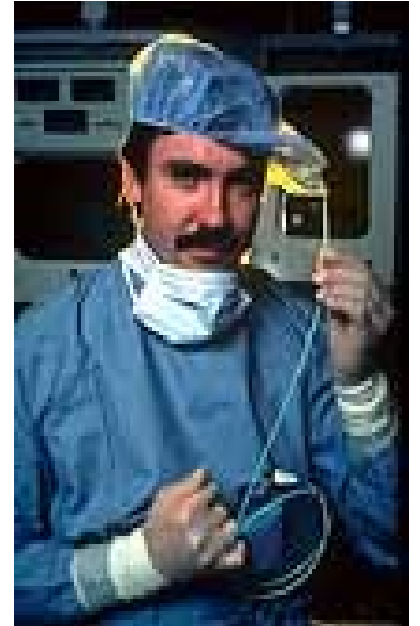


# RENAL ARTER GİRİŞİMLERİNDE TEKNİK VE SONUÇLAR?

Doç.Dr.Gökhan Alıcı  
İstanbul Girişimsel Kardiyoloji Kursu  
17-18 Şubat 2017

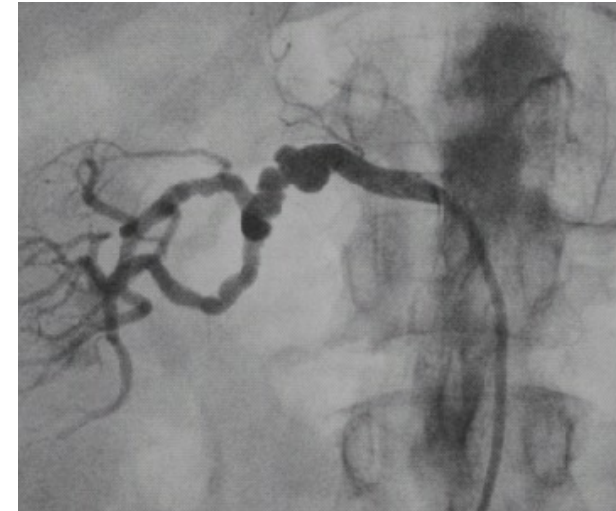
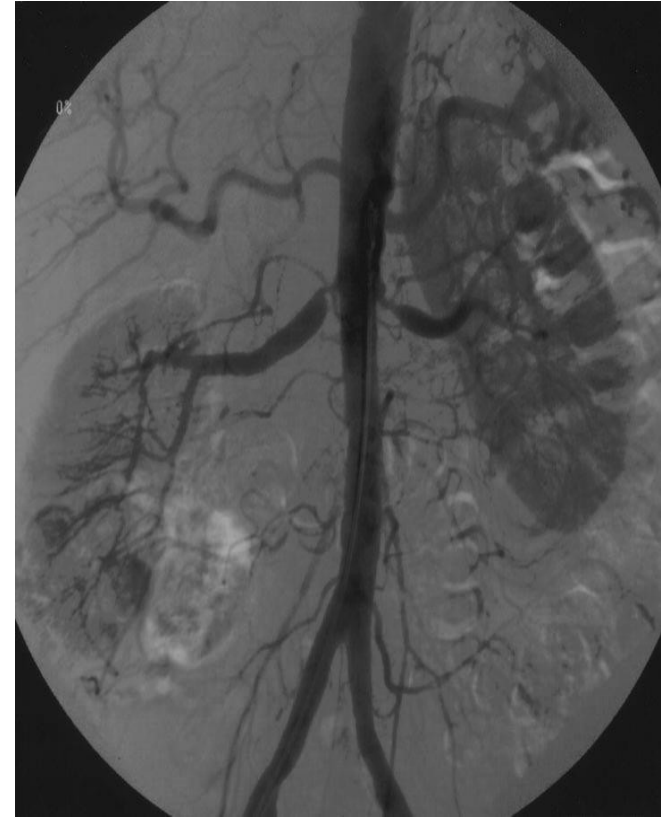
# Renal Arter Darlıđının Perkütan Tedavisi

- ▶ 1978 - Gruentzig ve ark., ilk olarak renal arter darlıđına başarılı anjioplasti
  - Gruentzig A, Kuhlmann U, Vetter W. Treatment of renovascular hypertension with percutaneous transluminal dilatation of a renal artery stenosis. *Lancet* 1978; 1:801-802.

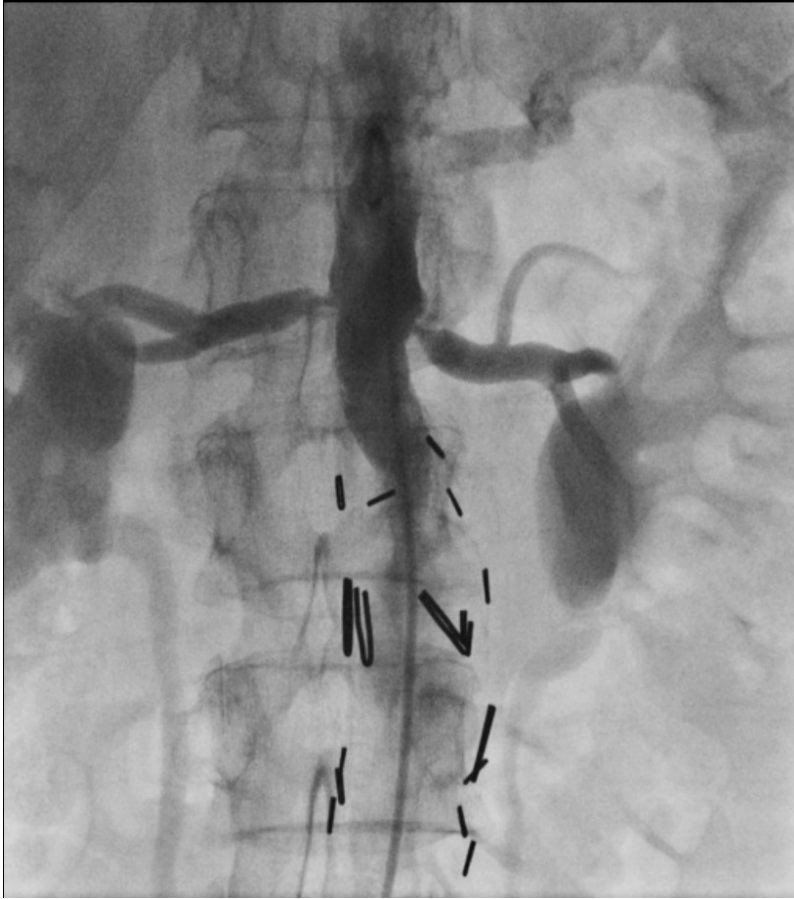


# Renal Arter Darlığı

- ▶ Aterosklerotik (90%)
- ▶ Fibromuskuler displazi (10%)
  - Medial fibroplazi (90%)
    - Klasik "string of beads" görünümü
    - Renal arterin mid-distal bölümü
  - Perimedial fibroplazi
    - Fokal darlıklar
  - İntimal/Medial fibroplazi
    - Fokal, konsantrik darlıklar
- ▶ Aortorenal disseksiyon
- ▶ Vaskulit-renal arteri tutan (ör; PAN)
- ▶ AVM- renal arteri tutan
- ▶ Radyoterapi
- ▶ Skleroderma



# Aterosklerotik Renal Arter Darlığı



- Genellikle osteal
- Aortadaki hastalık ile ilişkili
- Unilateral ya da bilateral

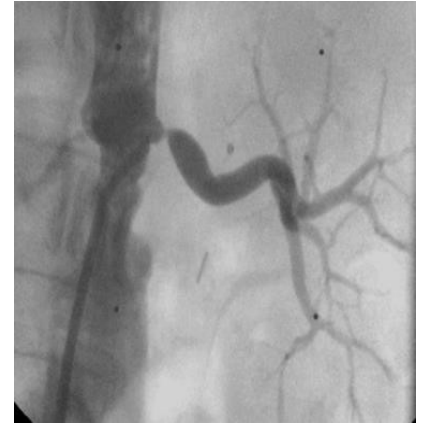


# Aterosklerotik Renal Arter Darlığı Sıklığı

Evaluation with renal artery duplex of 834 patients consecutive patients who were participants in the Forsyth county cohort of the Cardiovascular Health Study (*J Vasc Surg.* 2002;36:443–51).

- ▶ Otopsi serileri % 4-27
- ▶ Hipertansif % 1-4
- ▶ >65 yaş kişilerde % 6.8
- ▶ Diabetiklerde % 8

# Vasküler Hastalığı Olanlarda Renal Arter Darlığı Sıklığı

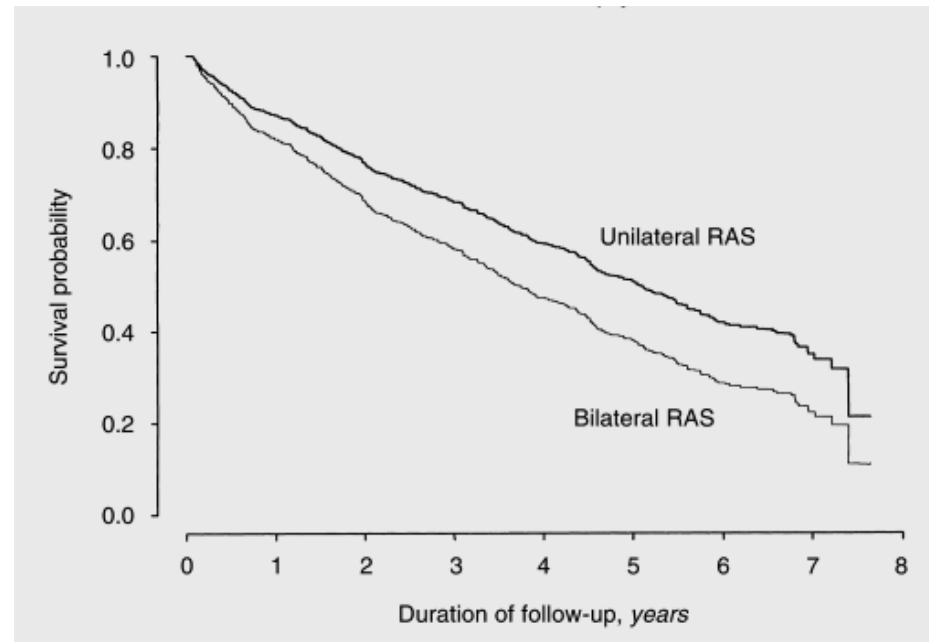
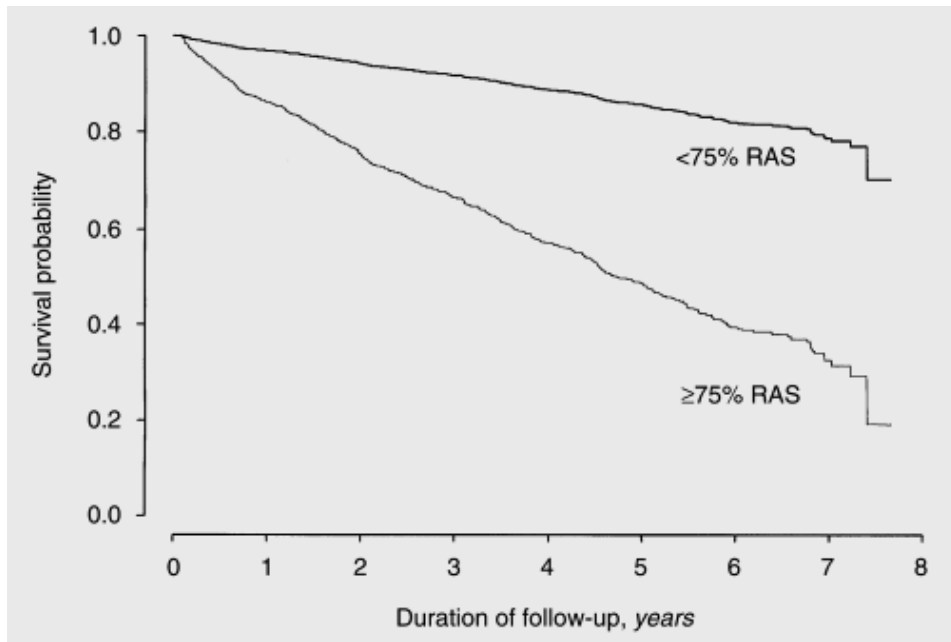


## ▶ Renal Arter Darlığı Sıklığı

- Miyokard infarktüsü % 12
  - Kardiyak kateterizasyon hastalarında % 6-19
  - Alt ekstremitte periferik arter hastalığı % 22-59
- 
- ▶ Kardiyak kateterizasyon uygulanan hastalarda renal arter darlığı belirteçleri:
    - Koroner arter hastalığı; Yaş; PAH; Serum kreatinin; Hipertansiyon

# Severity of renal vascular disease predicts mortality in patients undergoing coronary angiography

PETER J. CONLON, MARK A. LITTLE, KAREN PIEPER, and DANIEL B. MARK



# Renal arter stenozunun doğal seyri

## 5 anjiyografik çalışmanın değerlendirilmesi

Referanslar	Takip süresi (Ay)	Hasta sayısı	İlerleme (%)	Total oklüzyon (%)
Wollenweber, 1968	12-88	30	21 (70)	NA
Meaney, 1968	6-120	39	14 (36)	3 (8)
Dean, 1981	6-102	35	10 (29)	4 (11)
Schreiber, 1984	12-60+	85	37 (44)	14 (16)
Tollefson, 1991	15-180	48	34 (71)	7 (14)
<b>Toplam</b>		<b>237</b>	<b>116 (49)</b>	<b>28 (14)</b>

- İlerleyici seyir
- %65 üzerindeki darlıkların %12-15'inde bir yıl içinde total oklüzyon izlenir
- Bu hastaların %40'ında renal fonksiyonlarda belirgin bozulma olmaktadır



# Tanısal Testler

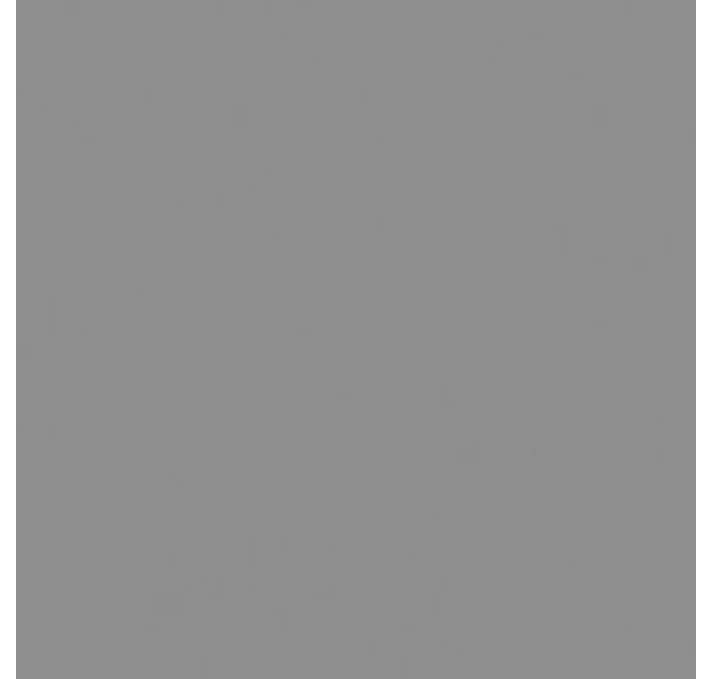
- ▶ Renal arter Doppler ultrasonografi
- ▶ Bilgisayarlı tomografik anjiyografi (CTA)
- ▶ Manyetik rezonans arteriyografi (MRI)
- ▶ İnvazif anjiyografi (DSA)– *Altın standart*

- Aortik/İliak ateroskleroz
- Aortik anevrizma (mural trombus?)
- Aksesuar renal arter
- Renal arter darlığı lokalizasyonu
- Renal arter angulasyonu
- Renal boyutlar

# Abdominal Aortografi

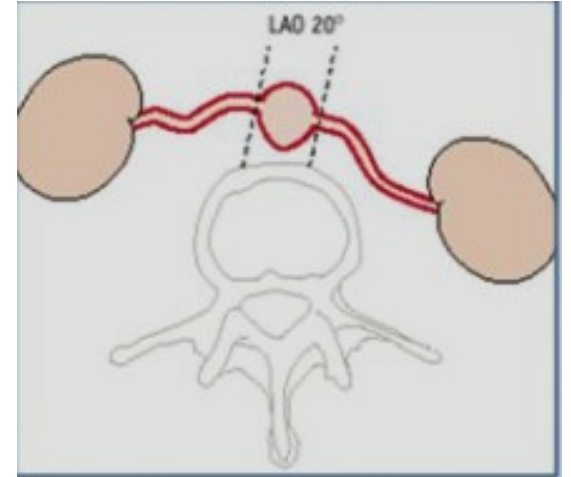
(AP,5-6F kateter, DSA, 30-40 cc kontrast madde)

- ▶ Osteal lezyonların saptanması
- ▶ Selektif renal anjiyografi için yol gösterici
- ▶ Aksesuar renal arterin saptanması
- ▶ Abdominal aortun değerlendirilmesi  
(anevrizma, ateroskleroz, ülser, trombüs)


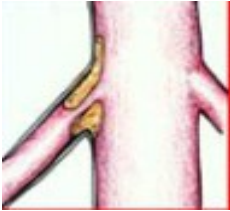



# Selektif Renal Arter Anjiyografisi

- ▶ En uygun çekimler AP, LAO 10°-20°, 20 cm FOV
- ▶ 4-6 cc/sn kontrast madde
- ▶ Bifurkasyon lezyonları için kranial ya da kaudal angülasyon
- ▶ Ana renal arterler, dalları ve nefrogram fazı değerlendirilmeli



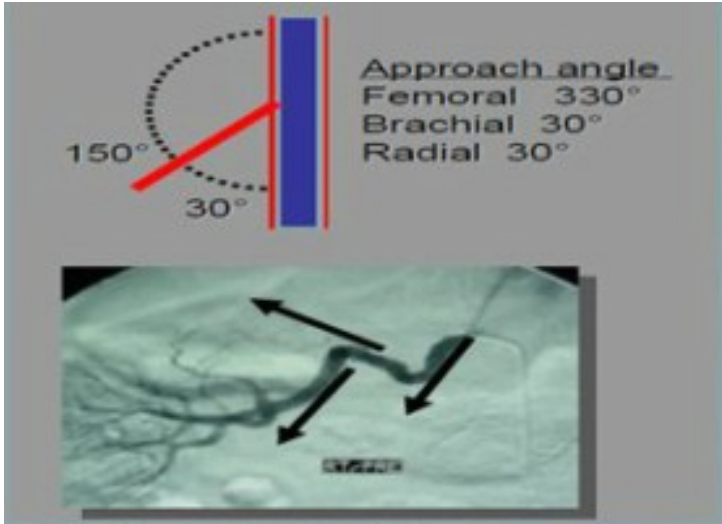
# Kateter seçimi

	Osteal orijin	Kateter seçimi
	Horizontal	JR,RDC,HS,MP,Sos
	İnferior	IMA, RDC, Cobra, MP&HS (brakial)
	Superior	MP,JR,HS

# Hangi yaklaşım?

## ► Femoral yaklaşım:

- i. Renal arter çıkışı horizontal, kaudal veya hafif sefalikse



## ► Brakial/Radial yaklaşım:

- i. Aortanın kronik oklüzyonu (Leriche sendromu)
- ii. İnfrarenal büyük aort anevrizması
- iii. Renal arter çıkışı aşırı sefalikse (inferior angulasyonlu)
- iv. Tortuöz aort



# Referans damar çapının belirlenmesi

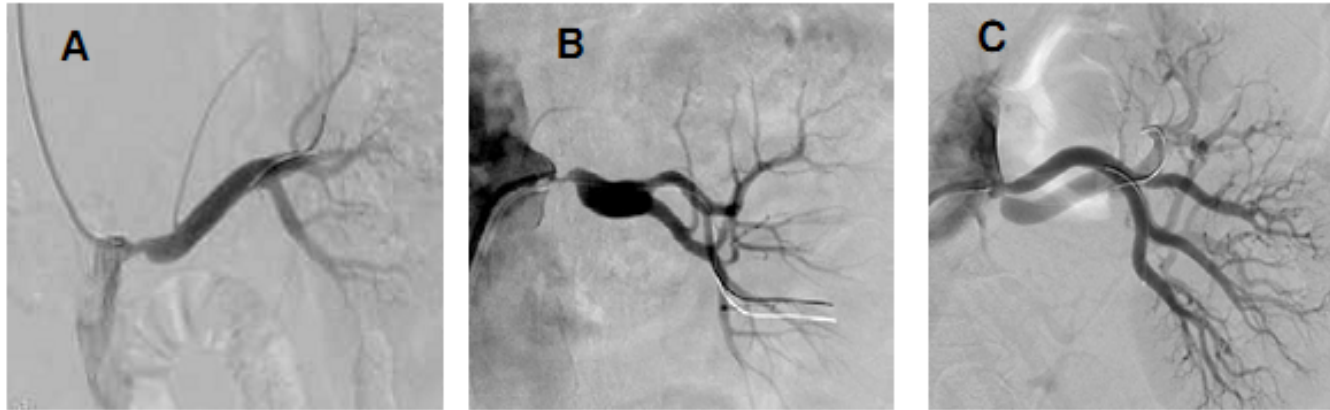


Fig. Renal 10: Reference vessel

To calculate % diameter stenosis or minimal lesion diameter, reference vessel must be determined.

A: Reference vessel can be determined about 2cm distal to stenosis.

B: Typical post-stenotic dilatation is seen and bifurcation follows. In this case, reference vessels can not be determined.

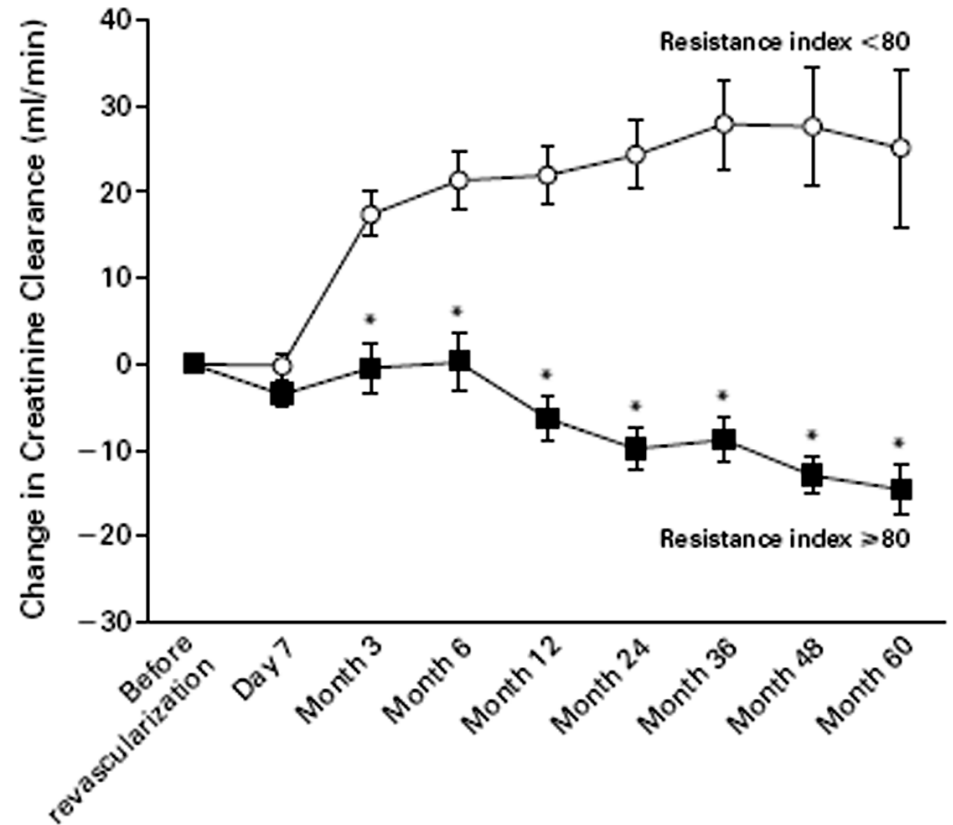
C: The bifurcation located at the ostium and real vessel size is not known.

# Hemodinamik olarak anlamlı darlık?

- ▶ Lezyon yüzdesi (>%70-80)
- ▶ Intermedier lezyonlar (%50-70/80)
  - i.  $Pd/Pa < 0.9$
  - ii. İstirahat ortalama transstenotik gradient  $> 10$  mmHg
  - iii. Hiperemik sistolik gradient  $> 20$  mmHg
  - iv. Renal FFR  $< 0.8$ 
    - $\leq 4$  F kateter ya da 0.014 basınç teli*
    - posthiperemik gradientler daha değerli*
    - papaverin/dopamin ile indüklenmiş ortalama gradient*

# Renal girişimden fayda görme: Renal resistiv indeks ?

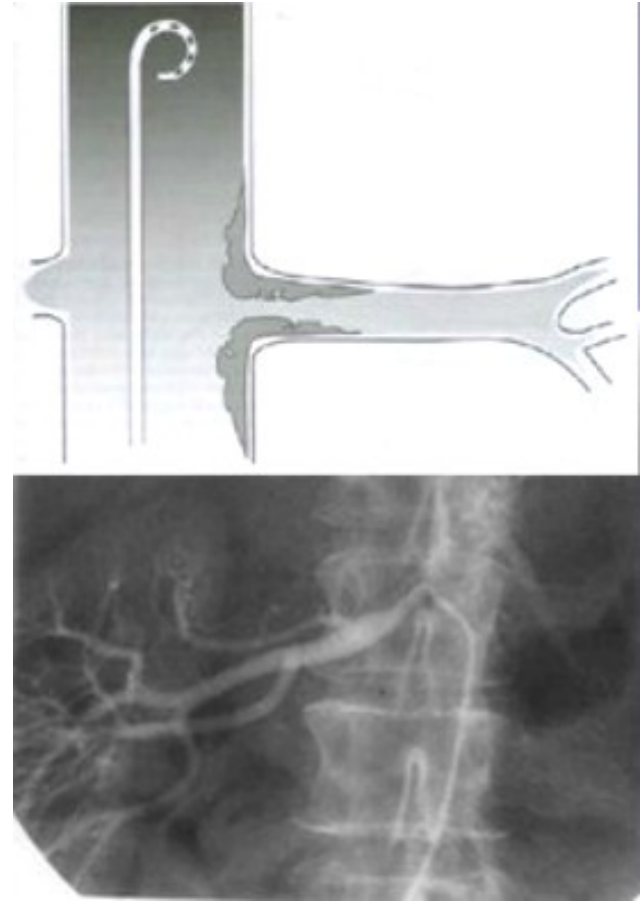
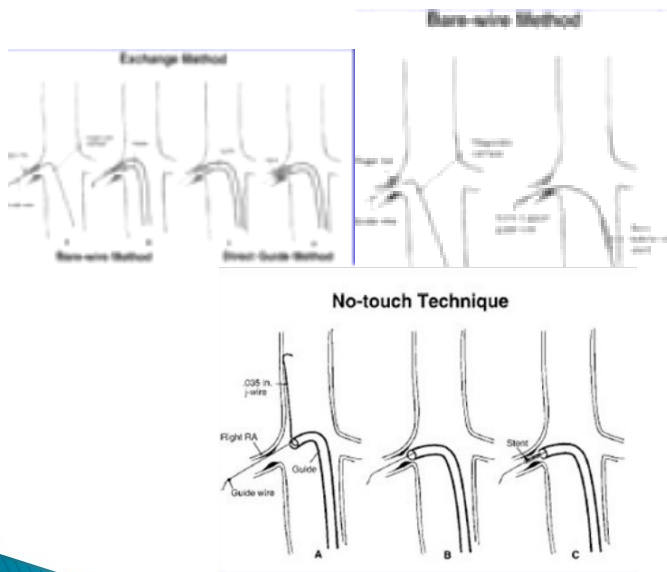
- ▶ Renal parankim hasarının göstergesi
- ▶ Doppler USG
- ▶ Rezistiv indeks= $[1-(EDV/PSV)] \times 100$



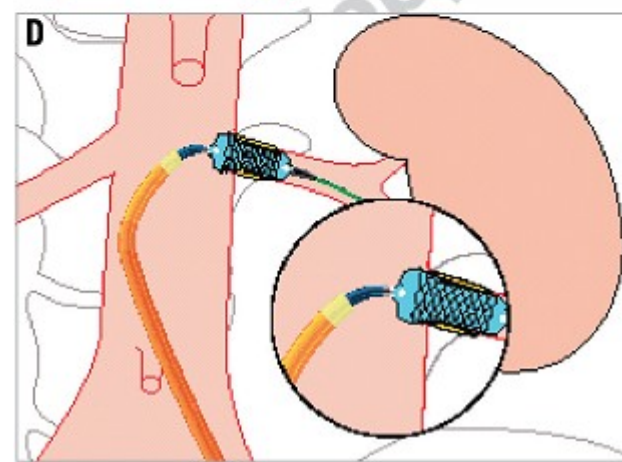
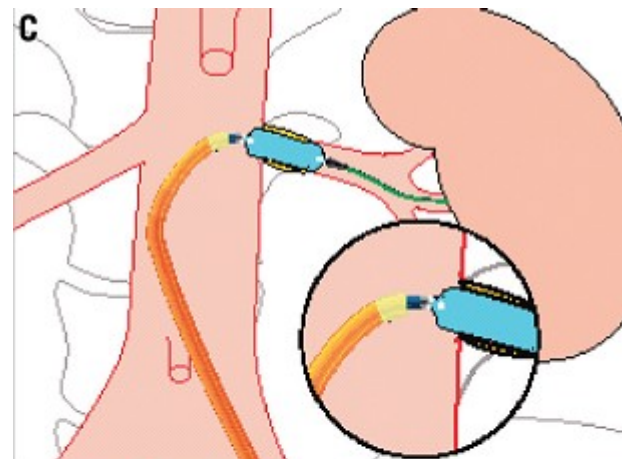
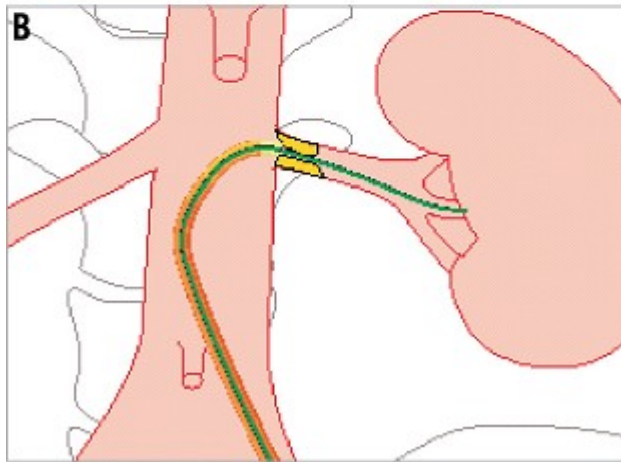
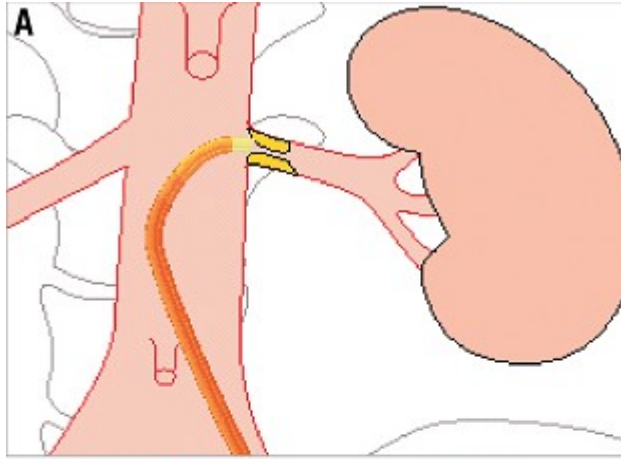


# Stentleme teknikleri

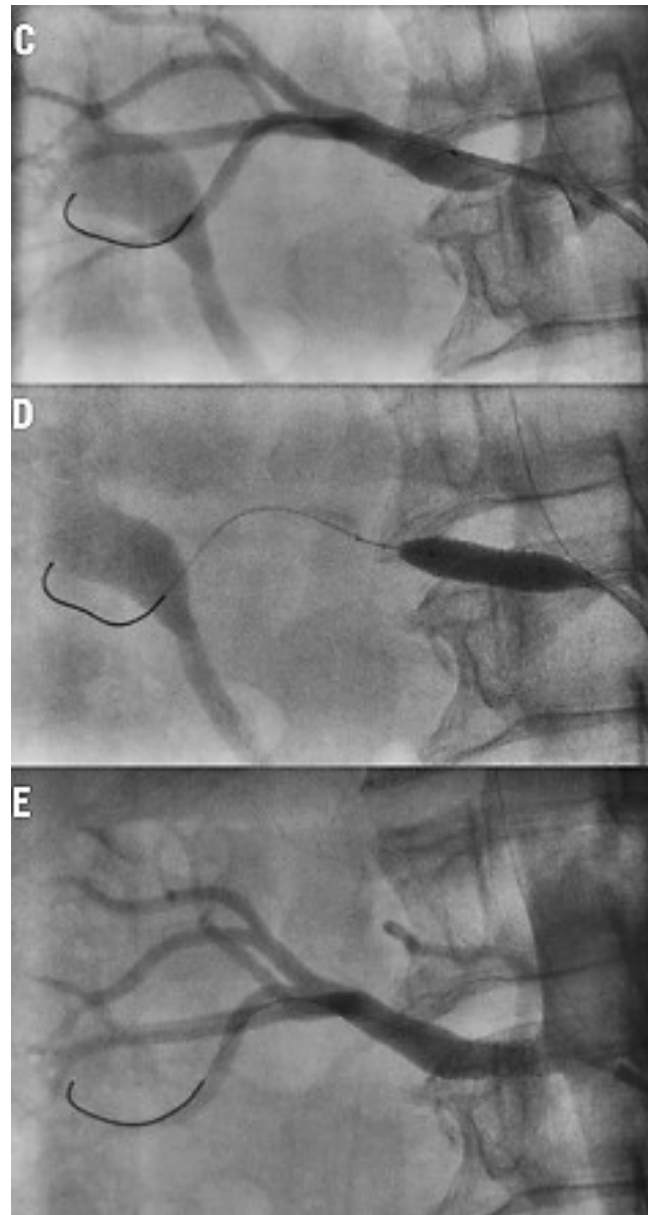
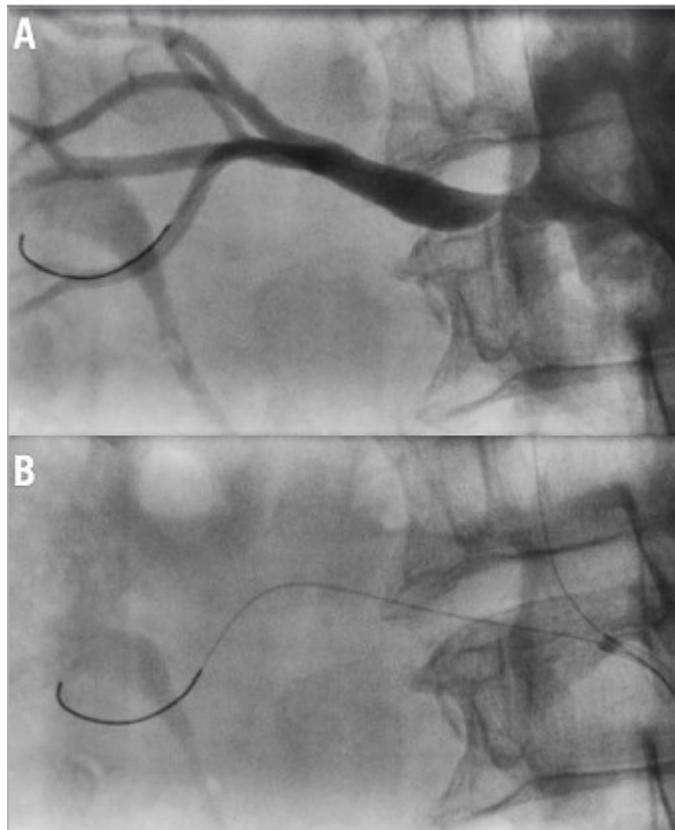
- ▶ Direkt yerleştirme
- ▶ No-touch
- ▶ Teleskop



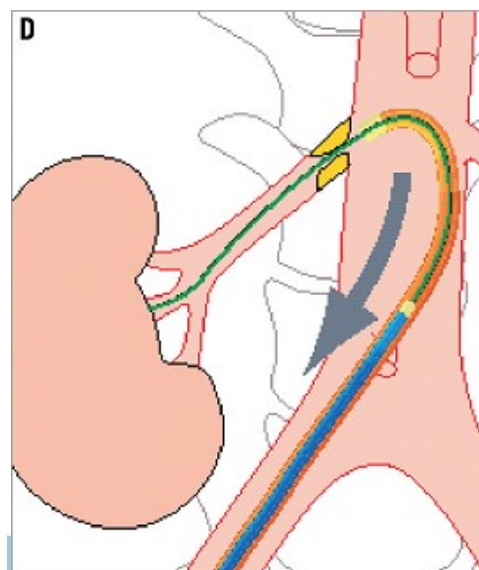
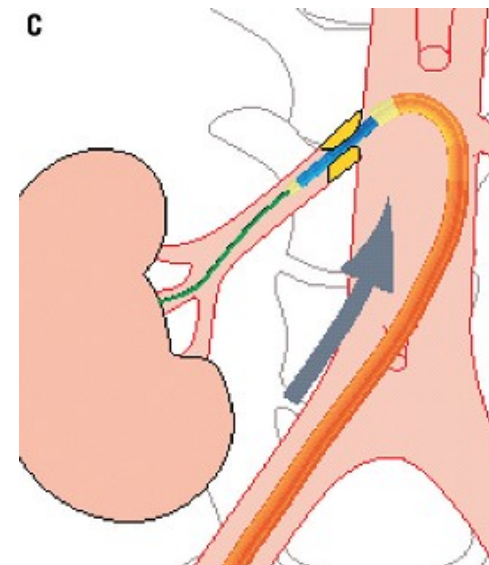
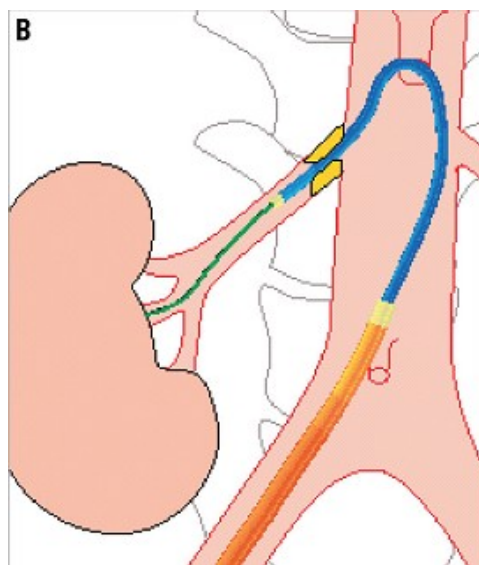
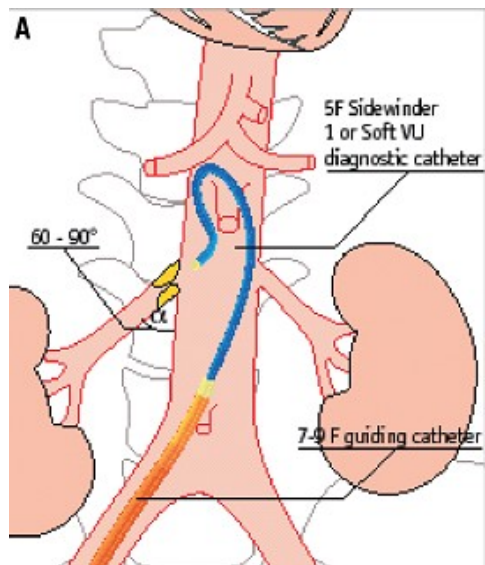
# Direkt yerleştirme tekniği



# No-touch tekniği

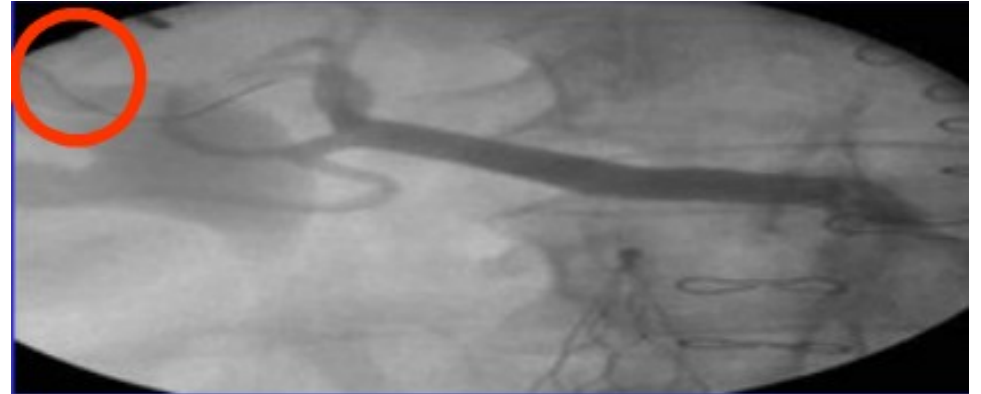


# Teleskop tekniği



# Kılavuz tel seçimi

- ▶ 190 ('Teleskop' tekniğinde 300) cm, 0,014" BMW, extrasupport
- ▶ Hidrofilik tellerden kaçınılmalı
- ▶ Kılavuz tel ile darlık geçilir, renal arterin ilk segmenti kanule edilir (2/3 distal segmente uzanılmamalı)
- ▶ En geniş ve kıvrımlı damara tel ilerletilmeli
- ▶ *Telin tamamı görüntü içinde olmalı*



# Predilatasyon

- ▶ Düşük profilli *gerçek çaptan 1 mm küçük* balon, 4.0 cutting balon düşünülebilir
- ▶ Osteal lezyon varsa, balon pozisyonu '*half-in/half-out*'
- ▶ Kateter ostiumdan çıkarılıp aortaya düşürülür (renal arterin inferiorunda)
- ▶ Kılavuz tel görüntülenmeli
- ▶ Balon tamamı ile açılana kadar yavaşça şişirilir (8-10 atm)
- ▶ Lezyon düzeline kadar balon şişirilmesi tekrarlanabilir
- ▶ Balonun distale gitmesinden kaçınılmalıdır (*disseksiyon*)

# Stent-Teknik başarı

Çalışmalar	Yayın Yılı	Çalışma Periyodu	Arter Sayısı	Stent Tipi	Osteal Lezyon	Başarı Tanımı	Teknik Başarı (%)
Rodriquez-Lopez	1999	93-96	125	Palmaz	66	RS/ Disseksiyon yok	98
van de Ven	1999	93-97	52	Palmaz	100	RS*<%50	90
Henry	1999	NA	104	AVE	77	RS< %20	99
Rocha-Singh	1999	93-95	180	Palmaz	43	P <5 mmHg	98
Tuttle	1998	91-96	148	Palmaz	100	RS<%30	98
Dorros	1998	90-95	202	Palmaz	NA	RS<%50	99
Rundback	1998	NA	54	Palmaz	NA	RS<%30	94
White	1997	92-94	133	Palmaz	81	RS<%30	99
Harden	1997	92-95	32	Palmaz	75	RS<%10	100
Blum	1997	89-96	74	Palmaz	100	RS<%50	100
Henry	1996	90-94	64	Palmaz	53	RS<%20	100
Iannone	1996	92-93	83	Palmaz	78	RS<%30	99
Hennequin	1994	87-91	21	Wallstent	33	NA	100
Rees	1994	88-92	296	Palmaz	100	RS<%30	98

\*: Rezidüel Stenoz PG: Basınç Gradienti

~ 98

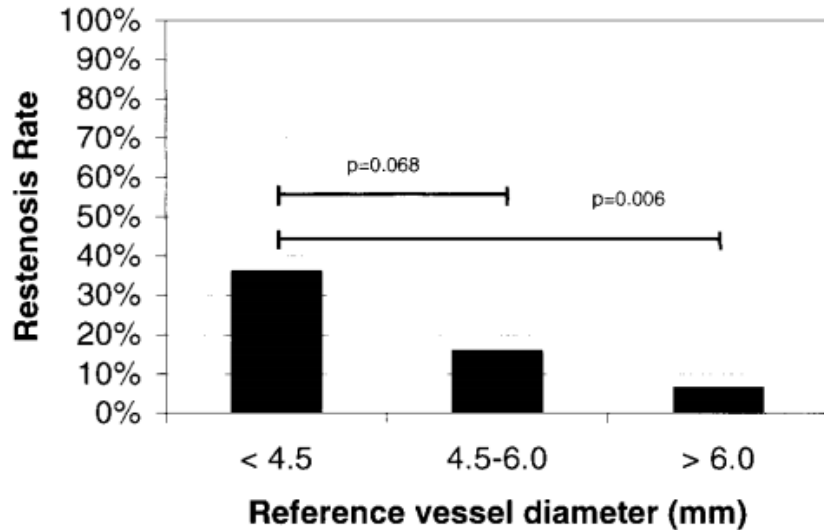
# Stent-Restenoz

Çalışmalar	Yayın Yılı	Arter Sayısı	Değerlendirilen Arter Sayısı (%)	Stent Tipi	Osteal Lezyon	Değerlendirme Metodu	Değerlendirmeye kadar geçen ortalama zaman (ay)	Restenoz (%)
van de Ven	1999	52	50 (%95)	Palmaz	100	anjio	6	%21
Rocha-Singh	1999	180	158(%88)	Palmaz	43	duplex+anjio	13	%12
Tuttle	1998	148	49 (%33)	AVE	100	anjio	8	%14
Rundback	1998	54	28 (%52)	Palmaz	NA	anjio+CT	12	%26
White	1997	133	80 (%60)	Palmaz	81	anjio	9	%19
Harden	1997	32	24 (%75)	Palmaz	75	anjio	6	%12
Blum	1997	74	74 (%100)	Palmaz	100	anjio	24	%11
Henry	1996	64	54 (%84)	Palmaz	53	anjio	14	%9
Iannone	1996	83	69 (%85)	Palmaz	78	duplex	11	%14
Dorros	1995	92	56 (%61)	Palmaz	100	anjio	7	%25
Hennequin	1994	21	20 (%95)	Palmaz	33	anjio	29	%20
Rees	1994	296	150 (%51)	Palmaz	100	anjio	7	%33

~ 16



# Stent-Resteno



Restenosis incidence after PTRAS according to reference vessel diameter.

The restenosis rate was 36.0% for vessels with a reference diameter <4.5 mm compared with 15.8% in vessels with reference diameter 4.5 to 6.0 mm ( $P = .068$  compared with smallest vessels) and 6.5% in vessels with reference diameter exceeding 6.0 mm ( $P < .01$  compared with smallest vessels)

# DES?

## Sirolimus-Eluting Versus Bare-Metal Low-Profile Stent for Renal Artery Treatment (GREAT Trial): Angiographic Follow-up After 6 Months and Clinical Outcome up to 2 Years

**Results:** At 6 months, the overall in-stent diameter stenosis for BMS was  $23.9\% \pm 22.9\%$  versus  $18.7\% \pm 15.6\%$  for SES ( $p=0.39$ ). The binary restenosis rate was 6.7% for SES versus 14.6% for the BMS ( $p=0.30$ ). After 6 months and 1 year, TLR rate was 7.7% and 11.5%, respectively, in the BMS group versus 1.9% at both time points in the SES group ( $p=0.21$ ). This rate remained stable up to the 2-year follow-up but did not reach significance due to the small sample. Even as early as 6 months, both types of stents significantly improved blood pressure and reduced antihypertensive medication compared to baseline ( $p<0.01$ ).

After 6 months, renal function worsened in 4.6% of the BMS patients and in 6.9% of the SES group. The rate of major adverse events was 23.7% for the BMS group and 26.8% for the SES at 2 years ( $p=0.80$ ).

**Conclusion:** The angiographic outcome at 6 months did not show a significant difference between BMS and SES. Renal artery stenting with both stents significantly improved blood pressure. Future studies with a larger patient population and longer angiographic follow-up are warranted to determine if there is a significant benefit of drug-eluting stents in treating ostial renal artery stenosis.

*J Endovasc Ther 2007;14:460-468*

**Title: Drug-eluting stents versus bare-metal stents for the prevention of restenosis in patients with renovascular disease**

**Authors:** Christian Bradaric, MD; Kristin Eser, MD; Stephanie Preuss, MD; Michael Dommasch, MD; Isabell Wustrow, MD; Nicolas Langwieser, MD; Bernhard Haller, PhD; Ilka Ott, MD; Massimiliano Fusaro, MD; Uwe Heemann, MD; Karl-Ludwig Laugwitz, MD; Adnan Kastrati, MD; Tareq Ibrahim, MD

### **Conclusions**

DES was superior to BMS in preventing ISR. Overall the BMS-in-DES-technique (hybrid) achieved the lowest risk for ISR.

# Stent-Renal fonksiyonlara etkisi

Study series	No. of patients	Renal function		
		Improved (%)	Stable (%)	Deteriorated (%)
van de Ven, 1999	42	12%	62%	26%
Rocha-Singh, 1999	150	22%	70%	8%
Tuttle, 1998	129	15%	81%	4%
Dorros, 1998	163	18%	48%	34%
Rundback, 1998	45	20%	47%	33%
Harden, 1997	32	34%	38%	28%
<b>Weighted Average</b>		<b>19%</b>	<b>62%</b>	<b>19%</b>

Kontrast  
nefropatisi

Kolesterol  
embolizasyonu

Yüksek perfüzyon  
basıncı

# Distal koruma?

## Embolic Protection and Platelet Inhibition During Renal Artery Stenting

Christopher J. Cooper, MD; Steven T. Haller, MS; William Colyer, MD; Michael Steffes, MD;  
Mark W. Burket, MD; William J. Thomas, MD; Robert Safian, MD; Bhagat Reddy, MD;  
Pamela Brewster, MA; Mary Ann Ankenbrandt, RN; Renu Virmani, MD; Eric Dippel, MD;  
Krishna Rocha-Singh, MD; Timothy P. Murphy, MD; David J. Kennedy, PhD; Joseph I. Shapiro, MD;  
Ralph D. D'Agostino, PhD; Michael J. Pencina, PhD; Sadik Khuder, PhD

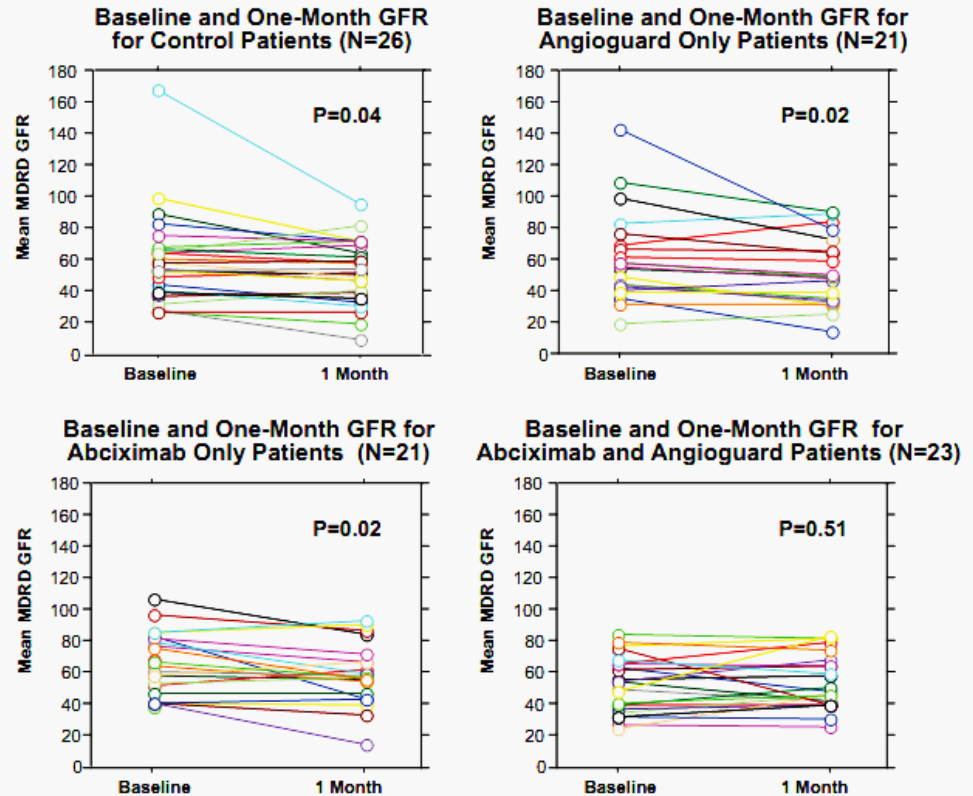
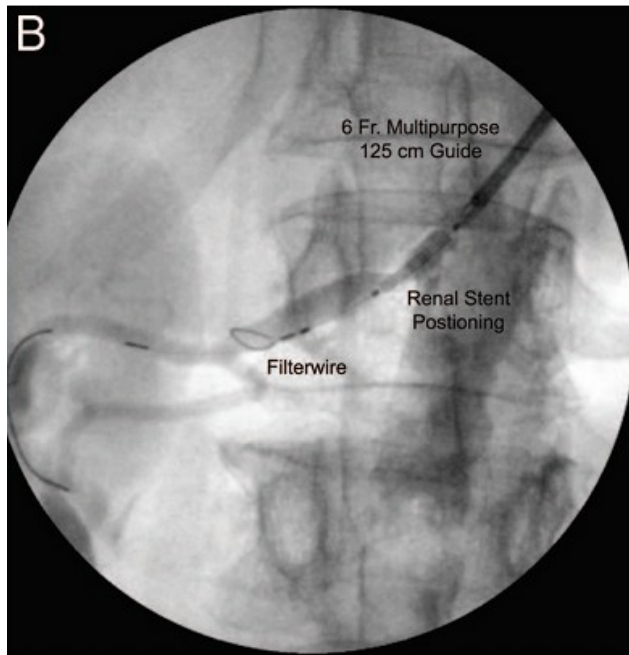
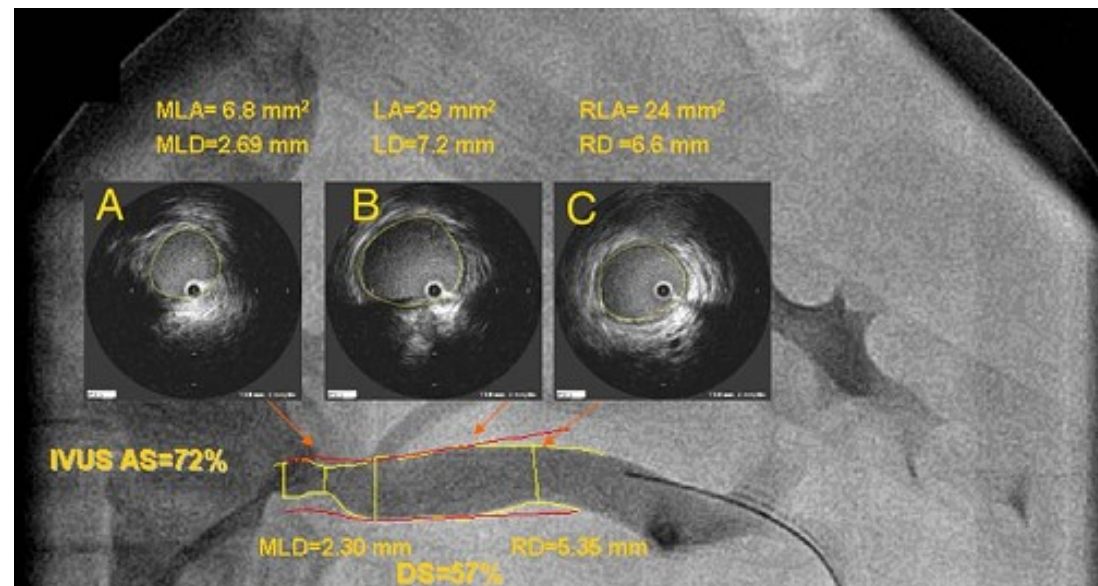


Figure 2. Line charts of individual patient MDRD-calculated GFR matched at baseline and 1 month. Comparisons between baseline and 1 month.

# IVUS

- ▶ MLA
- ▶ Plak yükü
- ▶ Referans damar çapı
- ▶ Kalsifikasyon varlığı
- ▶ Stent appozisyonu



## Hypertension

### Prediction of Hypertension Improvement After Stenting of Renal Artery Stenosis

CME

Comparative Accuracy of Translesional Pressure  
Gradients, Intravascular Ultrasound, and Angiography

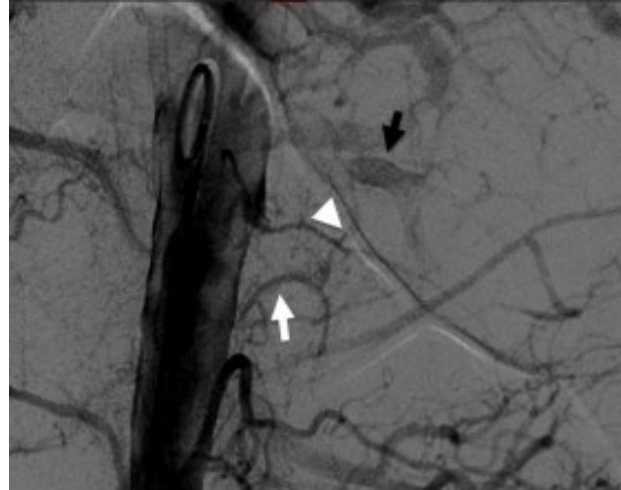
However, IVUS has not been demonstrated to improve outcomes in patients undergoing renal stenting, and therefore cannot be recommended for routine use [14].

# Kalsifikasyon

- ▶ Kalsifikasyon sıktır ancak ciddi kalsifikasyon nadirdir
- ▶ Problemler
  - ✓ Başarısız dilatasyon
  - ✓ Stent recoili
  - ✓ Perforasyon
- ▶ Yaklaşım
  - ✓ Direkt stentleme tercih edilmemeli
  - ✓ Balon dilatasyon yapılamadı ise stentleme yapılmamalı
  - ✓ Balon şişirilirken oluşabilecek ağrıya dikkat!

# Renal arter total oklüzyonu

- ▶ Klinik değerlendirme
- ▶ Uygun böbrek ölçüleri
- ▶ Anjiyografide kökün net şekilde görülmesi
- ▶ Artmış renin üretimi





# Komplikasyonlar

- ▶ Ateroemboli
- ▶ Spinal parapleji/paraplezi
- ▶ Disseksiyon (aortik/renal arter)
- ▶ Perforasyon /rüptür
- ▶ Kontrast nefropatisi/ Renal yetersizlik
- ▶ Renal arter trombozu/oklüzyon
- ▶ Girişim yeri komplikasyonları

