

Current Strategies for Percutaneous Treatment of SVG Disease in ACS

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Demographics

- **46% of SVG PCI's were for ACS.** (Cureus 2020; 12(11): e11496)
- **Only 5.7% of PCI's are on SVG's.** (NCDR: 1,596,966 PCI's in the US JACC Interv 2010;3:1068-73).
- **18% of PCI's are in patients with prior CABG.**
- **PCI of SVG has more complications and restenosis than PCI of native coronaries.**

SVG Failure Rate

- **In the past (2004-8)**
 - 3-12% before hospital discharge
 - 8-25% at 1 year
 - 40-60% at 10 years
- **Cascade Trial** (Hate A. et al. J Thor CV Surg 2018;155:212-222)
 - 91% patency at 8 years, similar to arterial grafts.
- **13% of CABG patients require revascularization within 10 years.**

Mechanism of SVG Failure

- **First week-1 month:**
 - Thrombosis
 - Technical failure
- **1-12 months:**
 - Intimal hyperplasia
- **After 1 year:**
 - atherosclerosis

Embolization in PCI of SVG's.

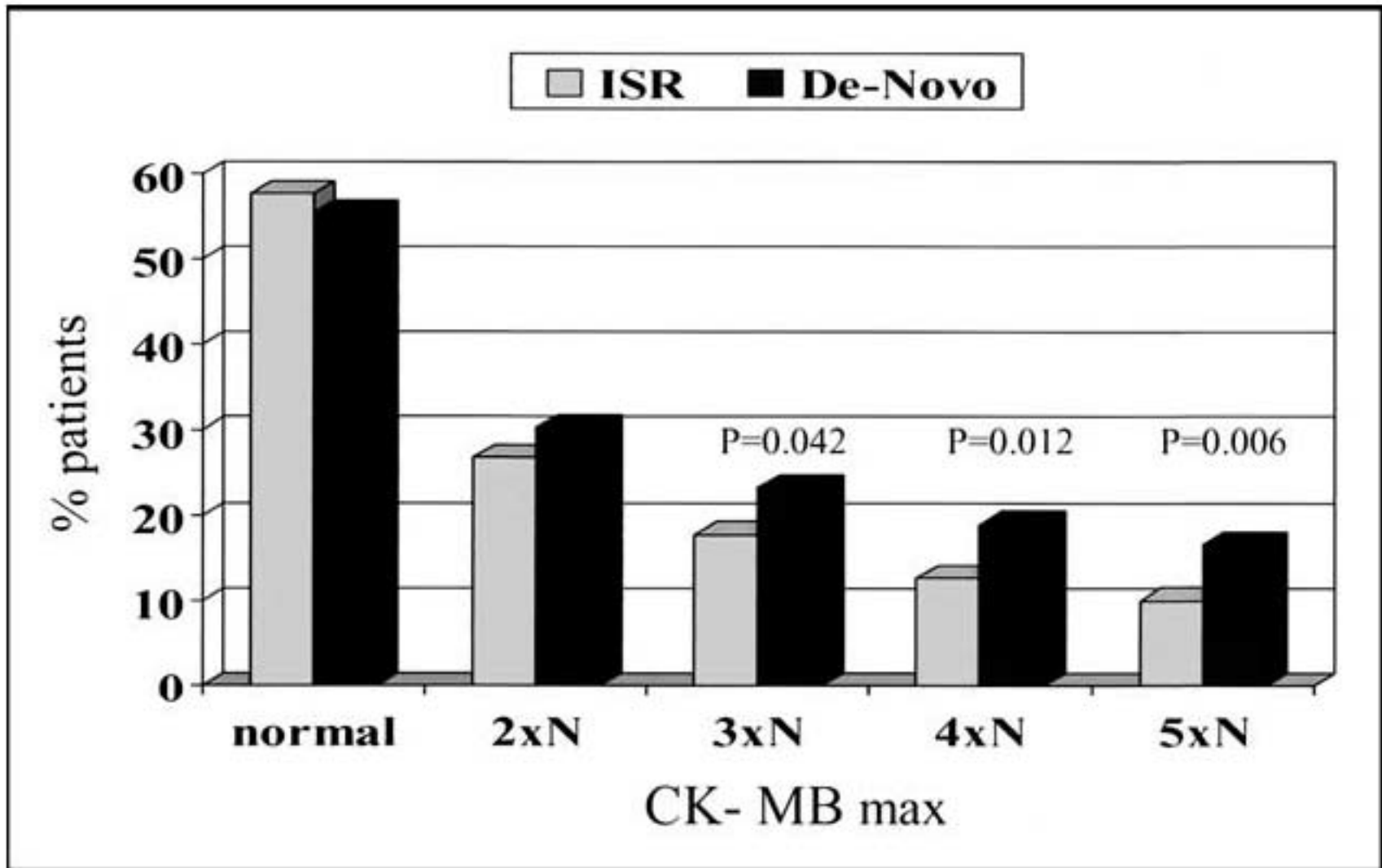
1. Significant embolization occurs in 5-20% of SVG's.
2. Cannot predict which lesion will embolize.
3. Cannot predict how severe the embolization will be.

(Predictors: ↑ plaque mass, positive remodeling, degeneration index).

SVG Restenosis Lesions Also Embolize.

WHC: Wolfram, Am J Cardiol 2003;92:980-983

342 ISRS and 2555 De Novo SVG Lesions.



Strategies to Prevent Distal Embolization **and No Reflow.**

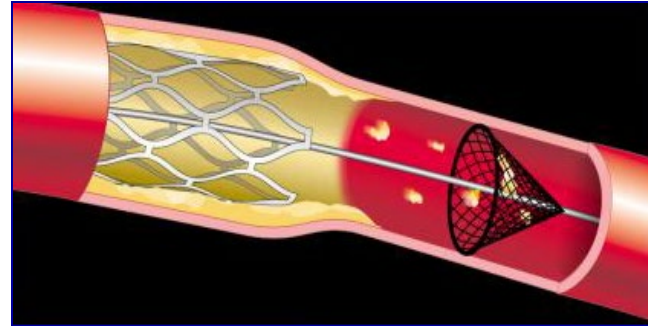
- 1. Protection Devices ?.**
- 2. 2B3A?**
- 3. Direct stenting.**
- 4. Small stent in large veins.**
- 5. Use of Vasodilators**

1. Protection Devices For Distal Embolization

Currently available in US:

Distal filters

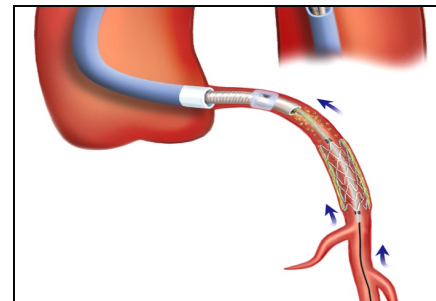
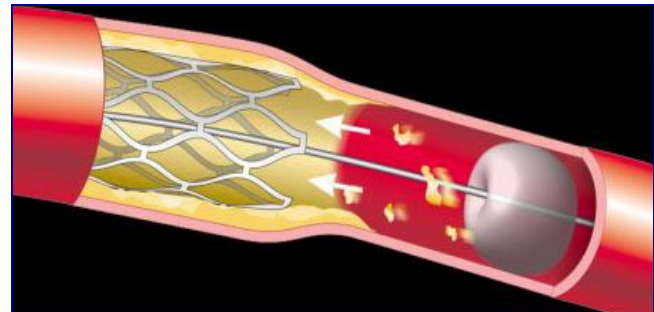
- FilterWireEZ (BSc)
- SpiderFX (Medtronic)



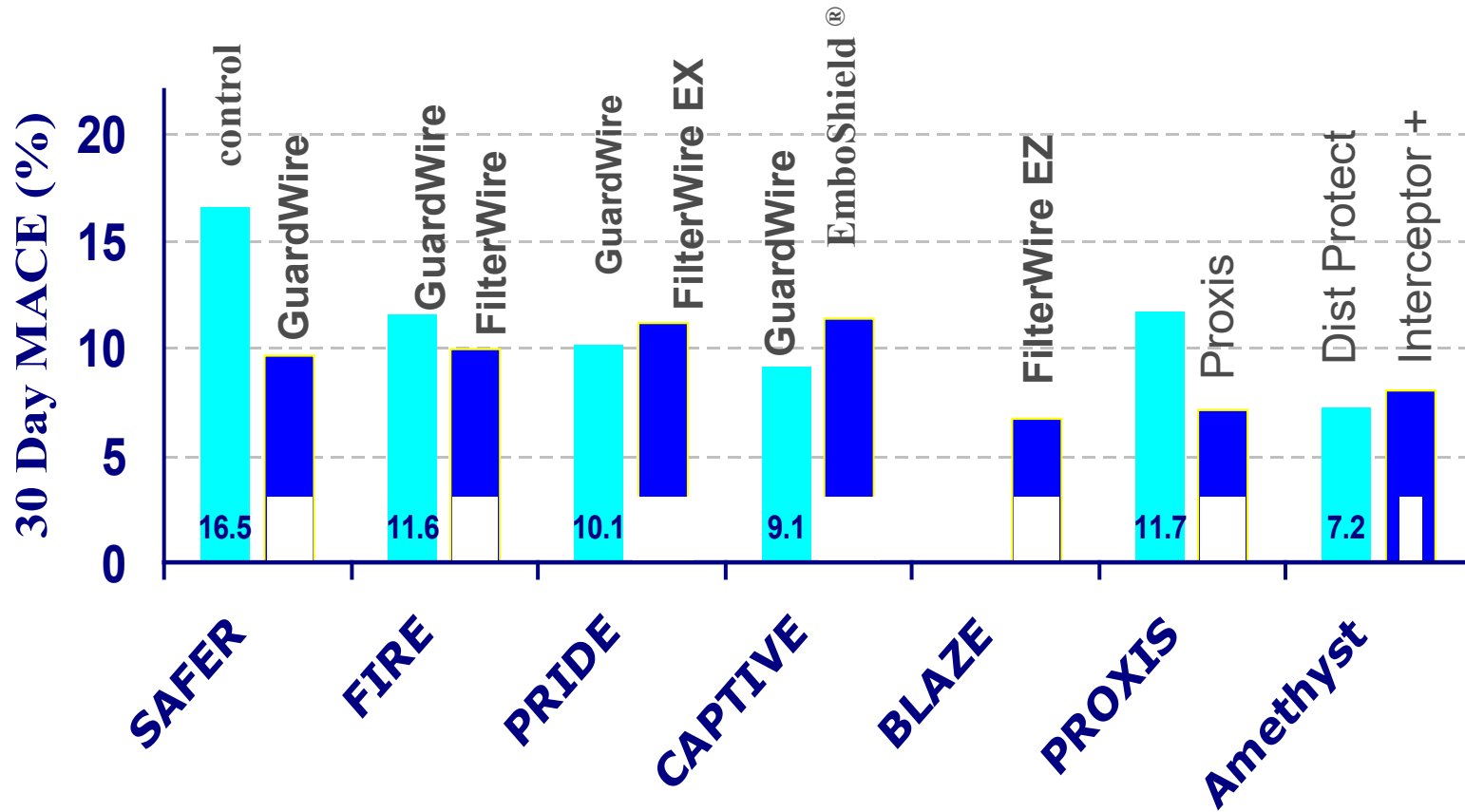
No longer available in US:

a) distal balloon + aspiration (Percusurge).

b) proximal occlusion + aspiration: (Proxis)



Protection Devices for SVG's. MACE Rates



NCDR Cath PCI Registry

49,325 patients with PCI of SVG

21% use Distal Protection

	EPD Cum Inc (n=10 432)	No EPD Cum Inc (n=38 893)	Unadjusted HR (95% CI)	PM HR (95% CI)
Death	25%	24%	1.05 (0.99–1.10)	0.96 (0.91–1.02)
MI	15%	14%	1.03 (0.97–1.10)	1.00 (0.93–1.09)
Repeat revascularization	30%	30%	1.00 (0.96–1.05)	1.02 (0.96–1.08)

- 30-day MACE was 5.5% (P=0.1)
- 3-year MACE was 52%

Complications Associated with Distal Protection

NCDR Cath PCI Registry Data

- Slightly higher complications with DP:
 - Peri-procedural MI: 2.8% vs 1.8%; $P < 0.001$
 - No reflow: 3.9% vs 2.8%; $P < 0.001$
 - Vessel dissection: 1.3% vs 1.1%; $P = 0.05$
 - Perforation: 0.7% vs 0.4%; $P = 0.001$

Conclusion

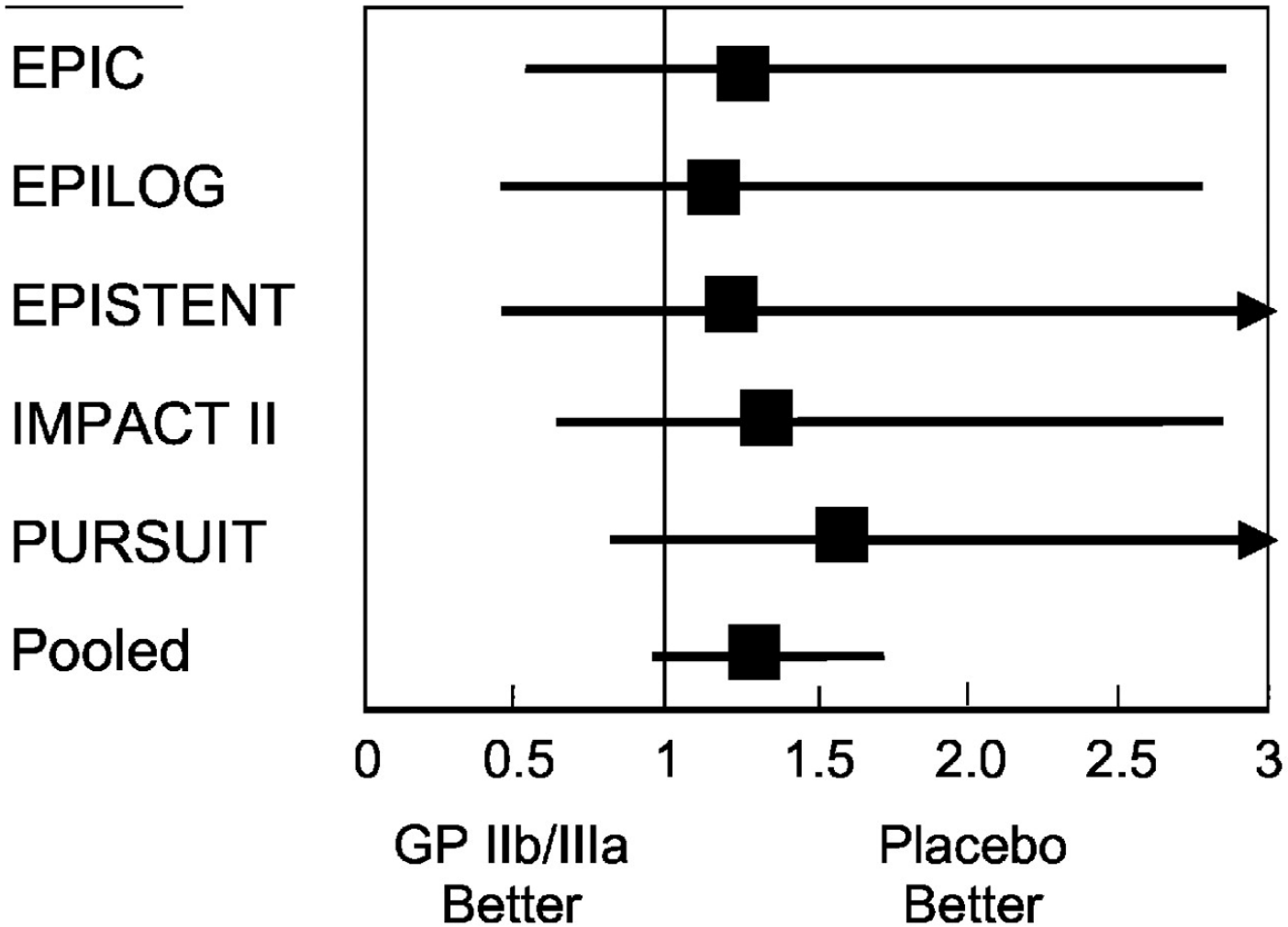
There is no evidence of improved outcome (acute or long-term) in routine use of EPD, even with high-risk clinical indications.

2. 2B3A inhibitors?

**They should not be used
in SVG angioplasty**

Trial

Hazard Ratio & 95% CI



3. Pre dilatation before stenting?

NO!

- **Always plan on direct stenting.**
- **Predilatation often associated with distal embolization.**

3. Post dilatation after stenting ?

NO!

- **It is the most common cause of distal embolization.**
- **Do it only if severe stent under expansion is evident.**
- **Consider distal protection.**

3. Direct Stent in SVG's.

WHC: Leborgne et al. AHJ 2003;146:501-6

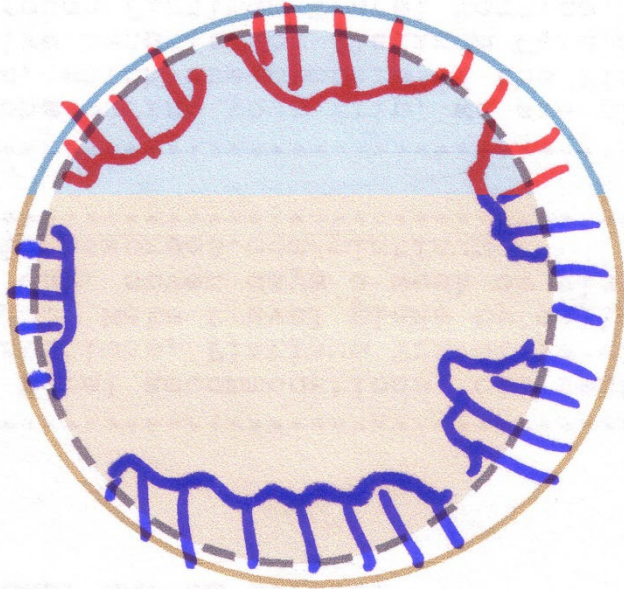
- 507 patients (672 lesions) with 12 months f/u.
- 229/672 lesions with direct stenting.
- **Direct stenting had**
 - **Less CK MB >4x (13.6 vs 23. p<0.12)**
 - **Lower Maximum CK MB (9.5 vs 19.6 p<0.001)**
 - **Less NQMI (10.7 vs 18.4 p< 0.024)**
 - **Less TLR at 1 year (p<0.02)**
 - **Improved EFS at 12 months**

Conclusion

- Direct Stenting is the technique of choice.
- It is the standard of care today.

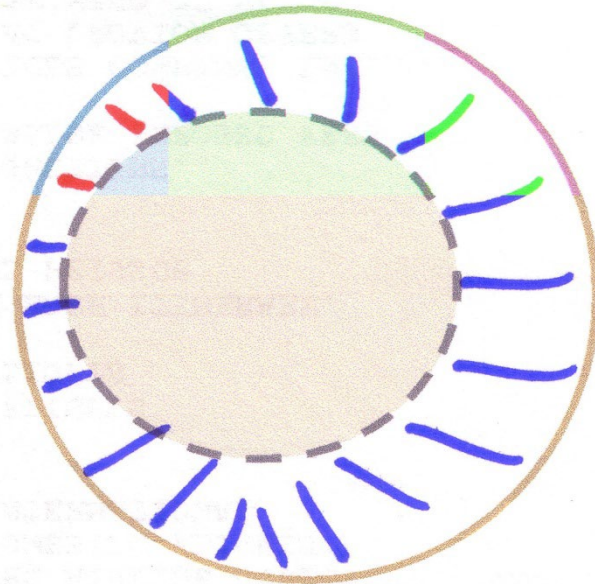
4. Small Stents for Large SVG's

Large Stent
in Large Vein

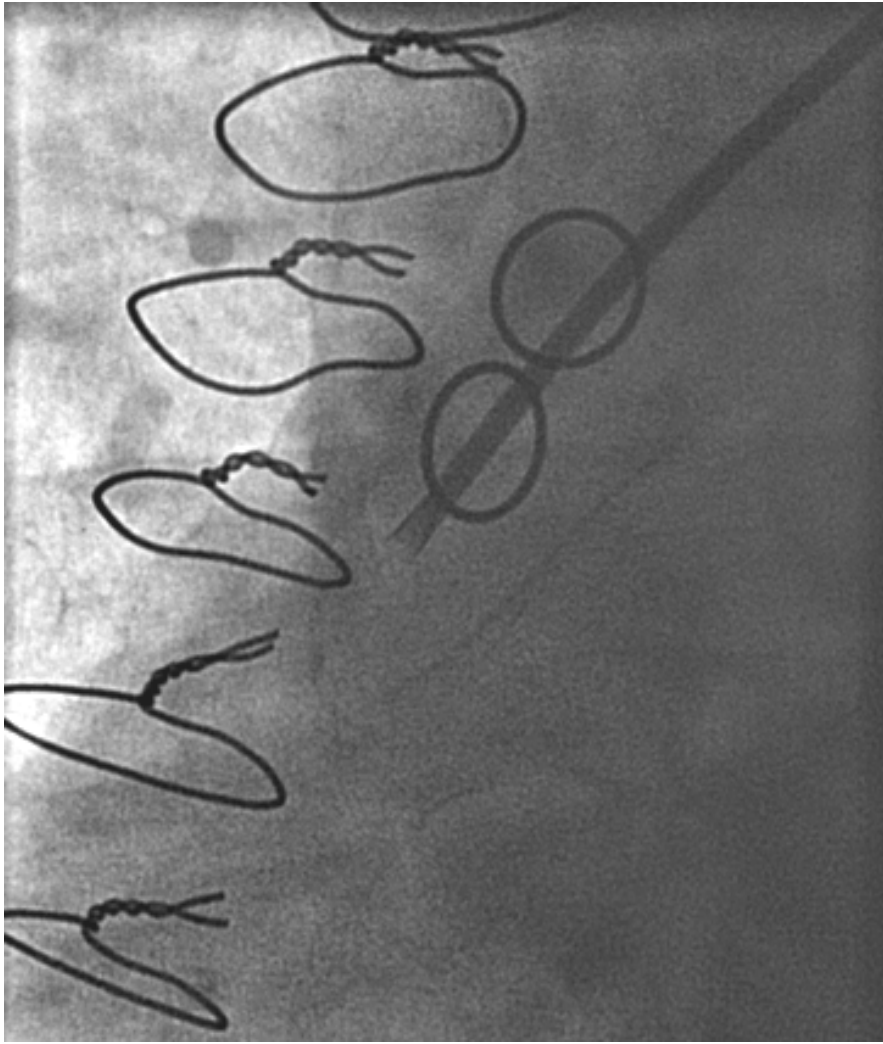


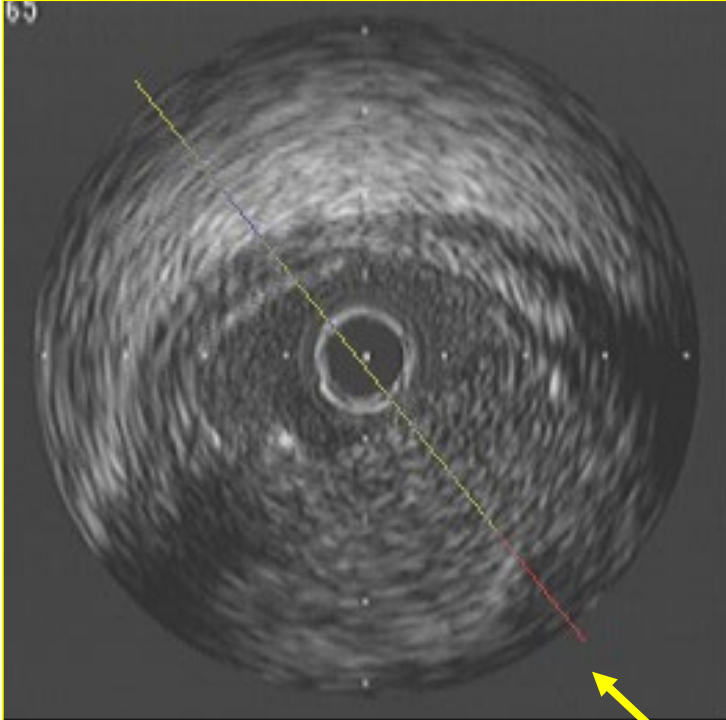
Plaque extrudes
through the stent
into the lumen

Small Stent
in Large Vein

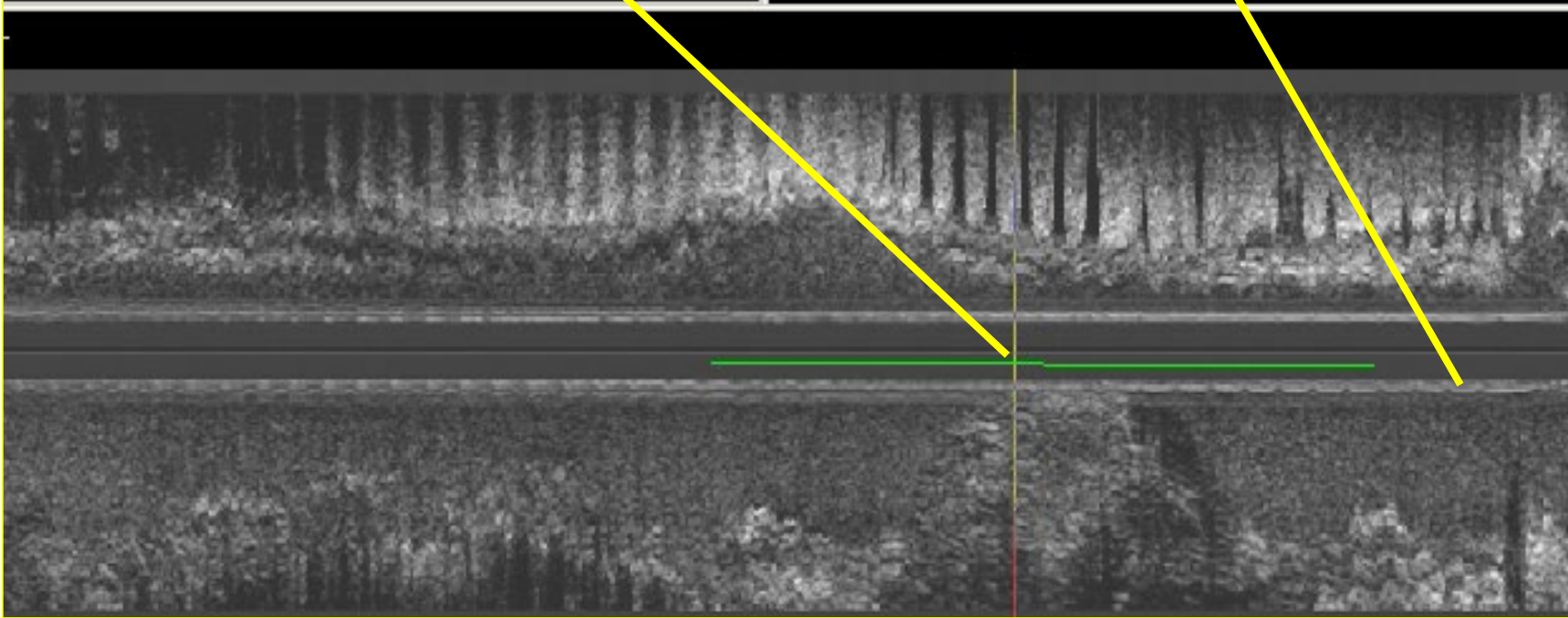
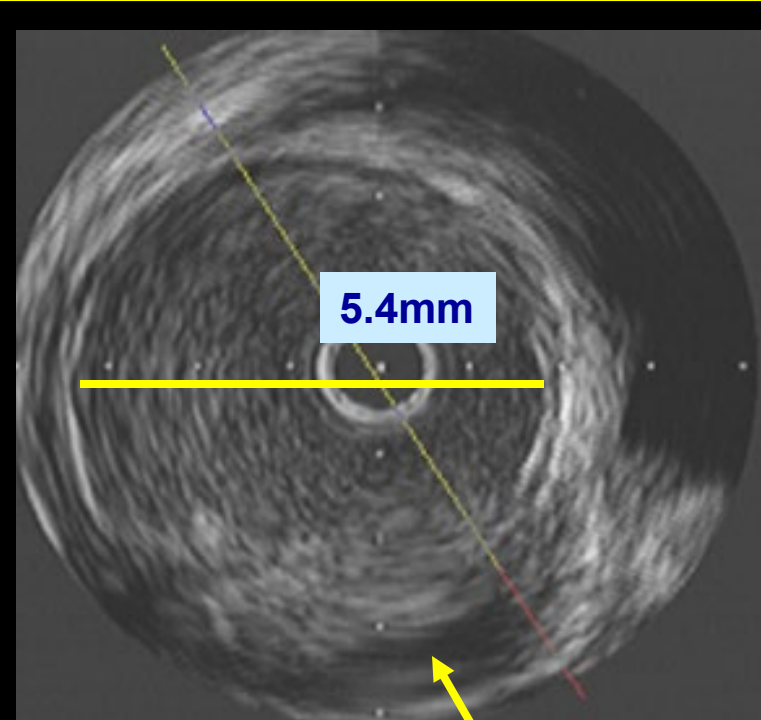


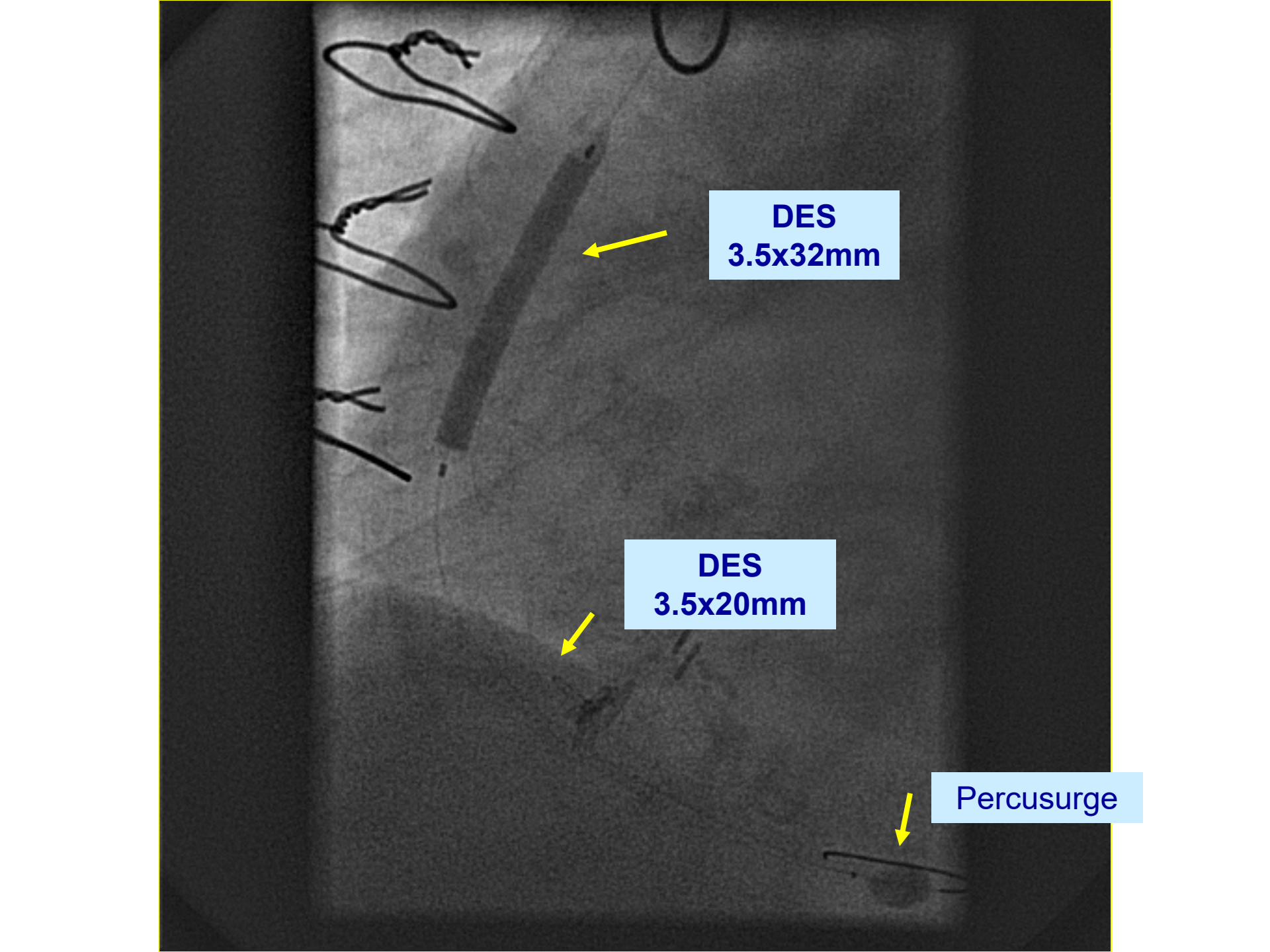
Plaque stays
behind the
stent struts





Dist: -7.50 / 47.73 mm Frame: 225 / 1432



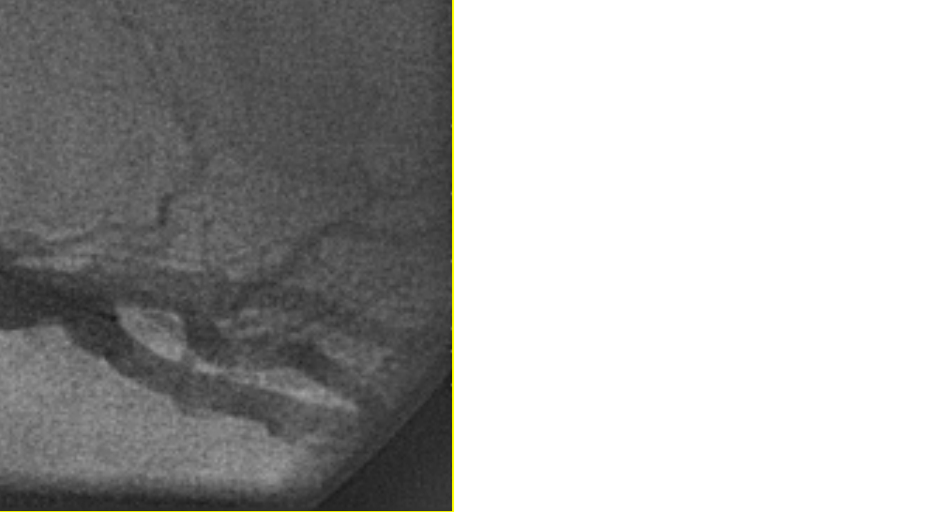
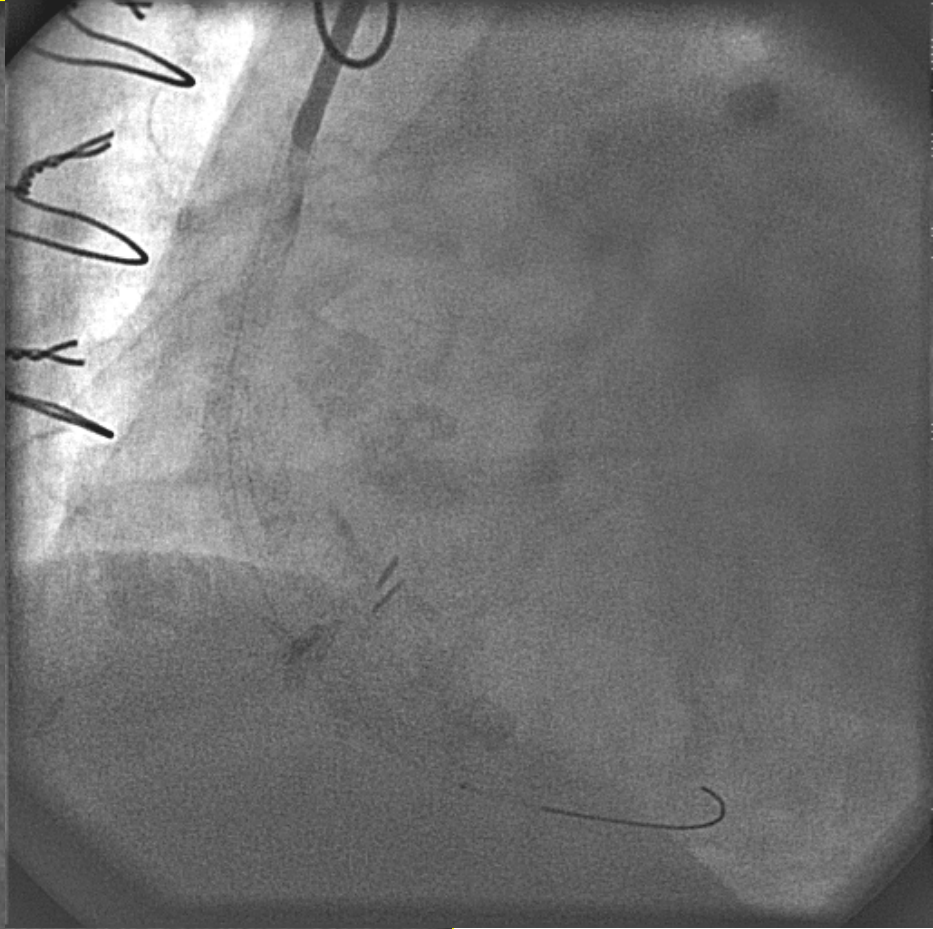


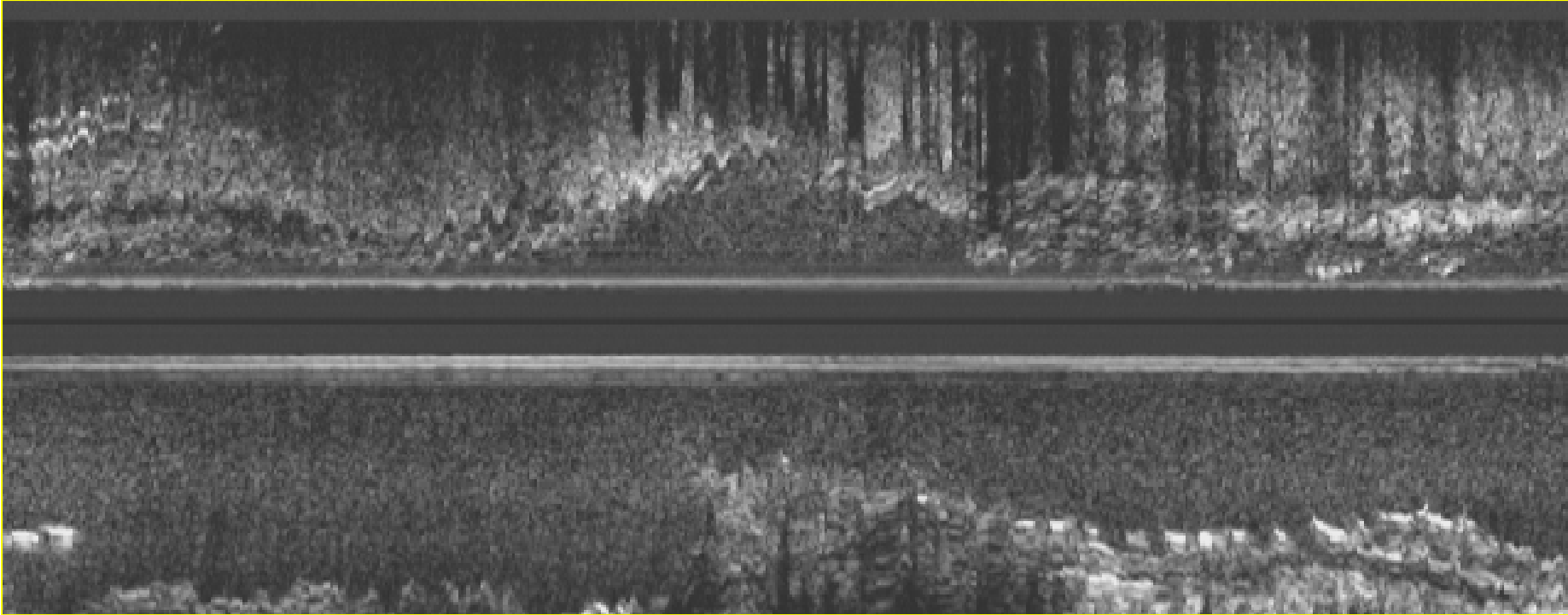
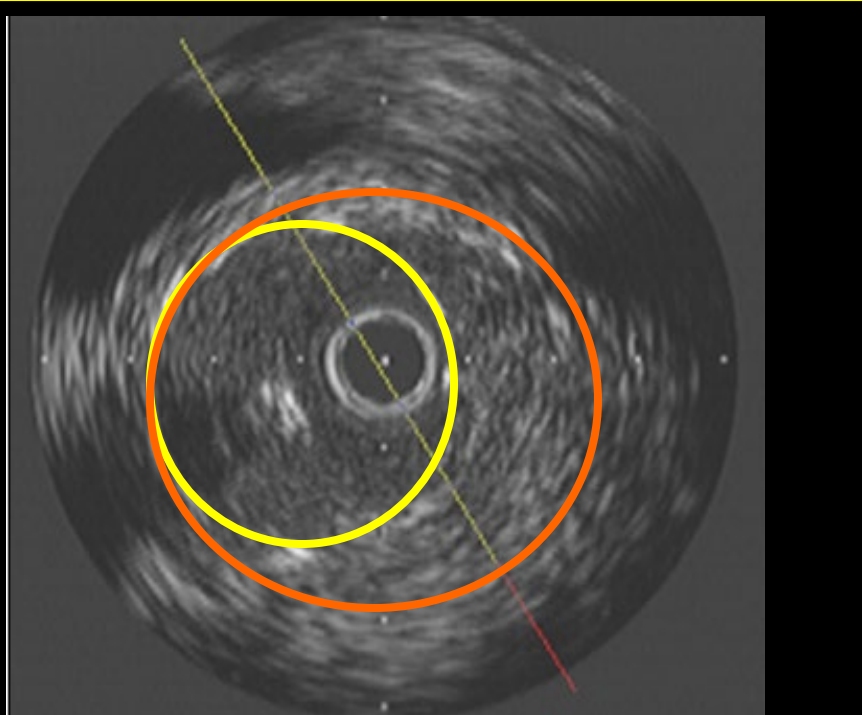
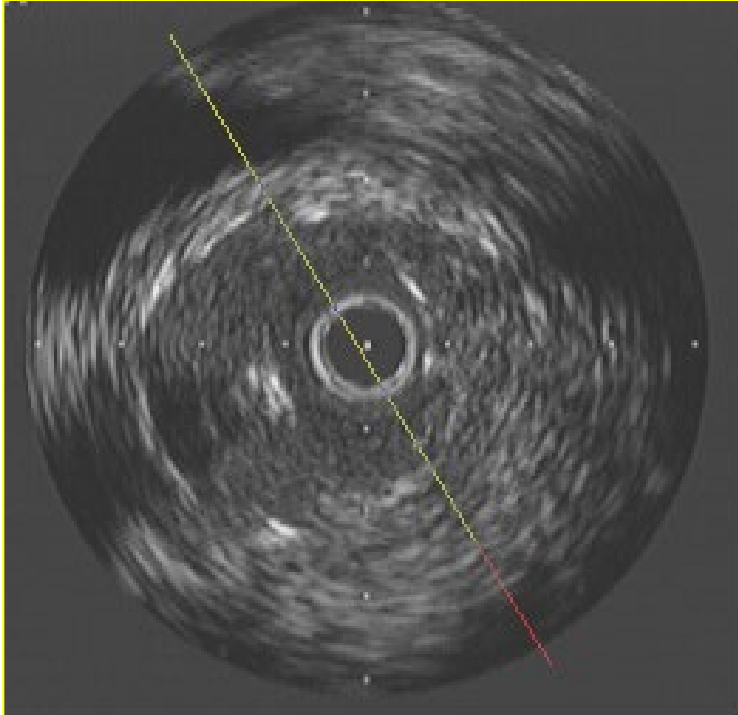
DES
3.5x32mm

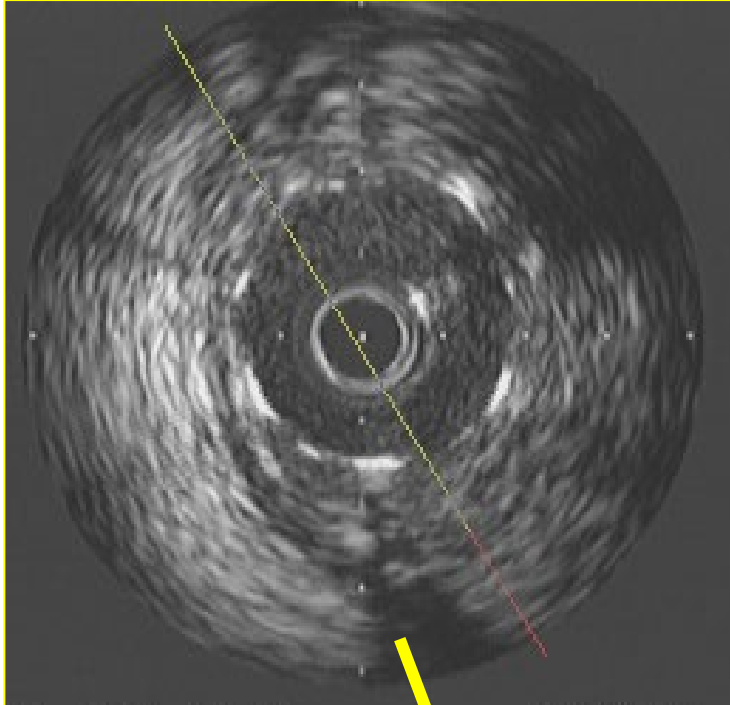
The image shows a fluoroscopic view of a catheter with three DES stents and a Percusurge catheter. The catheter is positioned vertically, and the stents are located at different heights. The Percusurge catheter is located at the bottom right. The labels are in blue boxes with yellow arrows pointing to the corresponding stents and catheter.

DES
3.5x20mm

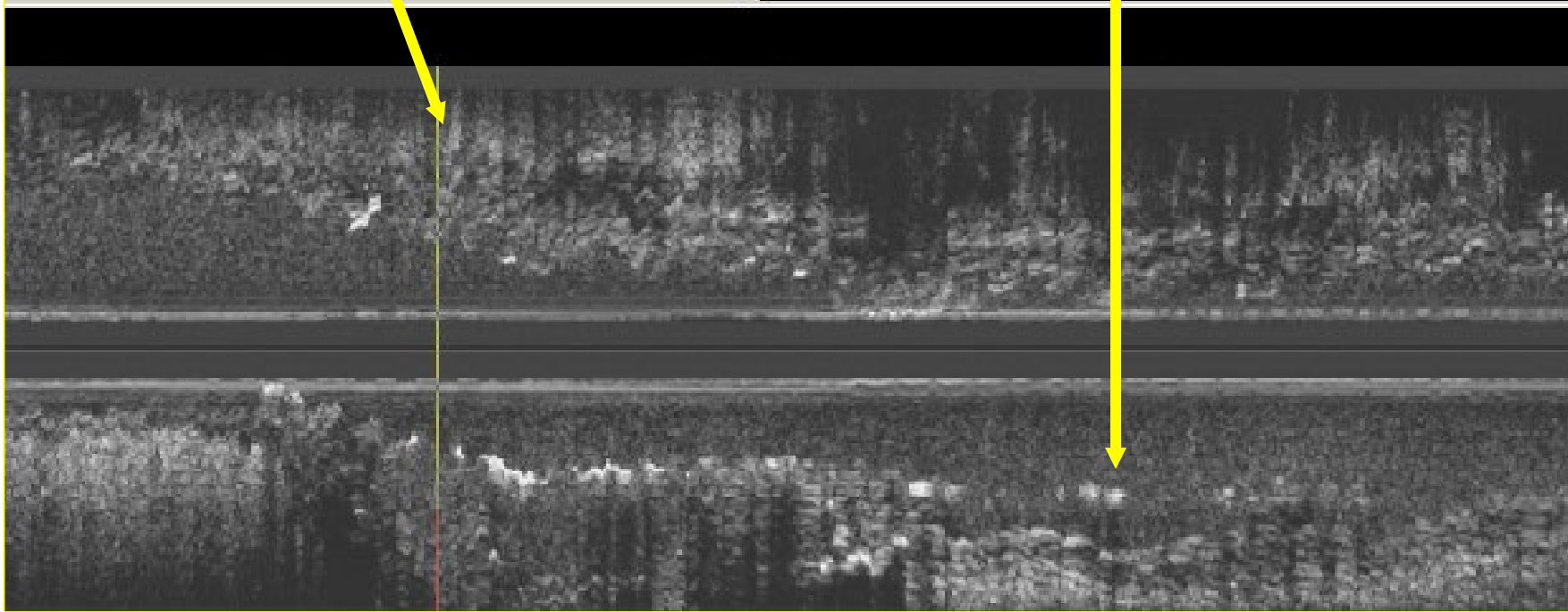
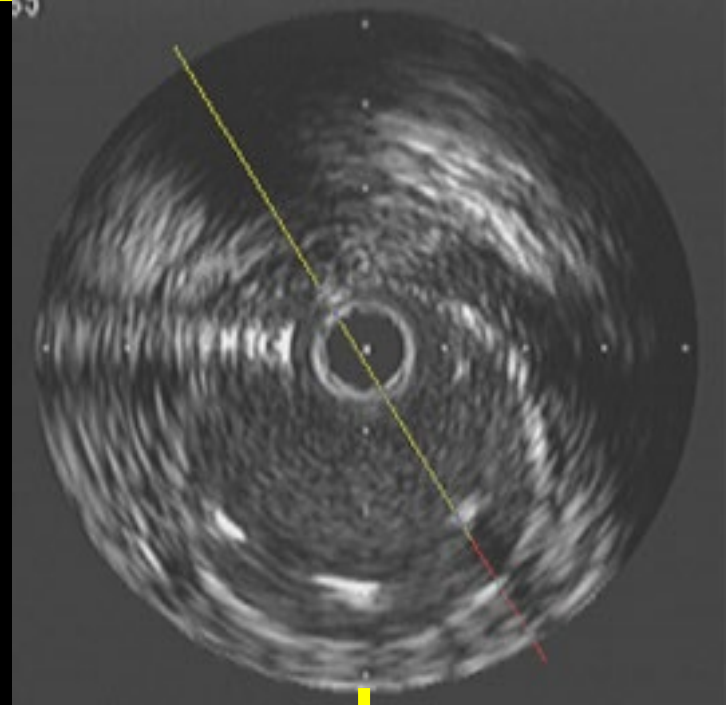
Percusurge



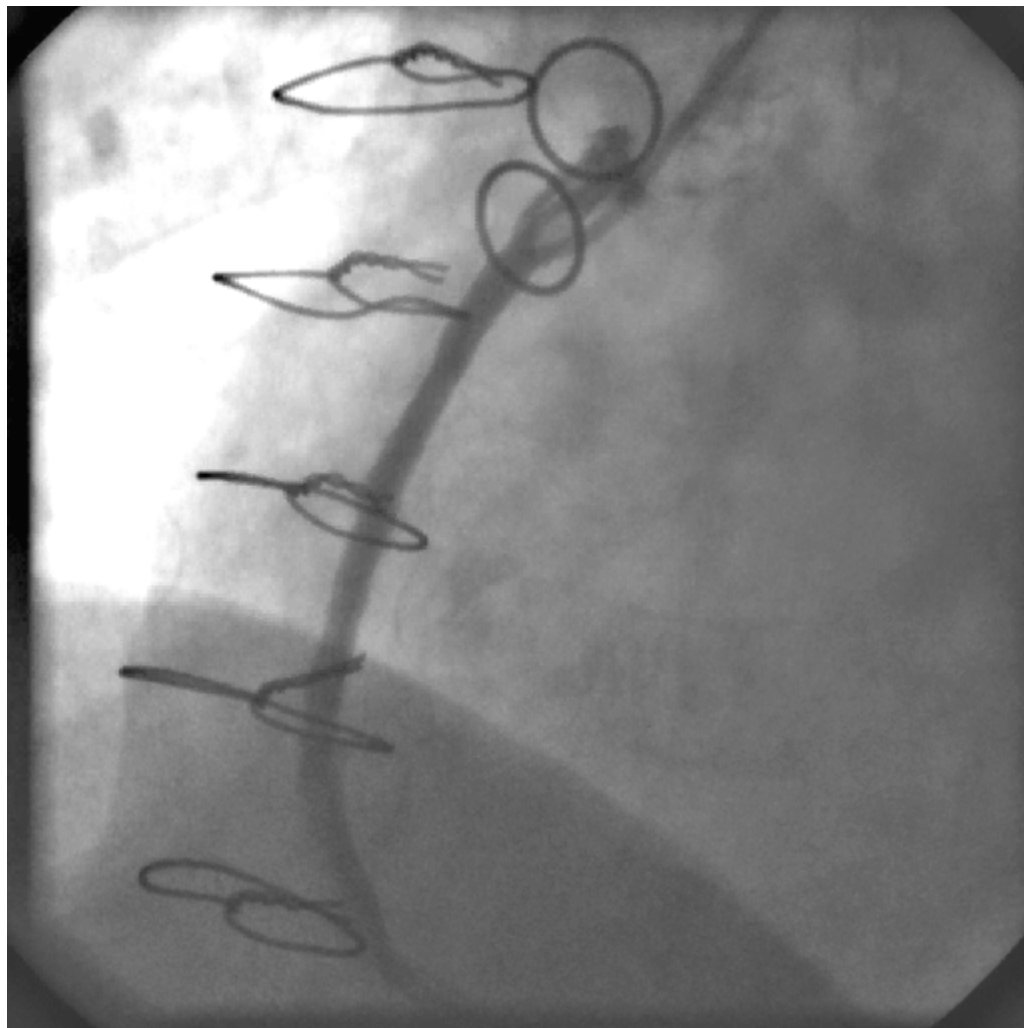




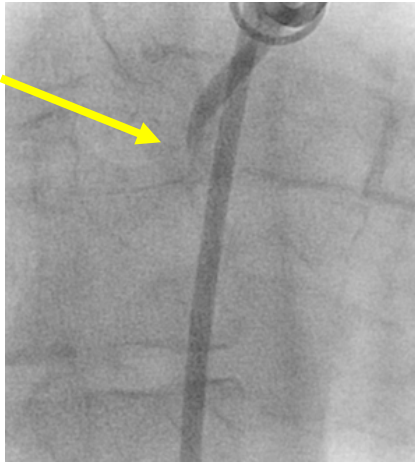
ist: -32.70 / 43.20 mm Frame: 981 / 1296



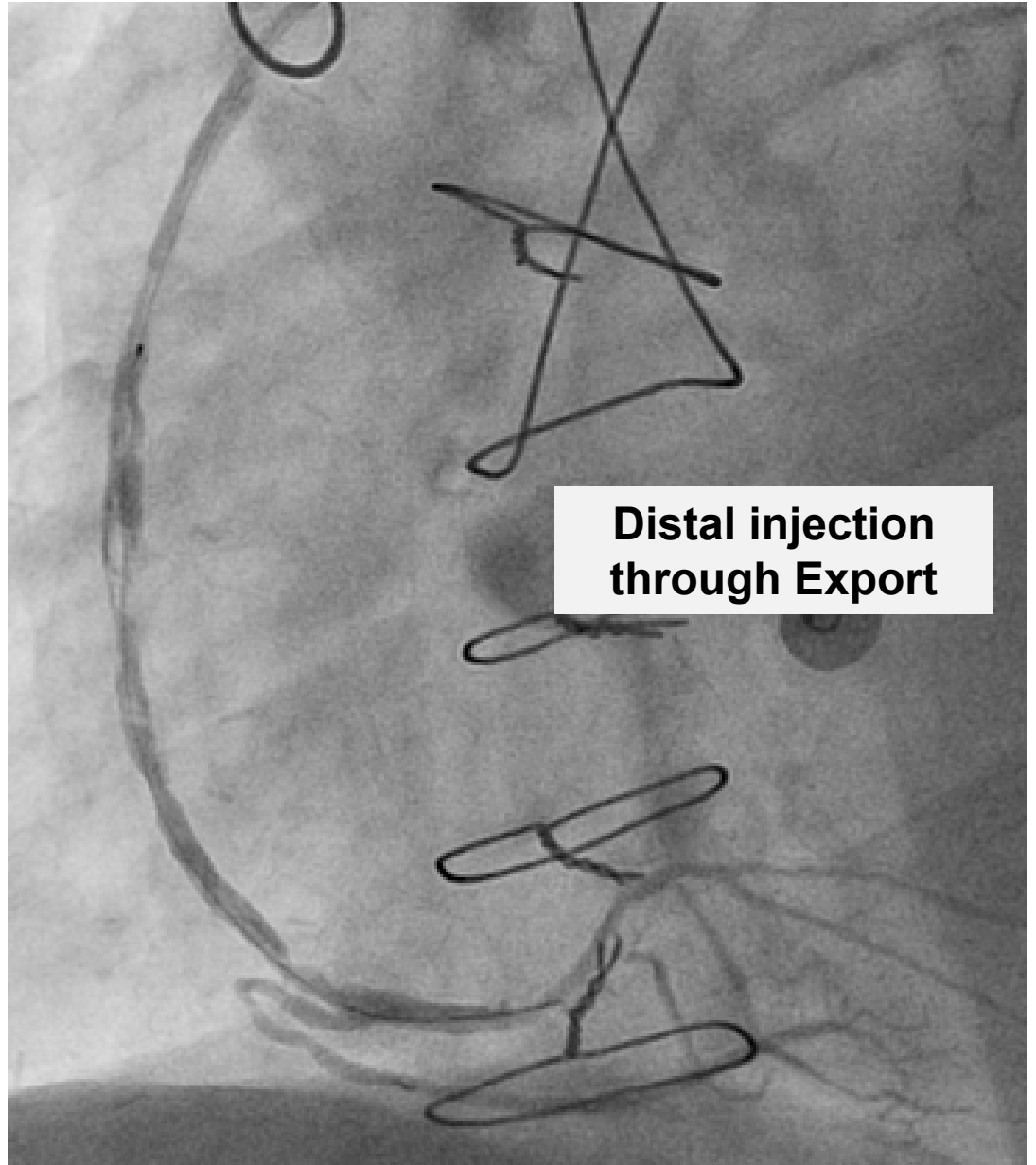
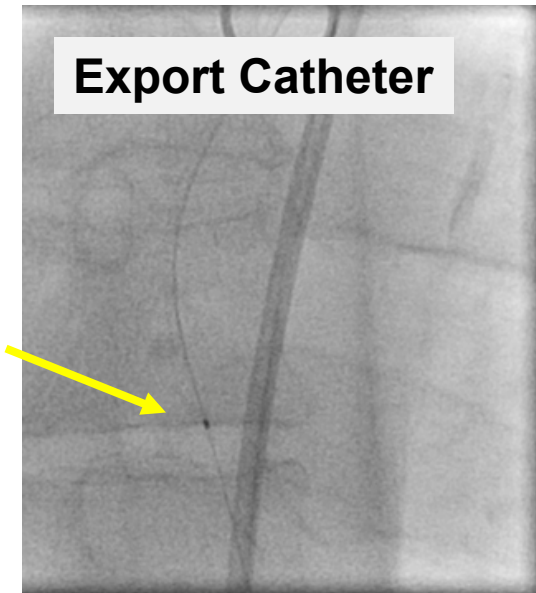
2 years later



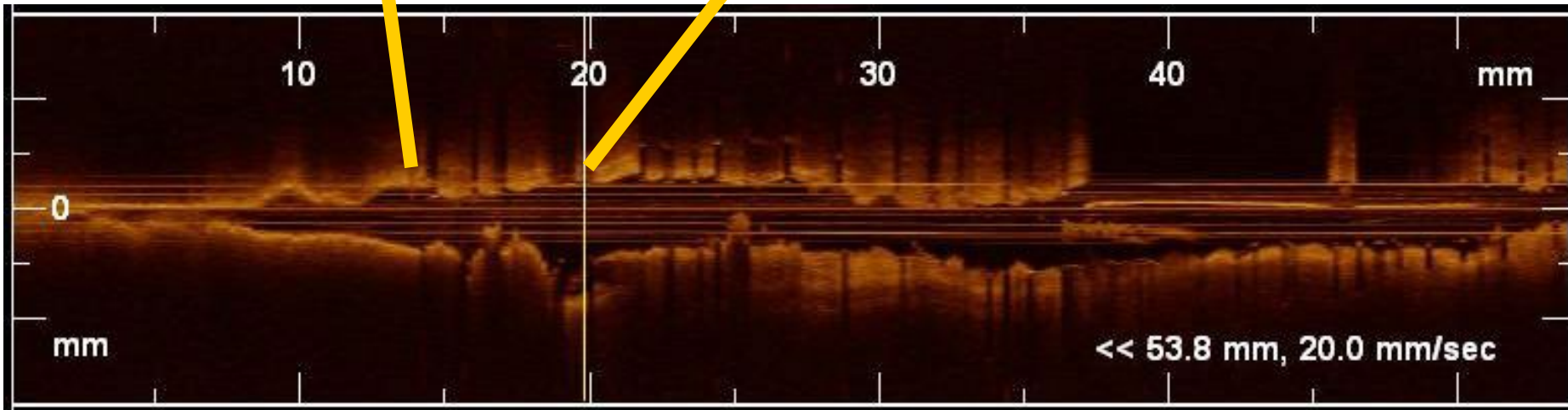
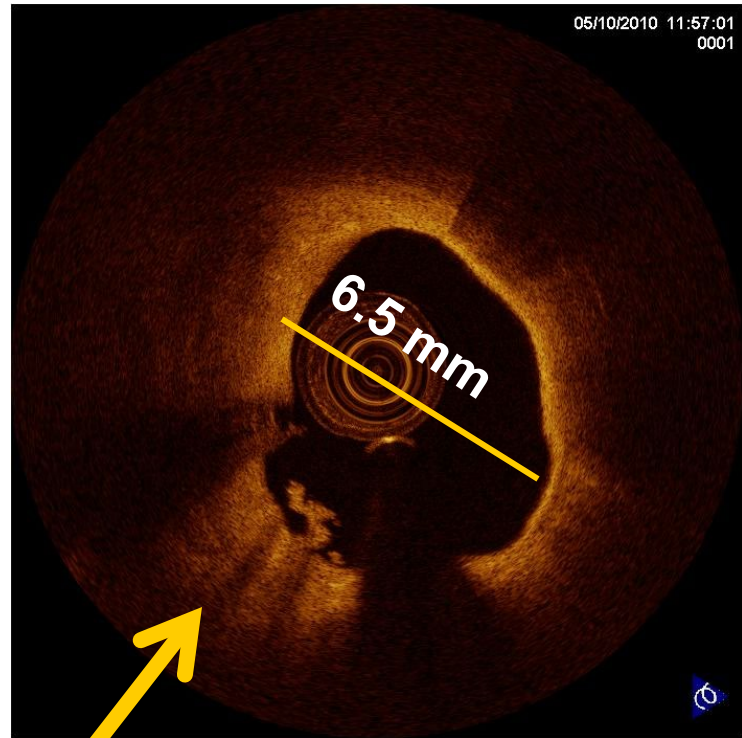
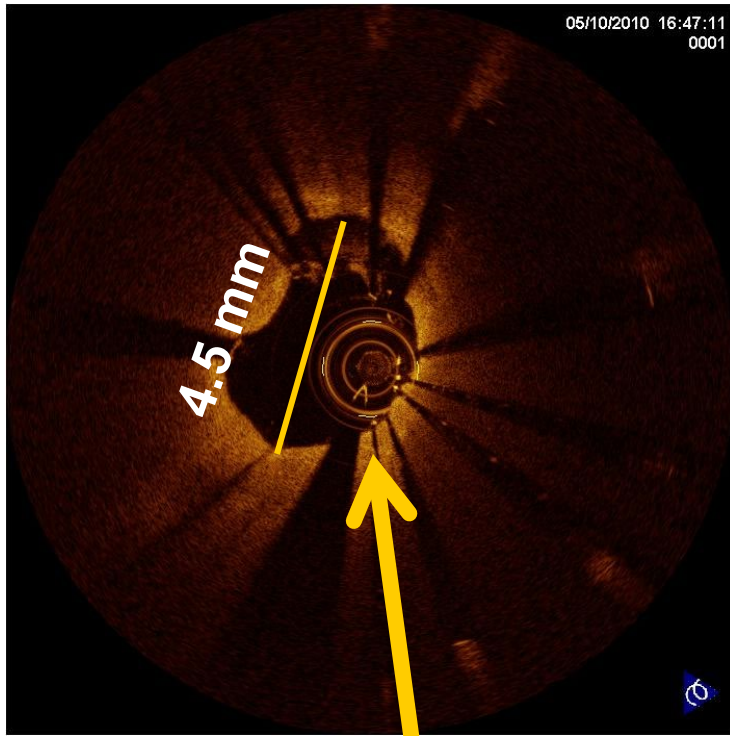
**SVG RCA:
100%**



Export Catheter

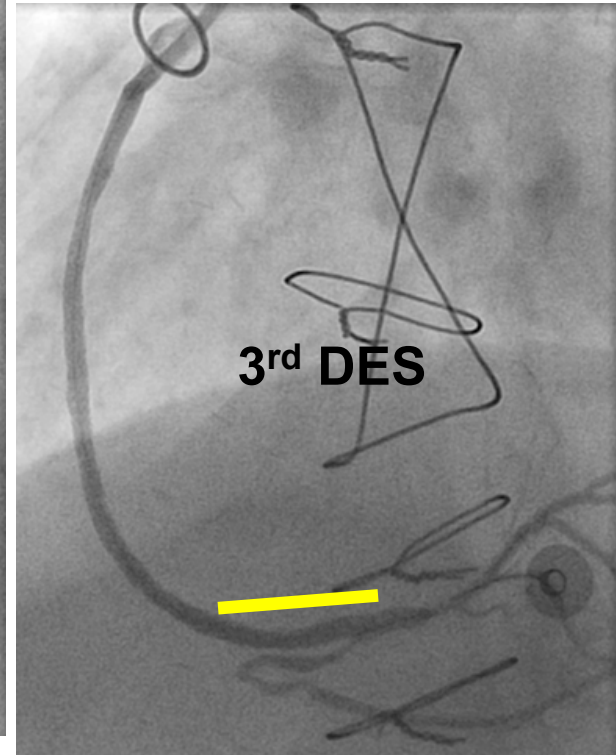
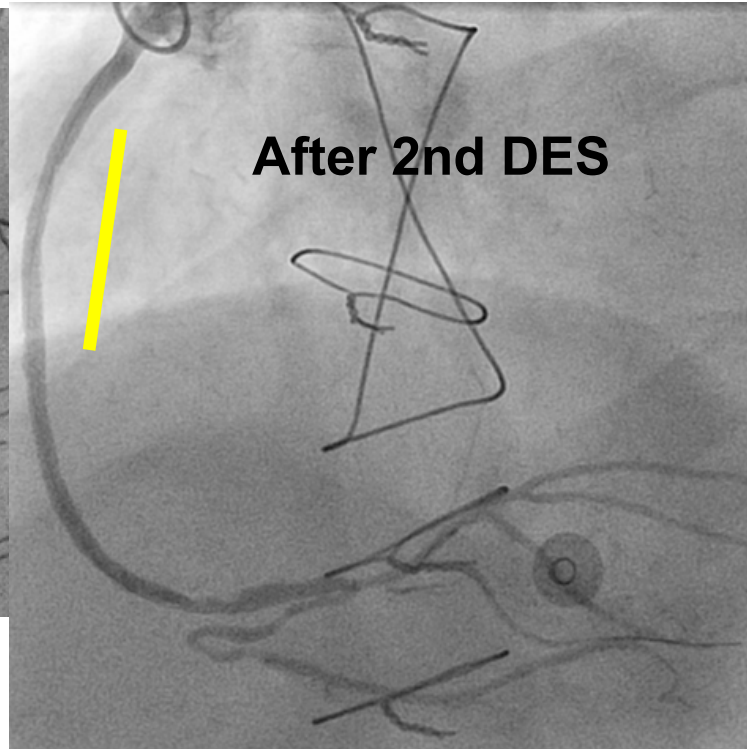
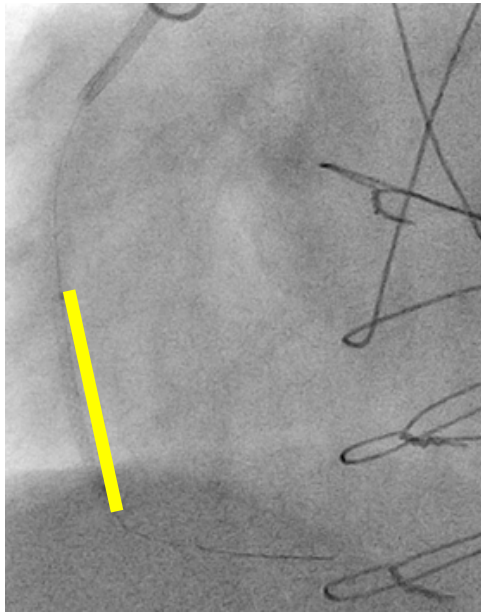


**Distal injection
through Export**

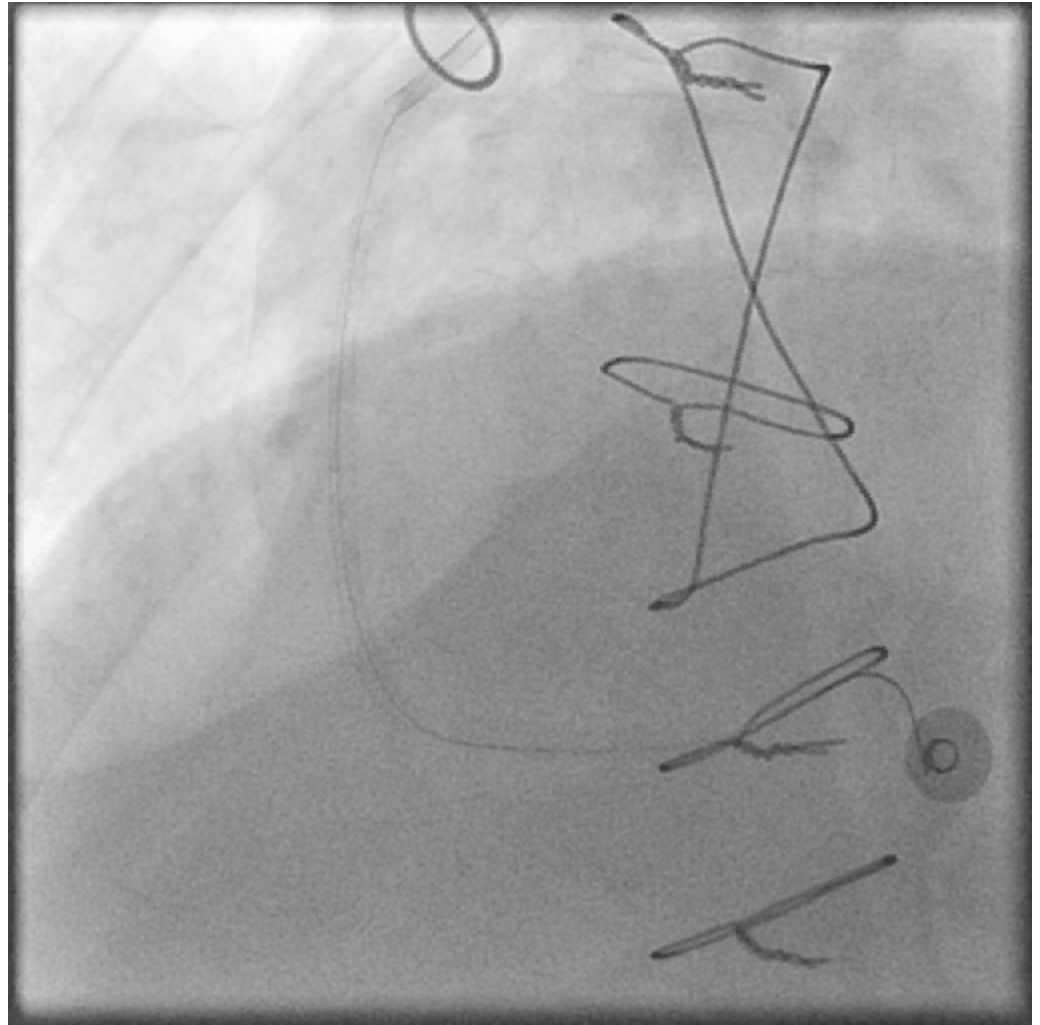
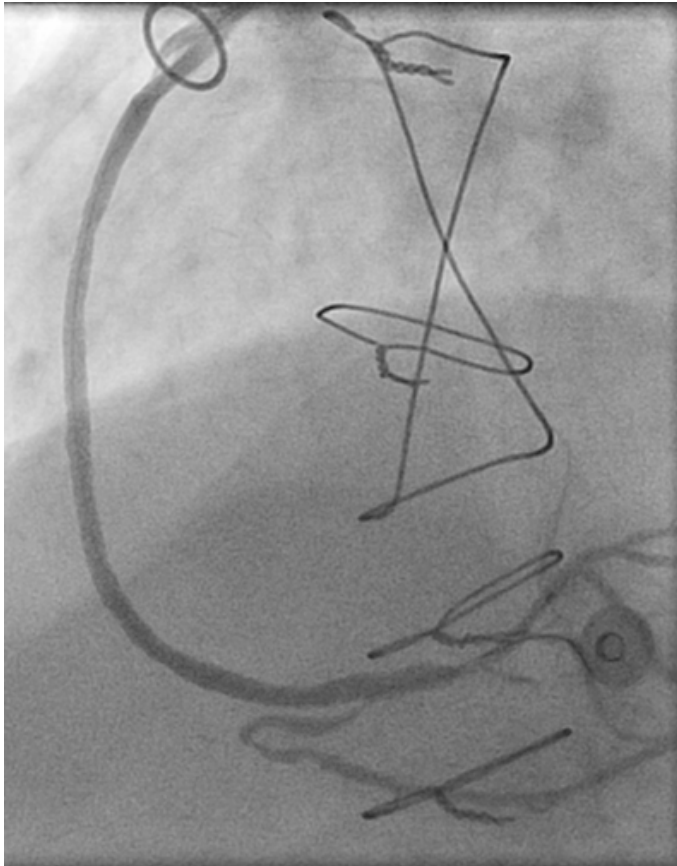


3 DES: 2.5x28mm

Nicardipine in the SVG before each stent

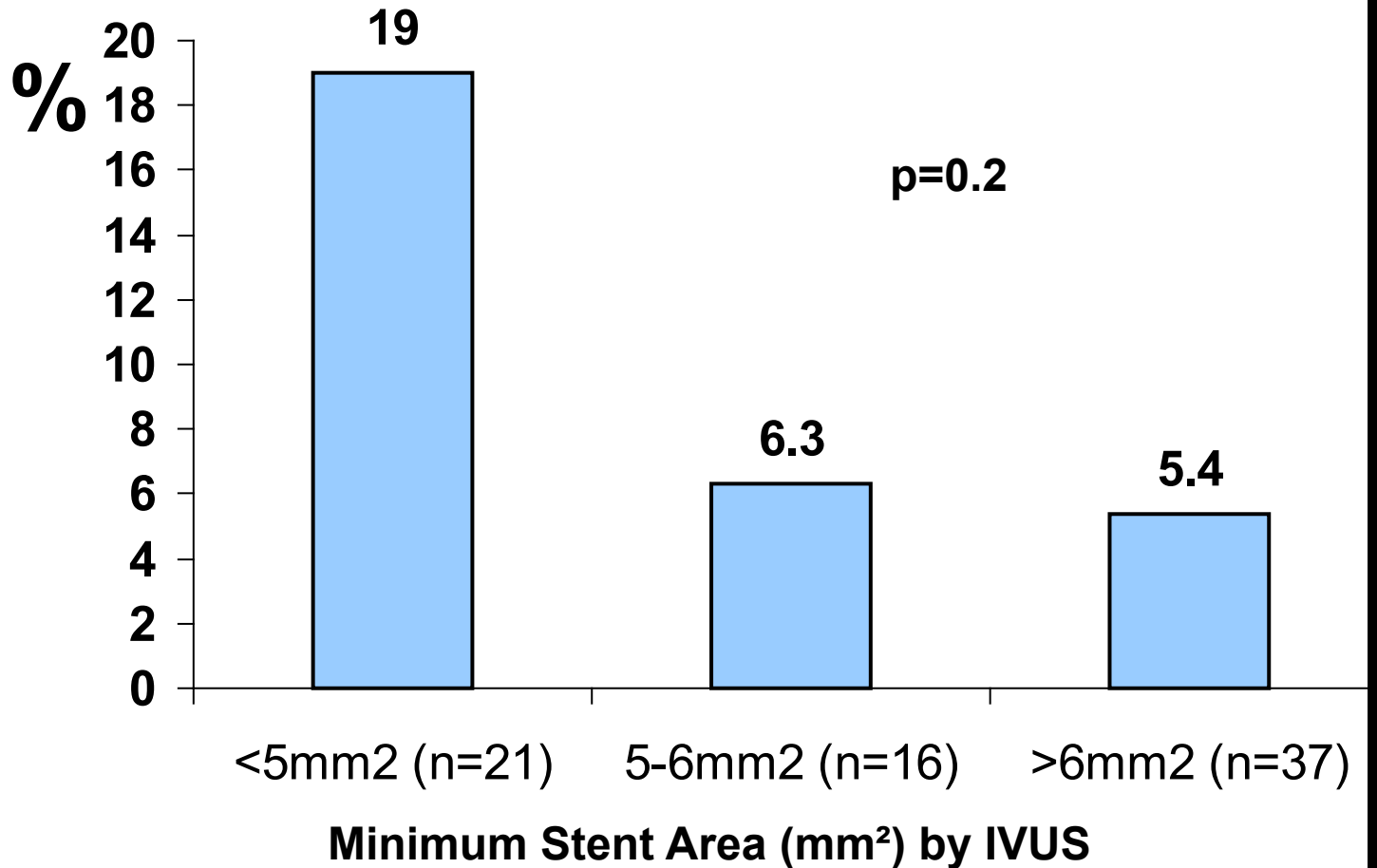


Final Angiography



Small Stents in Large SVG's. TLR at 1 year in 72 patients.

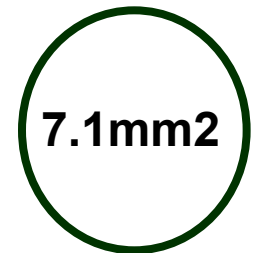
Washington Hospital Center. Salah et al. 06



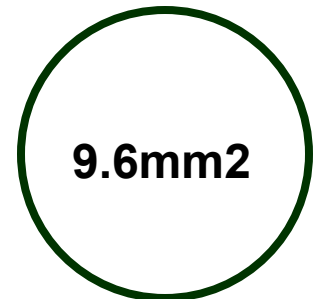
2.5x2.5 mm



3x3 mm

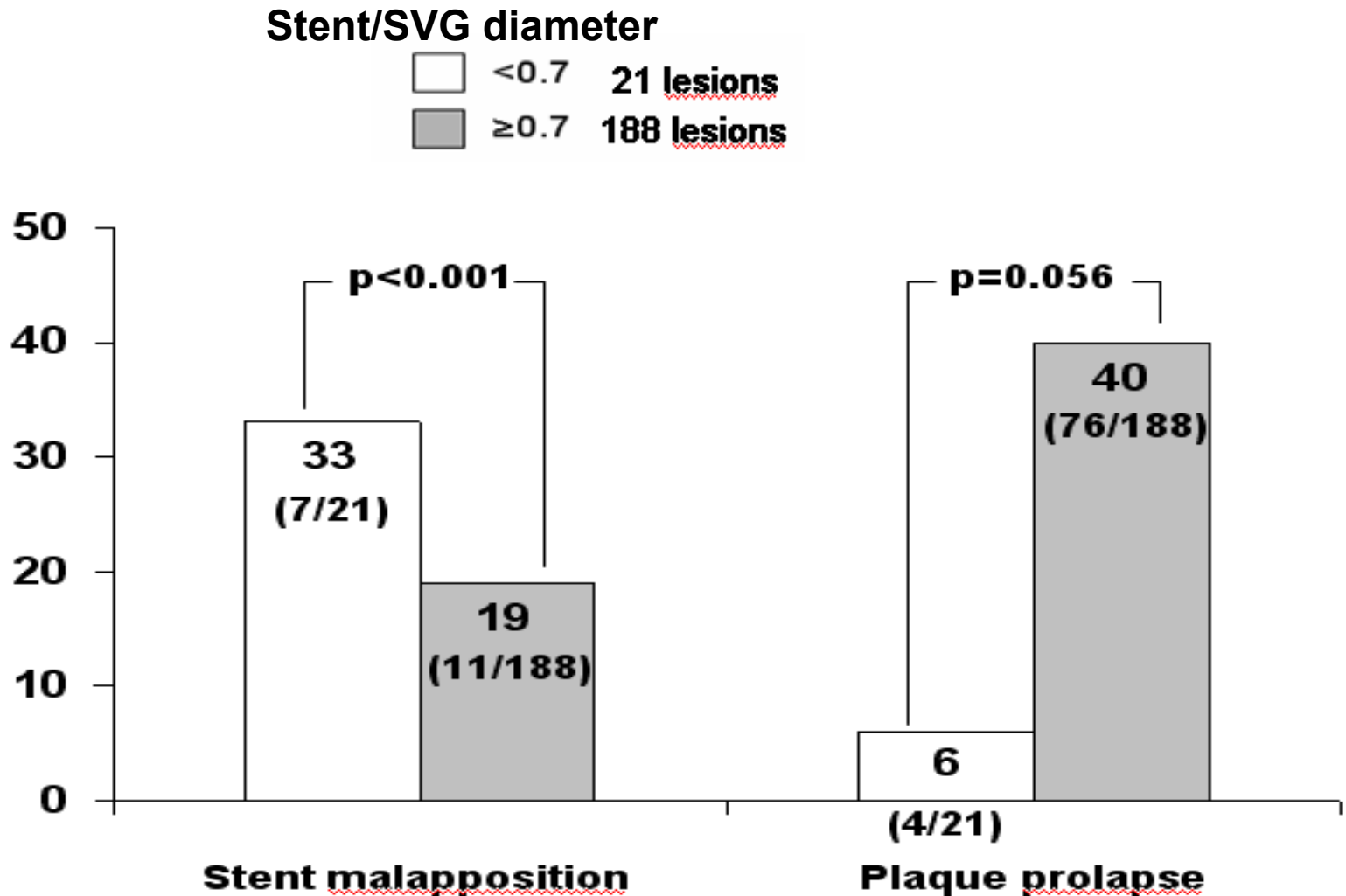


3.5x3.5 mm



Small Stent in Large SVG. IVUS Findings.

WHC: YJ Hong et al. Circulation. 2009;120:S993, AJC 2010;105:179-85



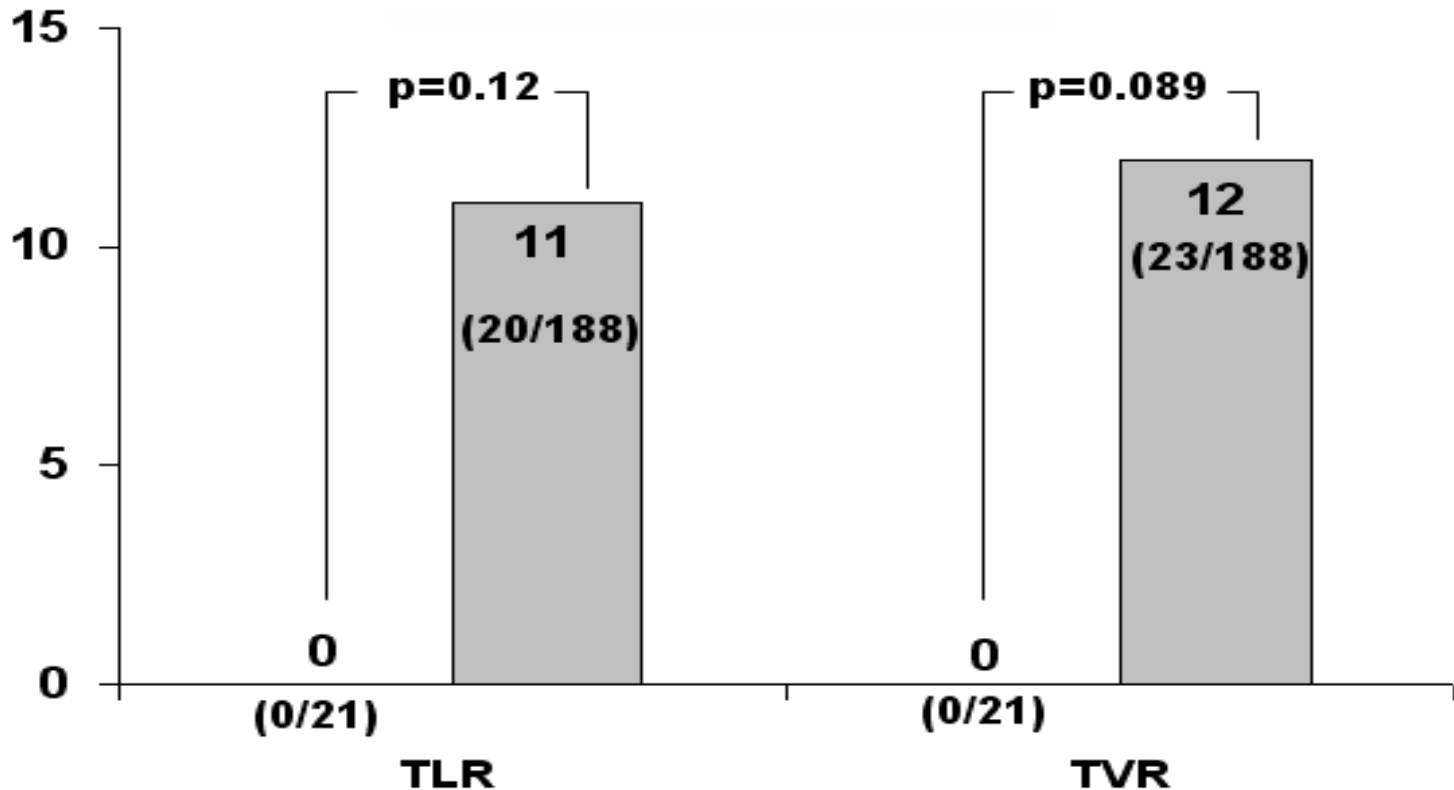
Small Stent in Large SVG.

WHC: WJ Hong et al. AJC 2010;105:179-185

209 SVG lesions

Stent/SVG diameter

- <0.7 21 lesions
- ≥0.7 188 lesions

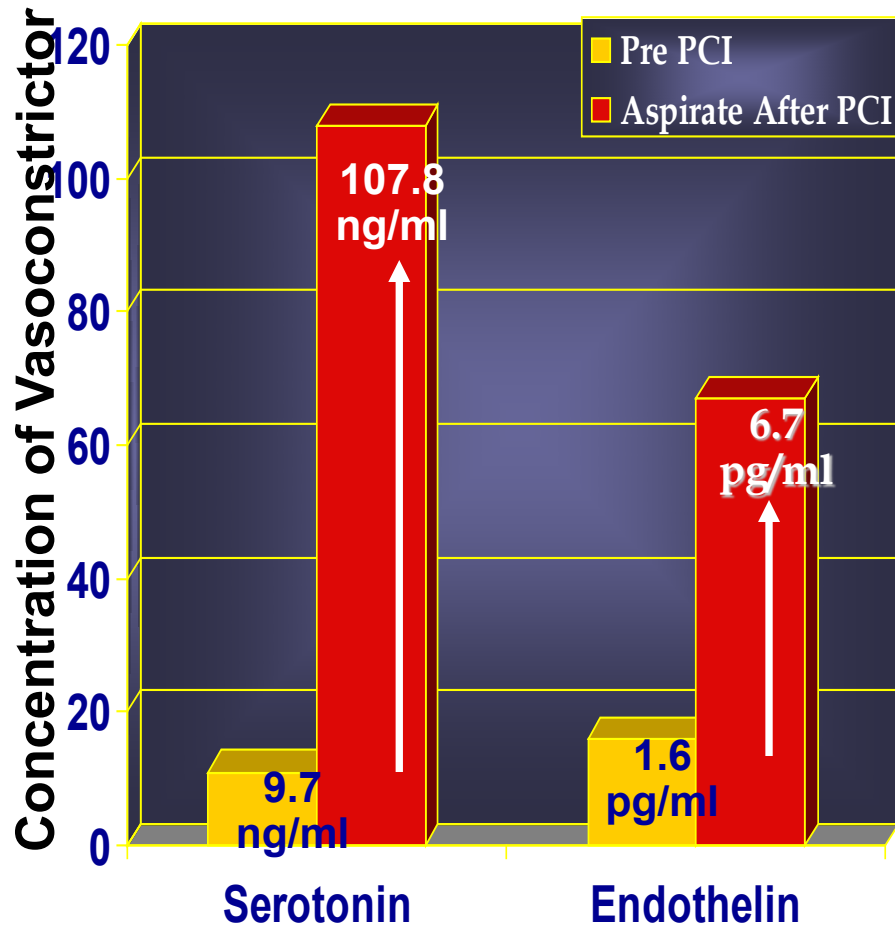


Fourth Conclusion

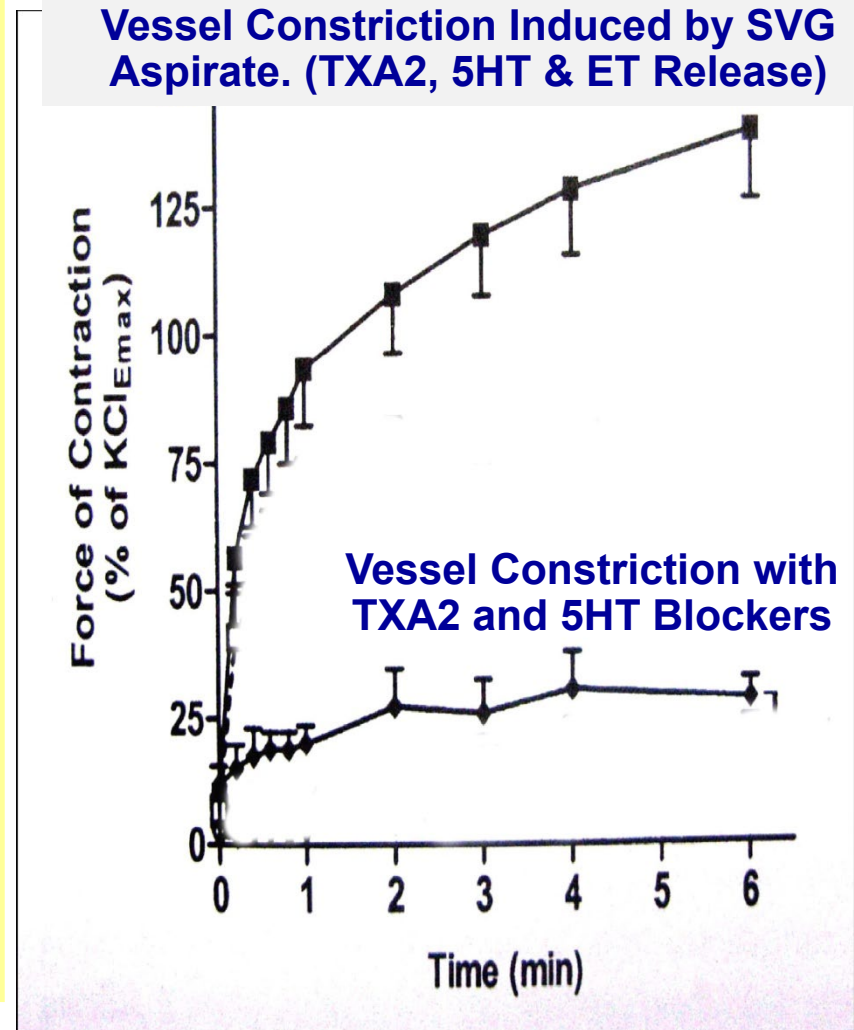
- **Vein grafts are often oversized.**
- **Stent size that matches the target native vessel provides adequate flow.**
- **Small stents in large saphenous veins decreases acute and longterm MACE.**
- **No increase in restenosis if MLA >6mm².**

5. Role of Vasodilators

Vasoconstrictors are Released during PCI of SVGs.



Salloum J, et al., 2005 JIC, 17:575-581.



Leineweber et al JACC 2006;47:981-6.

Pharmacologic Agents that Prevent/Reverse No-Reflow

IC Diltiazem 23/24 cases (95%) reversal to normal flow.

Mooney, et al 1995, *AJC*.

IC Adenosine with 92-94% reversal to normal flow

Fischell, et al, 1998, *Cath Cardiovasc Intervent* 45:360-365.

IC Verapamil -> 90% with improved flow.

Piana, Baim et al., 1994 *Circulation* 89:2514-2518.

IC Nitroprusside reversal in >90% of cases.

Hillegas, et al, *J Am Coll Cardiol*, 2001 37(5):1335-43.

IC Nitroprusside + Adenosine reversal in >90% of cases.

Barcin, et al, *Cath Cardiovasc Intervent* 61(4):484-491.

IC Nicardipine (Cardene): prevents no reflow in 98% of pts.

Fishell et al. *JIC* 2007;19:58-62

Conclusion

- **Intracoronary vasodilators are effective and should be used before and after stenting the SVG**

PCI of Intermediate SVG Lesions.

Rodes-Cabau et al.

- **VELETI Trial I:**
 - 57 patients randomized to Paclitaxel stent or Medical Therapy.
 - At 5 years: MACE 17 vs 33% $p=0.146$
- **VELETI II:**
 - 125 patients randomized
 - At 3.4 years: MACE 10 vs 17% $p=0.21$

Conclusion.

There is no evidence to support stenting Intermediate SVG lesions.

DES or BMS?

Multiple Randomized Trials:

Most show benefit of DES, but in some the benefit is lost at 5 years.

82. Brilakis ES, Edson R, Bhatt DL, Goldman S, Holmes DR Jr, Rao SV, Shunk K, Rangan BV, Mavromatis K, Ramanathan K, et al; DIVA Trial Investigators. Drug-eluting stents versus bare-metal stents in saphenous vein grafts: a double-blind, randomised trial. *Lancet*. 2018;391:1997–2007. doi: 10.1016/S0140-6736(18)30801-8
83. Patel NJ, Bavishi C, Atti V, Tripathi A, Nalluri N, Cohen MG, Kini AS, Sharma SK, Dangas G, Bhatt DL. Drug-eluting stents versus bare-metal stents in saphenous vein graft intervention. *Circ Cardiovasc Interv*. 2018;11:e007045. doi: 10.1161/CIRCINTERVENTIONS.118.007045

Summary

- Embolic protection effectiveness is currently questioned.
- 2b3a inhibitors should not be used.
- Pharmacological vasodilation is very effective.
- Direct stenting is standard of care.
- Small stent in large veins: preferred approach for degenerated grafts.
- Intermediate lesions should not be stented.
- DES is preferred.

The end

Calcified lesions in SVG's.

Role of Lithotripsy

Meijer et al. CV Revasc Medic July 2024

