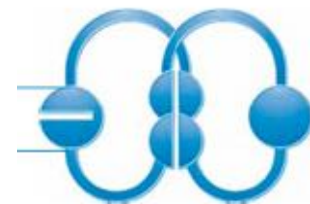






Les outils et la performance en pratique

Comment aborder les lésions résistantes calcifiées ?

Franck Digne
Centre Cardiologique du Nord, St Denis



Conflits d'intérêts

- | | |
|--|--|
|  Consultant ou membre d'un conseil scientifique | <input type="checkbox"/> OUI <input type="checkbox"/> NON |
|  Conférencier ou auteur/rédacteur rémunéré d'articles ou documents | <input type="checkbox"/> OUI <input checked="" type="checkbox"/> NON |
|  Prise en charge de frais de voyage, d'hébergement ou d'inscription à des congrès ou autres manifestations | <input checked="" type="checkbox"/> OUI <input type="checkbox"/> NON |
|  Investigateur principal d'une recherche ou d'une étude clinique | <input checked="" type="checkbox"/> OUI <input type="checkbox"/> NON |

Coronary Artery Calcification

Pathogenesis and Prognostic Implications

Mahesh V. Madhavan, BA,* Madhusudhan Tarigopula, MD, MPH,† Gary S. Mintz, MD,†
Akiko Maehara, MD,†† Gregg W. Stone, MD,†† Philippe G en ereux, MD*††
New York, New York; and Montr al, Quebec, Canada



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➤ M canismes r gulateurs du calcium +++

VSMCs

➤ Pericytes myofibroblasts



Osteoblast-type Cell

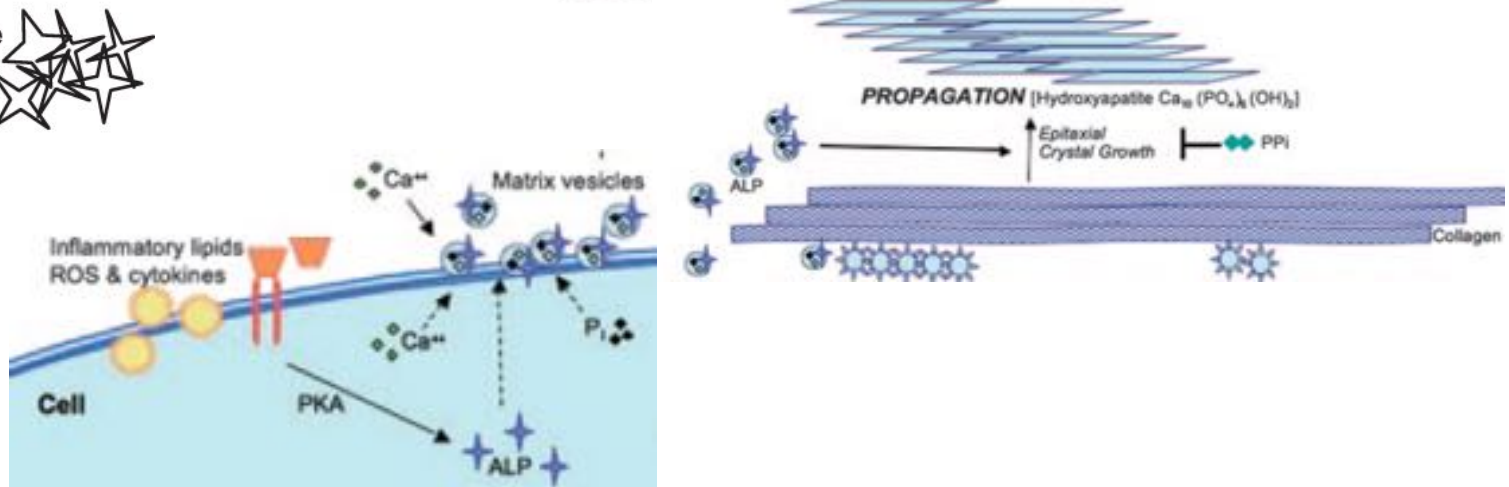


Osteocalcin+
ALP +

hydroxyapatite
Formation

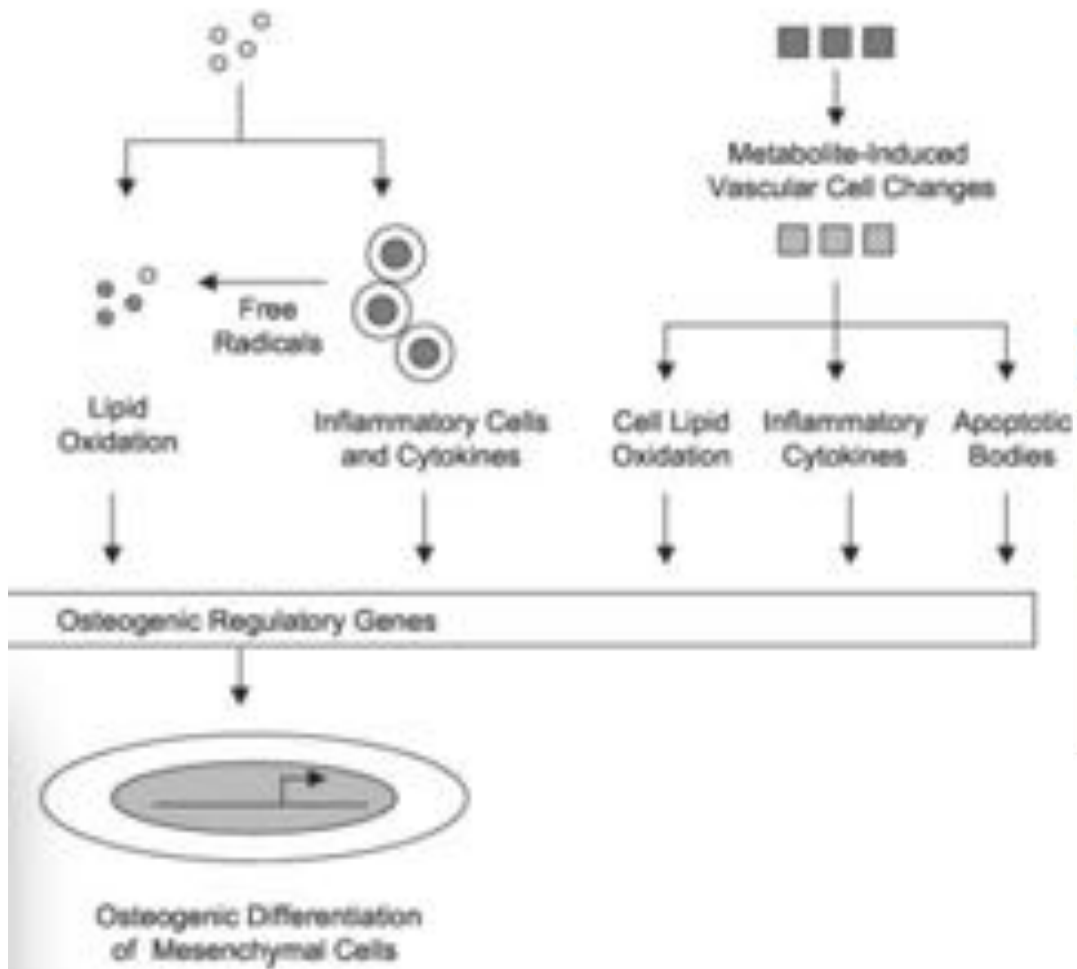


hydroxyapatite
Formation



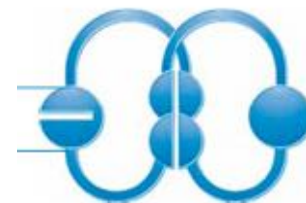
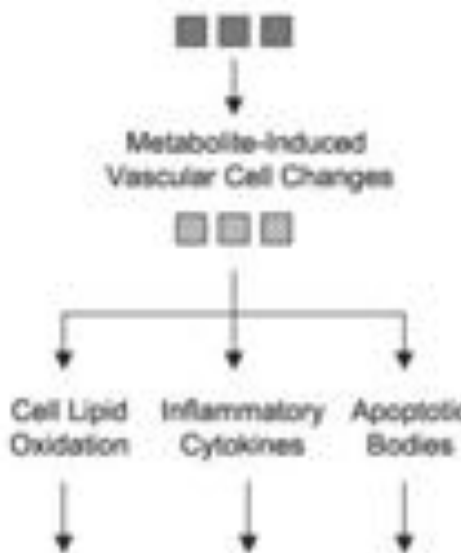
Atherosclerotic Calcification

Subintimal Lipid Deposition



Medial Calcification

Non-Atherosclerotic
(? Mediated by Toxic Substances)

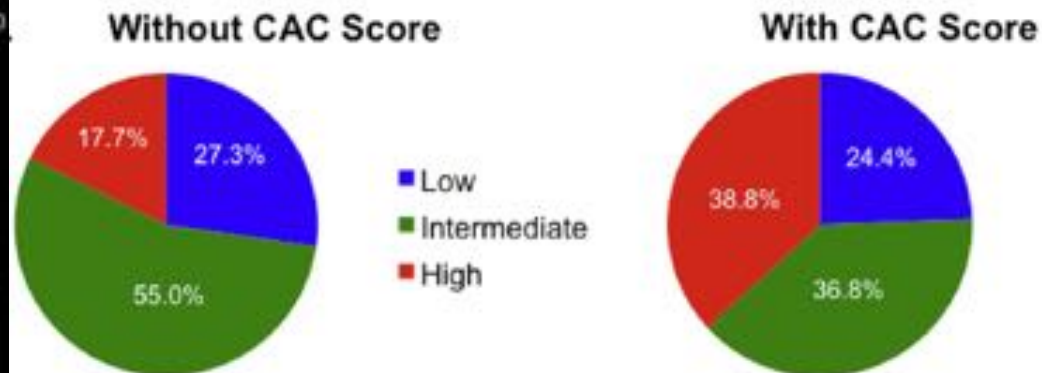
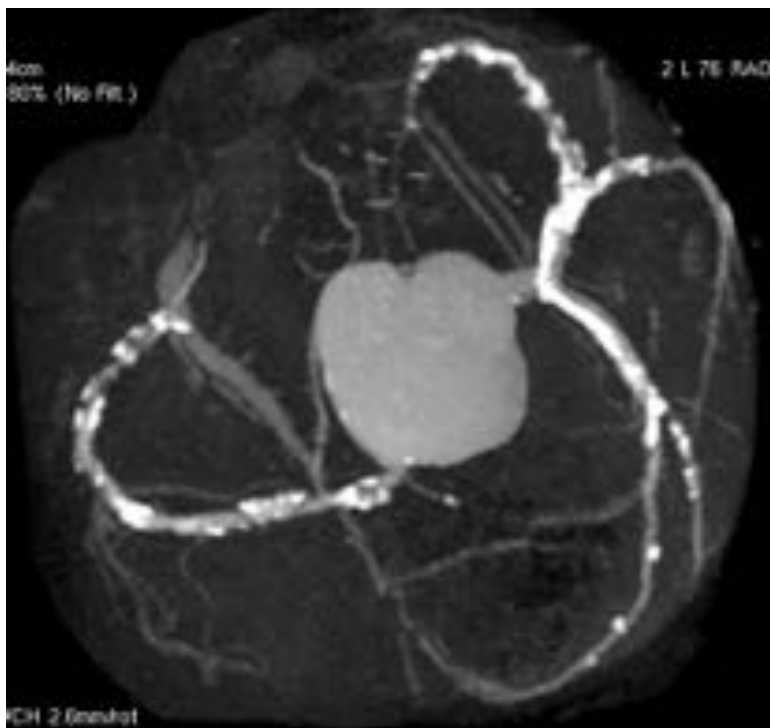


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Table 1 Risk Factors for Coronary Calcification

Risk Factor	Intimal Calcification	Medial Calcification
Advanced age	Yes	Yes
Diabetes mellitus	Yes	Yes
Dyslipidemia	Yes	No
Hypertension	Yes	No
Male	Yes	No
Cigarette smoking	Yes	No
Renal etiology		
Dysfunction (↓ GFR)	No	Yes
Hypercalcemia	No	Yes
Hyperphosphatemia	Yes	Yes
PTH abnormalities	No	No
Duration of dialysis	No	Yes

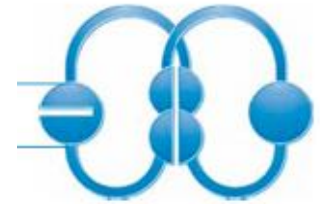
Select Studies Demonstrating Improved Risk Stratification of CHD Events With Use of CAC Scores



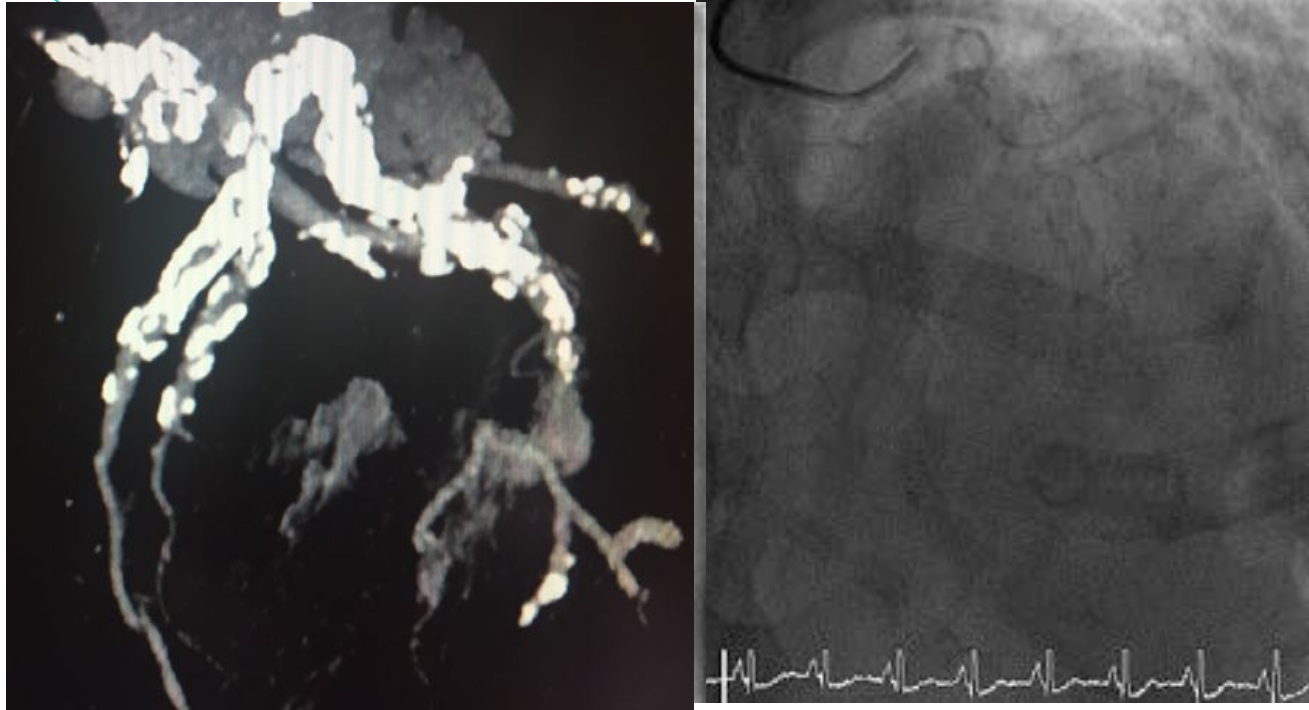
Score calcique coronaire élevé si ≥ 400 UH

« Patient asymptomatique sans FDRCV avec $SC \geq 400$ UH
=> plus mauvais pronostic qu'un patient avec plus de 3
FDRCV et SC nul »

Calcifications coronaires en angiographie



Centre Cardiologique du Nord



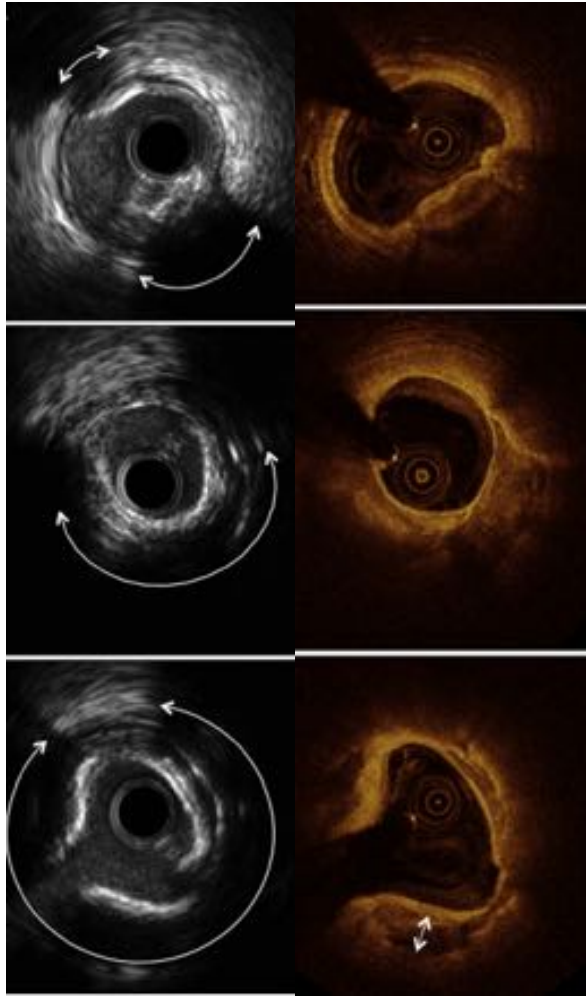
3 groupes:

- Absence
- Modérée
- Sévère

Moussa I, Ellis SG, Jones M, et al. Impact of coronary culprit lesion calcium in patients undergoing paclitaxel-eluting stent implantation (a TAXUS-IV sub study). Am J Cardiol. 2005;96:1242-7 **20% de lésions avec calcifications modérées à sévères**

Tanenbaum SR et al. Detection of calcific deposits in coronary arteries by ultrafast computed tomography and correlation with angiography. Am J Cardiol 1989 Apr 1;63(12):870-2.

Calcifications coronaires en IVUS et OCT

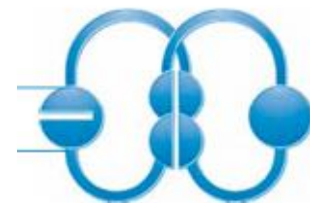


- 1 quadrant: arc de calcium 0-90° (minimes)
- 2 quadrants: 91-180° (modérées)
- 3 quadrants: 181-270° (sévères)
- 4 quadrants: 271-360°

Calcifications superficielles (intima)
Calcifications profondes (média)

OCT: mesure possible de l'épaisseur des calcifications

Angioplastie des lésions calcifiées



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Ryan TJ, Faxon DP, Gunnar RM, et al. Guidelines for percutaneous transluminal coronary angioplasty. A report of the American College of Cardiology/American Heart Association Task Force on Assessment of Diagnostic and Therapeutic Cardiovascular Procedures Subcommittee on Percutaneous Transluminal Coronary Angioplasty). **Circulation. 1988;78:486–502**

Classification ACC/AHA des lésions coronaires

**Le critère « lésions calcifiées modérées à sévères » = TYPE B
taux de succès d'ATL attendu de 60 à 85%**

ACTUELLEMENT: TAUX DE SUCCÈS DE 99%

Bangalore S, Vlachos HA, Selzer F, et al. Percutaneous coronary intervention of moderate to severe calcified coronary lesions: insights from the National Heart, Lung, and Blood Institute Dynamic Registry. **Catheter Cardiovasc Interv. 2011;77:22–8**

Angioplastie des lésions calcifiées



RISQUE ACCRU DE:

Dissection ou de rupture après ATL au ballon
(lésions-vaisseaux non compliants)

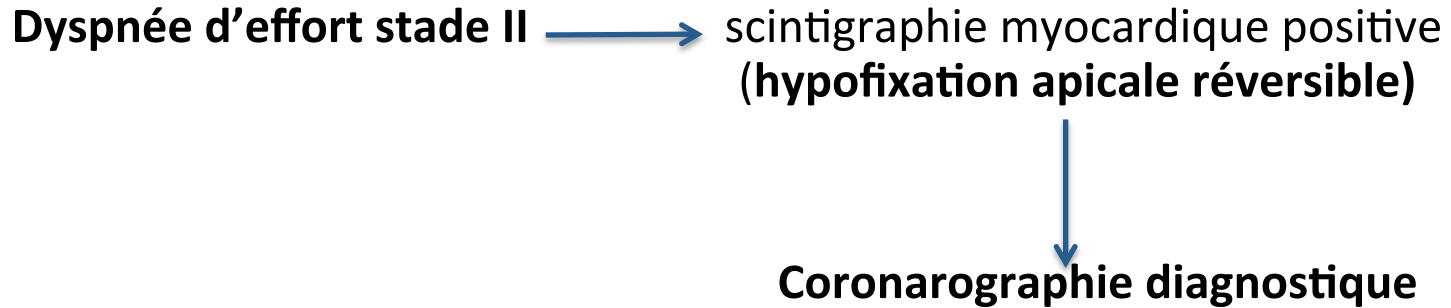
Thrombose de stent - Resténose

(mauvaise expansion des endoprothèses, expansion asymétrique, malapposition)

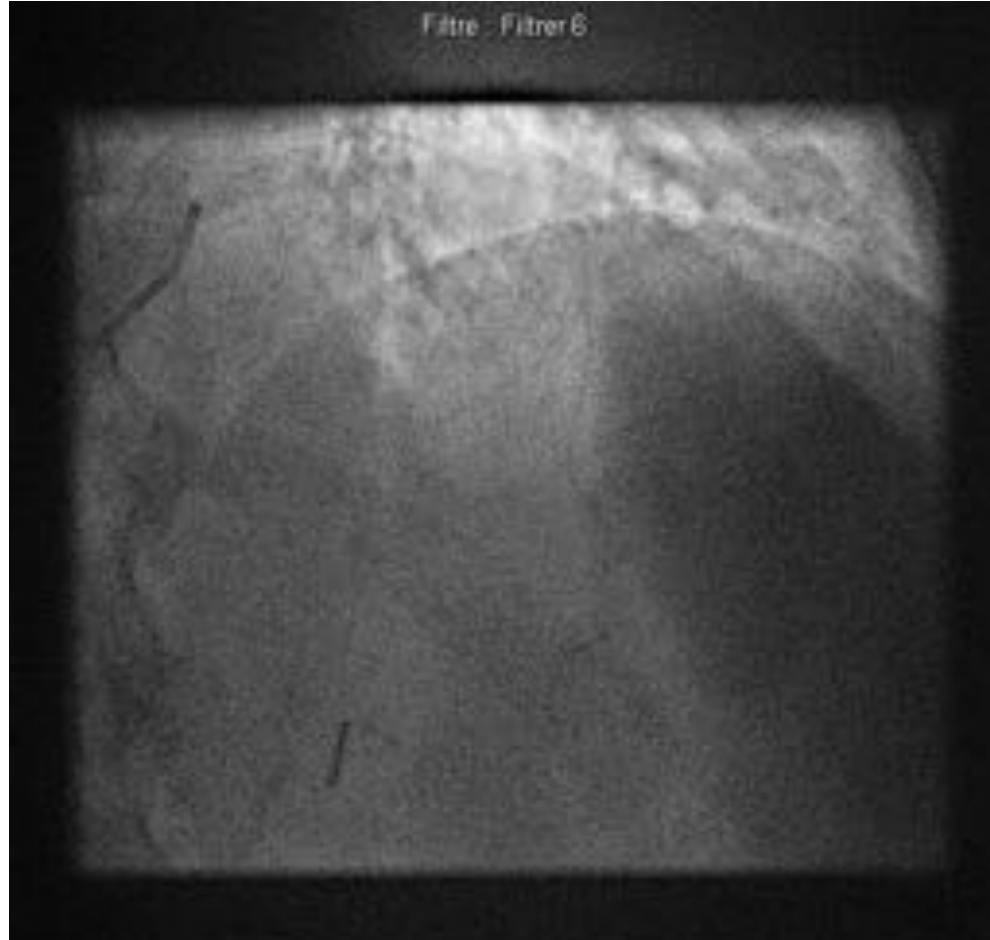
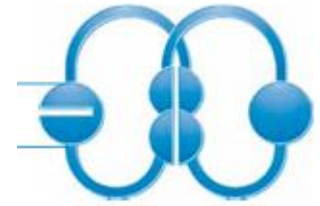
IDM péri procéduraux
(embolisations distales)

Madame L, 62 ans

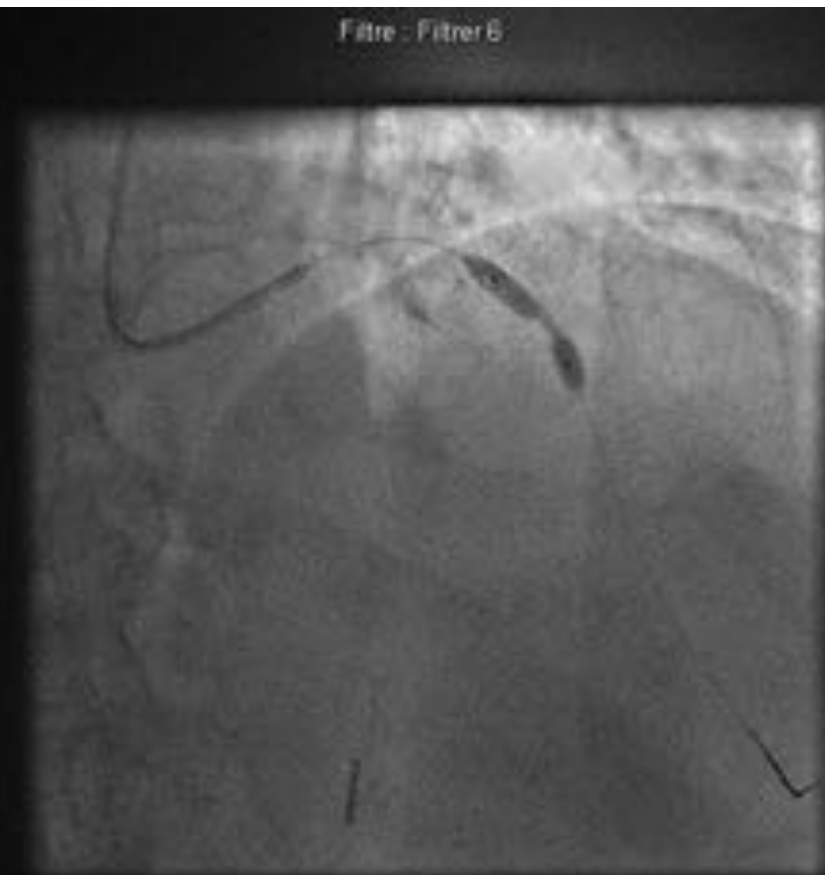
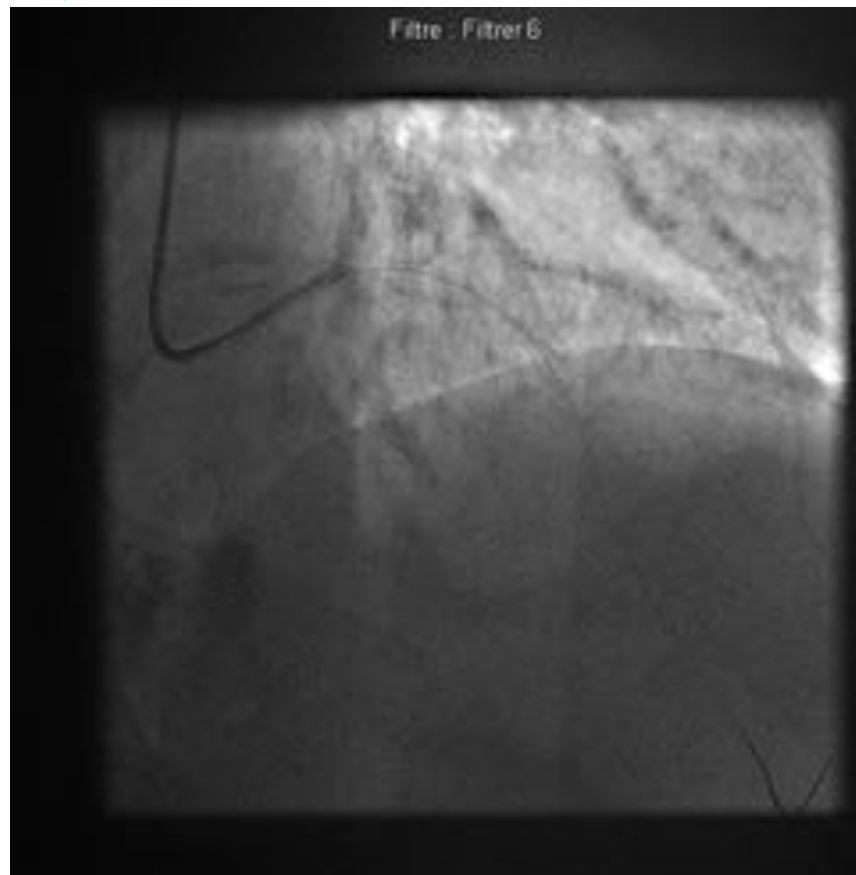
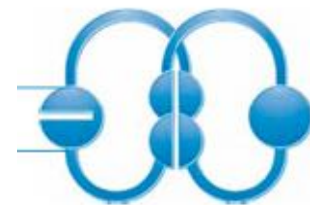
- **Diabète** non insulino-requérant
- **HTA** contrôlée sous bithérapie
- **Tabagisme actif**
- Obésité (IMC: 34 kg/m²)



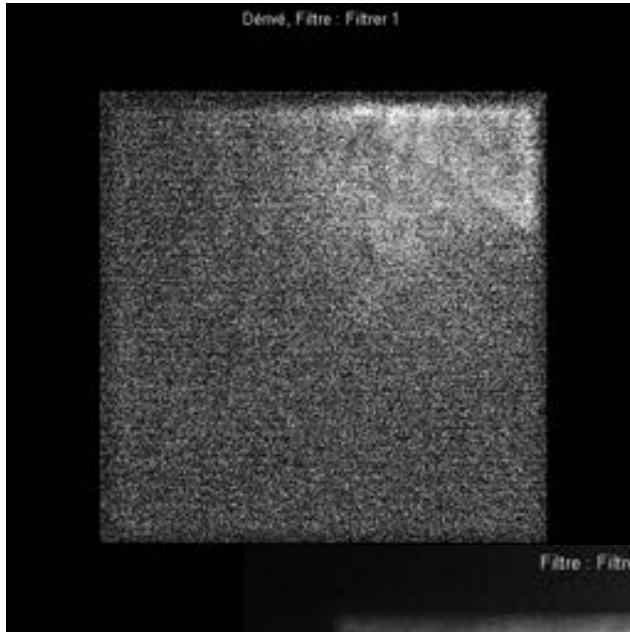
Lésion monotronculaire de l'IVA:



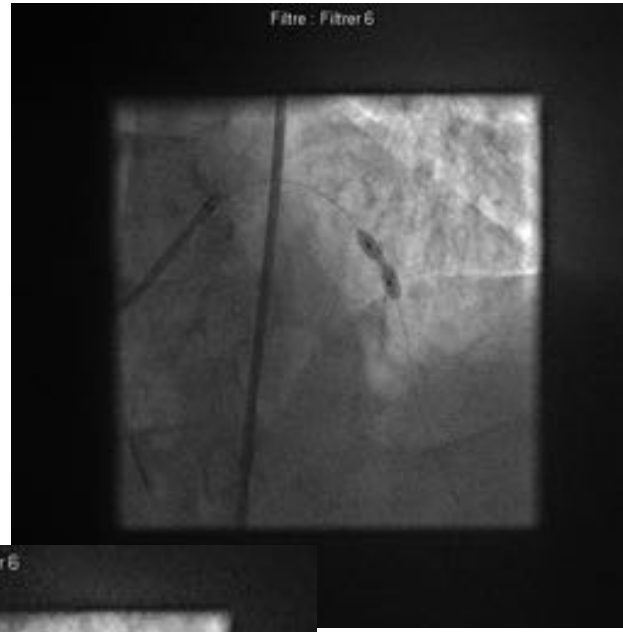
Résultat post Rotablator (1.75mm) ATL au ballon NC 3,5X15 mm

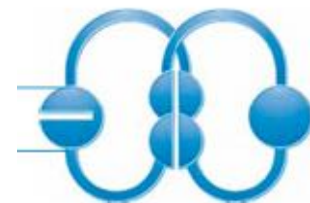


Rotablator 2.0mm



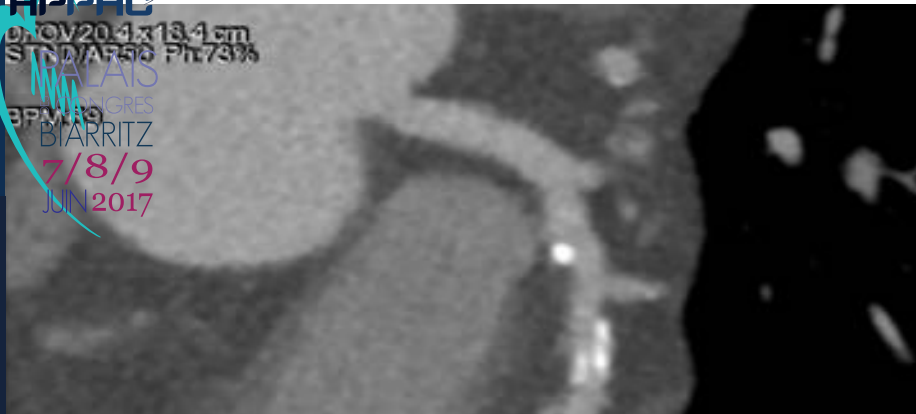
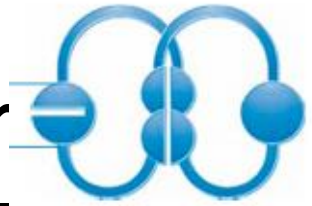
Ballon NC de 4.0X12 mm





Que faire?

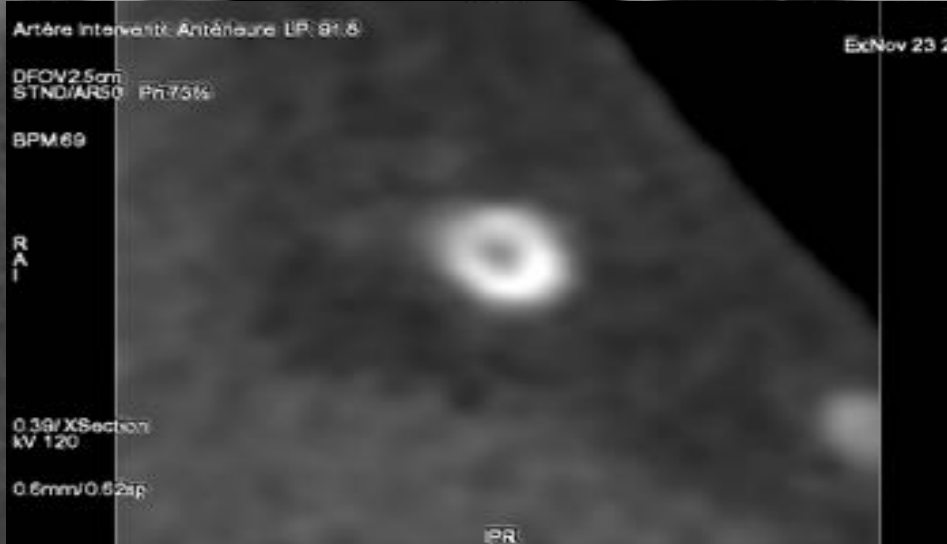
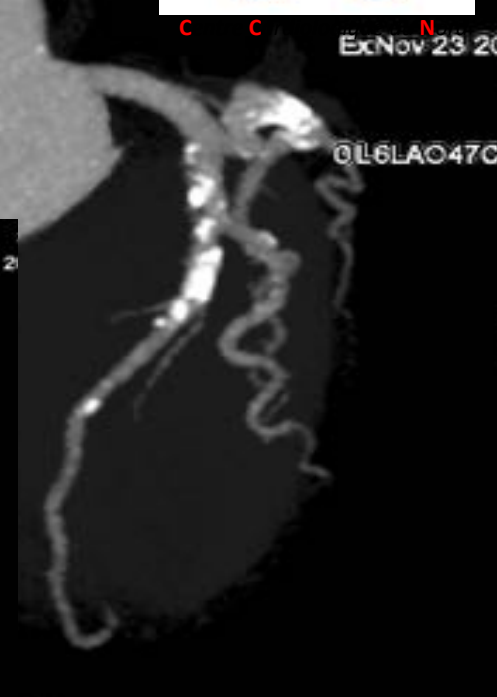
Coroscanner



MIP No out: Grayscale

DFOV 15.7 cm
STND/AR50 Ph: 73%

BPM: 69



kV 120

0.39/0.6mm/0.62sp

W = 1599 L = 256

AW electronic film

L: 128, W: 256 (500x400)



- Abord: Fémoral Droit 8F
- Guiding: Launcher EBU 3.5 en 8F
- **Echec de Rotablator avec une fraise de 2.5 mm!!**
 - **Ne passe pas dans la valve Y ni dans le 8F!!!!**

Rotablator[®]
Rotational Atherectomy System

**Boston
Scientific**

Quick Reference — Guide Catheter Selection

Burr (mm)	Diameter (Inches)	Recommended Guide Catheter (French)	Minimum Recommended Guide Catheter Internal Diameter (Inches)
1.25	0.049	6.0	0.060*
1.50	0.059	6.0	0.063
1.75	0.069	7.0	0.073
2.00	0.079	8.0	0.083

Fraise de 2 mm compatible avec 7F (0,081)

Fraise de 2,25 mm compatible avec 8F (0,090)

Fraise de 2,5 mm compatible avec 9F (0,10)

Guide sizes are based on larger lumen catheters.

Right: FNA, multipurpose

Left: Q-Curve[®], CLS[®], Left Back-Up

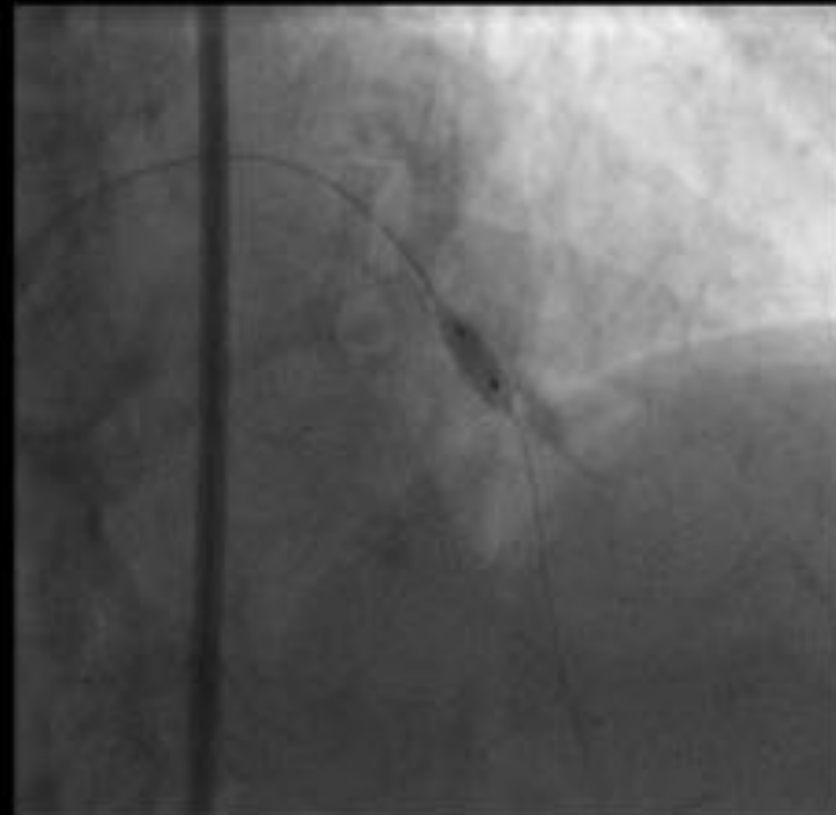
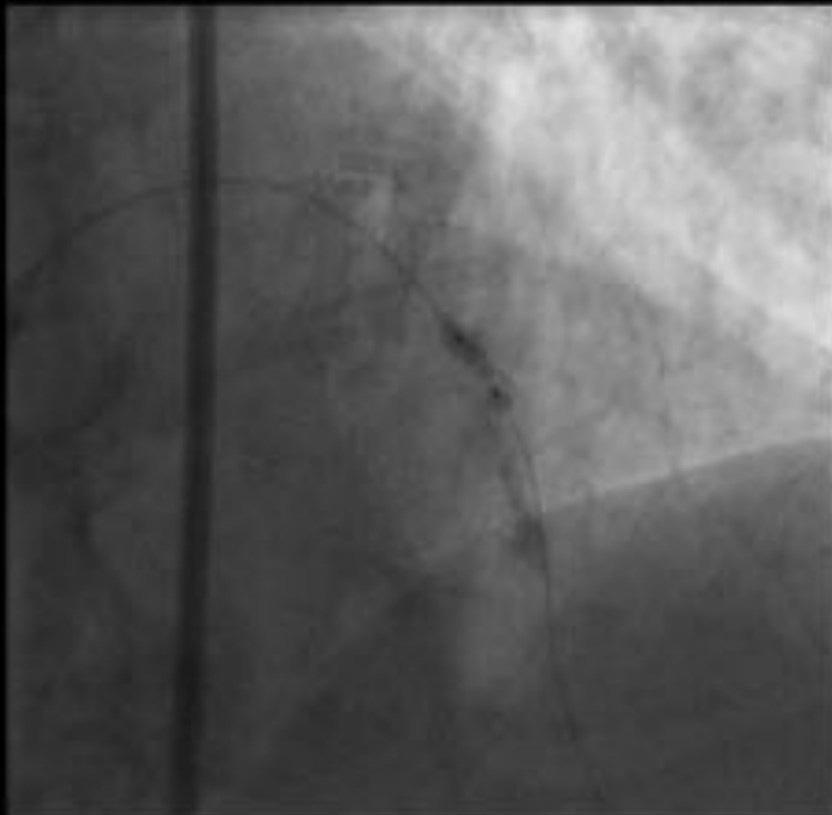
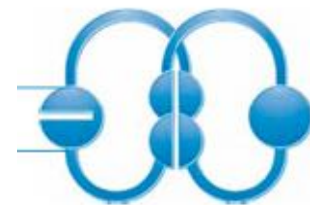
(Guide catheters with side holes can help to improve flow.)

Small Burrs (1.25 mm – 2.0 mm): 100,000 – 150,000 RPM

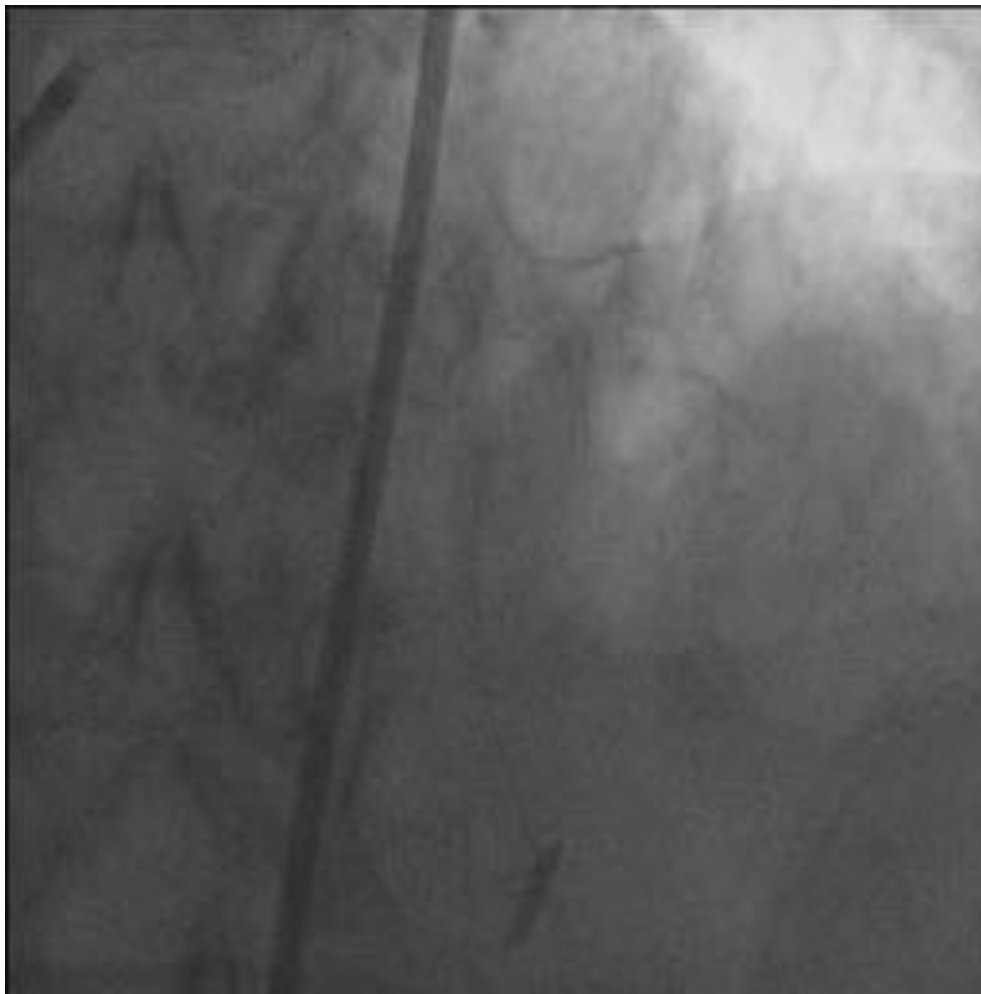
Large Burrs (≥ 2.15 mm): 140,000 – 160,000 RPM

Please see reverse side for Prescriptive Information.

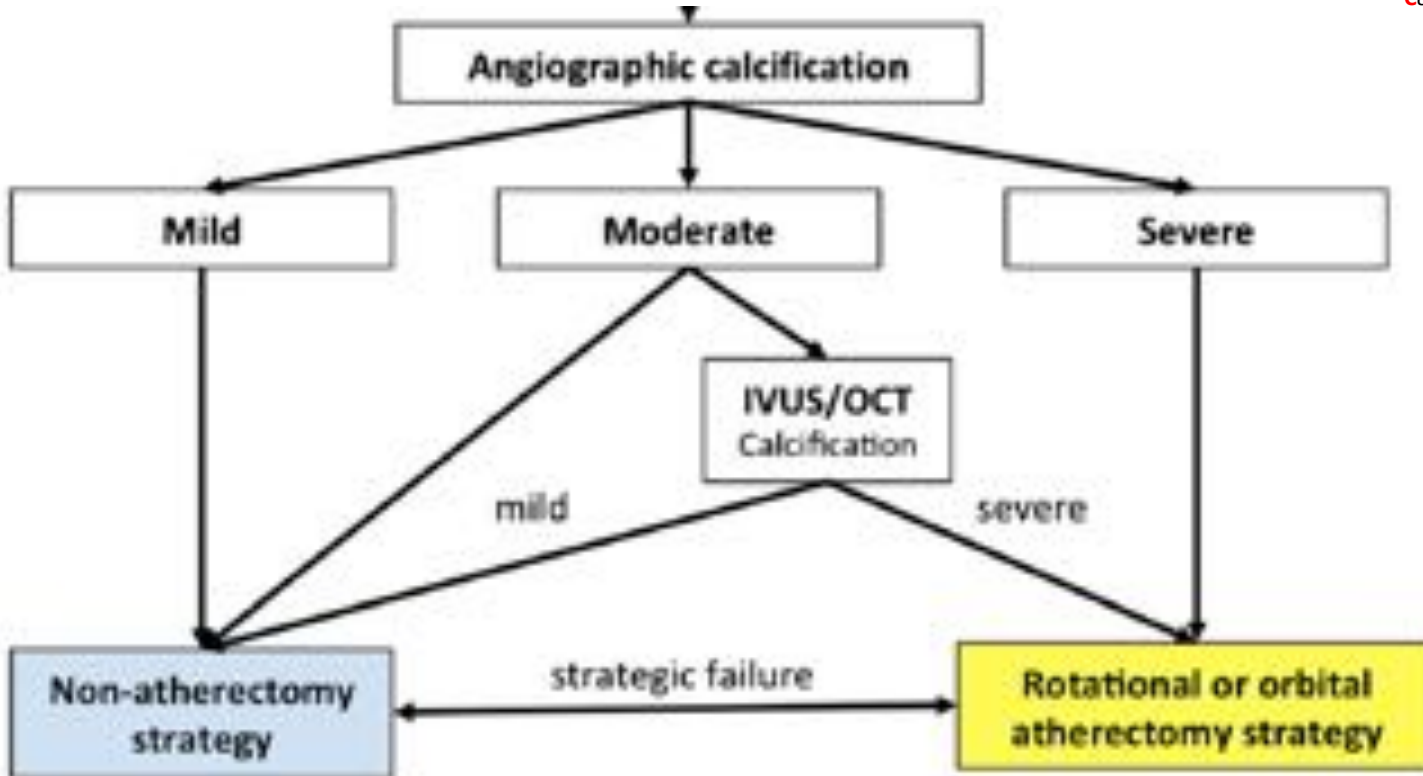
Cutting Ballon de 3,5 x 6mm à 20 ATM, >1minute



Résultat Final:



Quand décider d'un Rotablator?



Quand décider d'un Rotablator?



High-Speed Rotational Atherectomy Before Paclitaxel-Eluting Stent Implantation in Complex Calcified Coronary Lesions

The Randomized ROTAXUS (Rotational Atherectomy Prior to Taxus Stent Treatment for Complex Native Coronary Artery Disease) Trial

Mohamed Abdel-Wahab, MD,* Gert Richardt, MD,* Heinz Joachim Büttner, MD,†
 Ralph Toelg, MD,* Volker Geist, MD,* Thomas Meinertz, MD,‡ Joachim Schofer, MD,§
 Lamin King, MD,|| Franz-Josef Neumann, MD,† Ahmed A. Khattab, MD¶

Angiographic Inclusion Criteria*

First-degree criteria

1. De-novo lesion in a native coronary artery
2. Target reference vessel diameter between 2.5 and 4.0 mm by visual estimation
3. Luminal diameter reduction of 70% to 99% by visual estimation
4. Moderate to severe calcification of the target lesion†

Primary endpoint: in-stent late lumen loss (LLL) at 9 months

Secondary endpoints : MACE

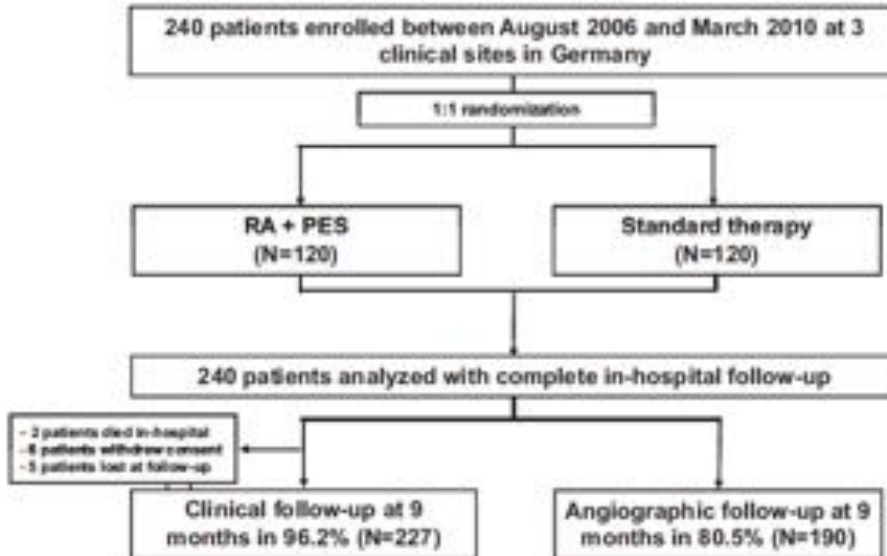


Table 7. Nine-Month Follow-Up Quantitative Coronary Angiography Data (N = 255 Lesions)

	RA + PES (n = 123)	Standard Therapy (n = 132)	p Value
Minimal lumen diameter, mm			
In-stent	2.14 ± 0.63	2.25 ± 0.63	0.17
In-segment	1.91 ± 0.57	2.00 ± 0.65	0.17
Diameter stenosis, %			
In-stent	22.01 ± 19.92	19.86 ± 19.64	0.35
In-segment	27.50 ± 18.97	26.99 ± 1.73	0.62
Late lumen loss, mm			
In-stent	0.44 ± 0.58	0.31 ± 0.52	0.04
In-segment	0.36 ± 0.57	0.25 ± 0.57	0.11
Binary restenosis, %			
In-stent	14 (11.4)	14 (10.6)	0.71
In-segment	15 (12.2)	17 (12.9)	0.89

Values are n (%) or mean ± SD.
Abbreviations as in Table 1.

Pas de gain à un rotablator de première intention

« Balloon dilation with provisional rotablation before stenting remains the default strategy for complex calcified lesions in The DES era »

Quand décider d'un Rotablator?



- LÉSION AVEC CALCIFICATIONS SÉVÈRES
- ECHEC DE FRANCHISSEMENT DE LA LESION PAR UN BALLON
- EMPREINTE RESIDUELLE SUR LE BALLON
- LESIONS CALCIFIEES OSTIALES

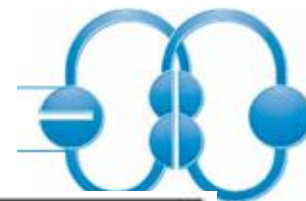
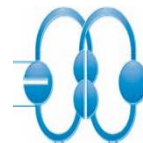


Table 2 Comparison of rotational atherectomy and orbital atherectomy

	Rotational atherectomy	Orbital atherectomy
Device	Rotablator™	Diamondback 3600
Manufacturer	Boston Scientific, Natick, MA	Cardiovascular Systems, Inc., St. Paul, MN
Wire	0.009" RotaWire™	0.012" ViperWire™
Lubricant flush	Rota Flush (heparin, nitroglycerin, venopamil)	ViperSlide™
Ablative device	"Burr"	"Crown"
Diamond chips	Anterior only	Anterior and posterior
Sizes	Multiple (1.25, 1.5, 1.75, 2.0, 2.25, 2.38, 2.5 mm), interchangeable	Single (1.25 mm), with larger path carved by higher speed
Guide catheter size	6 Fr for 1.25, 1.5, 1.75 mm burs 7 Fr for 2.0 mm burr 8 Fr for 2.25, 2.38, 2.5 mm burs	6 Fr
Axial motion	Rotational	Elliptical
Longitudinal motion	Pecking, intermittent	Gradual, continuous
Direction of ablation	Forward only	Forward and backward
Speed	140,000 to 160,000 rpm	80,000 or 120,000 rpm
Maximum run	20 s	25 s
Difficulty of setup	Higher	Lower
Learning curve	Longer	Shorter
Body of experience	Decades	Years
Effect on plaque	Shallower dissections	Deeper dissections

ROTAPRO™ Rotational Atherectomy



Centre Cardiologique du Nord

Gold standard Rotablator therapy on an enhanced, easy-to-use platform



Small console with intuitive LCD display & deceleration indicator (5k & 10k)



Advancer with on/off and Dynaglide controls

Mobile cart with small gas tank for quick set-up and portability



« CUTTING and SCORING BALLOON »



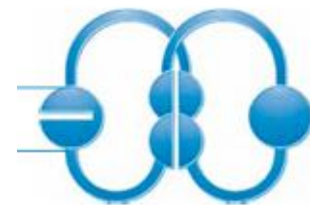
Centre Cardiologique du Nord



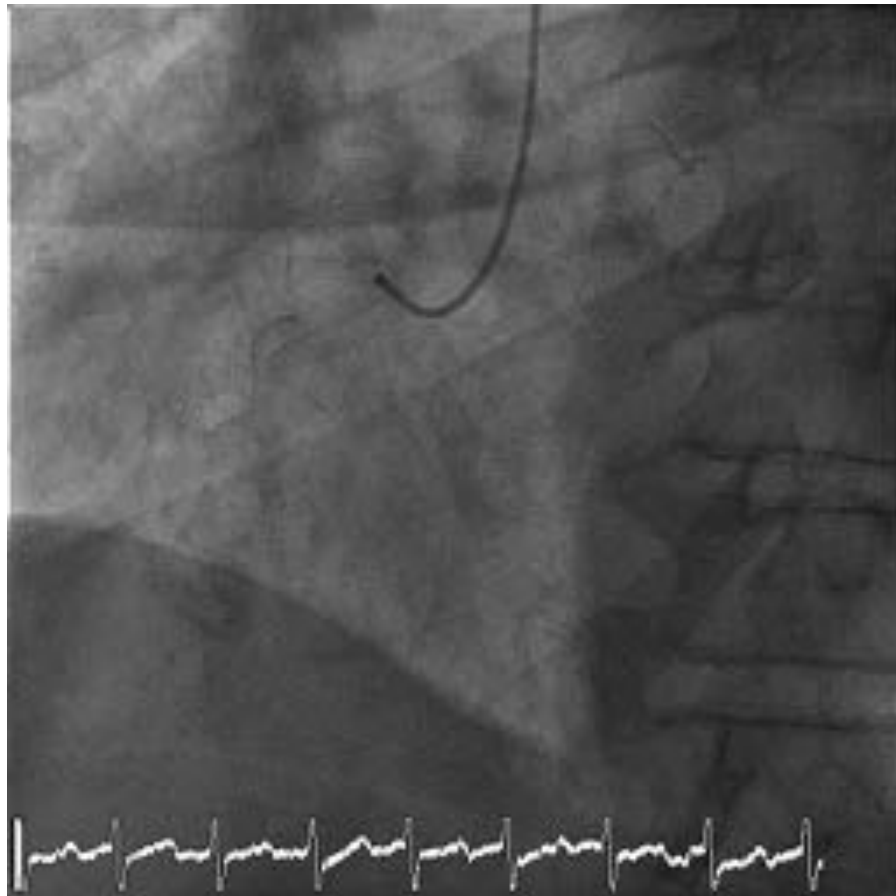
Studies of Cutting and Scoring Balloons in Calcified Coronary Lesions

First Author (Ref. #)	Year	N	Design	Intervention	Outcomes
Okura et al. (126)	2002	224	RCT	CBA vs. PTCA	CBA was associated with significantly greater lumen cross-sectional area gain than PTCA in calcified lesions. Dissections were more common with CBA.
de Ribamar Costa et al. (94)	2007	299	CS	DES vs. SBA/DES vs. semi-compliant balloon/DES	SBA was associated with greater stent expansion compared with direct stenting or stenting with pre-dilation with conventional balloons.
Grenadier et al. (95)	2008	521	CS	SBA + PTCA	SBA was associated with high rates of procedural success (97.9%), with low rates of short- and long-term adverse outcomes.
Vaquerizo et al. (93)	2010	145	CS	RA ± CBA + DES	Low rates of TLR and ST were observed with CBA alone and RA+ CBA in patients receiving DES at 15 ± 11 months.

« TIPS AND TRICKS »

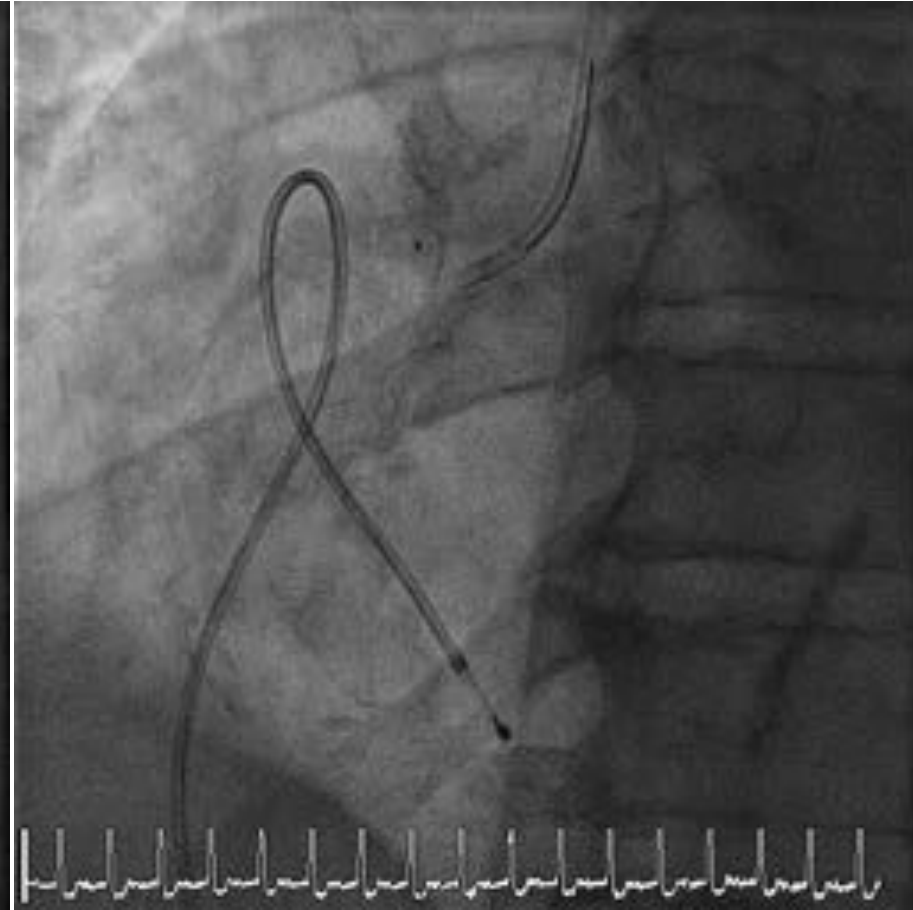
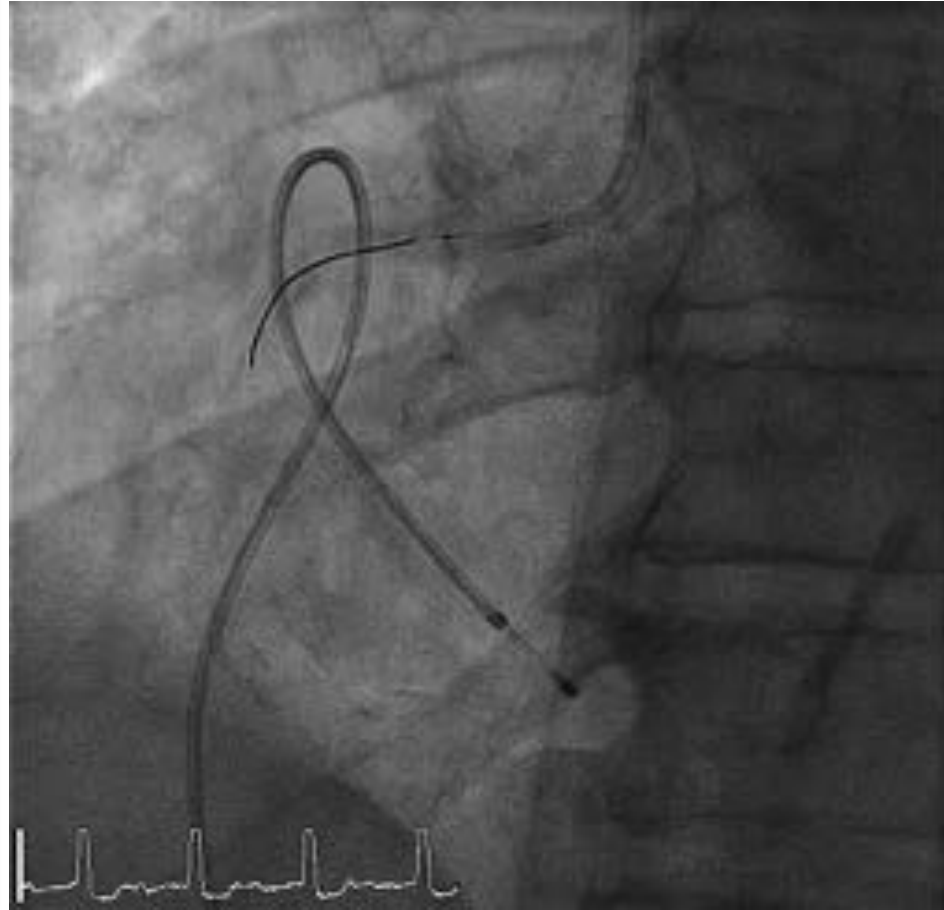
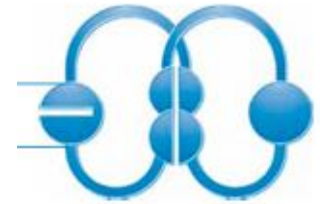


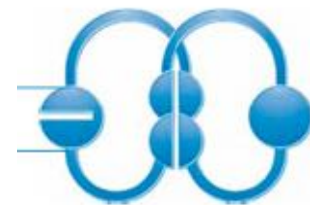
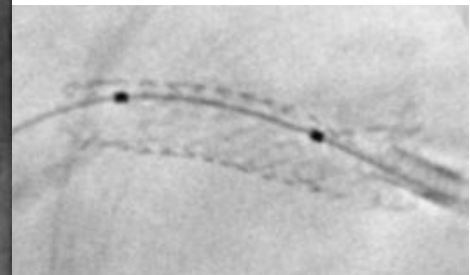
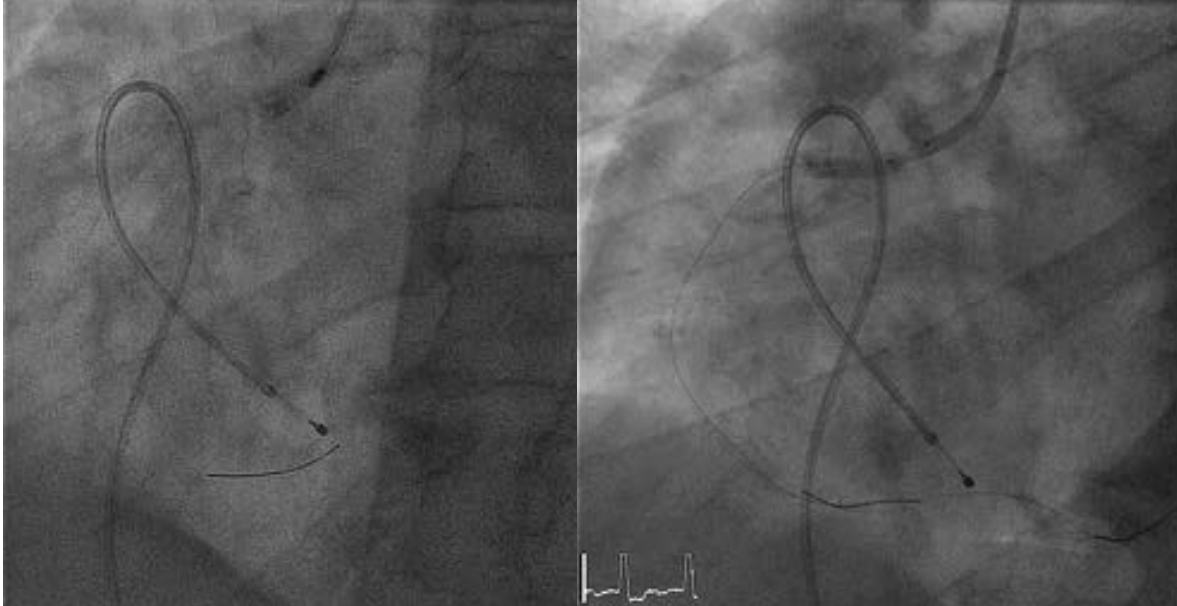
QUAND LE GUIDE ROTALINK NE FRANCHIT PAS LA LÉSION, QUE FAIRE? Centre Cardiologique du Nord



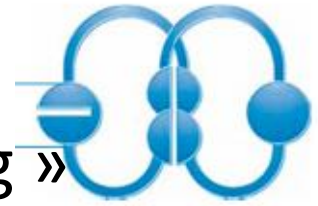
QUAND LE GUIDE ROTALINK NE FRANCHIT PAS LA LÉSION, QUE FAIRE?
⇒ Echange de guide sur microcathéter ou ballon coaxial

UN GUIDE HYDROPHILE POLYMÉRIQUE FRANCHIT LA LESION MAIS RIEN D'AUTRE....

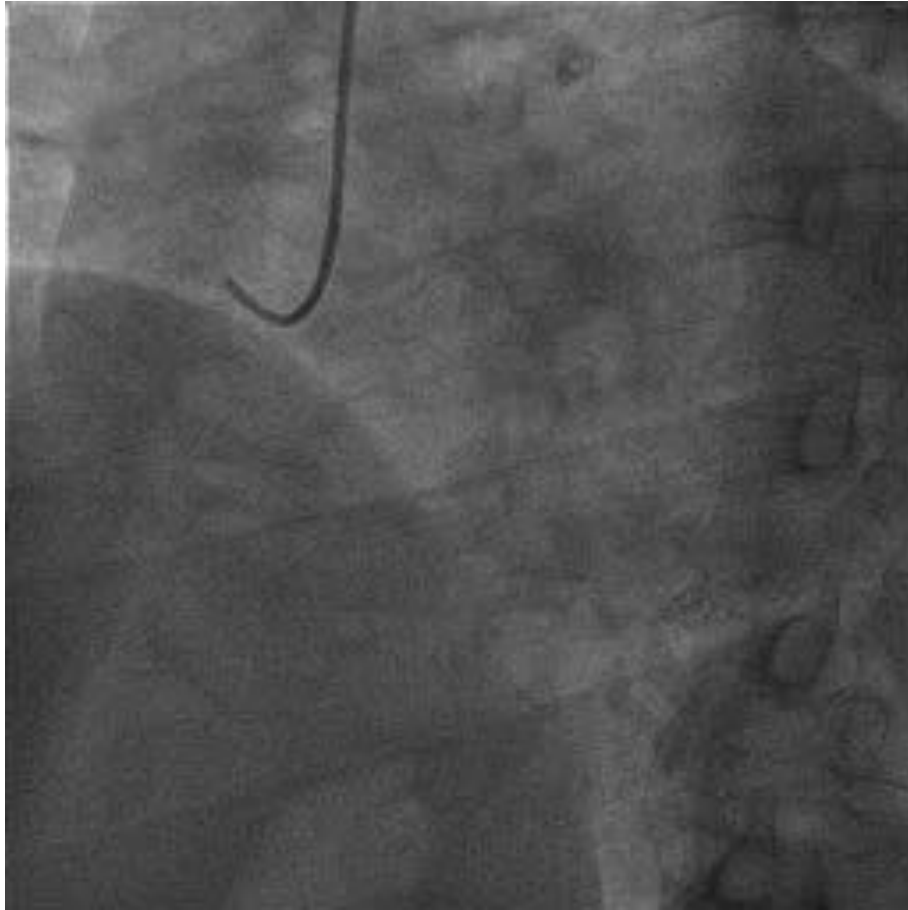


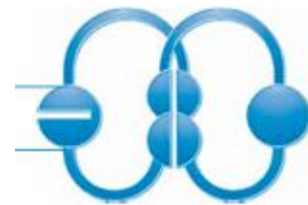
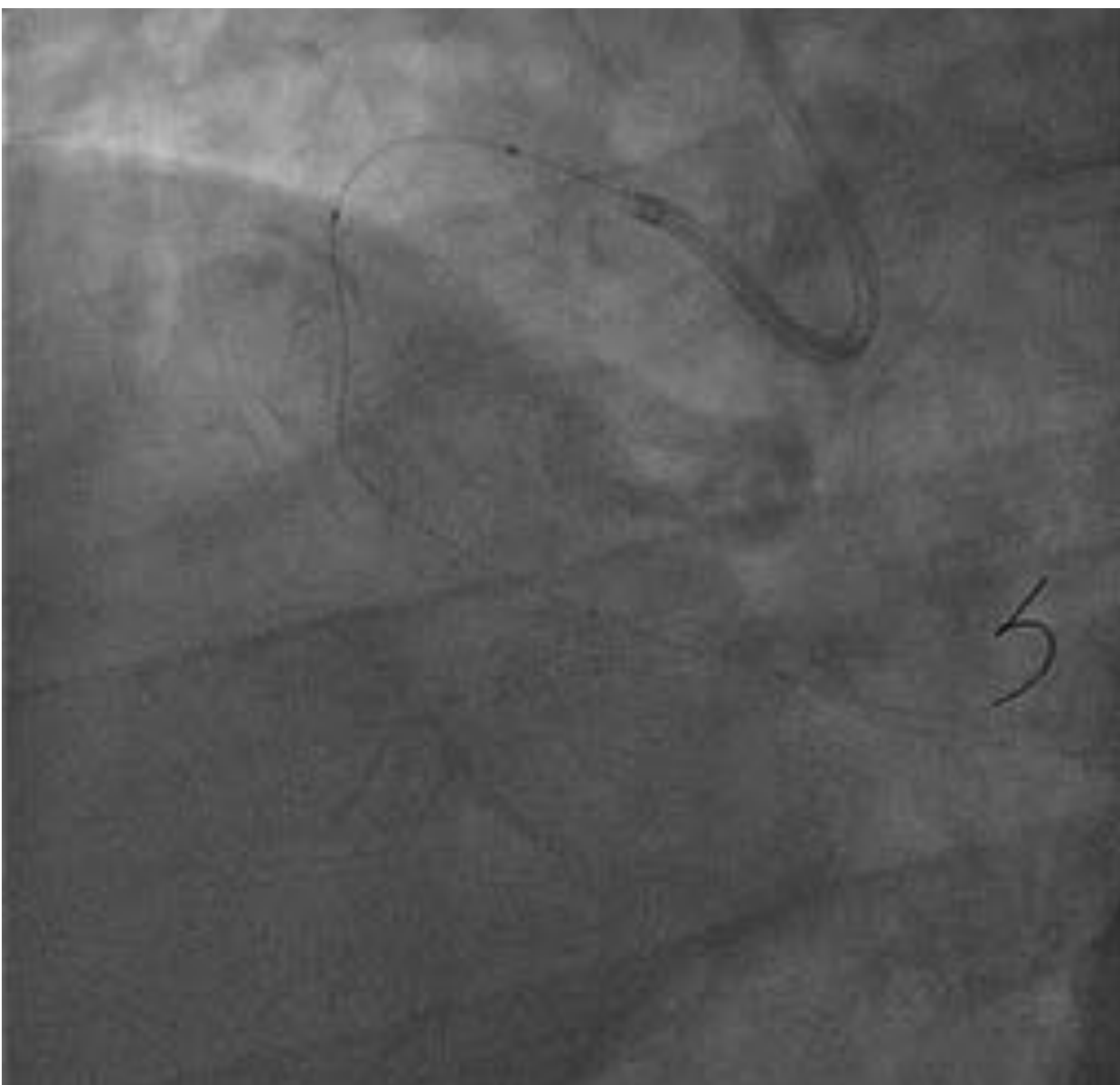


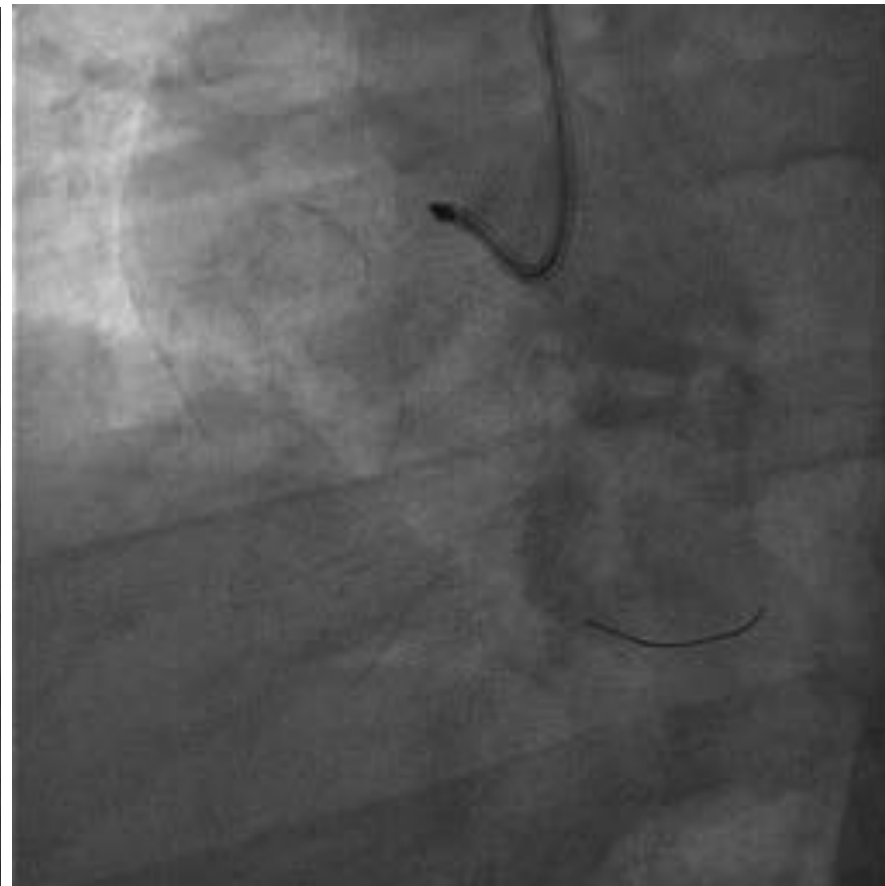
« TIPS AND TRICKS »

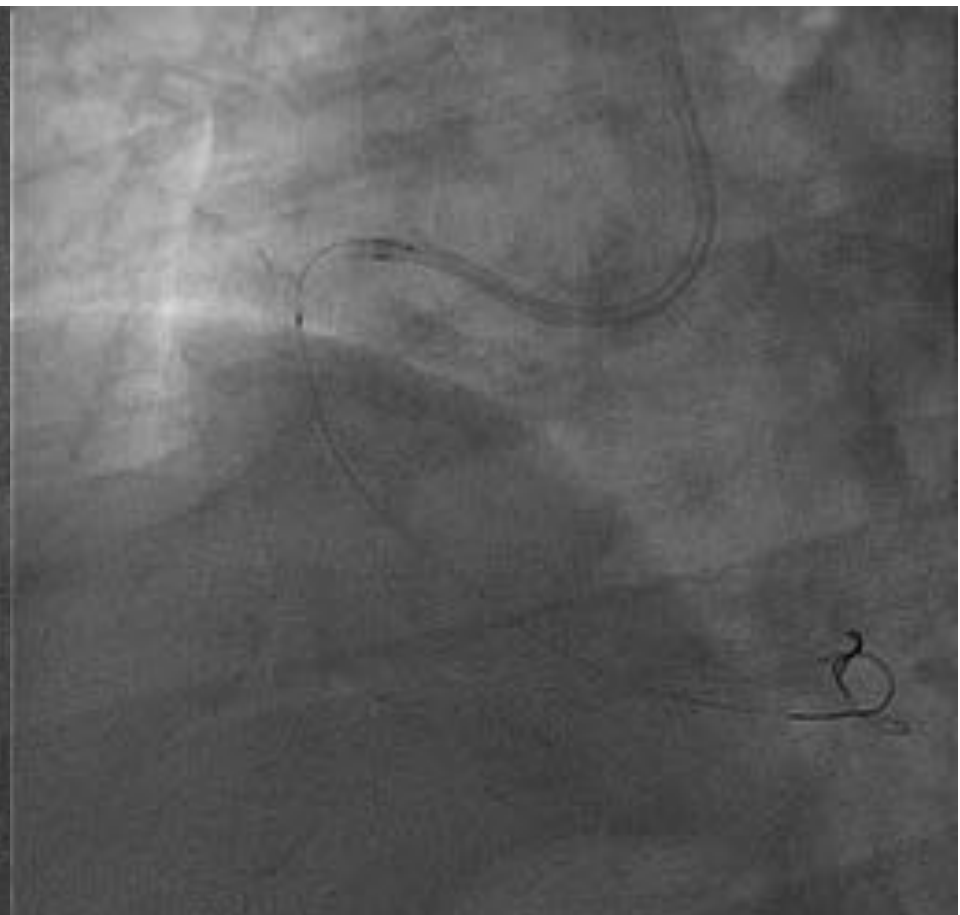
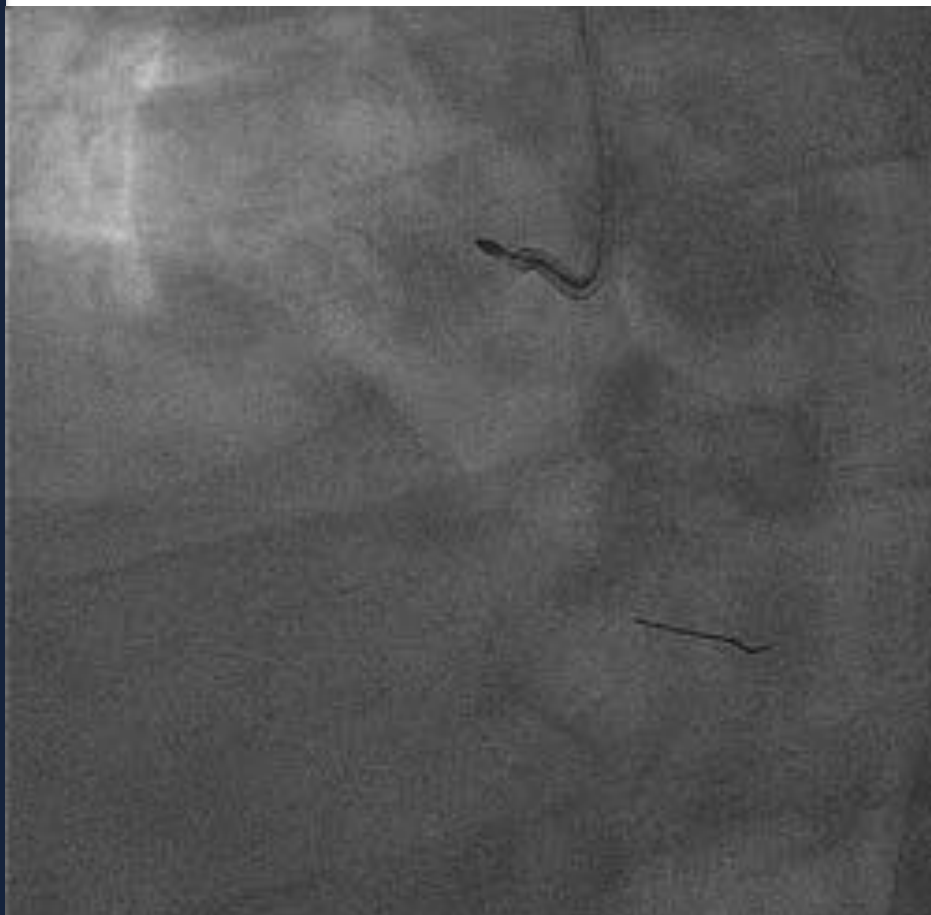
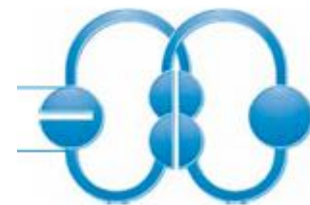


Tortuosités calcifiées empêchant « le stenting » »

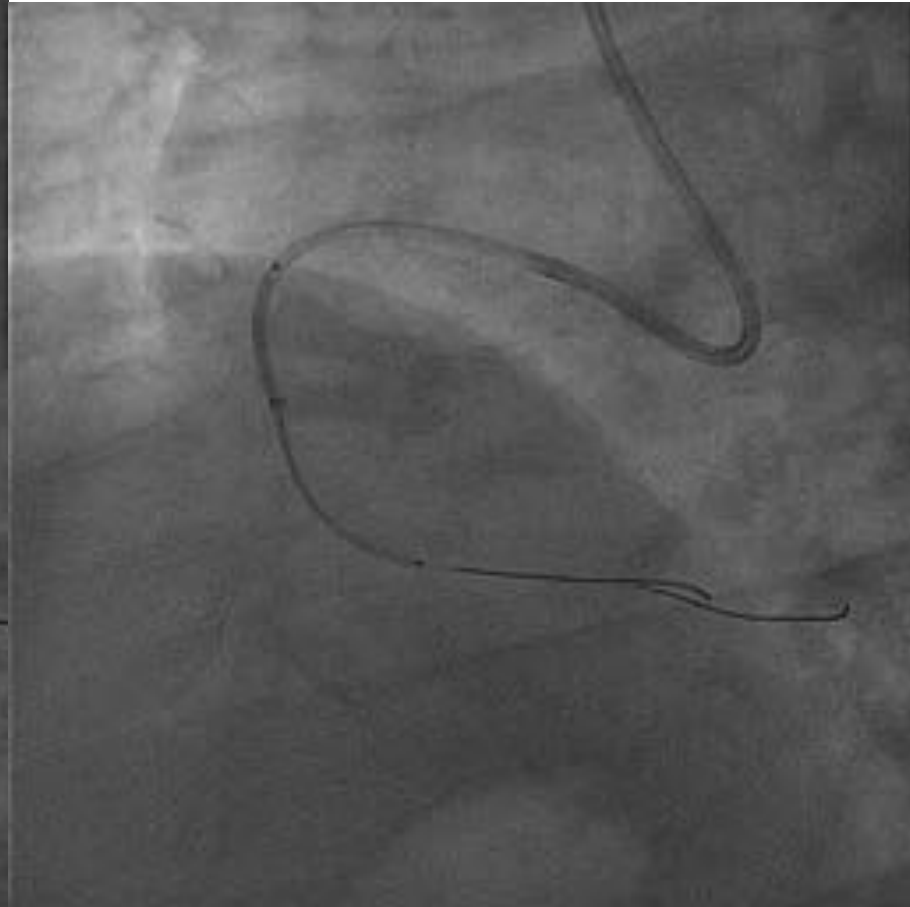
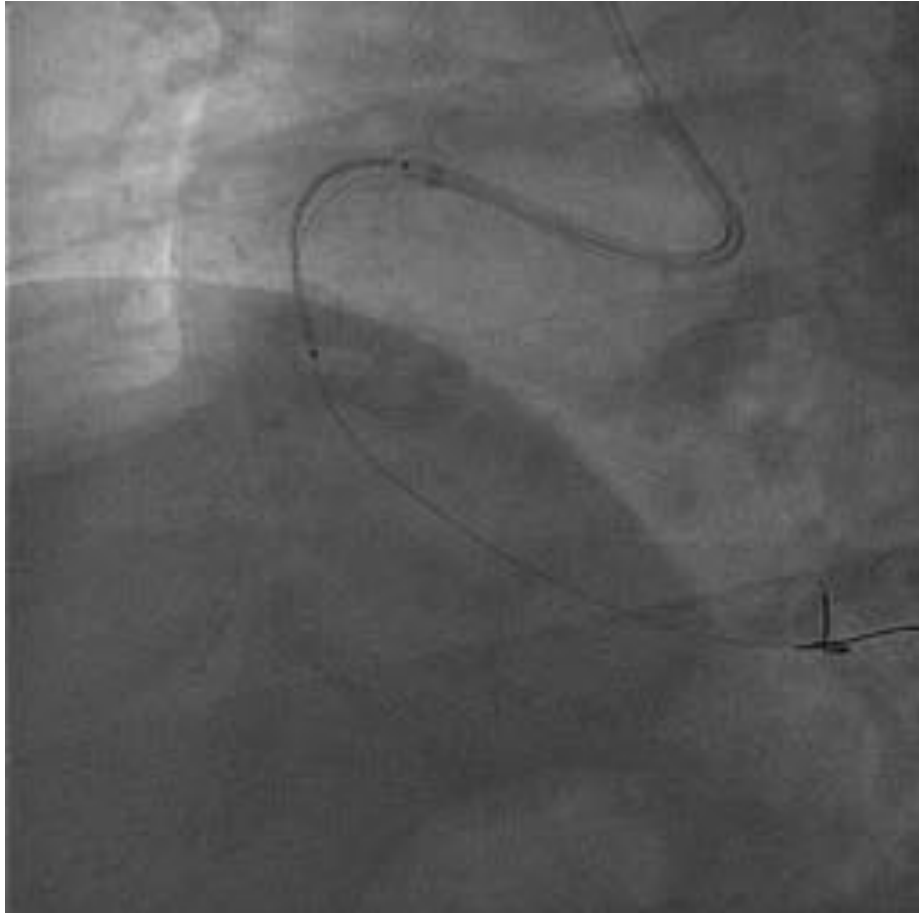
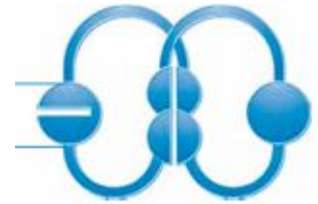


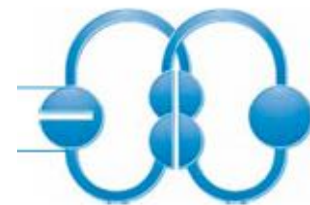




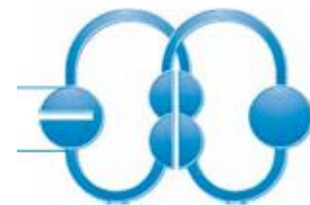


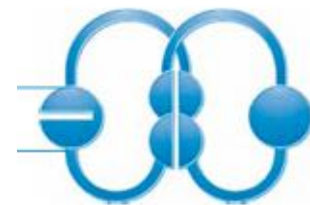
« Mother in child with Buddy wire technique »





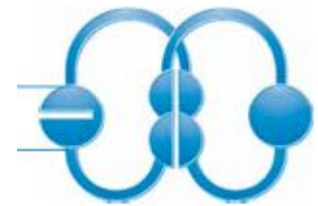
No LIMIT.....



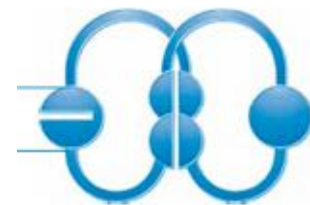
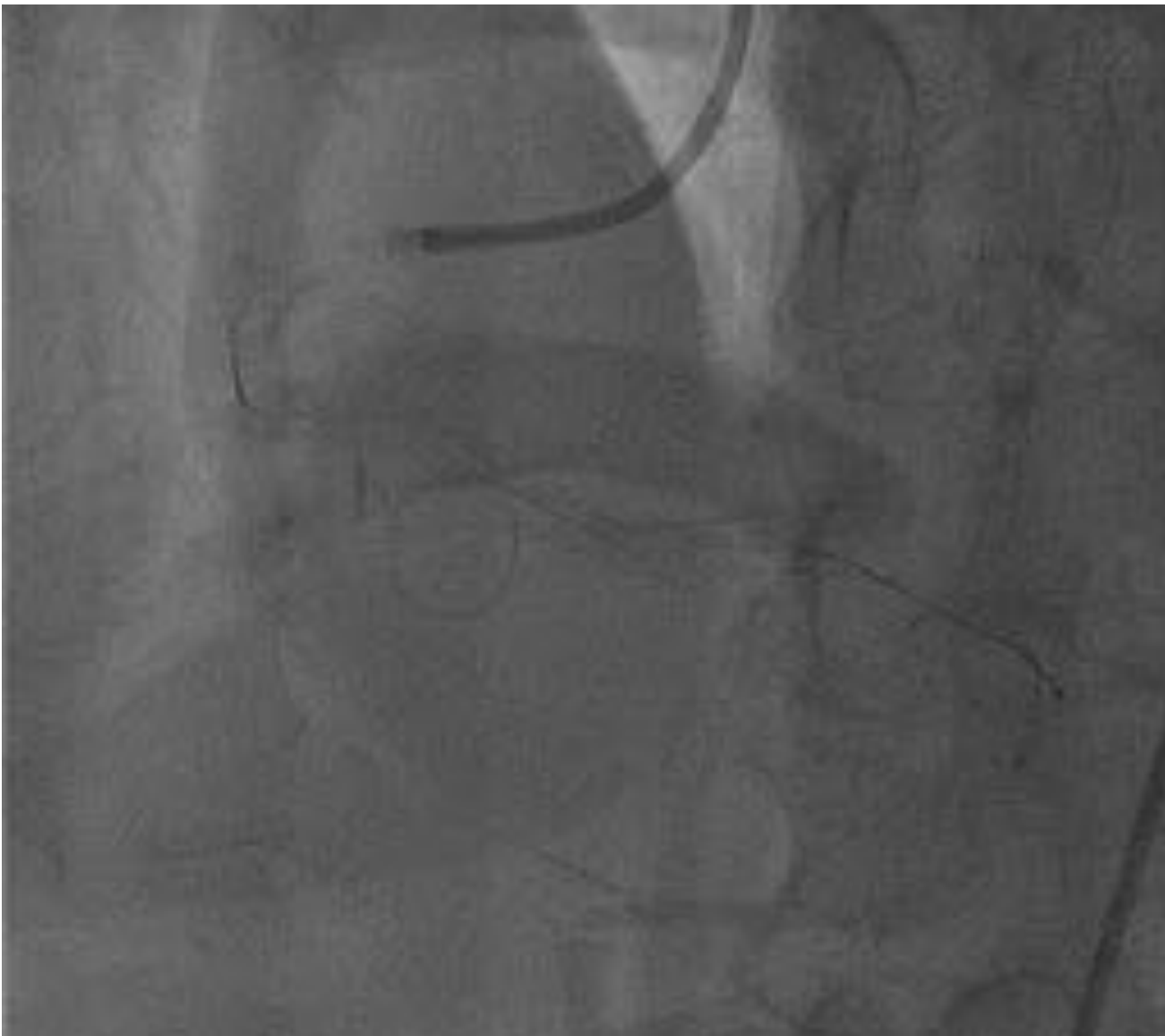


APPAC

PALAIS
DES CONGRES
BIARRITZ
7/8/9
JUN 2017



Centre Cardiologique du Nord



Pour conclure

- L'angioplastie des lésions calcifiées reste difficile
- ROTABLATOR +++++ (technique indispensable à acquérir) et « cutting Balloon » pour l'athérectomie
- Franchissement, acheminement du matériel: optimisation du support, choix des guides, des ballons, extension de cathéter, « buddy wire technique »....