

# CTO: partout? Pour tous? Tout le temps?

Voie rétrograde et dissection antérograde

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Hôpitaux de Toulouse

Pôle Cardiovasculaire et Métabolique

# DÉCLARATION DE LIENS D'INTÉRÊT AVEC LA PRÉSENTATION

**Intervenant : Nicolas BOUDOU, Toulouse**

Consultant (proctoring CTO): Abbott, Biotronik, Boston SC, Terumo

## Recommendations on specific lesion subsets

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
Stent implantation in the main vessel only, followed by provisional balloon angioplasty with or without stenting of the side branch, is recommended for PCI of bifurcation lesions. <sup>654–658</sup>	I	A
Percutaneous revascularization of CTOs should be considered in patients with angina resistant to medical therapy or with a large area of documented ischaemia in the territory of the occluded vessel. <sup>629,659–663</sup>	IIa	B
In true bifurcation lesions of the left main, the double-kissing crush technique may be preferred over provisional T-stenting. <sup>620</sup>	IIb	B

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## 16.3.2 Chronic total coronary occlusion

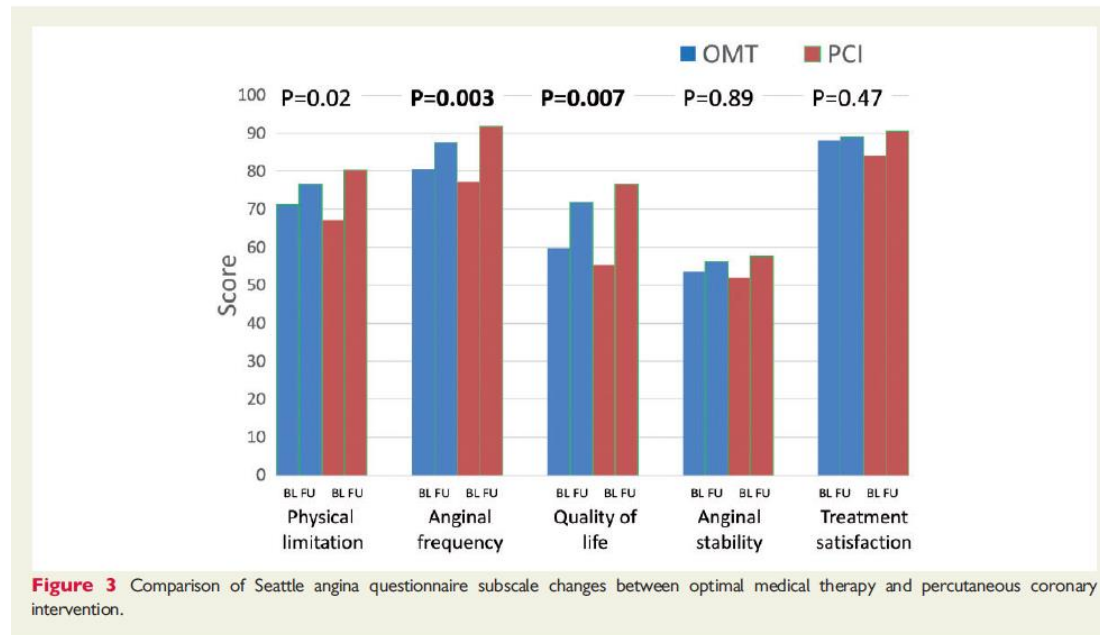
requirement for bypass surgery.<sup>630</sup> Broadly speaking, the treatment of CTOs may be considered analogous to the treatment of non-CTO lesions (see recommendations in section 5). In cases of regional wall motion abnormalities in the territory of the CTO, objective evidence of viability should be sought. The decision to attempt CTO-PCI should be considered against the risk of greater contrast volume, longer fluoroscopy time, and higher MACE rates in comparison with non-CTO PCI patients.<sup>631</sup> *Ad hoc* PCI is generally not recommended

# EUROCTO trial

## A randomized multicentre trial to compare revascularization with optimal medical therapy for the treatment of chronic total coronary occlusions

Gerald S. Werner<sup>1\*</sup>, Victoria Martin-Yuste<sup>2</sup>, David Hildick-Smith<sup>3</sup>, Nicolas Boudou<sup>4</sup>, Georgios Sianos<sup>5</sup>, Valery Gelev<sup>6</sup>, Jose Ramon Rumoroso<sup>7</sup>, Andrejs Erglis<sup>8</sup>, Evald Høj Christiansen<sup>9</sup>, Javier Escaned<sup>10</sup>, Carlo di Mario<sup>11</sup>, Thomas Hovasse<sup>12</sup>, Luis Teruel<sup>13</sup>, Alexander Bufe<sup>14</sup>, Bernward Lauer<sup>15</sup>, Kris Bogaerts<sup>16</sup>, Javier Goicolea<sup>17</sup>, James C. Spratt<sup>18</sup>, Anthony H. Gershlick<sup>19</sup>, Alfredo R. Galassi<sup>20</sup>, and Yves Louvard<sup>12</sup>; for the EUROCTO trial investigators<sup>†</sup>

European Heart J 2018



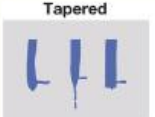

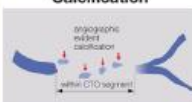
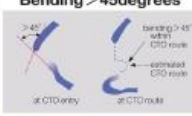
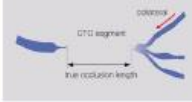
**Figure 3** Comparison of Seattle angina questionnaire subscale changes between optimal medical therapy and percutaneous coronary intervention.

# Predicting Successful Guidewire Crossing Through Chronic Total Occlusion of Native Coronary Lesions Within 30 Minutes

The J-CTO (Multicenter CTO Registry in Japan) Score as a Difficulty Grading and Time Assessment Tool

## J-CTO SCORE SHEET

Version 1.0

Variables and definitions		
<p><b>Tapered</b></p> 	<p><b>Blunt</b></p> 	<p>Entry with any tapered tip or dimple indicating direction of true lumen is categorized as "tapered".</p> <p><b>Entry shape</b></p> <input type="checkbox"/> Tapered (0) <input type="checkbox"/> Blunt (1)
point		
<p><b>Calcification</b></p> 	<p>Regardless of severity, 1 point is assigned if any evident calcification is detected within the CTO segment.</p>	<p><b>Calcification</b></p> <input type="checkbox"/> Absence (0) <input type="checkbox"/> Presence (1)
point		
<p><b>Bending &gt; 45degrees</b></p> 	<p>One point is assigned if bending &gt; 45 degrees is detected within the CTO segment. Any tortuosity separated from the CTO segment is excluded from this assessment.</p>	<p><b>Bending &gt; 45°</b></p> <input type="checkbox"/> Absence (0) <input type="checkbox"/> Presence (1)
point		
<p><b>Occlusion length</b></p> 	<p>Using good collateral images, try to measure "true" distance of occlusion, which tends to be shorter than the first impression.</p>	<p><b>Occl.Length</b></p> <input type="checkbox"/> <20mm (0) <input type="checkbox"/> ≥20mm (1)
point		
<p><b>Re-try lesion</b></p> <p>Is this Re-try (2<sup>nd</sup> attempt) lesion? (previously attempted but failed)</p>		<p><b>Re-try lesion</b></p> <input type="checkbox"/> No (0) <input type="checkbox"/> Yes (1)
point		
<p>Category of difficulty (total point)</p> <input type="checkbox"/> easy (0) <input type="checkbox"/> Intermediate (1) <input type="checkbox"/> difficult (2) <input type="checkbox"/> very difficult (≥3)		<p><b>Total</b></p> <div style="border: 1px solid black; width: 20px; height: 20px; display: inline-block; margin-right: 5px;"></div> points

Morino et al.

Development and Validation of the J-CTO Score

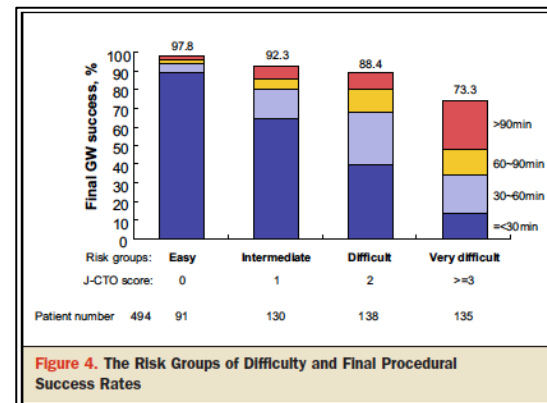
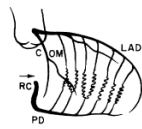


Figure 4. The Risk Groups of Difficulty and Final Procedural Success Rates

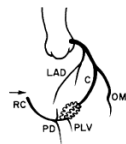
JACC: CARDIOVASCULAR INTERVENTIONS, VOL. 4, NO. 2, 2011

FEBRUARY 2011:213-21

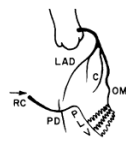
# Stratégies selon CTO et collatérales



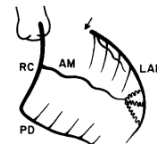
A. RAO-LC Injection (28)



B. LAO-LC Injection (24)



C. LAO-LC Injection (17)



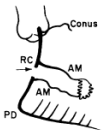
A. RAO-RC Injection (28)



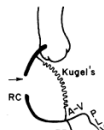
B. RAO-LC Injection (27)



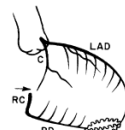
C. LAO-LC Injection (17)



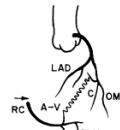
D. RAO-RC Injection (9)



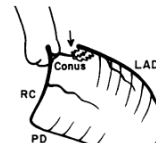
E. LAO-RC Injection (9)



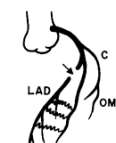
F. RAO-LC Injection (9)



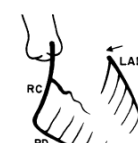
G. LAO-LC Injection (6)



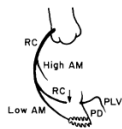
D. RAO-RC Injection (15)



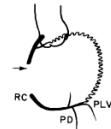
E. LAO-LC Injection (6)



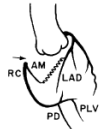
F. RAO-RC Injection (3)



H. LAO-RC Injection (6)



I. LAO-RC Injection (2)



J. LAO-LC Injection (2)

**Pathways and Functional Significance of the Coronary Collateral Circulation**

DAVID C. LEVIN

*Circulation* 1974;50:831-837

# Stratégie

*en fonction de l'anatomie de la CTO et des collatérales*

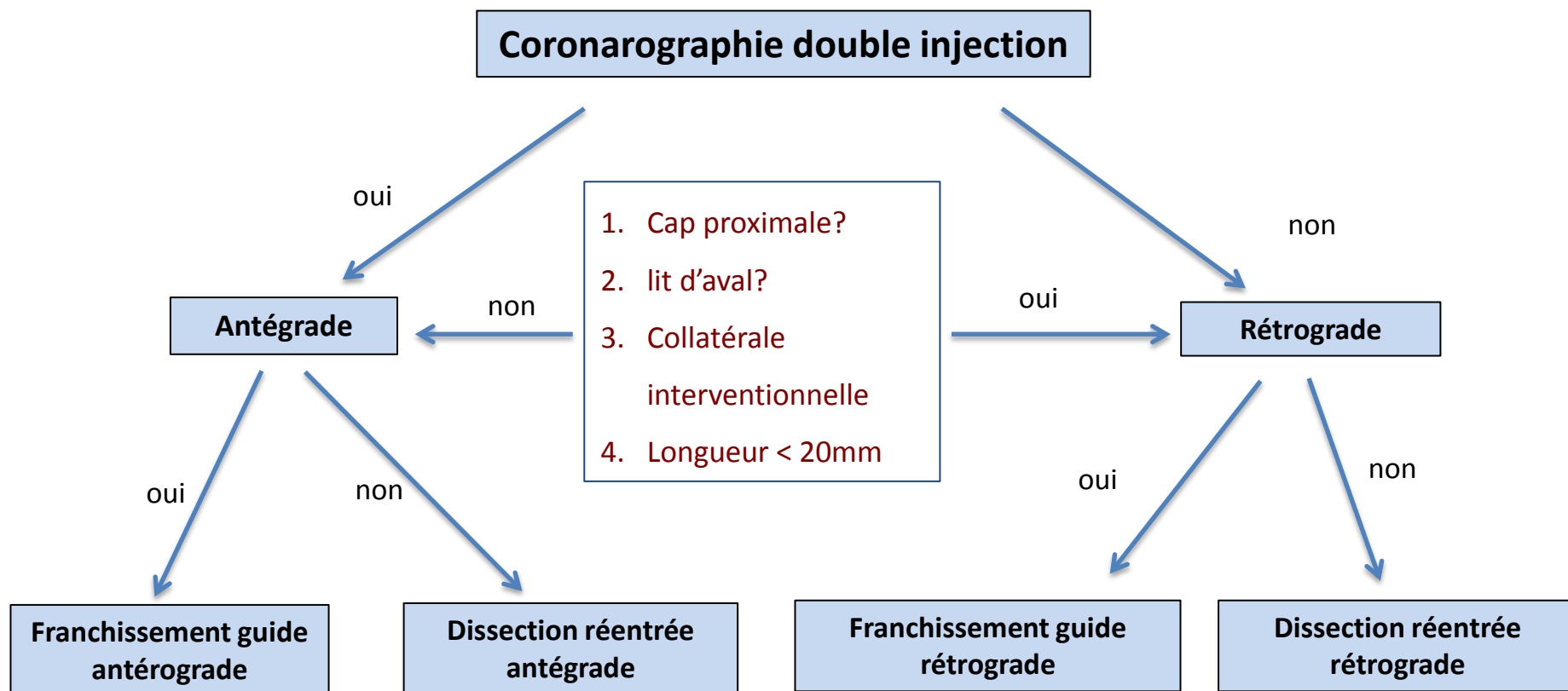
## Les questions



1. Cap proximale: bien identifiée ou ambiguë ?
2. Longueur de CTO > 20 mm?
3. Qualité du lit d'aval
  - pathologique?
  - Bifurcation?
4. Présence de collatérales de type interventionnelles

Brilakis E, Grantham JA, Rinfret S, et al. J Am Coll Cardiol Interv 2012

# L'algorithme hybride d'angioplastie de CTO



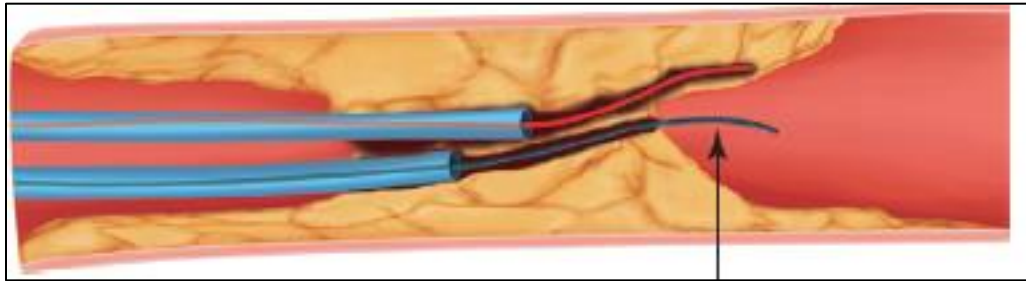
Brilakis E, Grantham JA, Rinfret S, et al. J Am Coll Cardiol Intv 2012



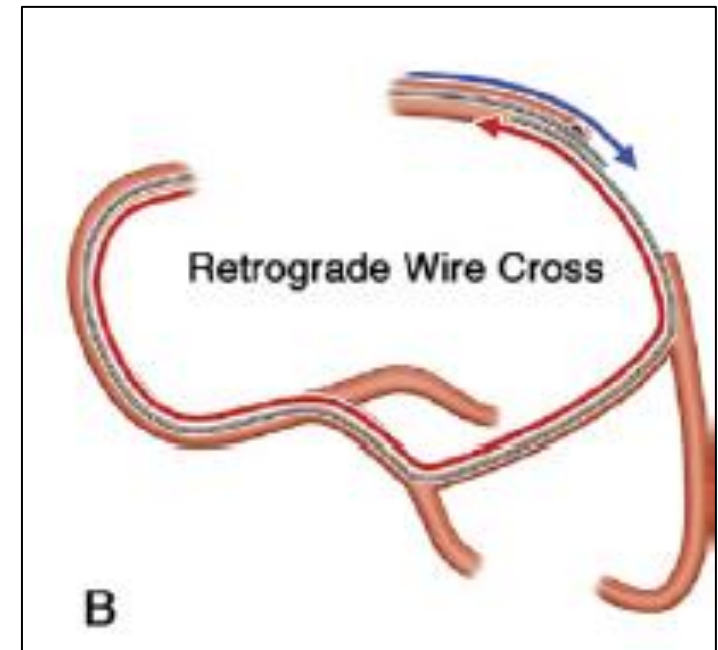
# Franchissement

## Par le guide

### Antérograde



### Rétrograde



Sumitsuji et al.

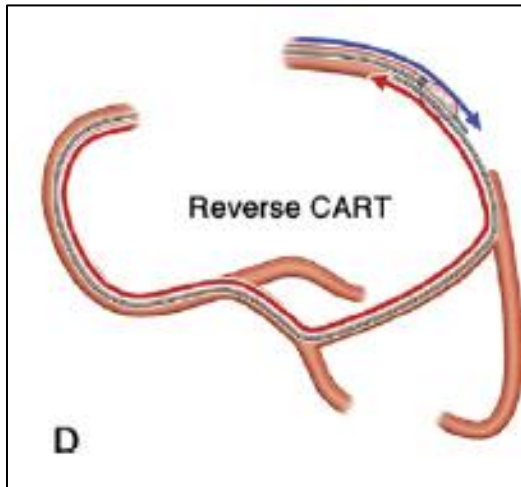
Contemporary Chronic Total Occlusion PCI JACC: CARDIOVASCULAR INTERVENTIONS, VOL. 4, NO. 9, 2011

# Franchissement

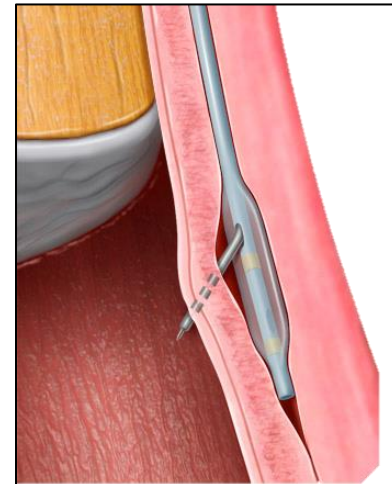
## Dissection réentrée

### Rétrograde

### Antérograde



Sumitsuji et al.  
Contemporary Chronic Total Occlusion PCI



JACC: CARDIOVASCULAR INTERVENTIONS, VOL. 4, NO. 9, 2011

# Retrograde techniques CTO PCI

## EUROCTO trial

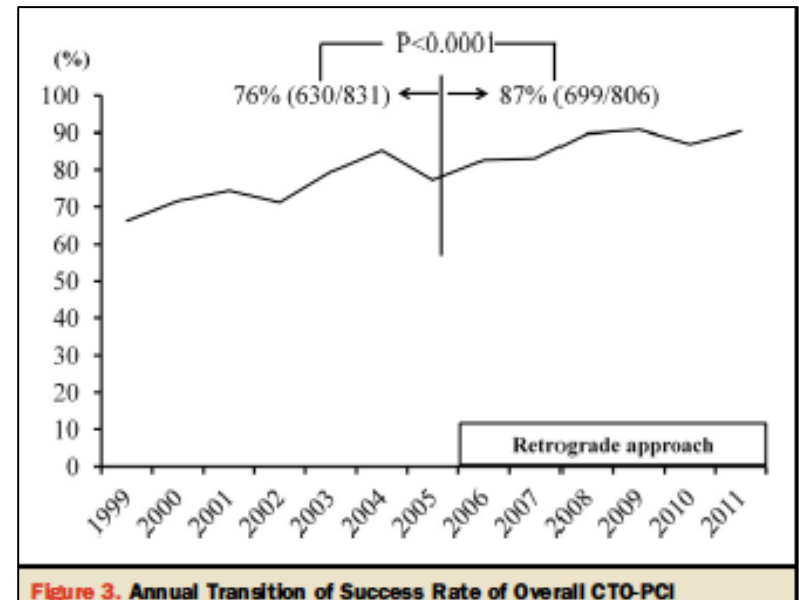
G.S. Werner et al

**Table 2** Procedural characteristics in patients randomized to coronary total occlusion percutaneous coronary intervention

	PCI
Total number of procedures	274
Radial approach for PCI, n/N (%)	94/274 (34.3)
Contralateral injection, n/N (%)	224/274 (81.8)
Retrograde approach, n/N (%)	98/274 (35.8)
Intravascular ultrasound used, n/N (%)	37/214 (17.3)
First procedure successful, n/N (%)	211/254 (83.1)
Final procedure success per lesion, n/N (%)	220/254 (86.6)
Drug-eluting stents used	
Biomatrix, n/N (%)	185/203 (91.1)
Others, n/N (%)	18/203 (8.9)
Total length of stent used (mm)	65.9 ± 28.9
Width of largest stent (mm)	3.3 ± 2.49
Number of stents used	2.0 ± 1.32
Procedure duration (min)	121.2 ± 67.8
Fluoroscopy time (min)	49.6 ± 34.9
Contrast volume (mL)	285 ± 198
Patient dose (mGy)	3685 ± 3058
Dose area product (cGy*cm <sup>2</sup> )	21 464 ± 19 056

European Heart J 2018

- ➔ Depuis 2006, ↗ taux de succès
  - ➔ Eviter de d'endommager le lit d'aval
- EuroCTO trial: retrograde CTO PCI 35,8%



Teramoto et al.  
Previous CABG Complicates CTO-PCI

JACC: CARDIOVASCULAR INTERVENTIONS, VOL. 7, NO. 1, 2014  
JANUARY 2014:39-46

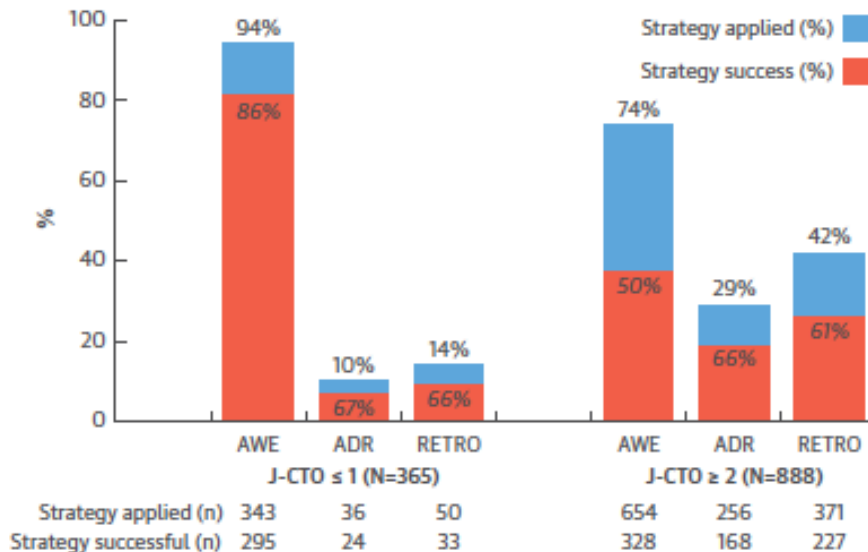
# The Hybrid Algorithm for Treating Chronic Total Occlusions in Europe

## The RECHARGE Registry

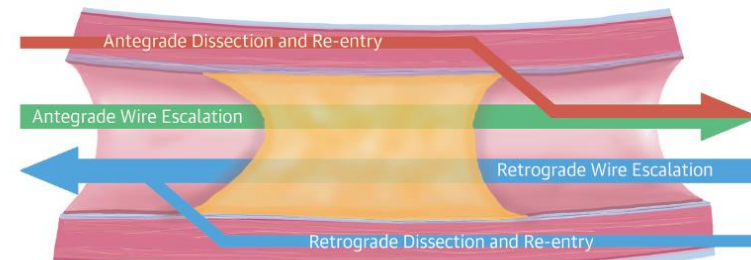
Joren Maeremans, MSc,<sup>a,b</sup> Simon Walsh, MD,<sup>c</sup> Paul Knaapen, MD, PhD,<sup>d</sup> James C. Spratt, MD,<sup>e</sup> Alexandre Avran, MD,<sup>f</sup> Colm G. Hanratty, MD,<sup>c</sup> Benjamin Faurie, MD, PhD,<sup>g</sup> Pierfrancesco Agostoni, MD,<sup>h,i</sup> Erwan Bressollette, MD,<sup>j</sup> Peter Kayaert, MD,<sup>k</sup> Alan J. Bagnall, MD, PhD,<sup>l,m</sup> Mohamed Egred, MD,<sup>l,m</sup> Dave Smith, MD,<sup>n</sup> Alexander Chase, MD, PhD,<sup>n</sup> Margaret B. McEntegart, MD, PhD,<sup>o</sup> William H.T. Smith, MB, BCHIR, PhD,<sup>p</sup> Alun Harcombe, MD,<sup>p</sup> Paul Kelly, MD,<sup>q</sup> John Irving, MD,<sup>r</sup> Elliot J. Smith, MD,<sup>s</sup> Julian W. Strange, MD,<sup>t</sup> Joseph Dens, MD, PhD<sup>a,b</sup>

JACC VOL. 68, NO. 18, 2016  
NOVEMBER 1, 2016:1958-70

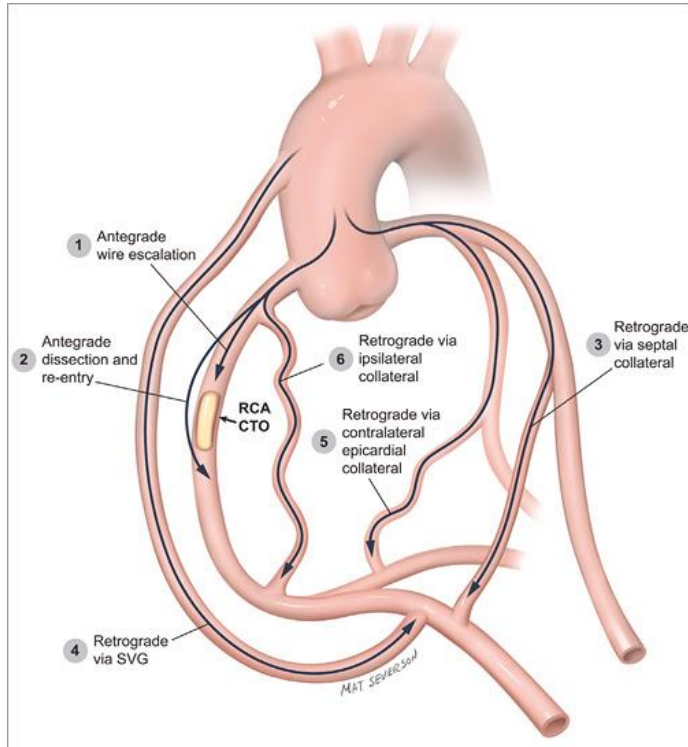
**FIGURE 2 Application and Outcomes of the Hybrid Techniques According to the J-CTO Lesion Complexity**



### A. The 4 Hybrid Strategies Applied in CTO-PCI



# Approches rétrogrades

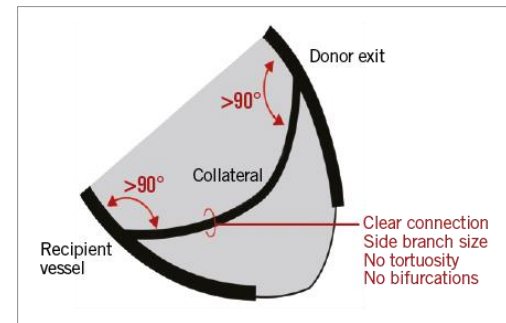


Brilakis E. EuroIntervention 2016

## Controlatéral ou ipsilateral

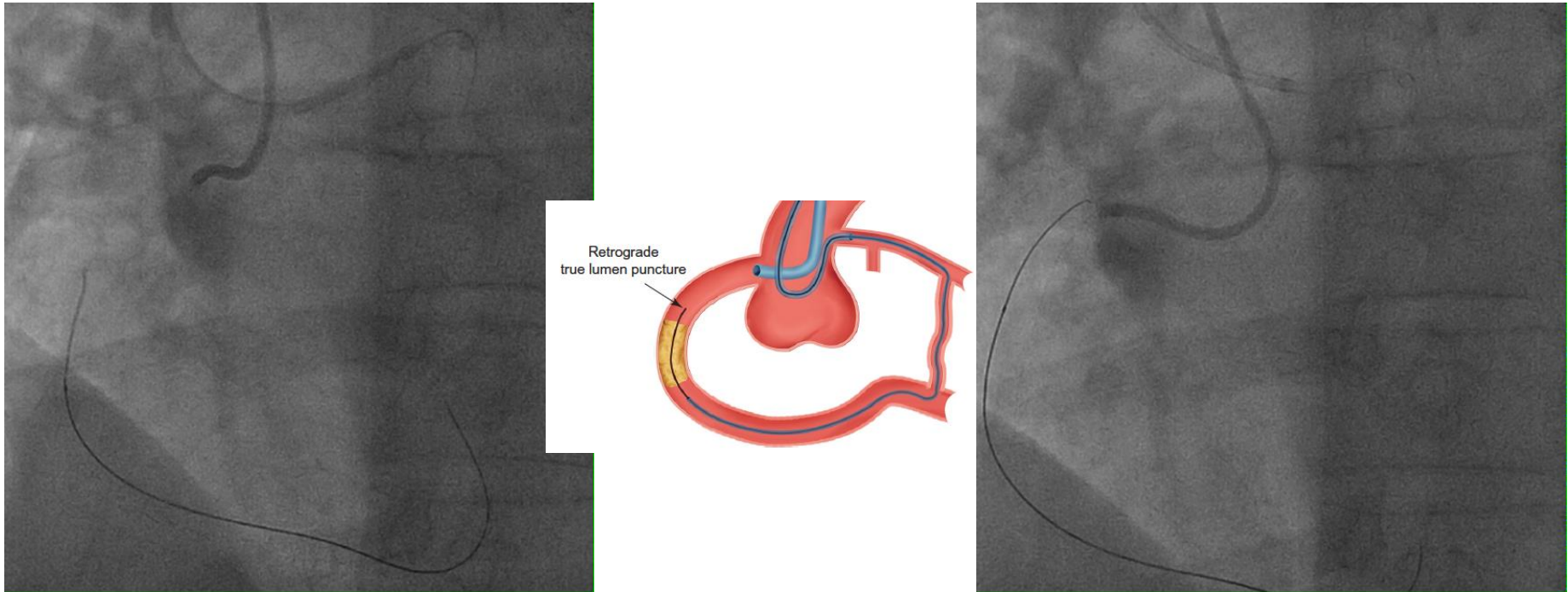
- Collatérale septale
- Collatérale epicardique
- Pontage:

- Saphène (patent ou occlus)
- Arteriel



McEntegart *et al.* EuroIntervention 2016;11  
**The collateral circulation of coronary chronic total occlusions**

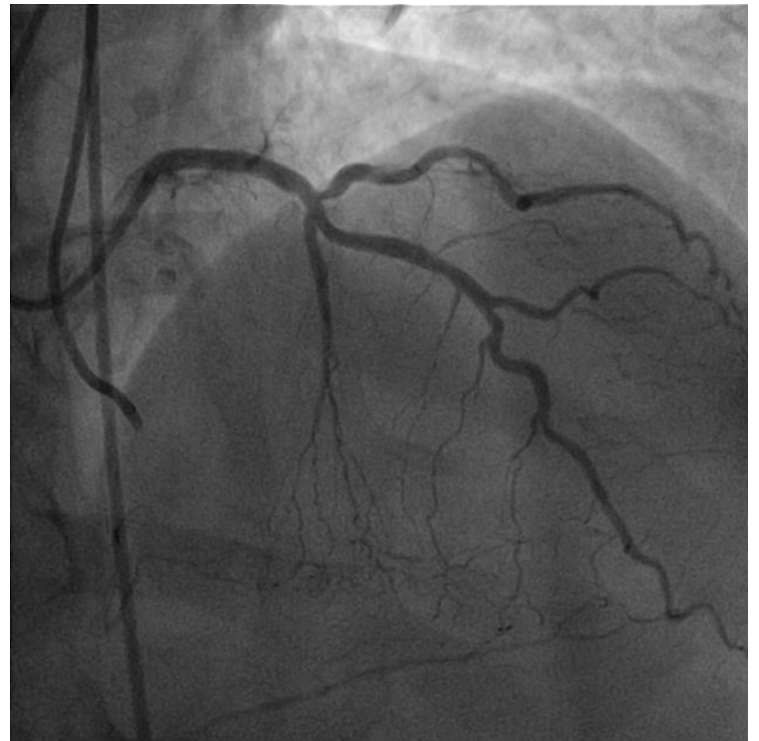
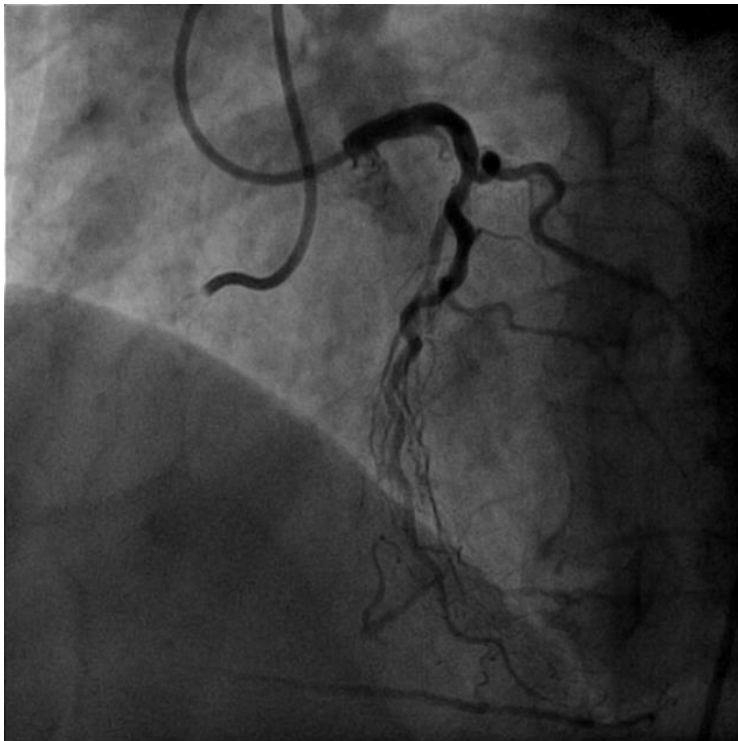
# Franchissement rétrograde



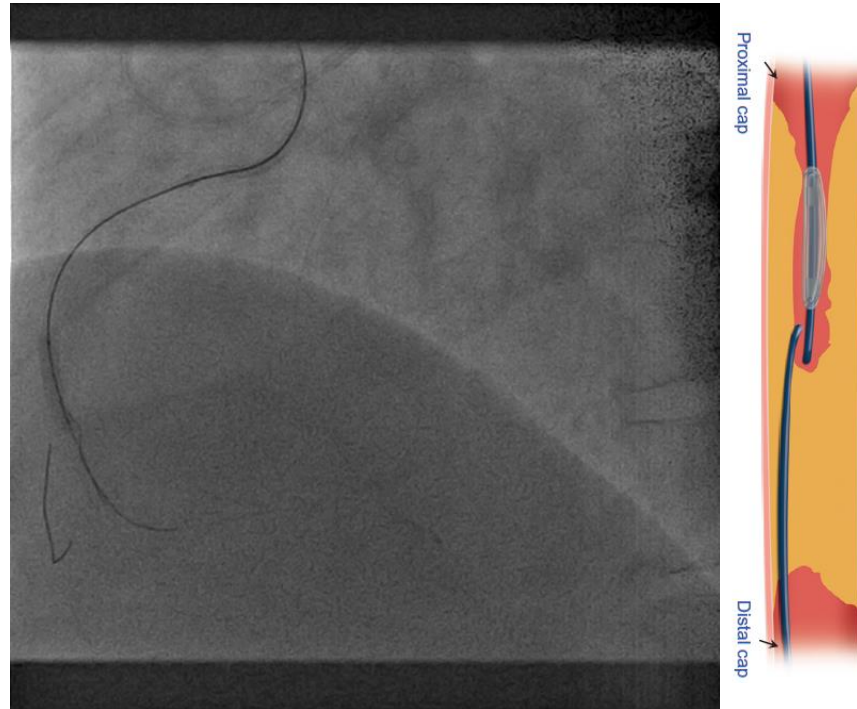
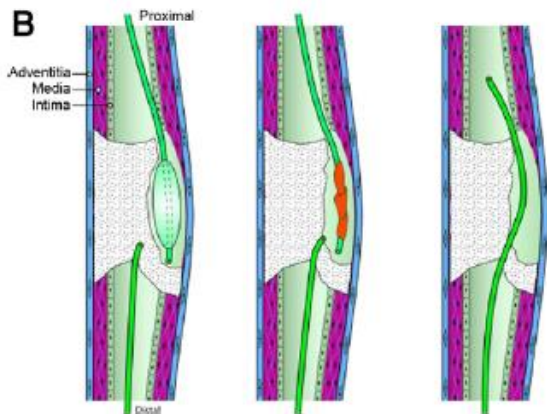
Franchissement rétrograde par guide rétrograde jusque dans le cathéter guide antérograde



# Dissection réentrée rétrograde



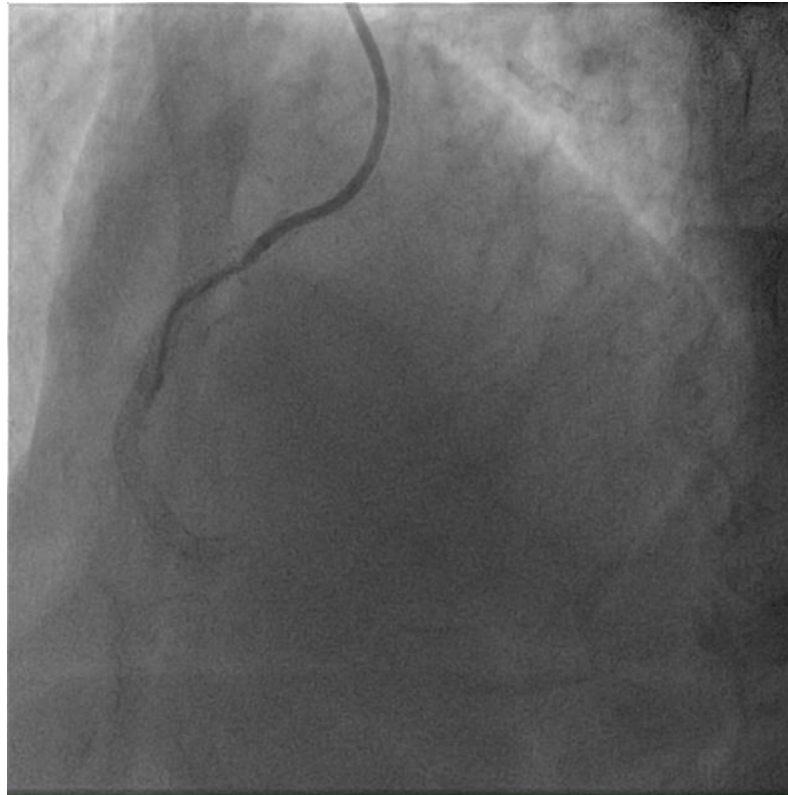
# Dissection réentrée rétrograde



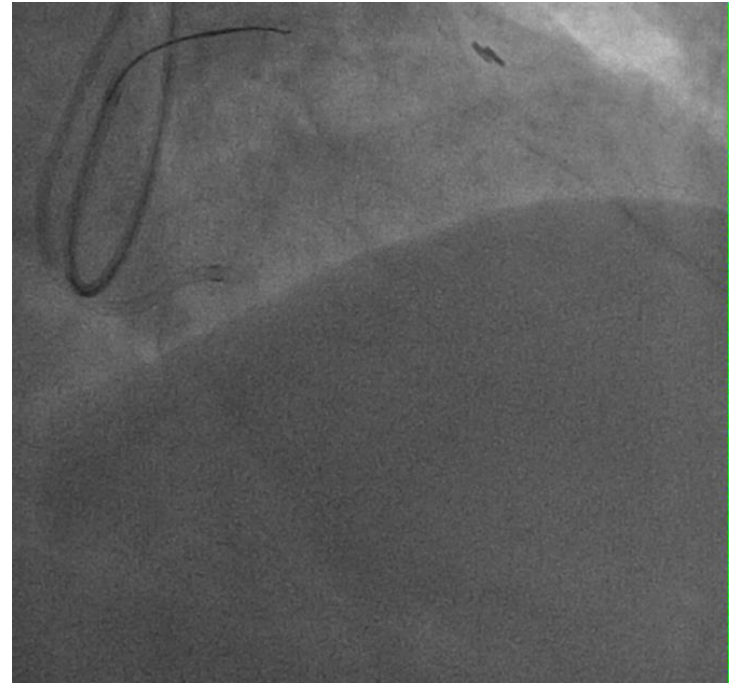
**RETRO CART** → franchissement par guide rétrograde d'une dissection antérograde contrôlée proximale



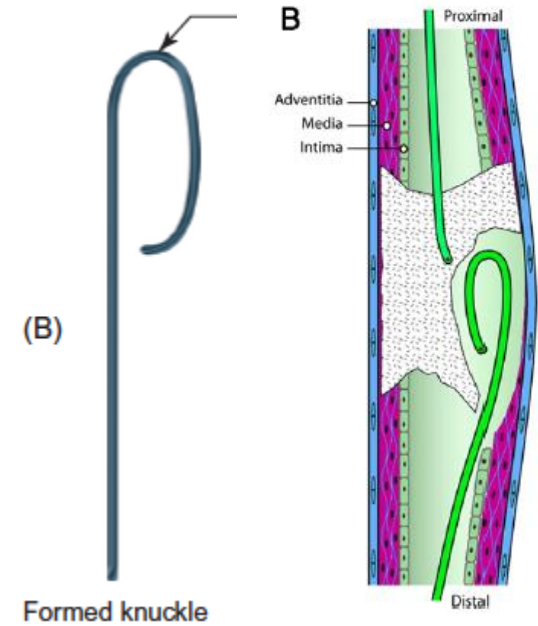
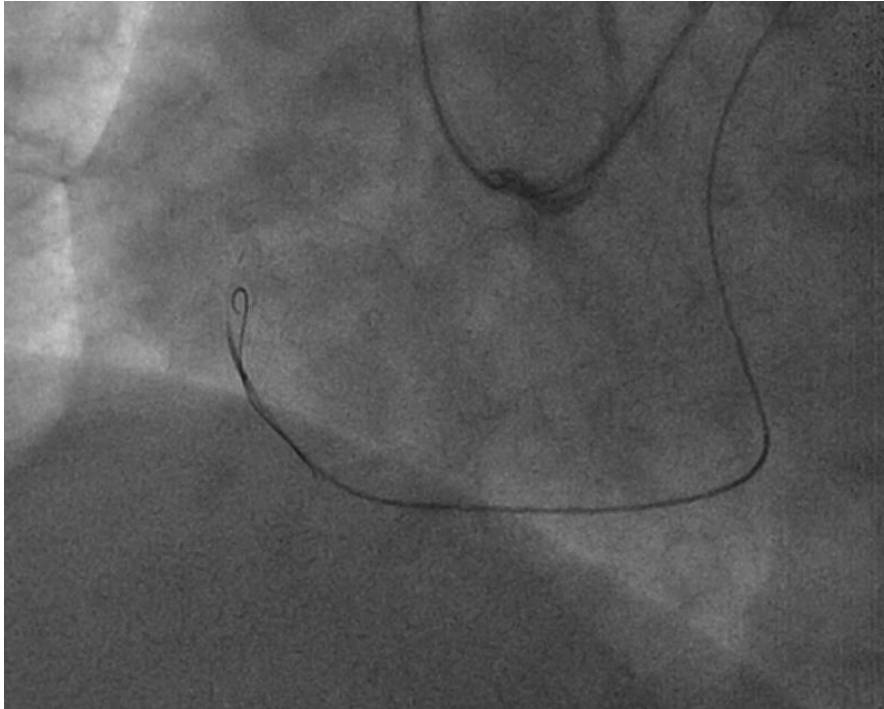
# Dissection réentrée rétrograde



# Dissection réentrée rétrograde

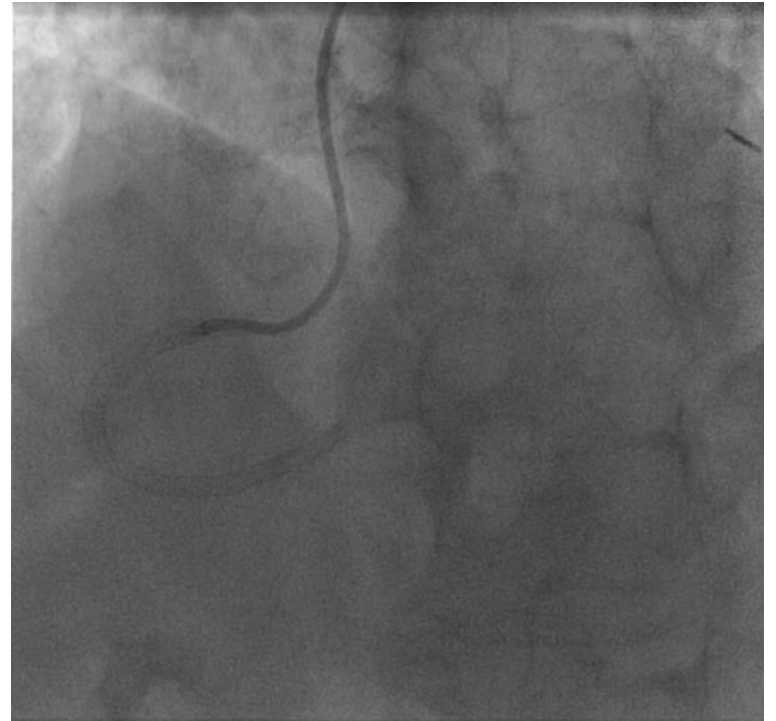
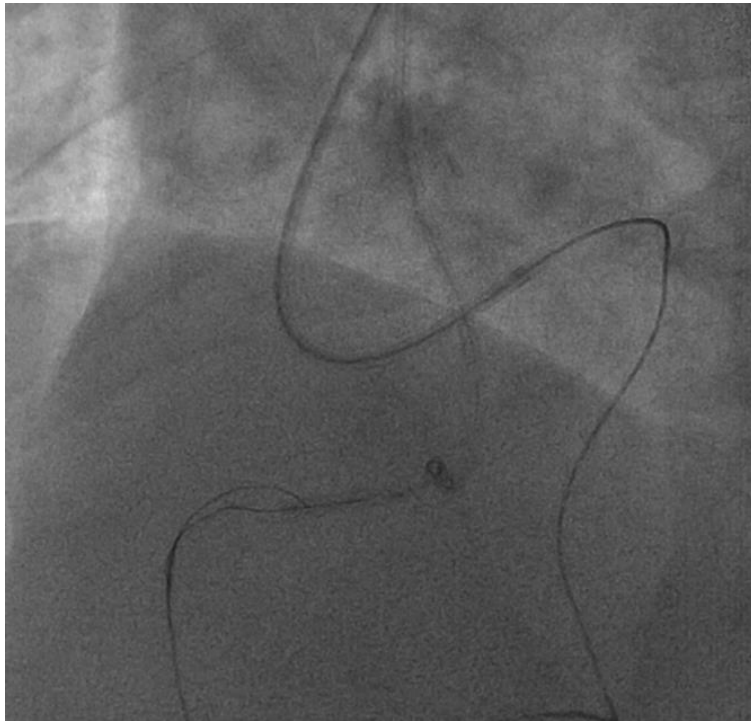


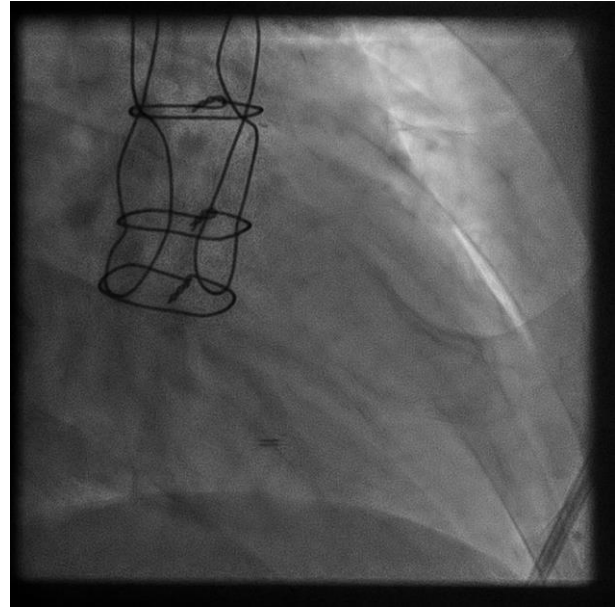
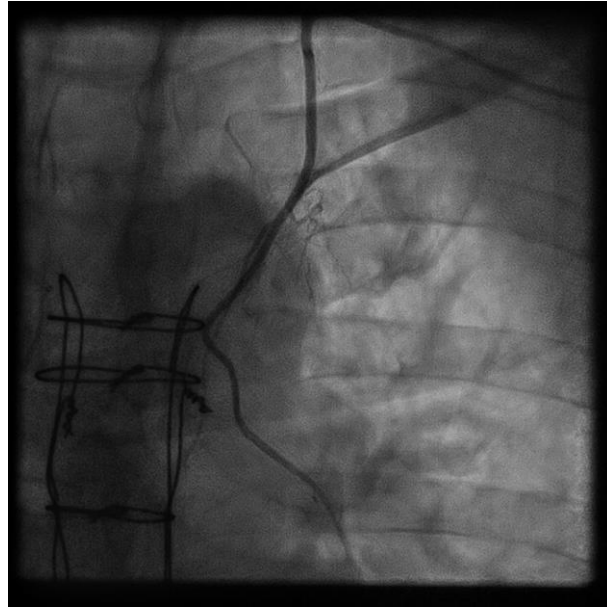
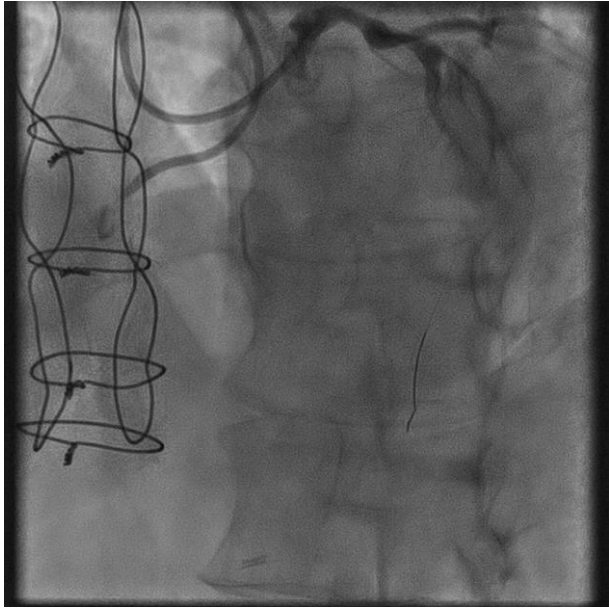
# Dissection réentrée rétrograde



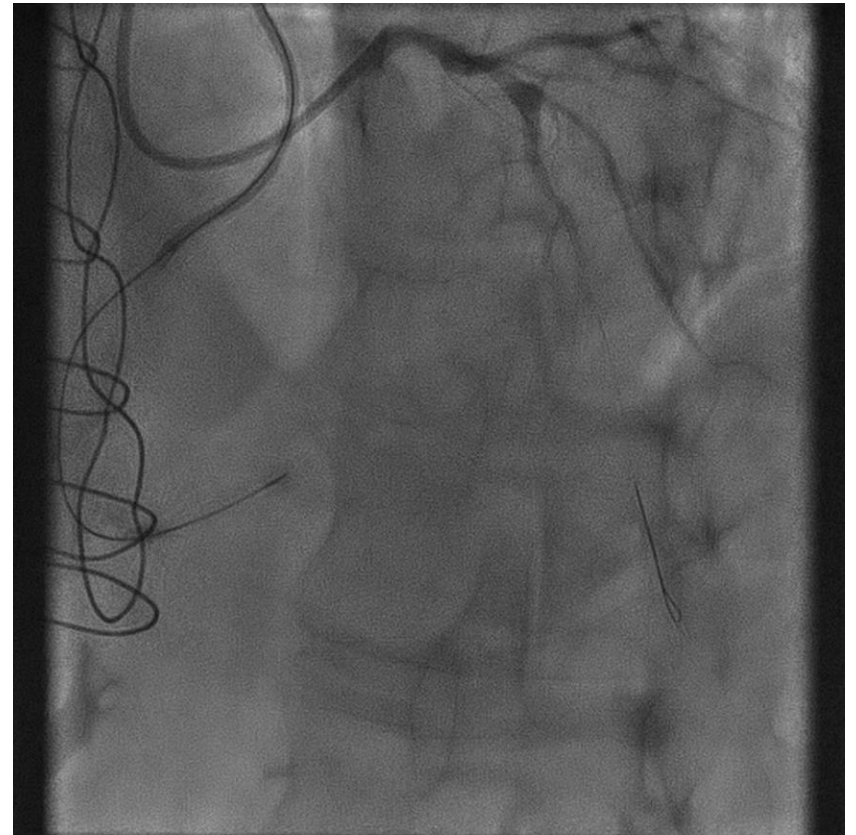
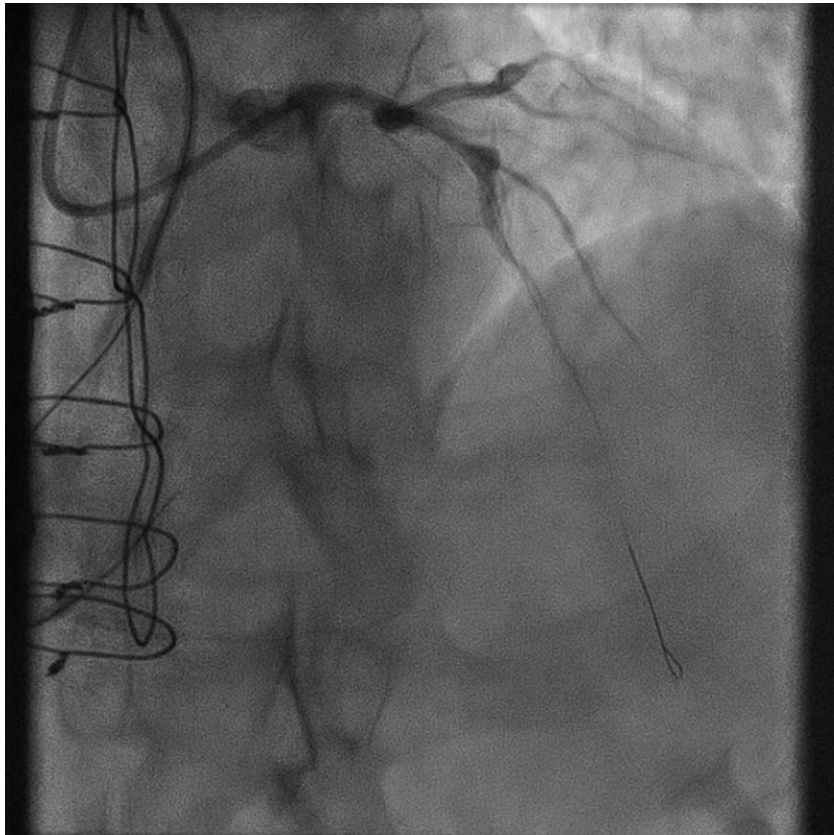
→ Knuckle: progression au sein du segment occlus (dans ou autour de la plaque)

# Dissection réentrée rétrograde

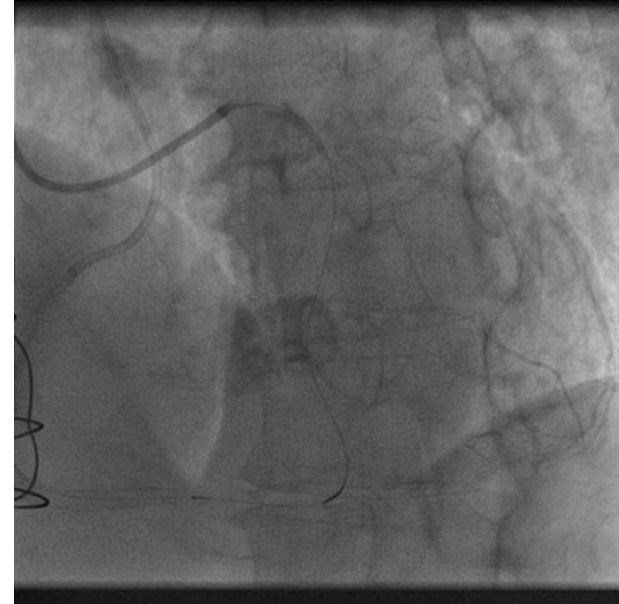
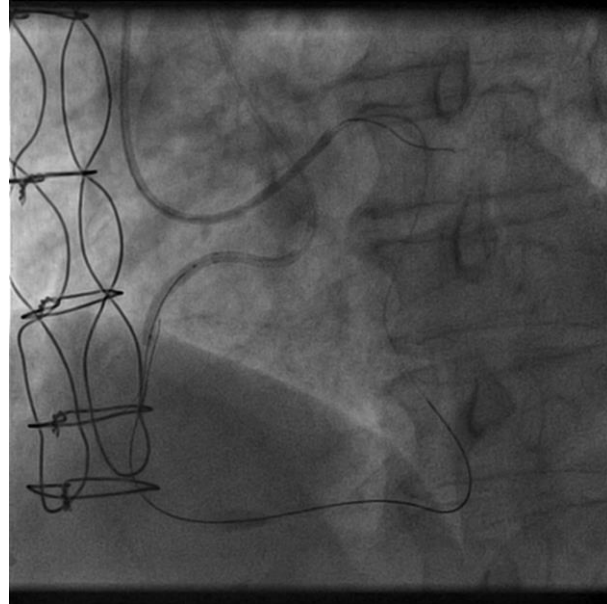
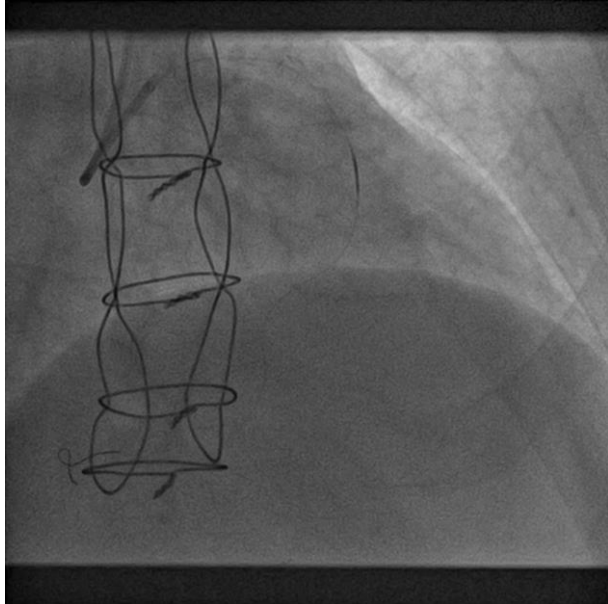




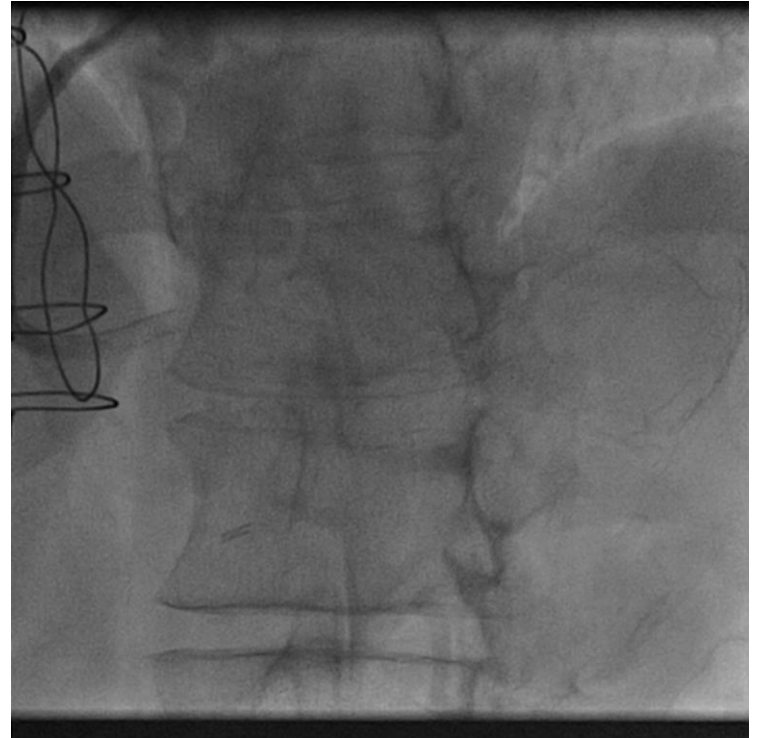
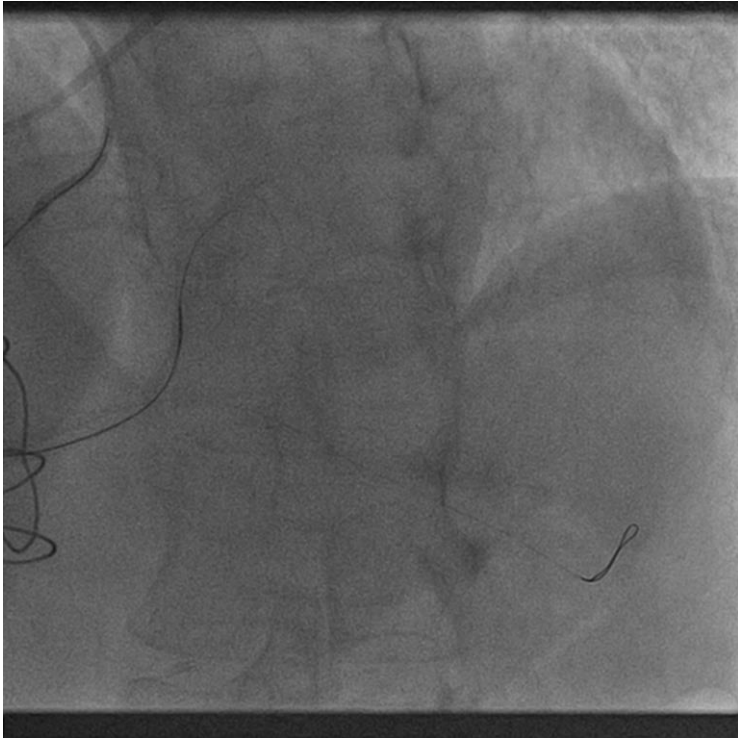




# Dissection réentrée rétrograde



# Dissection réentrée rétrograde

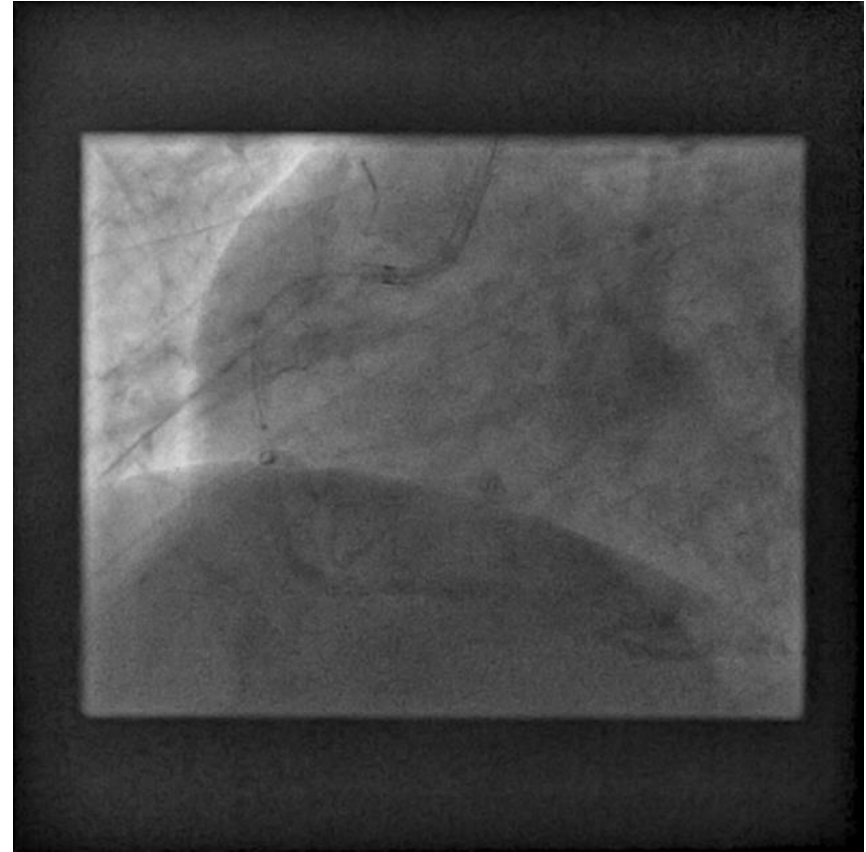
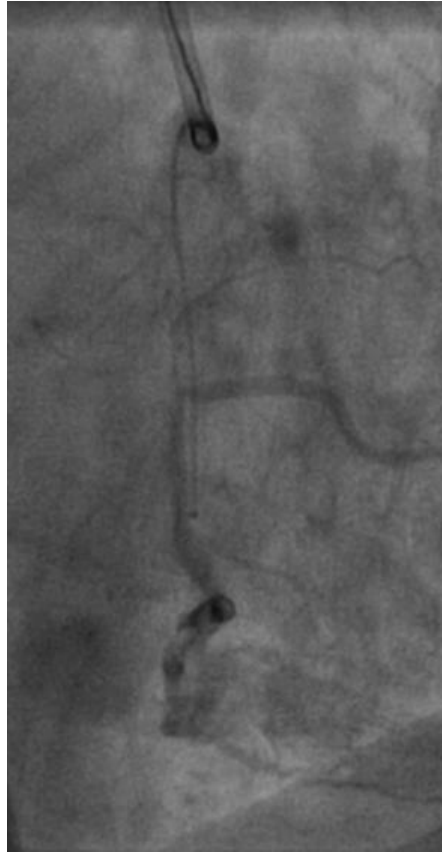




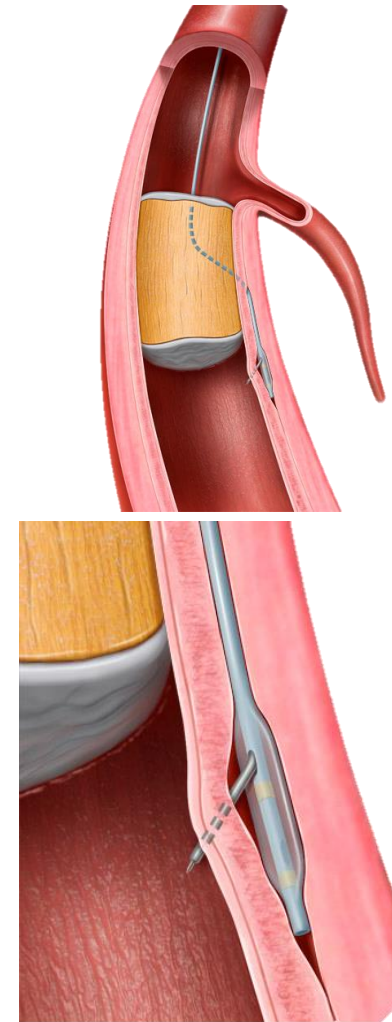
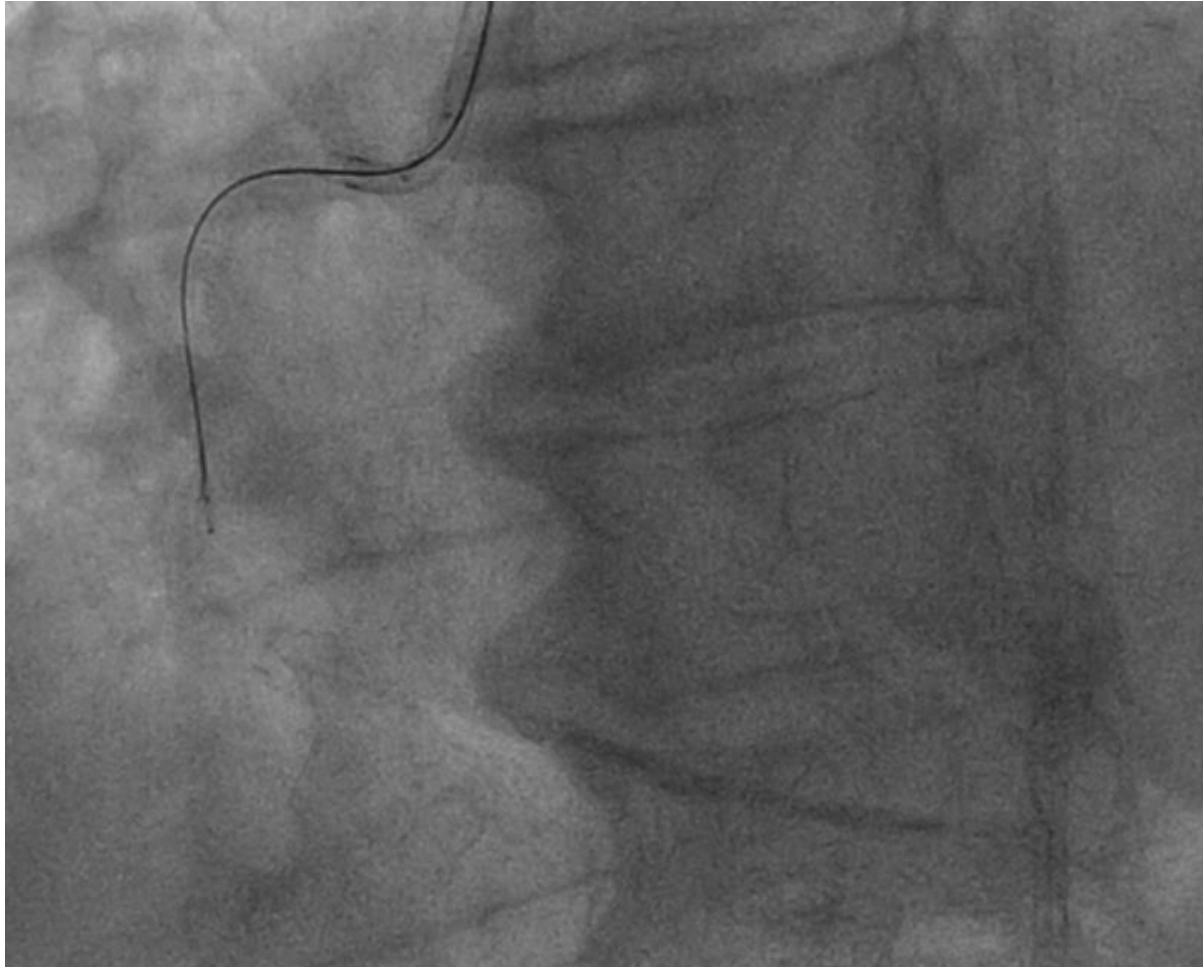
# Dissection réentrée antérograde



# Dissection réentrée antérograde



# Dissection réentrée antérograde



# Dissection réentrée antérograde

