Basic Technique of PAD Intervention
(Renal Artery)

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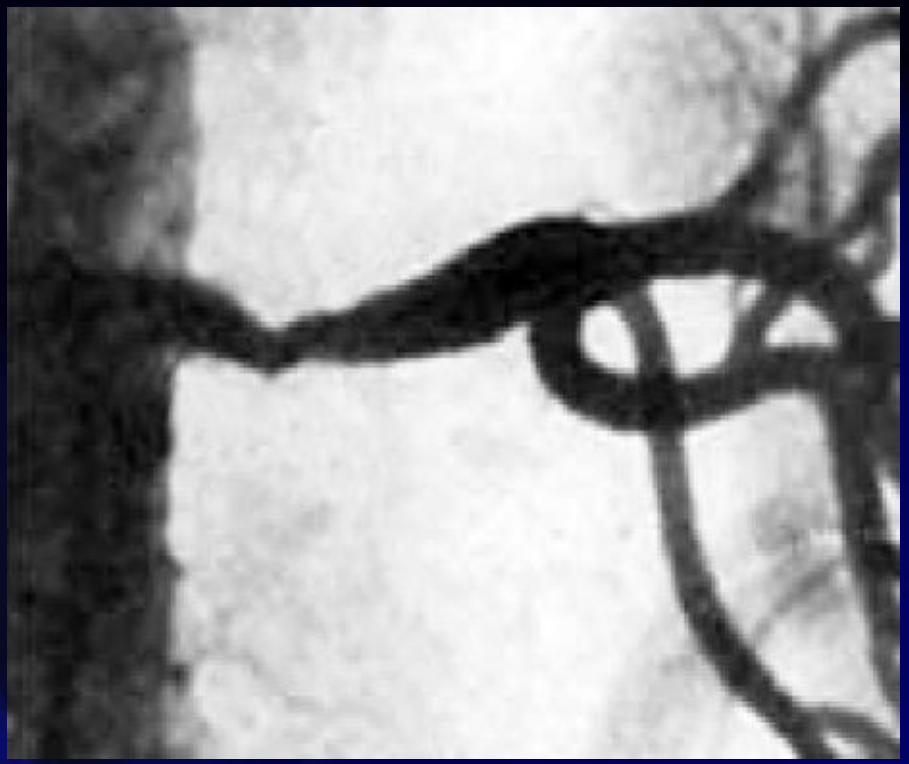
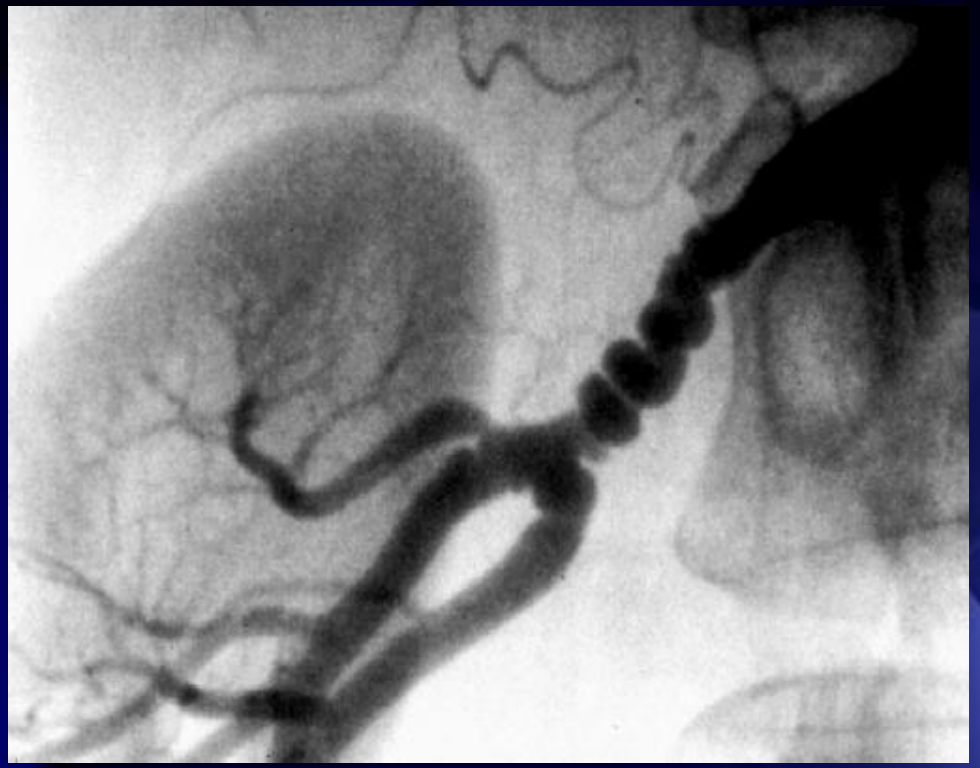
Renal artery stenosis (RAS)

.Caused by a heterogenous group of diseases with different pathophysiology, clinical manifestations, treatment approaches, and outcomes

A-RAS & FMD





.A-RAS :

.characterized by stenosis of the ostium and proximal renal artery

.FMD :

.Characterized by a beaded appearance of the mid or distal renal artery in which the beads are larger than the vessel

.RAS :

.May lead to renal failure & difficult in controlling HTN

.With comorbidity reaching appproximately 10% to 20% in patients with documented coronary atherosclerosis

.Despite PTRA being used increasingly to treat RAS :

.Decline in renal function after PTRA

.Substantial stenosis

.Absence of clinical benefit

.In 30-40% of patients have been reported

.Procedure success rates for PTRA in RAS are greater than 95%

.Clinical benefit lags behind at about 70%

J Am Coll Cardiol 2006;47:620-5

Revascularization versus Medical Therapy for Renal-Artery Stenosis

ASTRAL trial

.To evaluate reliably whether **PTRA with medication** improves renal function & other outcomes, as compared with medical therapy alone, **in patients with atherosclerotic RAS**

.Randomized, PTRA (n=403) vs Medical (n=403)

.5 years FU period

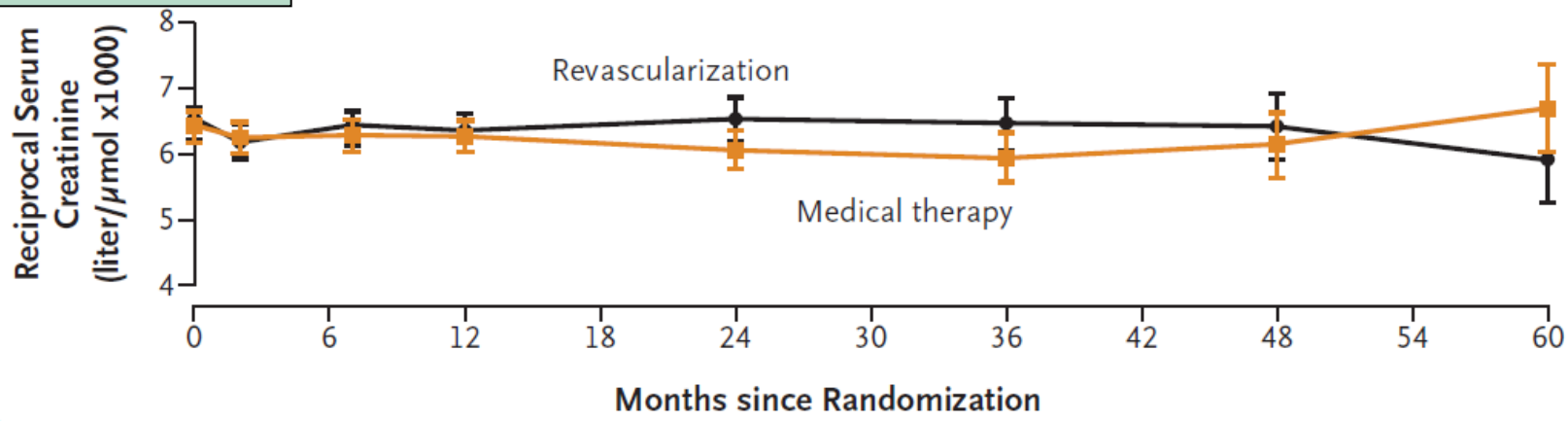
.**Primary end point as the change in renal function :**

.Assessed by measuring the mean slope of the reciprocal of the Scr level over time

N Engl J Med 2009;361:1953-62

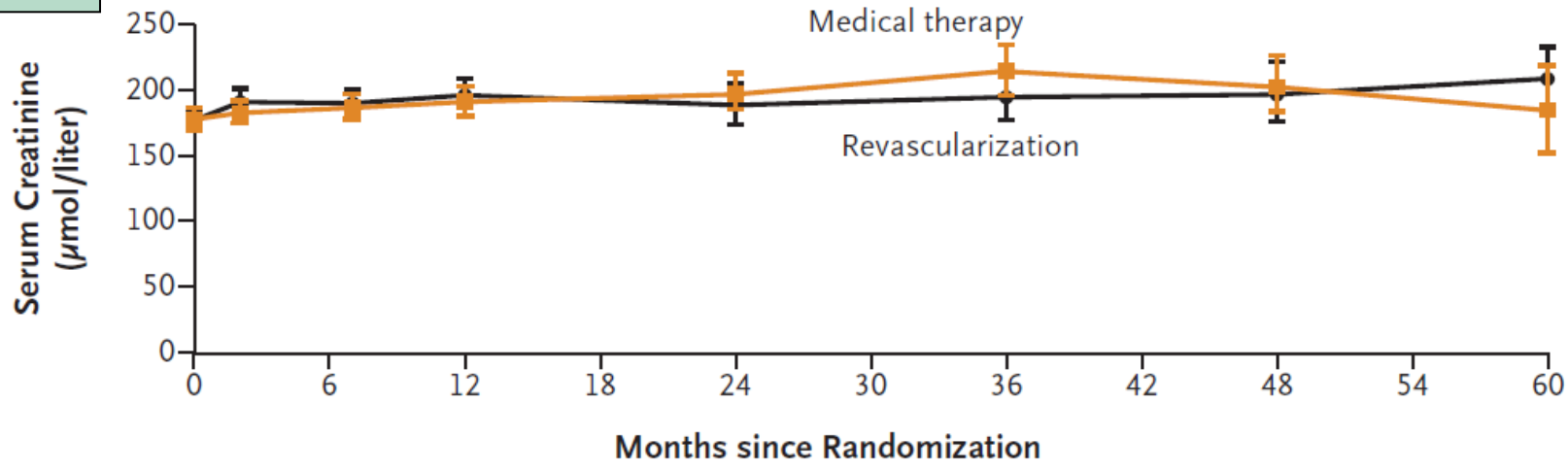
linear relationship with Ccr (l/umol)

Reciprocal of Serum Creatinine



.-0.07×10^{-3} l/umol/yr in the PTRA group, as compared with .-0.13×10^{-3} l/umol/yr in the medical-therapy group, a difference favoring PTRA of 0.06×10^{-3} l/umol/yr (p=0.06)

Serum Creatinine



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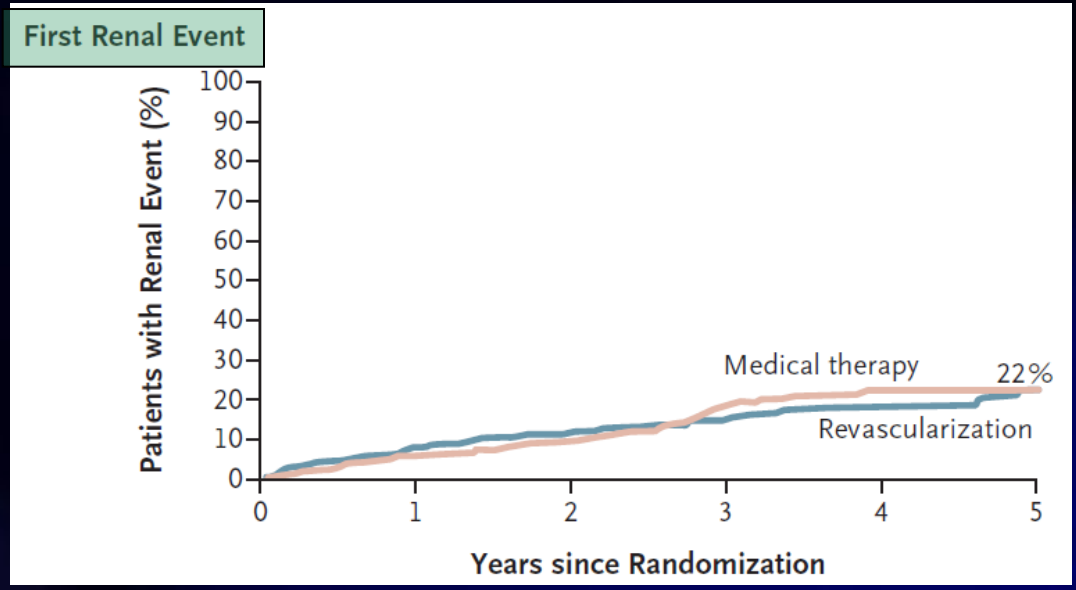
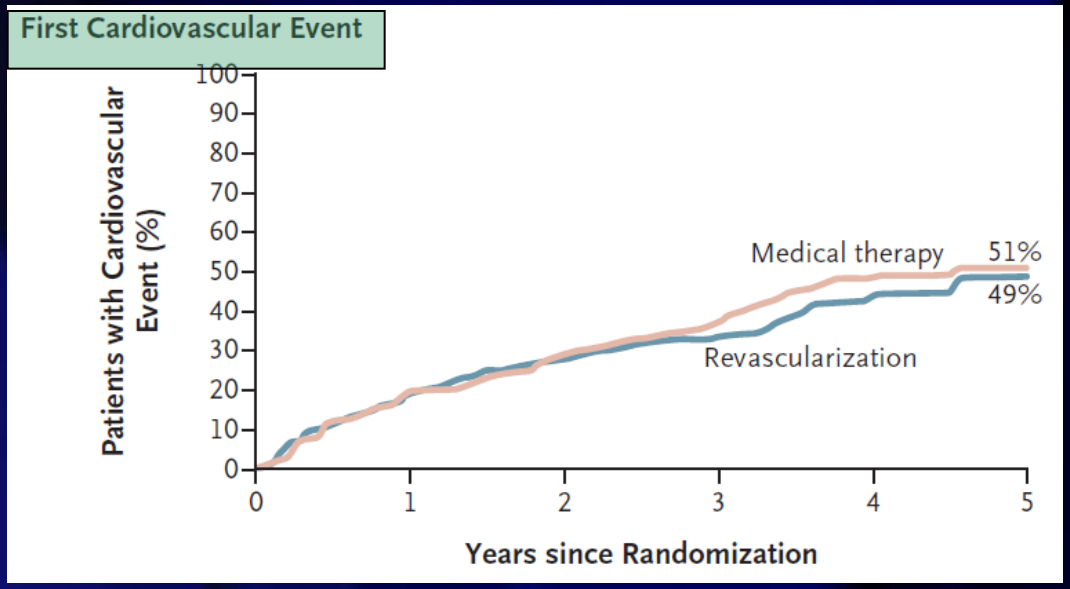




.Similar rates of renal events,MACE & death in both group

.Substantial risks but no evidence of a worthwhile clinical benefit from PTRA in patients with atherosclerotic RVD

N Engl J Med 2009;361:1953-62

Renal artery stenting

(Percutaneous transluminal angioplasty)

.The delimma is that many patients would benefit from revascularization in previously published reports

.Dramatic improvement in SCr after PTRA, compatible with beneficial effects of revascularization on renal function

Treatment of RAS

ACC/AHA 2005 Guidelines for the Management of Patients With Peripheral Arterial Disease (Lower Extremity, Renal, Mesenteric, and Abdominal Aortic): Executive Summary

A Collaborative Report From the American Association for Vascular Surgery/Society for Vascular Surgery,* Society for Cardiovascular Angiography and Interventions, Society for Vascular Medicine and Biology, Society of Interventional Radiology, and the ACC/AHA Task Force on Practice Guidelines (Writing Committee to Develop Guidelines for the Management of Patients With Peripheral Arterial Disease)

J Am Coll Cardiol 2006;47:1239-312

.PTRA strategies (indication for PTRA) :

.Asymptomatic stenosis
.Hypertension
.Preservation of renal function
.Impact of RAS on CHF & unstable angina

	Level of Evidence	Class
. Indications for revascularization*		
Asymptomatic bilateral ARAS	C	II B
Asymptomatic solitary ARAS	C	II B
Asymptomatic unilateral ARAS	C	II B
RAS and Class I indications for RAS evaluation	B	II A
RAS and intolerance to medication	B	II A
Bilateral ARAS and progressive renal dysfunction	B	II A
Solitary ARAS and progressive renal dysfunction	B	II A
Unilateral ARAS and chronic renal dysfunction	C	II B
ARAS and unexplained pulmonary edema	B	I
ARAS and unexplained recurrent CHF	B	I
ARAS and unstable angina	B	II A

J Am Coll Cardiol 2006;47:1239-312

Diagnosis of RAS

.Renal angiography

.Renal duplex ultrasound

.Contrast enhanced MRA

.Trans-stenotic catheter gradient determination
(Trans-lesional pressure gradient)

.Renal FFR

Procedure performance
(Diagnosis & selective angiography)

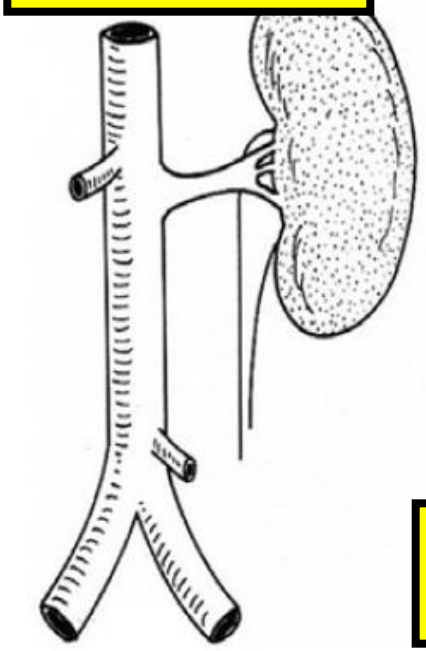
.Commonly used catheters :

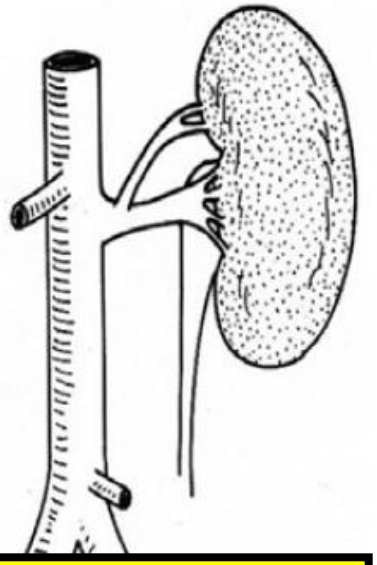
Guiding Catheters	
Femoral approach	Brachial approach
Renal double curve	JR 5-4
JR 5-4	AR-1
Hockey stick	Multipurpose
AR-1	5 Fr Simmons
Internal mammary artery	

Variation of RA anatomy

.Common configurations of RA origins from the abdominal aorta

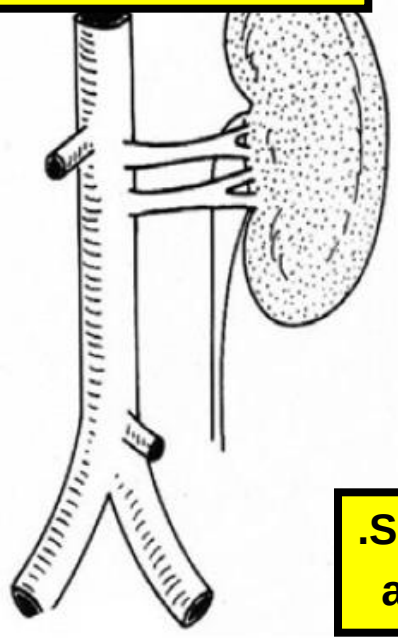
.Single RA 55%

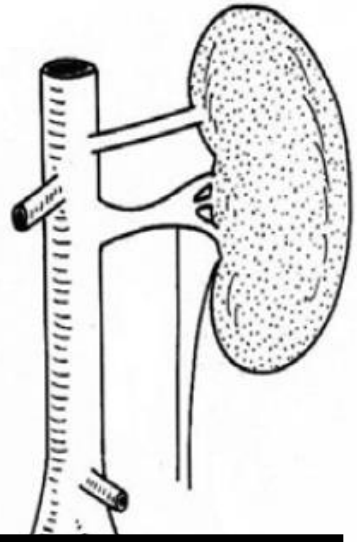




.Single RA with early bifurcation 14%

.Dual major RA 8%





.Single RA & ≥1 smaller accessory RA 7%

J Am Coll Cardiol Intv 2009;2:161-74

.In a non-tortuous aorta :

.The origins of Rt. Of Lt. renal arteries are identified :

.best in a 20° LAO projection

.Multi-angle angiograms in AP, LAO, RAO views :

.Should be taken to find the optimal projection &
to identify the ostium of both renal arteries

.Cranial or caudal angulation in renal bifurcation lesion

Procedure performance (Access)

.Femoral Approach

.Brachial Approach

Femoral Approach

.Guide wire technique

.Guiding catheter technique

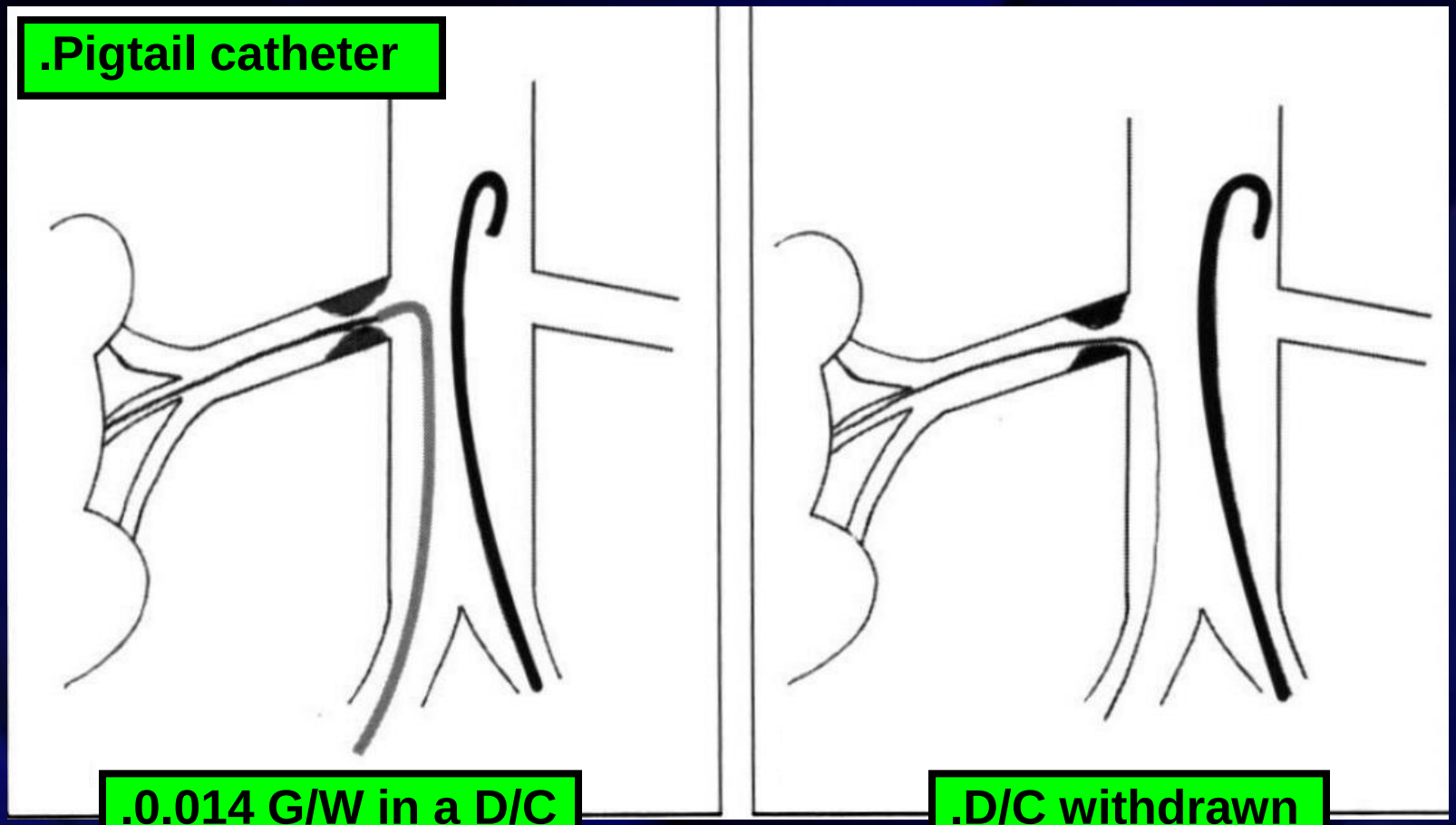
.Coaxial technique

.Guiding sheath technique

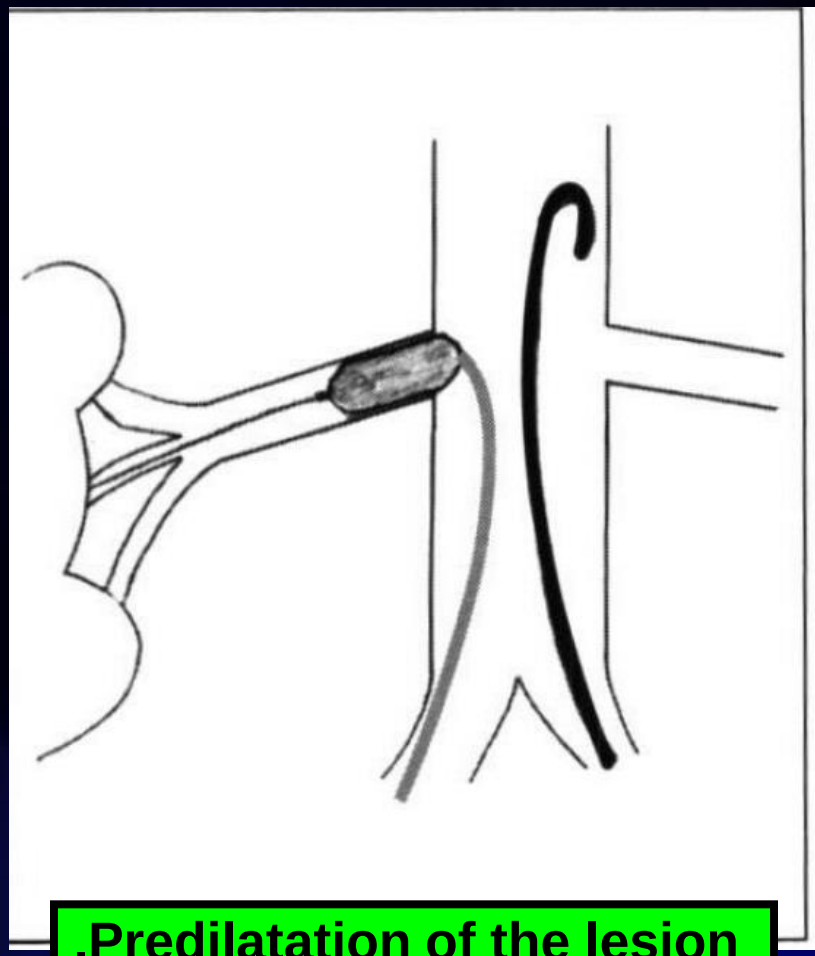
.No-touch technique

Guide wire technique

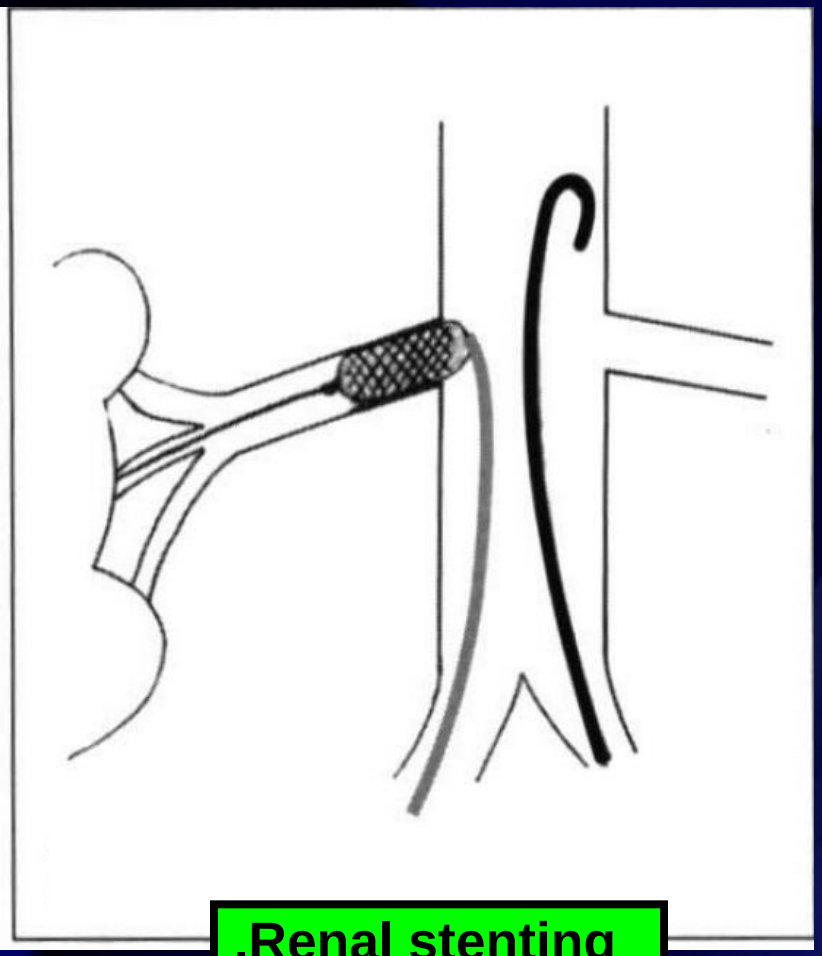
.The first technique ever used, requires 2 puncture sites



J Cardiovasc Surg 2007;48:411-42



.Predilatation of the lesion



.Renal stenting

.Not recommended :

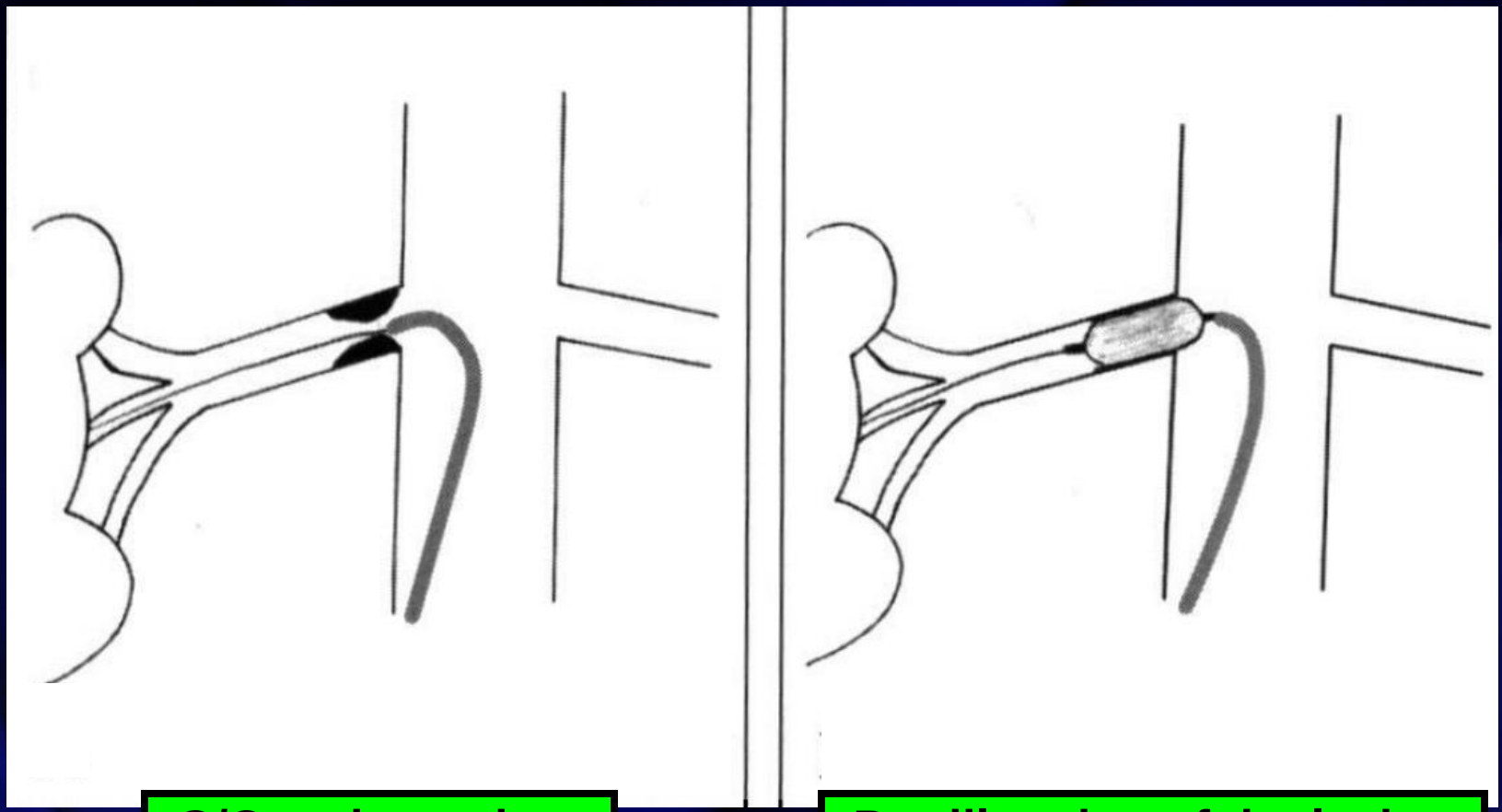
.Risk of local complication (2 puncture)

.Poor guidance of the balloon of stent

J Cardiovasc Surg 2007;48:411-42

Guiding catheter technique

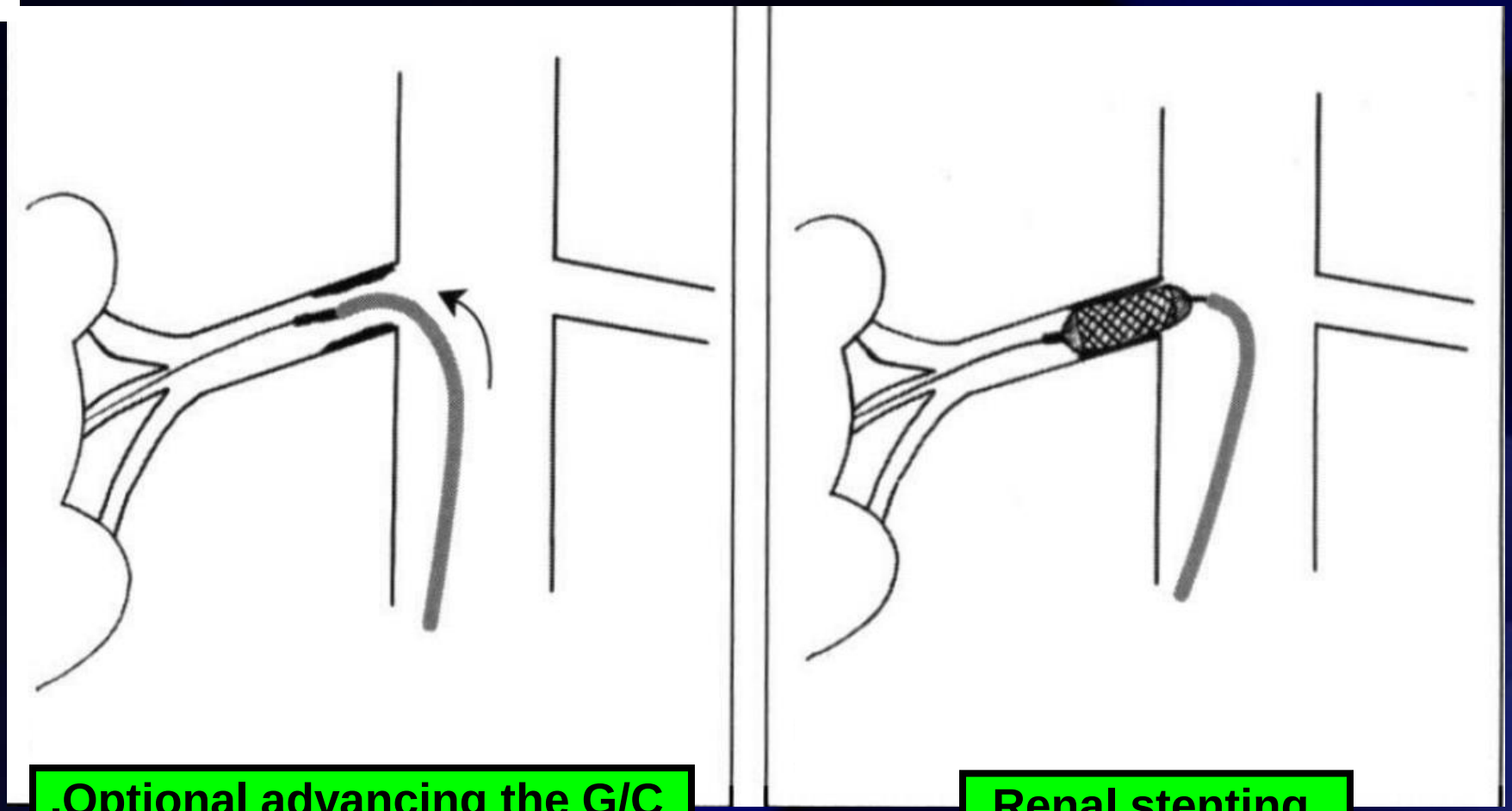
.Direct guide method



.G/C at the ostium

.Predilatation of the lesion

J Cardiovasc Surg 2007;48:411-42



.Optional advancing the G/C into the renal artery

.Renal stenting

.Puncture with femoral site with a 7Fr of 8Fr sheath

.In tortuous iliac arteries, longer sheath

J Cardiovasc Surg 2007;48:411-42

.Guiding catheters

RDC guiding catheter (Cordis Corp., Miami, FL, USA)

Hockey Stick catheter

Right Judkins (JR) catheter

Internal mammary catheter

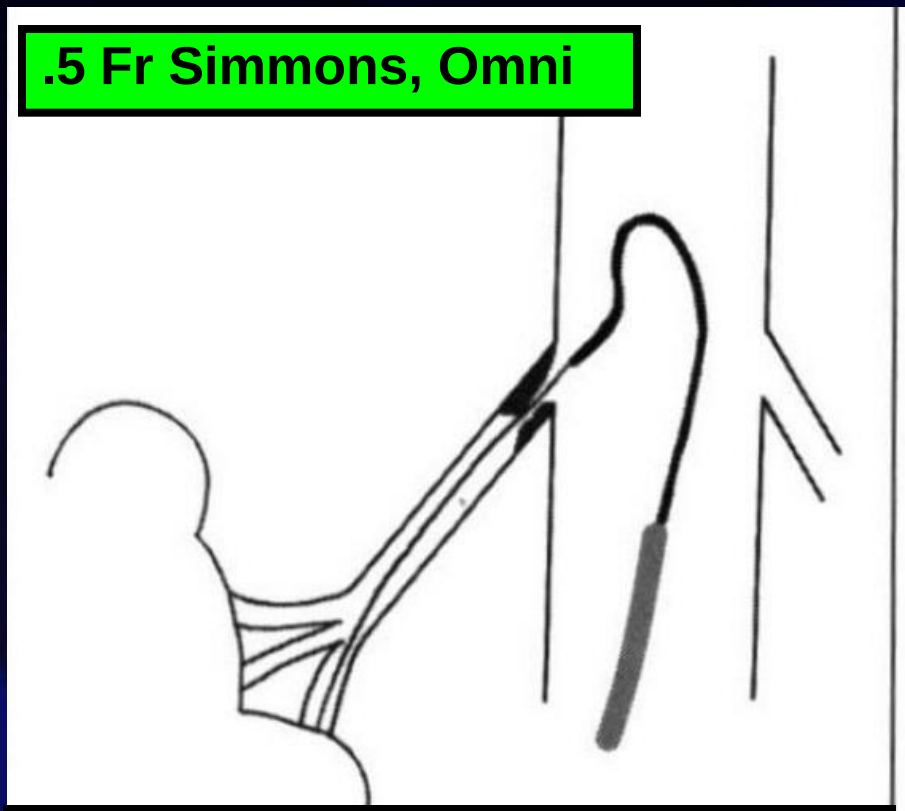
Right Amplatz-1 (AR-1)

J Cardiovasc Surg 2007;48:411-42

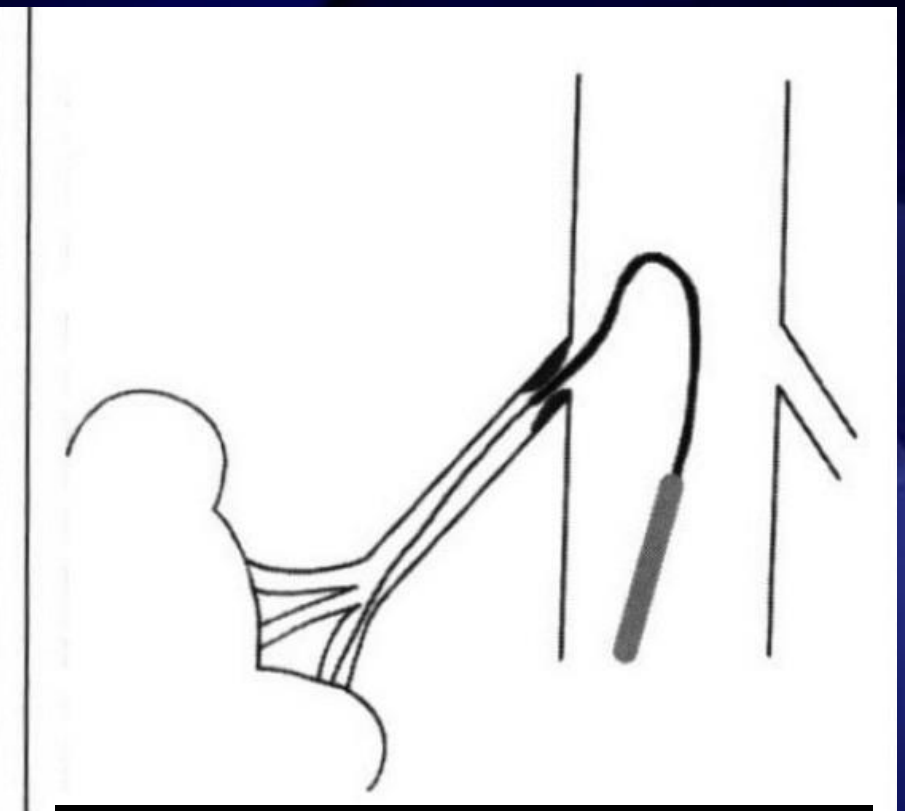
Co-axial technique

.Used in an acutely angled course of the renal artery

.5 Fr Simmons, Omni



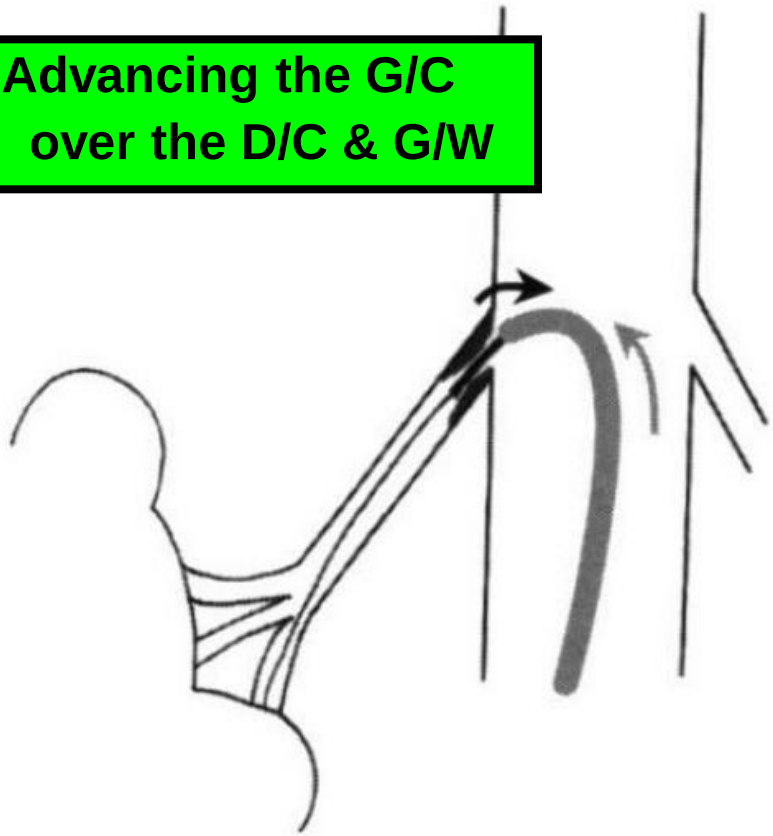
.Cannulation of the RA with a Simmons D/C through the G/C



.Crossing the lesion with a 0.018 stiff G/W with the D/C

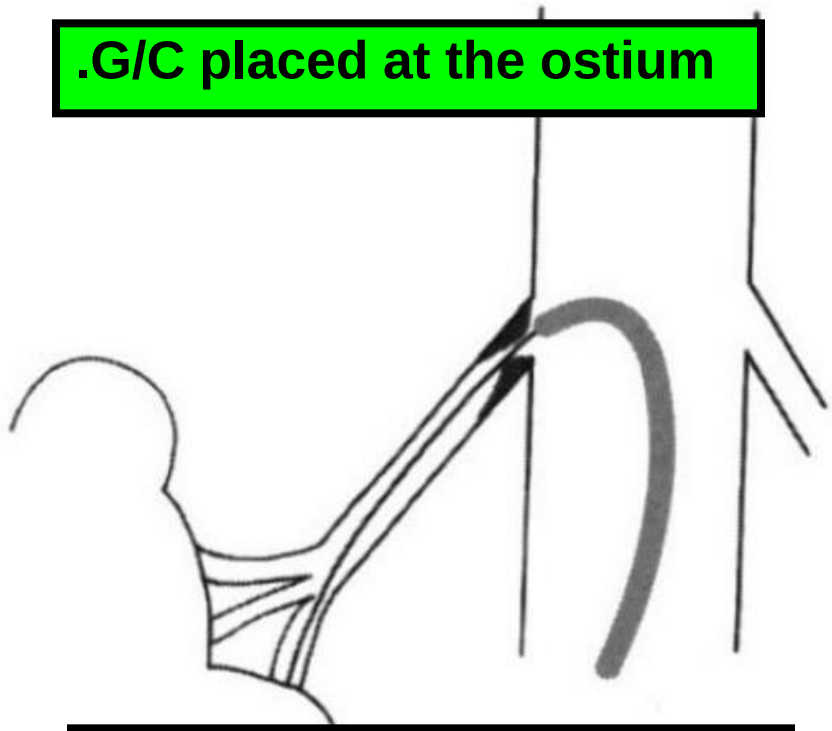
J Cardiovasc Surg 2007;48:411-42

.Advancing the G/C over the D/C & G/W



.Withdrawn the D/C, while advancing the G/C

.G/C placed at the ostium



.Predilatation of the lesion

.Optional advancing the G/C into the renal artery

.Renal stenting

J Cardiovasc Surg 2007;48:411-42

Guiding sheath technique

.Intervention can be performed as with the G/C technique

.6 Fr Vista Brite Tips, multipurpose shaped guiding sheath (Cordis Corp., Miami, FL, USA), available in RDC and Hockey Stick configurations

.Allows canulation of the ostium of the renal artery

J Cardiovasc Surg 2007;48:411-42

No-touch technique

.Differences between aortic interventions & coronary PCI :

.More G/C manipulation required for cannulation of the target vessel in the abdominal aorta

.The abdominal aorta contains more atherosclerotic Dz than the ascending aorta :

.Extensive manipulation of sharply angulated G/C within the diseased abdominal aorta is hazardous

Catheter Cardiovasc Interv 1999;46:245-8

No-Touch Technique for Reducing Aortic Wall Trauma During Renal Artery Stenting

.Minimal manipulation of the renal artery & reduced risk of atheroembolic complication

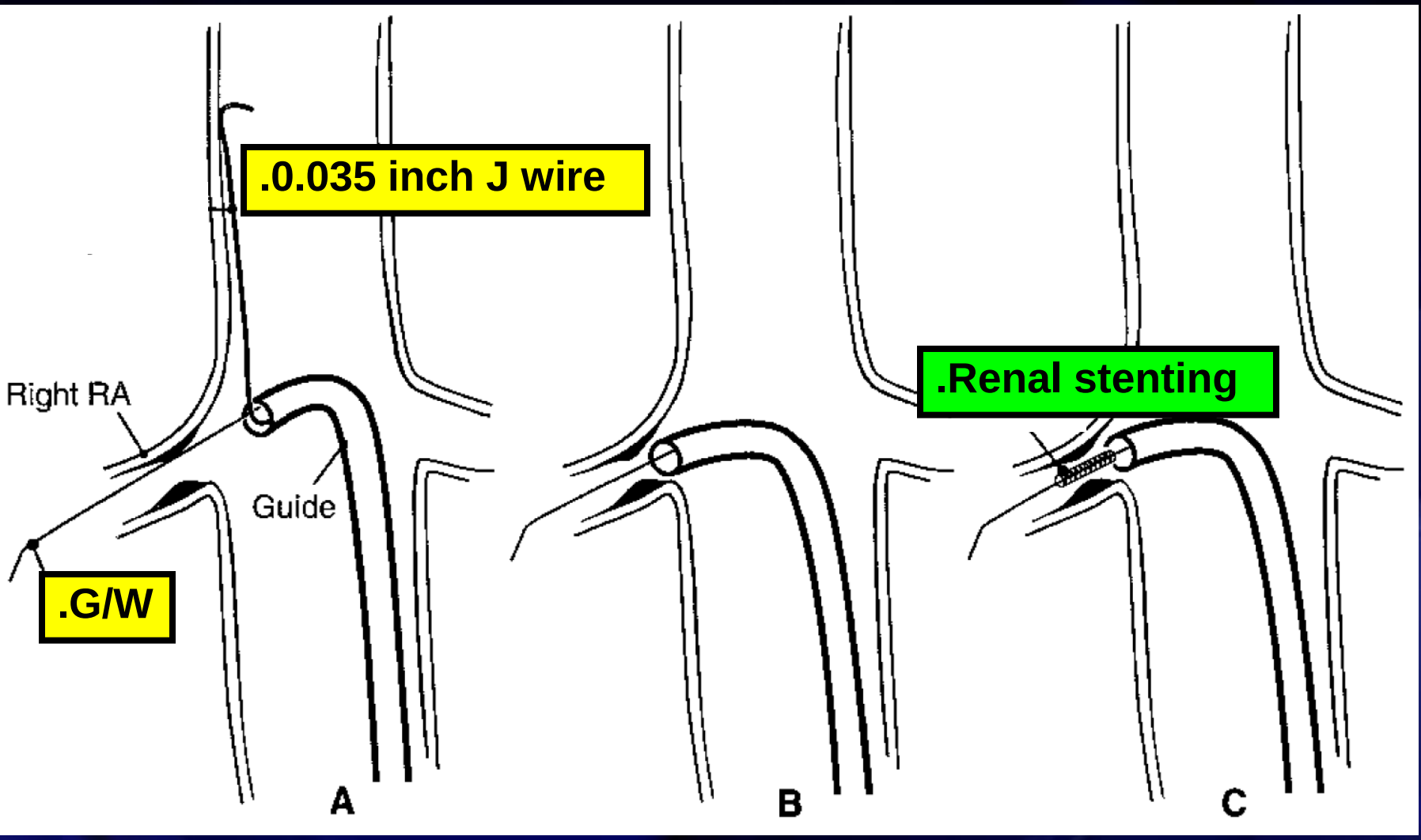
.Cholesterol embolism, a serious-infrequent complication of the renal stenting, may be avoided by this technique

.The critical step :

.0.035-inch J wire advanced above the tip of the G/C to reduce direct contact with the aortic wall

.Second steerable G/W is advanced into the target vessel

Catheter Cardiovasc Interv 1999;46:245-8



Catheter Cardiovasc Interv 1999;46:245-8

Brachial Approach

.Femoral approach in the majority of cases

.Brachial approach may be advantagenous :

.Signficant infra-renal aortic atheroma

.Significant infra-renal aneurysmal disease

.Extreme down-ward angulation of the renal arteries

detected by preprocedural non-invasive imaging

J Cardiovasc Surg 2007;48:411-42

.Both brachial approach can be used

.With a 5Fr or 6 Fr JR, multipurpose or AR-1 over a 0.035 inch Terumo stiff J wire

.Acute angulation between the LSA & the aorta :

.5 Fr Simmons, Sidewinder catheter, Omni

.0.035-inch extra-stiff guide wire (Amplatz Extra-Stiff)

.6 Fr Vista Brite Tips, multipurpose shaped guiding sheath

Angioplasty techniques

.Lesion crossing

.Lesion dilatation (ostial versus non-ostial)

.Stent implantation

Lesion Crossing

.Crossed with a G/W depending on the stent/balloon

.Prefer using 0.014 or 0.018 stiff G/W

.Balloon diameter (4, 5, 6 mm), most used

J Cardiovasc Surg 2007;48:411-42

Lesion dilatation (ostial lesion)

.All ostial lesions should be stented

.Can be attempted direct stenting in ostial lesion

.Predilation in a very tight lesion or calcified lesion

J Cardiovasc Surg 2007;48:411-42

.Never over dilate a renal artery :

.Renal or aorta dissection

.Arterial rupture

.Predilatation pressure :

.Depends on the degree of lesion calcification / severity

.Ask the patient whether he/she feels back pain

J Cardiovasc Surg 2007;48:411-42

.Balloon size :

.Should be approximately the size of the native normal renal artery beyond the stenosis

.Not a segment with post-stenotic dilatation

.Usually, 4 or 5 mm compliant balloon :

.Compliant nature of the balloon gives a range of diameters above & below 4 mm depending on the inflation pressure

Semin Vasc Surg 2003;16:300-10

Lesion dilatation (non-ostial lesion)

.May be treated only by balloon angioplasty

.In some cases, provisional stenting :

- .Residual stenosis
- .Dissection

Stent implantation

.Mandatory for atherosclerotic ostial RAS :

.Better acute & long term results with balloon alone

.Prompt stent placement for suboptimal angioplasty

.Genesis balloon-expandable stents :

(Cordis; Johnson & Johnson Medical, Miami, FL)

.Balloons premounted with flexible, low profile stent

.Diameter from 4 to 7 mm

.Closed stent designs for more radial strength

J Cardiovasc Surg 2007;48:411-42

Technical tips & Conclusion

.Origin of renal artery :

.Either anteriorly or posteriorly

.Diagnostic evaluation of the renal artery origins may be improved with oblique image intensifier views

.Arterial perforation or parenchymal injury :

.due to G/S advancement

.Very conscious of the tip of the wire, which should maintain a fixed position throughout the procedure

.Save the image of the fully expanded angioplasty balloon :

.Native artery diameter & Optimal stent size

.Compliant balloon

.Never overdilatation

.Stent for ostial lesion :

.Should extend into the aorta approximately 1 or 2 mm

. Access techinique :

.Not hydrophilic G/W (perforation of the parenchyma)

.Low profile devices via 7 Fr or 8 Fr G/C

.No touch technique for minimal manupulation

Thanks yours attention