GESTION DES COMPLICATIONS

Perforation distale

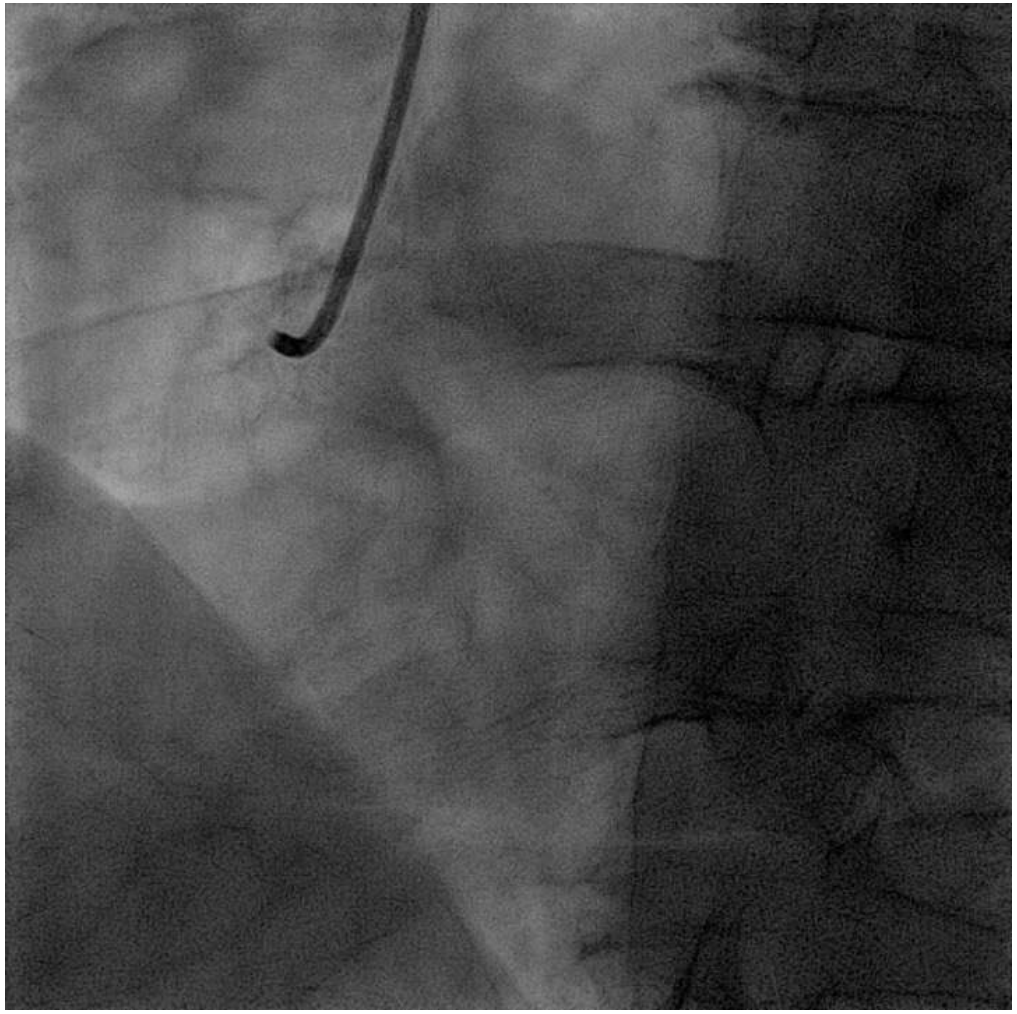
Olivier Muller, Lausanne, Suisse

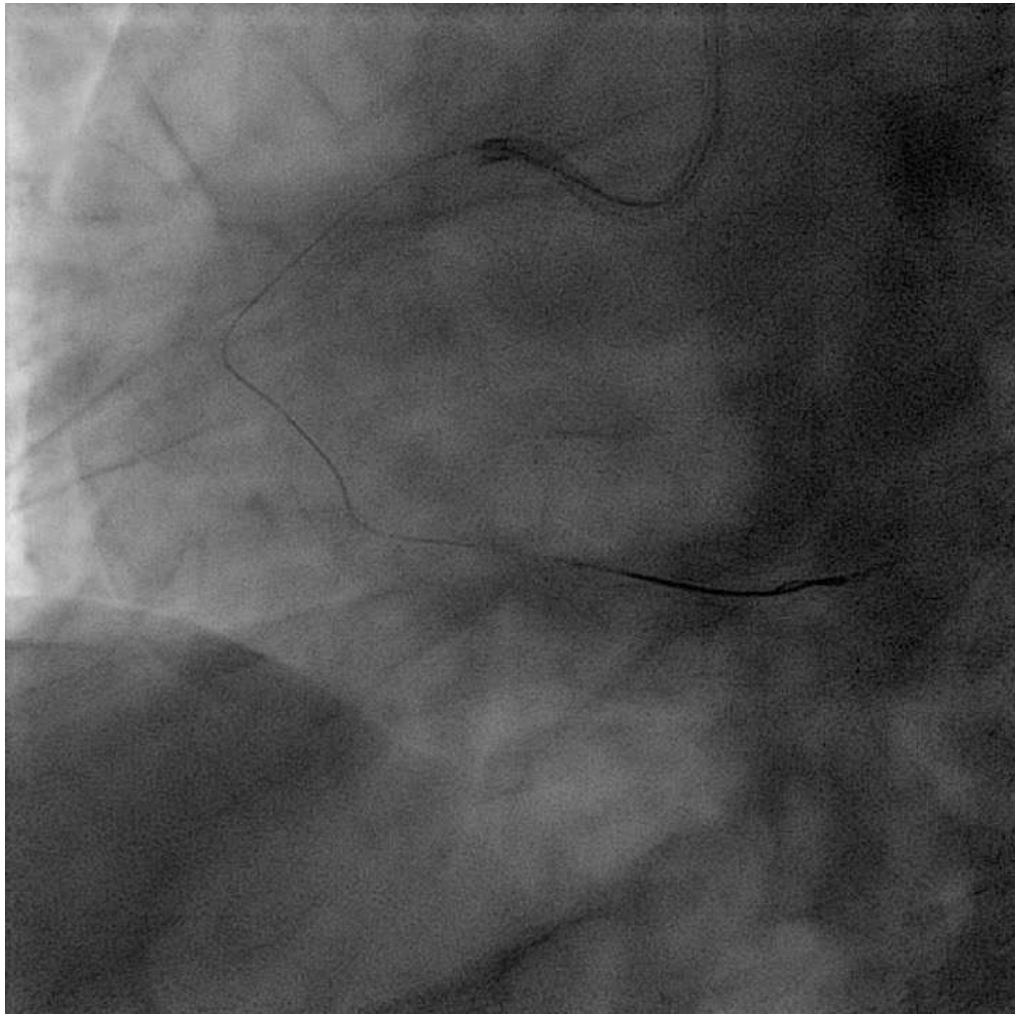
Les différents type de perforations

TYPE I	TYPE II	TYPE III	TYPE IV	TYPE V
EPICARDIAL SEGMENT	EPICARDIAL SEGMENT	EPICARDIAL SEGMENT	EPICARDIAL SEGMENT	DISTAL SEGMENT
Extraluminal crater without jet extravasation	Pericardial or myocardial blushing without jet extravasation	Active jet extravasation Exit jet > 1mm	Cavity spilling	Distal perforation

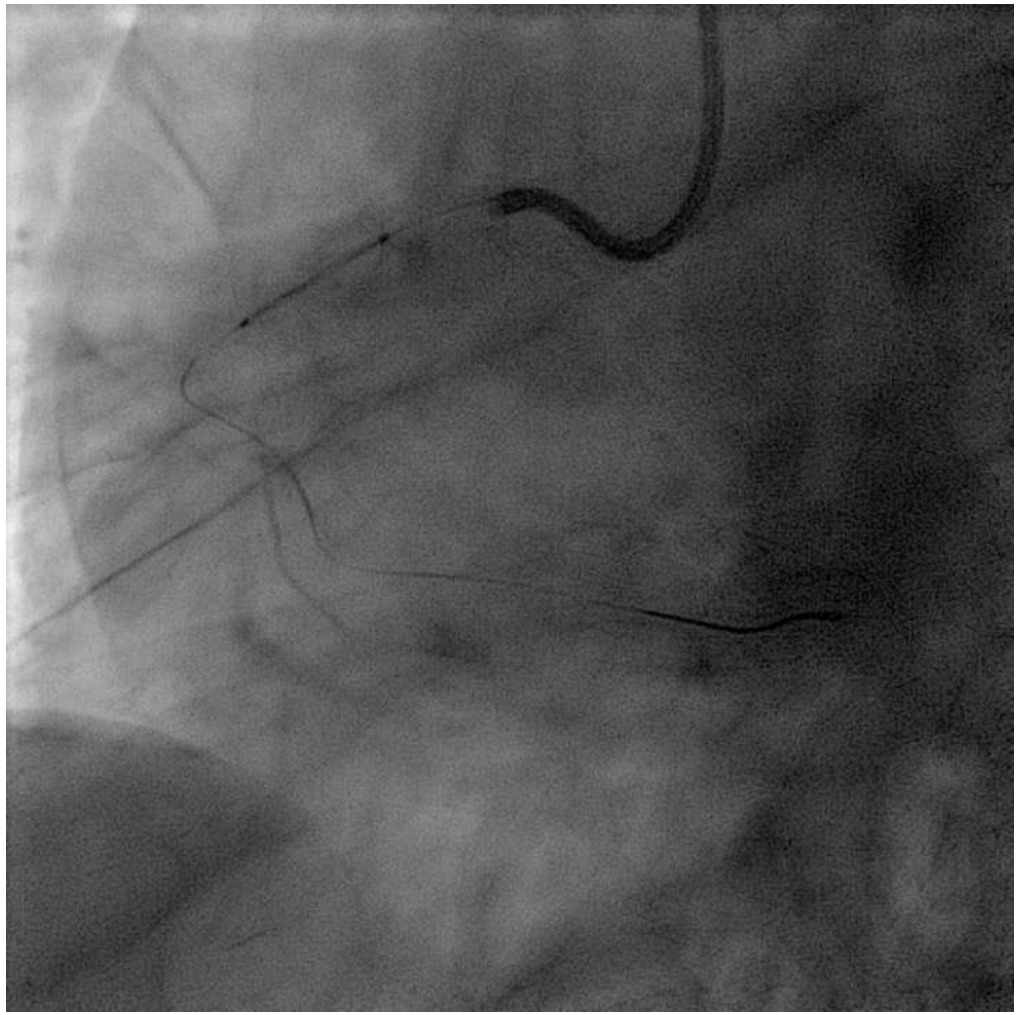
Muller, Cuisset, Eurointervention, 2008

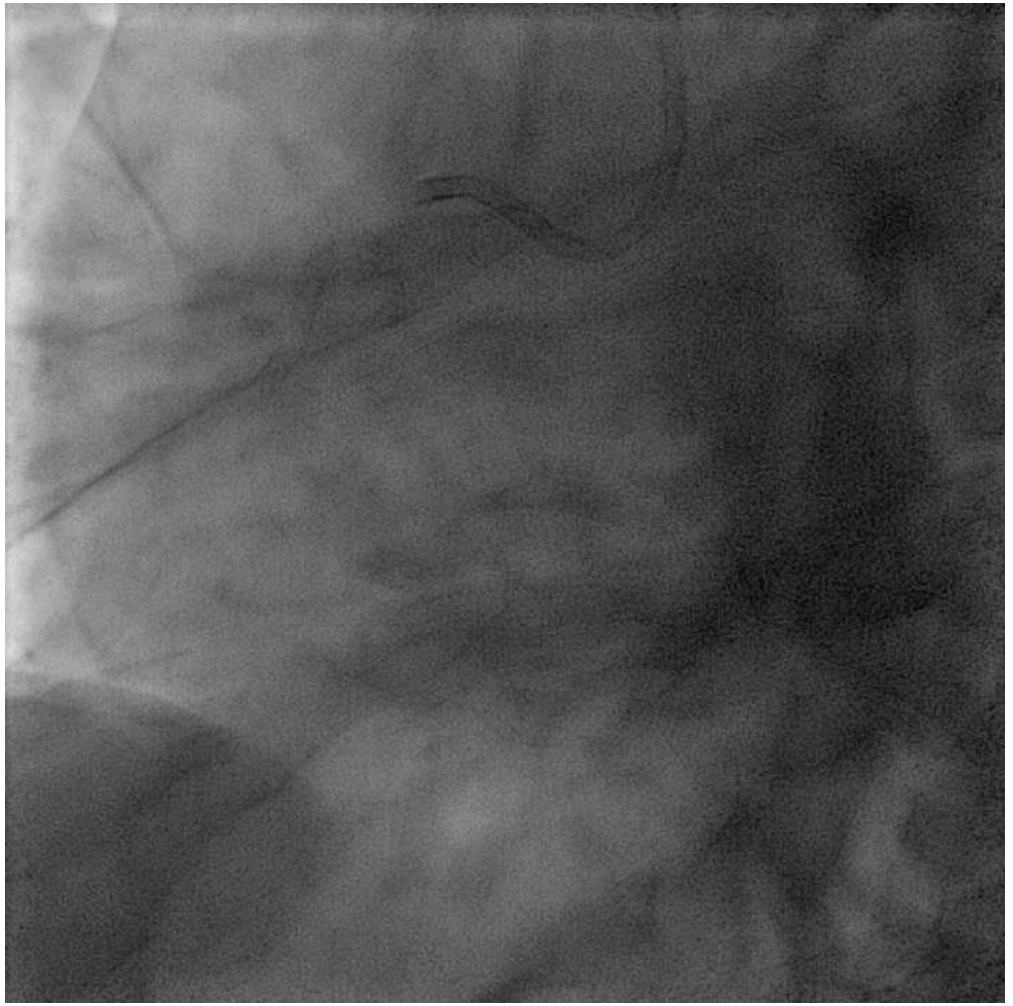
A propos d’un cas





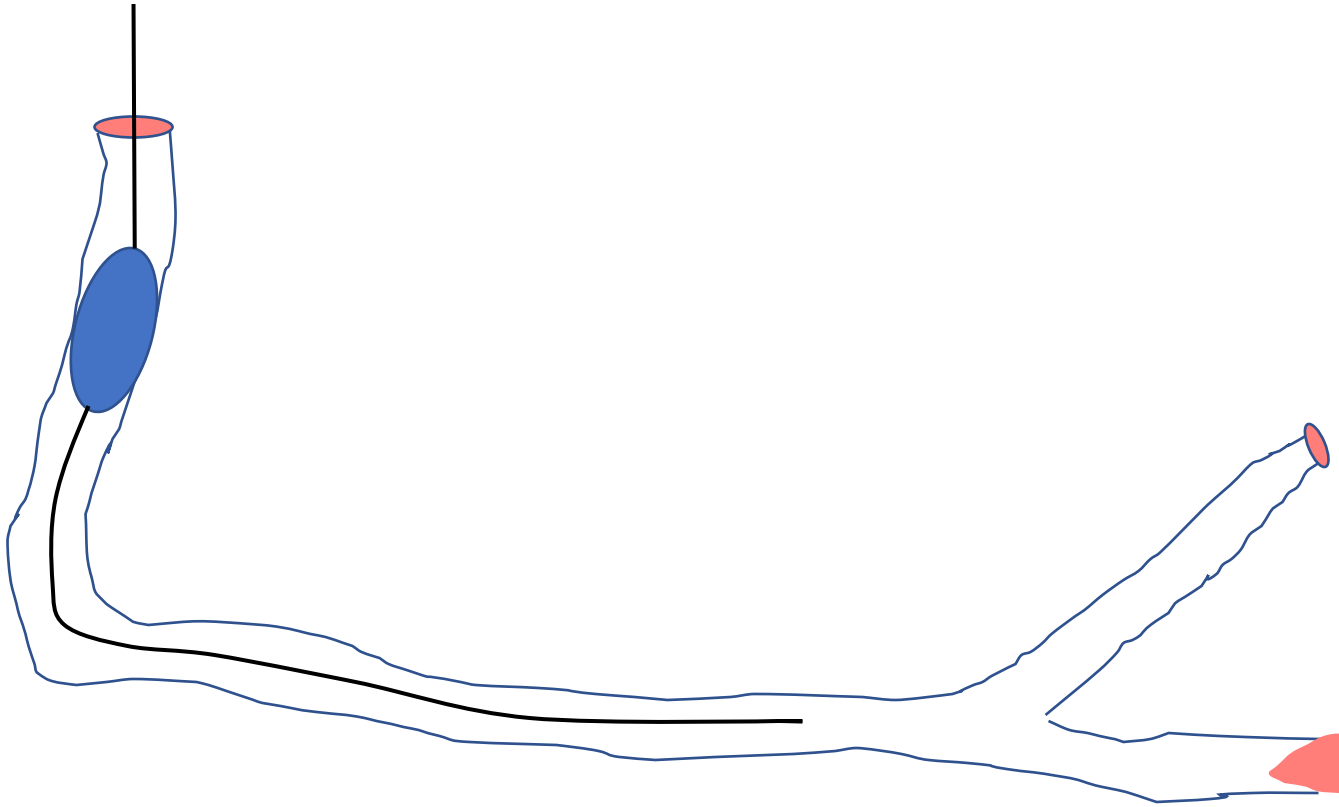
A propos d’un cas





1ère réaction = 4 actions

1. Gonfler un ballon en amont

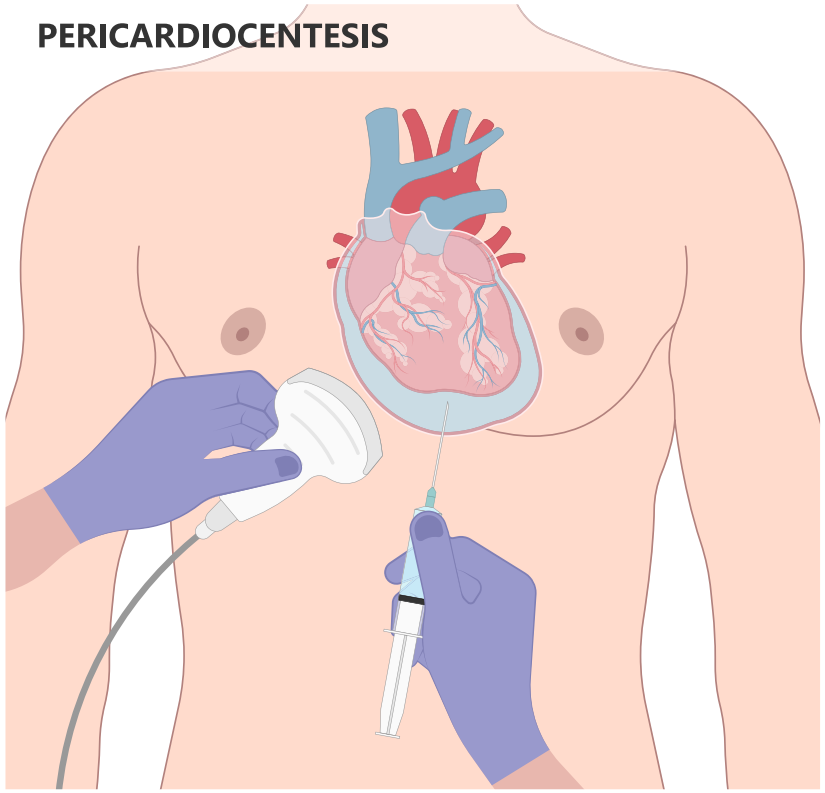


2. Avertir un chirurgien cardiaque

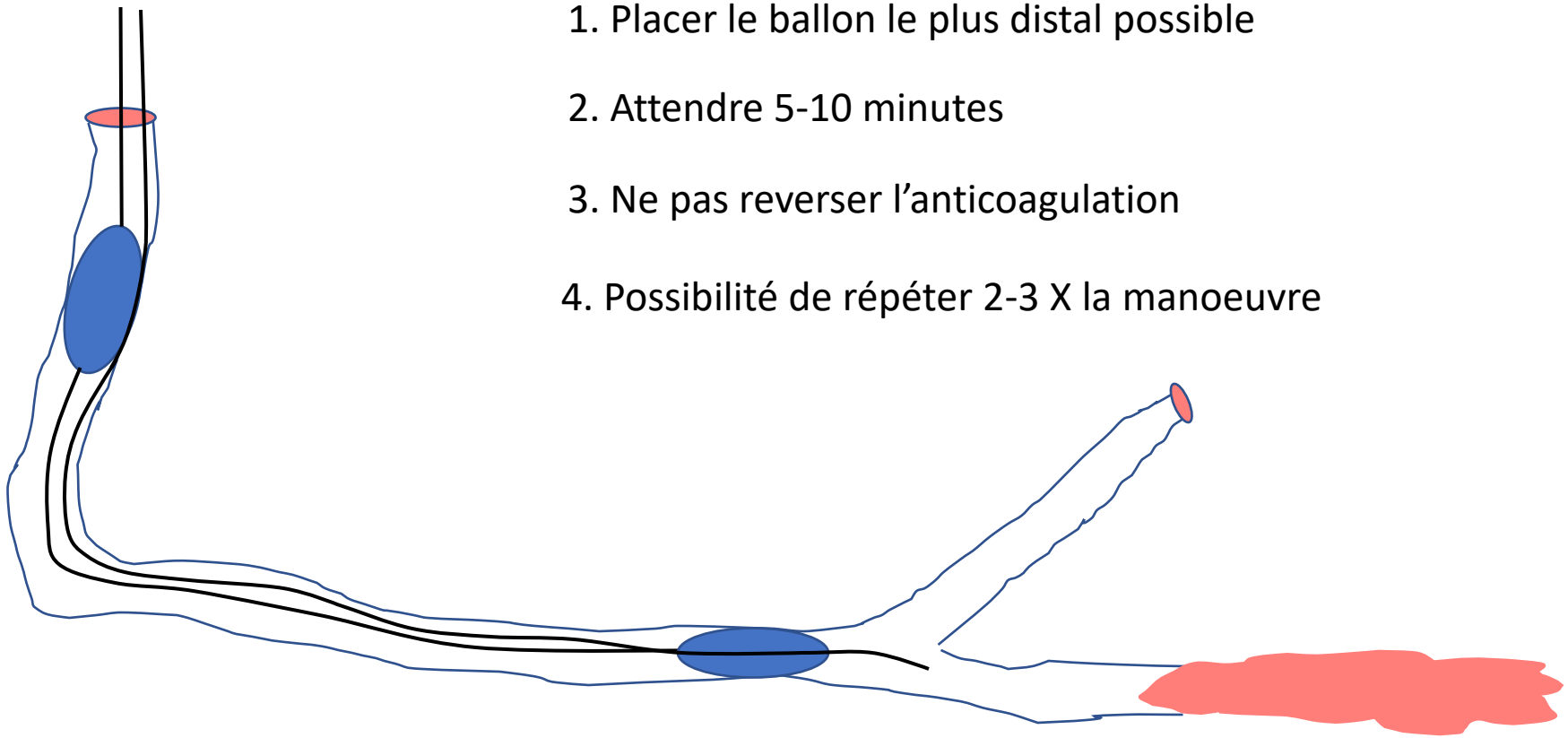
1ère réaction = 4 actions

3. Vérifier le status hémodynamique

4. Faire une écho



2ème réaction



1. Placer le ballon le plus distal possible
2. Attendre 5-10 minutes
3. Ne pas reverser l'anticoagulation
4. Possibilité de répéter 2-3 X la manoeuvre

Traiter la perforation = dispositif d'embolisation

Dispositif dédié

- Coils
- Thrombin
- Microparticule
- Cover stent (side branch)
- Etc…

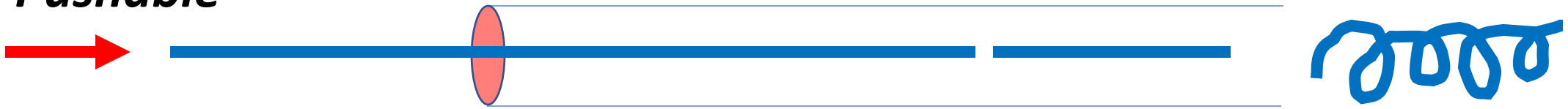
Dispositif « maison »

- Graisse sous-cutanée
- Thrombus
- Ballon coupé
- Fil de suture
- Etc…

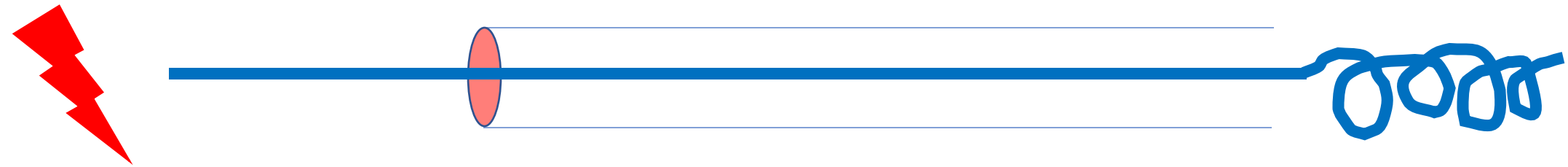
→ Coils détachable = positionnement contrôlable

Coils: « pushable versus detachable »

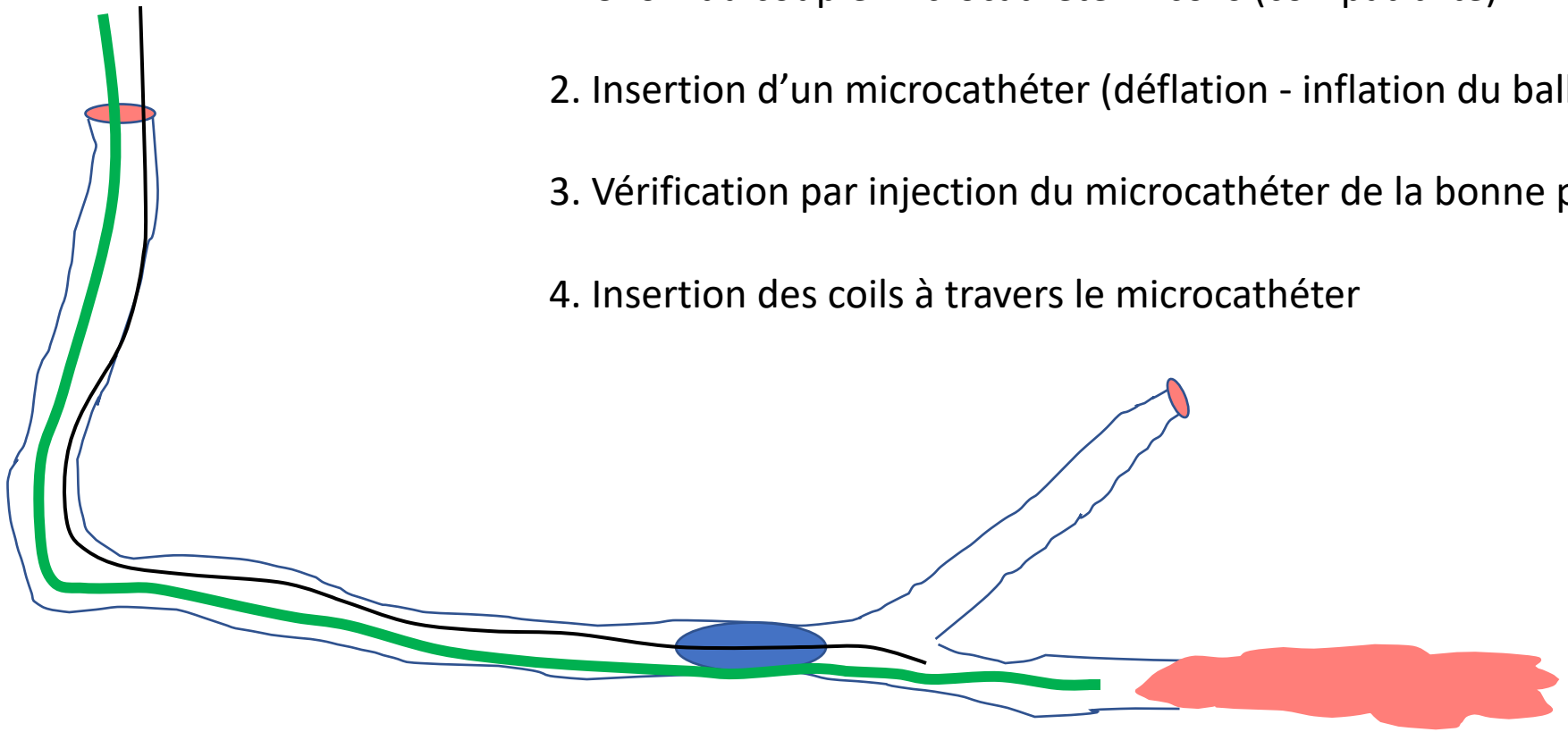
Pushable



Detachable



Coils



1. Choix du couple microcathéter – coils (compatiblité)
2. Insertion d’un microcathéter (déflation - inflation du ballon)
3. Vérification par injection du microcathéter de la bonne position
4. Insertion des coils à travers le microcathéter

Coils

Manufacturer	Microcatheter	Length (cm)	District	Max O.D. (Fr/mm)	I.D. (inch)	Embolic compatibility	BMT compatibility (Fr)
Stryker Neurovascular	EXCELSIOR SL10	150	Neuro	2.4/0.79	0.0165″	≤0.014″	≥**6**
	EXCELSIOR XT17	150	Neuro	2.4/0.80	0.017″	≤0.014″	≥**6**
	EXCELSIOR 1018	150	Neuro	2.6/0.87	0.019″	≤0.018″	≥**6**
Cordis	RAPID TRANSIT	70/150/170	Multidistrict	2.8/0.93	0.021″	≤0.018″	≥**7**
Terumo	PROGREAT	110/130/150	Multidistrict	2.9/0.97	0.022″	≤0.018″	**8**
	FINECROSS	130/150	Cardio	2.4/0.79	0.018″	≤0.014″	≥**6**
Asahi	CORSAIR	135/150	Cardio	2.8/0.93	0.015″	≤0.014″	≥**7**
	STRIDESMOOTH	125/150	Multidistrict	2.8/0.94	0.022″	≤0.018″	≥**7**
Volcano	VALET	135/150	Cardio	2.4/0.76	0.018″	≤0.014″	≥**6**
Imds	NHANCER PRO X	135/155	Cardio	2.6/0.87	0.015″	≤0.014″	≥**6**
Vascular Solution	TURNPIKE	135/150	Cardio	3.1/1.02	0.018″	≤0.014″	**8**

O.D: outer diameter; I.D: inner diameter; BMT: balloon-microcatheter technique and compatibility with guiding catheter diameter (French).

Garbo, CCI, 2018

Insertion d’un coil

Coils

TABLE 1. MOST-USED NEUROVASCULAR COILS COMPATIBLE WITH 0.014-INCH MICROCATHETERS				
Coil Name	**Manufacturer**	**Diameter (inch)**	**Description**	**Detachment System**
Axium detachable coil	Medtronic	0.018-0.010	Bare platinum coil with or without PGLA or nylon microfilaments enlaced through the coil	Mechanical
HydroCoil embolic system (HES)	MicroVention Terumo	0.018-0.010	Bare platinum coil combined with an expanding hydrogel polymer	Thermomechanical
MicroPlex coil system (MCS)			Bare platinum coil with various shapes and softness profiles	Thermomechanical
Target detachable coil	Stryker	0.010	Bare platinum coil with various shapes and softness profiles	Electromechanical

Coils

Received: 22 May 2020 | Revised: 30 September 2020 | Accepted: 26 October 2020
DOI: 10.1002/ccd.29381

ORIGINAL STUDIES

WILEY

EDITORIAL COMMENT: Expert Article Analysis for:
When and how to close vessels in the cardiac catheterization laboratory

Utilization and outcomes of transcatheter coil embolization for various coronary artery lesions: Single-center 12-year experience

Omar M. Abdelfattah MD[1,2] | Anas M. Saad MD[1] | Nicholas Kassis MD[3] | Shashank Shekhar MD[1] | Toshiaki Isogai MD, MPH[1] | Mohamed M. Gad MD[3] | Keerat R. Ahuja MD[3] | Essa Hariri MD[3] | Manpreet Kaur MD[1] | Medhat Farwati MD[3] | Jaikirshan Khatri MD[1] | Amar Krishnaswamy MD[1] | Samir R. Kapadia MD[1]

[1]Department of Cardiovascular Medicine, Heart and Vascular Institute, Cleveland Clinic Foundation, Cleveland, Ohio
[2]Department of Internal Medicine, Morristown Medical Center, Atlantic Health System, Morristown, New Jersey
[3]Department of Internal Medicine, Cleveland Clinic Foundation, Cleveland, Ohio

Correspondence
Samir R. Kapadia, Chair, Department of Cardiovascular Medicine, Heart and Vascular Institute, Cleveland Clinic Foundation, 9500 Euclid Avenue, J2-3, Cleveland, OH 44195.
Email: kapadis@ccf.org

Abstract

Objective: Determining the outcomes of transcatheter coil embolization (TCE) for several coronary artery lesions.

Background: TCE has been used as a treatment modality for various lesions in the coronary circulation. However, data on the efficacy and safety of TCE to treat coronary artery fistula (CAF), left internal mammary artery (LIMA) side-branch, coronary artery perforation (CAP), coronary artery aneurysm (CAA), and coronary artery pseudoaneurysm (CAPA) are limited.

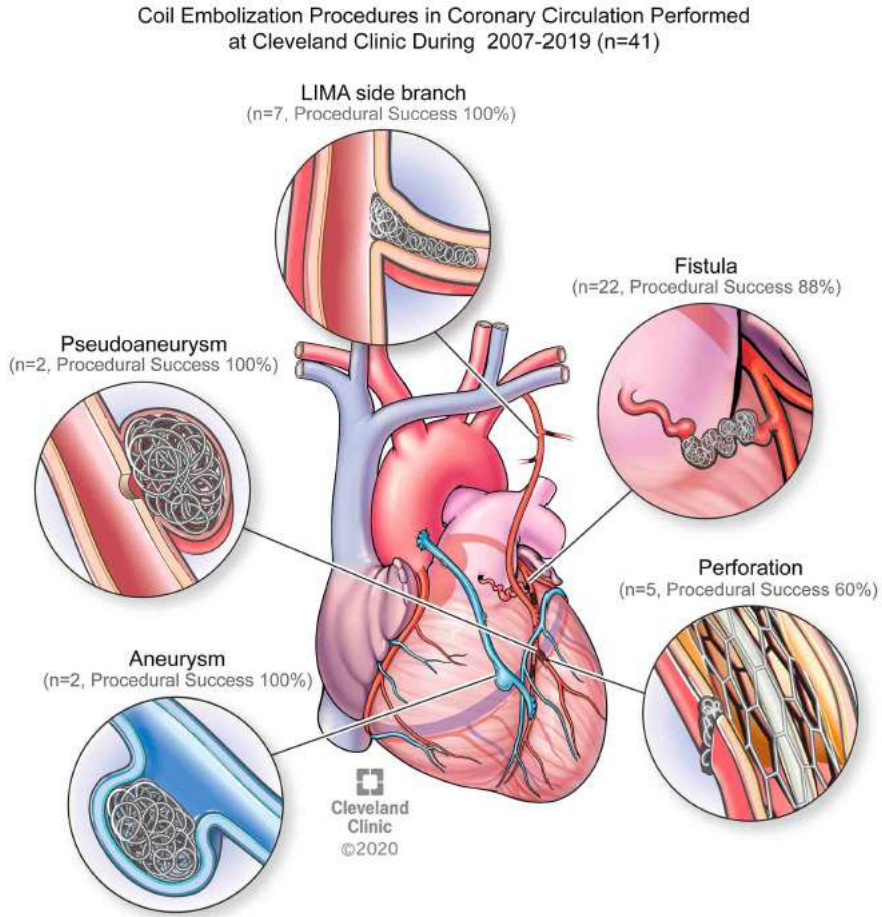
Methods: We conducted a retrospective, descriptive analysis of all TCE devices in coronary lesions at our center from 2007 to 2019. Forty-one studied lesions included 25 CAF, 7 LIMA side-branch, 5 CAP, 2 CAA, and 2 CAPA. Short- and 1-year mortality and hospital readmission were reported, in addition to coil-related complications and procedural success.

Results: The utilization rate of TCE in coronary artery lesions at our center was found to be 33.8 per 100,000 percutaneous coronary intervention procedures over 12 years. Successful angiographic closure was achieved in 37 out of 41 (87.8%) cases (88, 100, 60, 100, and 100% of CAF, LIMA side-branch, CAP, CAA, and CAPA, respectively). No adverse events were directly related to TCE among the LIMA, CAA, and CAPA cases, and only one patient with CAF required reintervention at 3 months due to coil migration.

Conclusions: Coil embolization in our institution was safe and effective in treating different coronary circulation abnormalities with a 87.8% overall success rate. Further study on the use of vascular plug devices in cases such as CAF or LIMA side-branch would be beneficial to understand the treatment options better.

Abbreviations: CAA, coronary artery aneurysm; CAF, coronary artery fistula; CAP, coronary artery perforation; CAPA, coronary artery pseudoaneurysm; LIMA, left internal mammary artery; TCE, transcatheter coil embolization.

 © 2020 Wiley Periodicals LLC.



Coils: « pushable et detachable »

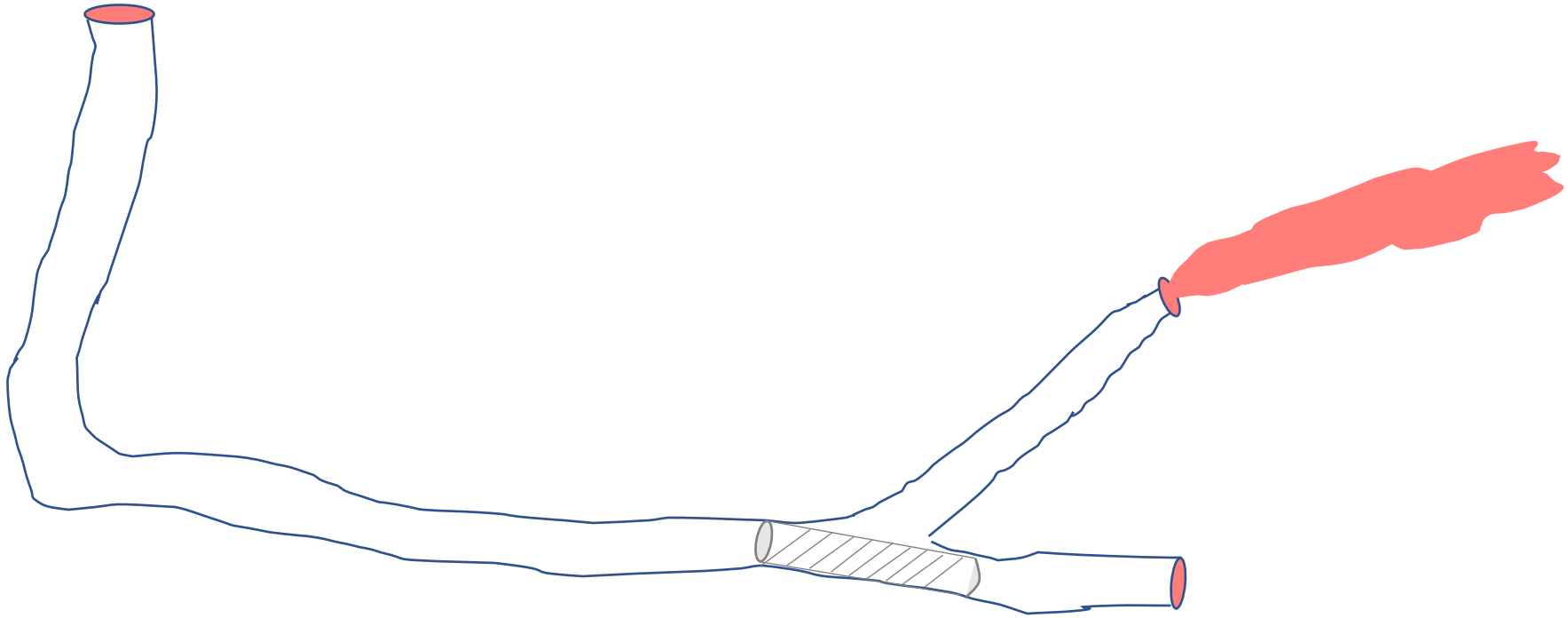
Coils

Product name	Brand	Type (detachable, pushable)	Material	Coil diameter (cm)	Coil length (cm)	Recommended delivery catheter size (ID) (inch)	Use FDA indicated	Key characteristics
Nester Embolization Coil 	Cook Medical	Pushable	Platinum	4, 6, 8, 10, 12, 14, 16, 18, 20	7, 14, 20	0.035	Arterial and venous embolization in the peripheral vasculature	• Fully fibered to promote thrombogenicity. • Can be used alone or in combination with other pushable and detachable embolization coils.
Retracta Detachable Embolization Coil	Cook Medical	Detachable	Platinum	4, 6, 8, 10, 12, 14, 16, 18, 20	7, 14	0.035	Arterial and venous embolization in the peripheral vasculature	• Completely repositionable with fully retractable design. • Fully fibered to promote thrombogenicity. • Can be used with other fibered pushable coils such as nester embolization coils, and tornado embolization coils
Azur CX Peripheral Coil.035 System 	Terumo Interventional Systems	Detachable	Platinum and hydrogel	4, 5, 6, 8, 10, 13, 16, 20	7, 9, 11, 12, 17, 19, 24, 32, 39	0.038–0.047	Intended to reduce or block the rate of blood flow in vessels of the peripheral vasculature; it is intended for use in the interventional radiologic management of AVMs, AVFs, aneurysms, and other lesions of the peripheral vasculature via establishing the base and filling space.	• Anchor (for more control in high flow areas) • Hydrogel induce neointima growth with hydrogel technology • Minimal landing zone requirements • Minimal catheter manipulation • High cross-sectional coverage
Azur Peripheral Framing Coil Embolization Detachable .018 System 	Terumo Interventional Systems	Detachable	Platinum	8, 10, 14, 20	20, 26, 34, 50	0.021–0.027	Establishes the base in arterial and venous vessel embolization in the peripheral vasculature	• Prevents migration through keeping additional coils added inside • Balanced distribution of coils at intended segment for embolization • Provides greater coverage

Coils

Product name	Brand	Type (detachable, pushable)	Material	Coil diameter (cm)	Coil length (cm)	Recommended delivery catheter size (ID) (inch)	Use FDA indicated	Key characteristics
Azur Peripheral Framing Coil Embolization Detachable .035 System 	Terumo Interventional Systems							
Azur Peripheral HydroCoil Embolization Pushable .035 System 	Terumo Interventional Systems	Pushable	Platinum and hydrogel	4, 5, 6, 8, 10, 15	4, 6, 10, 14, 20	0.038–0.047	Filling the space in arterial and venous vessel embolization in the peripheral vasculature	• 4–5 times expansion from original size with blood achieving large filling volume • May reduce rate of recanalization via induced tissue proliferation • Cost saving/procedure by fewer coils for desired filling volume • Reduced reliance on thrombus for embolization
Azur Peripheral HydroCoil Embolization Detachable .018 System 	Terumo Interventional Systems	Pushable	Platinum and hydrogel	2, 3, 4, 5, 6, 8, 10	2, 4, 6, 10, 14, 20	0.021–0.027		
Tornado Embolization Microcoil 	Cook Medical	Pushable	Platinum	3–2, 4–2, 5–2, 6–2, 7–3, 8–4, 10–4	2–14.2	0.018	Arterial and venous embolization in the peripheral vasculature	• Fully fibered for thrombogenicity • -Can be used alone or in combination with other pushable and detachable embolization coils

Cover stent



Traiter la perforation = dispositif d'embolisation

Dispositif dédié

- Coils
- Thrombin
- Microparticule
- Cover stent (side branch)
- Etc…

Dispositif « maison »

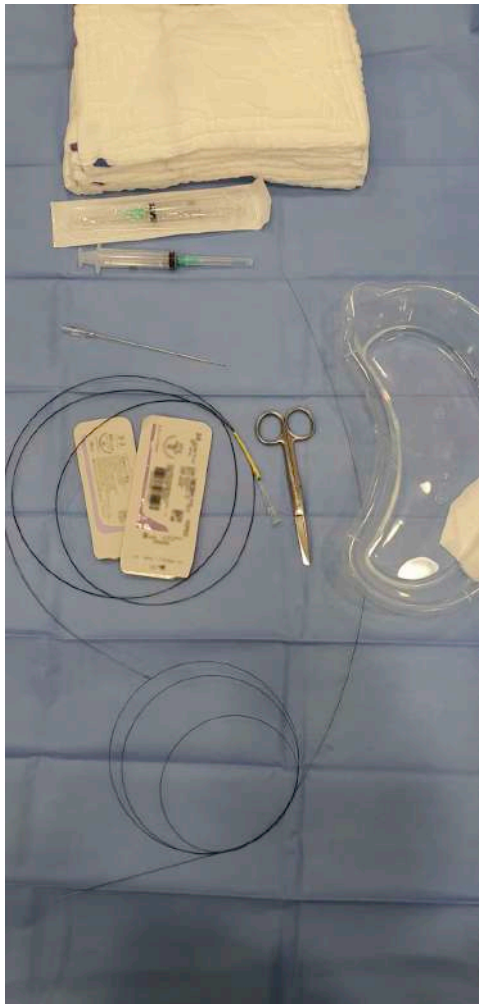
- Graisse sous-cutanée
- Thrombus
- Ballon coupé
- Fil de suture
- Etc…

→ Coils détachable = positionnement contrôlable

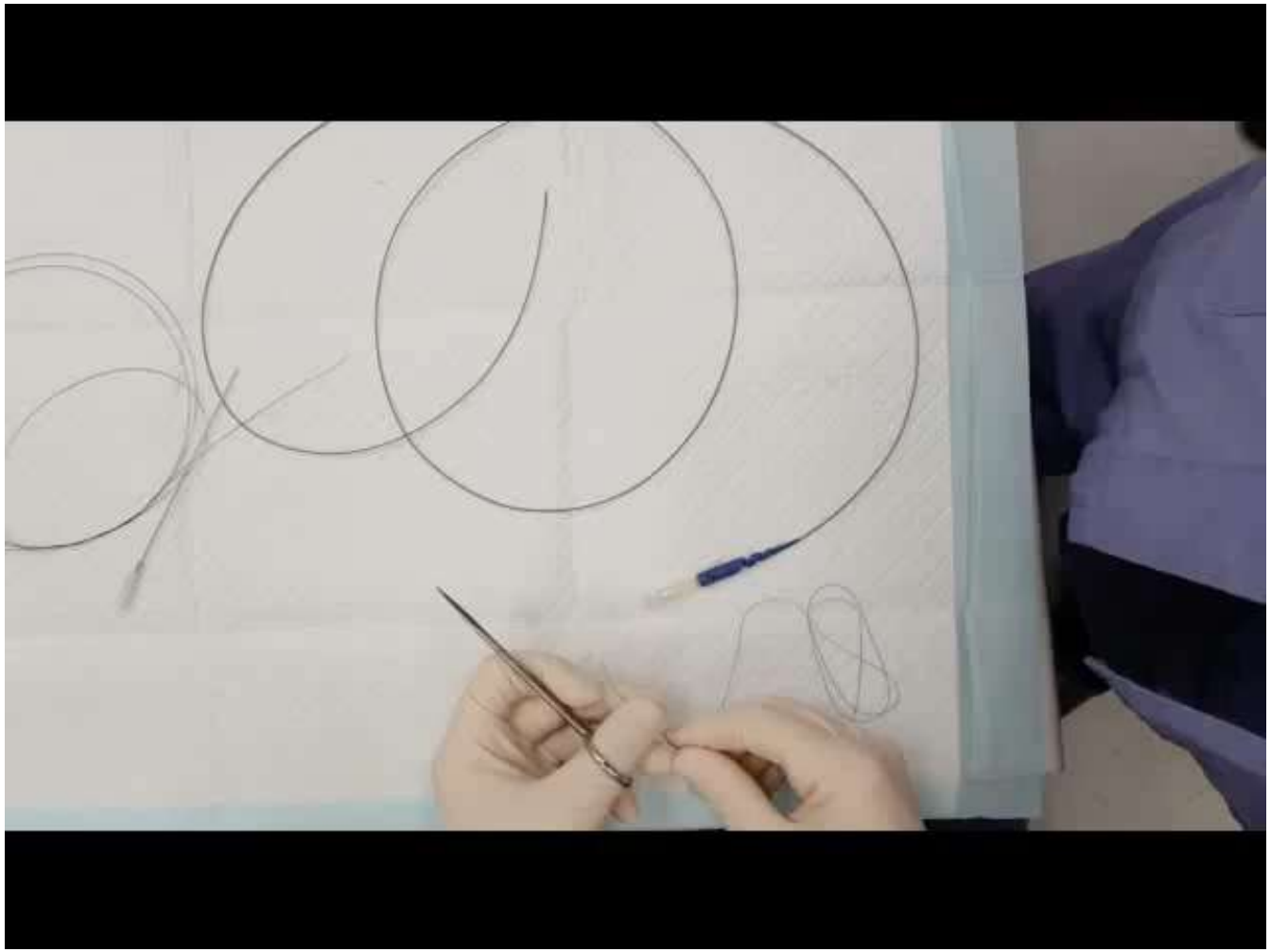
Fat embolization

https://www.youtube.com/watch?v=RWsCcbmQsow

Fil de suture absorbable

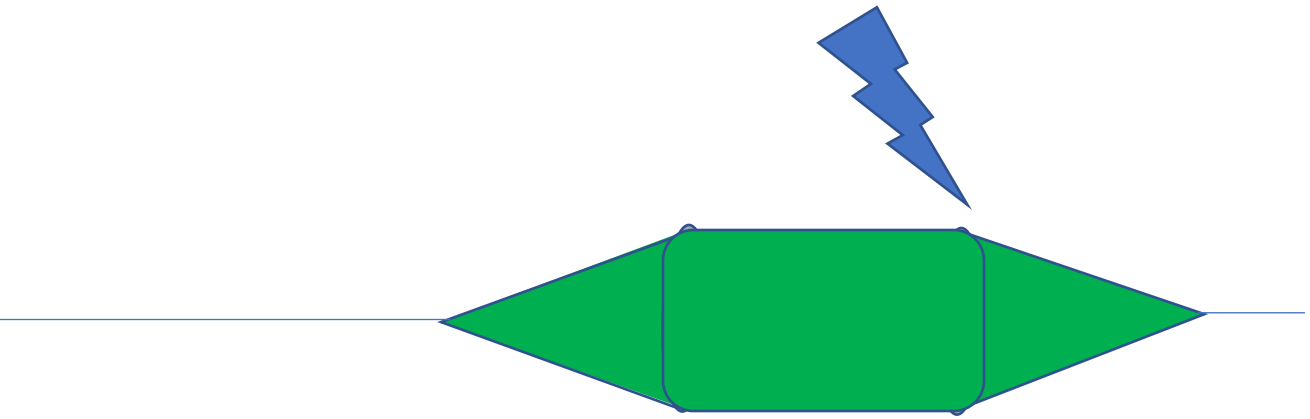


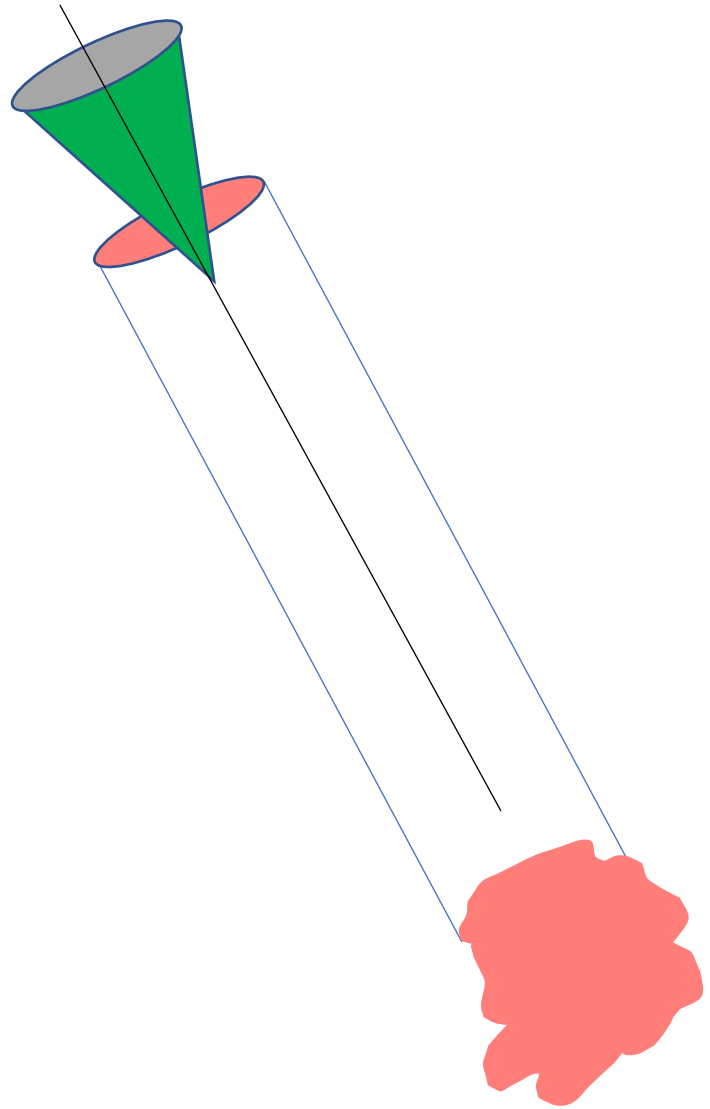
3.0 mm



Al-Omary, JACC case report 2022

Cut Balloon in side branch

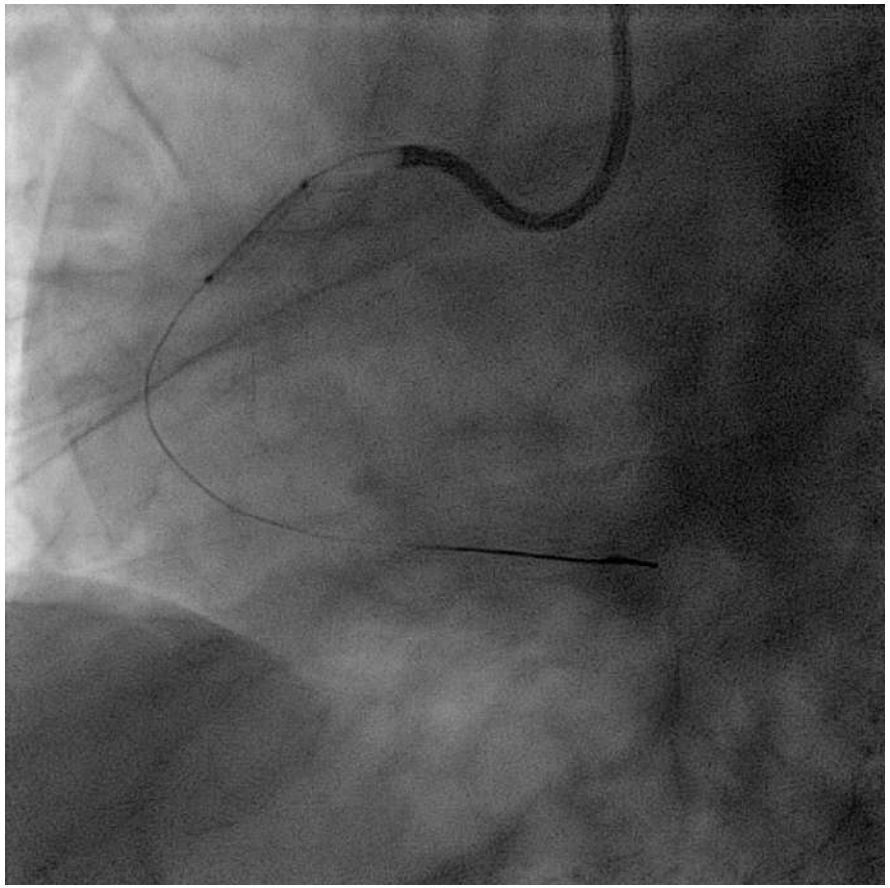




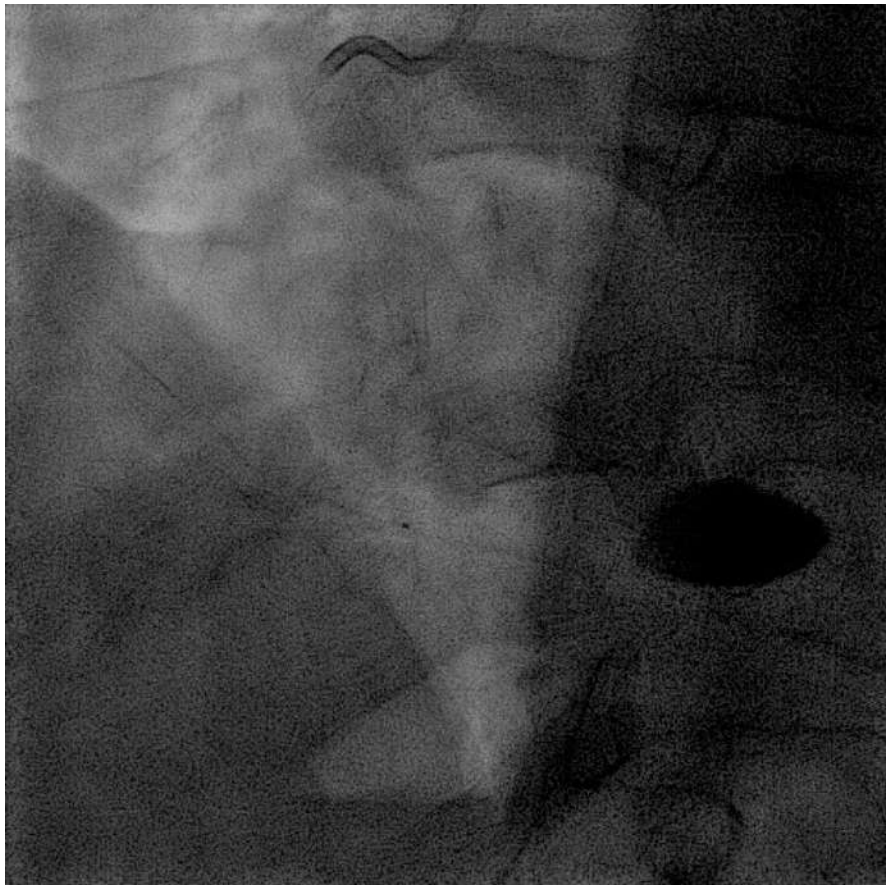
Cut Balloon in side branch

A propos d’un cas

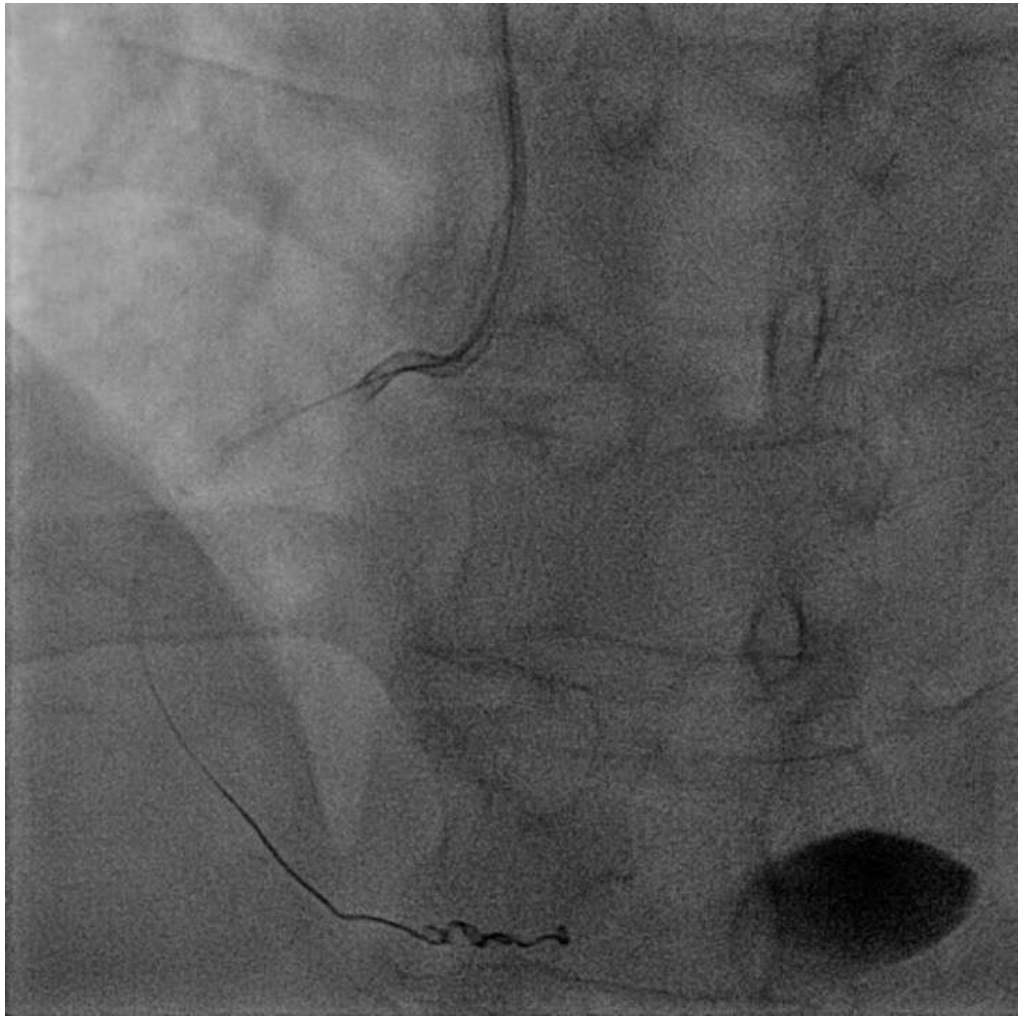
Gonfler un ballon en amont

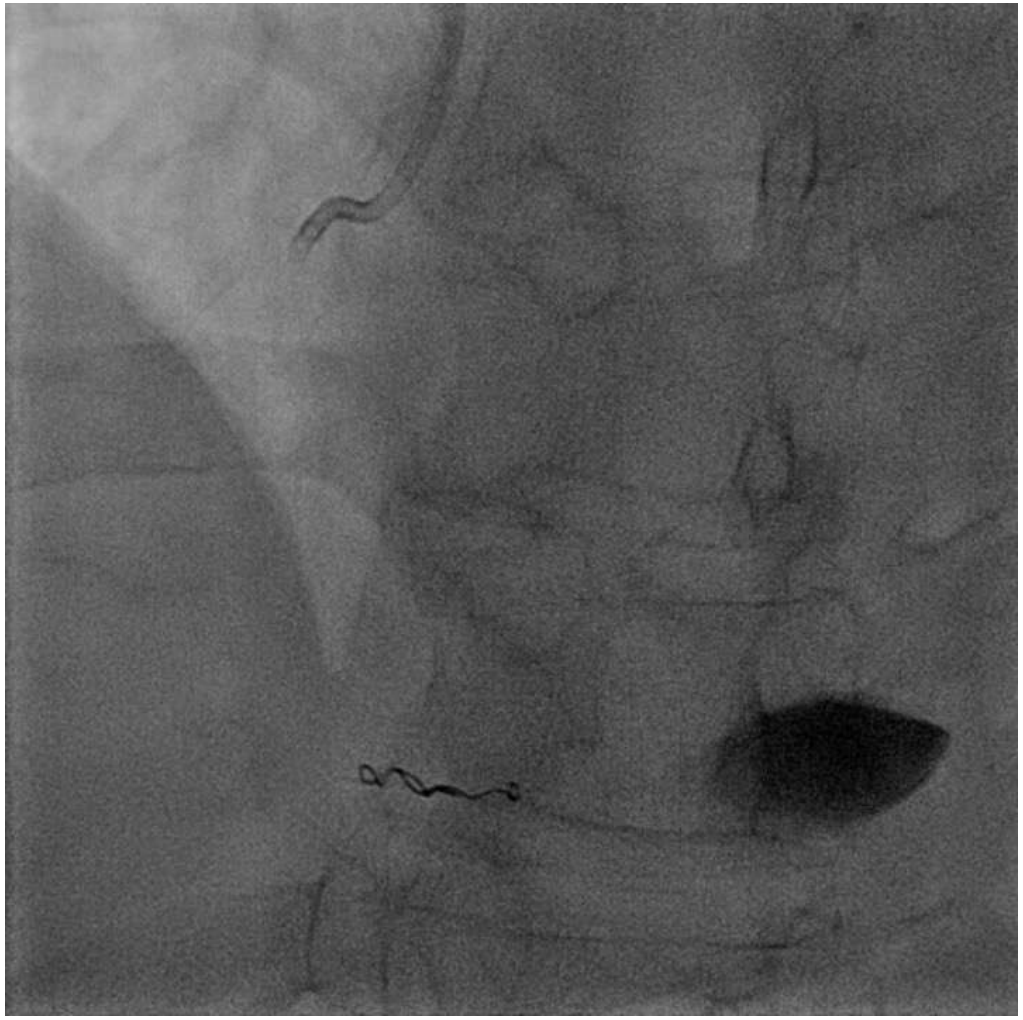


Insertion d’un microcathéter



A propos d’un cas





Take home message

- Prévention
  - Attention aux guides hydrophiliques/ »stiff »
  - Toujours un œil sur la distalité du guide
  - Ciné final long
- Traitement
  - Gonfler un ballon en amont et réfléchissez après
  - Ne reverser pas l'héparine tant que vous avez du matériel à bord
  - Connaissez votre matériel disponible dans vos armoires
  - Méthode dédiée (positionnement réversible)
  - Méthode « maison » graisse, thrombus, fil de suture, ballon coupé etc…
- Pcronline.com section complication