Comparison of efficacy in lesion preparation for the severely calcified lesions

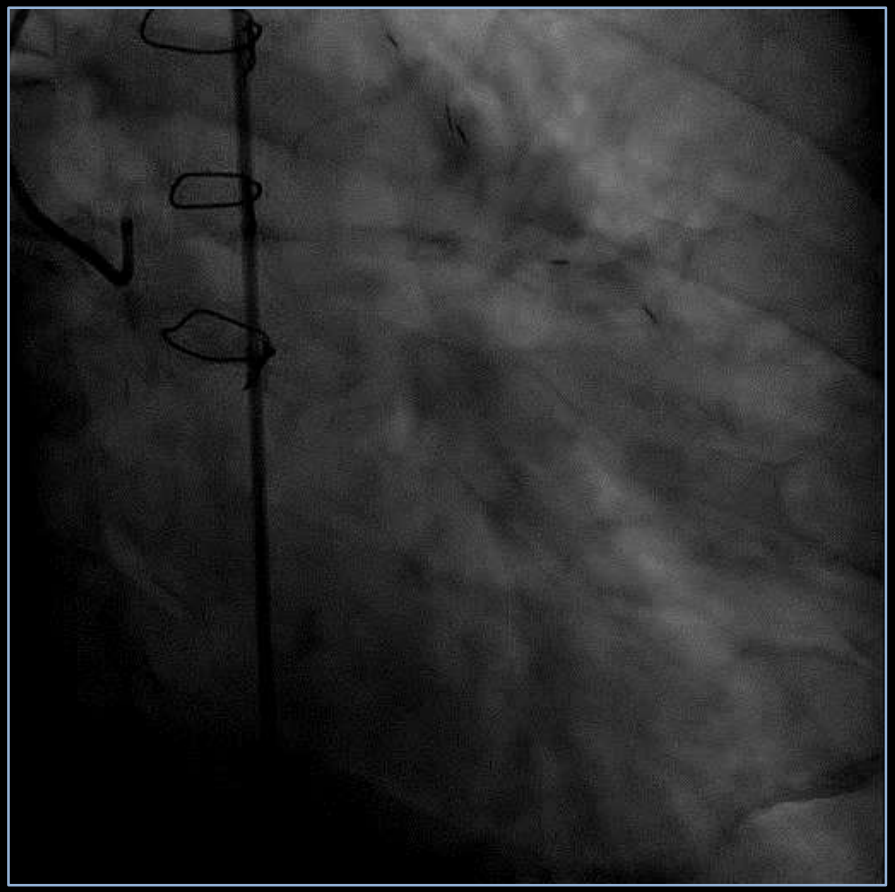
Cutting balloon
vs.
Super high pressure NC balloon

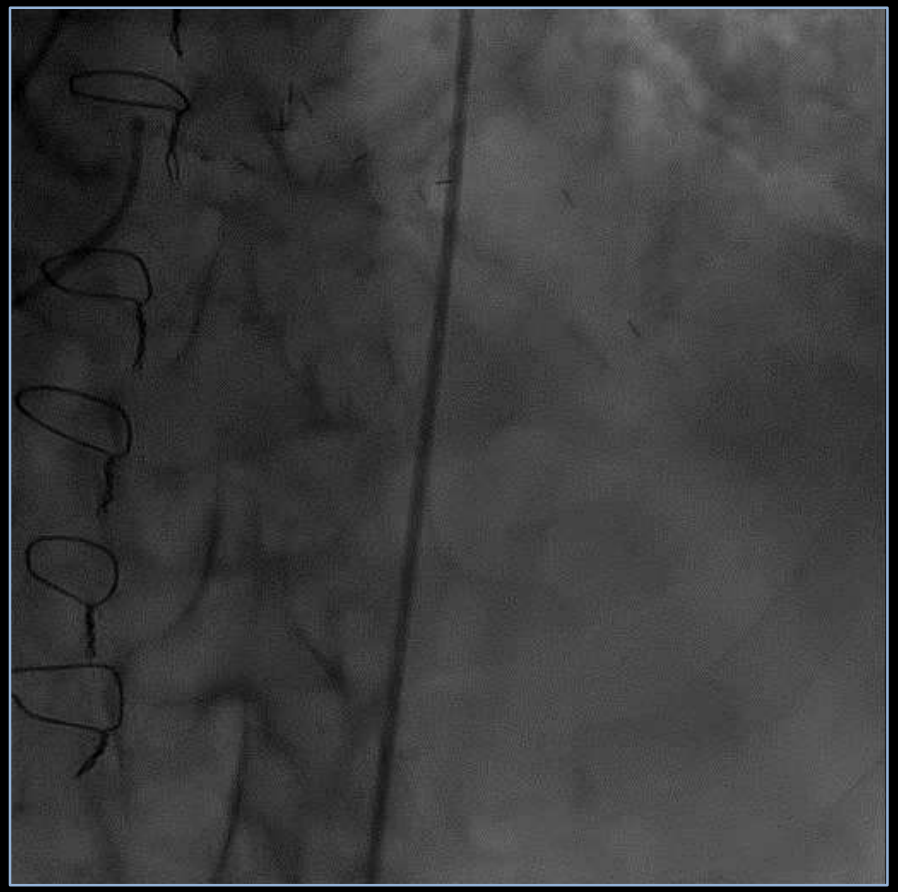
Satoru Mitomo
Antonio Colombo

EMO GVM Centro Cuore Columbus, Milan, Italy
New Tokyo Hospital, Tokyo, Japan

The index PCI for severely calcified lesion in mid LAD

71-year-old, male
Coronary risk factors: hypertension, dyslipidemia
EF: 30% (prior history of anterior MI)
1990 CABG: LIMA-LAD. RIMA-RCA
1999 PCI for mid LAD (BMS)
2018 ICD implantation (sustained VT)

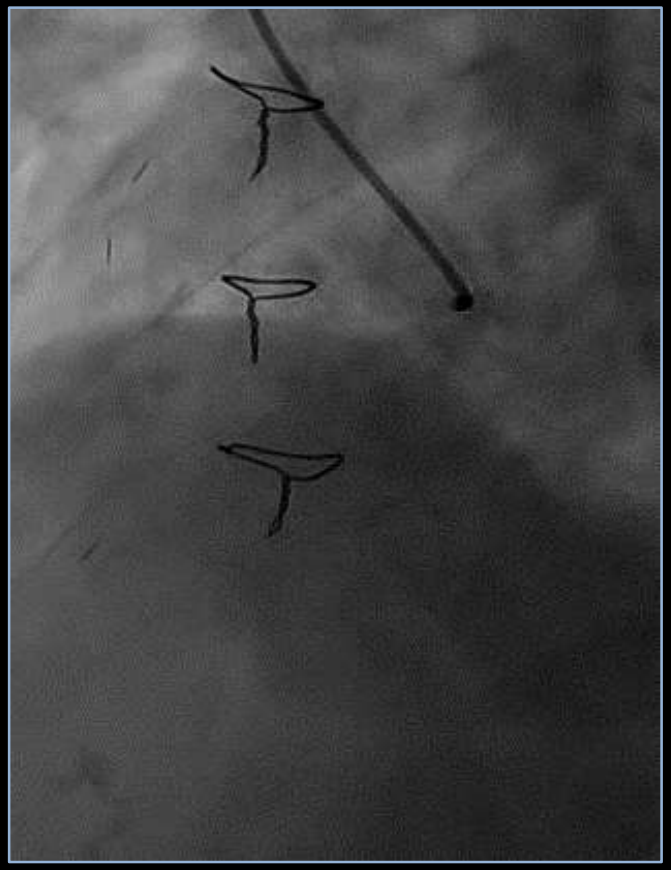


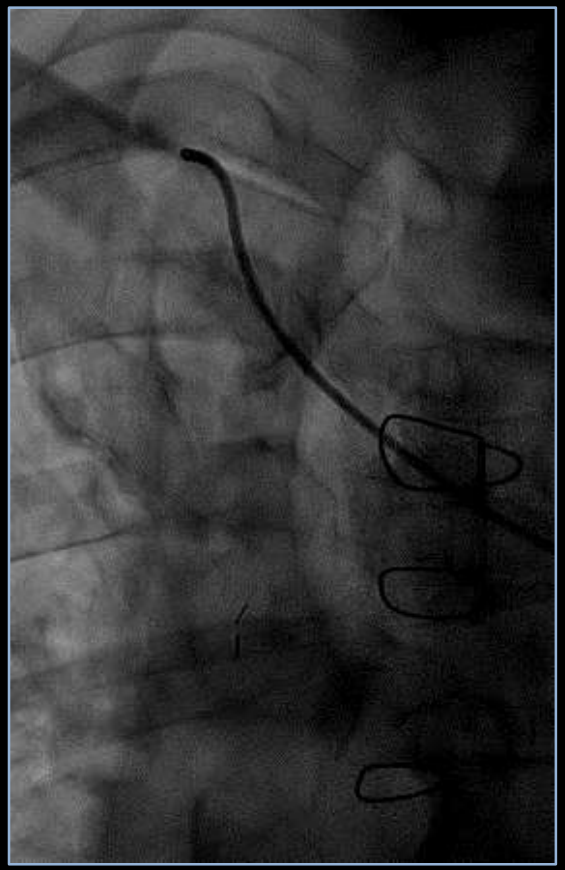


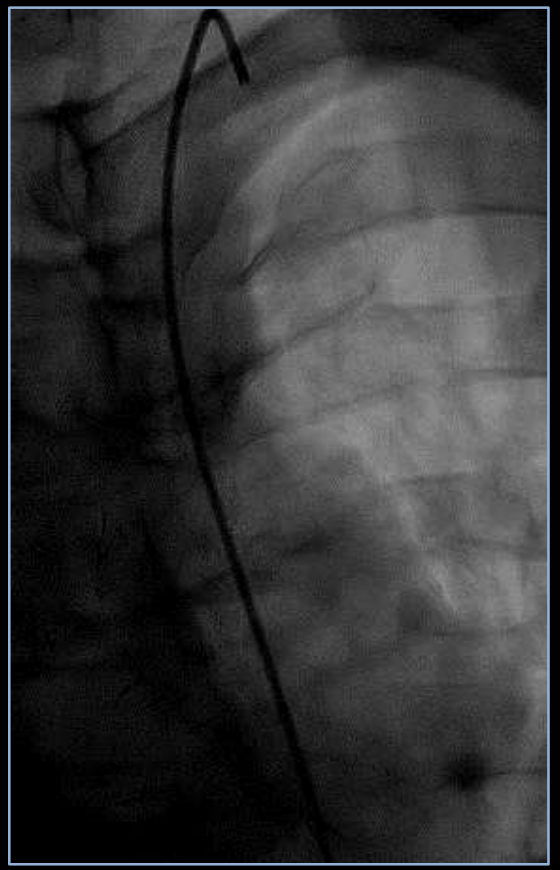
Mid LAD: Severely calcified lesion (90% stenosis)

The index PCI for severely calcified lesion in mid LAD

71-year-old, male
Coronary risk factors: hypertension, dyslipidemia
EF: 30% (prior history of anterior MI)
1990 CABG: LIMA-LAD. RIMA-RCA
1999 PCI for mid LAD (BMS)
2018 ICD implantation (sustained VT)





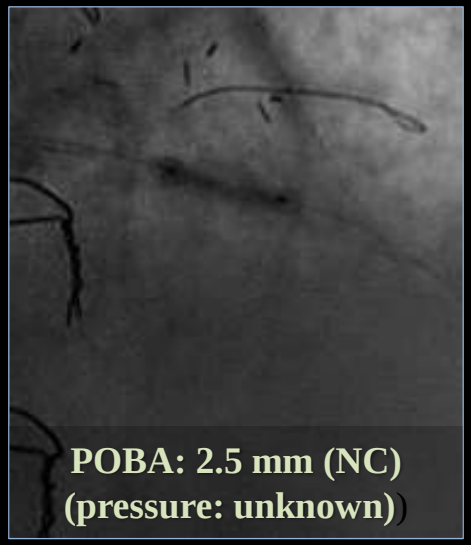


Distal RCA: diffuse disease

RIMA-RCA: Occlusion

LIMA-LAD: Occlusion

The index PCI for severely calcified lesion in mid LAD



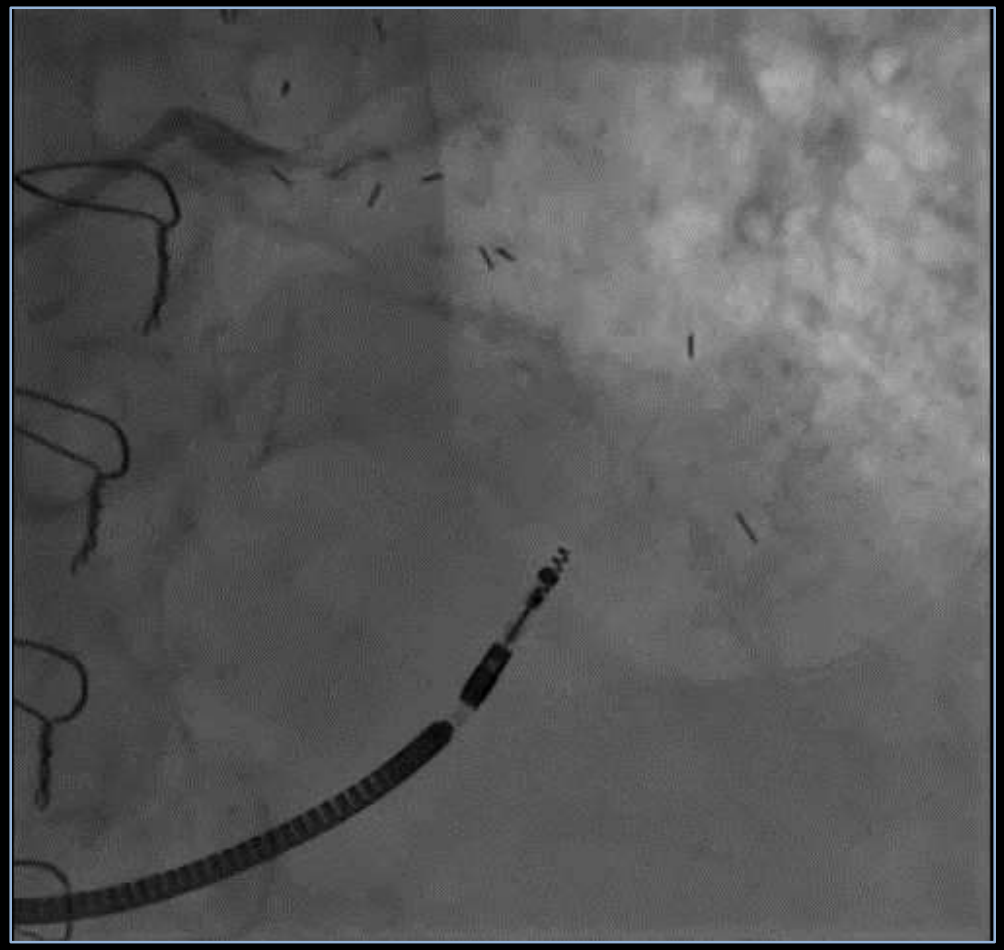
POBA: 2.5 mm (NC)
(pressure: unknown)

Even high pressure inflation, the lesion could not been expanded sufficiently.

After POBA

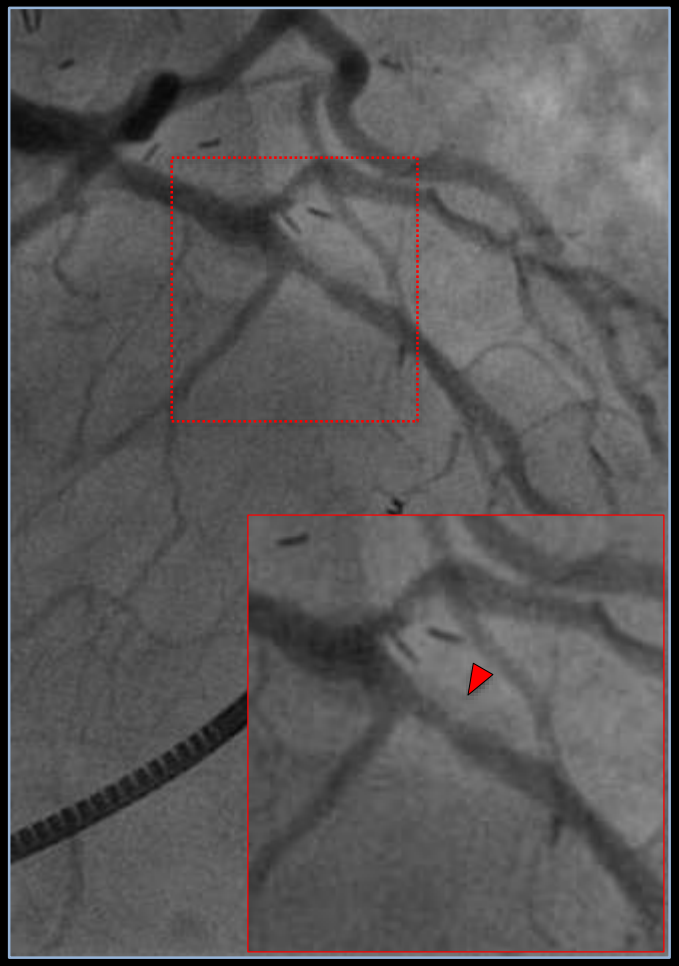
➡ The patient was referred to our hospital to treat the lesion with rotational atherectomy.

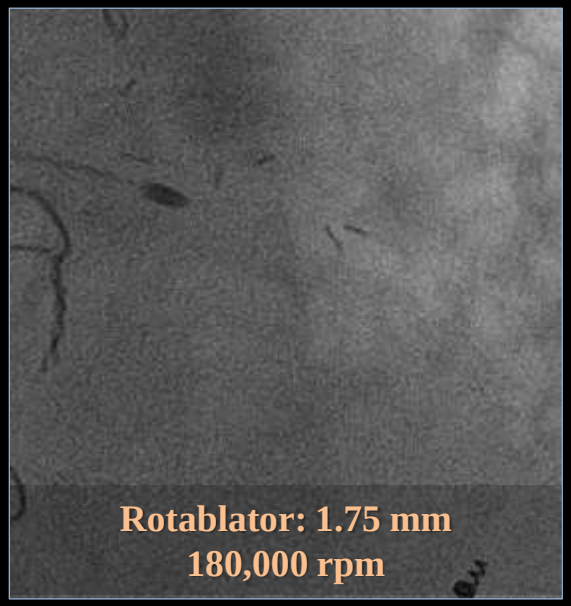
The 2nd PCI for severely calcified lesion in mid LAD



Baseline CAG at the 2nd procedure

The 2nd PCI for severely calcified lesion in mid LAD



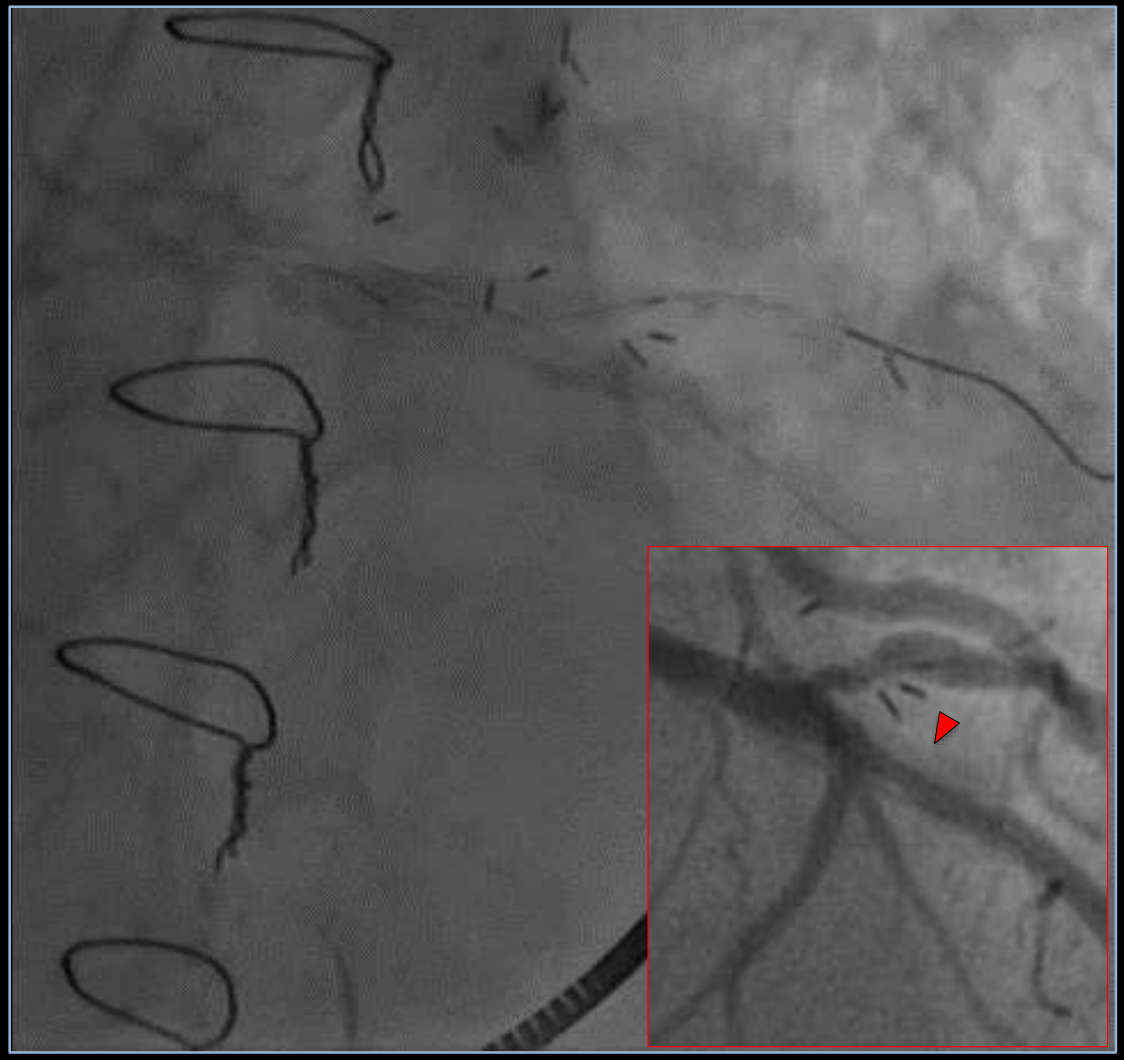


Rota burr (1.75 mm) successfully crossed the lesion.

Subsequent pre-dilatation with 2.5 mm NC balloon at high pressure (24atm)

➡ The lesion could not be expanded sufficiently.

The 2nd PCI for severely calcified lesion in mid LAD



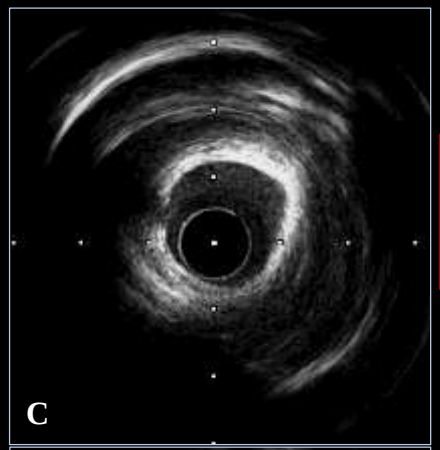
After rotational atherectomy and pre-dilatation

➡ Suboptimal lesion expansion

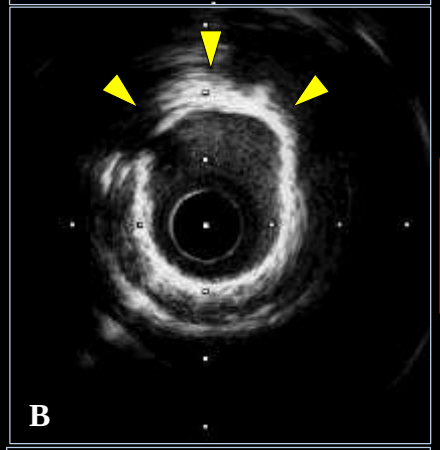
EMO GVM CENTRO CUORE COLUMBUS s.r.l.

New Tokyo Hospital

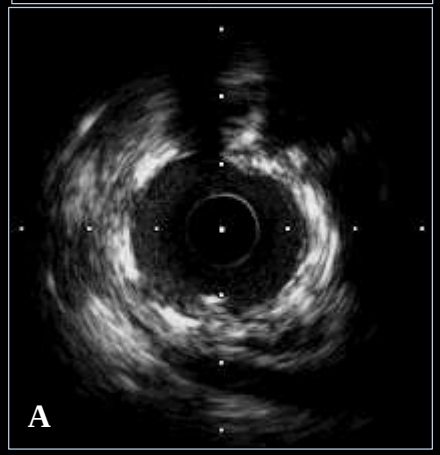
IVUS findings after rotational atherectomy



- ✓ Circumferential calcification
- ✓ MLA
  2.51 mm^2 (1.71/1.88 mm)

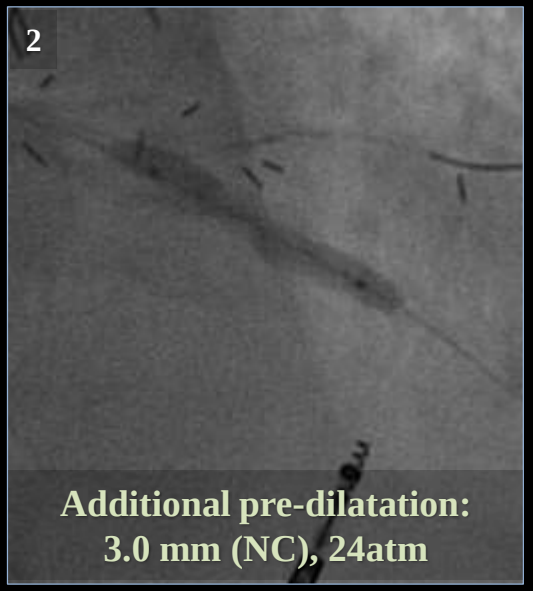


- ✓ Circumferential calcification
- ✓ Evidence of debulking by rotational atherectomy



- ✓ Previous stent
- ✓ Lumen area
  4.64 mm^2 (2.43/2.58 mm)

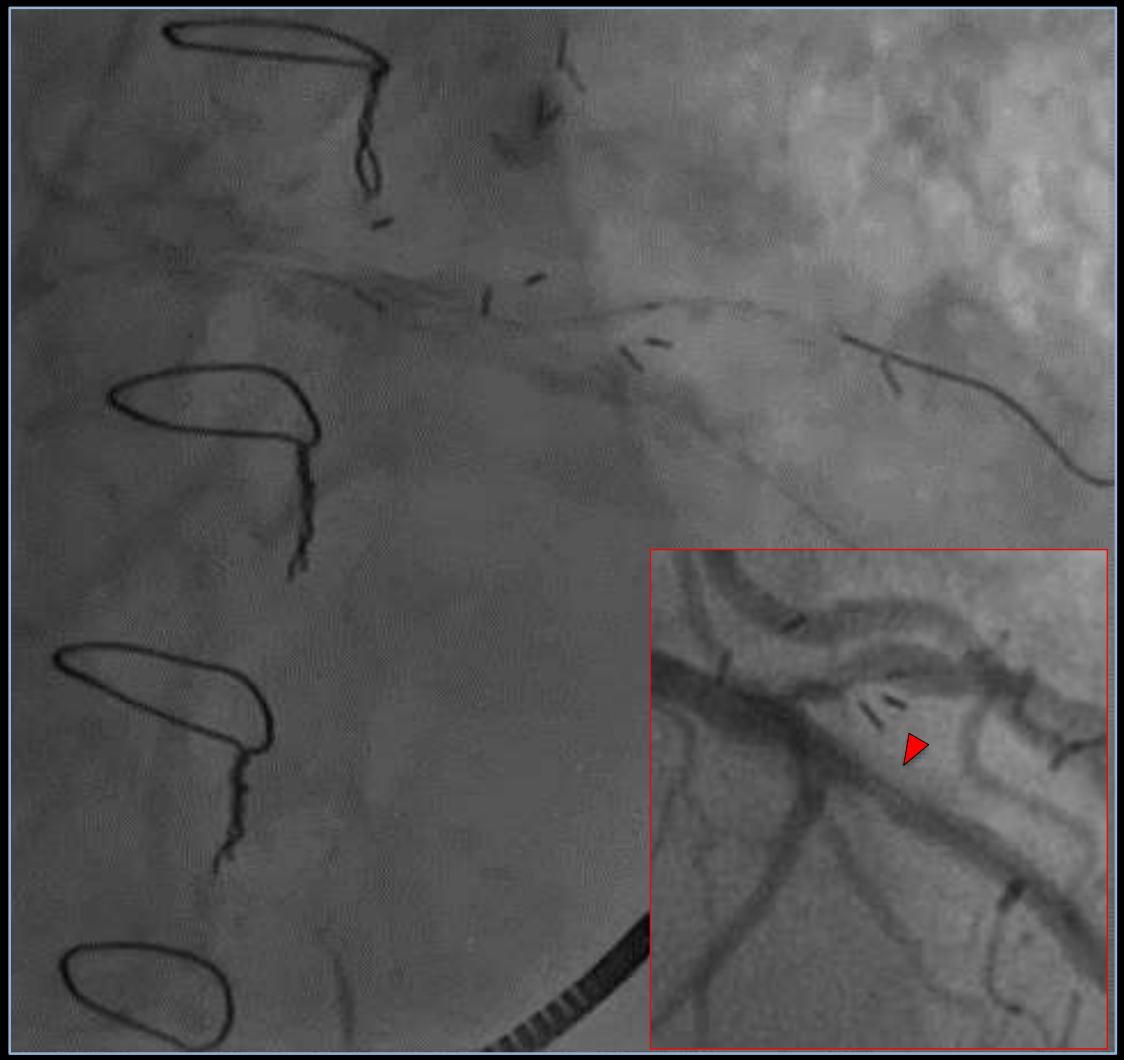
Additional lesion preparation: OPN NC balloon



Additional pre-dilatations
- ✓ OPN NC balloon: 2.5 mm, **40atm**
- ✓ NC balloon: 3.0 mm, **24atm**

➡ Even multiple high pressure pre-dilatations, the lesion could not be expanded sufficiently.

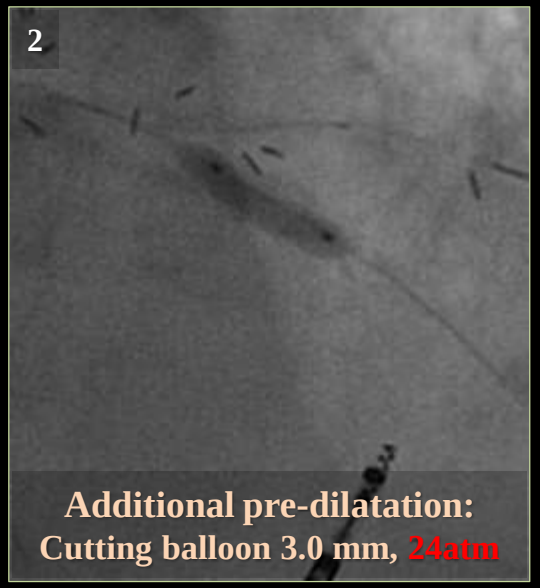
Additional lesion preparation: OPN NC balloon



After additional pre-dilatations

➡ Suboptimal lesion expansion

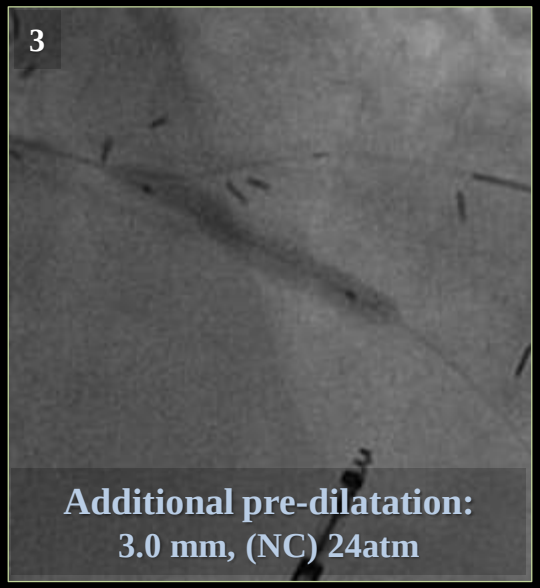
Additional lesion preparation: cutting balloon



Considering severely calcified lesions, pre-dilatation with cutting balloon at high pressure was additionally attempted.

➡ The lesion could be expanded.

Additional lesion preparation: cutting and NC balloons



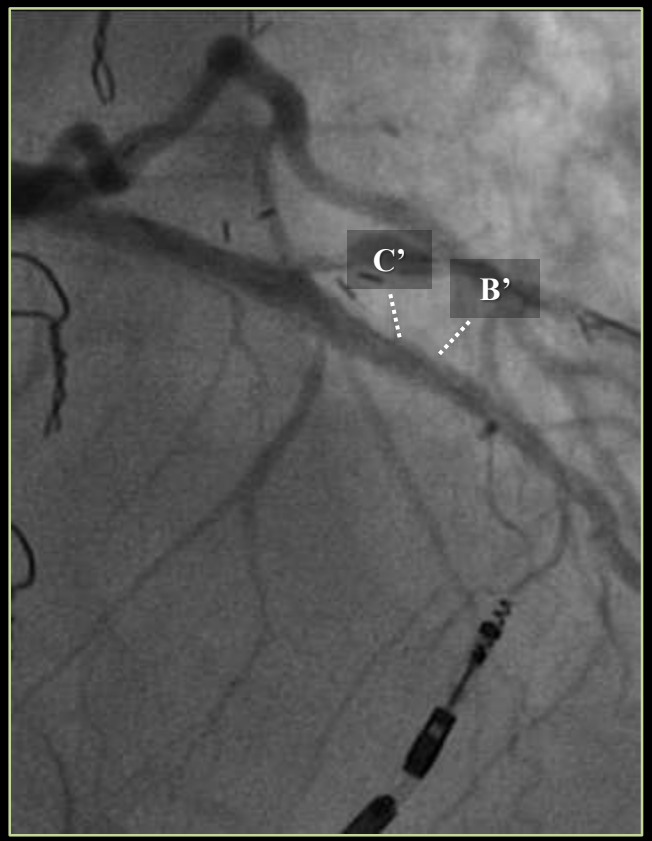
After additional pre-dilatations with
3.0 mm cutting balloon and
3.0 mm NC balloon

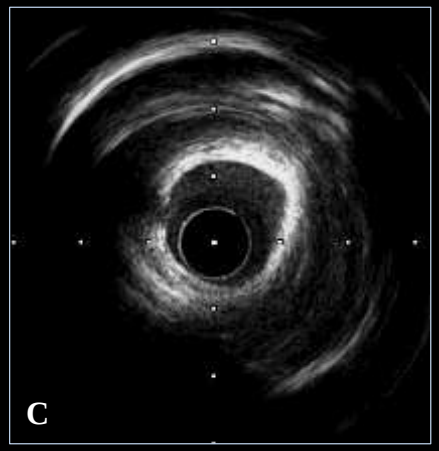
➡ Optimal lesion expansion

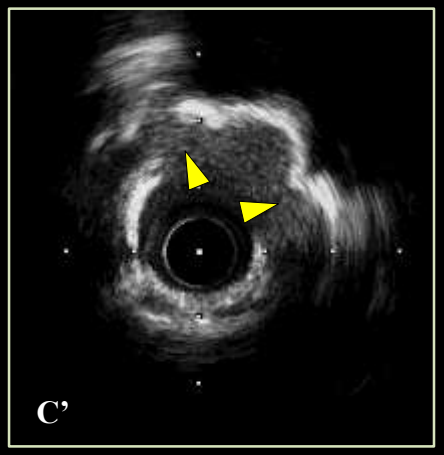
EMO GVM CENTRO CUORE COLUMBUS s.p.l.

New Tokyo Hospital

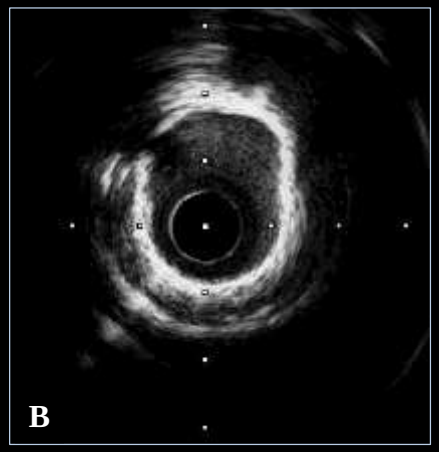
IVUS findings after cutting and NC balloons

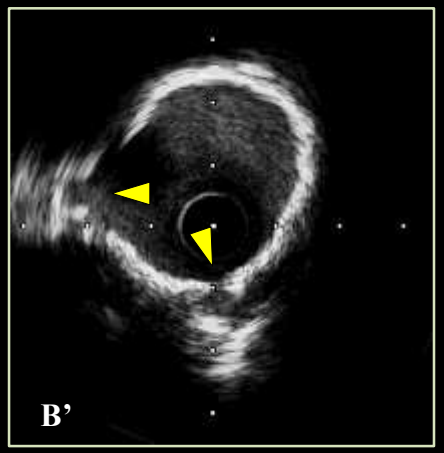






Cracks on the calcification

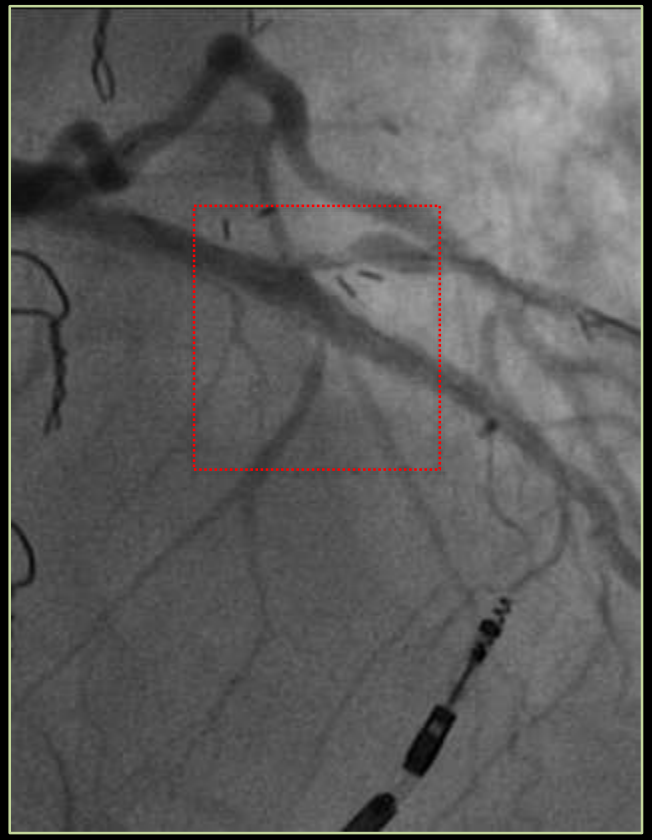




Before cutting balloon

After cutting balloon
(+ 3.0 mm NC balloon)

The 2nd PCI for severely calcified lesion in mid LAD



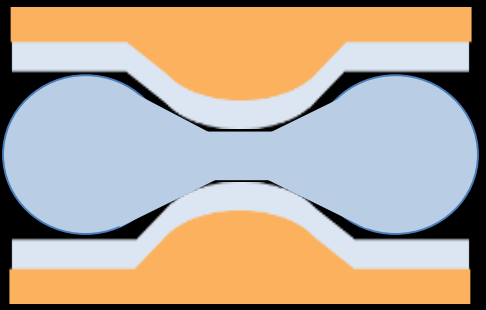
According to the IVUS findings showing optimal lesion preparation, the lesion was treated with DCB

The 2nd PCI for severely calcified lesion in mid LAD

Final angiography: Excellent angiographic results

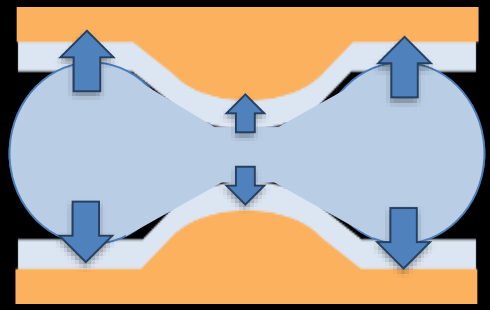
Expansion force: NC balloon vs. Cutting balloon

NC balloon



High pressure

Non-uninform expansion

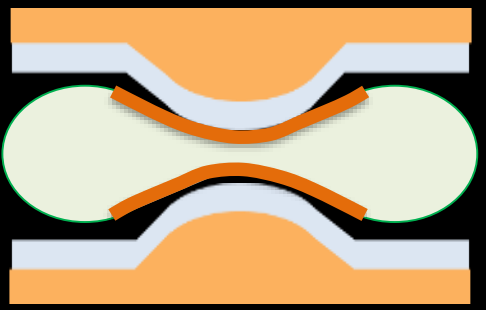


Suboptimal expansion
at the severely calcified stenosis

Expanding force tends to be distributed more to the segments with less resistance.

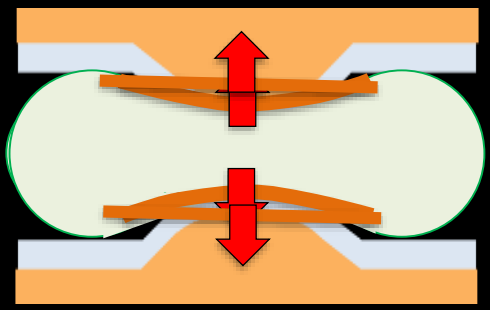
➡ Insufficient expansion at the tight lesion.

Cutting balloon



High pressure

Uninform expansion



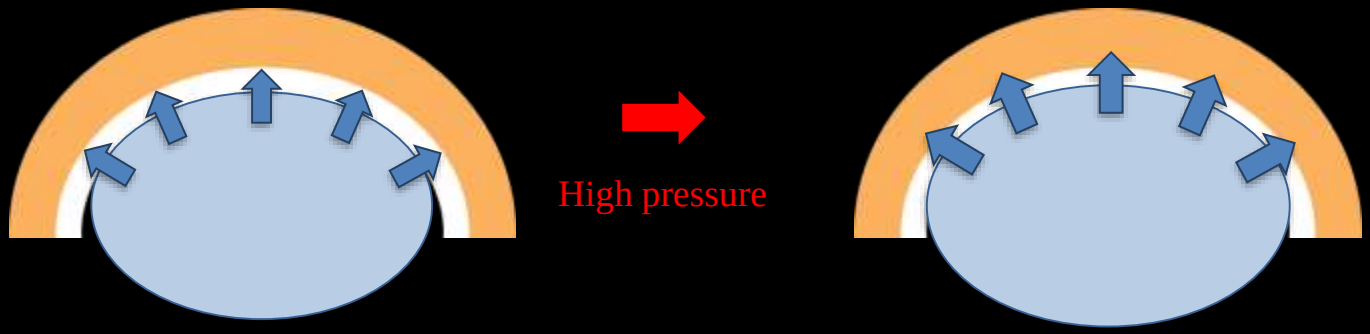
Suboptimal expansion
at the severely calcified stenosis

By the blades of cutting balloon, expanding force can be uniformly transmitted to the lesion.

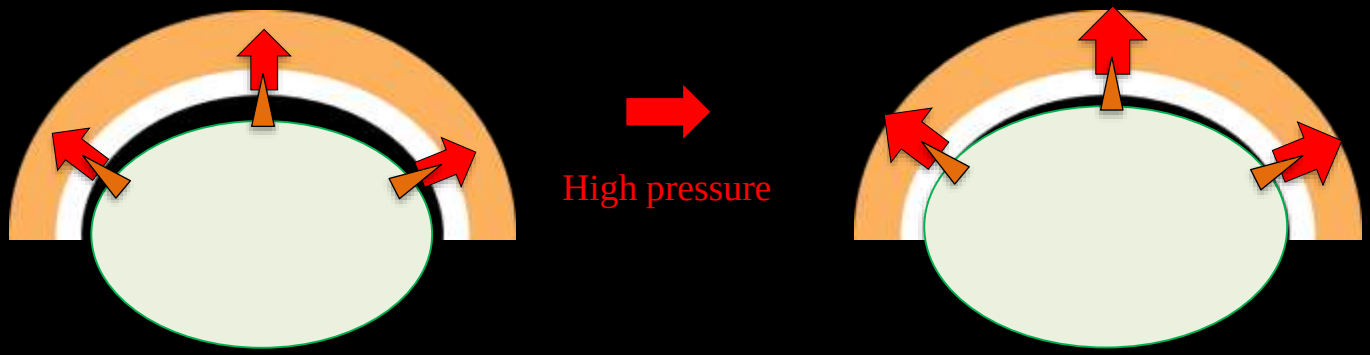
➡ Sufficient expansion at the tight lesion.

Expansion force: NC balloon vs. Cutting balloon

NC balloon



Cutting balloon



Expansion force is divided by balloon surface area contacting the lesion.

Cutting balloon can contact the lesion at the point of the blades, resulting in stronger expansion force creating cracks on the calcifications