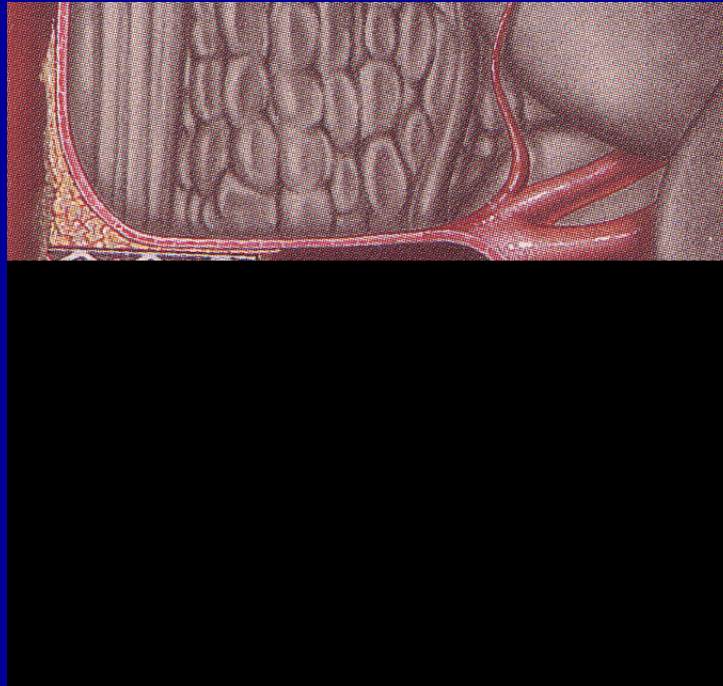


Dilatation des Artères Rénales & Viscérales

**Rappels Anatomiques – Physiopathologie
Examens Paracliniques
Sélection des Patients / Chirurgie**

L'Angioplastie Rénale



Dr Jacques Busquet
Chirurgie Vasculaire
Clinique Chirurgicale Val d'Or



Sténose Athéromateuse des Artères Rénales

Risque Rénal Majeur +++



Hypertension Artérielle Maligne

Néphropathie Ischémique

Les Techniques de Revascularisation Rénale

Chirurgie par Endartériectomie ou Pontage

Dilatation par Ballonnet

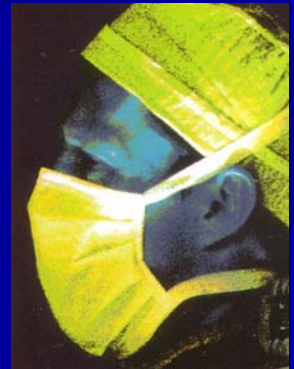
Stenting par Dilatation-Endoprothèse

Chirurgie de Revascularisation Rénale

Indications Opératoires

- Occlusions Rénales
- Chirurgie Aortique
- Echec de Franchissement
- Complications

Chirurgien Vasculaire Expérimenté



Angioplastie Rénale



***Une Nouvelle Solution
Thérapeutique***

***Utilisant les Techniques
Endoluminales Percutanées***

Dilatation Endoluminale « Les Pionniers »

Zeitler

Gruentzig

Dotter



Premier Cas 1978

Grüntzig A et al:

*Treatment of Renovascular Hypertension
with Percutaneous Transluminal Dilatation of
a Renal Artery Stenosis*

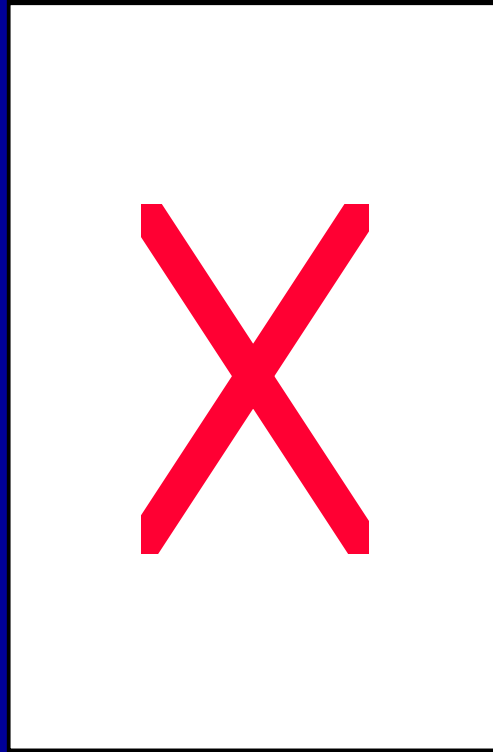
Lancet 1978, 801-807

Stent Expandible sur Ballonnet

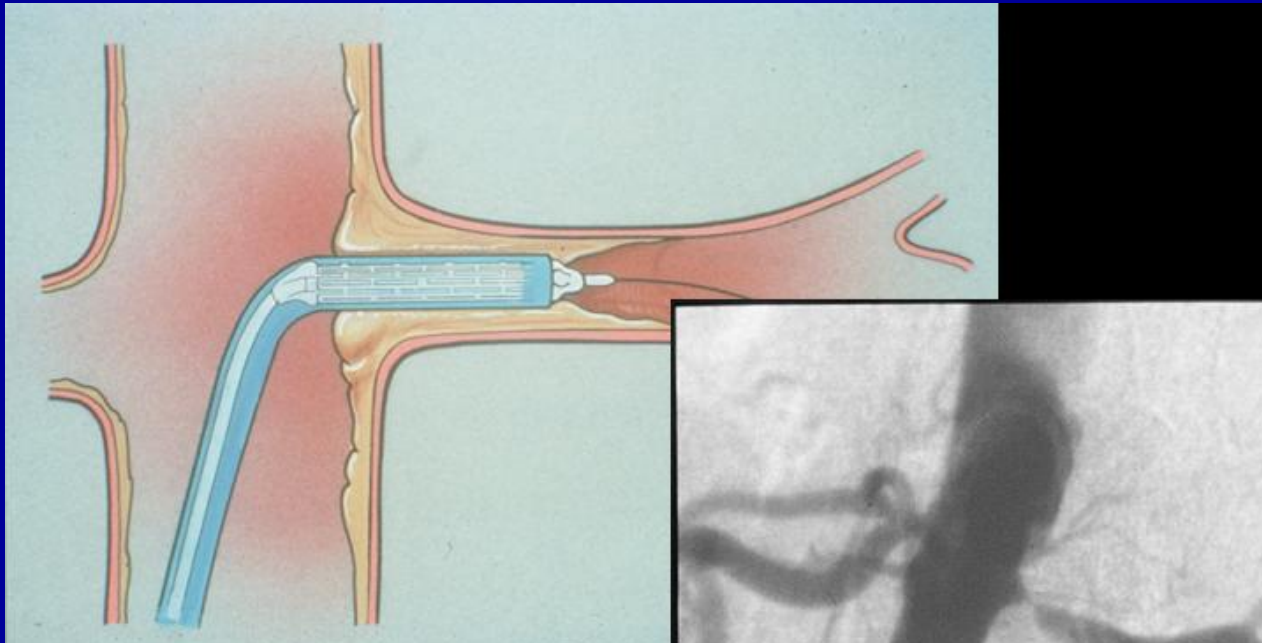


**Inventé par le Dr PALMAZ
en 1986**

Julio Palmaz, MD



Stenting Rénal Par Stent Prémonté sur Ballonnet



**Plaque Ostiale
Juxta-Rénale**

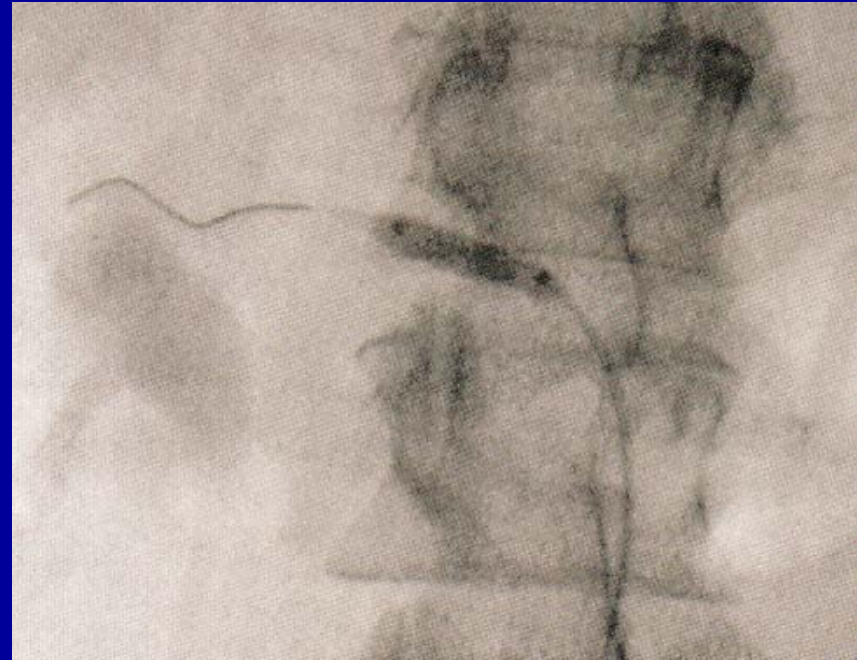
Indications de l'Angioplastie Rénale

- Hypertension Mal Contrôlée
- Altération de la Fonction Rénale
- OAP Récurrent
- Coronaropathie Associée
- Insuffisance Rénale Aigue ou Sub-Aigue

Sténose Rénale > 70% Uni ou Bilatérale

Angioplastie Rénale

- *Profil*
- *Support*
- *Positionnement*
- *Temps d'Intervention*
- *Produit de Contraste*



Angioplastie et Stenting des Artères Rénales

Study series	Year of publication	Study period	No. of Arteries	Stent type	Ostial lesion	Success definition	Technical success (%)
Rodriguez-Lopez [20]	1999	93 - 96	125	Palmaz	66	No RS / dissection	98
van de Ven [9]	1999	93 - 97	52	Palmaz	100	RS* < 50%	90
Henry [21]	1999	NA	104	AVE	77	RS < 20%	99
Rocha-Singh [12]	1999	93 - 95	180	Palmaz	43	#PG < 5mmHg	98
Tuttle [22]	1998	91 - 96	148	Palmaz	100	RS < 30%	98
Dorros [23]	1998	90 - 95	202	Palmaz	NA	RS < 50%	99
Rundback [24]	1998	NA	54	Palmaz	NA	RS < 30%	94
White [25]	1997	92 - 94	133	Palmaz	81	RS < 30%	99
Harden [17]	1997	92 - 95	32	Palmaz	75	RS < 10%	100
Blum [8]	1997	89 - 96	74	Palmaz	100	RS < 50%	100
Henry [26]	1996	90 - 94	64	Palmaz	53	RS < 20%	100
Iannone [27]	1996	92 - 93	83	Palmaz	78	RS < 30%	99
Hennequin [28]	1994	87 - 91	21	Wallstent	33	NA	100
Rees [29]	1994	88 - 92	296	Palmaz	100	RS < 30%	98

* RS=residual stenosis

PG=pressure gradient

~98%

Intervention Vasculaire Périphérique

les Acteurs Interventionnels

Cardiologue Interventionnel

Radiologue Vasculaire

Chirurgien Endovasculaire

Les Nouveaux Chirurgiens Vasculaires

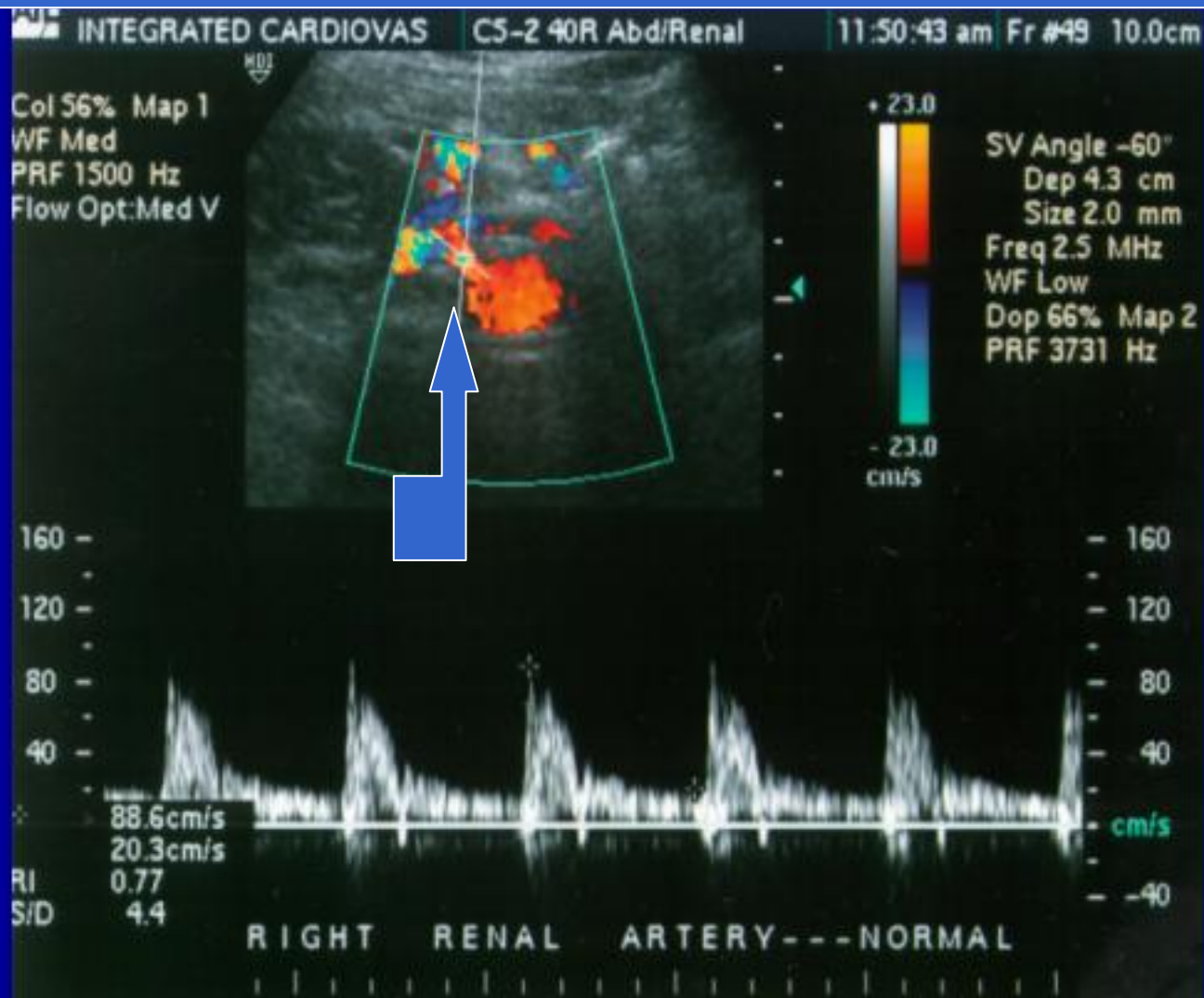


Les Images

- **La Nouvelle Imagerie Radiologique**
- **Dénominateur Commun**
- **Progrès Constant**
- **Investissement**



Echo-Doppler des Artères Rénales

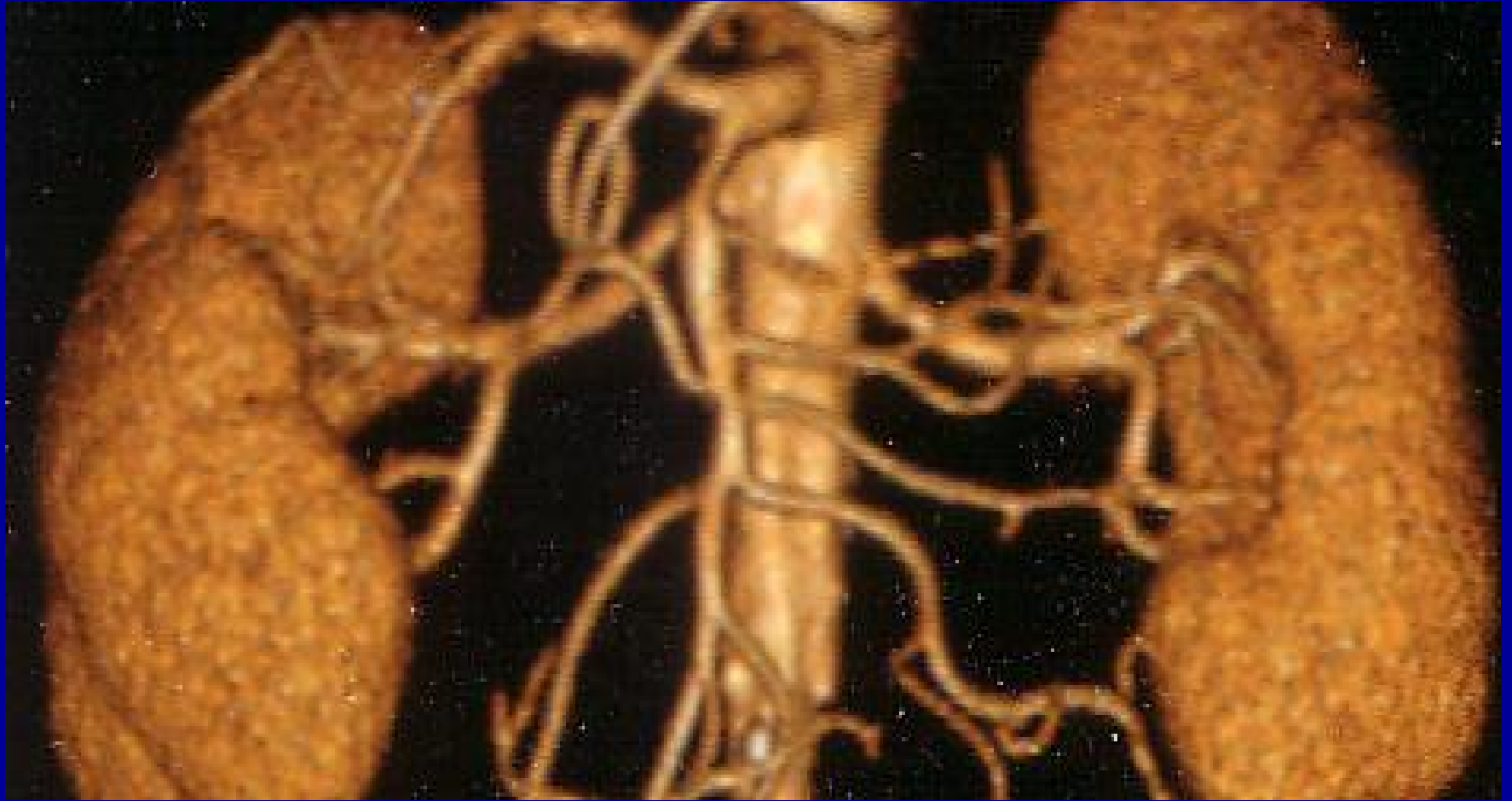


Courtesy of
M.Jaff

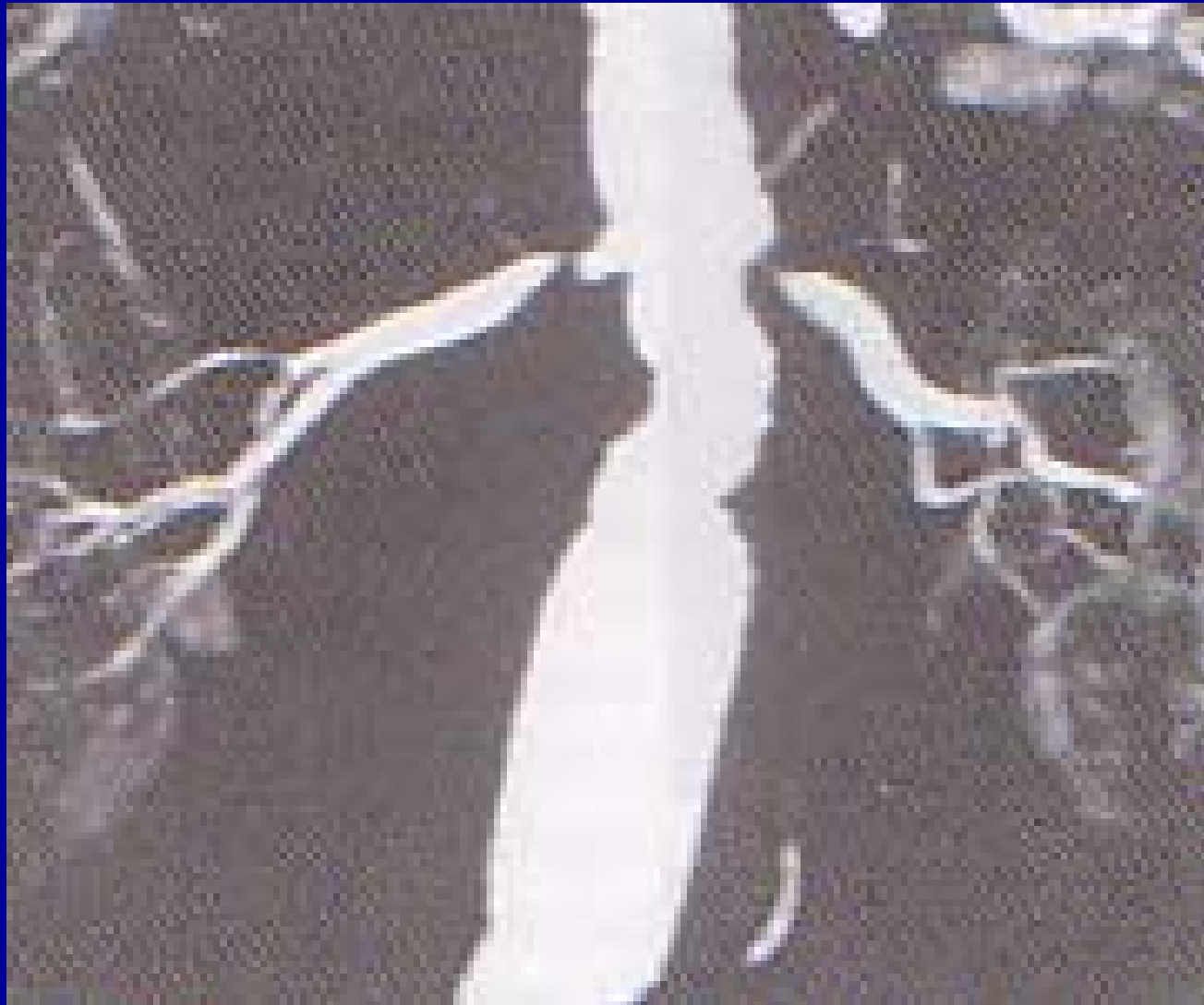
Angio-Scanner



Reconstruction 3-D



Angio-IRM



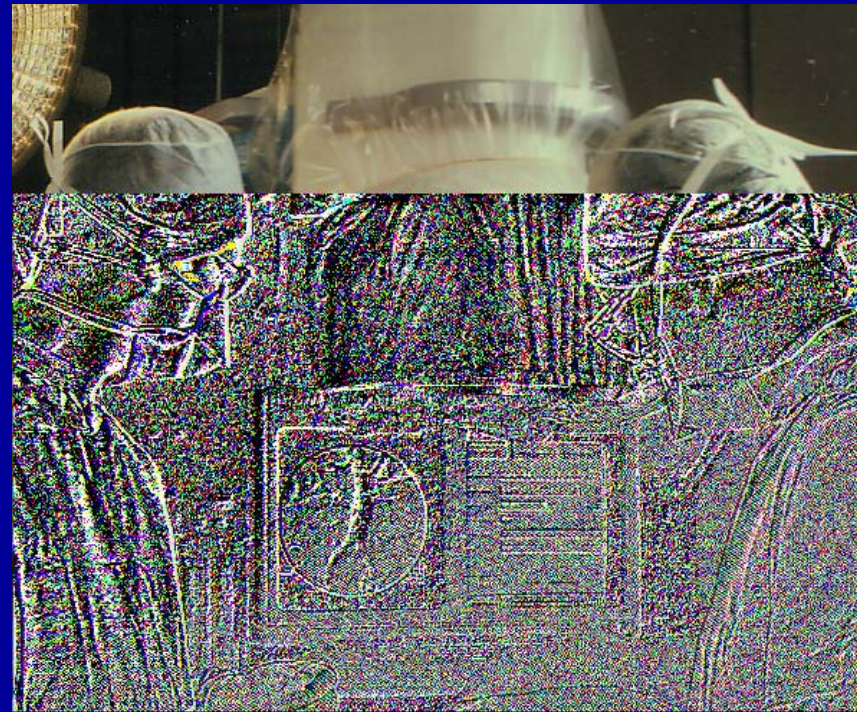
Salle de Cathétérisme

- **Systeme Sophistique**
- **Imagerie de Haute Qualité**
- **Usage Multidisciplinaire**
- **Actes Diagnostiques & Interventionels**
- **Radioprotection**



Intervention Endovasculaire au Bloc Opératoire

- *Arceau Mobile*
- *Amplificateur de Brilliance*
- *Polyvalence*
- *Environnement Stérile*
- *Coût : 100K euros*
- *Limites d'Utilisation*



Arizona Heart Institute

Phoenix-USA

« *Endovascular Suite* »

Bloc Opératoire

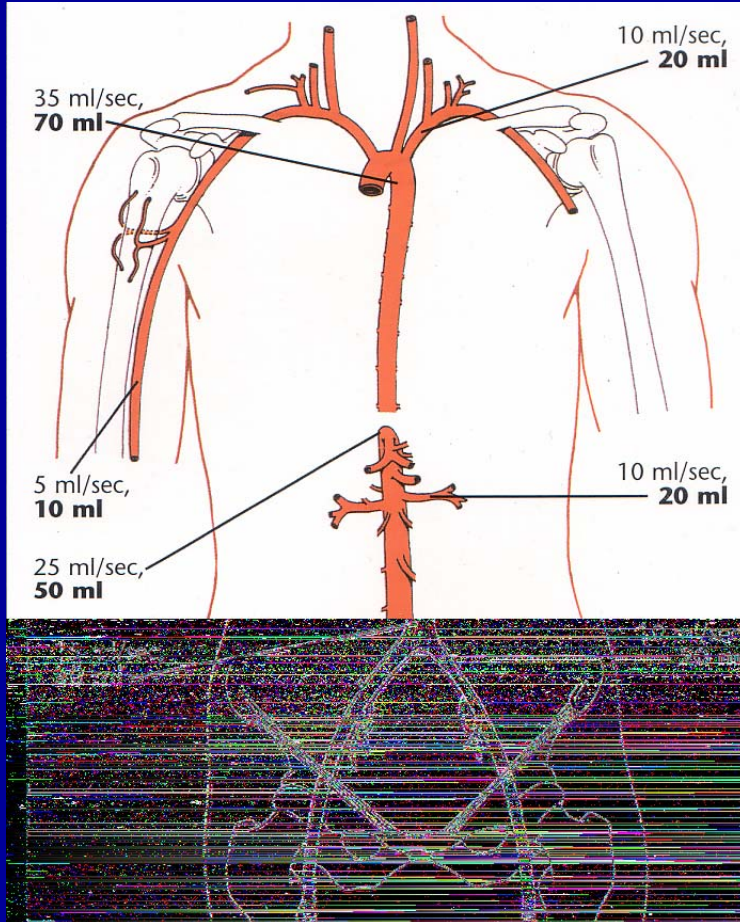
Arceau Radiologique Fixe

Table Carbone

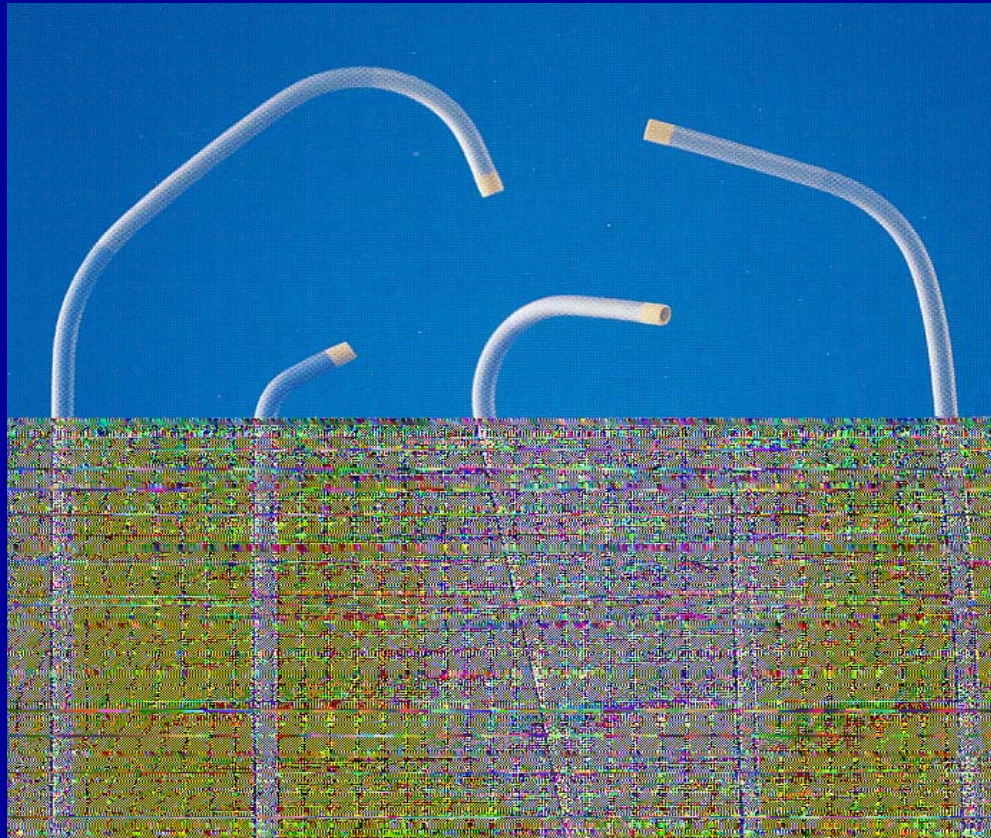
100m² de Surface au Sol



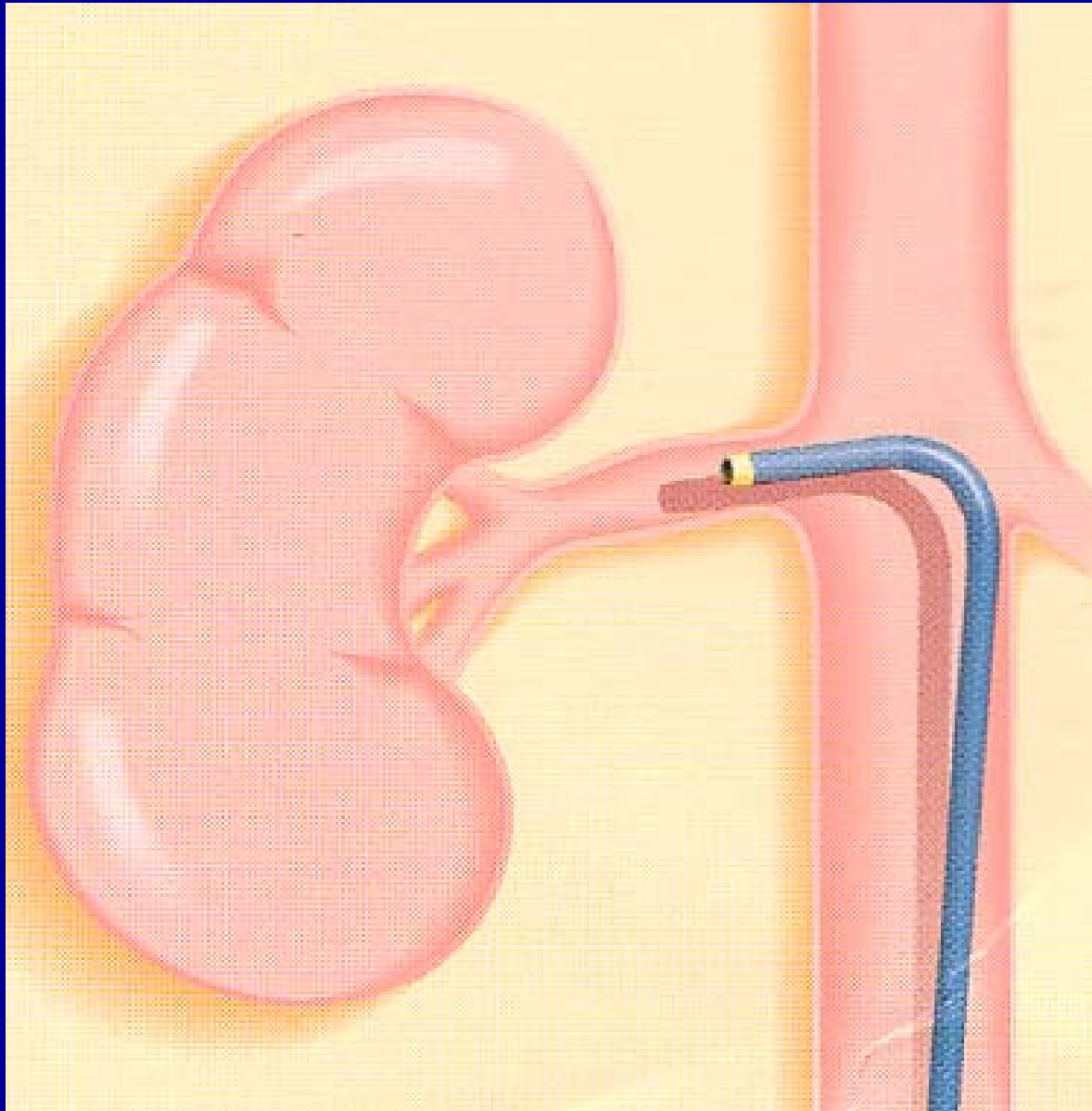
Injecteur de Produit de Contraste



Cathéters-Guides

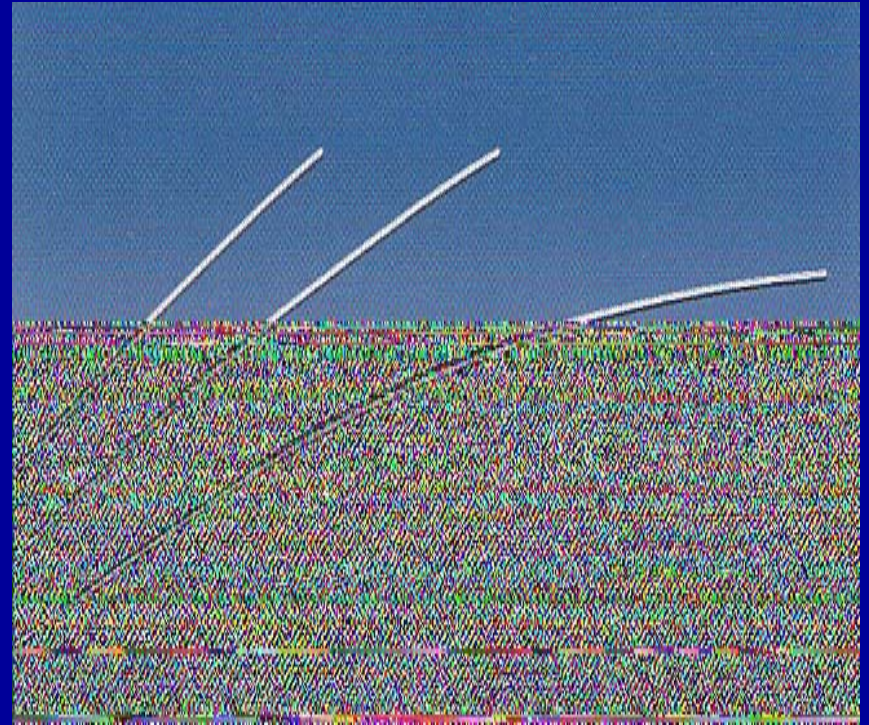


Cathétérisme Rénal Sélectif

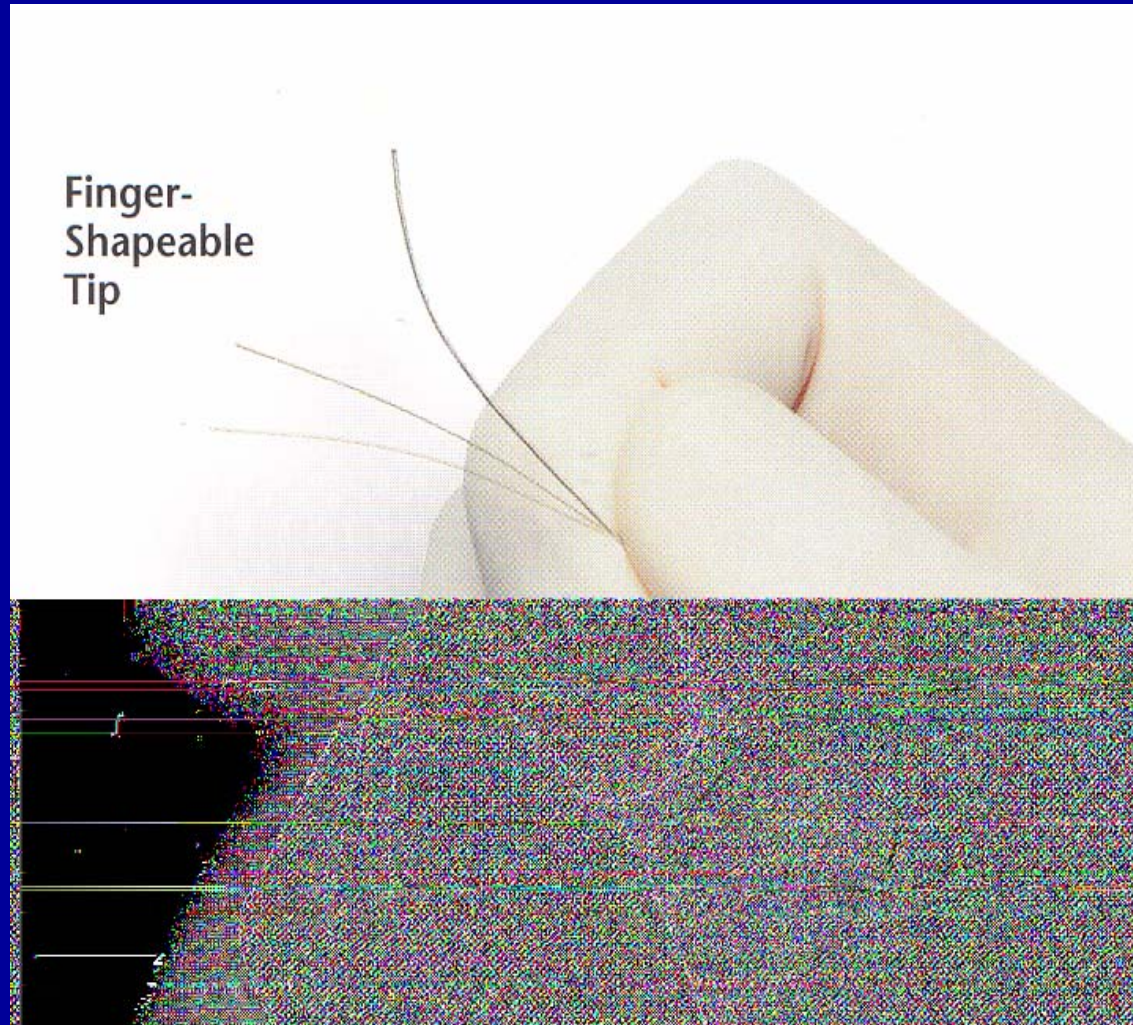


Guides Coronaires

- **0.018 – inch**
- **0.014 - inch**



Guides



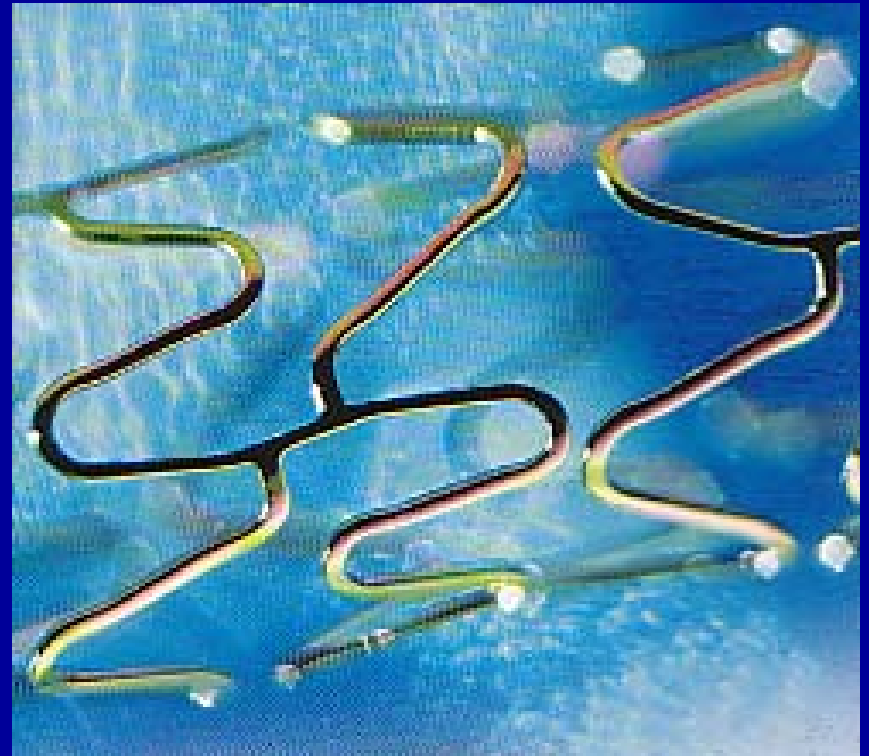
Les Nouveaux Ballons de Dilatation

- **Compliance**
- **Bas-Profil**
- **Stabilité**
- **Résistance**

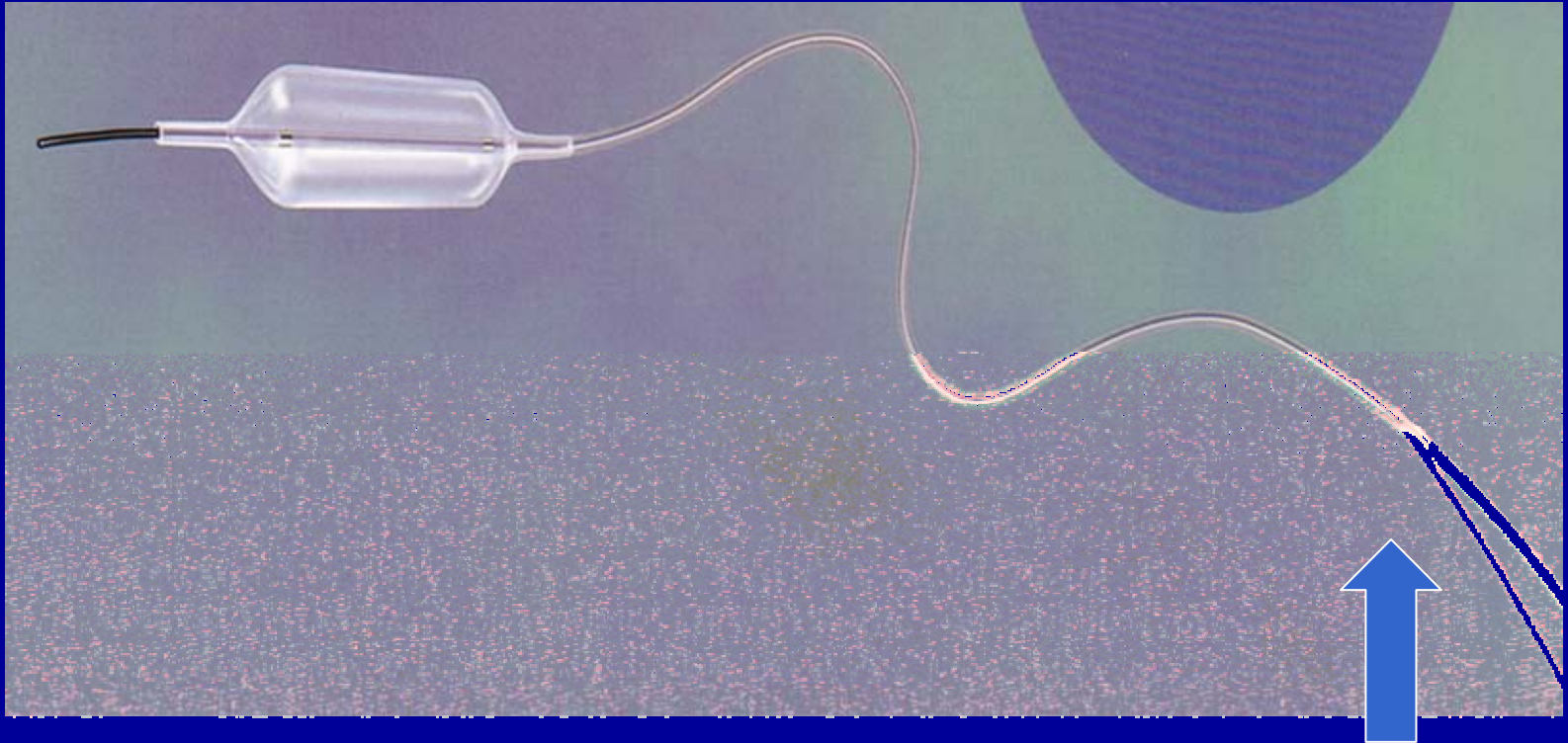


Les Endoprothèses

- **Prémontées sur Ballonnet**
- **Modèles Multiples**
- **Stenting Primaire**



Systeme Monorail



Cathétérisme Rénal Sélectif



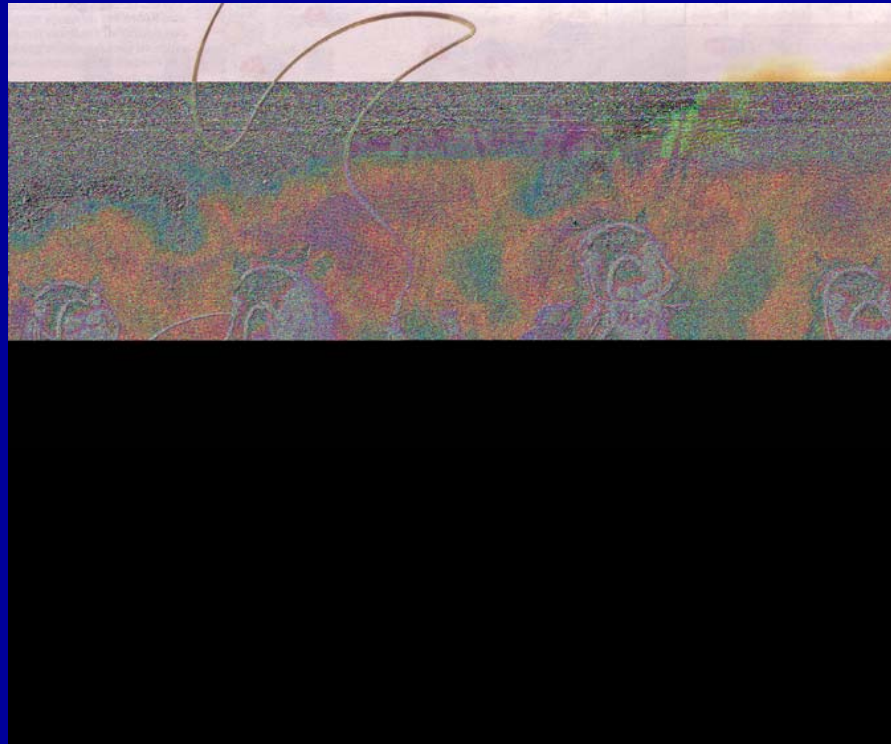
Angiographie



Dilatation-Endoprothèse

Angioplastie Rénale

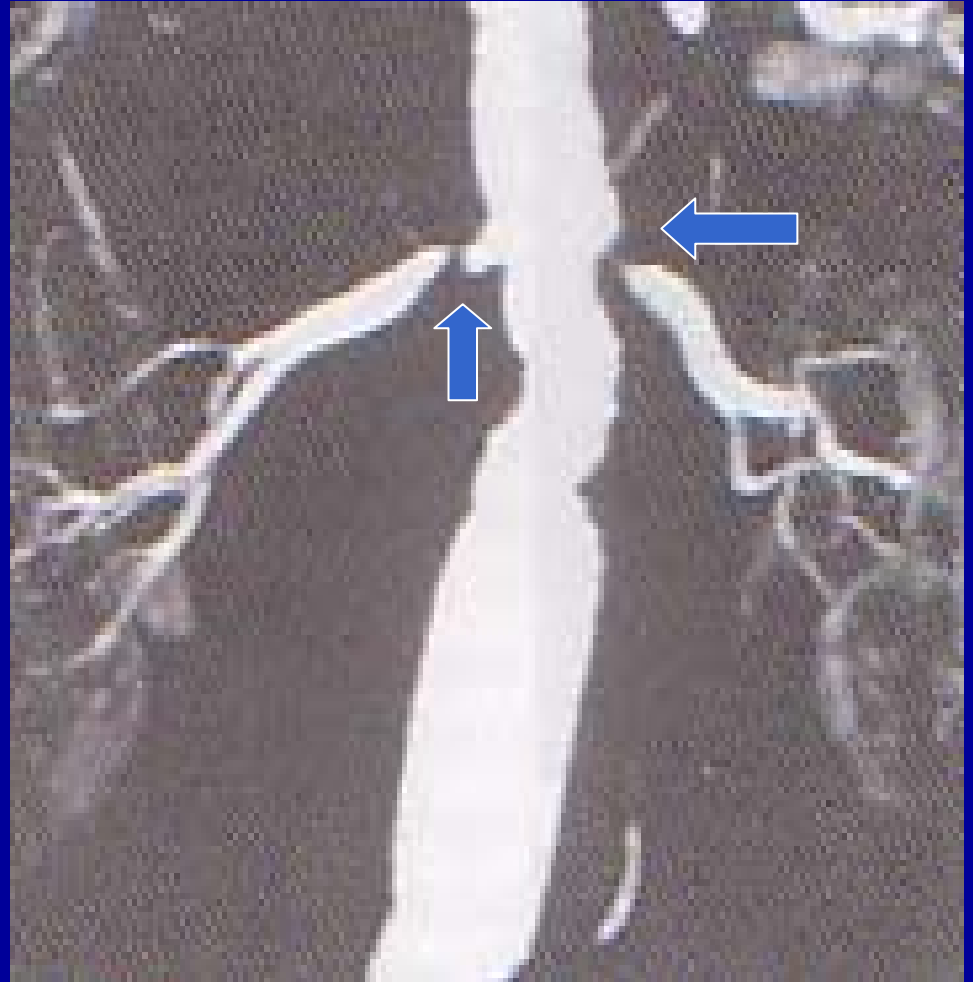
Les Indications



Ne pas s'emballer...!

Patient à Haut Risque

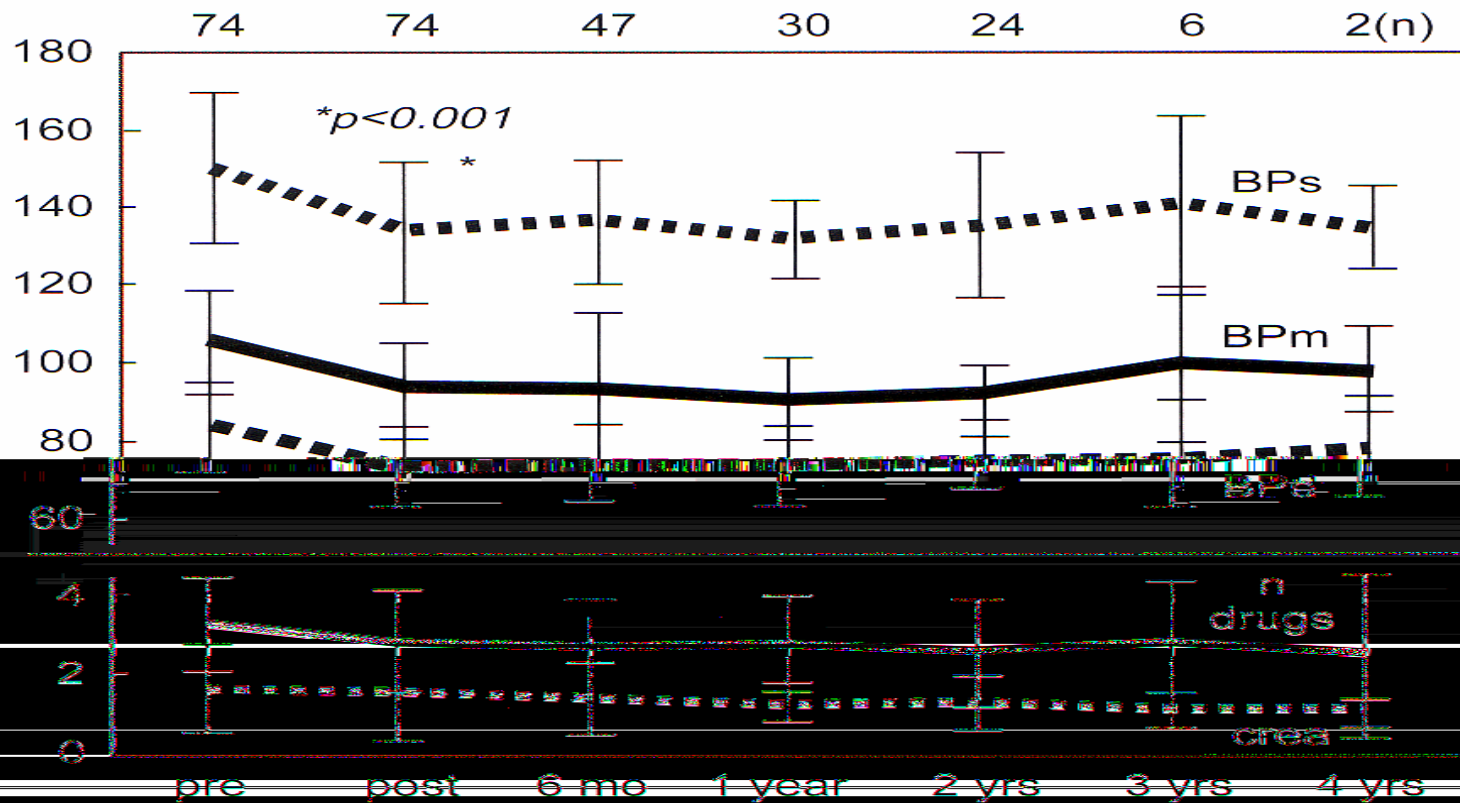
- **Insuffisance Rénale Aigue**
- **Dialyse Rénale**



Indications

- **Patient Hypertensif**
- **Porteur d'une Sténose Serrée**
- **Poussées d'Hypertension**
- **Mauvais Contrôle du Traitement**
- **Sténose Bilatérale**
- **Polyvasculaire**

Résultats à Long Terme



Tension Artérielle

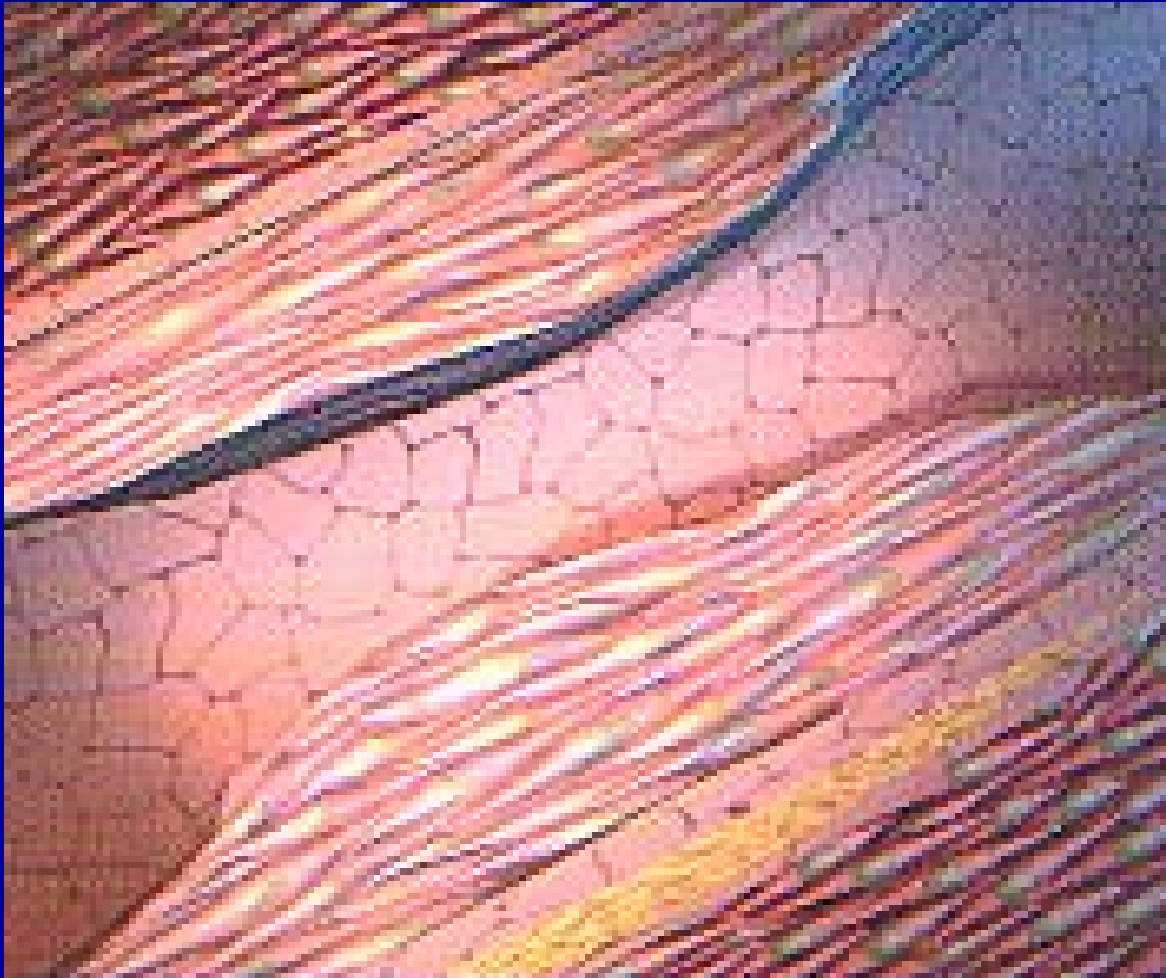
Traitement HTA

Créatinine

Complications du Stenting Rénal

- **Dissection**
- **Perforation**
- **Migration du Stent**
- **Micro-Embolisation**
- **Spasm**
- **Thrombosis**
- **Produit de Contraste**

Resténose Post-Angioplastie



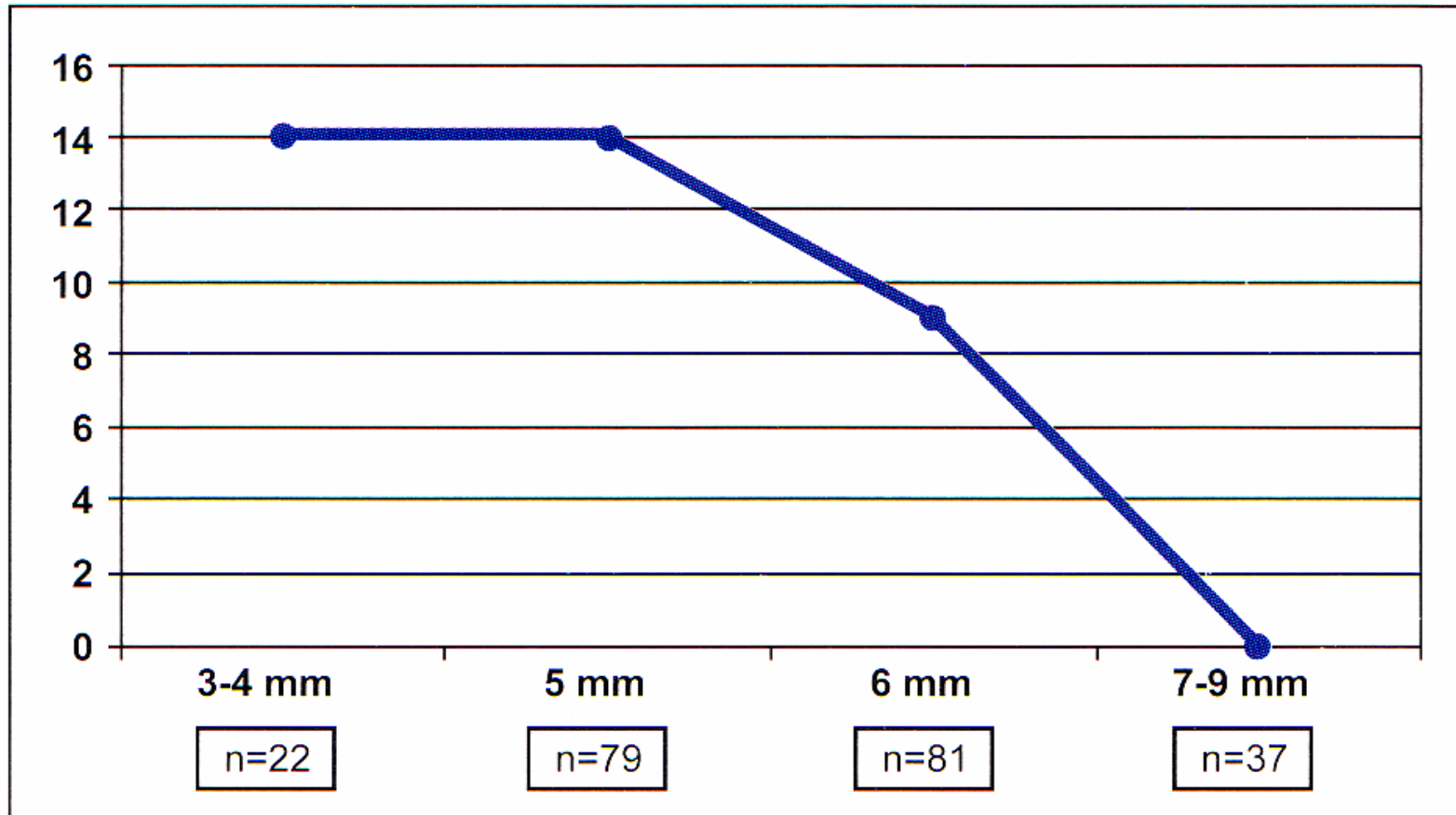
Resténose Post-Stenting Rénal

Study series	No. of Arteries	Arteries evaluate (%original total arteries)	Ostial lesion (Stent type	Method of evaluation	Average time to evaluation(month	Restenosis (o artery evaluatec
van de Ven, 1999	52	50 (95%)	100	Palmaz	angio*	6	21%
Rocha-Singh, 1999	180	158 (88%)	43	Palmaz	duplex + angio	13	12%
Tuttle, 1998	148	49 (33%)	100	Palmaz	angio	8	14%
Rundback, 1998	54	28 (52%)	NA	Palmaz	angio* + spiral CT	12	26%
White, 1997	133	80 (60%)	81	Palmaz	angio*	9	19%
Harden, 1997	32	24 (75%)	75	Palmaz	angio*	6	12%
Blum, 1997	74	74 (100%)	100	Palmaz	angio*	24	11%
Henry, 1996	64	54 (84%)	53	Palmaz	angio*	14	9%
Iannone, 1996	83	69 (85%)	78	Palmaz	duplex	11	14%
Dorros, 1995 [30]	92	56 (61%)	100	Palmaz	angio*	7	25%
Hennequin, 1994	21	20 (95%)	33	Wallstent	angio*	29	20%
Rees, 1994	296	150 (51%)	100	Palmaz	angio*	7	33%
<i>weighted average</i>						10	~20%

Lim and Rosenfield, Curr Int Cardiol 2000,2:130-139.

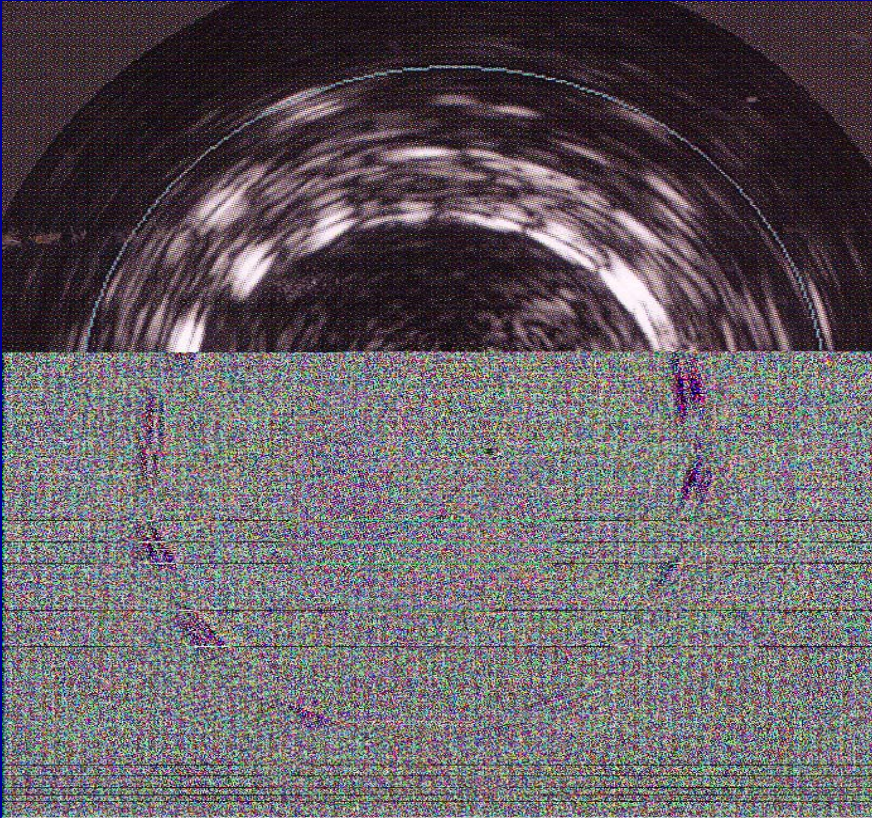
Resténose Rénale Post-Angioplastie

T. Zeller et al, 2002

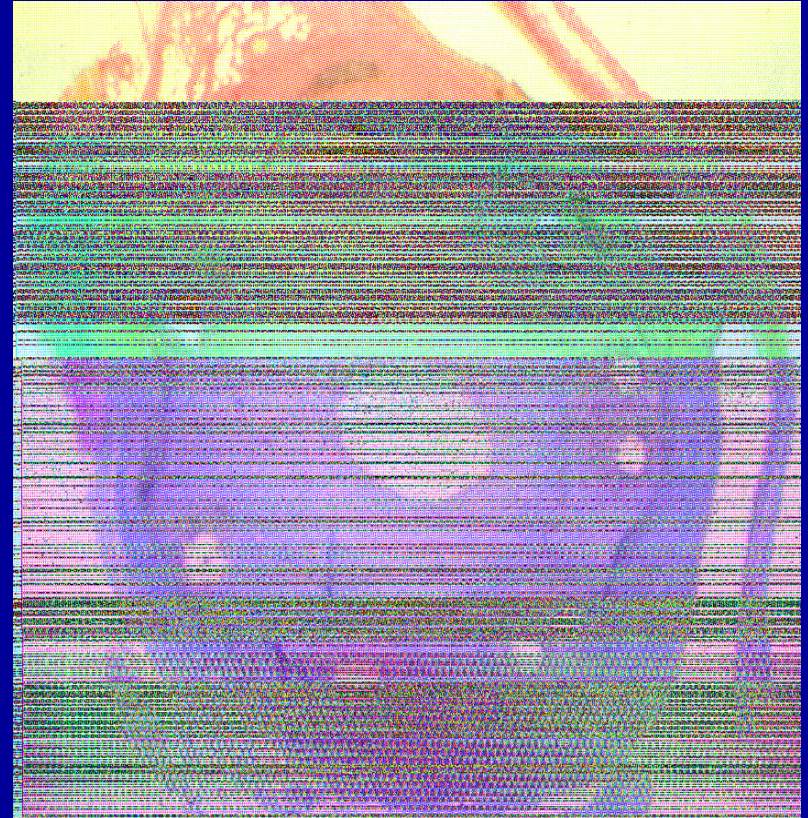


Diamètre Artériel

Resténose Intra-Stent

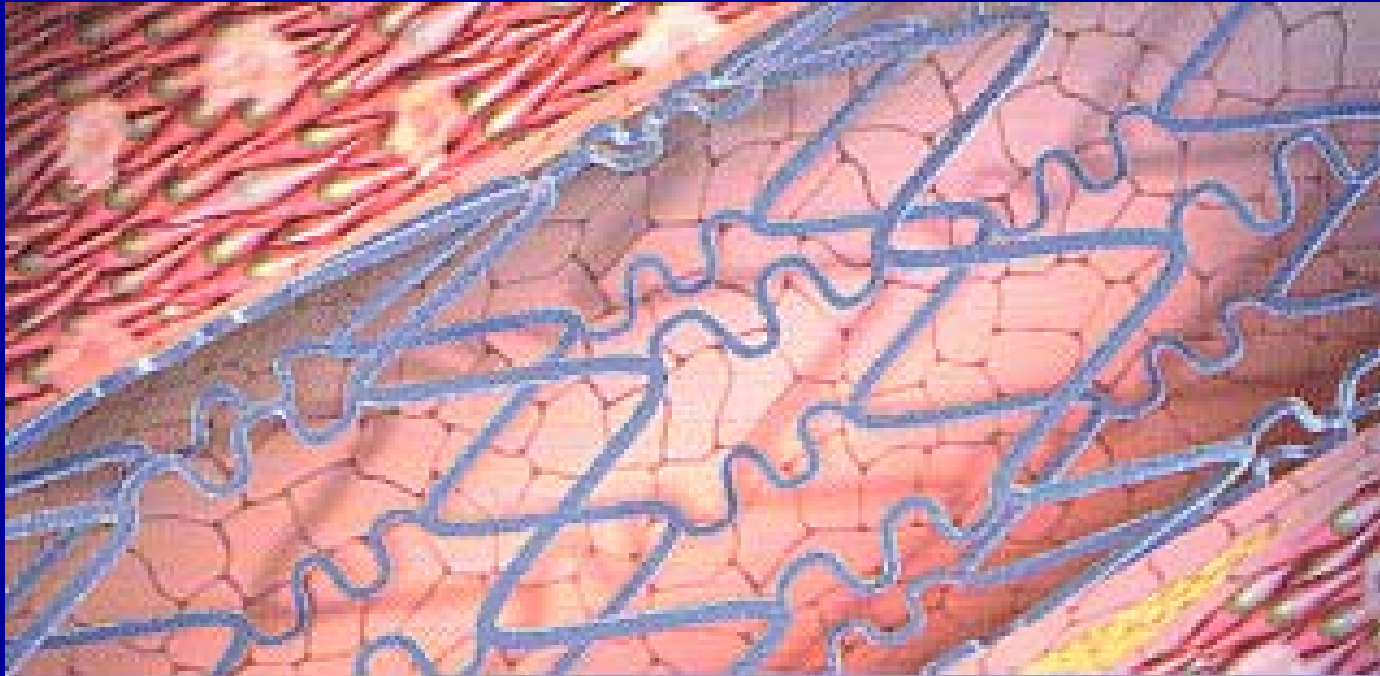


IVUS

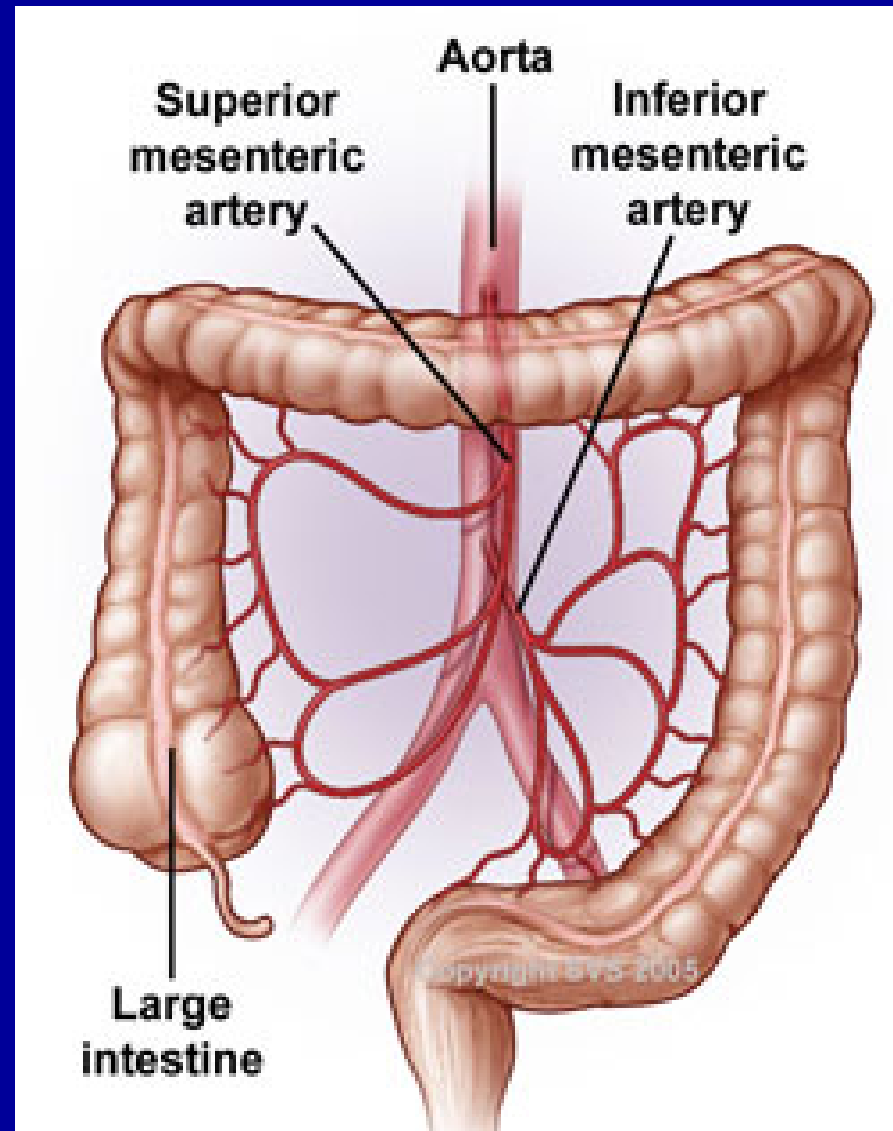


Histologie

Stents Actifs



Circulation Intestinale



Infarctus Mésentérique

- **Mortalité**
90%
- **Mortalité Opératoire**
20%

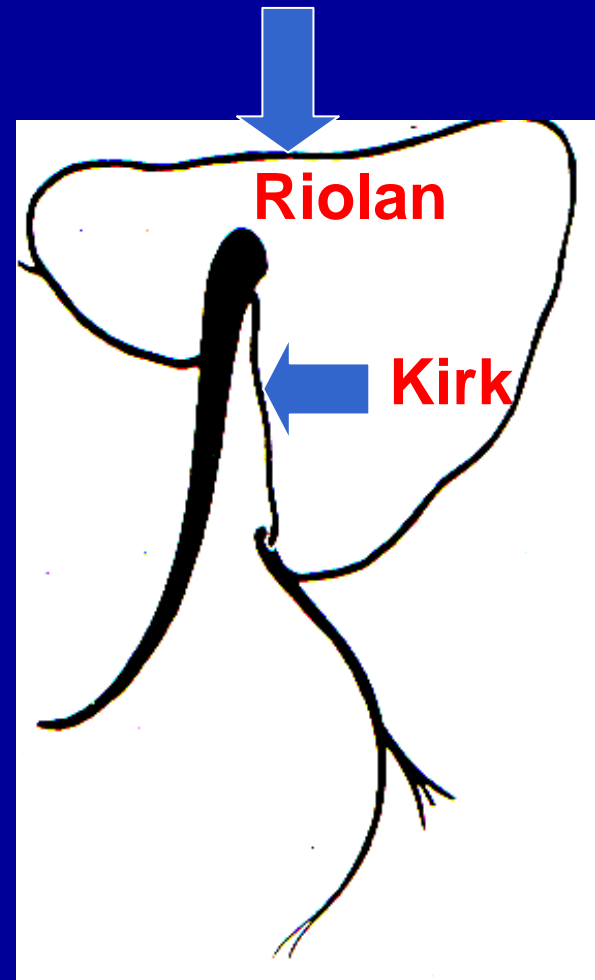


Les Artères Mésentériques

- **Tronc Coeliaque**
- **Mésentérique Supérieure**
- **Mésentérique Inférieure**

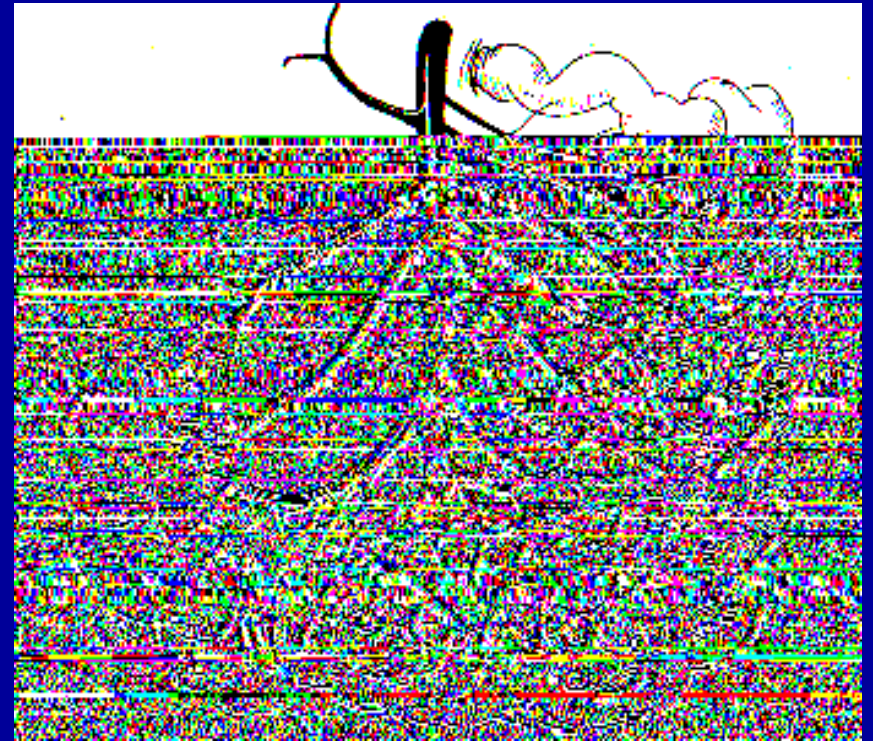
Circulation Collatérale & Anastomoses

- A. Mésentérique Supérieure
- A. Mésentérique Inférieure



L'Artère Mésentérique Supérieure

Artère Intestinale
Majeure



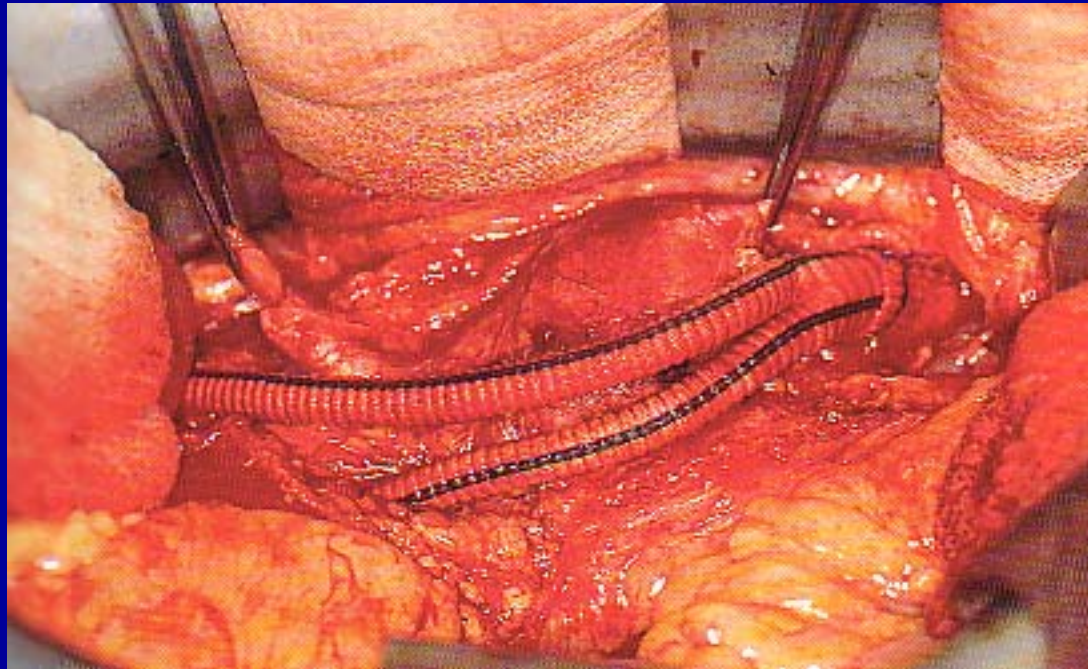
Artère Mésentérique Inférieure

Circulation Colique Gauche

Circulation Sigmoide

Anastomose avec le Système Hypogastrique

Chirurgie Conventionnelle



Réimplantation de l'Artère Mésentrique Inférieure

Imagerie Artérielle Mésentérique

- **Système de Haute Résolution**
- **Aortographie de Profil**
- **Angiographie Sélective**



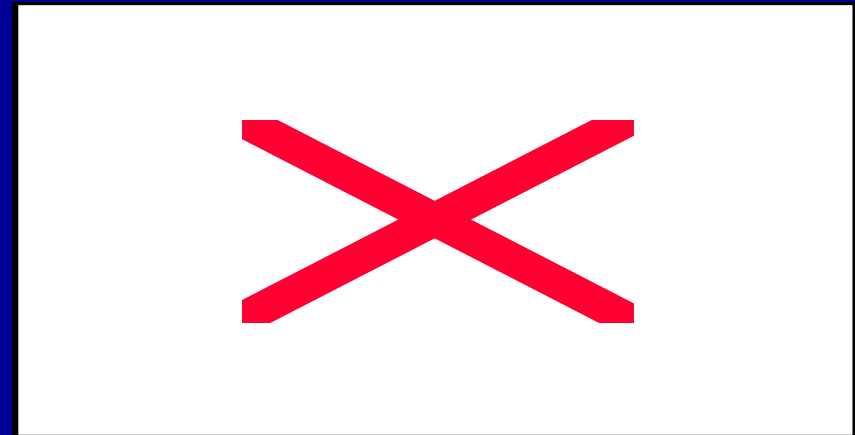
Computed Tomographic Angiography 64 Slices

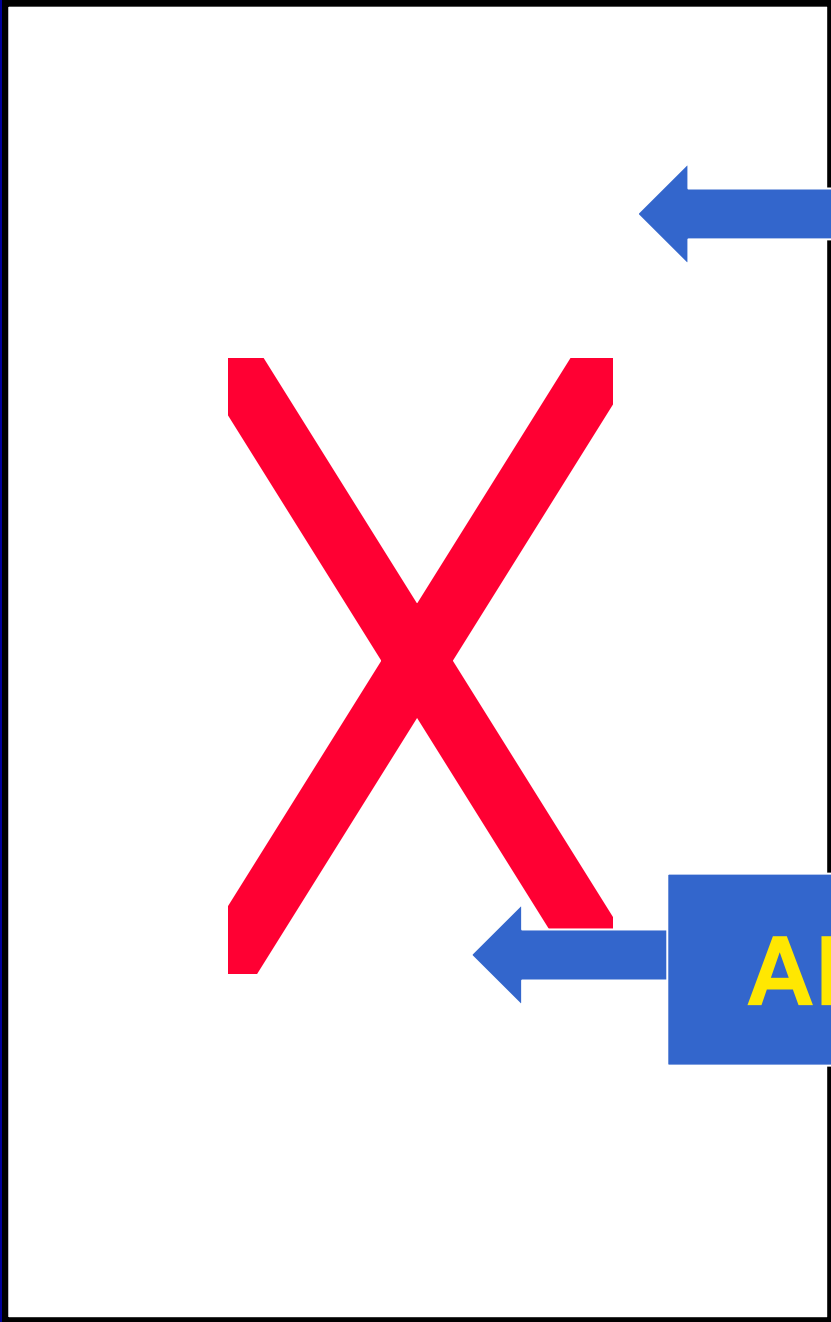
Spiral Scanning

1-2 mm Intervals

IV Bolus Contrast

2 & 3-D Reconstruction





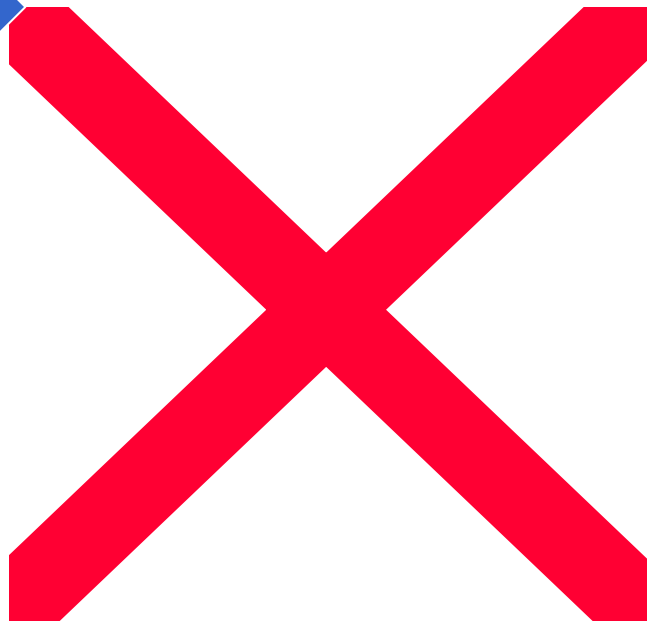
AMS



AMI

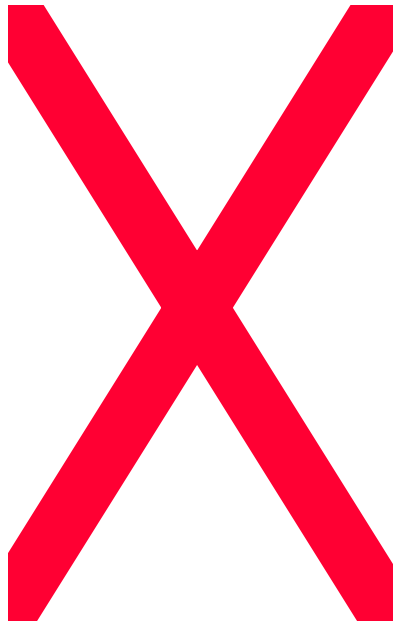


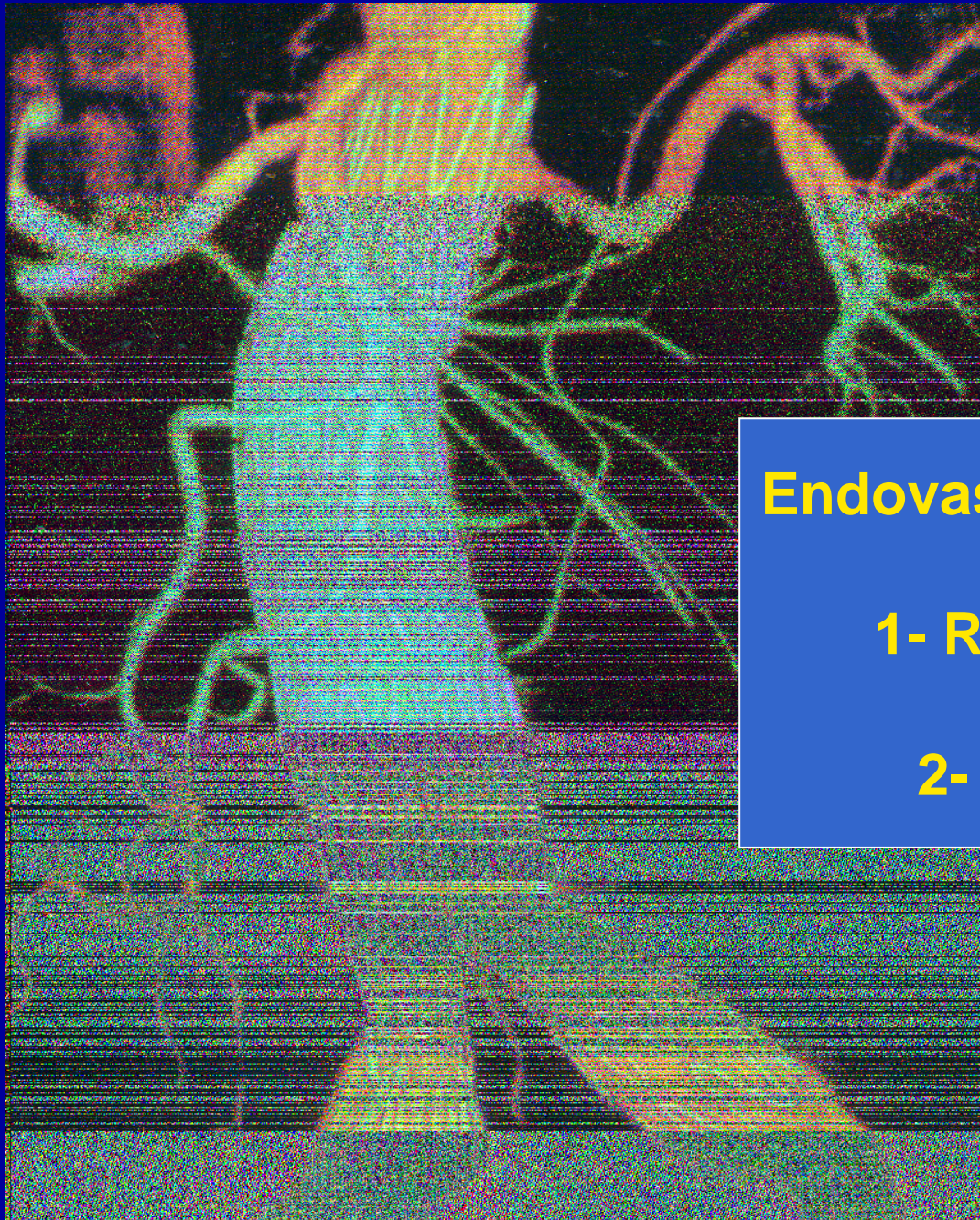
Patent SMA



**IMA
Not Visible**







Endovascular Exclusion of AAA

1- Respects SMA Origin

2- Covers IMA Origin

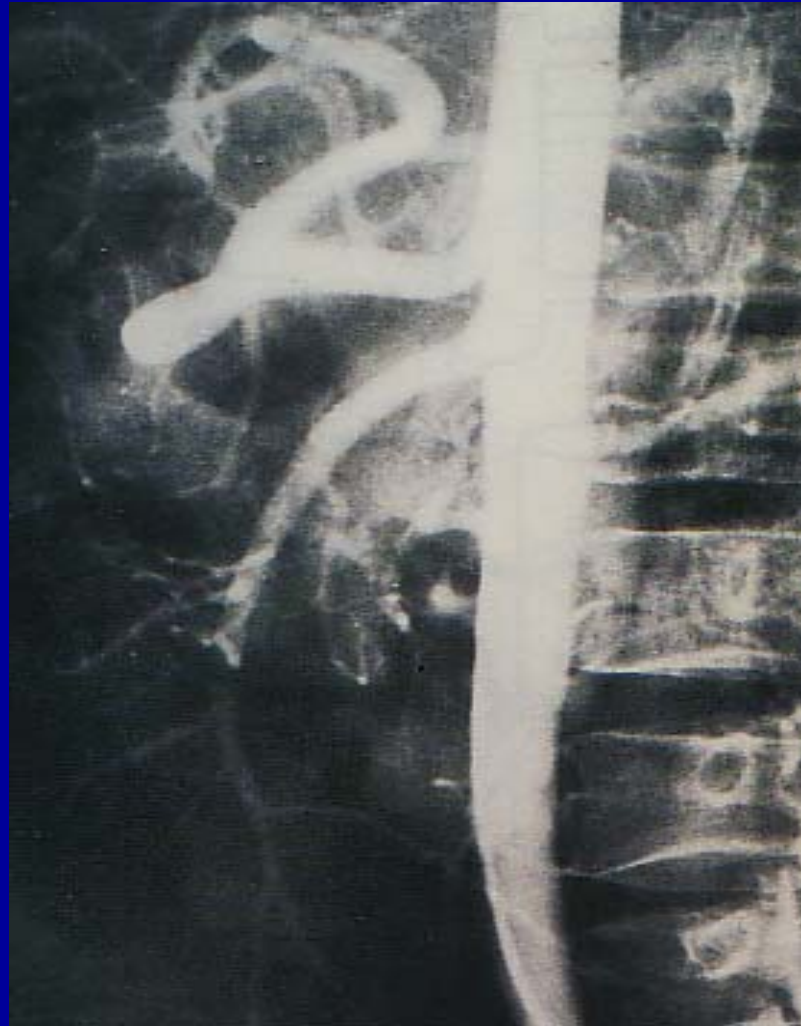
Angor Abdominal

Douleur

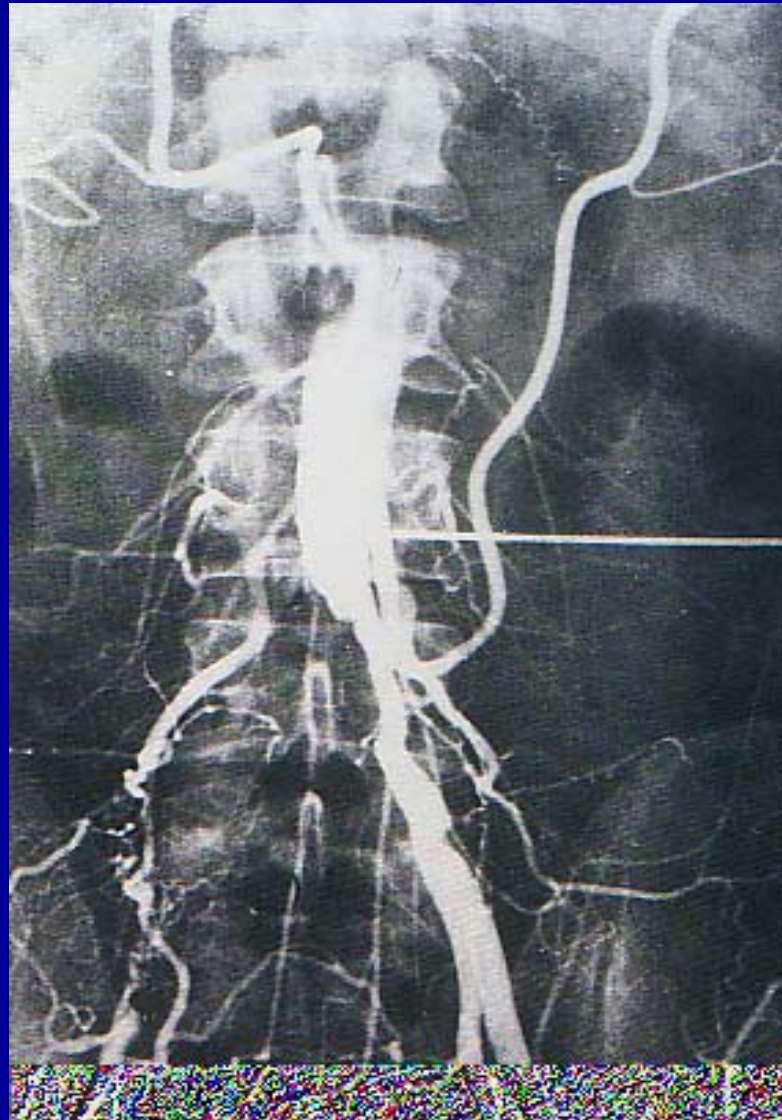
Perte de Poids

Diarrhée

Aortographie de Profil

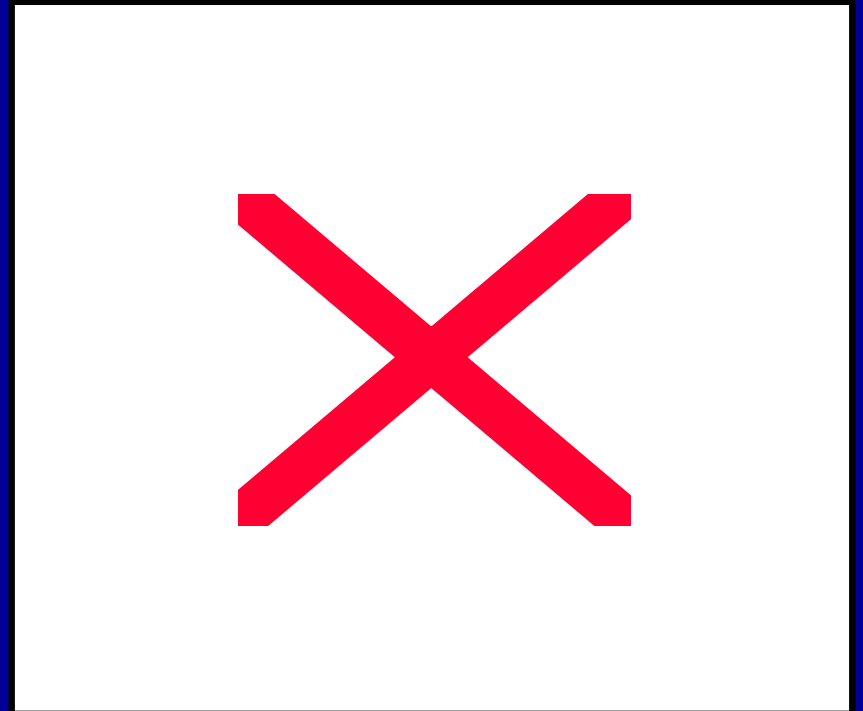


L'Arcade de Riolan



IRM

- **Absence de Radiation**
- **Gadolinium**
- **Globalisation**



- **Severe Stenosis of Celiac Trunk & Superior Mesenteric Artery**
- **Moderate Stenosis of Inferior Mesenteric Arteries**



**Collateral Flow
from
Arc of Riolan**



**Extrinsic
Compression of
Celiac Trunk by
the Median
Arcuate Ligament**

**Normal Superior and
Inferior Mesenteric
Arteries**



1980

**First Publications on
Mesenteric Balloon Angioplasty**

Mesenteric Balloon Angioplasty

Furrer J, Gruentzig A, Kugelmeier J:

***Treatment of Abdominal Angina With
Percutaneous Dilatation of an Arterial
Mesenteric Artery Stenosis***

Cardiovasc Intervent Radiol 3:43-44, 1980

Mesenteric Balloon Angioplasty

Novelline RA:

*Percutaneous Transluminal
Angioplasty:*

Newer Applications.

AJR 135: 983-993, 1980

Limitation of Mesenteric Balloon Angioplasty

Primary Success

90%

Recurrence

50%

Mesenteric Stenting

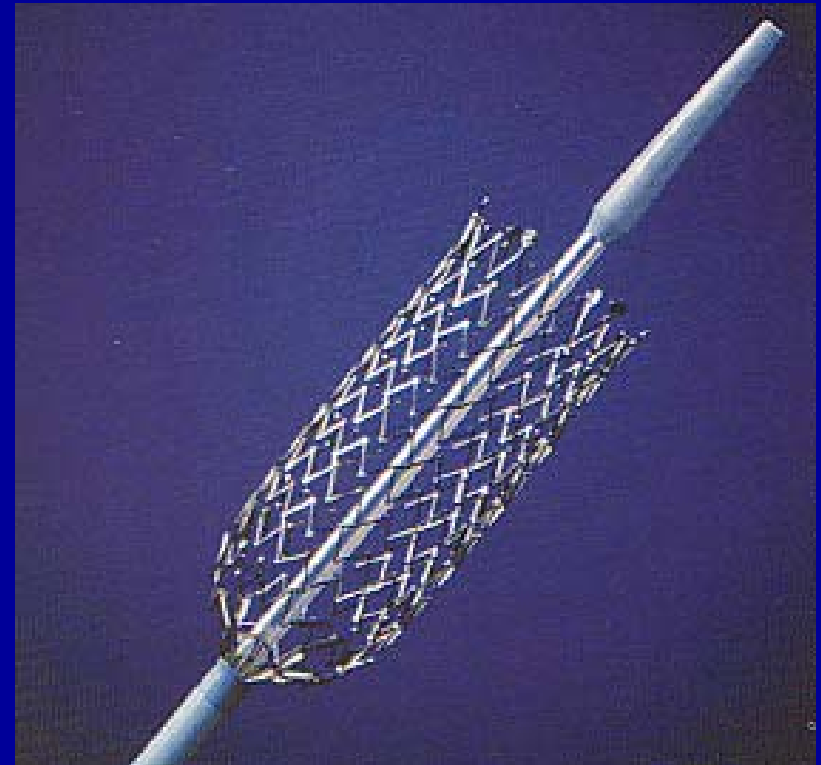
First Publications in 1995

CONNELL D.A

University of Melbourne

1995

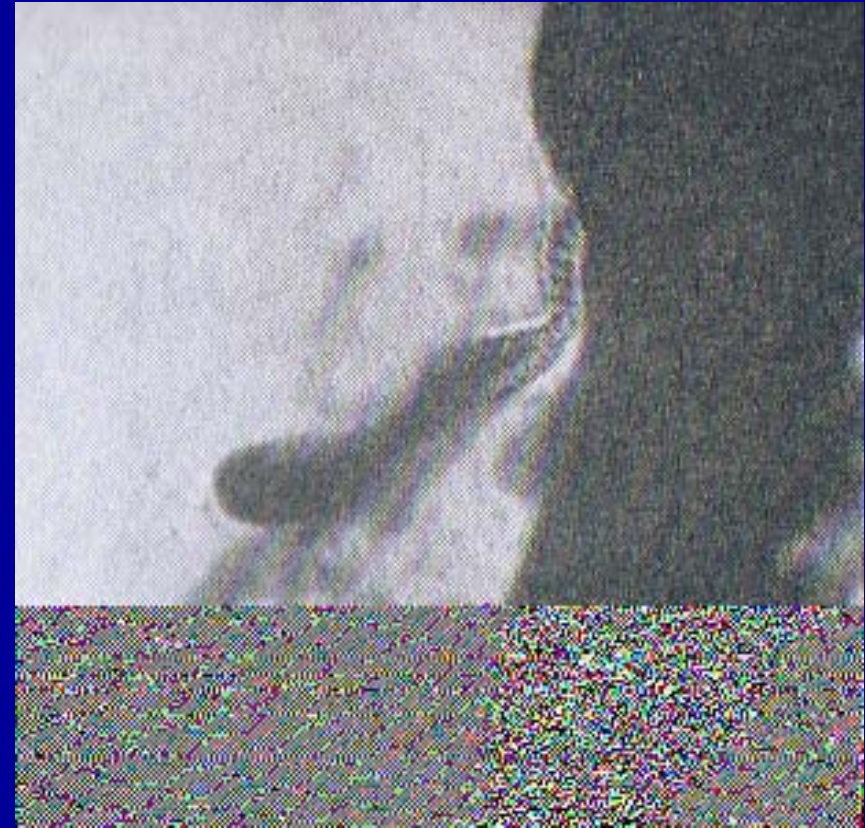
- Aortic Dissection
- Exclusion of Celiac Trunk & SMA
- Two Successful Stent Implantations



Liermann D & Strecker E.P 1995

MESENTERIC STENTING

- 12 Patients
- Mean Follow-Up:
28 Months (6 - 48)
- 4 Restenosis due to
Stent Deformation



◆ CASE REPORT ◆

Intravascular Stenting in the Superior Mesenteric Artery for Chronic Abdominal Angina

Jacques Busquet, MD

Department of Cardiovascular and Endovascular Surgery,
Clinique Chirurgicale Bel Air, Bordeaux, France

◆ ————— ◆
Purpose: Abdominal angina is an early clinical expression of occlusive mesenteric arterial insufficiency, a condition that requires aggressive treatment to prevent intestinal infarction. We report a case of chronic mesenteric ischemia in a young polyvascular man who had symptoms of abdominal angina.

Methods and Results: An aortic angiogram revealed a significant ostial stenosis of the superior mesenteric artery (SMA) associated with an occlusion of the inferior mesenteric artery. After predilation of the ostial portion of the SMA, significant residual stenosis remained. A balloon-expandable Palmaz P154 stent was deployed, restoring adequate luminal dimensions and blood flow. The patient was discharged after 2 days and remains asymptomatic at 5 months.

Conclusion: Intraluminal stenting for treatment of mesenteric ischemia represents a viable alternative to surgical revascularization in selected cases.

J Endovasc Surg 1997;4:380-384

Key words: atherosclerosis, balloon angioplasty, mesenteric ischemia, splanchnic vessels

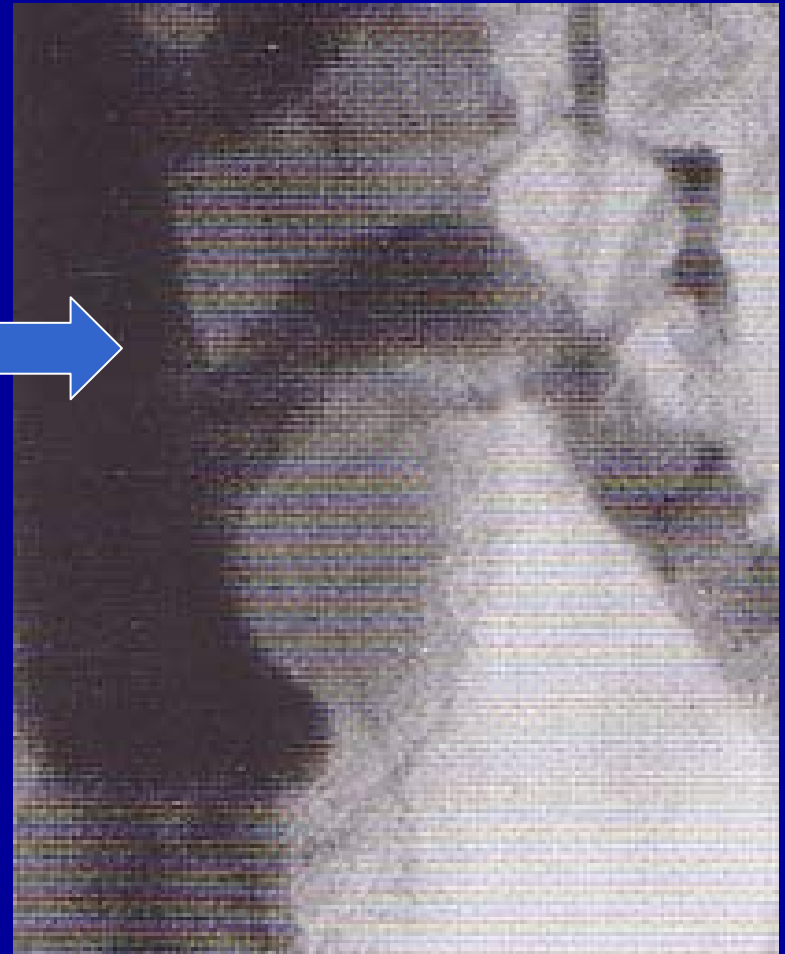
SMA Stenting

Pre-Operative
Angiogram



SMA Stenting

Post-Operative
Angiogram



Kasirajan K & al, JVS 2001

- 28 Angioplasty Patients / compared to
- 85 Surgical Patients

Complications: 8% versus 11%

Mesenteric Infarction: 7% versus 2%

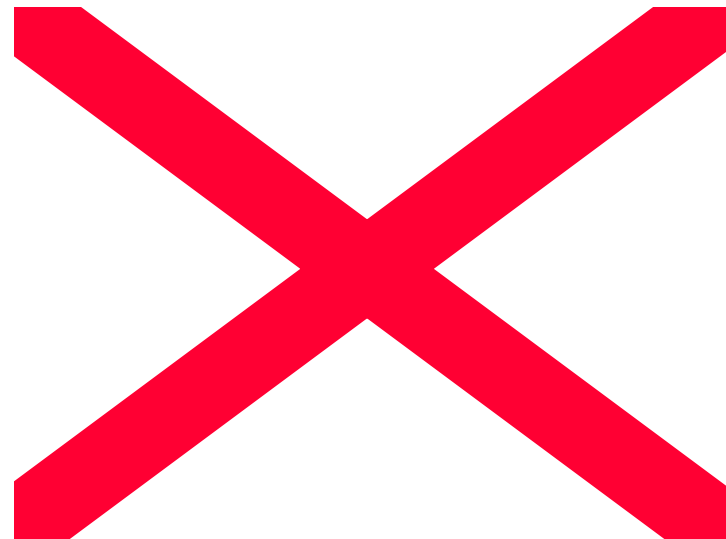
Clinical Recurrence: 34% versus 13%

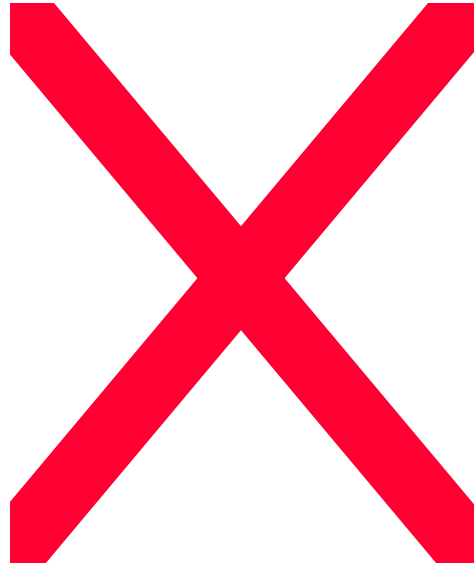
Dilatation > 33%

Stenting > 11%

Indications du Stenting Mésentérique

- **Patient Symptomatique**
- **Haut Risque Opératoire**
- **Patient Inopérable**
- **ATCD de Laparotomie**
- **Resténose sur Pontage**





Conventional Aortography

Type 2 Endoleak after EVAR

Retrograde Sac Injection

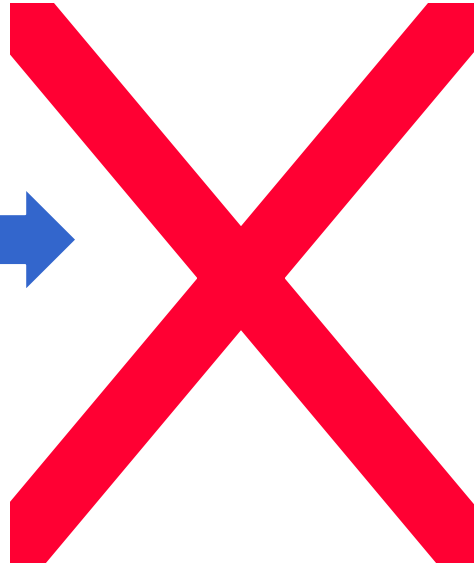
Via Patent Inferior Mesenteric Artery

Solutions:

Preventive Embolization of IMA

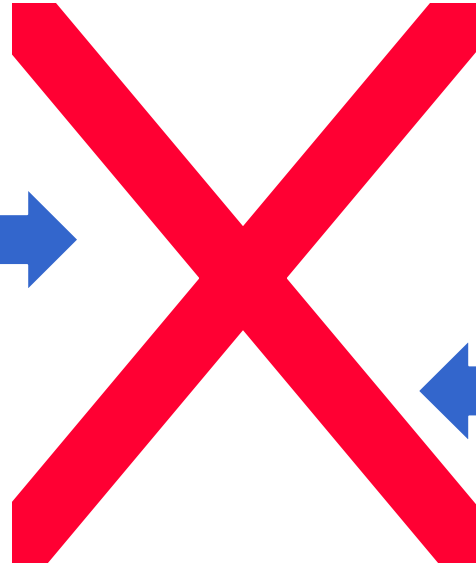
Post-Operative Coelioscopic Clip Ligation or
Coil Embolization

**SMA
Patency**



Conventional Aortography

**SMA
Patency**



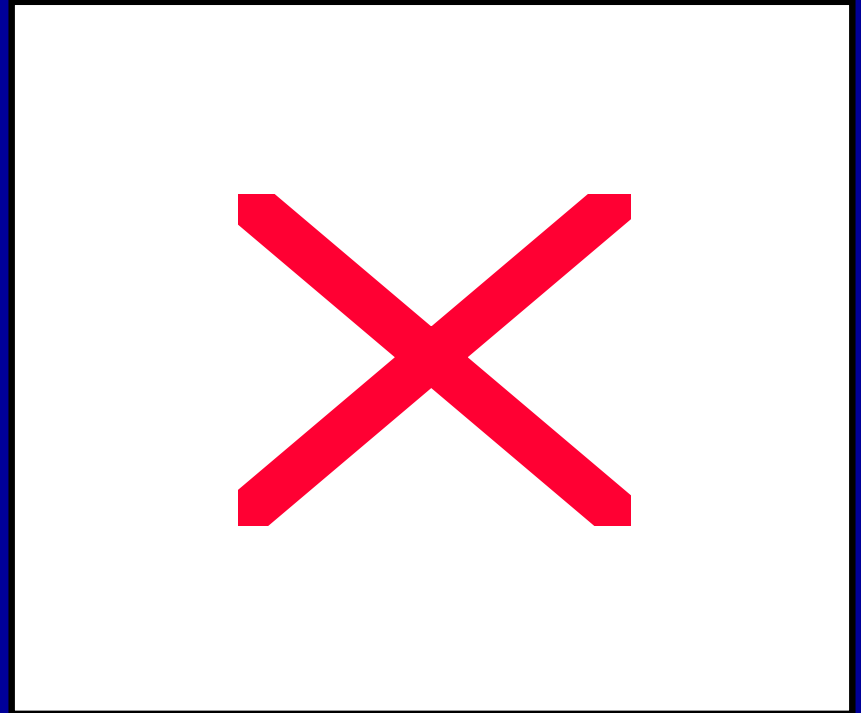
**IMA
Thrombosis**

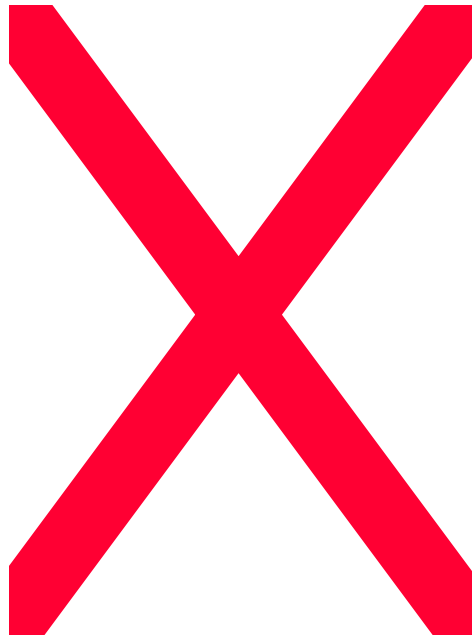


Conventional Aortography

Magnetic Resonance Angiography

- **No Incision**
- **No Radiation**
- **Gadolinium
Contrast**
- **Global Arterial
View**





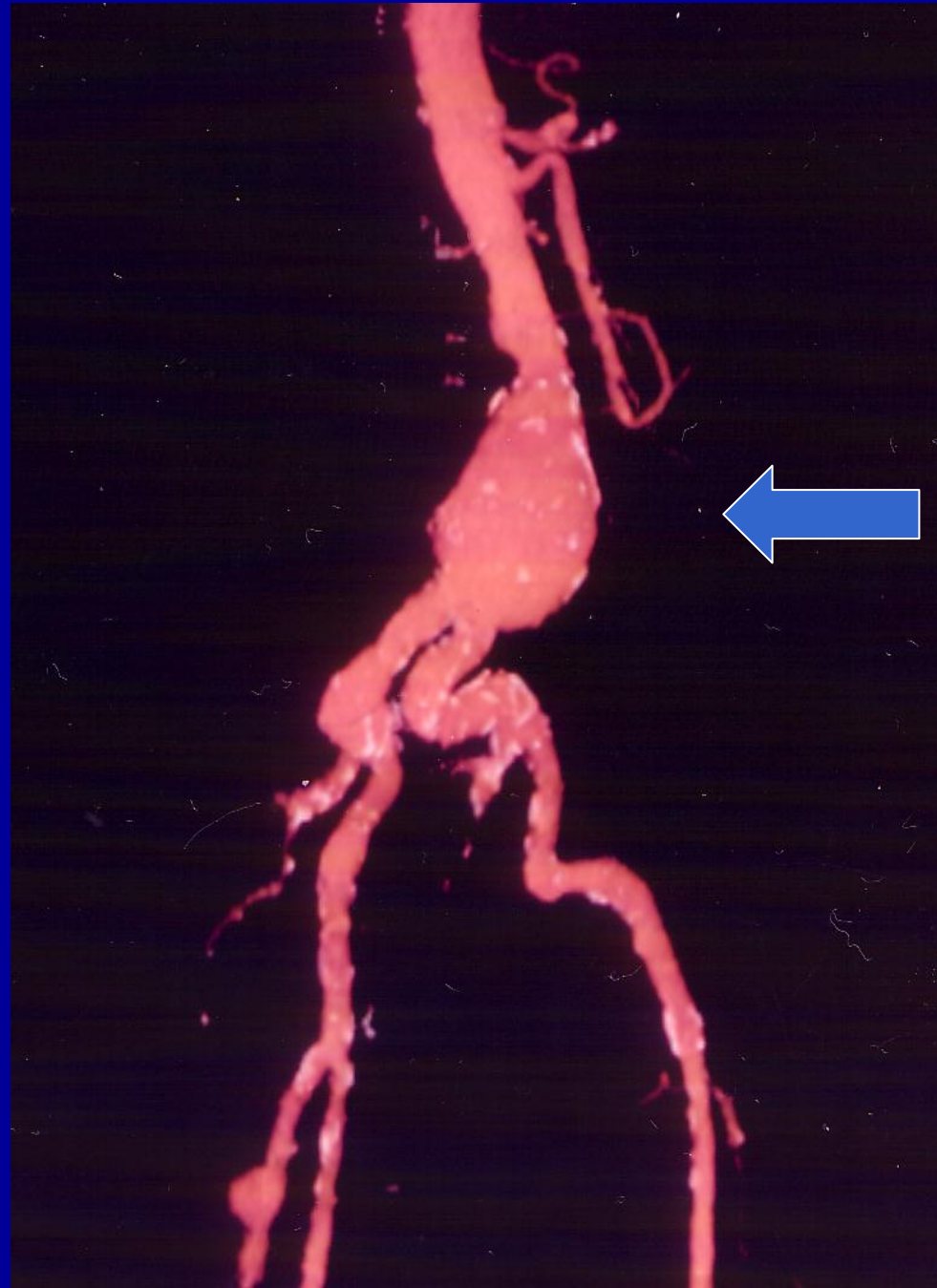
Magnetic Resonance Angiography

AAA

Natural History

**Natural Occlusion of
Inferior Mesenteric Artery**

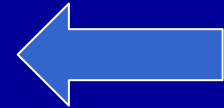
**Functional Mesenteric
Arterial Collaterals**



MRA

*Pseudoaneurysm at the
Proximal Anastomosis*

*Following
Aorto-Bifemoral Graft*



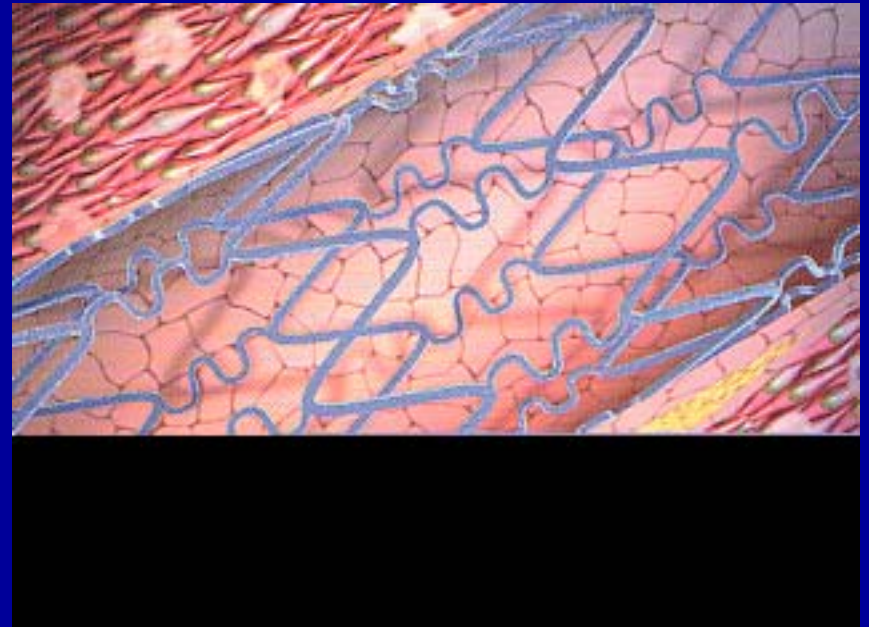
MRA

**Collateral Flow
from
Arc of Riolan**



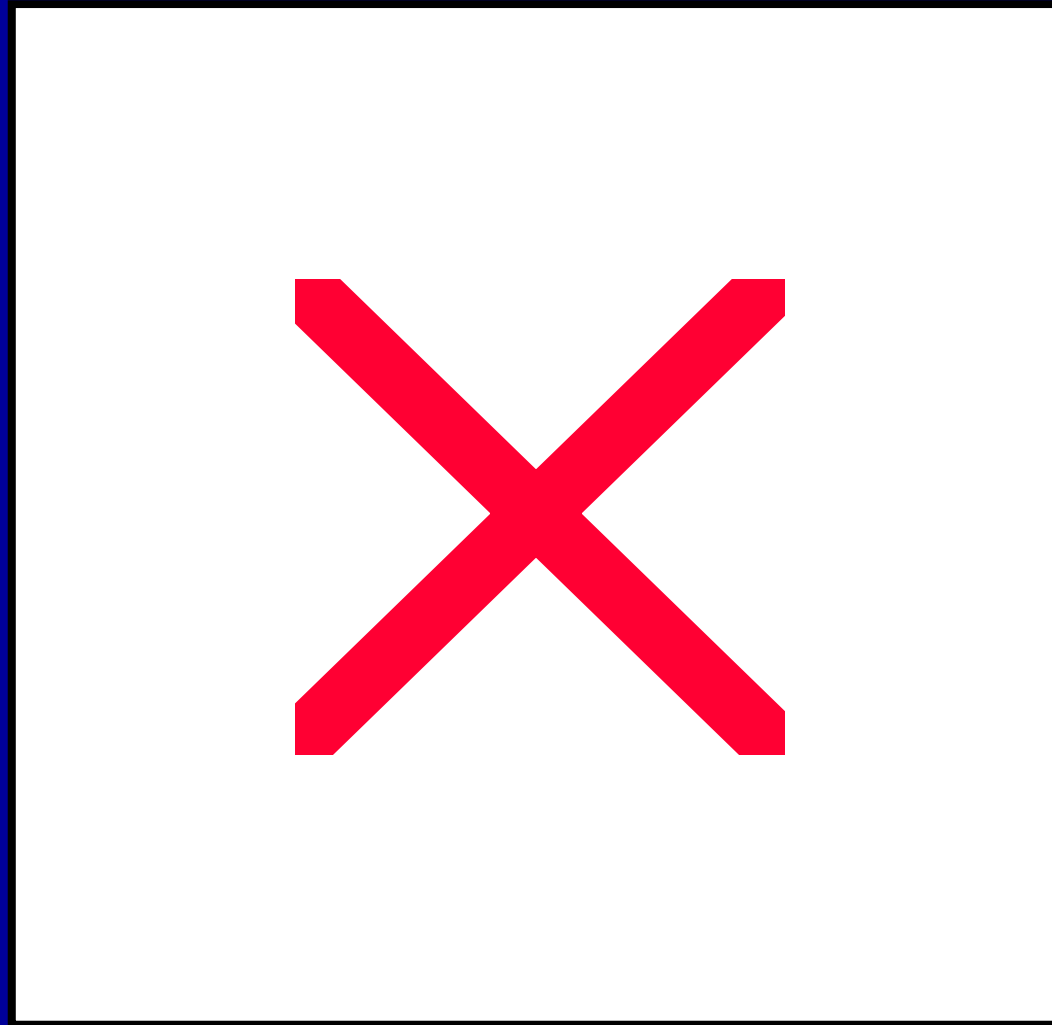
Mesenteric Stenting

- **Short and Rigid Stent**
- **Good Radiopacity**
- **Coronary Catheter-Based techniques**
- **Monorail Delivery System**
- **Drug Eluting Stent Technology ?**

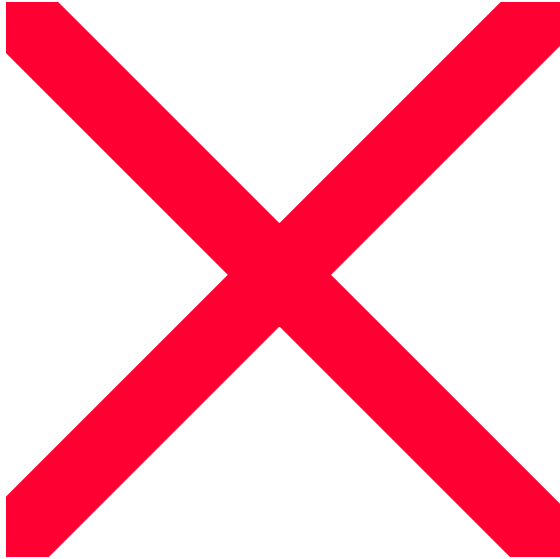


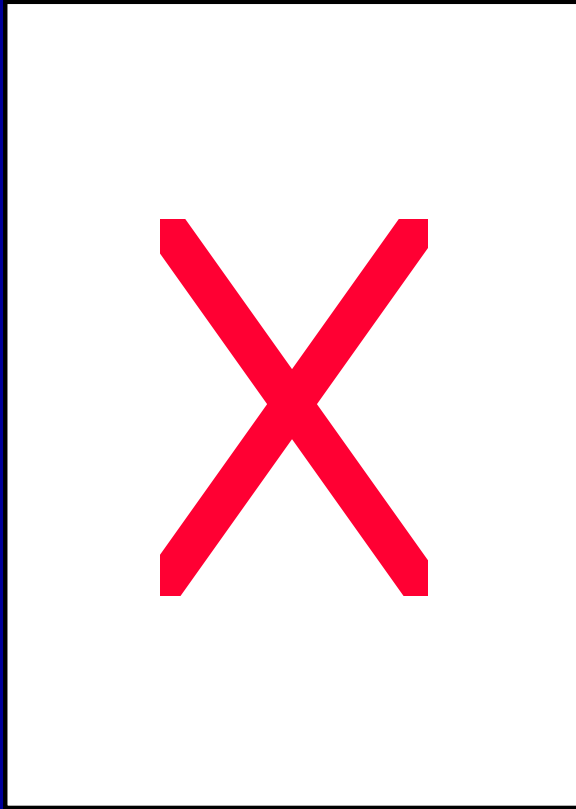
Case Report 1

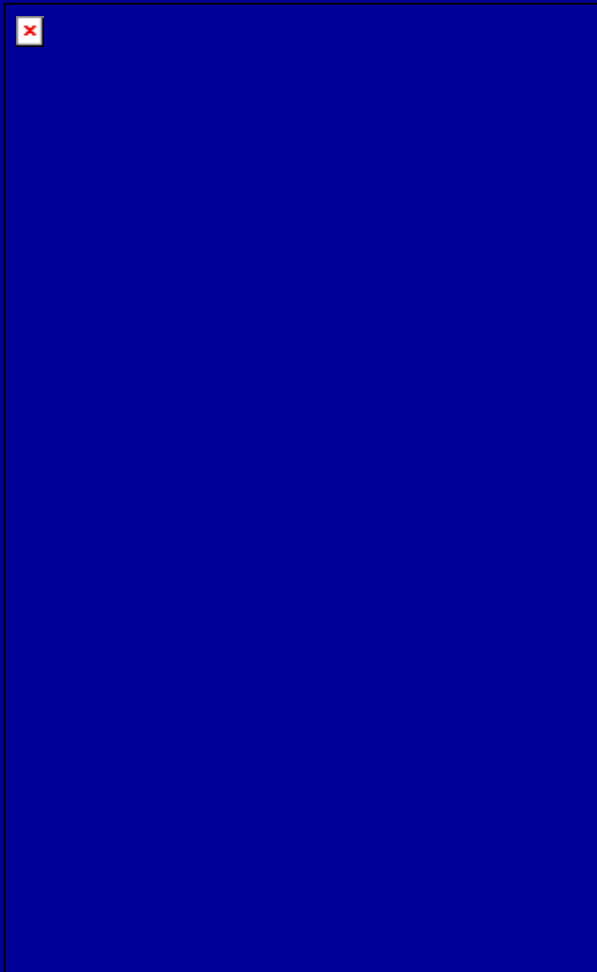
- **73 years Old Man**
- **Sudden Abdominal Pain**
- **AAA 53mm**
- **IMA Occlusion**
- **EVAR**

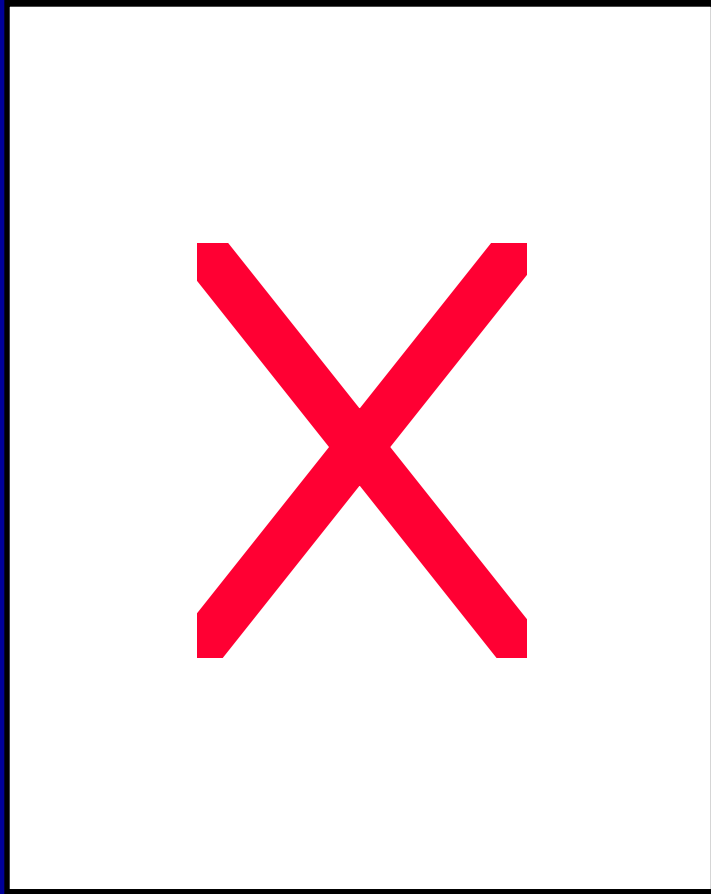


Mild Reversible Mesenteric Ischemia Grade 1

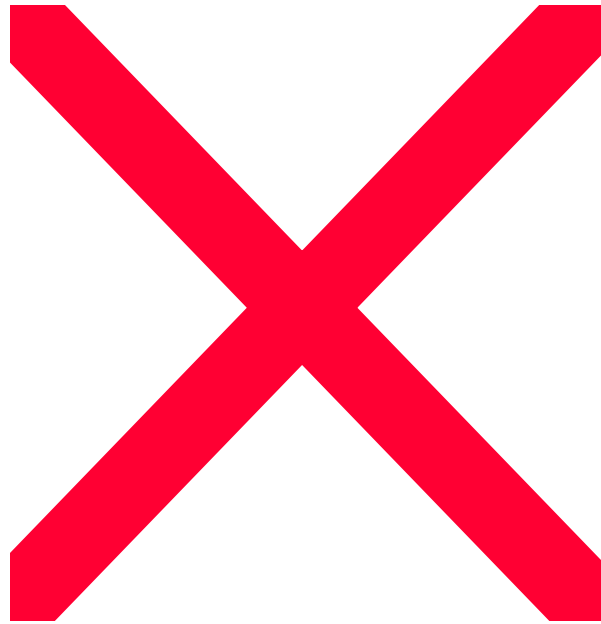






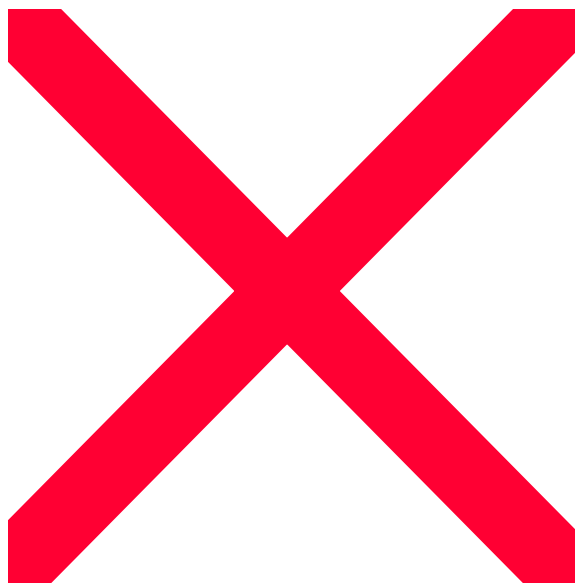






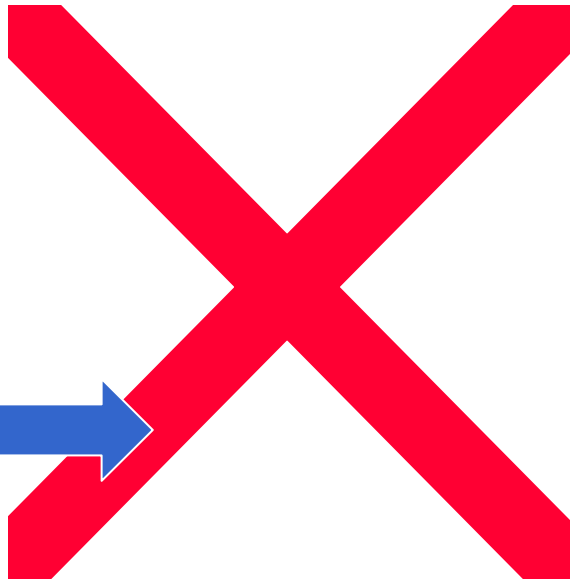
Case Report # 2

- **70 years old Man**
- **55 mm AAA**
- **Left Common Iliac Aneurysm 45 mm**
- **Including Hypogastric Artery**
- **Tight Stenosis of SMA**



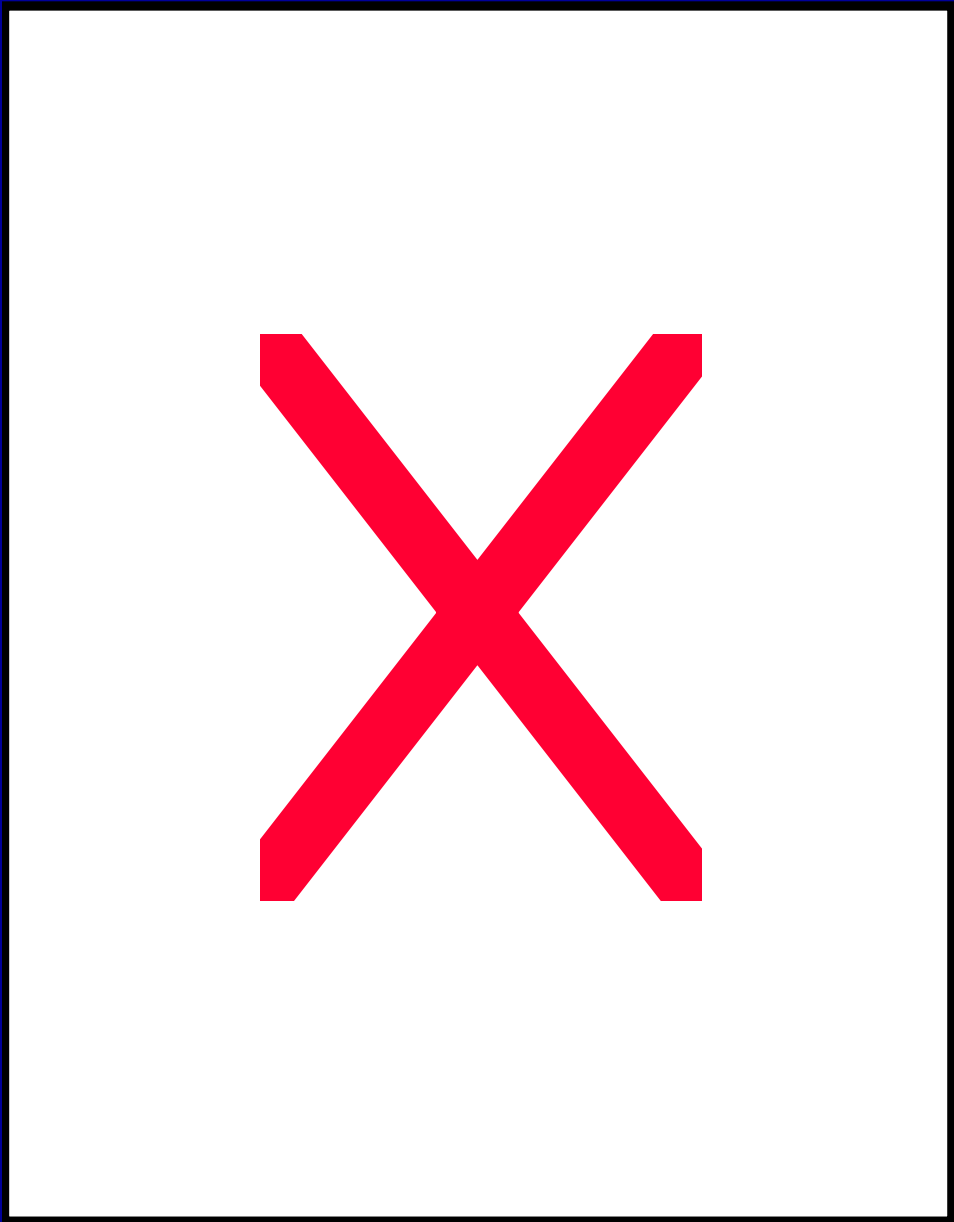
**Inferior Mesenteric
Artery Not Visible**

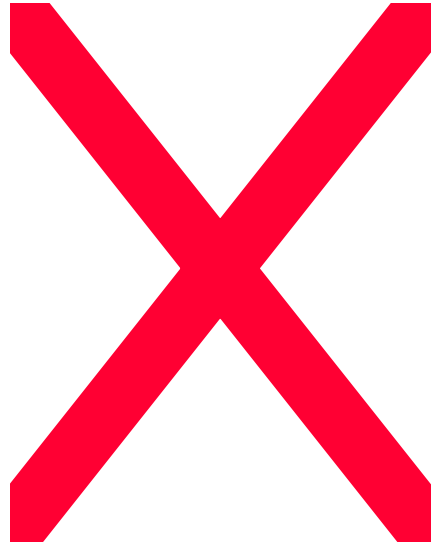
55 mm AAA



**45 mm
Common Iliac
Aneurysm**

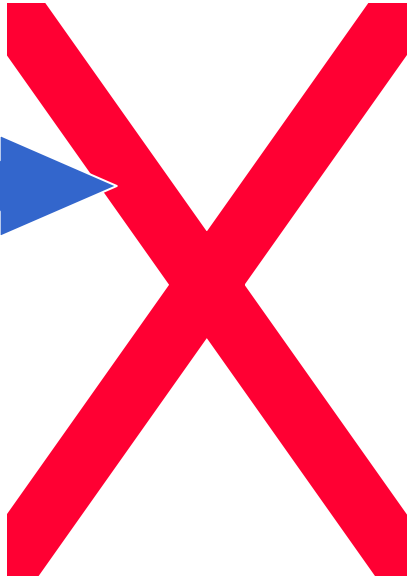




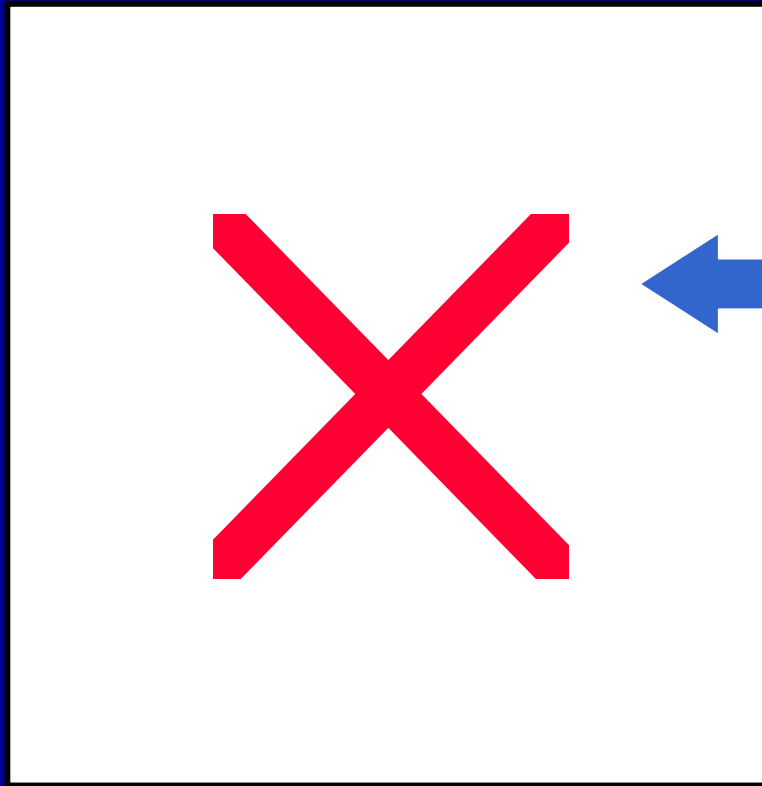


**Left Hypogastric
Artery Origin**

**SMA Severe
Proximal
Stenosis**

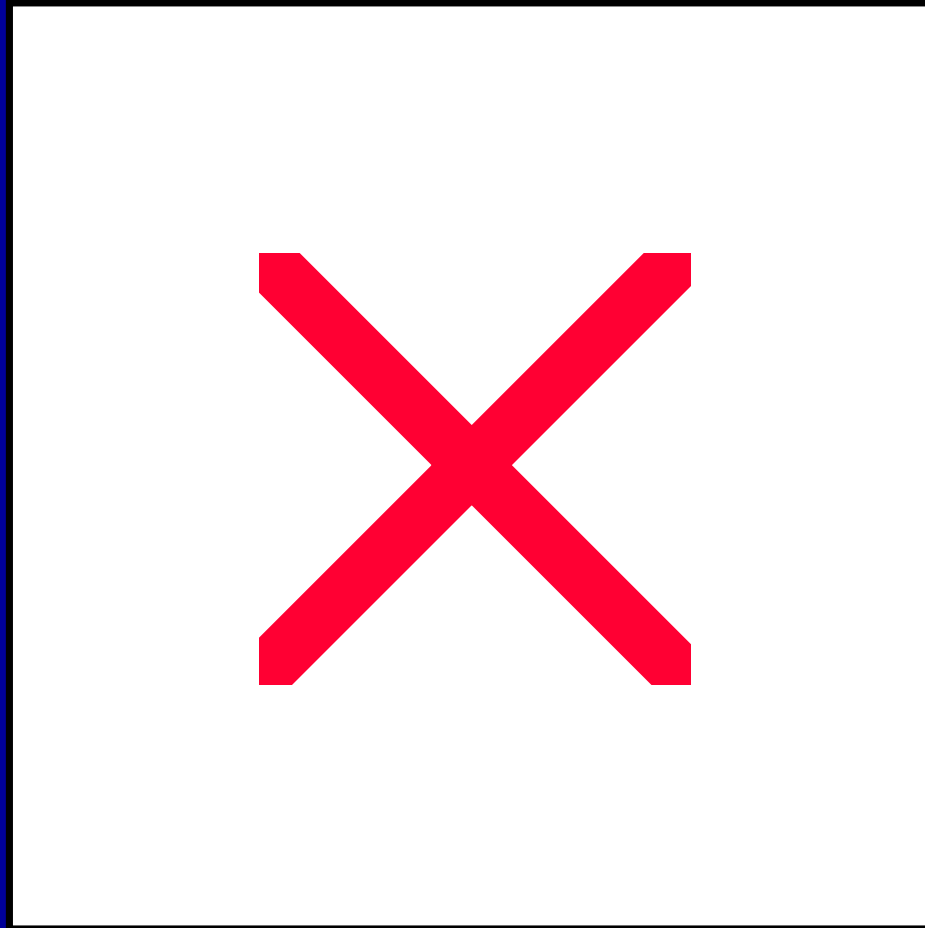


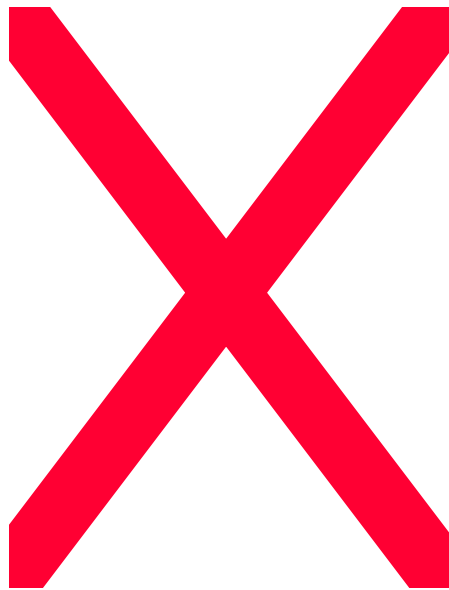
Preventive SMA Stenting



**Balloon-Expendable
Short Stent
0.14 Monorail Platform**

Left Hypogastric Artery Coil Embolization





Conclusion

- *Preoperative Visualization of Mesenteric Arteries*
- *Early Colonoscopy in case of Mesenteric Ischemia*
- *Detection of Type Endoleak after EVAR*

