controlled Trial of Renal Denervation for Resistant Hypertension

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 SYMPPLICITY HTN-3 Investigators\*



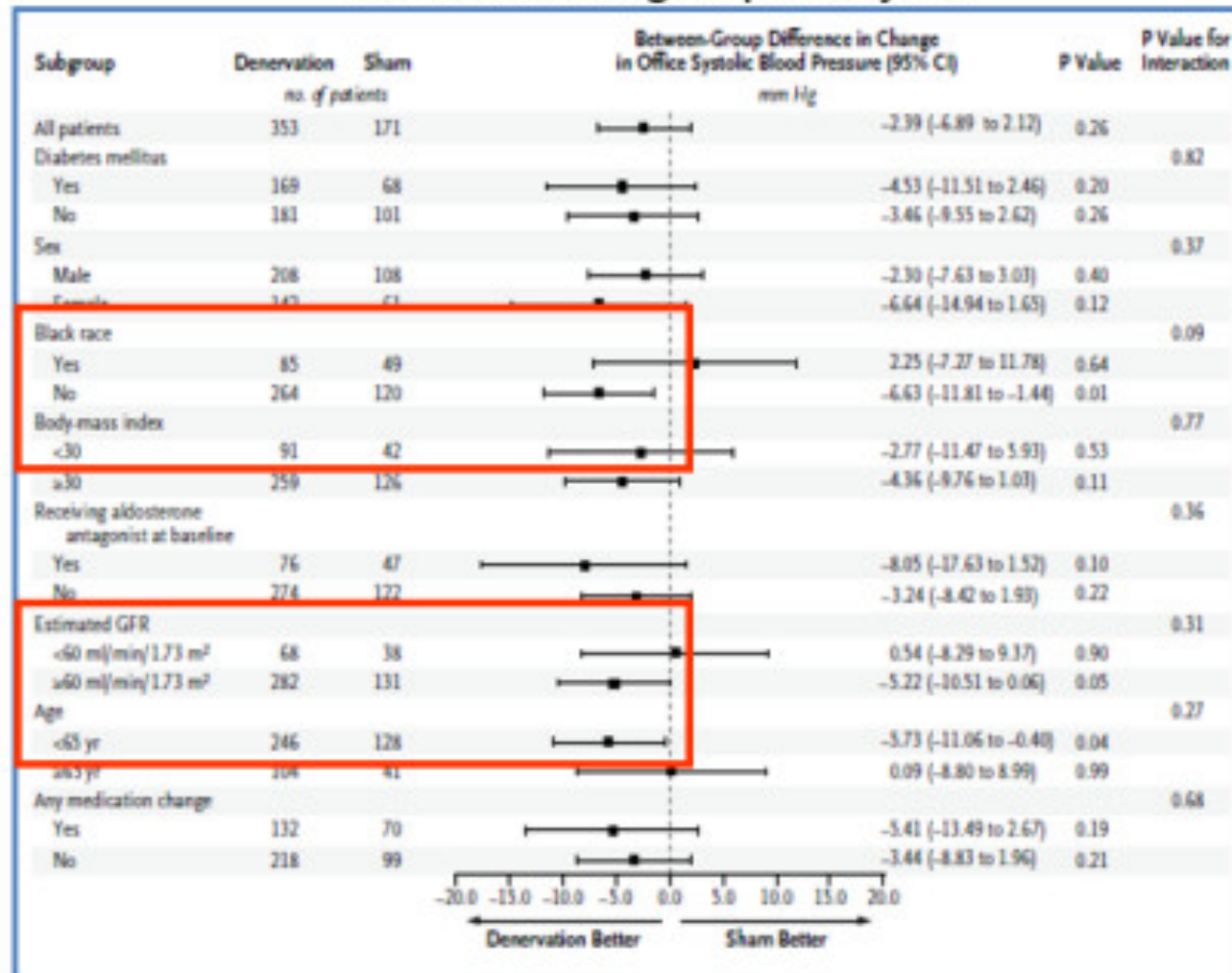
# Could we have predicted the outcome of the SYMPPLICITY HTN-3 Study?

## Selected Subgroup Analyses



# Could we have predicted the outcome of the SYMPPLICITY HTN-3 Study?

## Selected Subgroup Analyses



# Acute Treatment with RDN in pt with Hemorrhagic Stroke and Resistant Hypertension



49 y-old-male

Resistant Hypertension despite:

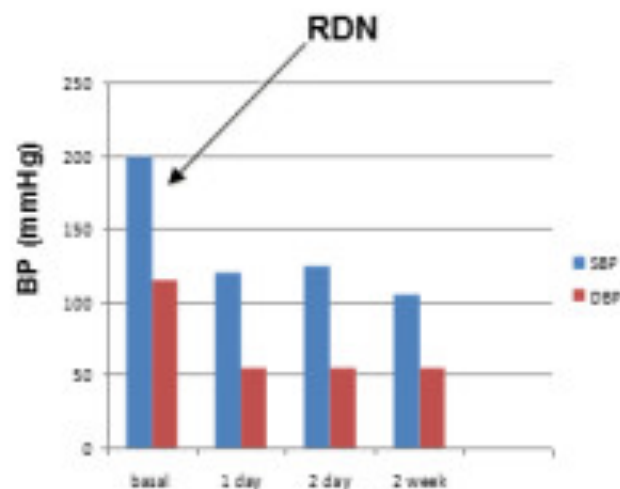
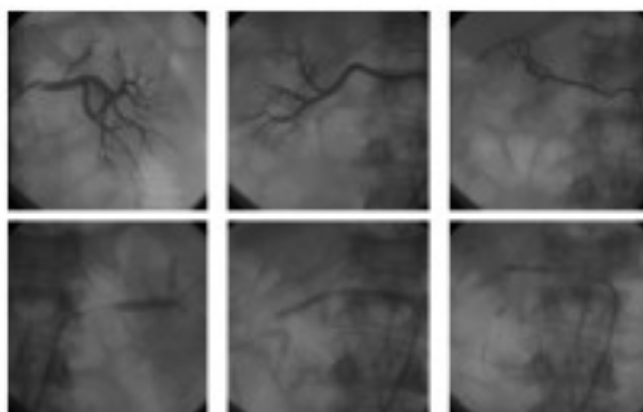
- Bisoprolol 2.5 mg twice daily
- Ramipril 10 mg twice daily
- Amlodipine 10 mg twice daily
- Furosemide 25 mg twice daily
- Metolazone 5 mg

27-08-2014: Hemorrhagic stroke

Glasgow Coma Scale: 9

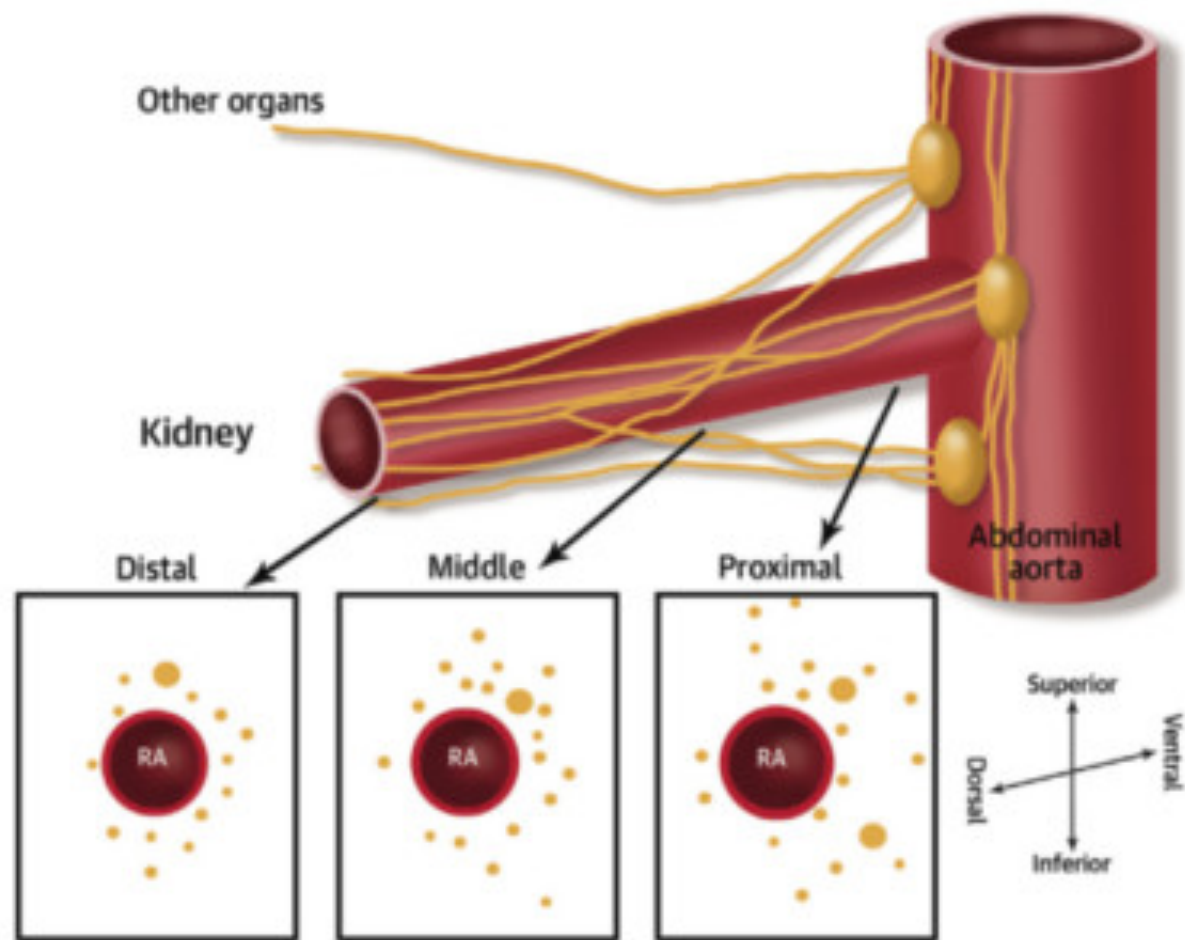
Norton Scale: 8

Persistent hypertension during hospitalization (BP 200/110 mmHg) despite 6 medications p.o. and urapidil iv

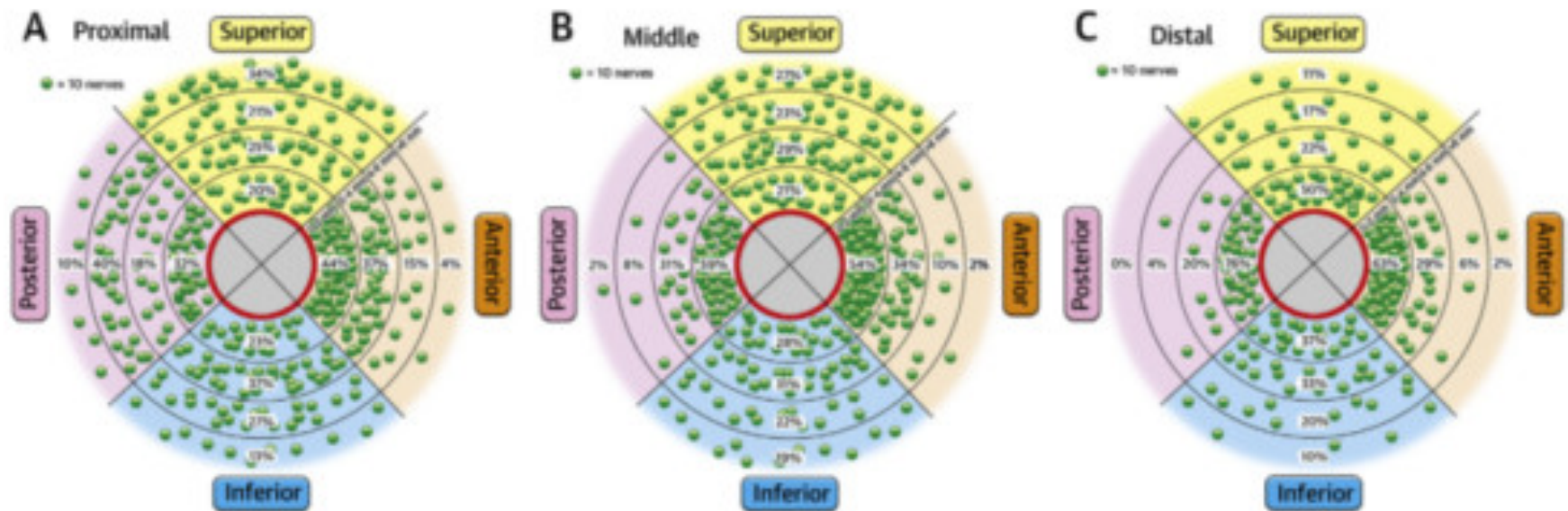


Versaci et al. JACC intv. In press





# Anatomic Assessment of Sympathetic Peri-Arterial Renal Nerves in Man





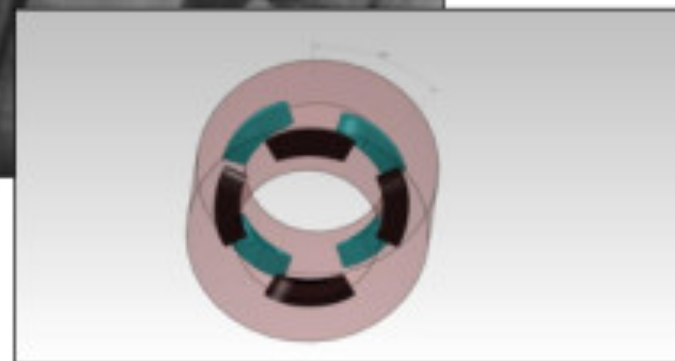
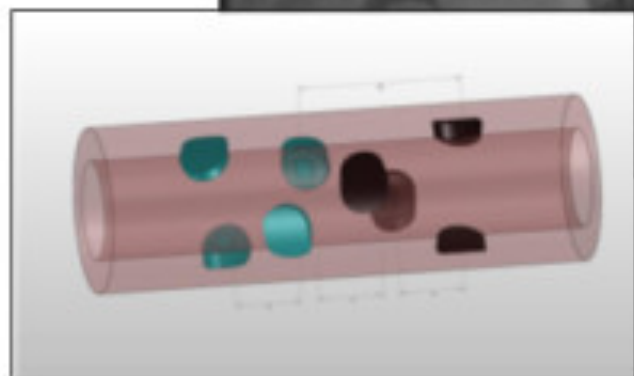
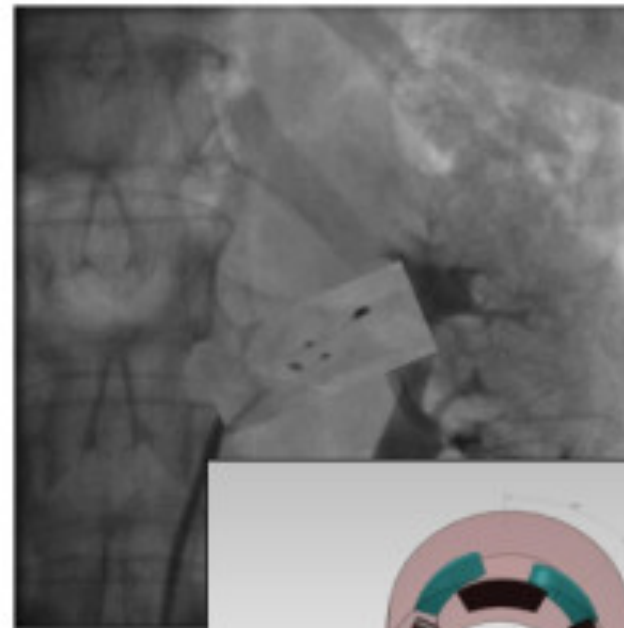
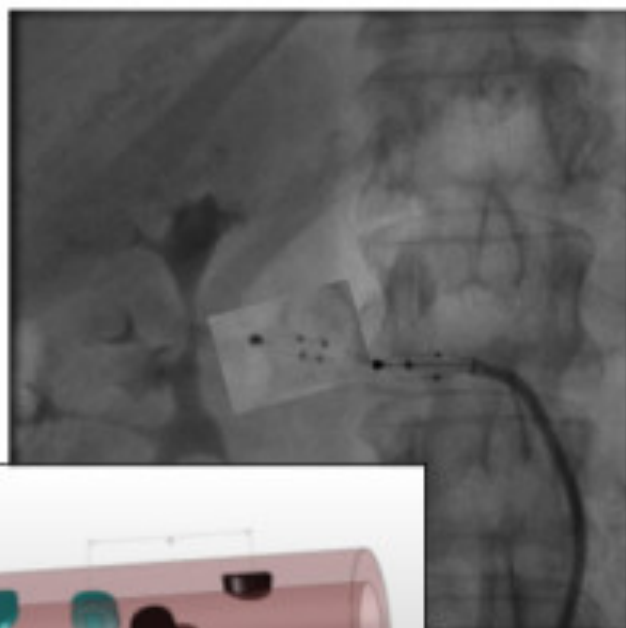
## RDN (EnlighHTN)



F.Versaci, et al. Int J Cardiol, May 2014



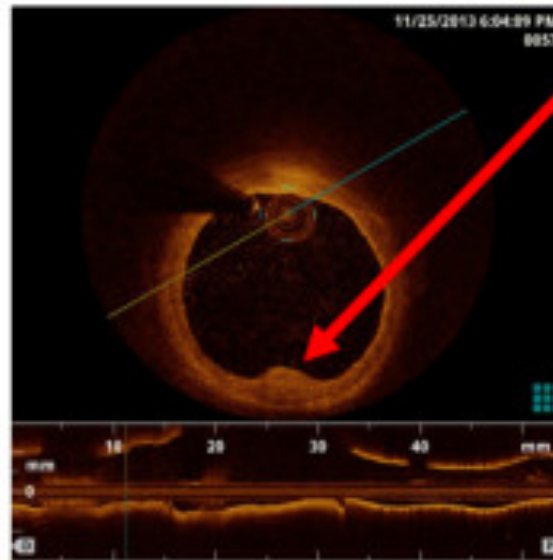
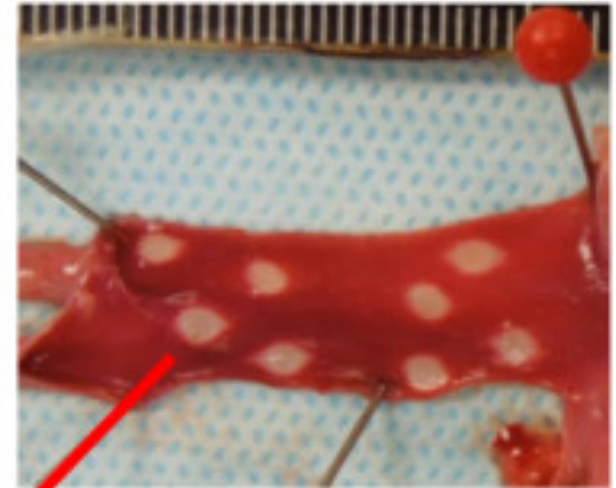
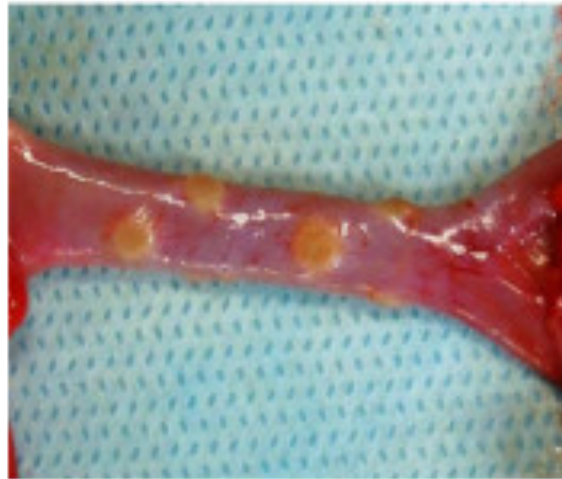
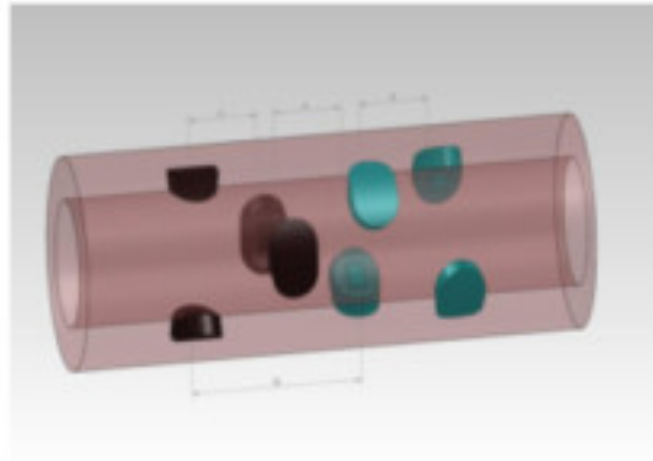
# RDN (EnlighHTN)



F.Versaci, et al. Int J Cardiol, May 2014



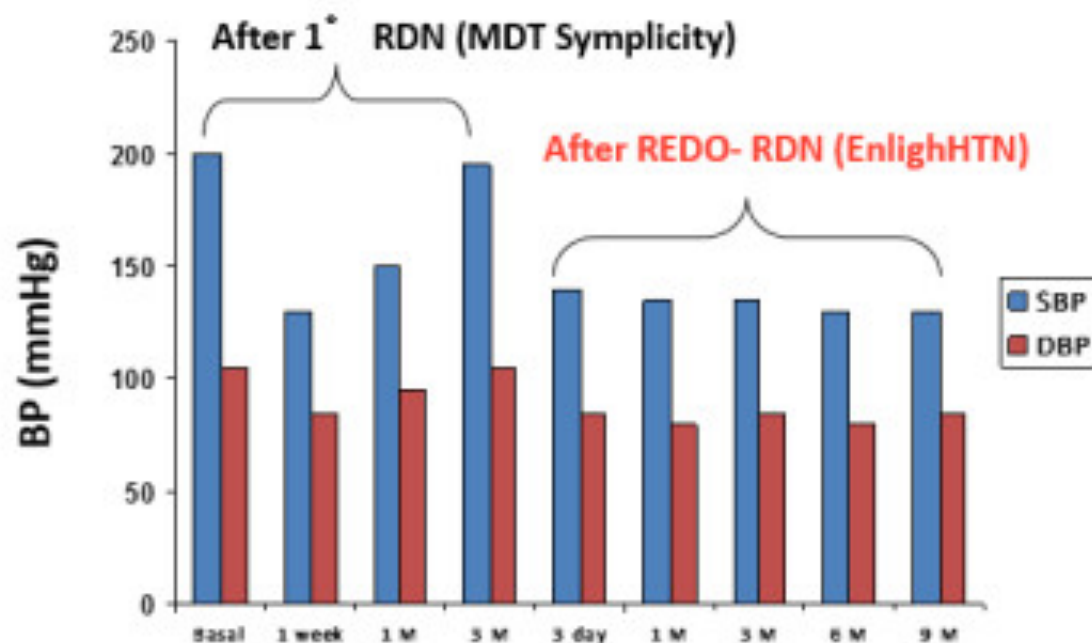
# RDN (EnlighHTN)



F. Versaci, et al. Int J Cardiol, May 2014



## Redo of RDN: a case of effective treatment with a second generation of device in a patient with recurrent resistant hypertension after primary treatment success.



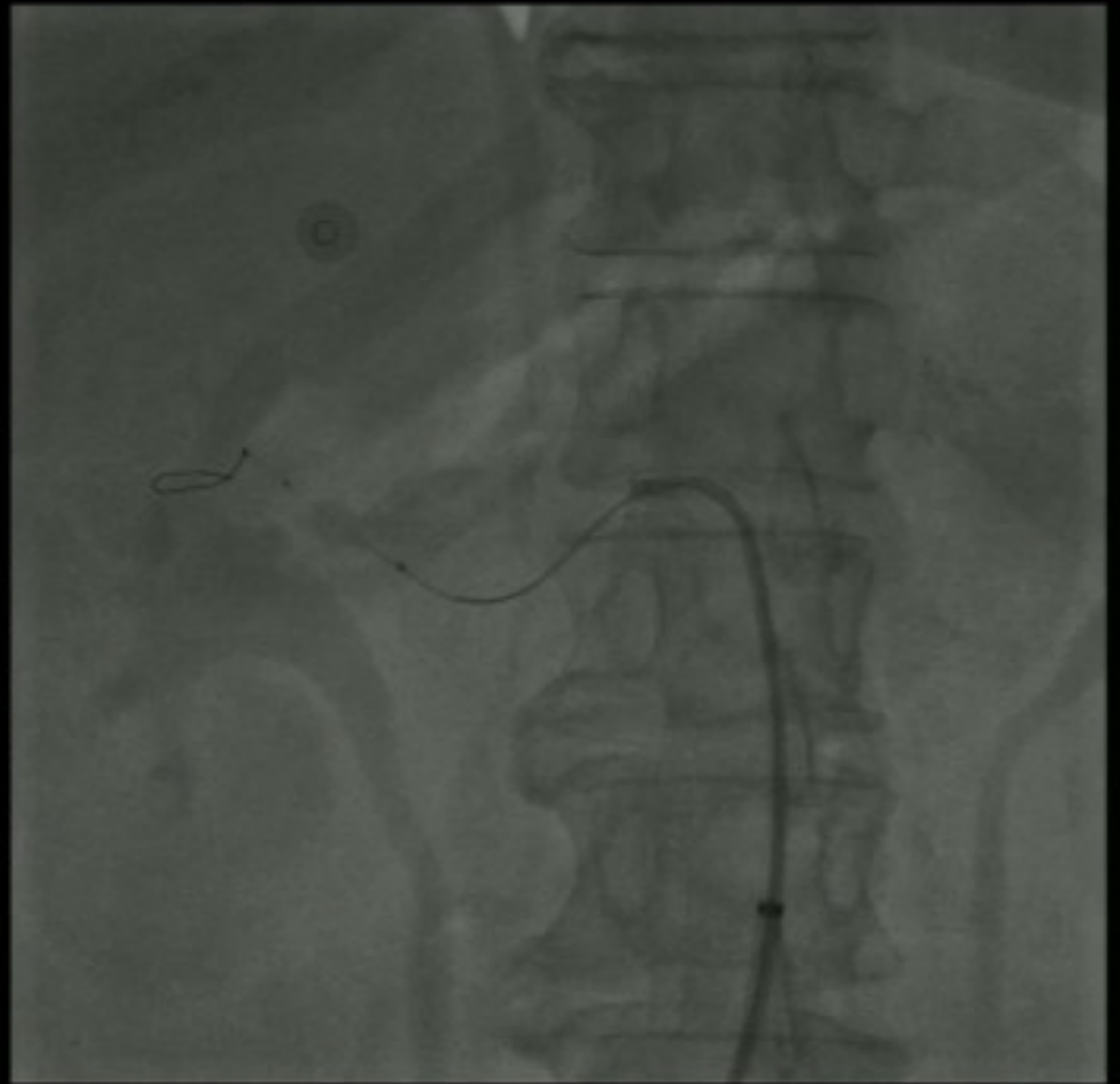
F.Versaci, et al. Int J Cardiol, May 2014





Rateo dose  
mGy/min 53.4

Geometria  
20 cm





Rateo dose  
mGy/min 53.4

Geometria  
20 cm





Patient Summary

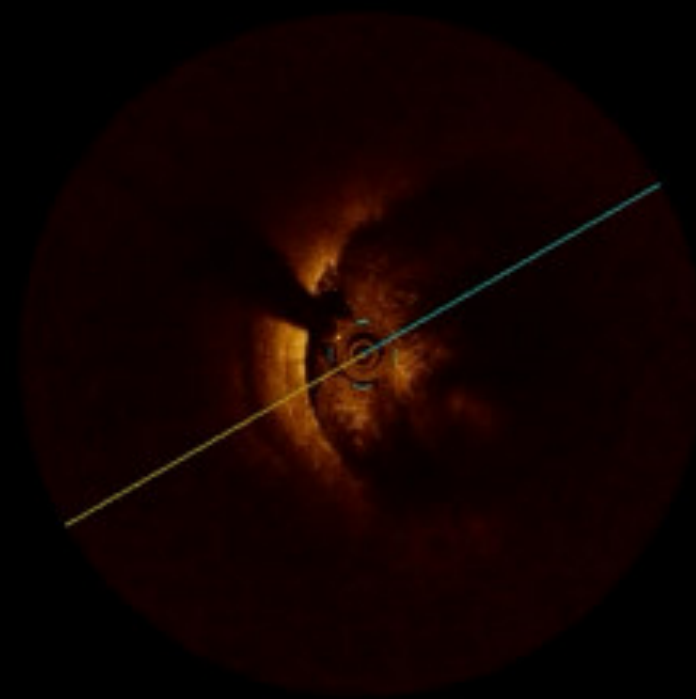
**OCT Pullback**  
December 16, 2013 2:47:50 PM

Export

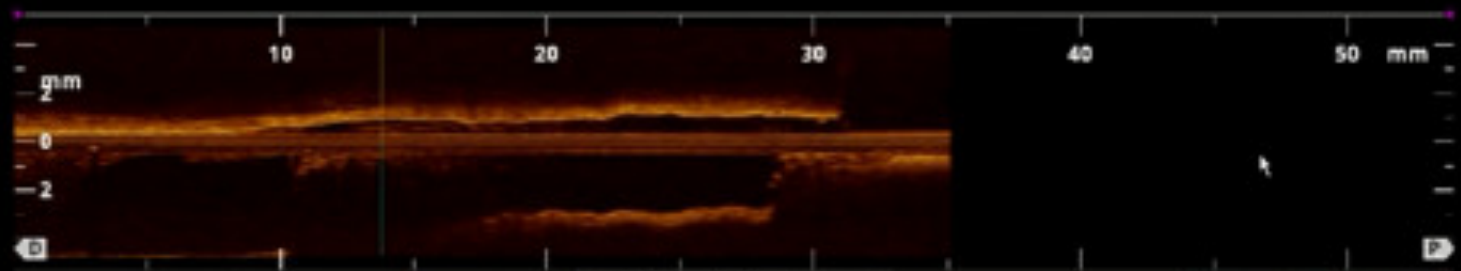
Capture



Settings



- Line tool
- AS (Anterior) marker
- PS (Posterior) marker
- OCT mode
- T (Time) marker
- Right arrow
- REF (Reference) marker
- 0.6 AS (0.6mm AS)
- 0.6 DS (0.6mm DS)



Adjust Calibration | Vessel | Procedure | Playback controls (Back, Play, Forward) | End Review



Patient Summary

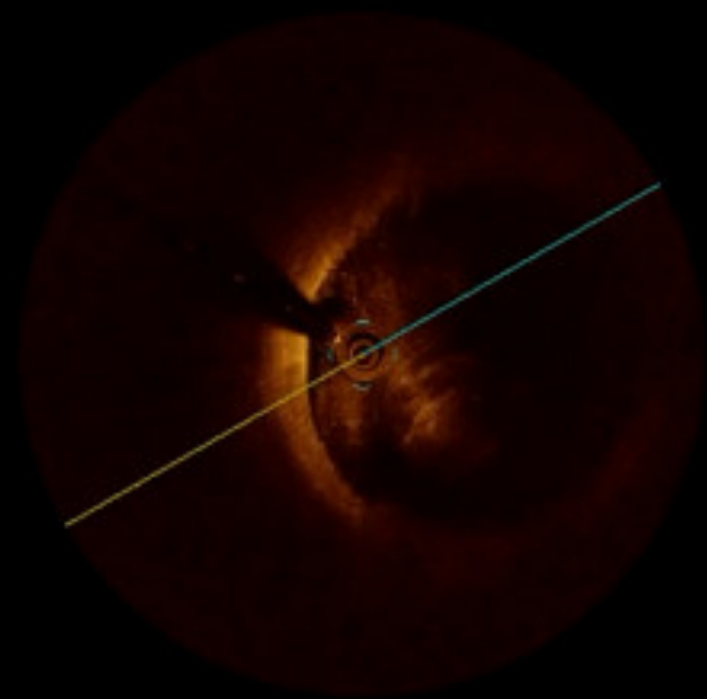
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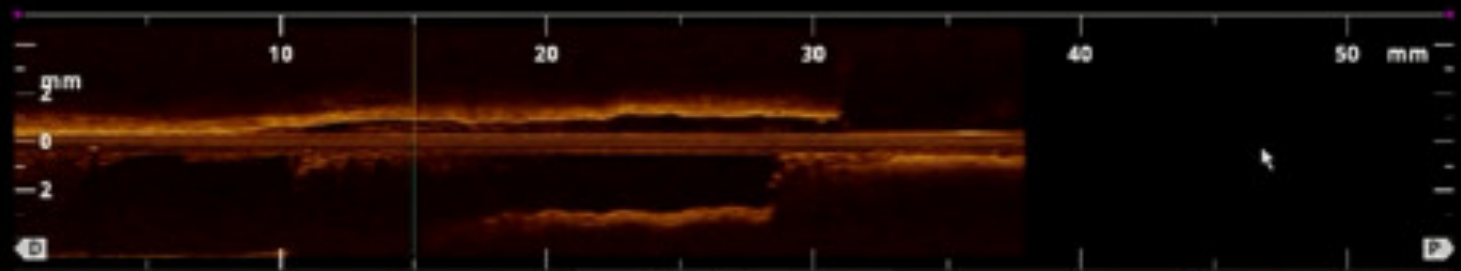
Capture



Settings



- Line tool
- AS (Anterior) icon
- Posterior icon
- OCT icon
- T icon
- Right arrow icon
- REF icon
- 0.6 AS
- 0.6 DS



Adjust Calibration

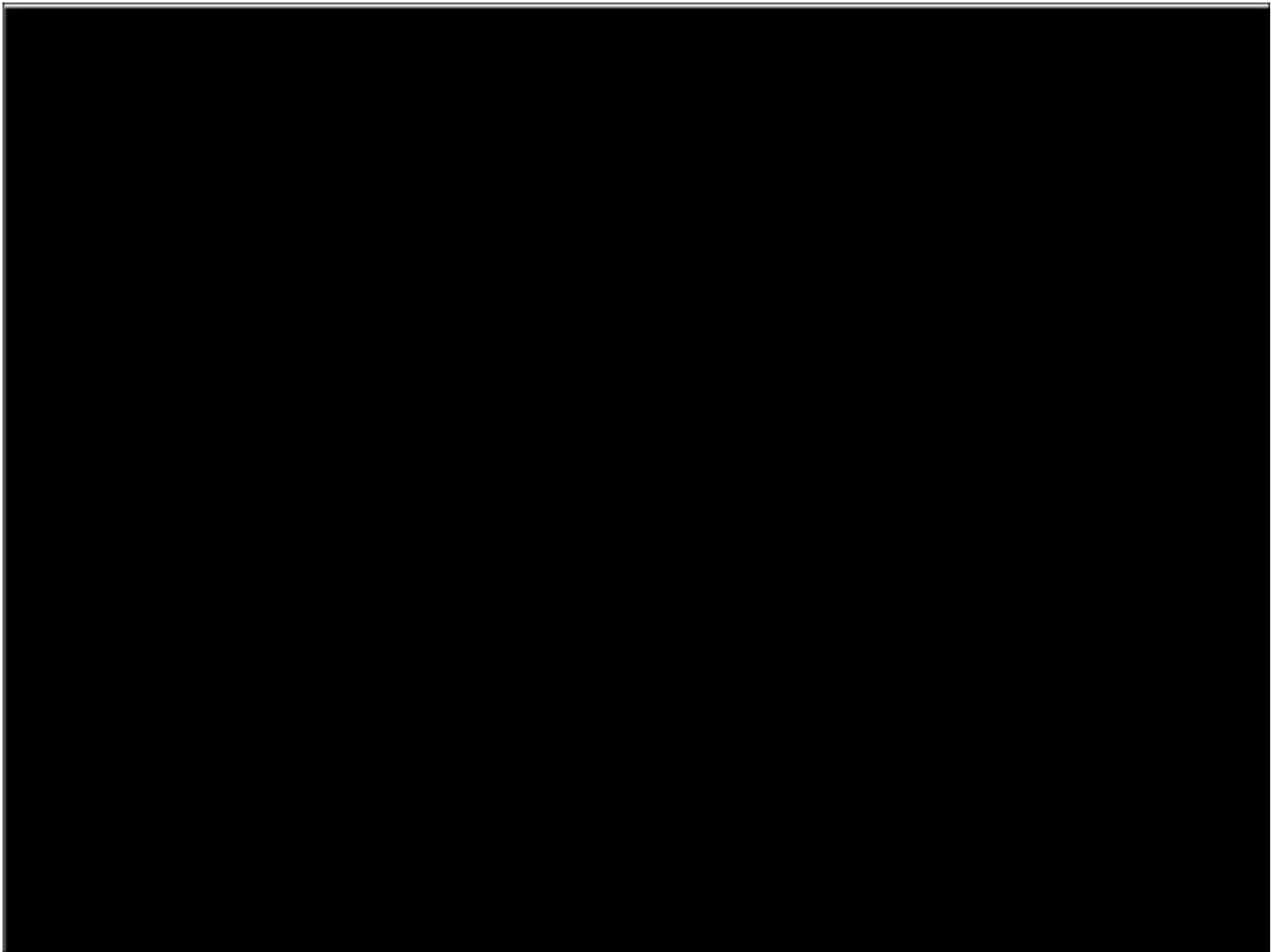
Vessel

Procedure



End Review

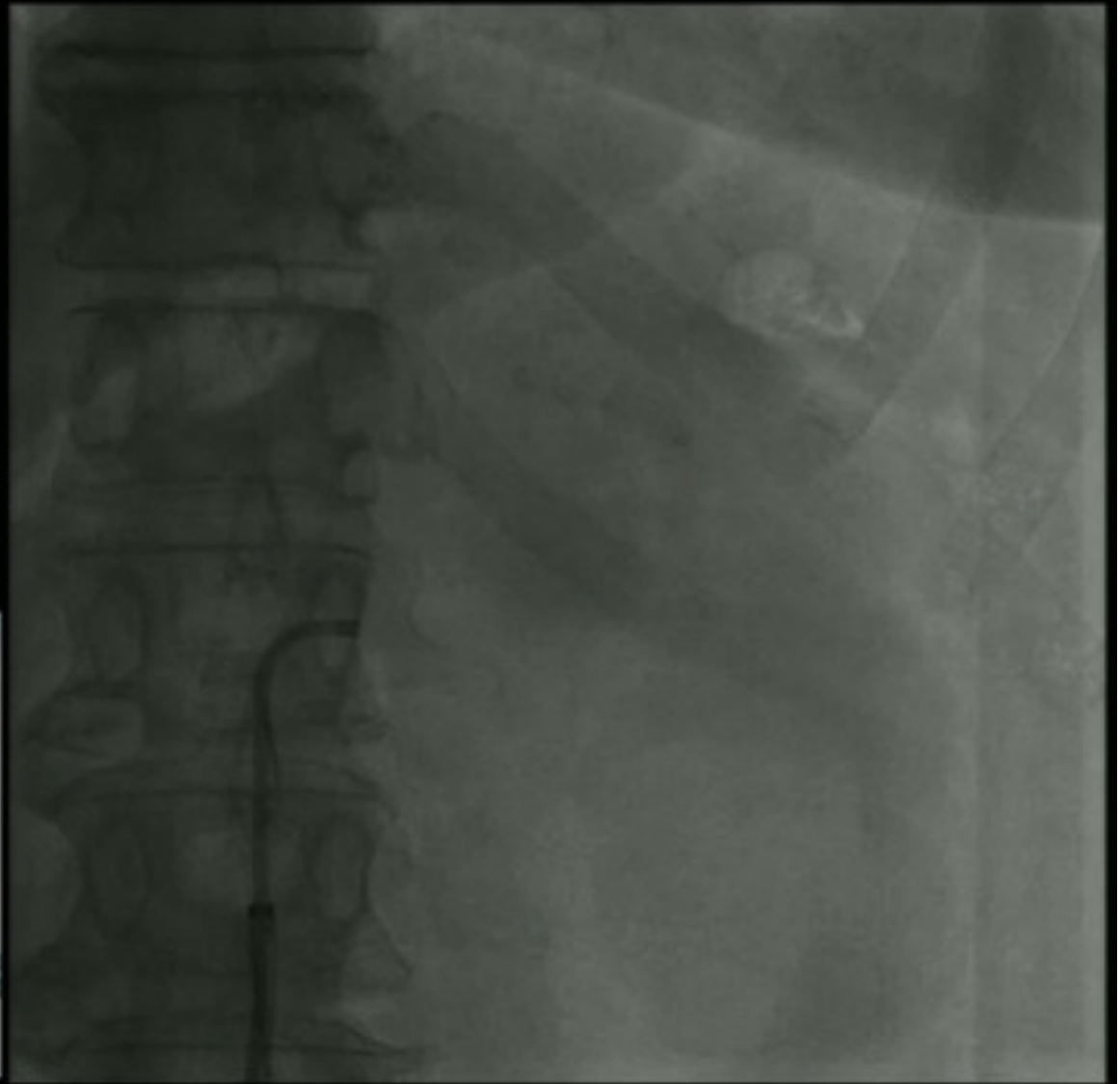






Rateo dose  
mGy/min 0

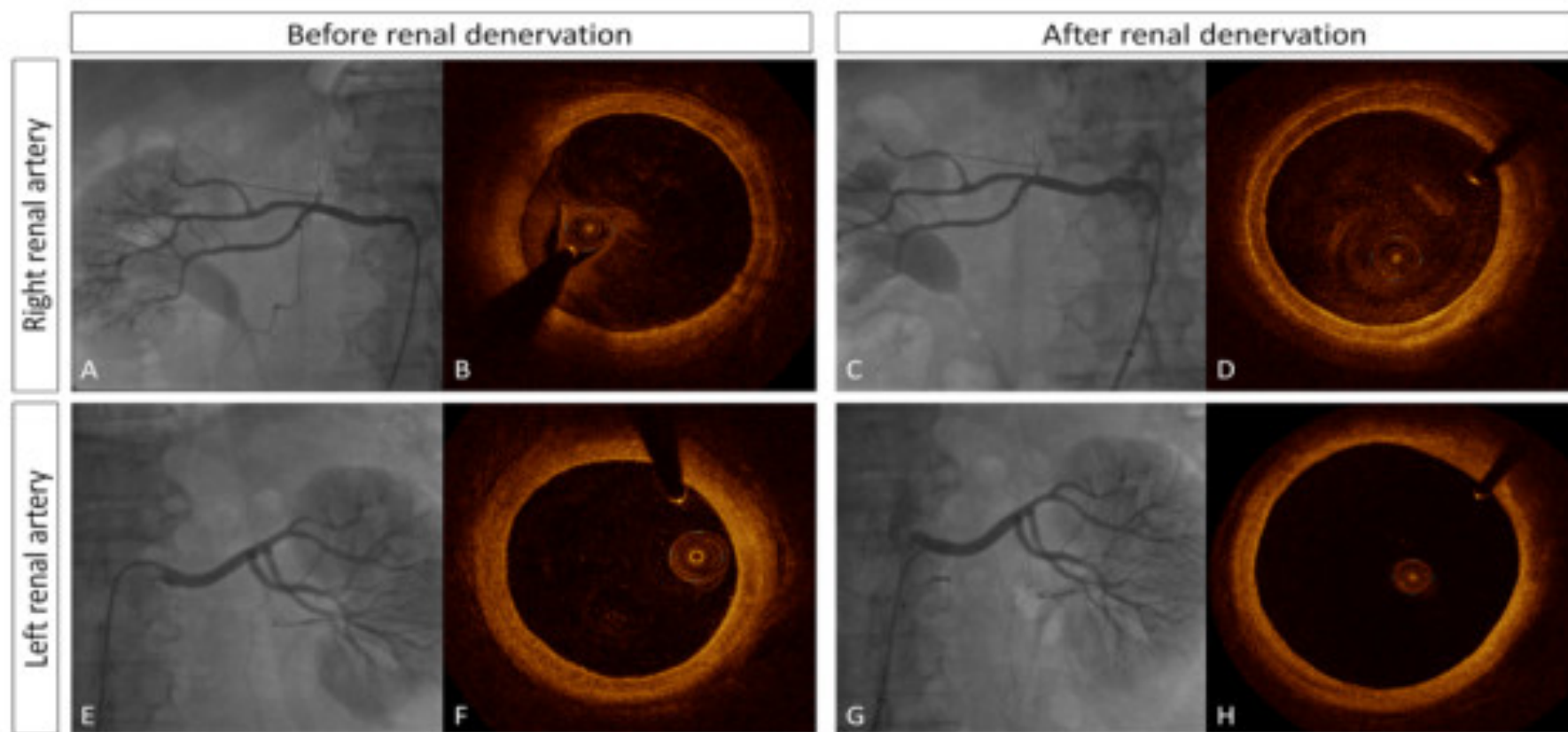
Geometria  
20 cm





# Vascular response after percutaneous sympathectomy: not all devices are equal.

OCT evaluation of 14 renal arteries



F.Versaci et al. , Int J Cardiol, April 2014



# Take home message

- L'ipertensione resistente rappresenta un problema importante, con una prevalenza che oscilla dal 12 al 15% nella popolazione globale, l'incidenza è più elevata (35%) nei pazienti anziani o nei pazienti con IRC (60%).
- La denervazione delle arterie renali dovrebbe essere riservata solo ai pazienti con "vera" ipertensione-resistente escludendo i pazienti con ipertensione secondaria e dopo aver controllato la compliance al trattamento.
- La denervazione renale nei pazienti con IR dovrebbe essere effettuata solo in centri cardiologici dedicati alla cura dell'ipertensione in grado di effettuare accurata selezione dei pazienti ed accurato follow up.



# The NEW ENGLAND JOURNAL of MEDICINE

Vol. 324 No. 1 FOLLOW-UP OF SELF-EXPANDING CORONARY-ARTERY STENTS — SERRUYS ET AL. 13

## ANGIOGRAPHIC FOLLOW-UP AFTER PLACEMENT OF A SELF-EXPANDING CORONARY-ARTERY STENT

PATRICK W. SERRUYS, M.D., BRADLEY H. STRAUSS, M.D., KEVIN J. BRATT, M.B., B.S.,  
MICHEL E. BERTRAND, M.D., JACQUES PYEL, M.D., ANTHONY F. RICKARDS, M.B., B.S.,  
BERNHARD MEIER, M.D., JEAN-JACQUES GOY, M.D., PHILIP VOGT, M.D., LUKAS KAPPENBERGER, M.D.,  
AND ULRICH SWART, M.D.

**Abstract** Background. The placement of stents in coronary arteries after coronary angioplasty has been investigated as a way of treating abrupt coronary-artery occlusion related to the angioplasty and of reducing the late intimal hyperplasia responsible for gradual restenosis of the dilated lesion.

**Methods.** From March 1986 to January 1988, we implanted 117 self-expanding, stainless-steel endovascular stents (Wallstent) in the native coronary arteries (94 stents) or saphenous-vein bypass grafts (23 stents) of 105 patients. Angiograms were obtained immediately before and after placement of the stent and at follow-up at least one month later (unless symptoms required angiography sooner). The mortality after one year was 7.6 percent (8 patients). Follow-up angiograms (after a mean [ $\pm$ SD] of 5.7 $\pm$ 4.4 months) were obtained in 95 patients with 105 stents and were analyzed quantitatively by a computer-assisted system of cardiovascular angiographic analysis. The 10 patients without follow-up angiograms included 4 who died.

**Results.** Complete occlusion occurred in 27 stents in

25 patients (24 percent); 21 occlusions were documented within the first 14 days after implantation. Overall, immediately after placement of the stent there was a significant increase in the minimal luminal diameter and a significant decrease in the percentage of the diameter with stenosis (changing from a mean [ $\pm$ SD] of 1.88 $\pm$ 0.43 to 2.48 $\pm$ 0.51 mm and from 37 $\pm$ 12 to 21 $\pm$ 10 percent, respectively;  $P<0.0001$ ). Later, however, there was a significant decrease in the minimal luminal diameter and a significant increase in the stenosis of the segment with the stent (1.68 $\pm$ 1.78 mm and 48 $\pm$ 34 percent at follow-up). Significant restenosis, as indicated by a reduction of 0.72 mm in the minimal luminal diameter or by an increase in the percentage of stenosis to  $\geq 50$  percent, occurred in 32 percent and 14 percent of patent stents, respectively.

**Conclusions.** Early occlusion remains an important limitation of this coronary-artery stent. Even when the early effects are beneficial, there are frequently late occlusions or restenosis. The place of this form of treatment for coronary artery disease remains to be determined. (*N Engl J Med* 1991; 324:13-7.)

