



APPORT IMAGERIE ENDOCORONAIRE DANS LES LÉSIONS CALCIFIÉES

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CHU Clermont-Ferrand



Conflits d'intérêts

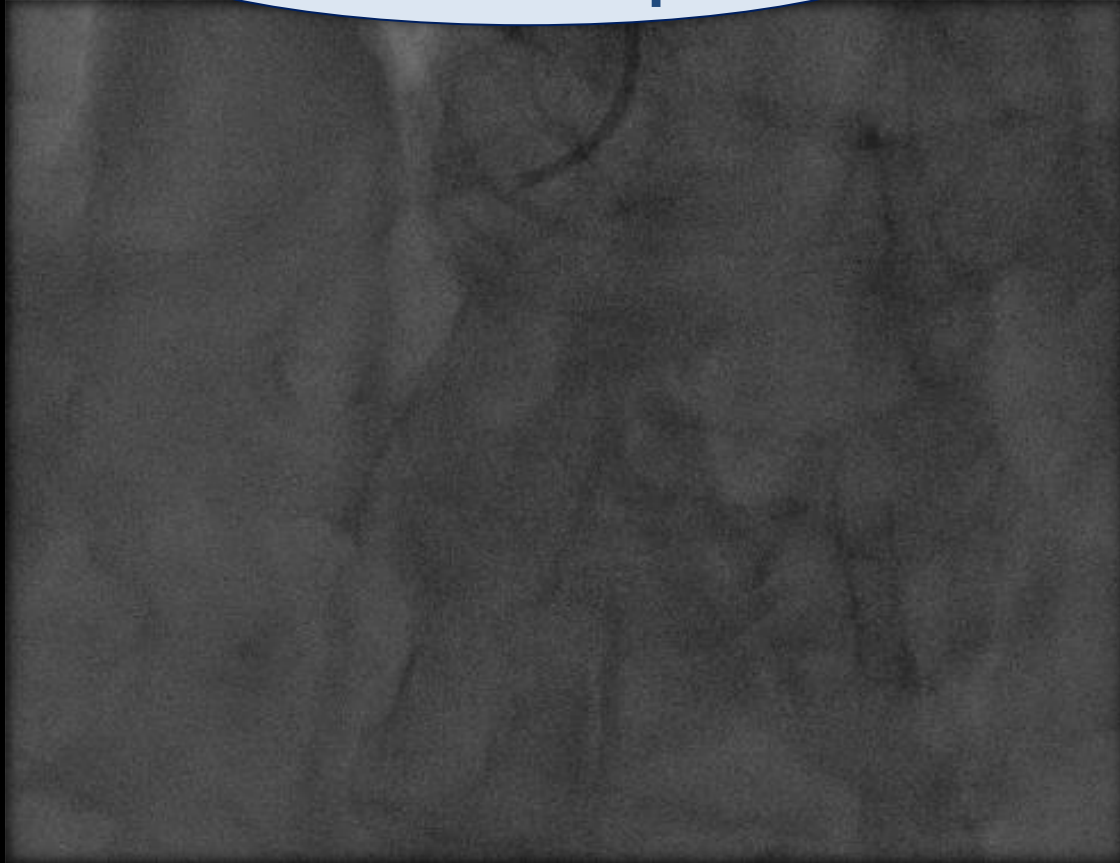
Consultant Terumo, Medtronic, Abbott, B Braun, Schockwave



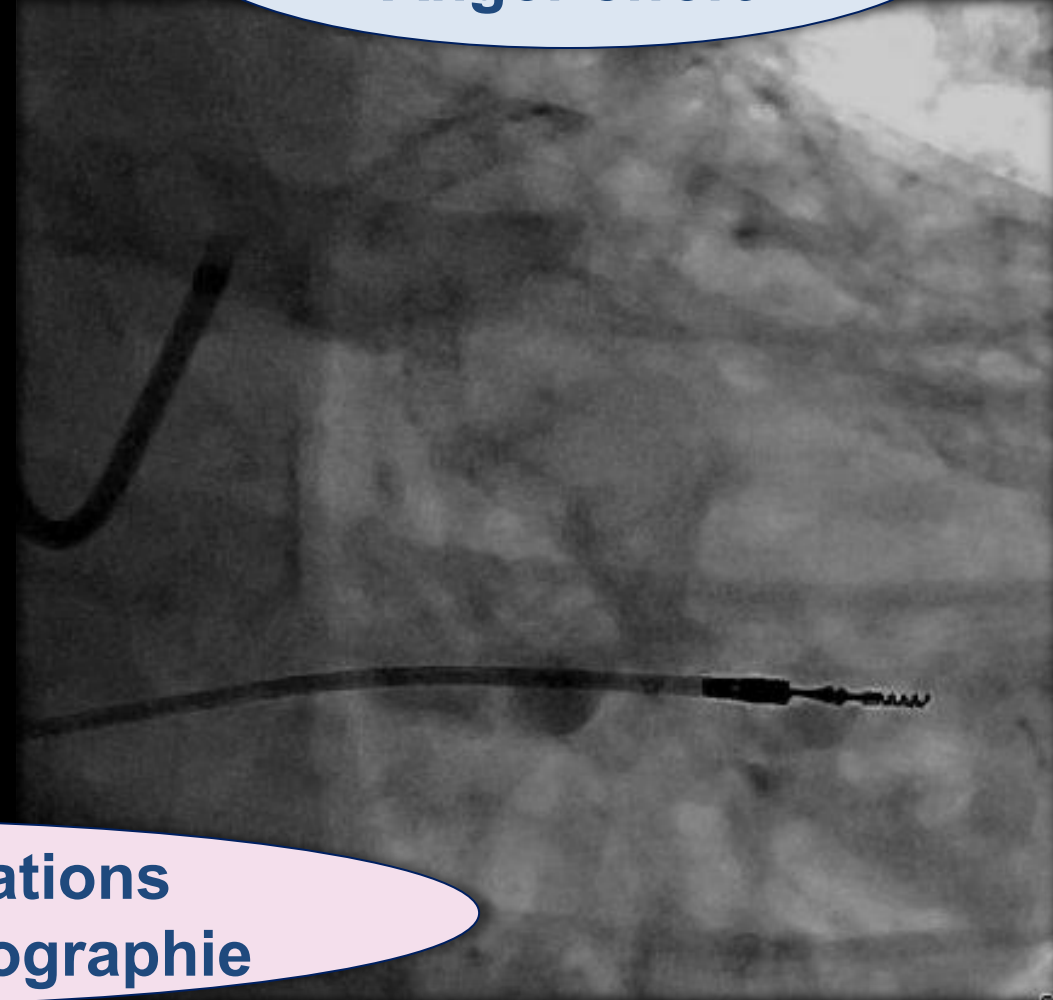
**Pourquoi faire de l'imagerie endocoronaire
dans les lésions calcifiées?**

OCT et lésions calcifiées

Homme 62 ans
Douleurs repos



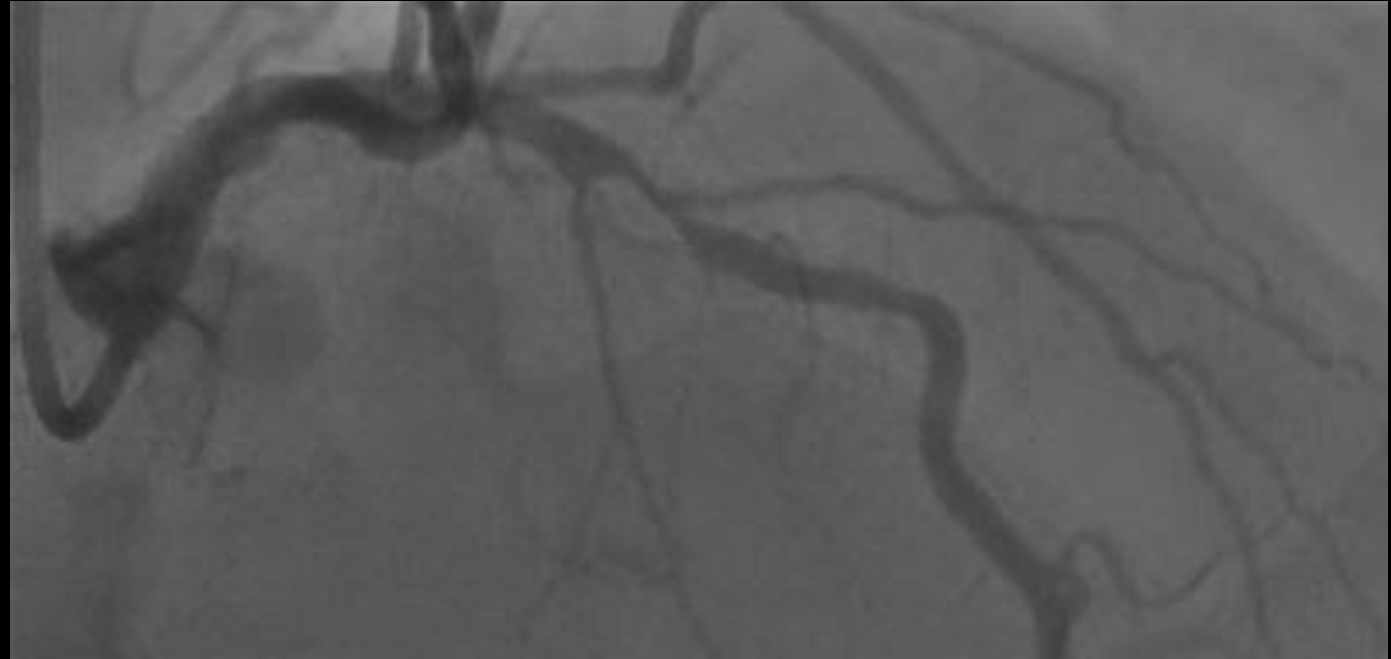
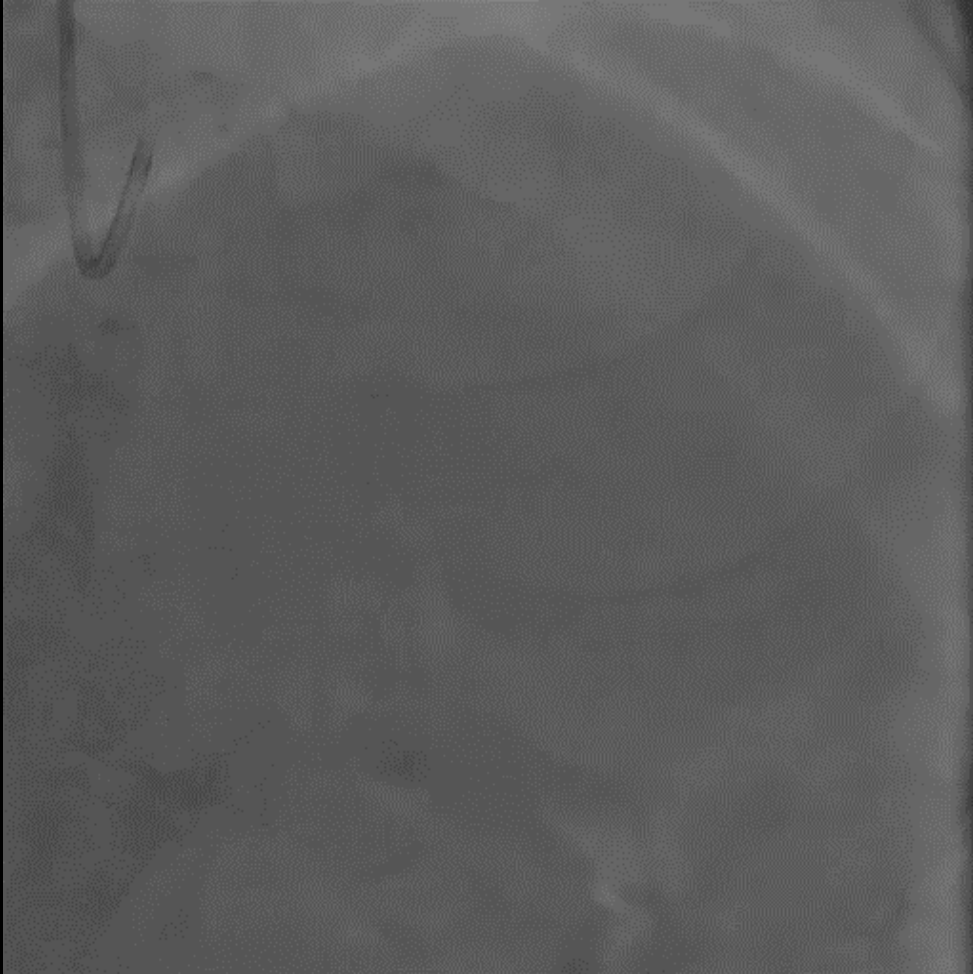
Homme 75 ans
Angor effort



20 à 30 % calcifications
importantes à l'angiographie

OCT et lésions calcifiées

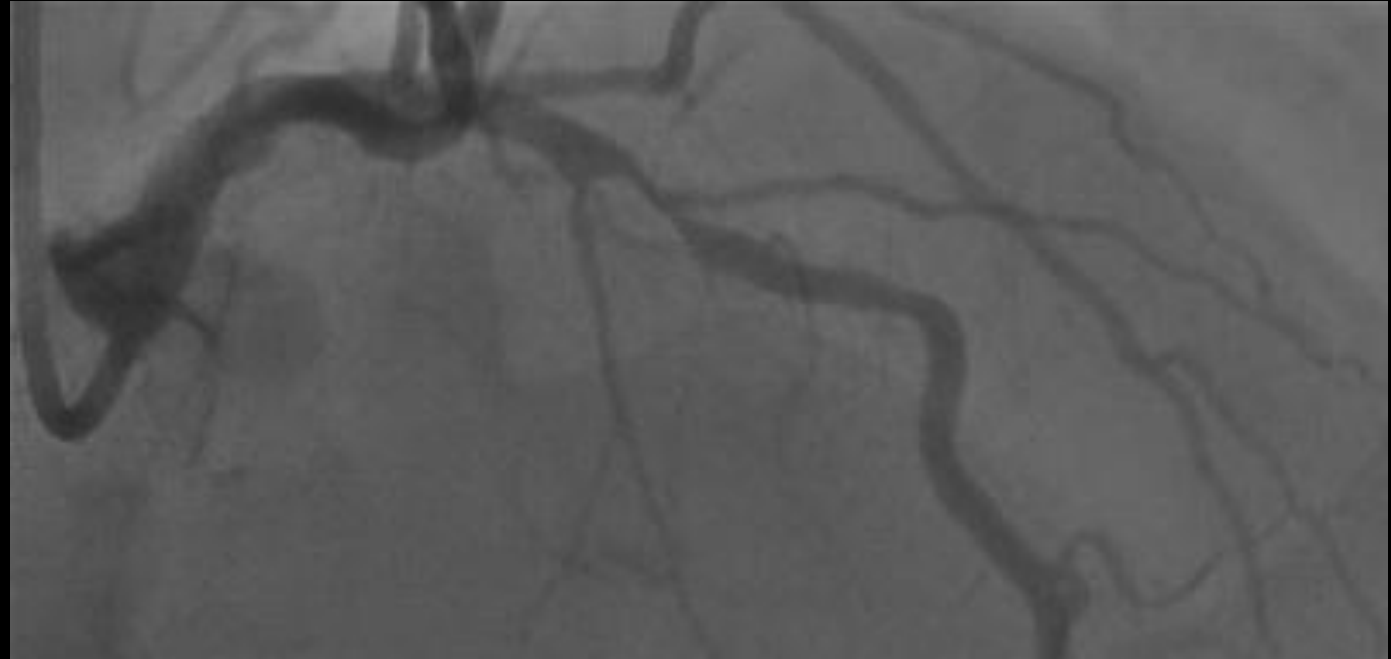
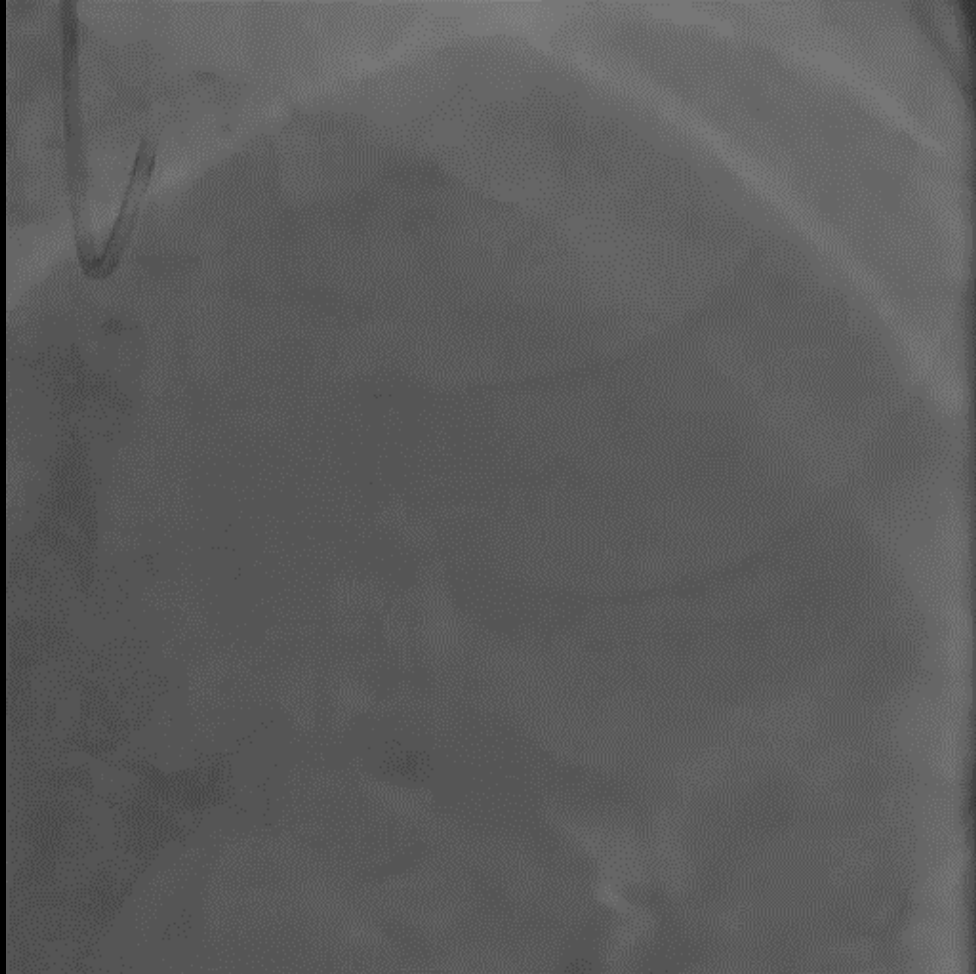
Patient 76 ans
Rao serré
Angor d'effort



Calcifications importantes?

OCT et lésions calcifiées

Patient 76 ans
Rao serré
Angor d'effort

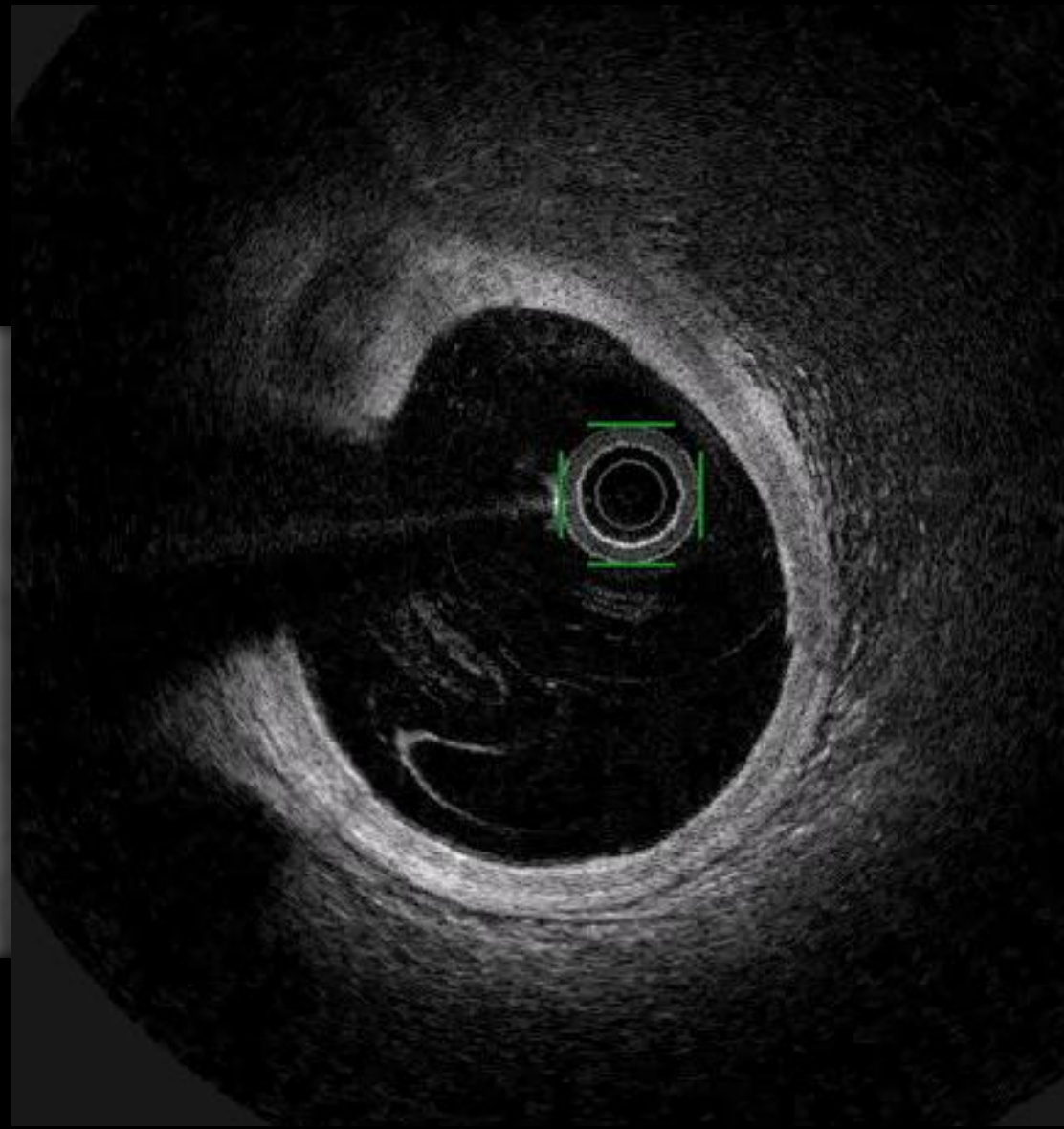


OCT et lésions calcifiées

Inclus dans I care
Groupe Rotablator®



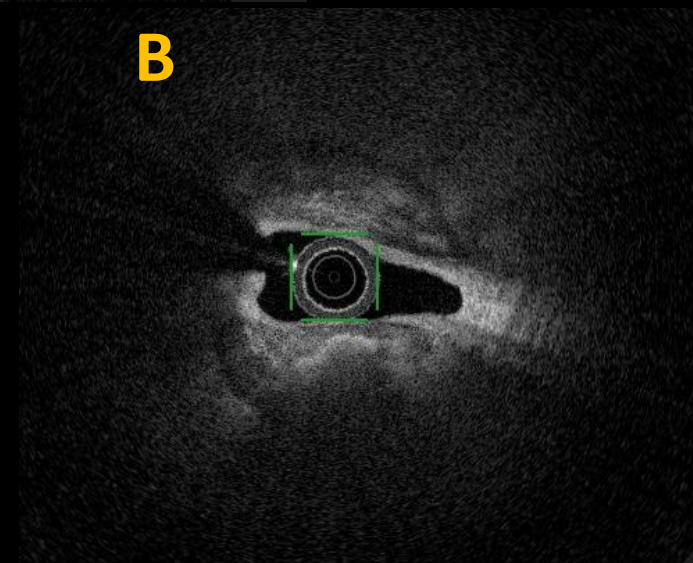
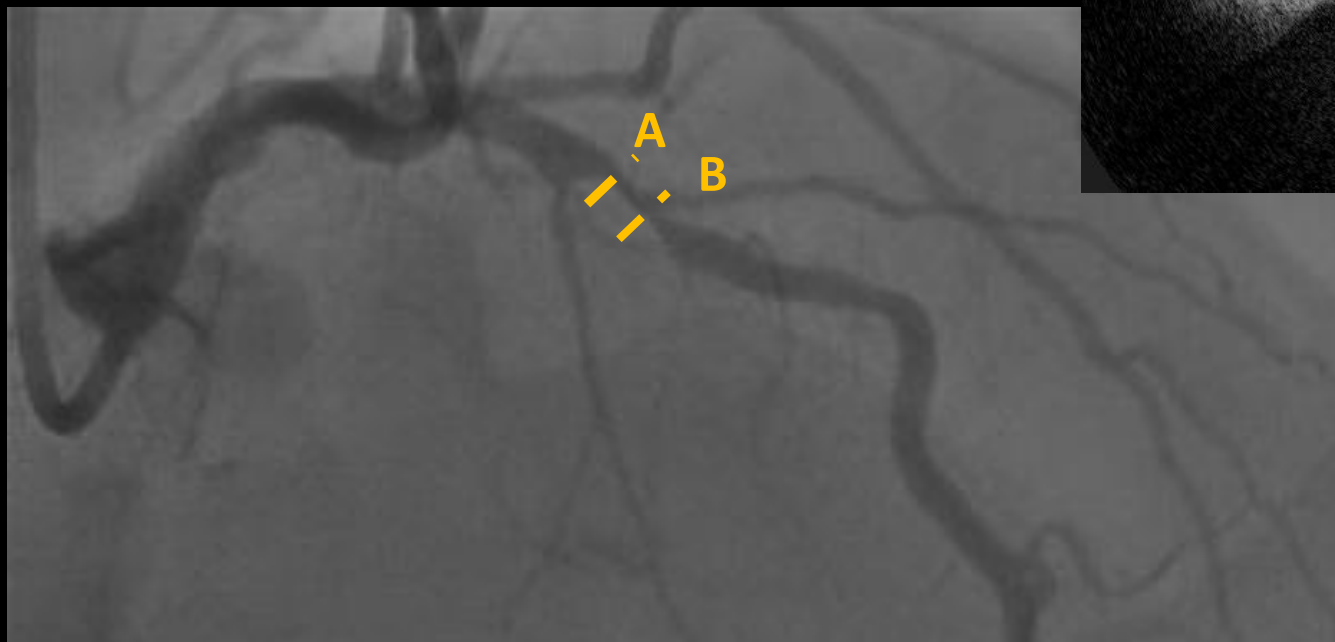
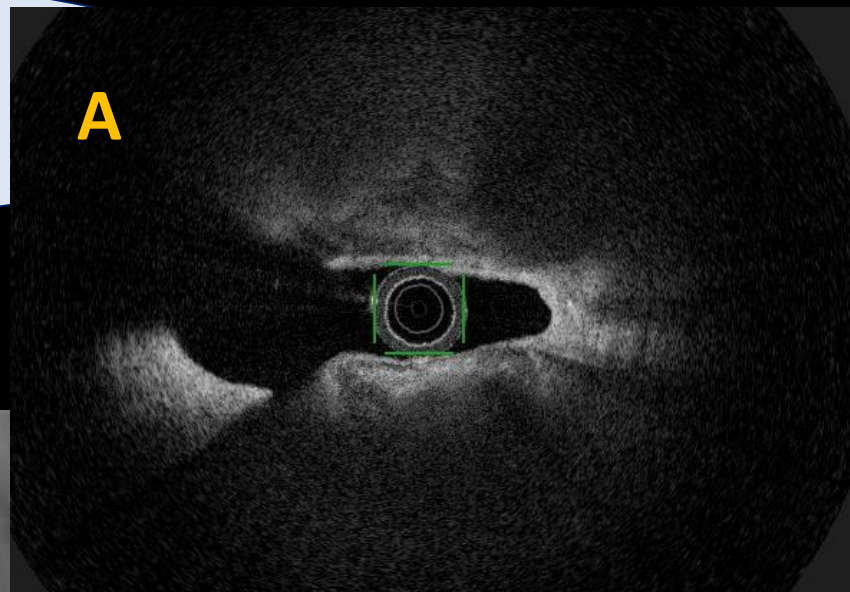
OCT



OCT et lésions calcifiées

OCT

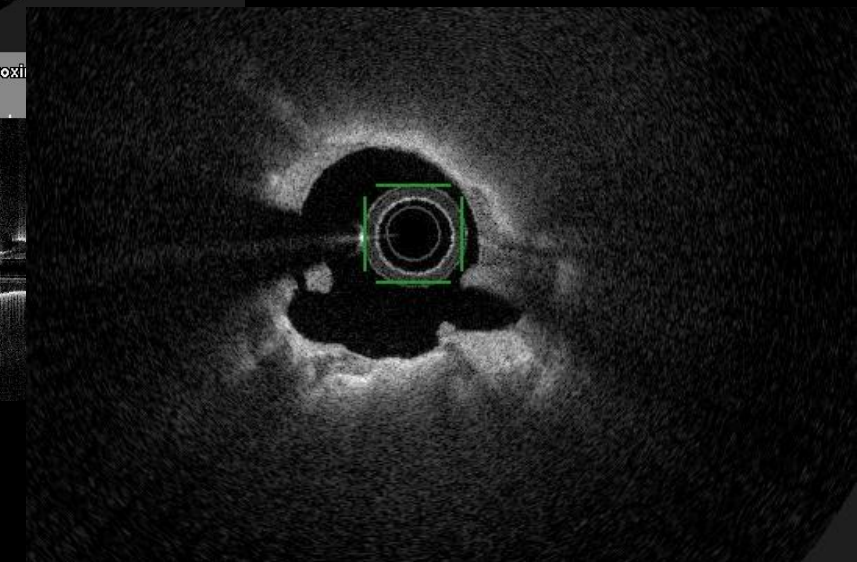
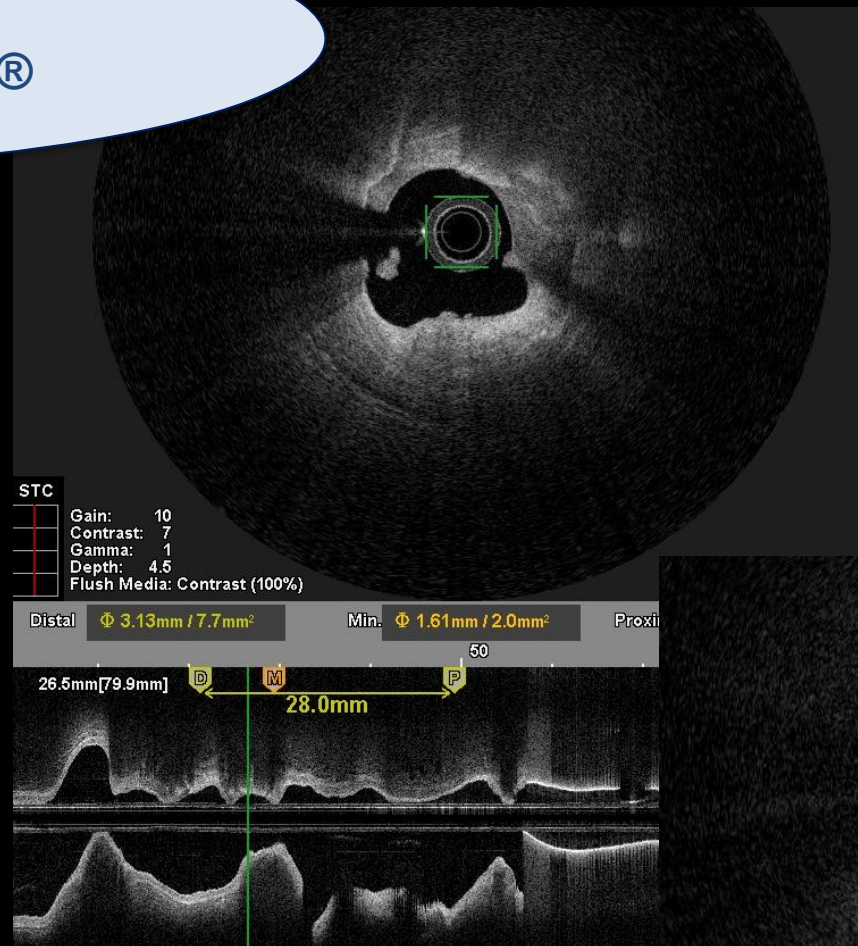
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OCT et lésions calcifiées

OCT

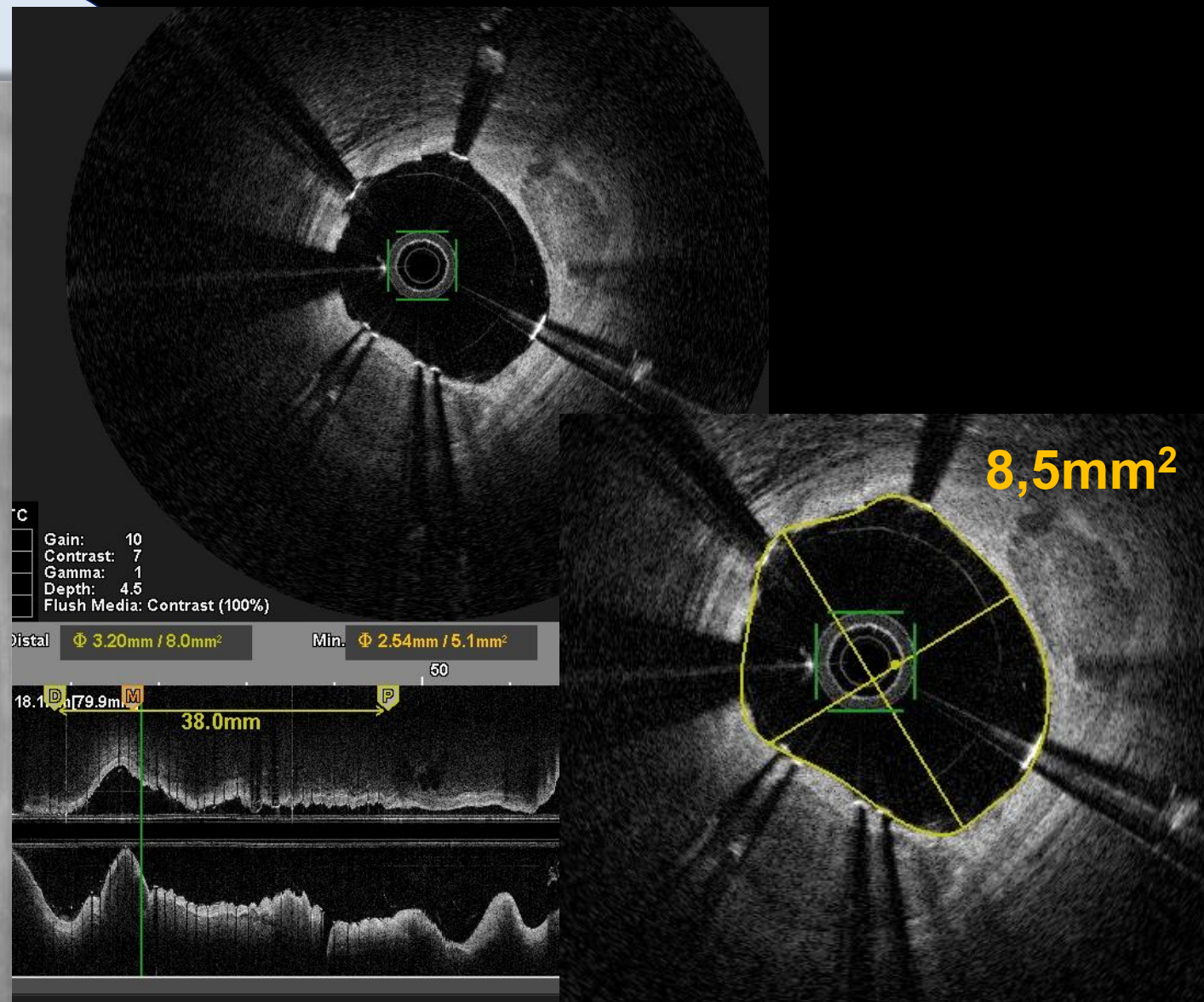
Inclus dans I care
Groupe Rotablator®



OCT et lésions calcifiées

OCT

Résultat post-angioplastie



OCT et lésions calcifiées

Quel risque avec l'angioplastie?

- Revascularisation moins souvent complète
- Plus de mort subite dans les suites (10.8 vs 4.4%)
- ↑ risque thrombose de stent ou resténose

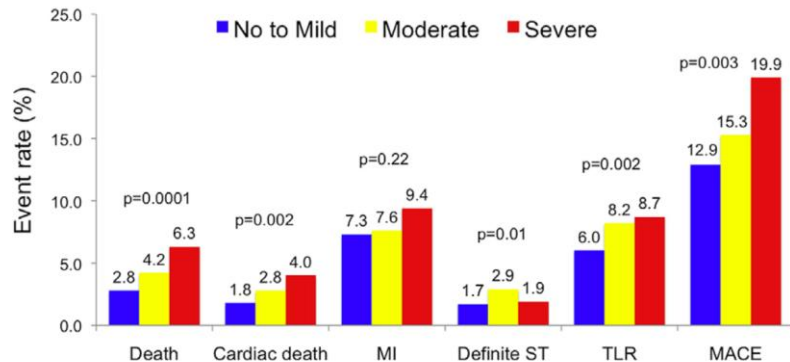
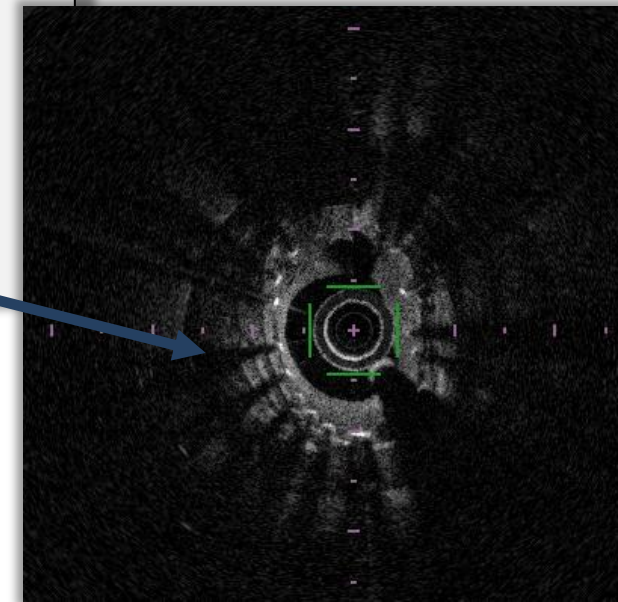
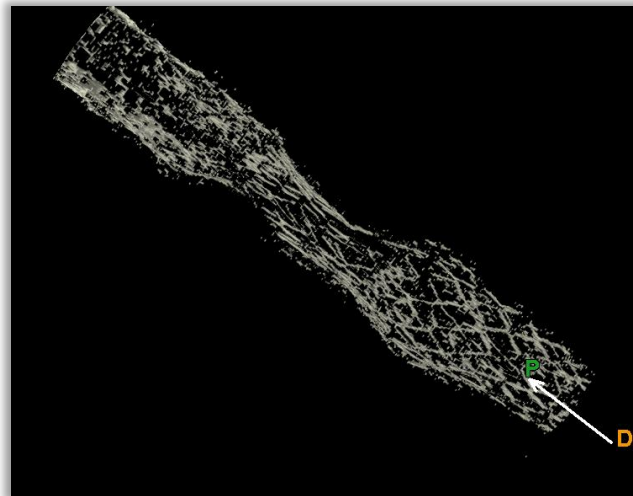


Figure 1

Adverse Outcomes Through 1 Year According to Severity of Target Lesion Calcification



Bourantas CV. Heart 2014.
Genereux P. JACC 2014

OCT et lésions calcifiées

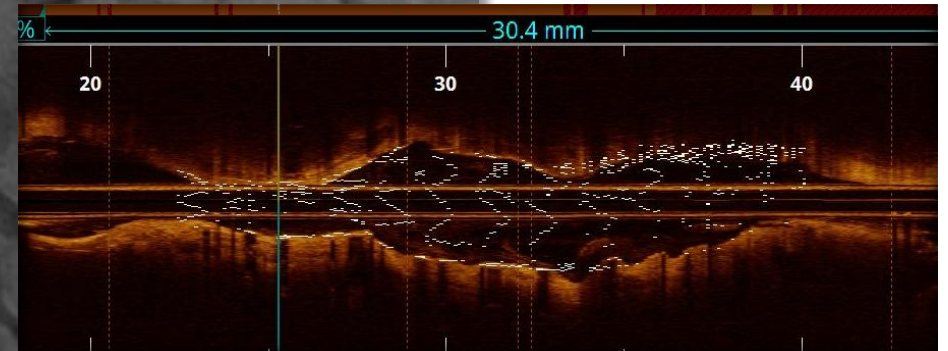
Quel intérêt de l'imagerie ?

**Eviter sous-expansion++
Adapter le traitement**

**MSA = 1.3mm^2
Expansion 34%**

1.3 mm^2

5.8 mm^2



Resténose à 8 mois post-angioplastie

OCT et lésions calcifiées

Comment l'imagerie endoconaire peut aider dans les lésions calcifiées?

Aide à la stratégie thérapeutique

Intérêt après technique spécifique

Contrôle final

OCT et lésions calcifiées

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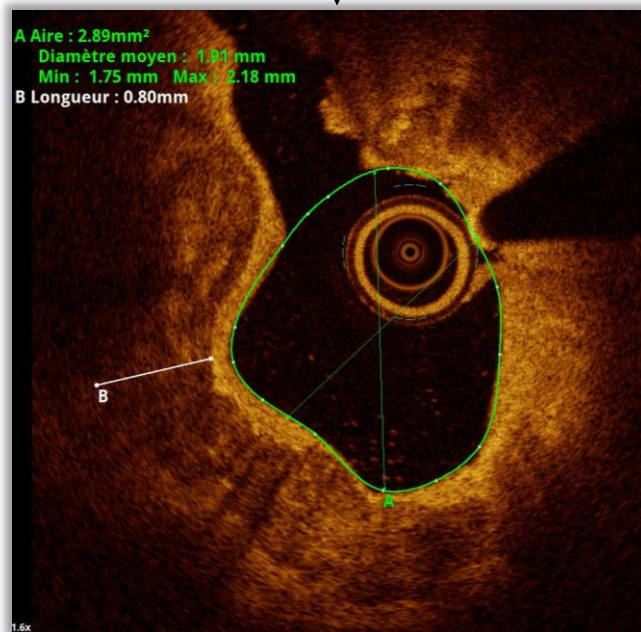
OCT et lésions calcifiées

Apport Initial OCT

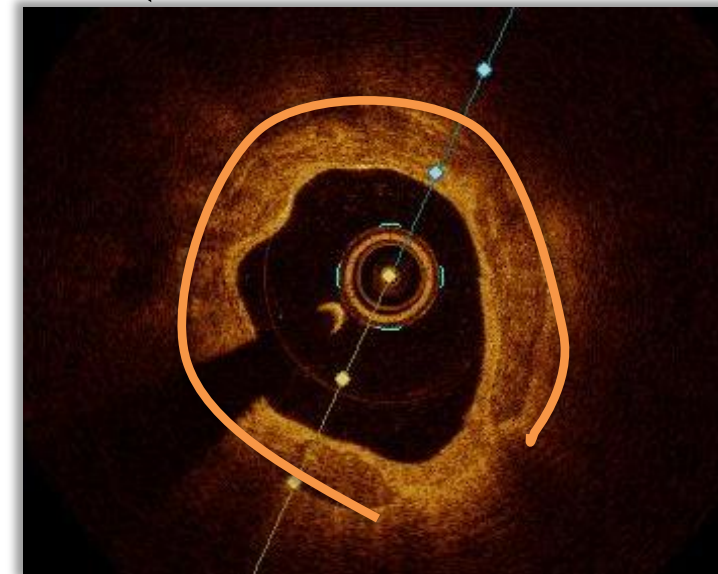
Technique spécifique si 3 critères



Longueur > 5mm



Epaisseur > 500µm

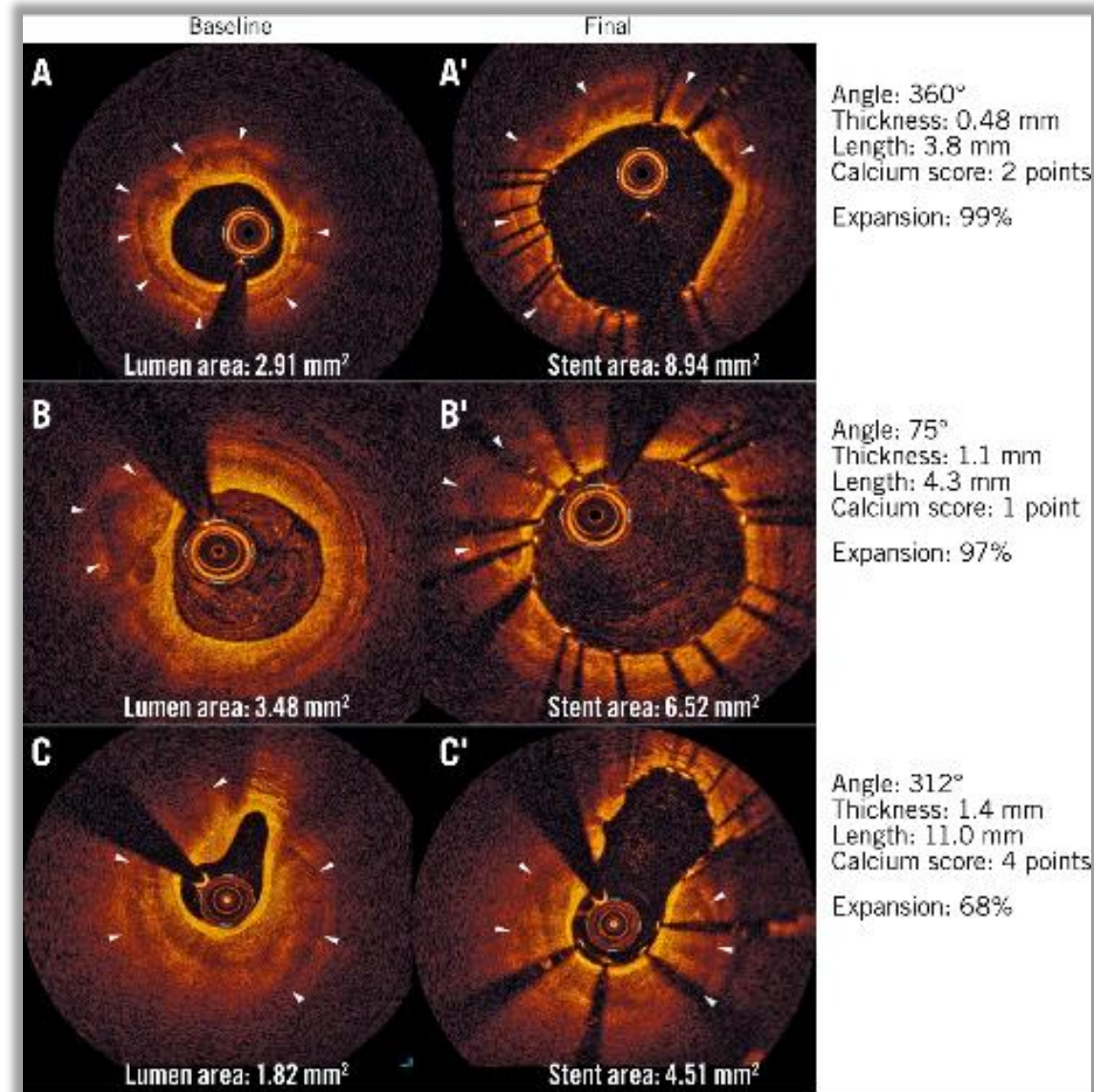
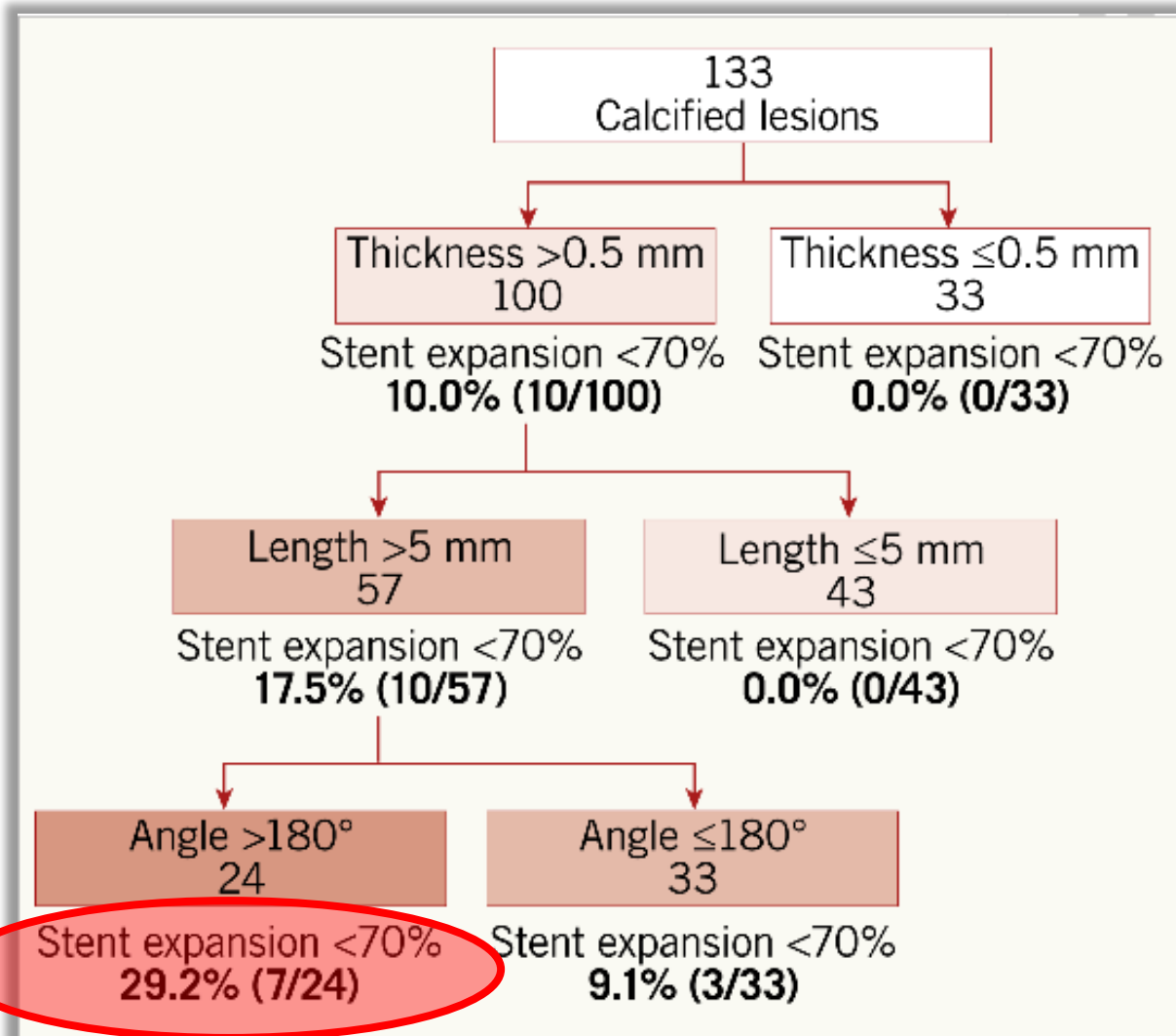


Arc > 180°

Fujino Eurointervention 2018

OCT et lésions calcifiées

Apport Initial



OCT et lésions calcifiées

Apport Initial

A Revised Optical Coherence Tomography-Derived Calcium Score to Predict Stent Underexpansion in Severely Calcified Lesions

Angiographic Calcium?

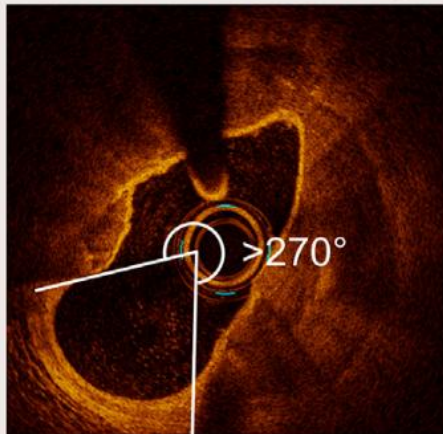
Yes ↓

OCT: Maximum Superficial Calcium >270°?

Yes ↓

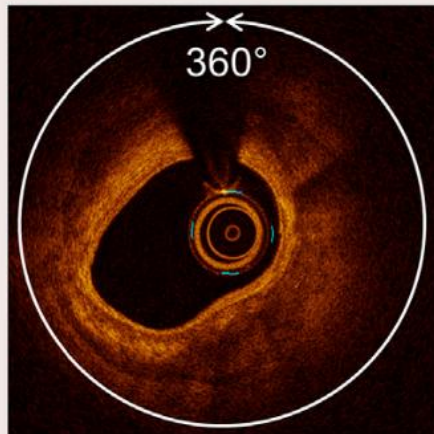
OCT Calcium Score

Calcium >270°
that was ≥3mm in length



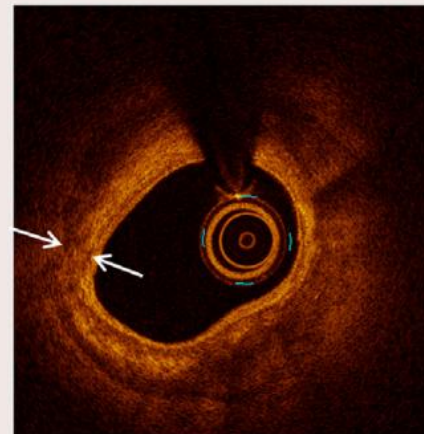
Yes=1, No=0

360° of Calcium



Yes=1, No=0

Minimum Calcium
thickness >0.3mm



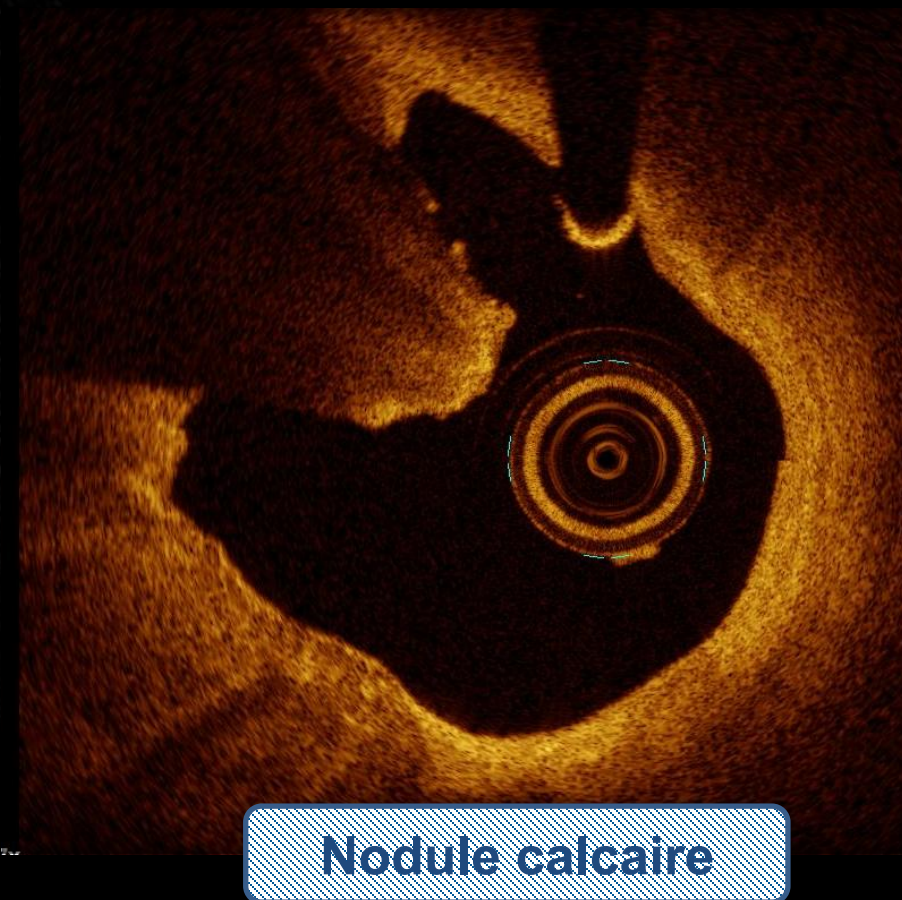
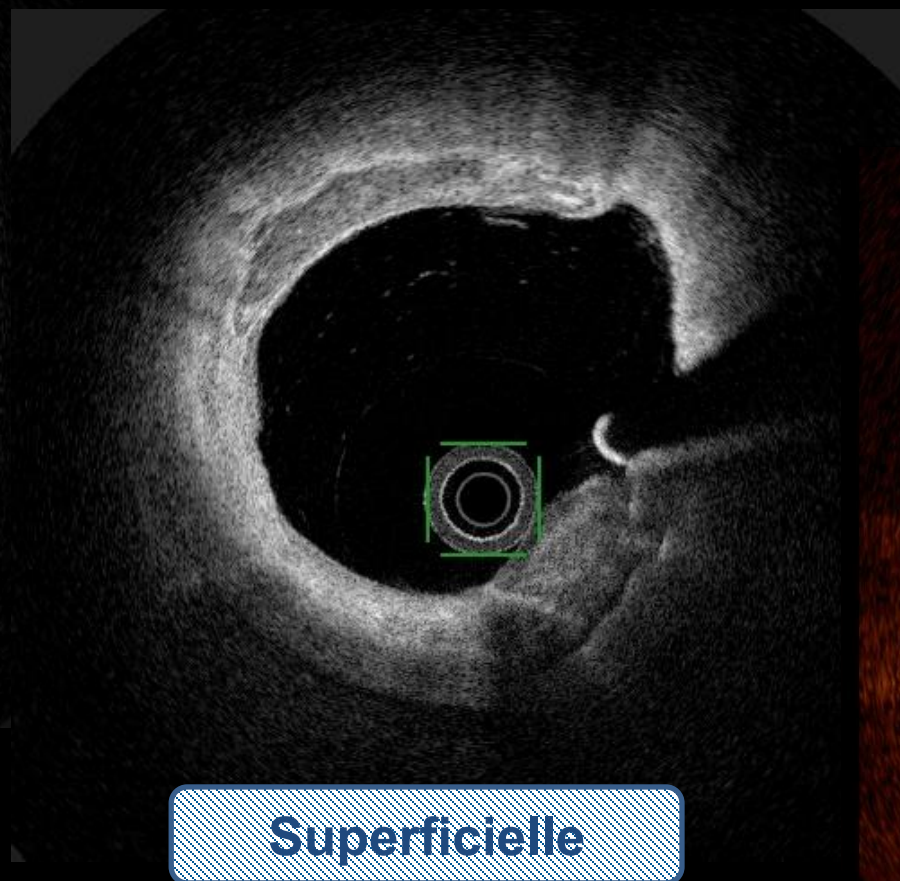
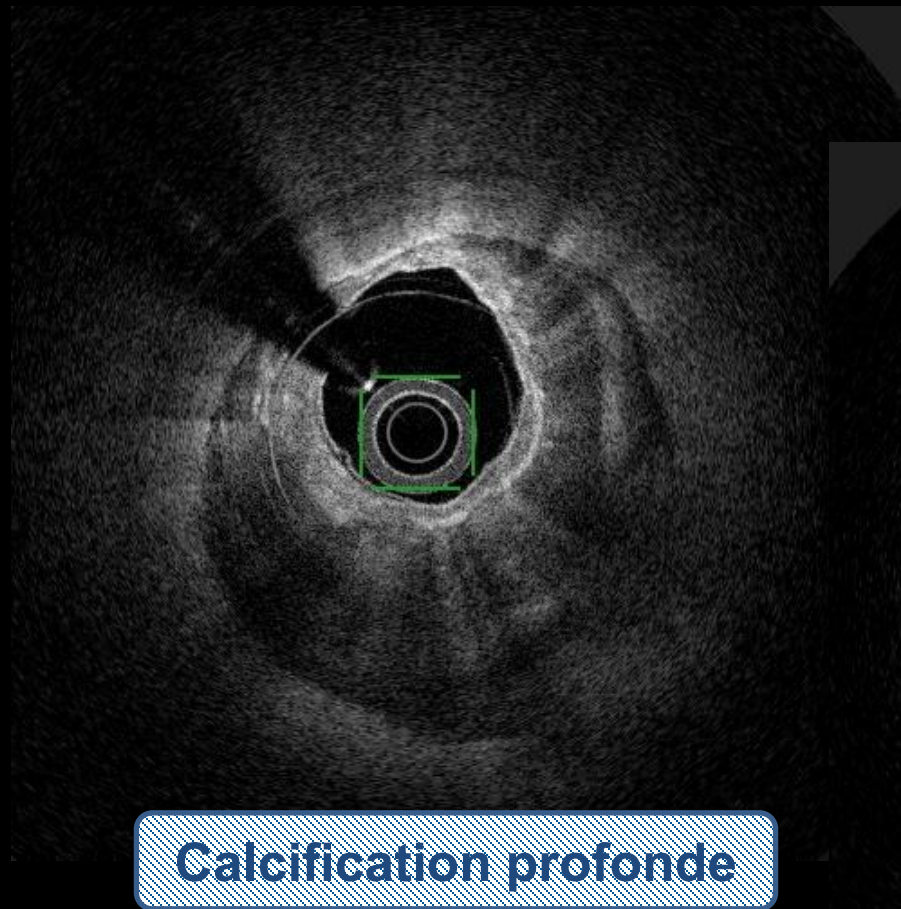
Yes=1, No=0

**Mieux corrélé à sous
expansion stent**

OCT Calcium Score = 2 or 3 ? If yes, consider calcium modification

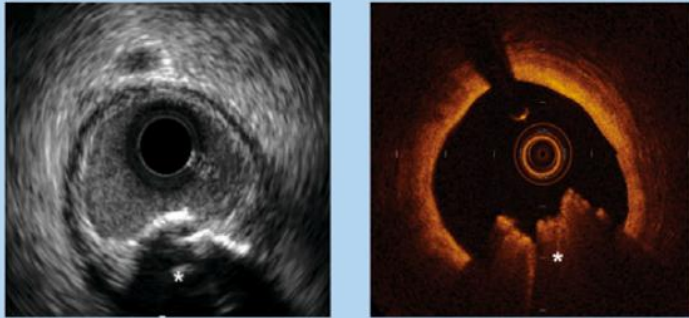
OCT et lésions calcifiées

Apport Initial



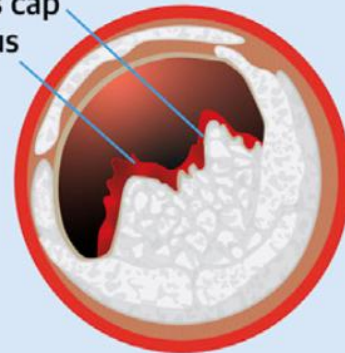
Nodule calcaire

Eruptive Calcified Nodule

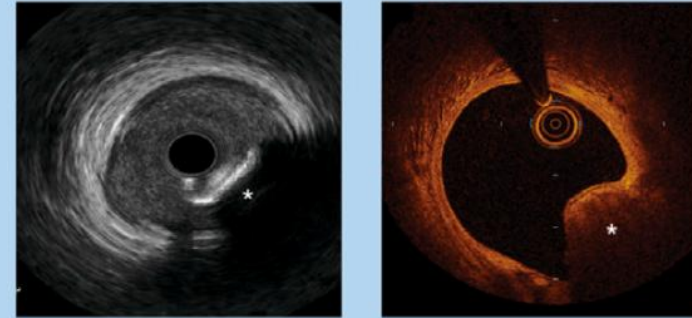


Disrupted fibrous cap
± Overlying thrombus

Disrupted
fibrous cap
Thrombus

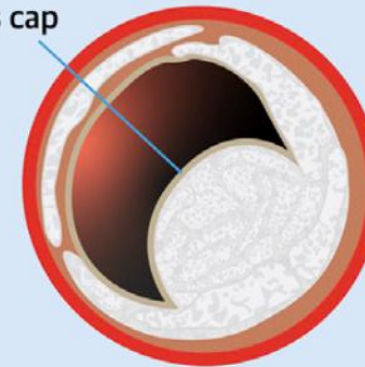


Noneruptive Calcified Nodule



Intact fibrous cap
No thrombus

Intact
fibrous cap



OCT et lésions calcifiées

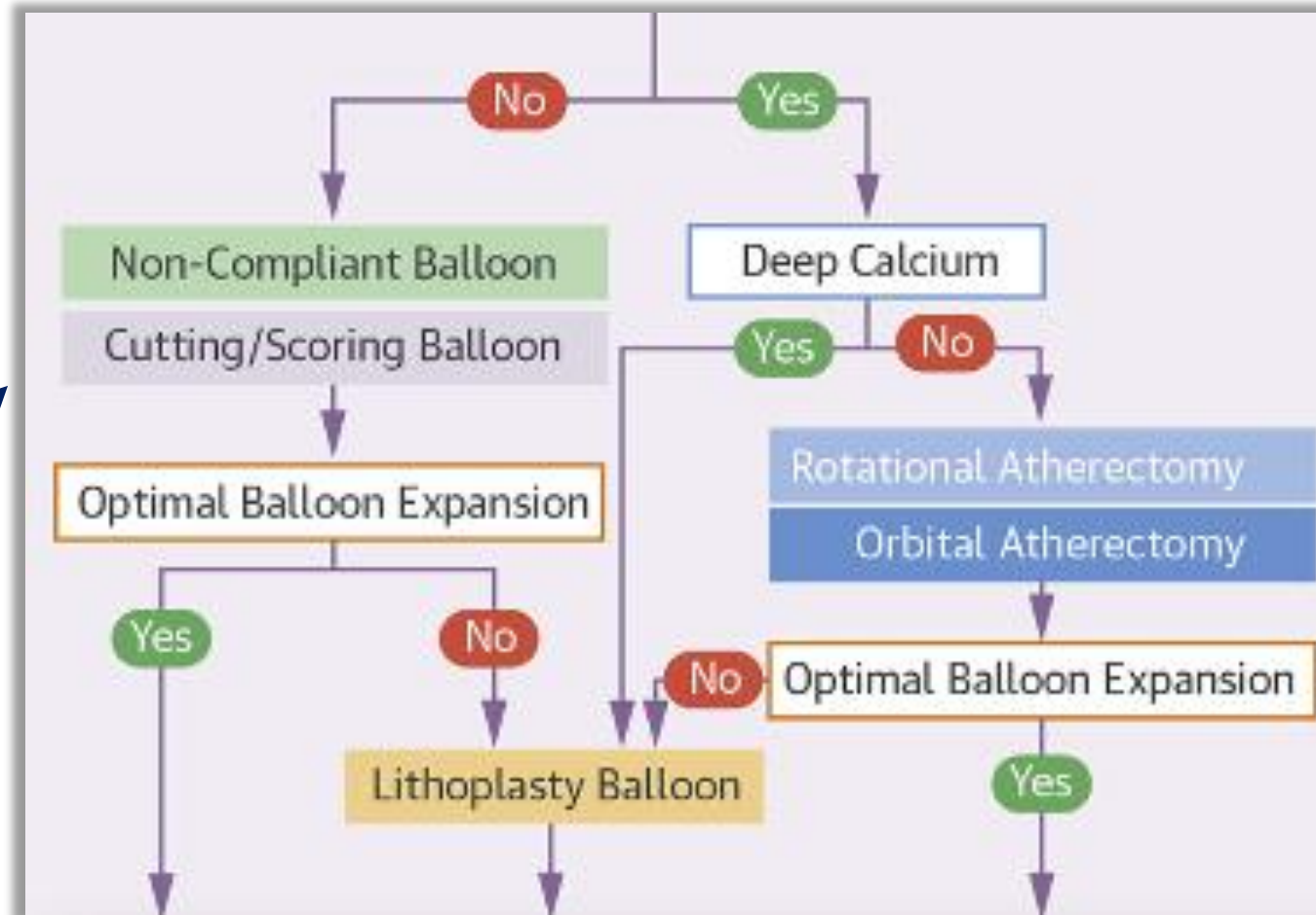
Management of Calcific Coronary Artery Lesions Is it Time to Change Our Interventional Therapeutic Approach?

Franchissement
du ballon? OUI

Pré-dilatation

Intravascular Imaging (OCT > IVUS)

- Calcium Arch > 180°
- Calcium Length > 5 mm
- Calcium Thickness > 0.5 mm



OCT et lésions calcifiées

Management strategies for heavily calcified coronary stenoses: an EAPCI clinical consensus statement in collaboration with the EURO4C-PCR group

UNCROSSABLE

**SUPERFICIAL
CALCIUM**

UNDILATABLE

**DEEP
CALCIUM**

Rotational Atherectomy/Orbital Atherectomy

Laser

Intravascular Lithotripsy

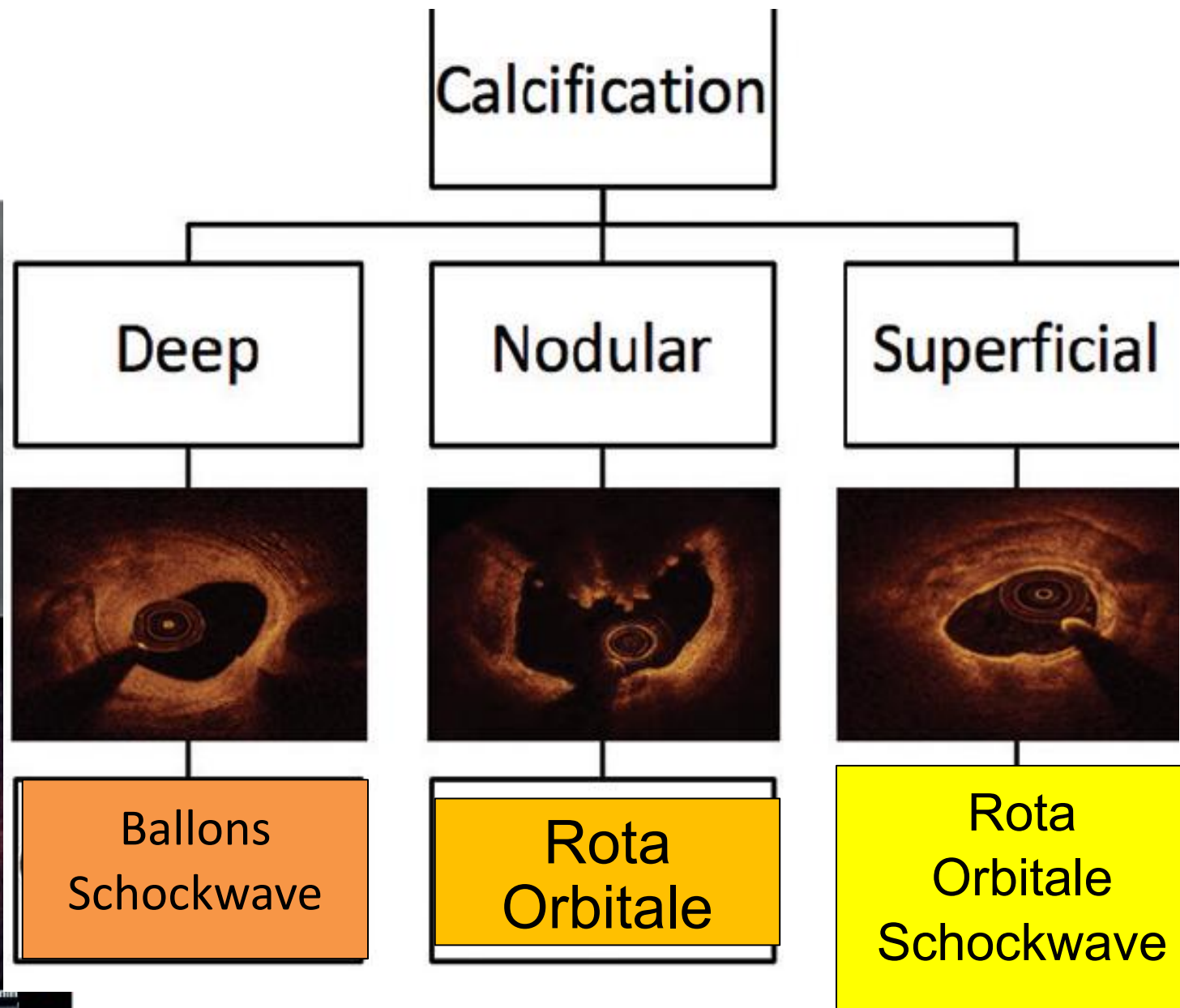
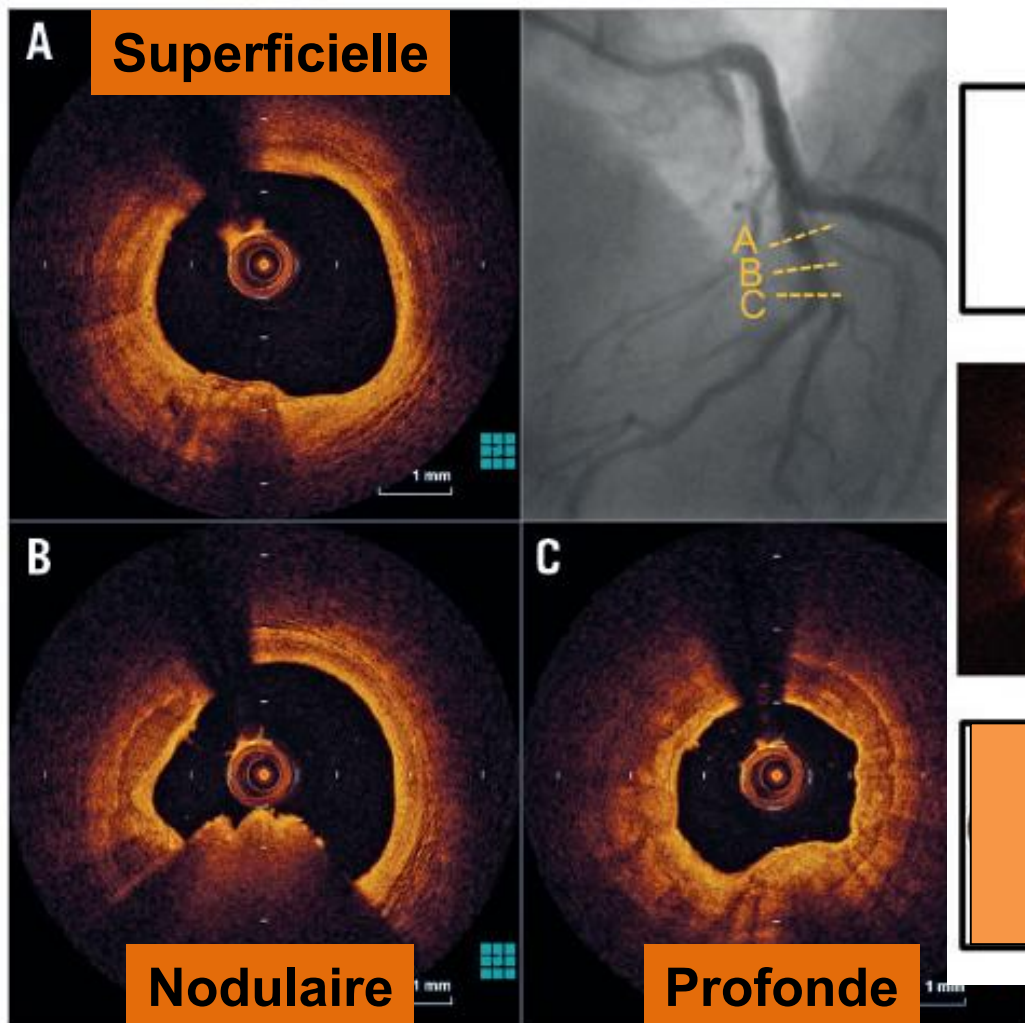
C/S Balloon

SHP Balloon

NC Balloon

OCT et lésions calcifiées

Apport Initial



OCT et lésions calcifiées

Comment l'imagerie endoconaire peut aider dans les lésions calcifiées?

Aide à la stratégie thérapeutique

Intérêt après technique spécifique

Contrôle final

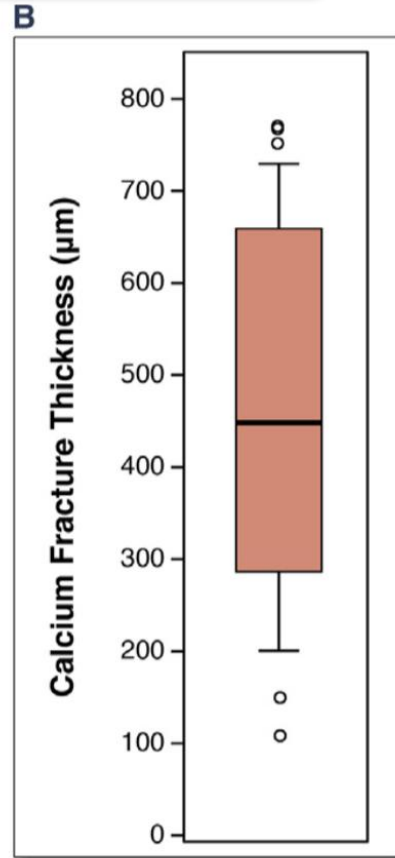
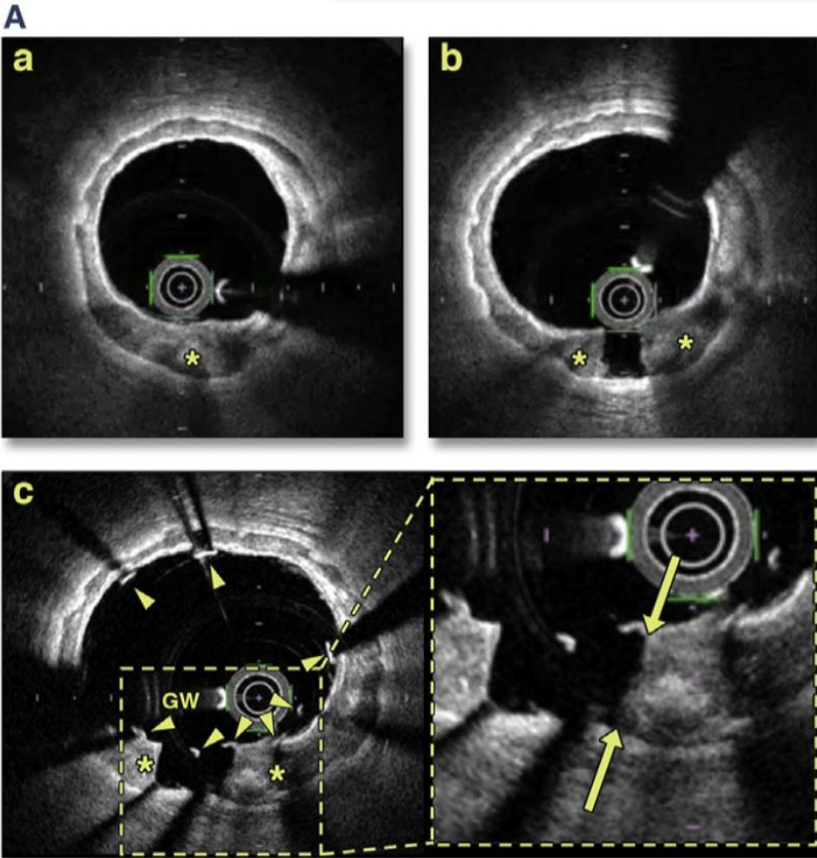
Critères d'efficacité ?

Détection fracture plaque

Gain luminal

Persistance calcification circonférentielle

Critères d'efficacité ?



61 patients avec lésions calcifiées
Analyse systématique en OCT
Fracture du calcium dans 48% cas
+ fréquent en cas d'athérectomie

Fracture Ca post ATL associée à moins evts & moins restenoses

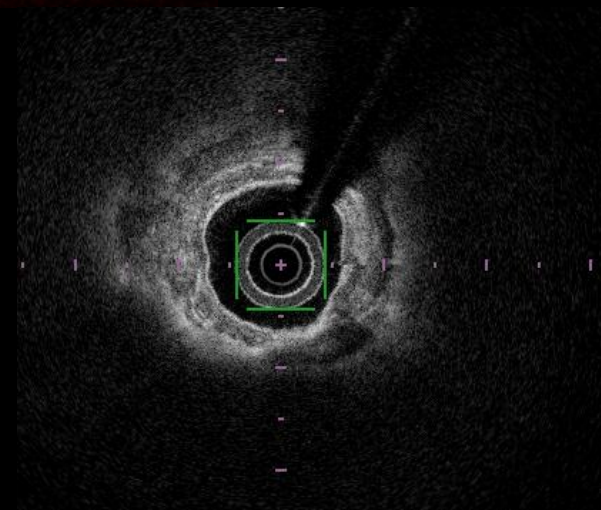
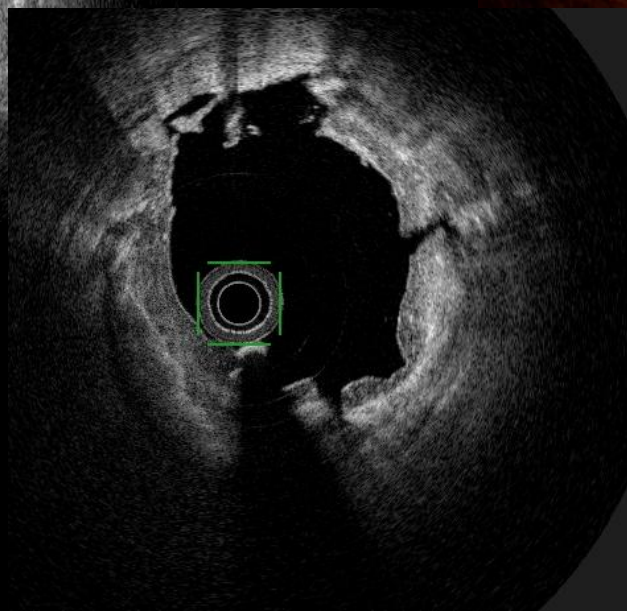
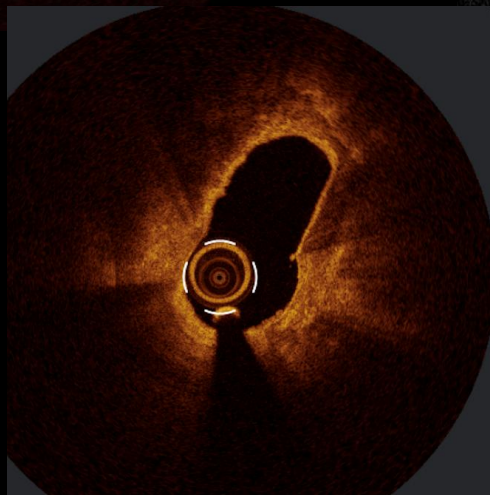
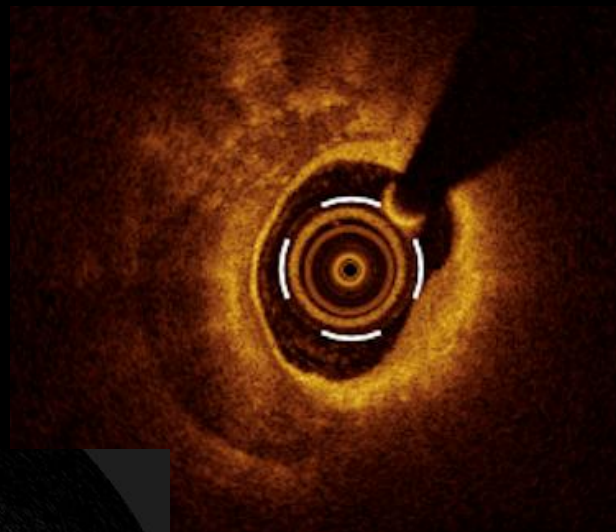
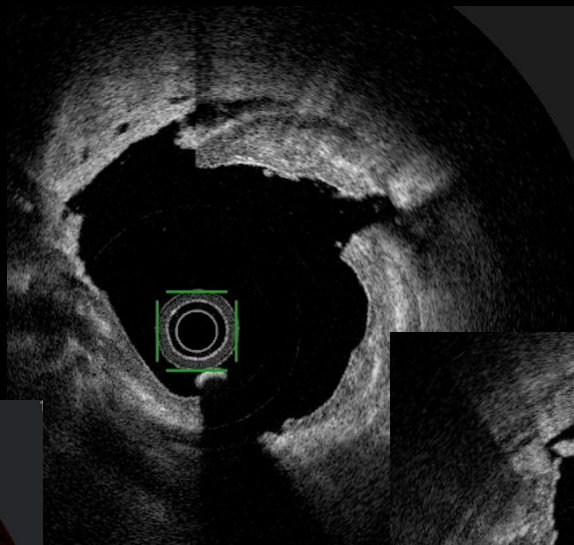
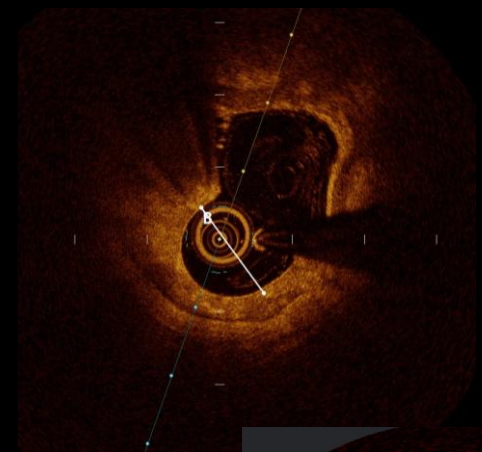
OCT et lésions calcifiées

Evaluation efficacité

Ø ring calcaire

Gain surface luminale

Fractures



OCT et lésions calcifiées

Comment l'imagerie endoconaire peut aider dans les lésions calcifiées?

Aide à la stratégie thérapeutique

Intérêt après technique spécifique

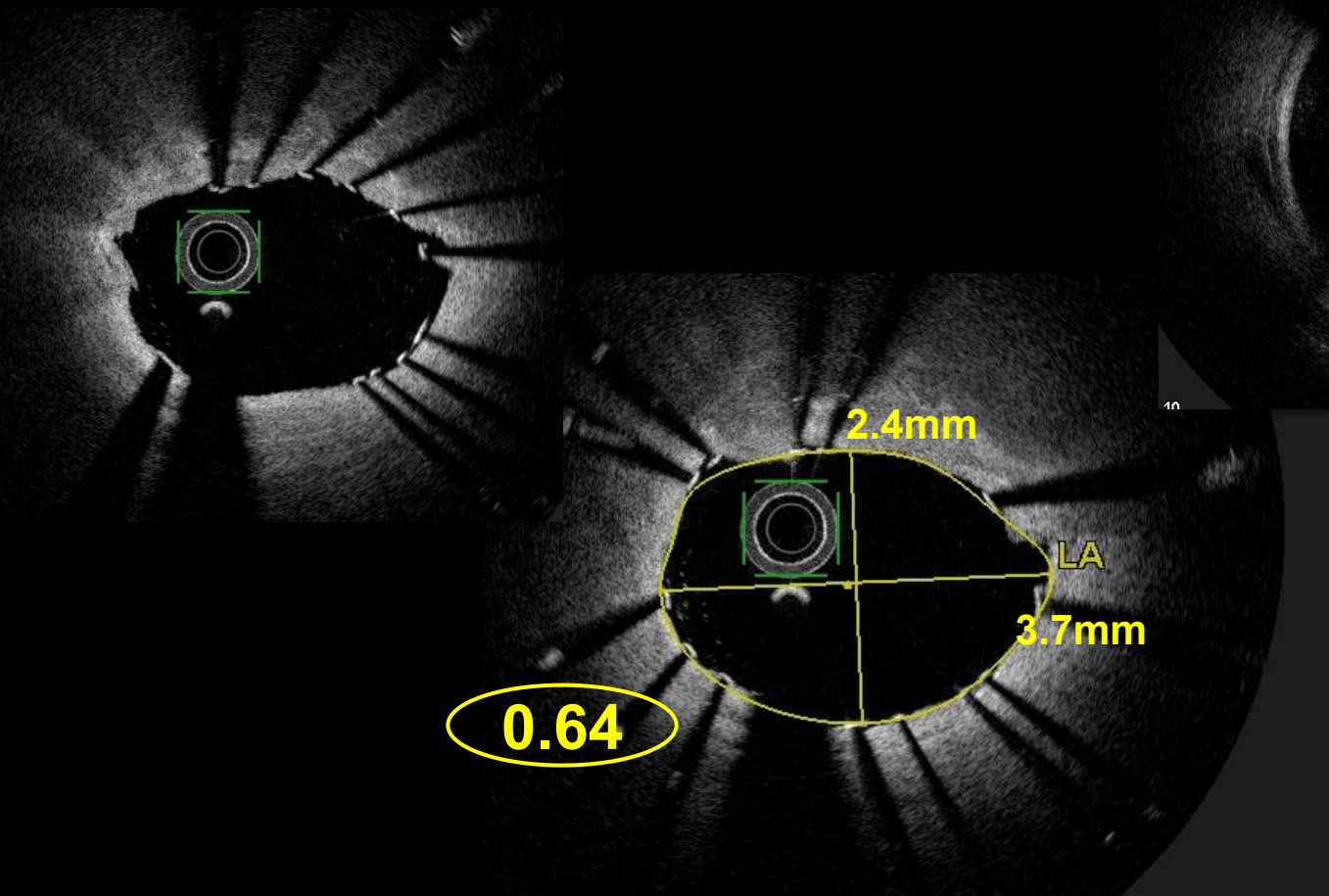
Contrôle final

OCT et lésions calcifiées

Post-angioplastie

Stent excentricité

MLD/Max lumen $\varnothing$: <0.7



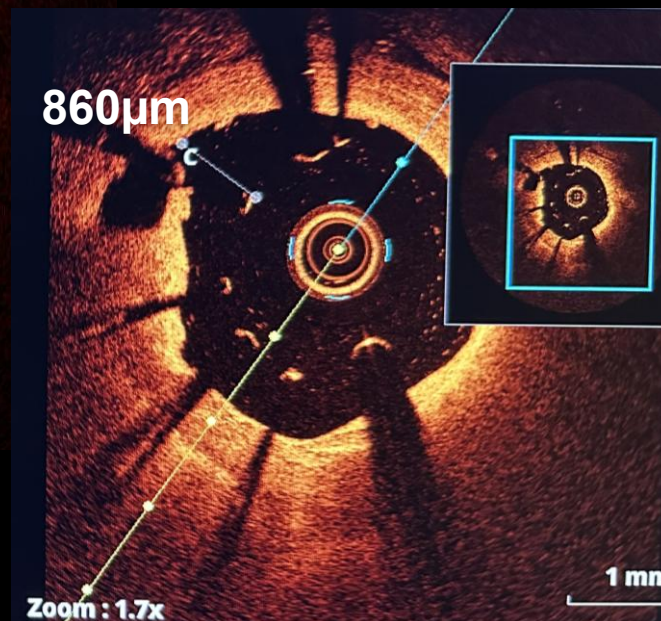
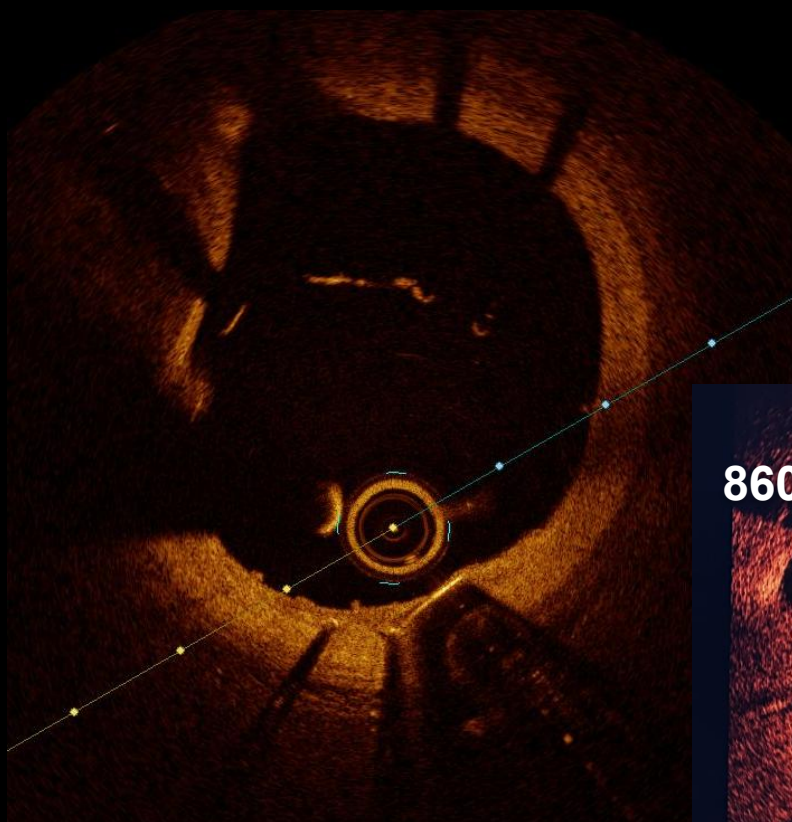
Dissection coronaire



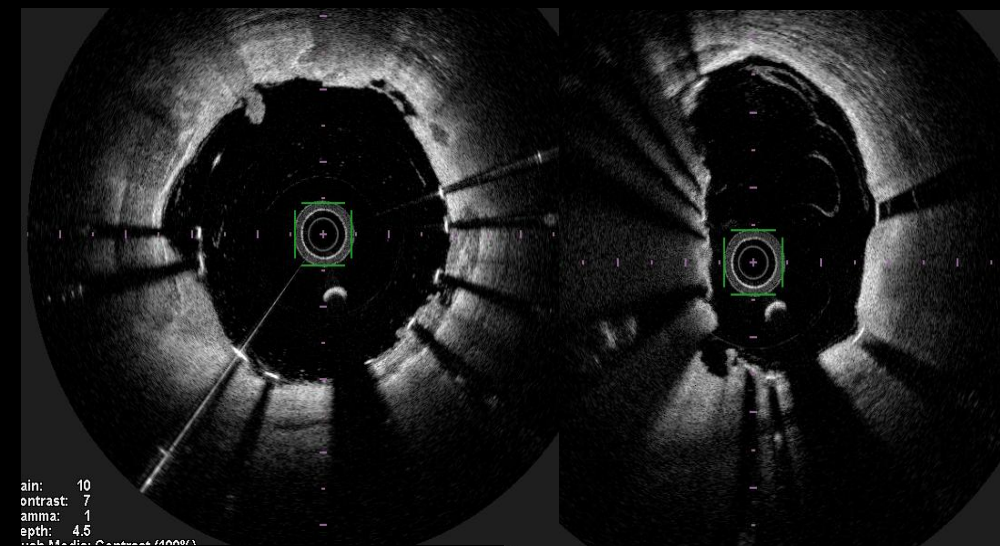
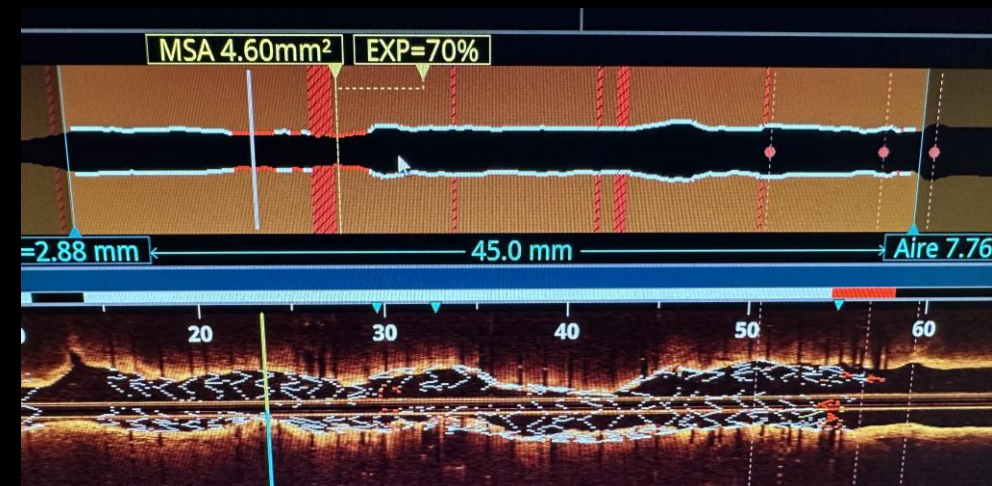
OCT et lésions calcifiées

Post-angioplastie

Malapposition

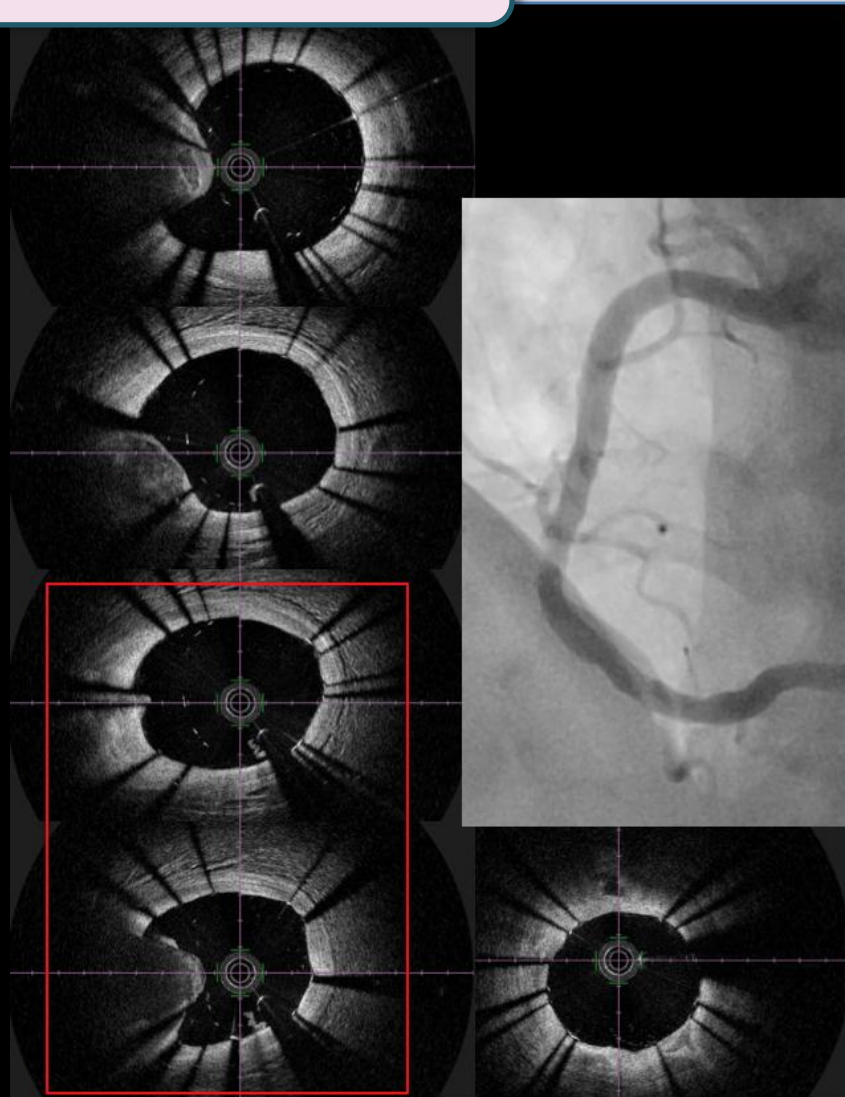


Expansion

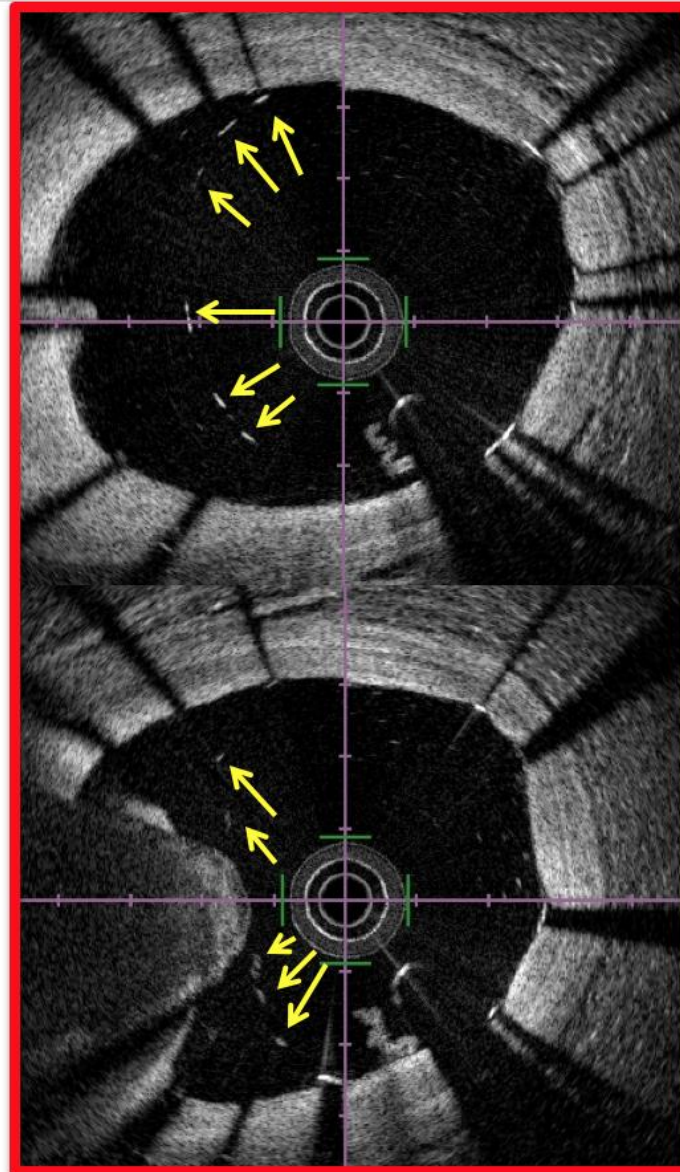


OCT et lésions calcifiées

Post-angioplastie

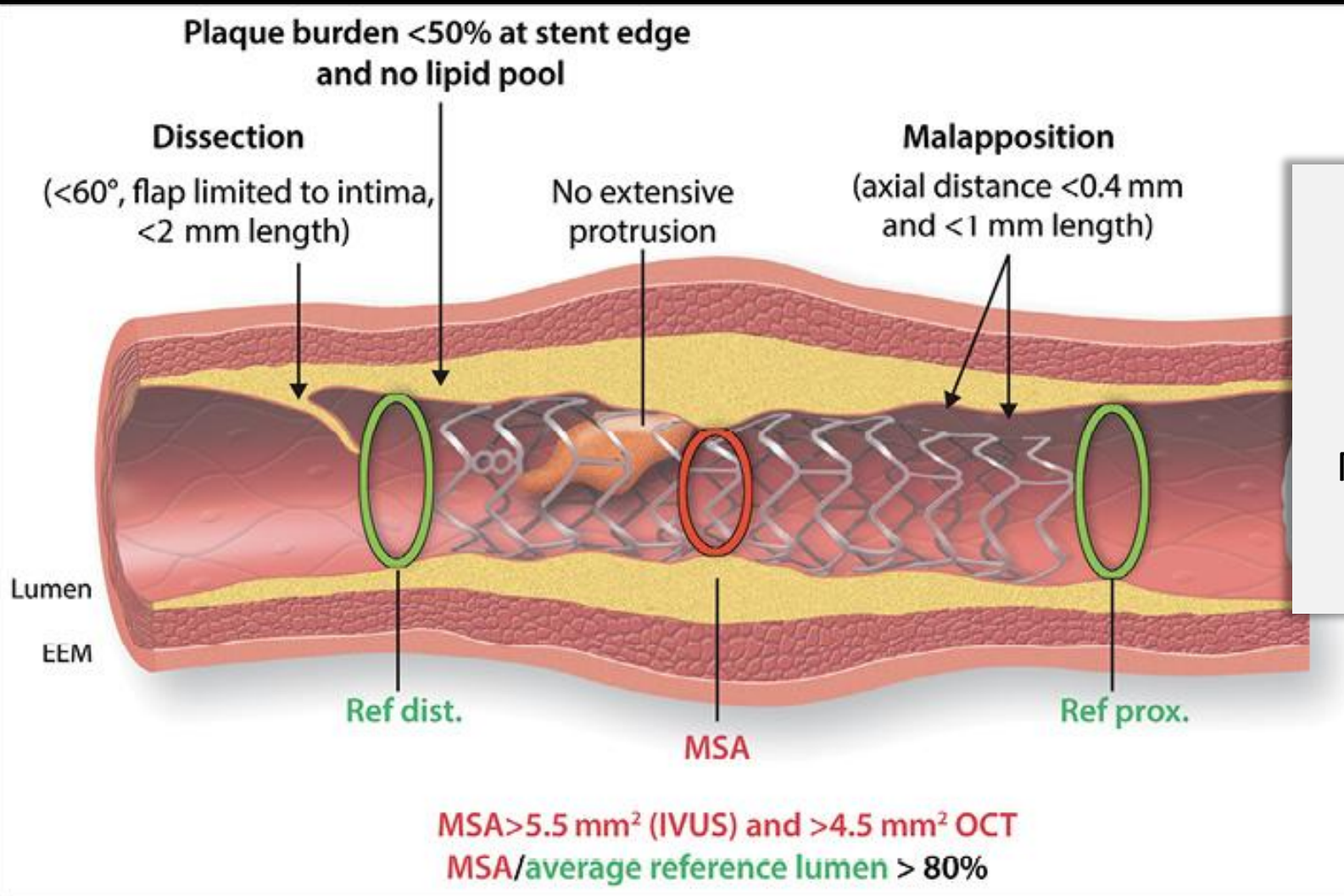


Minimal stent area = 4.6mm



OCT et lésions calcifiées

Post-angioplastie



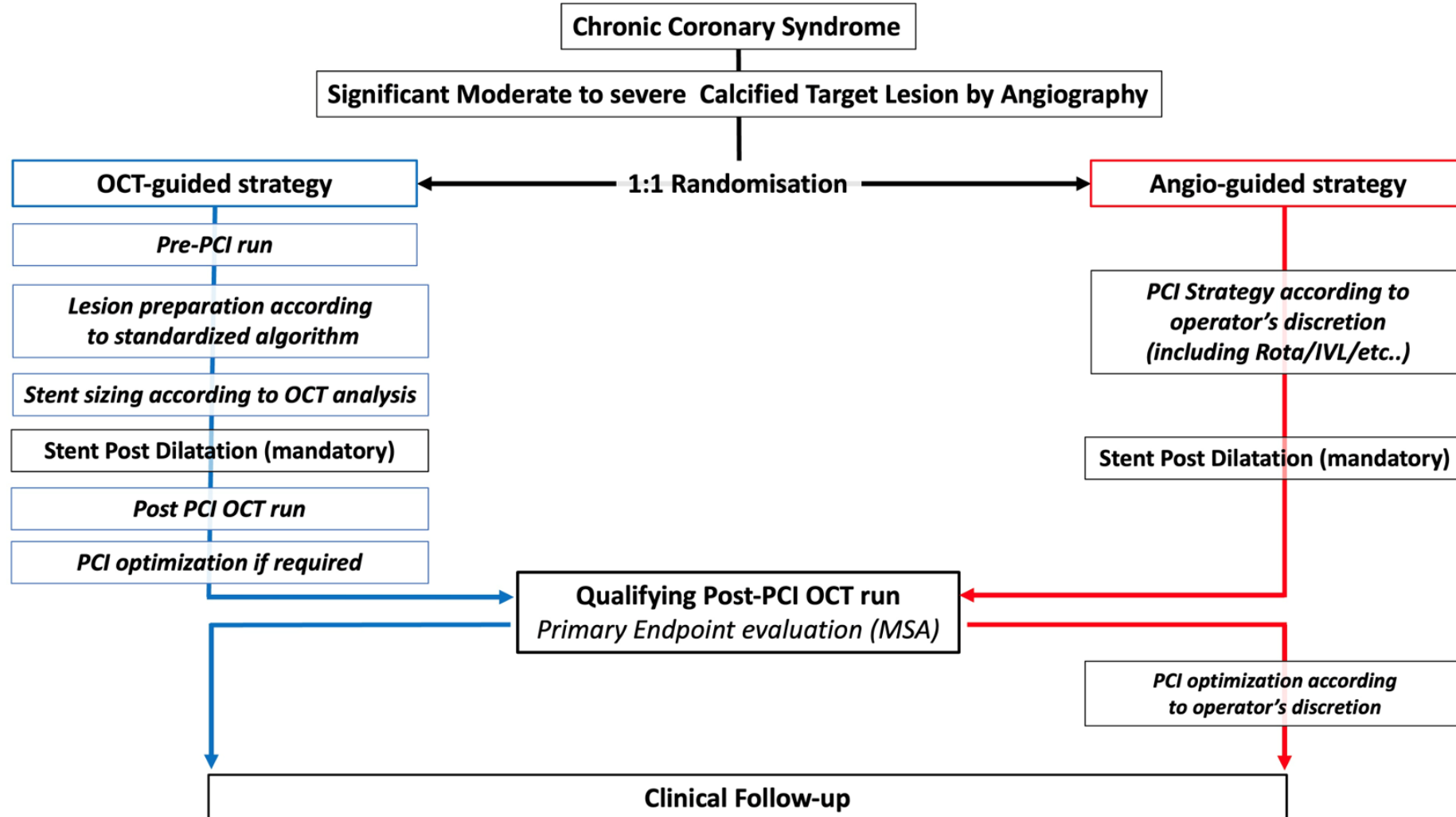
Acceptable

Dissection <60°, intimale, <2mm
Plaque burden <50% en limite
Pas de protrusion extensive
Malapposition <400µm sur moins d'1mm
MSA > 4.5mm²
Expansion > 80%

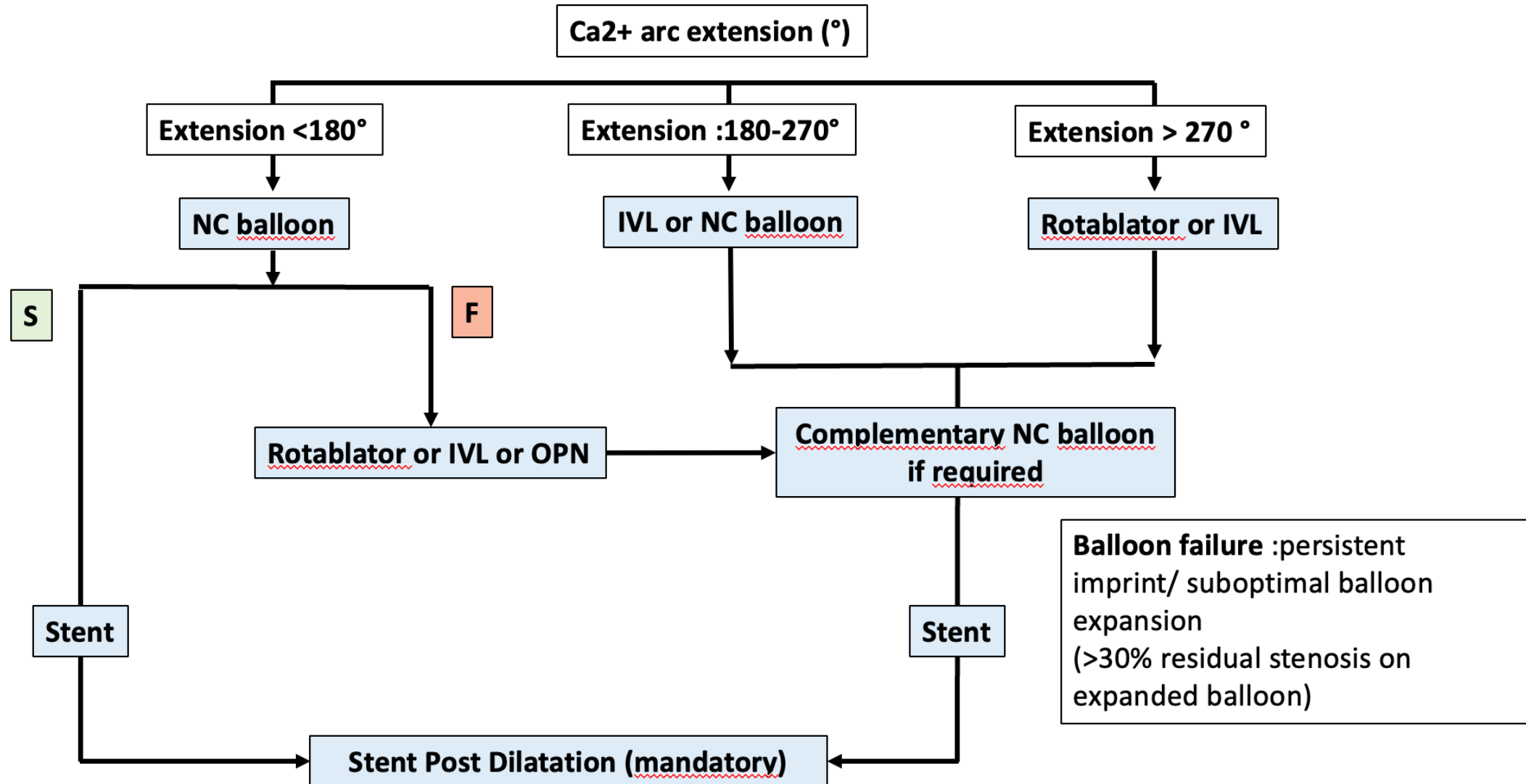
Etudes récentes

OCT vs Angiography for Guidance of Percutaneous Coronary Intervention of Calcified Lesions The CALIPSO Randomized Clinical Trial

Nicolas Amabile, MD, PhD; Gregoire Rangé, MD; Quentin Landolff, MD; Erwan Bressollette, MD;
Nicolas Meneveau, MD, PhD; Benoit Lattuca, MD, PhD; Sebastien Levesque, MD; Ziad Boueri, MD;
Julian Adlardi, MD, PhD; Frederic Caecilio, MD; Ayoub Ralfabih, MD; Aurélie Vauganic, MD.

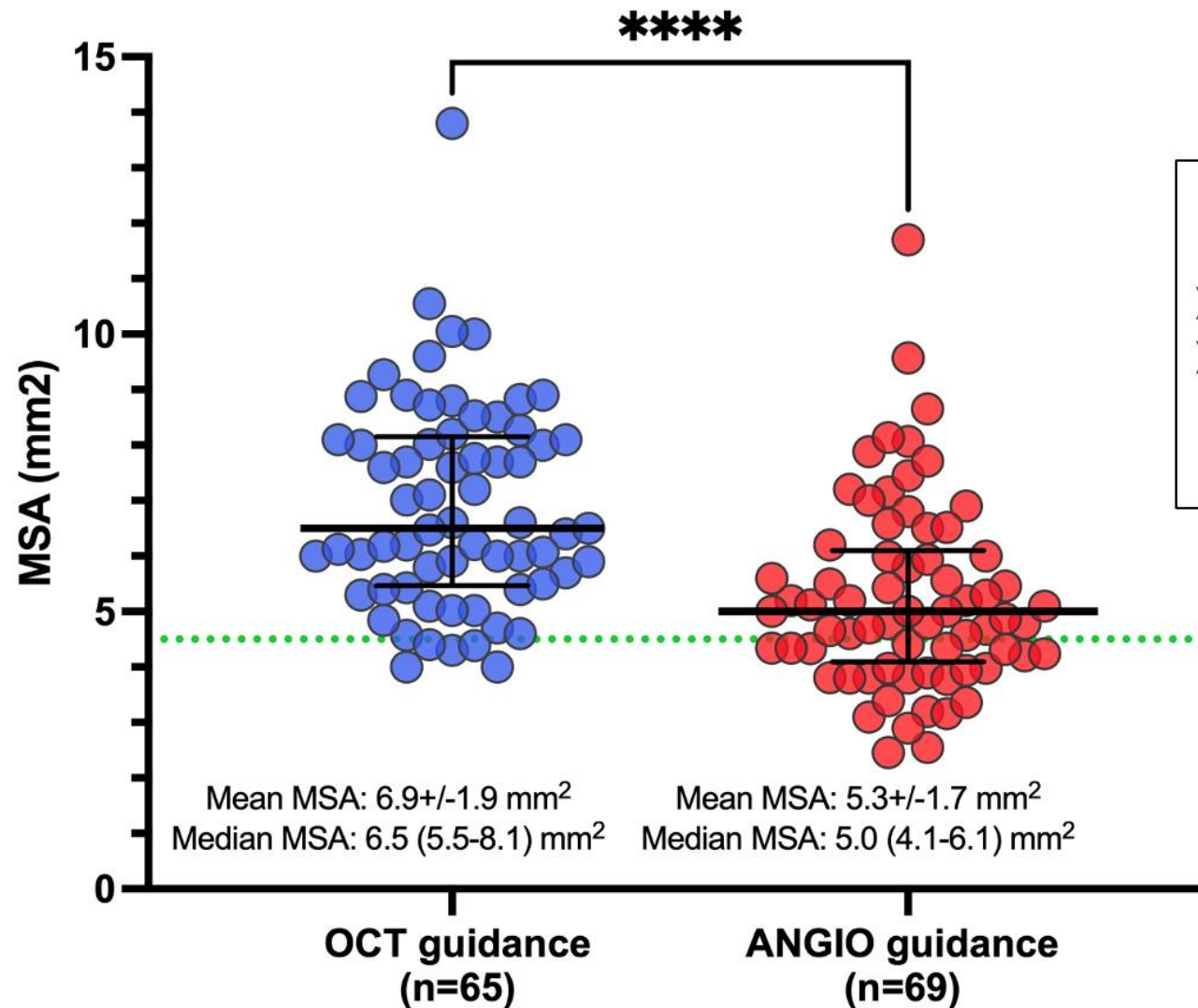


Nicolas Amabile, MD, PhD; Gregoire Rangé, MD; Quentin Landolf, MD; Erwan Bressollette, MD;
Nicolas Morvan, MD, PhD; Benoît Lattès, MD, PhD; Sébastien Lemesle, MD; Ziad Bouari, MD



OCT et lésions calcifiées

Primary endpoint



% Patients with MSA < 4.5 mm²

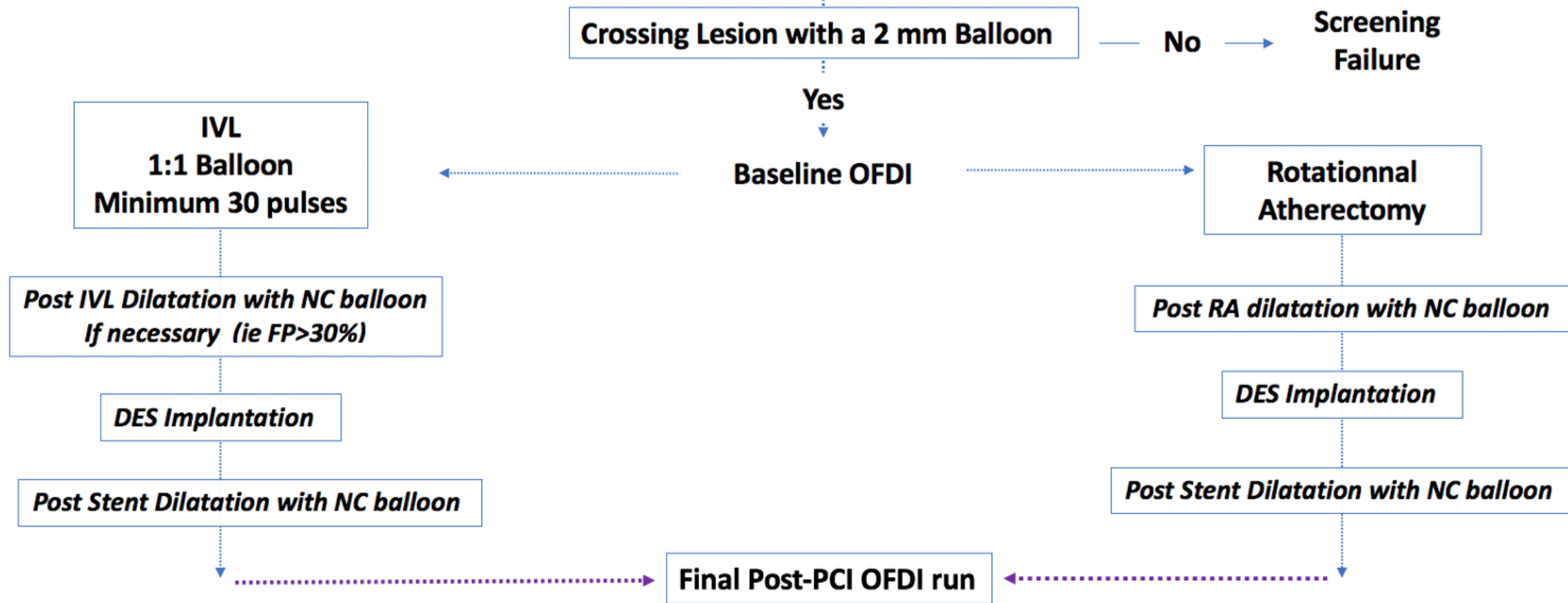
- OCT guid. group: 5/65 (8%)
- Angio guid. group: 25/68 (36%)

p < 0.001 Chi square

OCT et lésions calcifiées



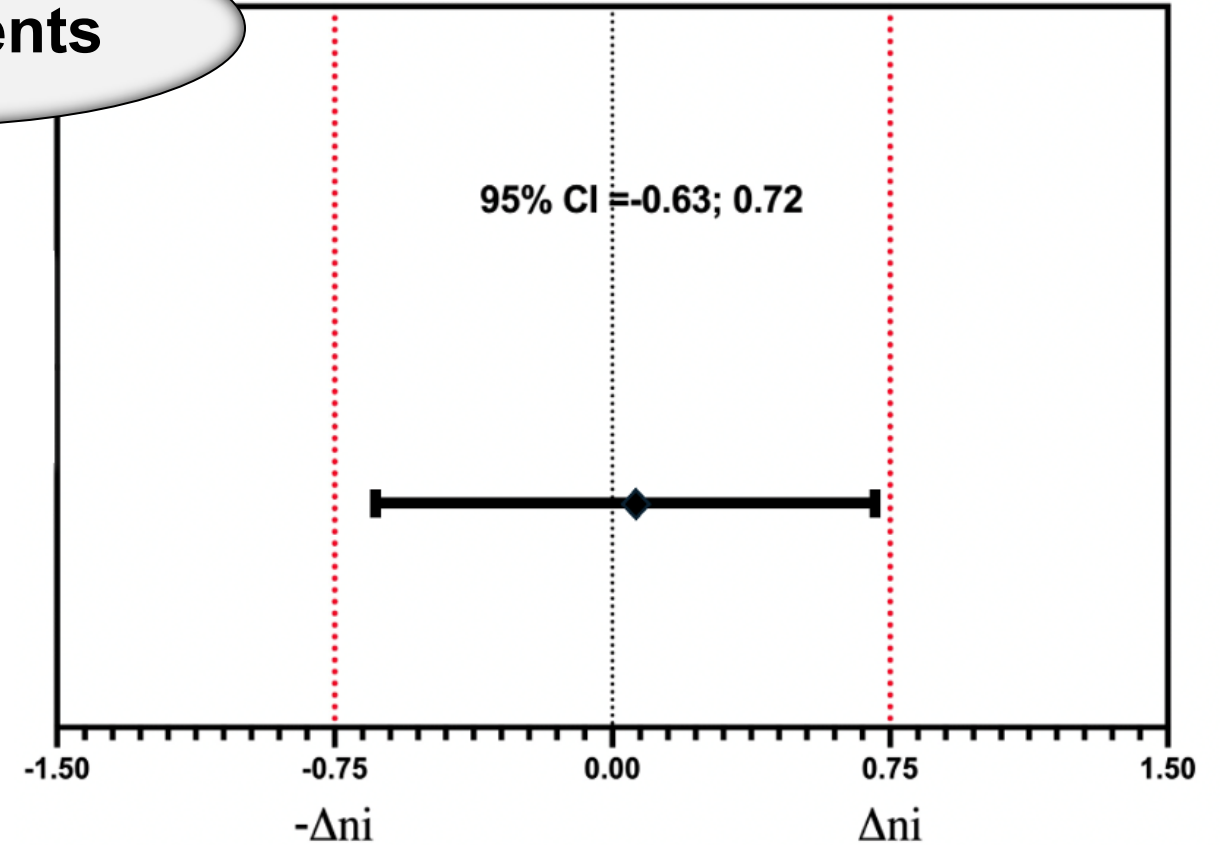
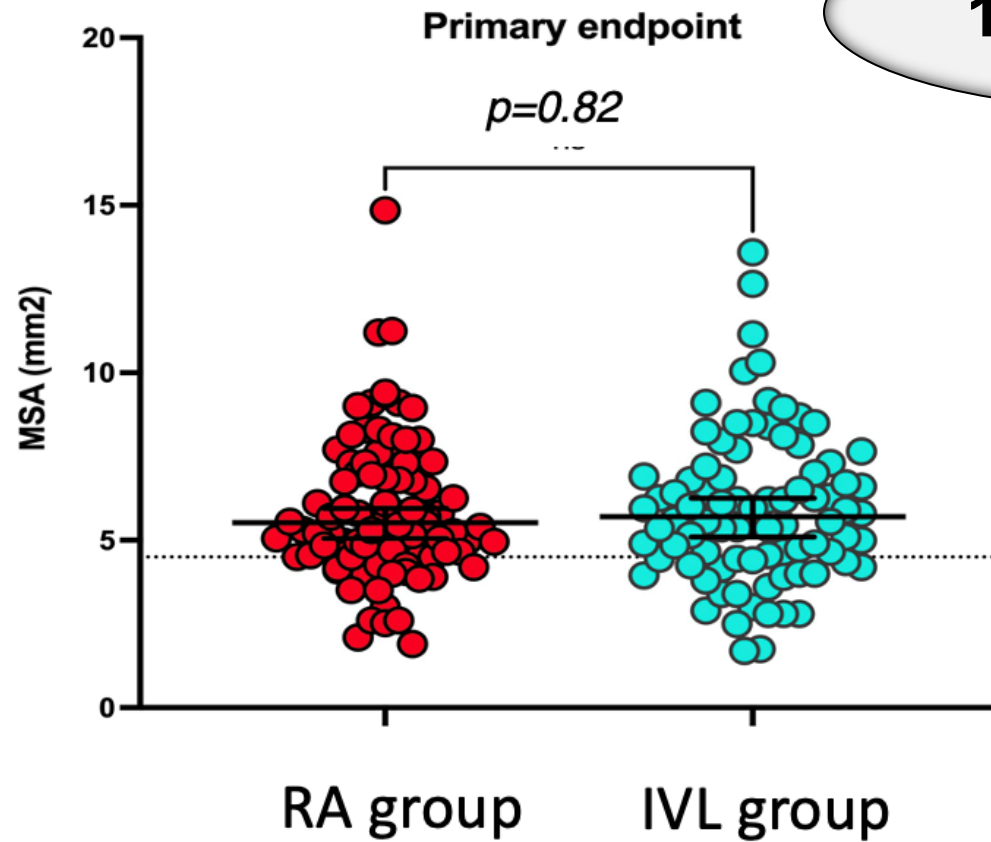
Moderate to severe calcified de Novo Lesion – Chronic Coronary Disease
>70% <100% or 50-70% with FFR <0.80 or Stress Test Ischemia
Maximum lesion length 40 mm length – 2.5 to 4 mm RVD
1:1 Randomisation



Primary Efficacy Endpoint : Minimal Stent Area
Secondary Safety Endpoint : 30 days - MACE

Honton B. Euro PCR 2024

170 patients



Median MSA RA: 5.5 mm² [4.5 - 7.3]

Median MSA IVL: 5.8 mm² [4.5 - 7.2]

$P_{\text{non inferiority}} < 0.05$

1082

Angiographically moderate or severe calcification

544

OCT-guided

vs

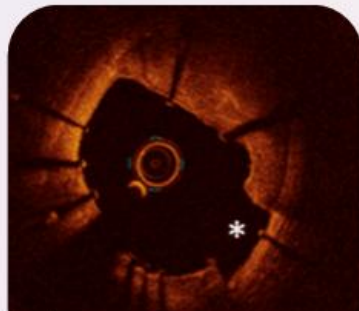
538

Angiography-guided

OCT-guided PCI in calcified lesions

More aggressive procedure

- ↑ Post-dilatation
- ↑ Inflation pressure
- ↑ Advanced lesion prep
- ↑ Stent size



↑ Calcium fracture

Enhanced safety and efficacy

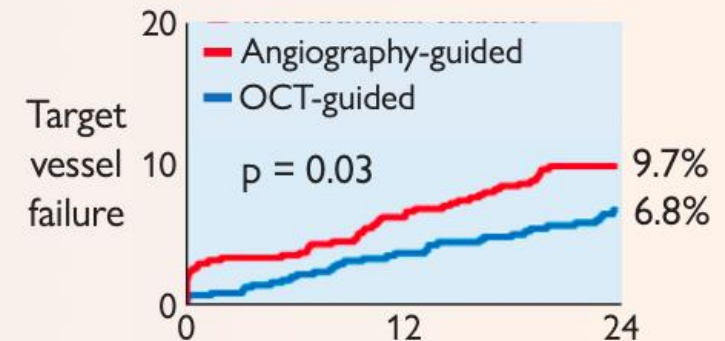
- ↑ Post-PCI MSA
- ↓ Major edge dissection
- ↓ Untreated focal disease
- ↓ Periprocedural MI



↑ MSA

Improved outcomes at 2 years

- ↓ TVF by 38%
- ↓ Serious MACE by 51%
- ↓ TV-MI by 64%
- ↓ Stent thrombosis by 89%



OCT et lésions calcifiées

ESC 2024

Assessment of procedural risks and post-procedural outcomes

In patients with complex CAD in whom revascularization is being considered, it is recommended to assess procedural risks and post-procedural outcomes to guide shared clinical decision-making.

I

C

Calculation of the STS score is recommended to estimate in-hospital morbidity and 30-day mortality after CABG.^{777,862–864}

I

B

In patients with multivessel obstructive CAD, calculation of the SYNTAX score is recommended to assess the anatomical complexity of disease.^{786,865}

I

B

Intracoronary imaging guidance by IVUS or OCT is recommended when performing PCI on anatomically complex lesions, in particular left main stem, true bifurcations, and long lesions.^{866,337,810,840,841}

I

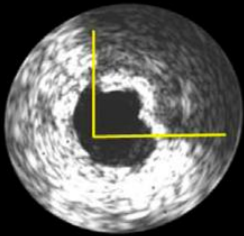
A

Call to ACTION

Coronary Calcium Needs Comprehensive Evaluation and Preparation

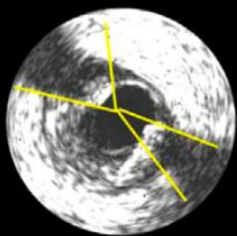
A

ARC



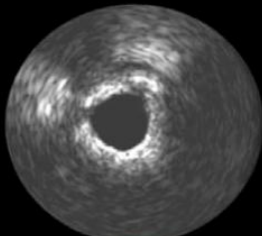
C

CONCENTRICITY



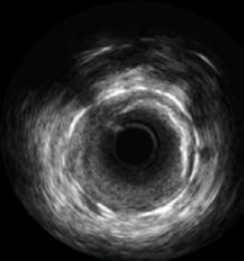
T

THICKNESS



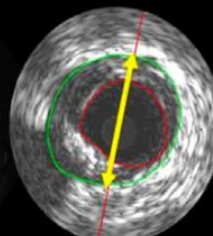
I

IN-STENT
RESTENOSIS



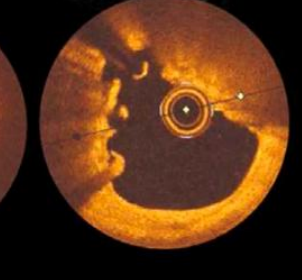
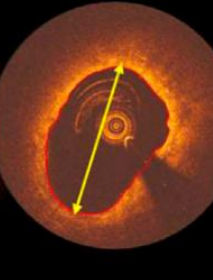
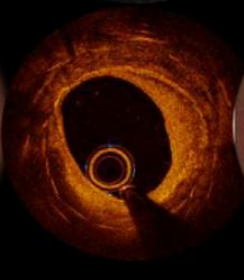
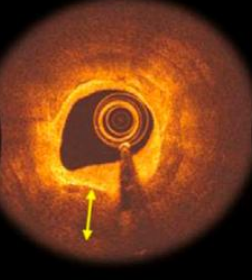
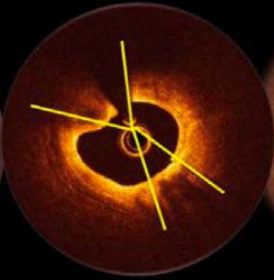
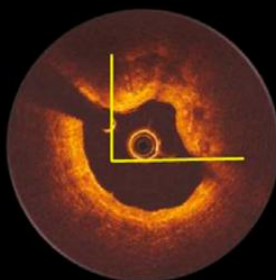
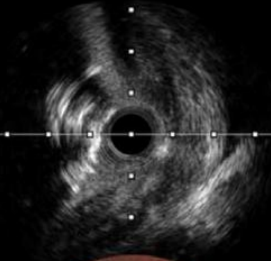
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DIAMETER
OF VESSEL



N

NODULAR
CALCIUM



OCT et lésions calcifiées

Les limites

Parfois franchissement difficile fibre

Procédures longues

Coût

Utilisation lode++

Conclusions

Apport de l'imagerie à toutes les étapes

Point ++ expansion du stent

Valider traitements adaptés

Conclusions

Invited Commentary

OCT and Calcium—You Cannot Treat What You Cannot See

Marc-André d'Entremont, MD, MPH; Sanjit S. Jolly, MD, MSc