RENAL SEMPATİK DENERVASYON

Teknik ve Cihazlar

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HIPERTANSIYON

- Primer (Esansiyel) HT (%95)
- Sekonder HT (%5)
  - Renal parankimal
  - Renovasküler
  - İlaçlar (Oral kontraseptif, NSAİ)
  - Endokrin sebepler
    - Primer aldosteronizm, Feokromasitoma,
    - Cushing sendromu,
    - Hipo/Hipertiroidizm, Hiperparatiroidizm
  - Uyku apne sendromu
  - Aorta koarktasyonu

Dirençli Hipertansiyon

- Biri diüretik olmak üzere, ≥3 antihipertansif ilaç kullanımına rağmen,

  Kan basıncının;

  ≥140/90 mmHg

  ≥130/80 mmHg (KBY / DM)

- Hipertansiyonun kontrol altına alınması için ≥4 ilaç gerekmesi

- Hastaların %5-20'sinde tedaviye dirençli HT mevcuttur.

Resistant hypertension: diagnosis, evaluation, and treatment: a scientific statement from the American Heart Association Professional Education Committee of the Council for High Blood Pressure Research.*Calhoun DA, Jones D, Textor S, Goff DC, Murphy TP, Toto RD, White A, Cushman WC, White W, Sica D, Ferdinand K, Giles TD, Falkner B, Carey RM, American Heart Association Professional Education Committee Circulation. 2008 Jun 24; 117(25):e510-26.*

Dirençli Hipertansiyonda Tedavi Yaklaşımı

1. **Pseudorezistans:** Beyaz önlük etkisi, yanlış ölçüm, uygunsuz tedavi, hasta uyumsuzluğu.
2. **Yaşam biçiminde değişiklik:** Kilo verilmesi, tuz kısıtlaması, fiziksel aktivite, alkol alımının azaltılması.
3. **İlaç etkisi:** NSAİ, Sempatomimetikler, OK, Kortikosteroidler…

4. **Sekonder Nedenler:**
   - OSAH
   - RVH
   - Renal parankimal HT
   - Aort koarktasyonu
   - Feokromositoma
   - **Primer aldosteronizm**
   - Cushing sendromu

5. **Antihipertansif ilaç tedavisi tekrar düzenlenmesi** (mineralokortikoid res ant, Alfa bloker 1 bloker, diüretik doz artırılması, loop diüretik, chlorthalidone ilavesi…)

6. **Carotid baroreceptor stimulation**

7. **Renal Sempatik Denervasyon**

Therapeutic strategies in patients with resistant hypertension

Recommendations	Class [a]	Level [b]	Ref. [c]
In resistant hypertensive patients it is recommended that physicians check whether the drugs included in the existing multiple drug regimen have any BP lowering effect, and withdraw them if their effect is absent or minimal.	I	C	-
Mineralocorticoid receptor antagonists, amiloride, and the alpha-1-blocker doxazosin should be considered, if no contraindication exists.	IIa	B	604, 606, 607, 608
In case of ineffectiveness of drug treatment invasive procedures such as renal denervation and baroreceptor stimulation may be considered.	IIb	C	-
Until more evidence is available on the long-term efficacy and safety of renal denervation and baroreceptor stimulation, it is recommended that these procedures remain in the hands of experienced operators and diagnosis and follow-up restricted to hypertension centers.	I	C	-
It is recommended that the invasive approaches are considered only for truly resistant hypertensive patients, with clinic values ≥160 mmHg SBP or ≥110 mmHg DBP and with BP elevation confirmed by ABPM.	I	C	-

ABPM = ambulatory blood pressure monitoring; BP = blood pressure; DBP = diastolic blood pressure; SBP = systolic blood pressure.
[a]Class of recommendation.

ESC.2013 GUIDELINES

Neden Renal Sempatik Denervasyon ?

Araştırmaların büyük bir bölümü Esansiyel HT'nin olası nedenlerini aydınlatmaya yöneliktir.

Etyoloji

MSS sempatik aktivite artışı
Genetik ve yaş
Aşırı sodyum alımı
Renin-anjiyotensin-aldosteron sistemi
Periferik damar direnci
Atrial natriüretik peptit

Vazopressin
Endotel işlev bozukluğu
Aşırı kilo
İnsülin direnci ve hiperinsülinemi
Sigara ve Alkol
Baroreseptörler
……..

Son yıllarda esansiyel HT'nin, özellikle **sempatik sinir sisteminin aşırı etkinliği** ile başlayıp devam ettiği yönündeki kanıtlar artmaktadır [1,2].

1) Review Assessment of sympathetic cardiovascular drive in human hypertension: achievements and perspectives.*Grassi G Hypertension. 2009 Oct; 54(4):690-7.*

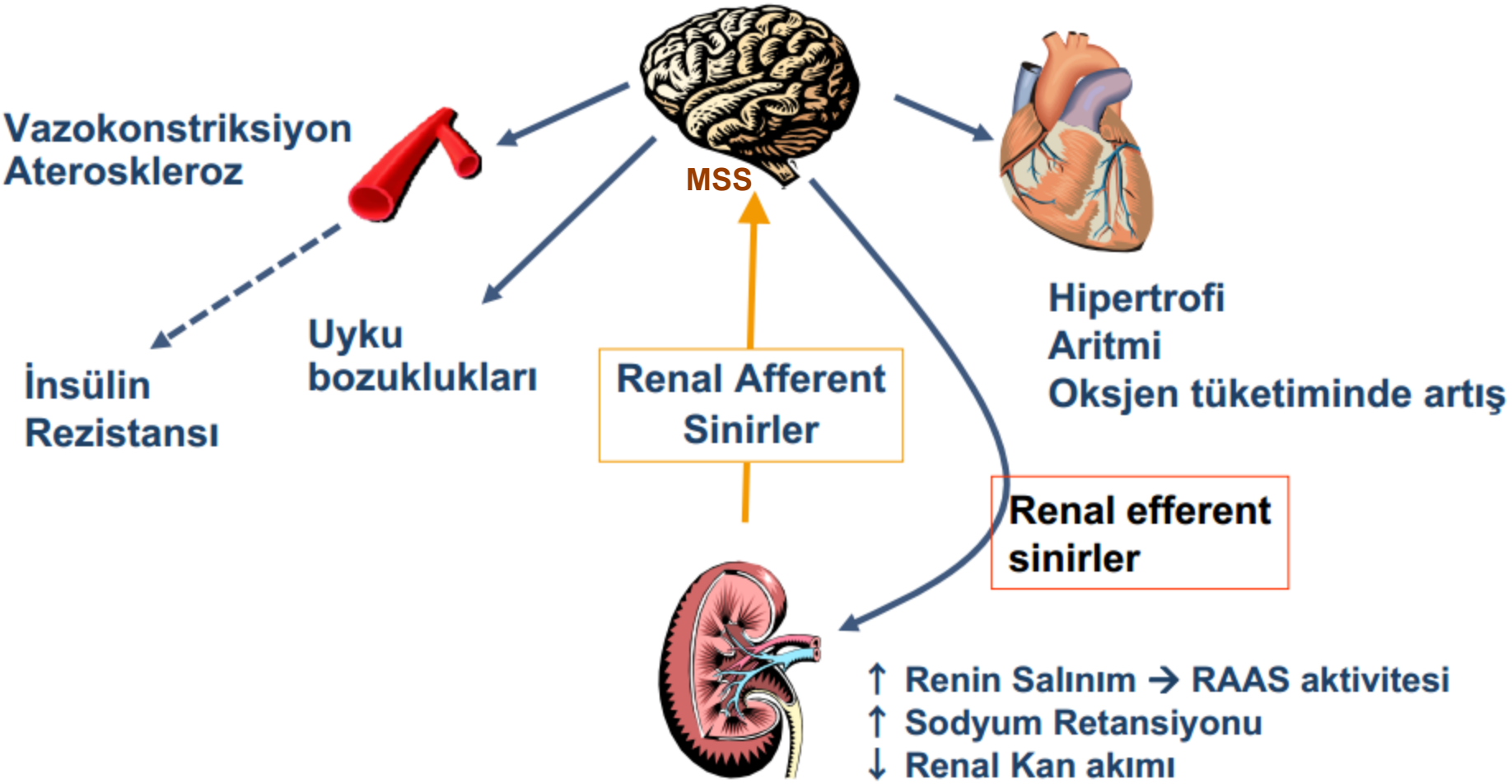
2) Sympathetic and reflex alterations in systo-diastolic and systolic hypertension of the elderly.*Grassi G, Seravalle G, Bertinieri G, Turri C, Dell'Oro R, Stella ML, Mancia GJ Hypertens. 2000 May; 18(5):587-93*

Renal Sempatik Denervasyon Geçmişi

- Cerrahi sempatektomi,
  1950'li yıllarda radikal cerrahi sempatektomi
  - Kan basıncında ciddi düşüşler var.
  - Yan etkiler; Ortostatik taşikardi, postüral hipotansiyon erektil disfonksiyon, mesane ve barsak sorunları ….
- Renal arterin kesilmesi ve reanastomozu

- **Renal sempatik sinir radyofrekans ablasyonu**

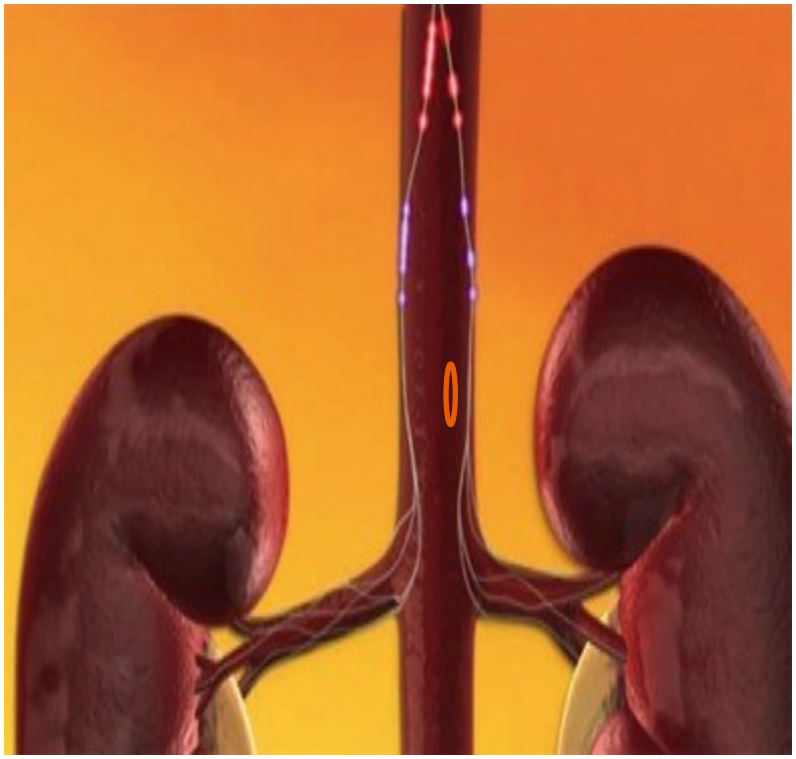
Renal Sempatik Efferent ve Afferent Sinirler:
(Böbrek, santral sempatik uyarı oluşumunda merkez işlevi görür)

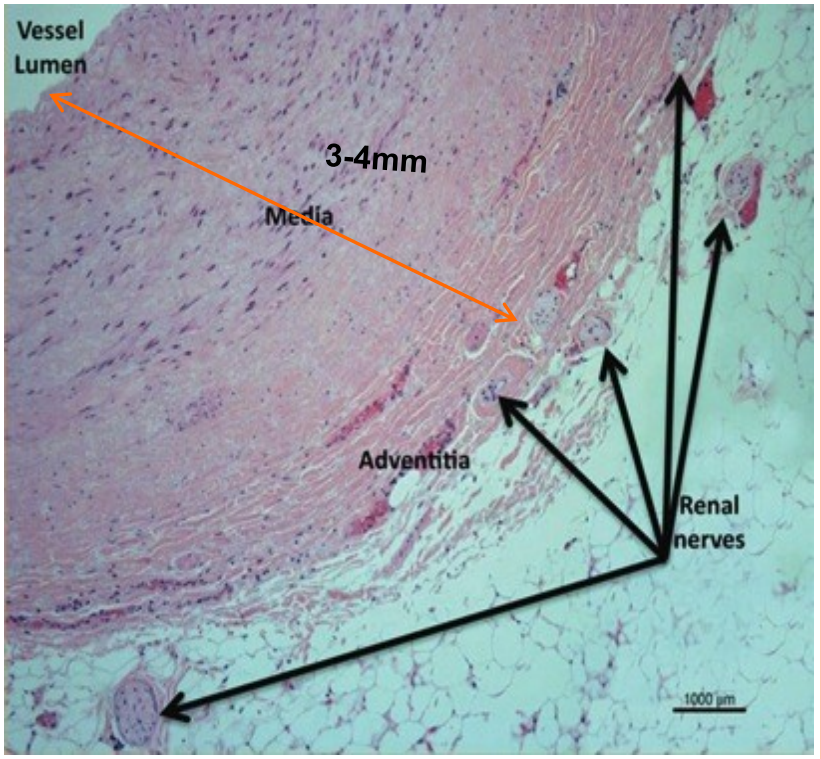


Anatomik Renal Sempatik Denervasyon

Amaç:

- Adventisyası içindeki sempatik afferent ve efferent sinirlerin ablasyonu
- Renal arterin distal kısmında sempatik sinirler lümene daha yakın yerleşimli





Hasta Seçimi

Uygun hasta grubu:

- Dirençli HT tedavi algoritmasına göre yanıt alınamayan,
  - ≥ 3 antihipertansif ilaç (Bir tanesi diüretik)
  - Ofis SBP ≥160 mmHg (Tip II diabetli olgularda ≥150 mmHg)
  - GFR ≥45 mL/dk
  - Renal arter çapı ≥4mm (Aksesuvar renal arter ?? Kateter seçimi)

Uygun olmayan hasta grubu:

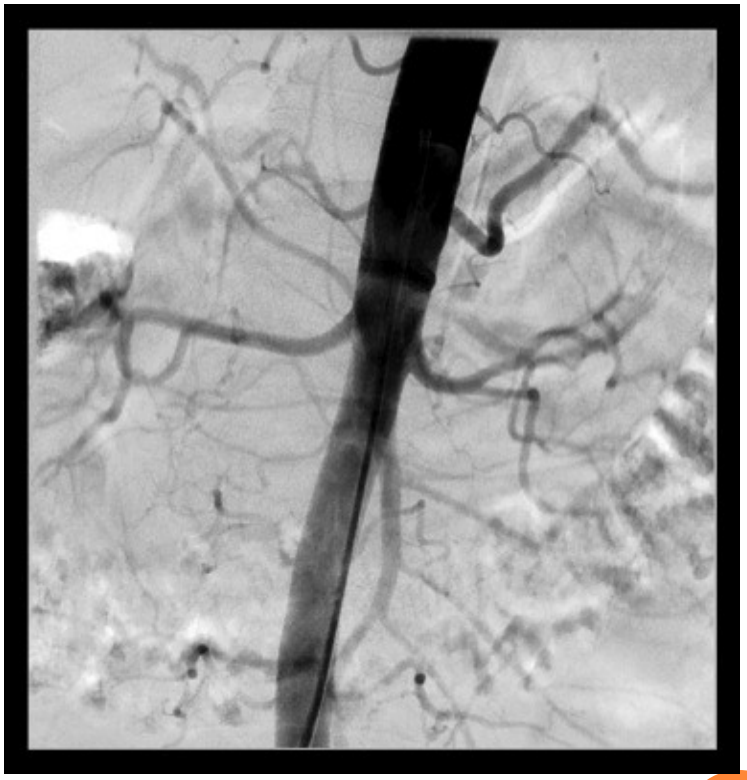
- Hemodinamik veya anatomik olarak belirgin renal arter anomalisi (Darlık, FMD)
- Son 6 ay içinde renal arter girişimi (PTA/Stent)→ 6 aydan sonra ?
- GFR < 45 mL/ dk (Nefroloji görüşü alınmalı !)
- Gebelik
- Stenotik kalp kapak hastalığı varlığı, Unstable angina

The Joint UK Societies' Consensus Statement on Renal Denervation for Resistant Hypertension.

26th January 2012 - http://guidance.nice.org.uk/IPG418

Teknik

- Standart femoral arter girişi (6-8F vasküler kılıf)
- Bilateral renal anjiografi
(Renal arter anatomisi, Aksesuar renal arter)
- İV heparinizasyon
- Kılavuz kateter (6F-8F, RDC / İMA)



Anatomik Hedef

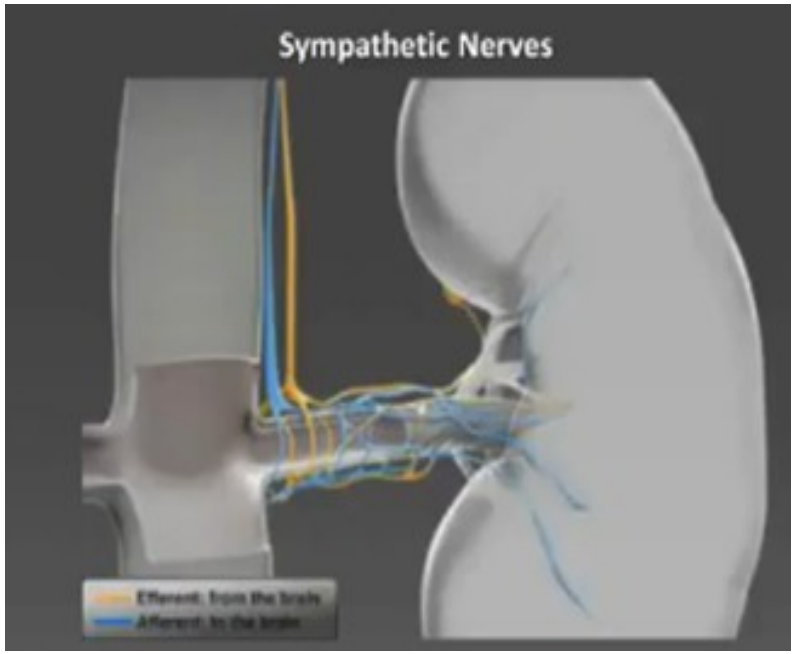
❖ Afferent ve efferent sinirlerin birlikte seyrettiği renal arter bölgesi

❖Multiple bölgeye düşük RF enerjisi (4-6)…(12)

❖Bilateral uygulama

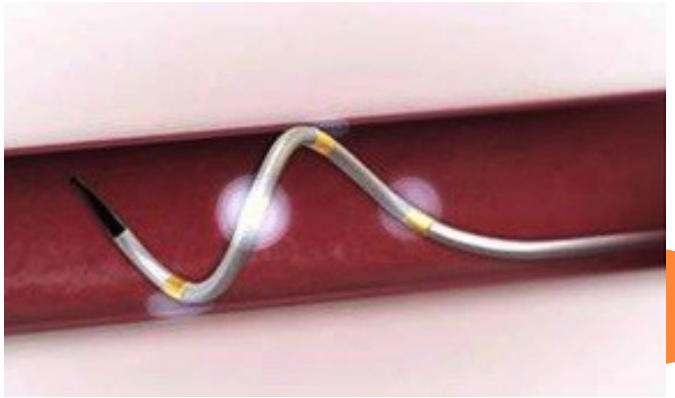
❖**Başarılı denervasyon bölgesi olarak distal (Bifurkasyon) renal arter (*)**

❖Aksesuar renal arter ve erken bifurkasyon 1/3 olguda (3 mm büyük ise denerve edilmeli



*Mahfoud F, Tunev S, Ewen S, Cremers B, Ruwart J, Schulz-Jander D, Linz D, Davies J, Kandzari DE, Whitbourn R, Böhm M, Melder RJ. Impact of Lesion Placement on Efficacy and Safety of Catheter- Based Radiofrequency Renal Denervation. *J Am Coll Cardiol 2015;* 66: 1766-1775 [PMID: 26483099 DOI: 10.1016/j.jacc.2015.08.018]
* Henegar JR, Zhang Y, Hata C, Narciso I, Hall ME, Hall JE. Catheter-Based Radiofrequency Renal Denervation: Location Effects on Renal Norepinephrine. *Am J Hypertens 2015; 28:* 909-

❖ Renal denervasyon kateteri (Açılı uçlu / basket / balon / spiral)



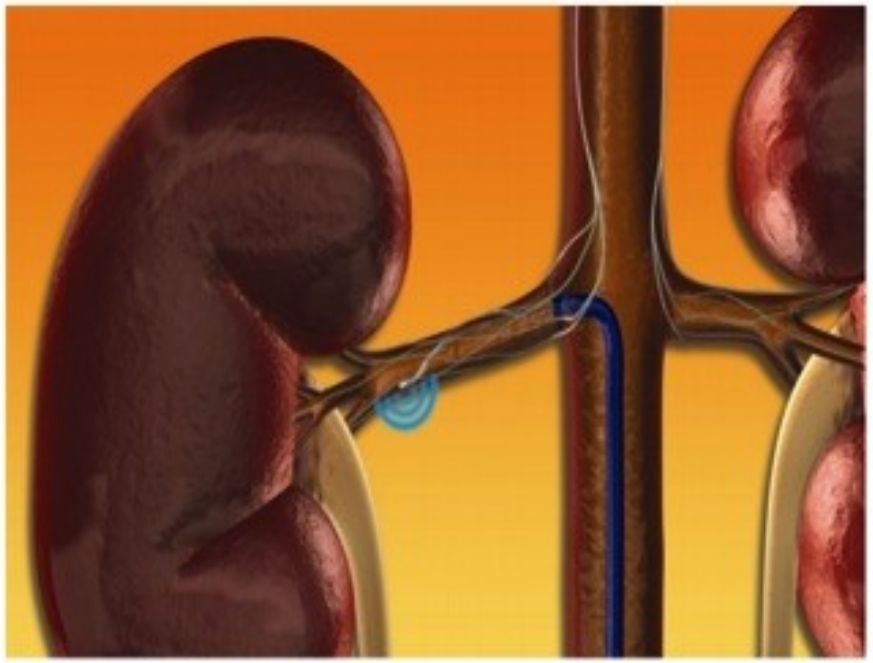
Symplicity Flex Renal Sempatik Denervasyon Katater

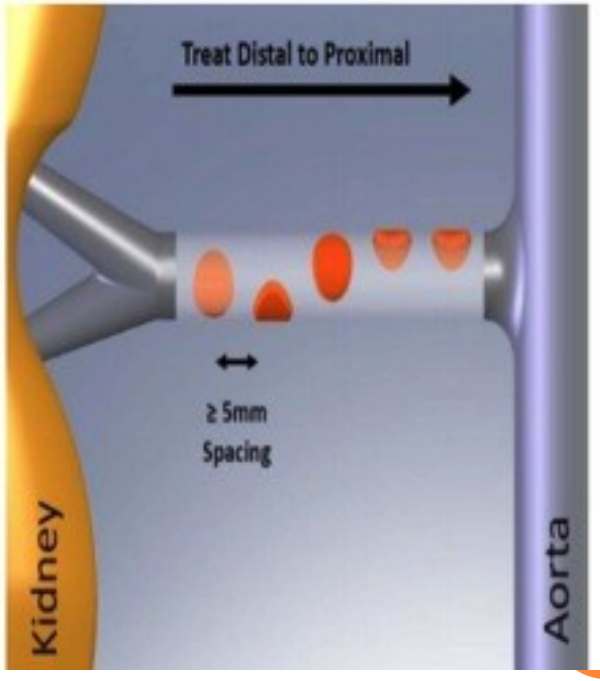
- 6F guiding katater
- Güvenli, hedefe yönelik terapi
- Kendi yönlenen atravmatik damar teması

❖ Denervasyon kateteri segmental arter ayrımına kadar ilerletilir.

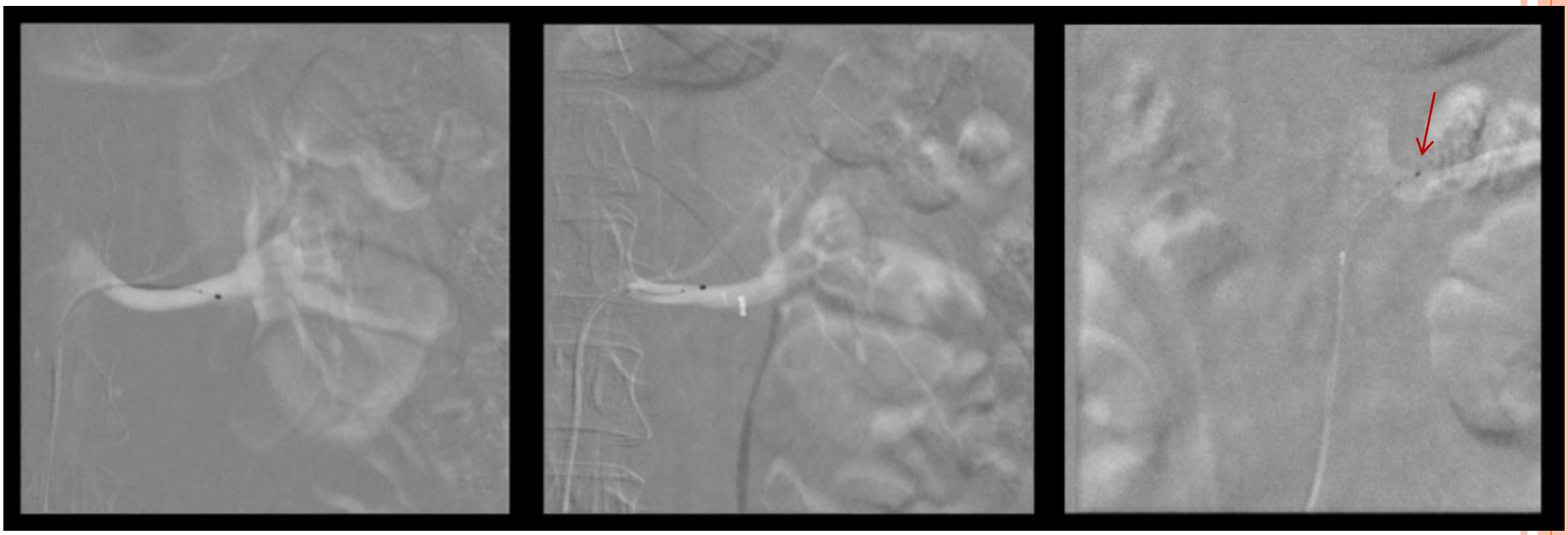
❖ Segmental arter ayrımı öncesinden, orifise kadar 5mm aralıklarla, helikal konumlandırılarak 2’şer dk süreyle ablasyon uygulanır.

❖Ortalama 4-6 nokta.





SYMPLICITY İLE RENAL DENERVASYON



- Her 5mm'de, 90º rotasyon ve 2 dk süreli RF ablasyon uygulanır.
- Renal arter orifisi düzeyinde, üst duvar ablasyonu !!
- İşlem sırasında bradikardi → Atropin
- İşlem sırasında ve sonrasında kontrol anjiografi (Spazm, Diseksiyon, Rüptür ?

Simplicity Spiral Multi-elektrod Renal Sempatik Denervasyon Kateteri

- Helical multi elektrode sistem
- 4 farklı bölgeye aynı anda ablasyon
- Kısa işlem süresi
- Self expanding dizayn sayesinde farklı çap ve anatomideki damara uyumluluk (3-8mm)
- 4f kateter ve 0,014 kılavuz tel ile hedef bölgeye yönlendirilme

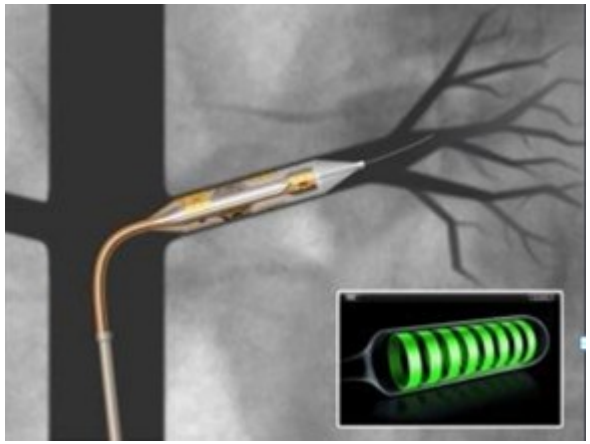
Enlig HTN Renal Sempatik Denervasyon Kateteri

- 4 farklı bölgeye eş zamanlı ablasyon
- Operatör bağımlılığında azalma
- Kısa işlem süresi

MULTI-ELEKTRODE ABLASYON AVANTAJLARı

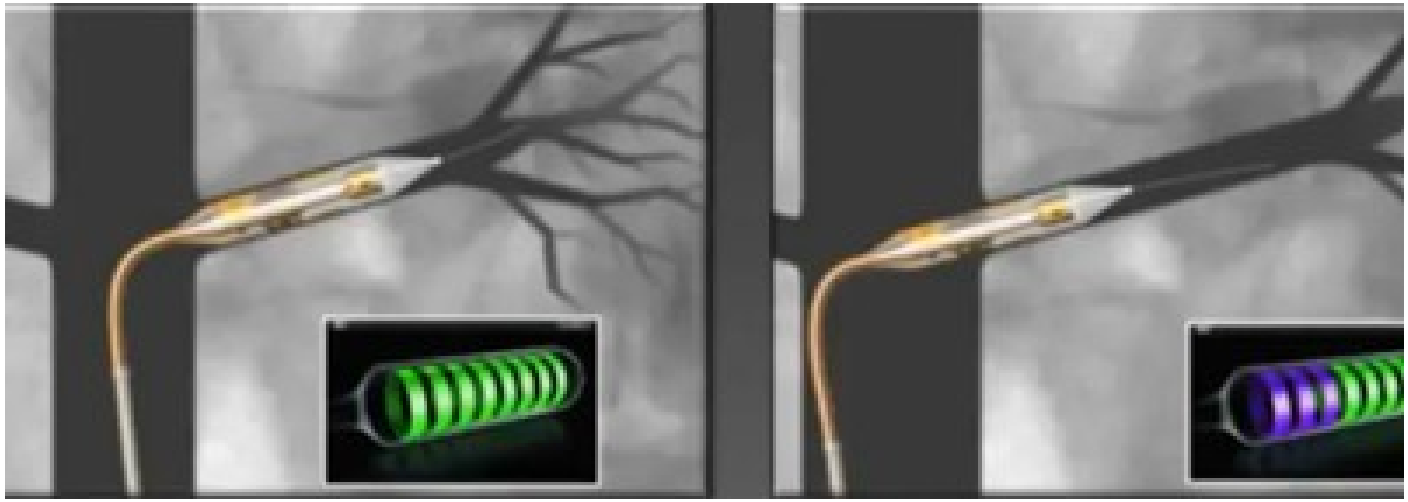
Daha az manipulasyon, süre ve hata payı ile daha kesin sonuçlar

Vessix Renal Sempatik Denervasyon Kateteri



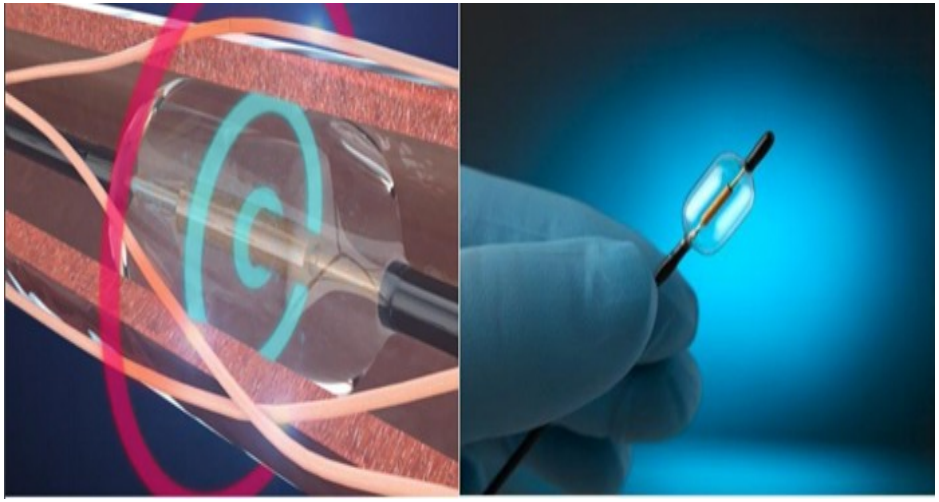
- Bipolar RF ablasyonu
- Düşük enerji
- Kısa işlem zamanı
- İşlemler arası variabilitede azalma
- Over the wire balon kateter ile değişik damar çaplarına uyum (<4mm)

Vessix Renal Denervasyon Kateteri



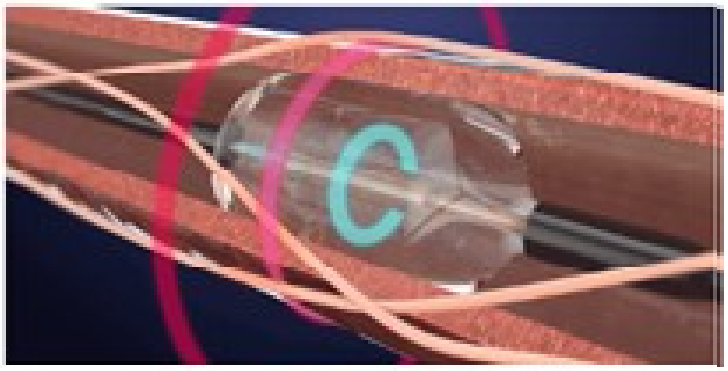
Arter ablasyon uygulanmak istenen bölgeye göre otomatik deaktive edilebilen elektrode teknolojisi

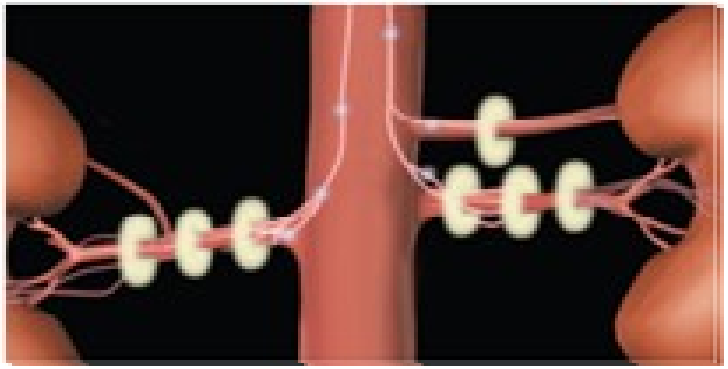
Paradise Renal Denervasyon Sistemi



- Ultrason enerjisini ısıya çeviren sistem
- Renal arterin zarar görmesini engellemek için eş zamanlı soğutma

Paradise Renal Denervasyon Sistemi





- Kırmızı halkalar damar duvarına verilen ısıyı
- Mavi halkalar sistemdeki soğuk su vasıtasıyla ısıtma sonrası damar hasarını engellemek için soğutma işlemini gösteriyor
- Beyaz halkalar böbreklere giden sinirlerin aşırı aktivitesini azaltmak için dokuda biriken ısıyı göstermektedir
- Her halka bir 7 saniyelik tedaviyi temsil eder.

SIK KULLANILAN CİHAZLAR

Symplicity, Ardian/Medtronic

- Monopolar
- Tek elektrod
- 6F Kılavuz kateter
- 8W
- 2dk'lık RF periyodu x ~5
- ≥ 4mm arterlerde
- **~20dk**

EnligHTN, St.Jude

- Monopolar
- Dört elektrod (1cm)
- **8F** Kılavuz kateter
- 6W
- 1.5dk'lık RF periyodu x 2-3
- ≥ 4mm arterlerde
- ~10dk

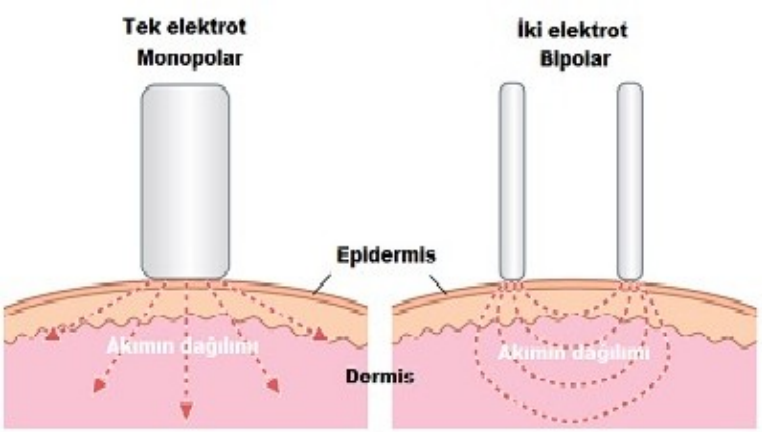
Vessix, Boston

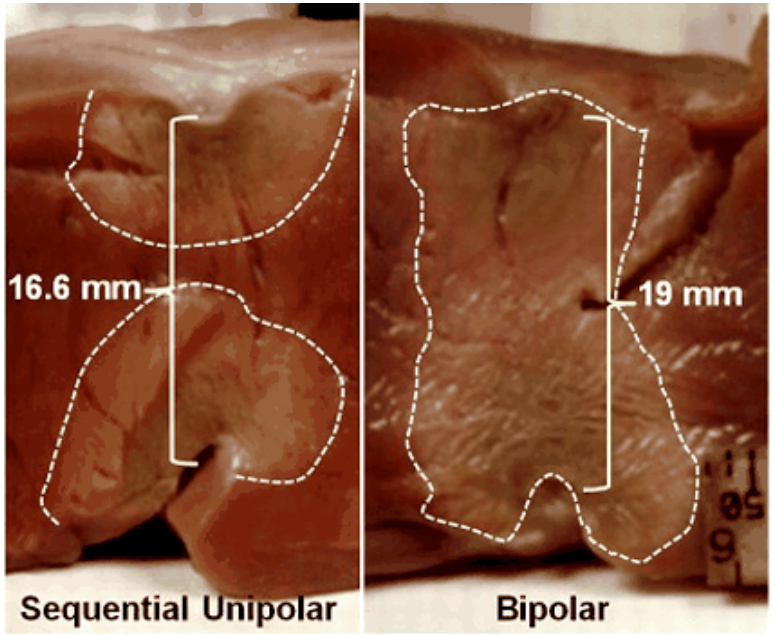
- **Bipolar**
- Sekiz elektrod (2cm)
- 6F Kılavuz kateter
- **1-2W**
- **30sn** RF periyodu x 1-2
- ↓ **4mm** arterlerde
- ~2dk

❖ Anatomiye göre kateter seçimi !

- Aksesuar renal arter
- Tortioz anatomi (Renal arter orifis üst duvarı)

Monopolar X Bipolar RF





KLİNİK SONUÇ-1

- **Symplicity-HTN 3 Çalışması**

*İlk prospektif randomize çalışma

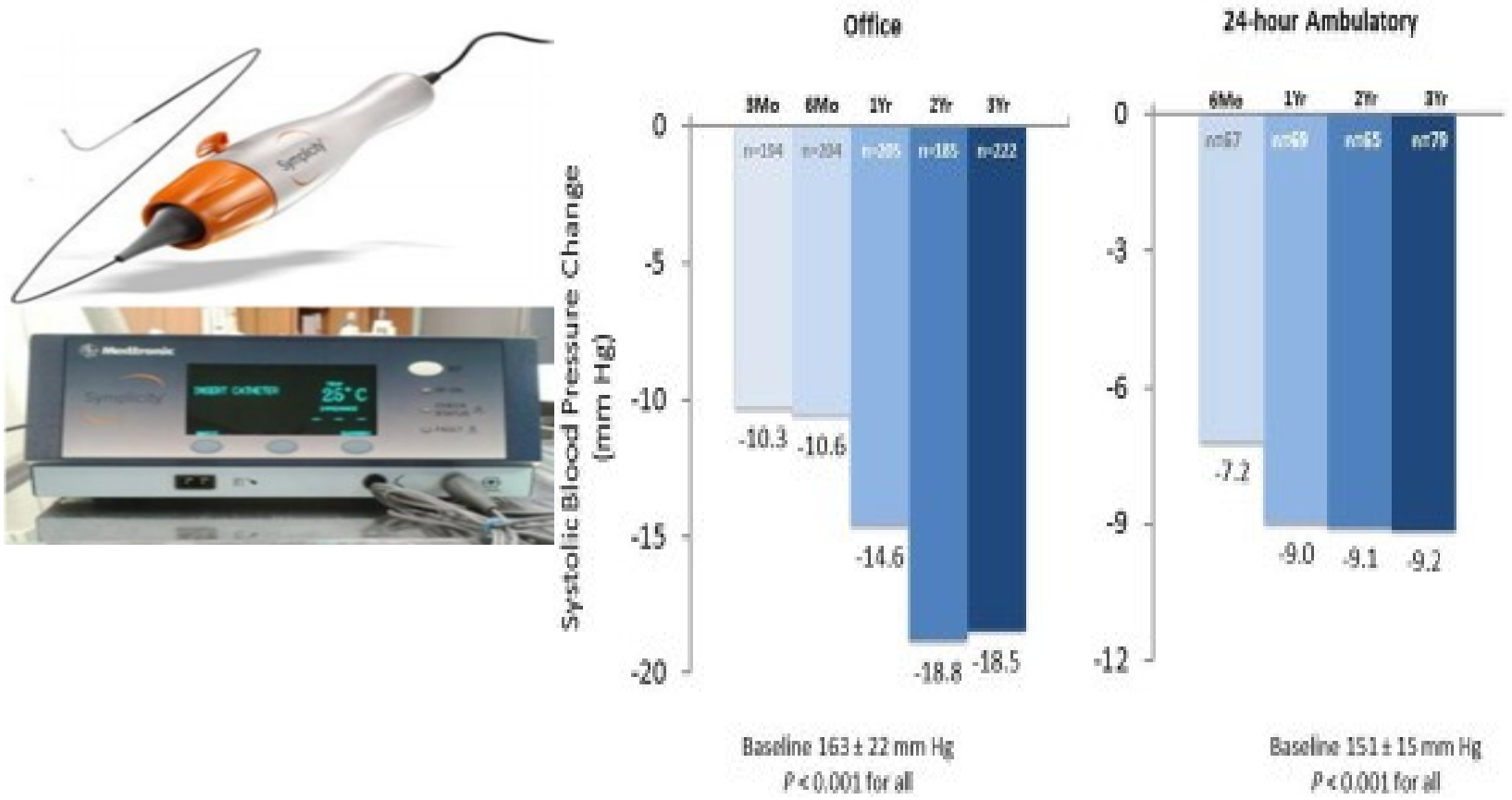
*Symplicity RSD kateter kullanılmı

*4-6 bölge ablate edilmiş??.

*Sonuç; KB düşüşü kontrol grubuna üstün deyil (6 aylık).

*İlaç kullanım, çalışma protokol ve teknik ??

3 yıllık Global symplicity registry;



TCT-761 Long-term (3-year) safety and effectiveness from the Global SYMPLICITY Registry of renal denervation in a real world patient population with uncontrolled hypertension

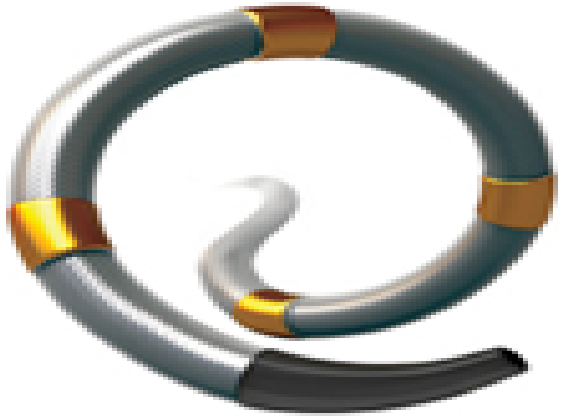
Journal of the American College of Cardiology, Volume 68, Issue 18, Supplement, 2016, B308

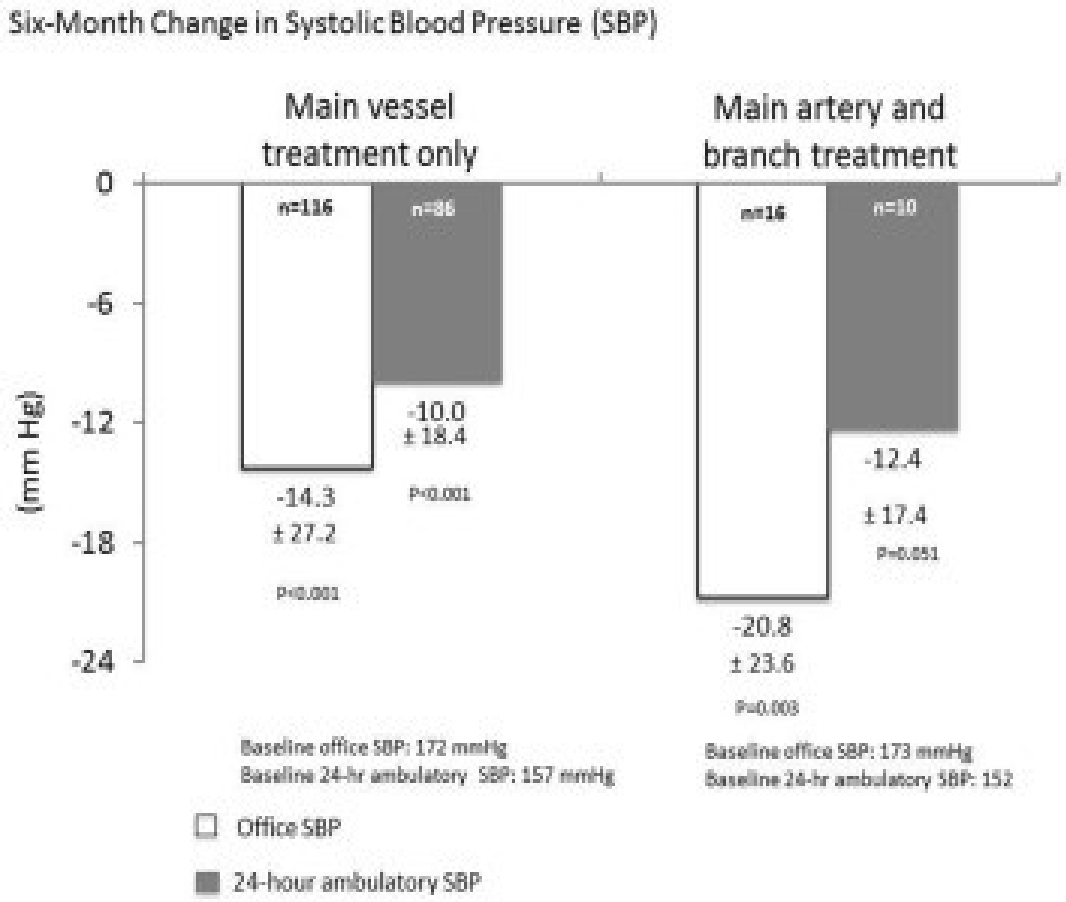
http://dx.doi.org/10.1016/j.jacc.2016.09.791

Hypertension Therapies and Renal Denervation

TCT-762 Renal denervation treatment with the Symplicity Spyral multielectrode catheter: 6-month safety and blood pressure outcomes from the Global SYMPLICITY Registry

Michael Böhm[1], Nicole Brilakis[2], Giuseppe Manc ...JS
Schlaich[6], Felix Mahfoud[7]





Michael Böhm, Nicole Brilakis, Giuseppe Mancia, Krzysztof Narkiewicz, Luis Ruilope, Markus Schlaich, Felix Mahfoud

TCT-762 Renal denervation treatment with the Symplicity Spyral multielectrode catheter: 6-month safety and blood pressure outcomes from the Global SYMPLICITY Registry

Journal of the American College of Cardiology, Volume 68, Issue 18, Supplement, 2016, B308

http://dx.doi.org/10.1016/j.jacc.2016.09.792

< Previous Article | December 15, 2015 Volume 201, Pages 345–350 | Next Article >

Catheter-based renal denervation for resistant hypertension: Twenty-four month results of the EnligHTN™ I first-in-human study using a multi-electrode ablation system☆

Costas P. Tsioufis, Vasilios Papademetriou, Kyriakos S. Dimitriadis, Alexandros Kasiakogias, Dimitrios Tsiachris, Matthew I. Worthley, Ajay R. Sinhal, Derek P. Chew, Ian T. Meredith, Yuvi Malaiapan, Costas Thomopoulos, Ioannis Kallikazaros, Dimitrios Tousoulis, Stephen G. Worthley

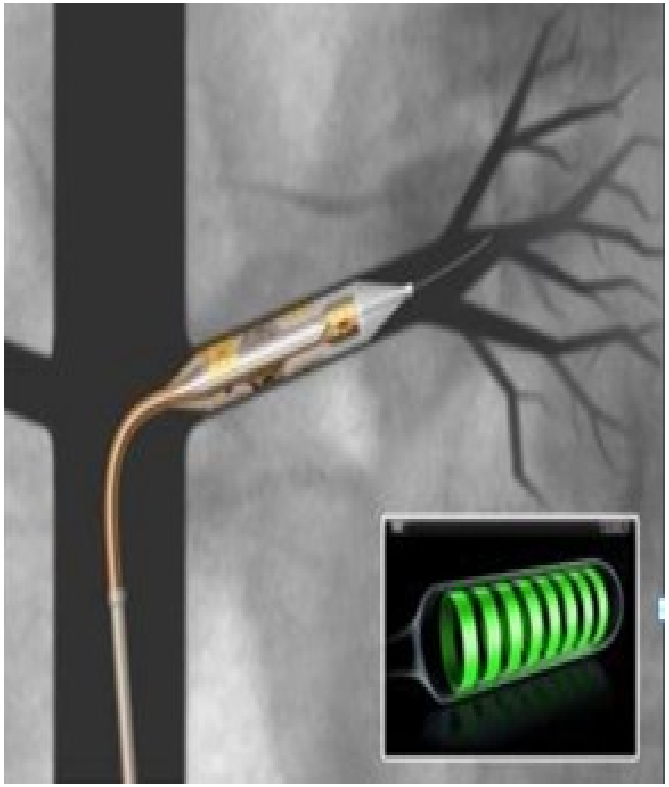
DOI: http://dx.doi.org/10.1016/j.ijcard.2015.08.069 | CrossMark

Methods and results

We studied 46 patients (age: 60 ± 10 years, 4.7 ± 1.0 antihypertensive drugs) with drug resistant hypertension (dRHT). Reduction in office BP at 24 months from baseline was −29/−13 mm Hg, while the reduction in 24-hour ambulatory BP and in home BP at 24 months were −13/−7 mm Hg and −11/−6 mm Hg respectively ($p < 0.05$ for all). A correlation analysis revealed that baseline office and ambulatory BP were related to the extent of office and ambulatory BP drop. Apart from higher body mass index (33.3 ± 4.7 vs 29.5 ± 6.2 kg/m^2, $p < 0.05$), there were no differences in patients that were RDN responders defined as ≥10 mm Hg decrease (74%, n = 34) compared to non-responders. Stepwise logistic regression analysis revealed no prognosticators of RDN response (p = NS for all). At 24 months there were no new serious device or procedure related adverse events.

Conclusions

The EnligHTN I study shows that the multi-electrode ablation system provides a safe method of RDN in dRHT accompanied by a clinically relevant and sustained BP reduction.



Journal of Human Hypertension , (12 January 2017) | doi:10.1038/jhh.2016.82

Bipolar radiofrequency renal denervation with the Vessix catheter in patients with resistant hypertension: 2-year results from the REDUCE-HTN trial

H Sievert, J Schofer, J Ormiston, U C Hoppe, I T Meredith, D L Walters, M Azizi, J Diaz-Cartelle and on behalf of the REDUCE-HTN Investigators

One hundred forty-six hypertensive patients were treated with bipolar radiofrequency balloon-based renal denervation. Significant office blood pressure (BP) reductions were sustained through 2 years of follow-up, with few patients experiencing related serious adverse events. Although confirmatory randomised controlled trials with designs to minimise confounding factors are needed, long-term follow-up after renal denervation continues to support procedure safety and suggests that it may have a lowering effect on BP.

Hypertension

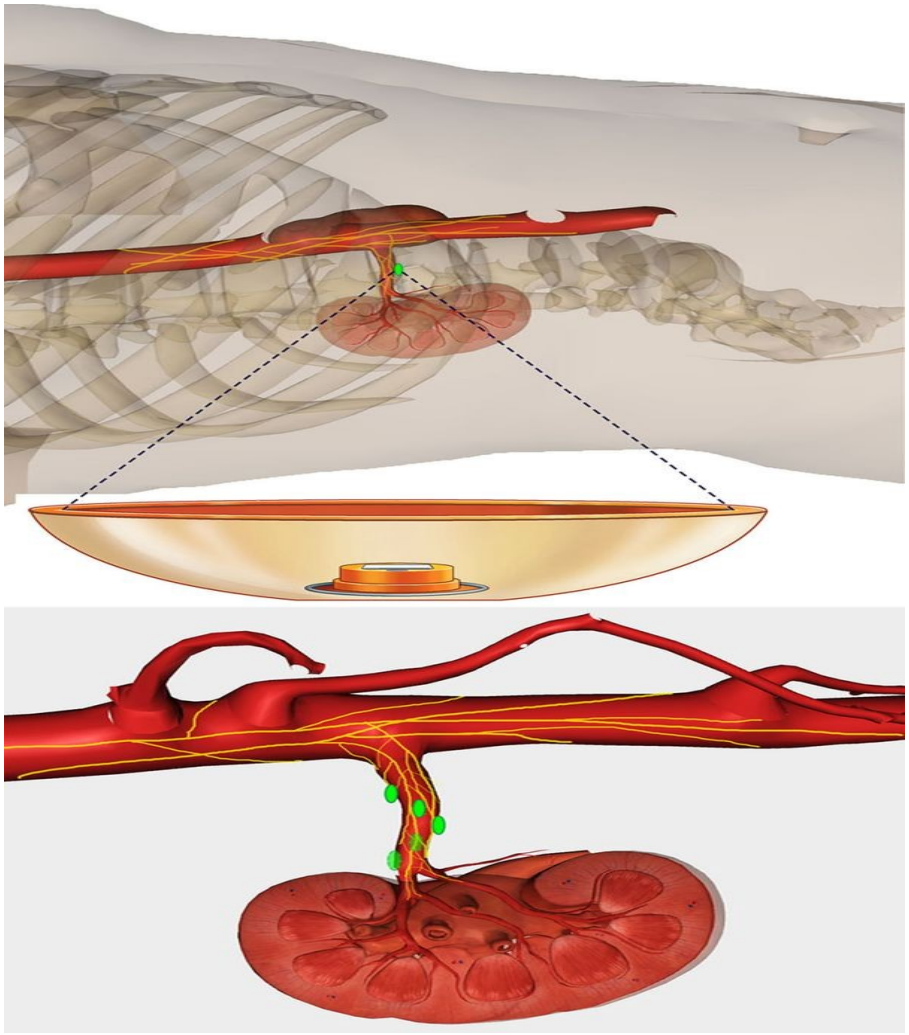
LETTER TO THE EDITOR

Noninvasive Renal Denervation for Resistant Hypertension Using High-Intensity Focused Ultrasound

Shunkang Rong, Hui Zhu, Dichuan Liu, Jun Qian, Kun Zhou, Que Zhu, Yonghong Jiang, Gang Yang, Changming Deng, Dengqing Zhang, Qi Zhou, Han Lei, Tong-Chuan He, Zhibiao Wang, Jing Huang

DOI https://doi.org/10.1161/HYPERTENSIONAHA.115.05754
Hypertension. 2015;66:e22-e25
Originally published August 3, 2015

A schematic of high-intensity focused ultrasound–based renal denervation.



Shunkang Rong et al. Hypertension. 2015;66:e22-e25

American Heart Association.

In conclusion, noninvasive RDN by extracorporal HIFU appeared to have a BP lowering effect that was sustained for 6 months with a good safety in resistant hypertensive patients. This first-in-man study has provided the scientific basis for future randomized controlled trials.

JACC Cardiovasc Interv. 2016 Mar 28;9(6):589-98. doi: 10.1016/j.jcin.2015.11.041.

Transcatheter Alcohol-Mediated Perivascular Renal Denervation With the Peregrine System: First-in-Human Experience.

Fischell TA[1], Ebner A[2], Gallo S[2], Ikeno F[3], Minarsch L[4], Vega F[5], Haratani N[6], Ghazarossian VE[6].

Author information

Abstract

OBJECTIVES: This study evaluated the first clinical use of a new endovascular approach to renal denervation, using chemical neurolysis, via periadventitial infusion of dehydrated alcohol (ethanol) to perform "perivascular" renal artery sympathetic denervation.

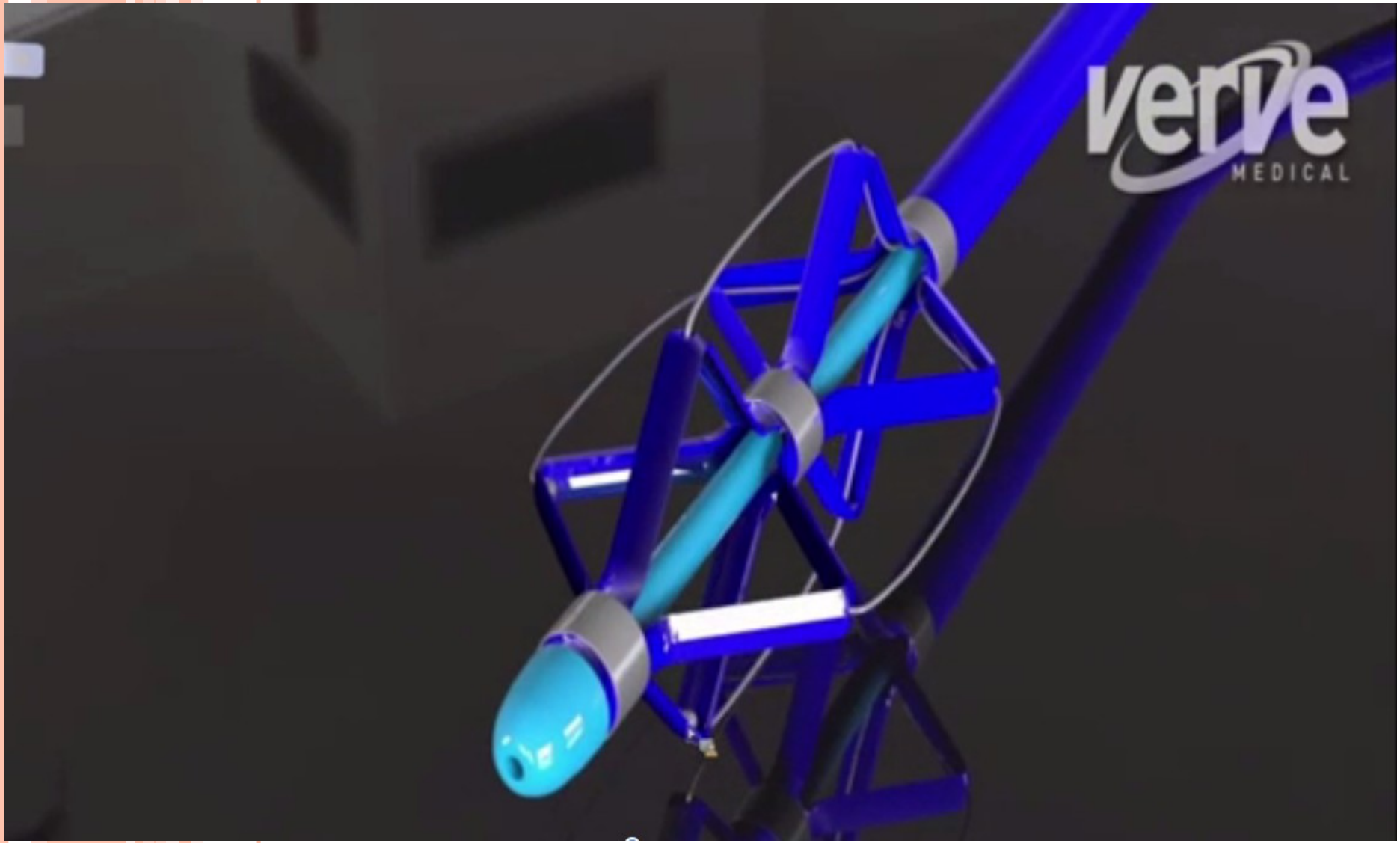
BACKGROUND: Renal denervation remains a promising technology for the treatment of hypertension and other disorders.

METHODS: A novel 3-needle delivery device (Peregrine System Infusion Catheter, Ablative Solutions, Inc., Kalamazoo, Michigan) was introduced into the renal arteries of 18 subjects with refractory hypertension. Microdoses of alcohol were infused bilaterally via the 3 needles into to the adventitial space (0.30 ml/artery, 37 arteries). Renal artery angiography was performed at the time of the procedure and at 6 months (n = 16). The primary safety endpoints were complications associated with the catheter insertion and delivery of the neurolytic agent or any major vascular access complications. The secondary performance endpoint was a reduction in office-based systolic blood pressure at 6 months compared with baseline.

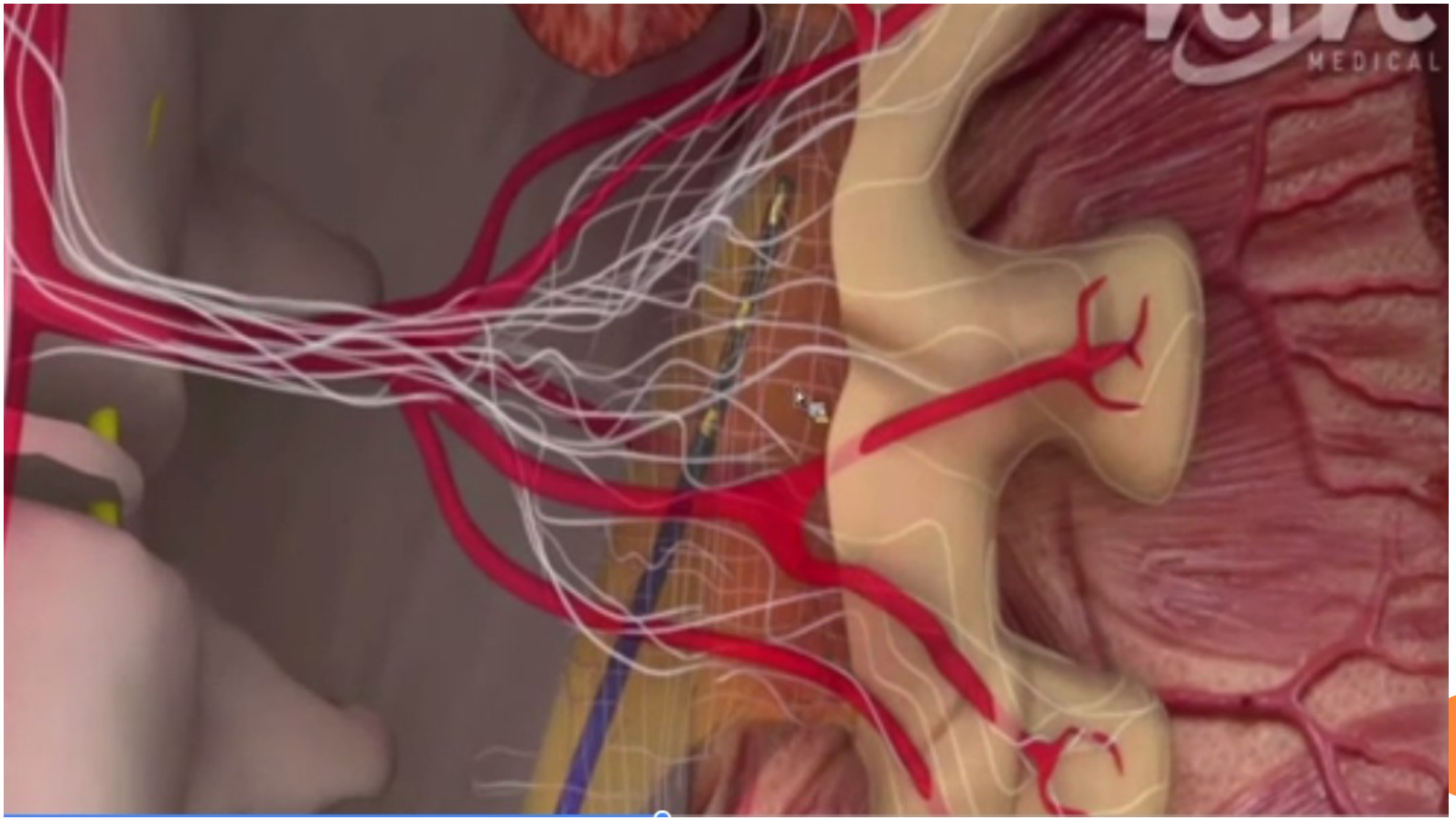
RESULTS: Procedural success was achieved in 100% of subjects (N = 18) and arteries (N = 37). There were no study-related adverse clinical events at follow-up. One death of a subject was recorded but determined by the investigator and an independent medical monitor to be non-study related. There were no angiographic observations of renal artery stenosis, aneurysms, or other renal artery abnormalities at 6 months (32 renal arteries). Sixteen of the 18 subjects had a 6-month follow-up. The mean office systolic blood pressure decreased from 175 ± 17 mm Hg to 151 ± 26 mm Hg (-24 mm Hg). There was an average reduction of antihypertensive medications from 3.4 (baseline) to 2.0 per subject at 6 months.

CONCLUSIONS: Chemical renal denervation using the infusion of very low doses of alcohol directly into the adventitial space appears to be feasible and safe. This approach may be a promising alternative approach to perform catheter-based renal denervation. These results need to be confirmed in larger scale clinical studies.

Transuretral Yaklaşım, VERVE



Transuretral Yaklaşım



Renal Sempatik Denervasyonun Kan Basınç Üzerine Etkisi (*)

Table 2 Blood pressure effects of renal sympathetic denervation

Ref.	Year	Control	*n* (RDN/control)	Systolic office BP (mmHg)	*P*-value	Systolic ambulatory BP (mmHg)	*P*-value
Krum *et al*[7]	2009	None	50	-22	< 0.001[a]	NA	NA
Esler *et al*[11]	2010	RDN *vs* medical	106 (52/54)	-32 *vs* 1	< 0.00001[b]	-11/-7 *vs* -3/-1	NA
Bhatt *et al*[8]	2014	RDN *vs* sham	535 (364/171)	-14 *vs* -12	0.26[b]	-6.8 *vs* -4.8	0.98[b]
Desch *et al*[10]	2015	RDN *vs* sham	71 (35/36, intention to treat)	NA	NA	-8.5 *vs* -4.7	0.06[b]
			63 (29/34, per protocol)	NA	NA	-8.3 *vs* -3.5	0.04[b]
Rosa *et al*[13]	2015	RDN *vs* intensified medical treatment	106 (52/54)	-12 *vs* -14	< 0.001[a]/0.60[b]	-8.6 *vs* -8.1	< 0.001[a]/0.87[b]
Azizi *et al*[14]	2015	Stepped-care antihypertensive treatment with *vs* without RDN	106 (53/53)	-15 *vs* -9	0.15[b]	-15.8 *vs* -9.9	0.03[b]
Böhm *et al*[12]	2015	None	998	-12	< 0.00001[a]	-6.6	< 0.00001[a]

(*)Fengler K[1], Rommel KP[1], Okon T[1], Schuler G[1], Lurz P[1]. Renal sympathetic denervation in therapy resistant hypertension pathophysiologicalaspects and predictors for treatment success. World J Cardiol. 2016 Aug 26;8(8):436-46. doi: 10.4330/wjc.v8.i8.436.

Renal Sempatik Denervasyonun Tansiyon Dışı Etkileri (*)

- Böbrek
- Kalp
- Hemodinamik parametreler
- Sinir sistemi
- Metabolik
- Enflamasyon
- Biomarkır

(*)Fengler K[1], Rommel KP[1], Okon T[1], Schuler G[1], Lurz P[1]. Renal sympathetic denervation in therapy resistant hypertension pathophysiological aspects and predictors for treatment success. World J Cardiol. 2016 Aug 26;8(8):436-46. doi: 10.4330/wjc.v8.i8.436.

- **Renal Sempatik Denervasyon Sonrası (*);**

*Böbrek Na atılışında artış

*Sol ventrikül kitlesi ve atriyal kontraksiyon da düzelme

*Kalp hızı, kalp hızı değişkenliği, ve ventriküler aritmi de azalma

* Hemodinamik parametrelerde düzelme: Santral kan basın
Büyüme indeks
Aortic nabız basınç
Nabız dalga velozitesin de azalma

* Ekzersiz KB azalma

*Sistemik enflamasyon da azalma

* Neropeptid Y ve beyin kökenli nötrofik faktör de azalma

(*)Fengler K[1], Rommel KP[1], Okon T[1], Schuler G[1], Lurz P[1]. Renal sympathetic denervation in therapy resistant hypertension pathophysiologicalaspects and predictors for treatment success. World J Cardiol. 2016 Aug 26;8(8):436-46. doi: 10.4330/wjc.v8.i8.436.

- **Renal Sempatik Denervasyon Sonrası (*)**
  * Kardiyak sempatik aktivite de (Azalma; değişme yok)
  * İnsulin sensitivitesin de (Düzelme; değişme yok)
  * Ortastatik hipotansiyon (Değişmiyor)

*Fengler K[1], Rommel KP[1], Okon T[1], Schuler G[1], Lurz P[1].
Renal sympathetic denervation in therapy resistant hypertension pathophysiologicalaspects and predictors for treatment success. World J Cardiol. 2016 Aug 26;8(8):436-46. doi: 10.4330/wjc.v8.i8.436.

Renal Sempatik Denervasyon Sonrası; Kan Basınç Azalması için Pozitif Prediktörler(*)

- Yüksek KB varlığı
- Aksesuar renal arter yokluğu
- İzole sistolik hipertansiyon
- Düşük nabız dalga velositesi
- Bozulmuş barorefleks sensitivitesi

- *Fengler K[1], Rommel KP[1], Okon T[1], Schuler G[1], Lurz P[1].
  Renal sympathetic denervation in therapy resistant hypertension pathophysiologicalaspects and predictors for treatment success. World J Cardiol. 2016 Aug 26;8(8):436-46. doi: 10.4330/wjc.v8.i8.436.

Diğer Prediktörler(*)

- Obesite , (artmış sempatik aktivite); iyi yanıt beklenebilir.
- Çinsiyet; çalışmalar erkekler daha fazla oranda; %23-40 kadınlar konusunda daha sınırlı bilgiye sahibiz.
- Yaş 60 üstü tartışmalı
- Yüksek vasküler stiffnıss (KAH, SVO): kötü KB cevap göstergesi
- Böbrek fonksiyonları (artmış sempatik aktivite); iyi yanıt beklenebilir.
- Kalp yetersizliği ve aritmi hastaları için tedavi umudu ??

*Fengler K[1], Rommel KP[1], Okon T[1], Schuler G[1], Lurz P[1].
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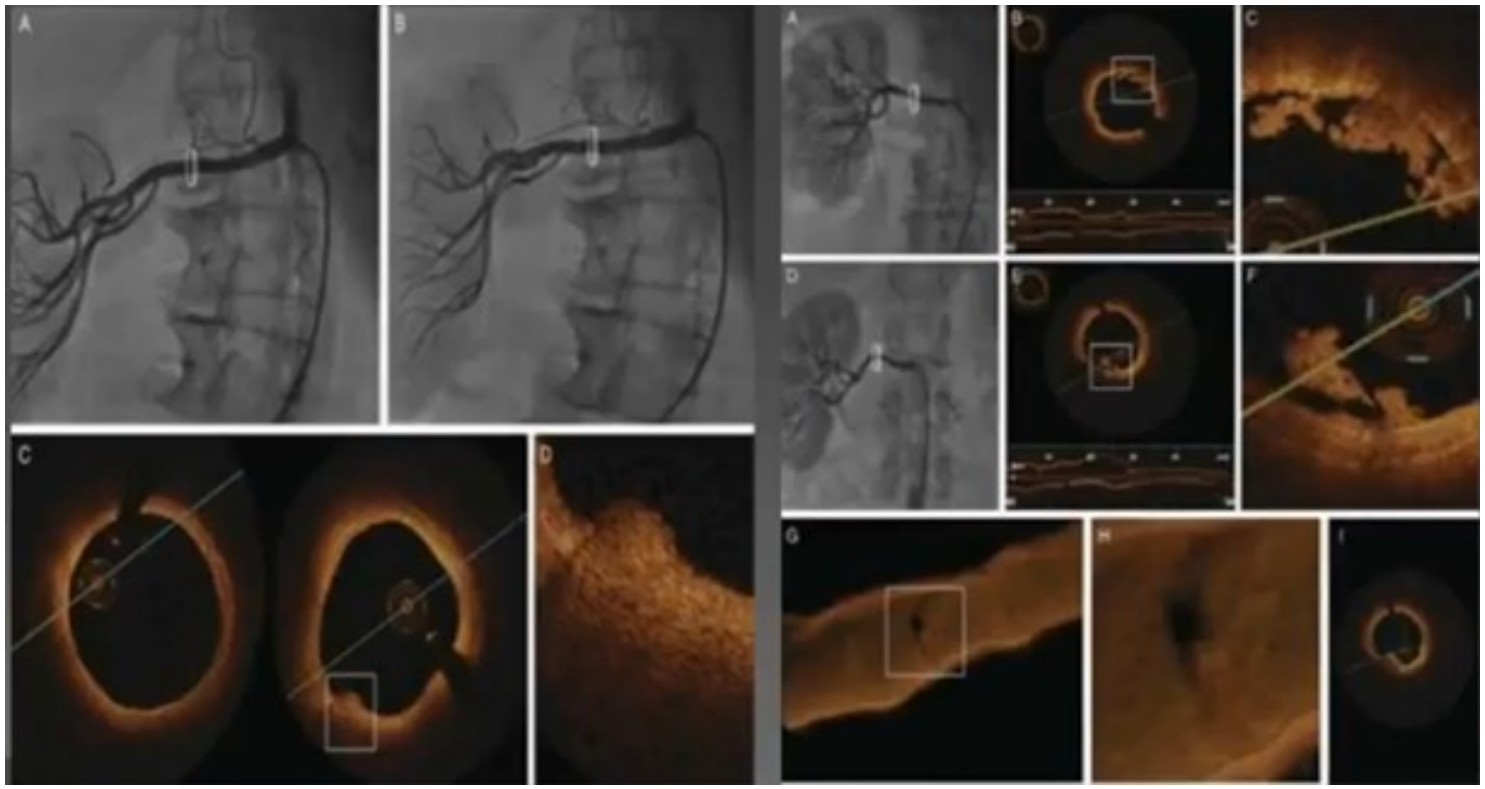
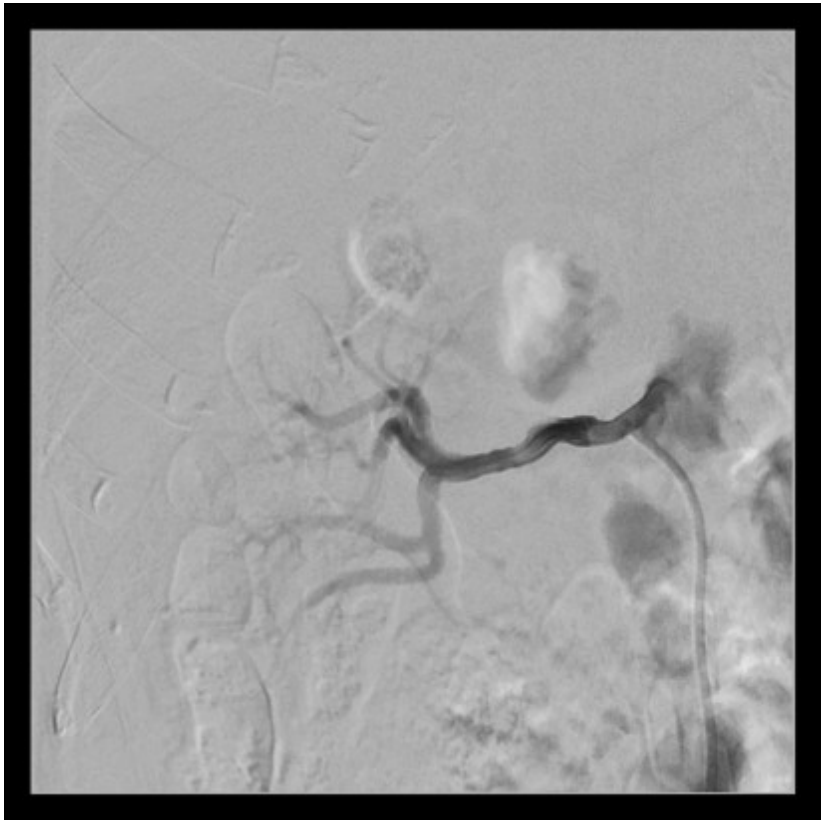
Teknolojik Olarak EKSİKLERİMİZ

- Direk böbrek sempatik aktivitenin ölçülememesi
- Denervasyon sayısı
- Ultrason bazlı ve ilaç bazlı yaklaşımlar alternatif ??

ETKİNLİK ve GÜVENLİK;VASKÜLER DUVAR ÖDEM-TROMBÜS



Ablasyon sonrası anjiografide; arter duvarında vazospazm nedenli düzensizlik



Operatif komplikasyon;

- Giriş yerinde hematom / psödoanevrizma
- Ablasyon uygulanan segmentte diseksiyon
- Renal arterde rüptür
- Postoperatif erken dönemde hipotansiyon

Gelecek ?

- Fayda görecek dirençli HT tanımlanması; **ENDİKASYON**
- İşlem sonrası tedavi etkinliğinin ölçülebilmesi; **TEDAVİ**
- Uzun dönem tedavi etkinligi; **ŞİFA**
- Kateter teknolojisi
- Aritmi , Kalp yetmezliği, OSAS, Tip-2 DM gibi farklı hastalıklarda tedavi?
- Maliyet yüksekliği, SUT karşılığı ve SGK ödemesi

SABRINIZ İÇİN TEŞEKKÜRLER