

# **Neoatherosclerosis in New DES: Insight from Intracoronary Imaging**

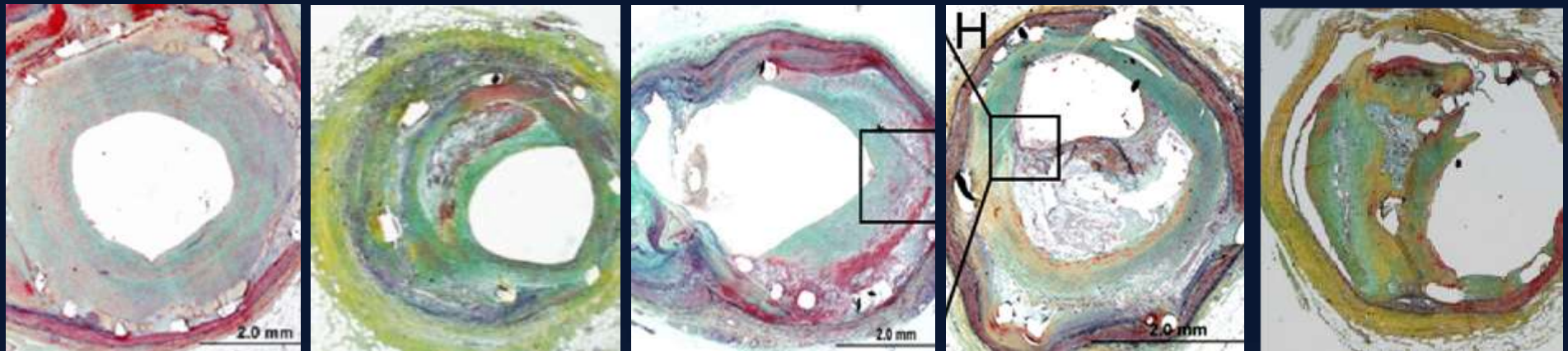
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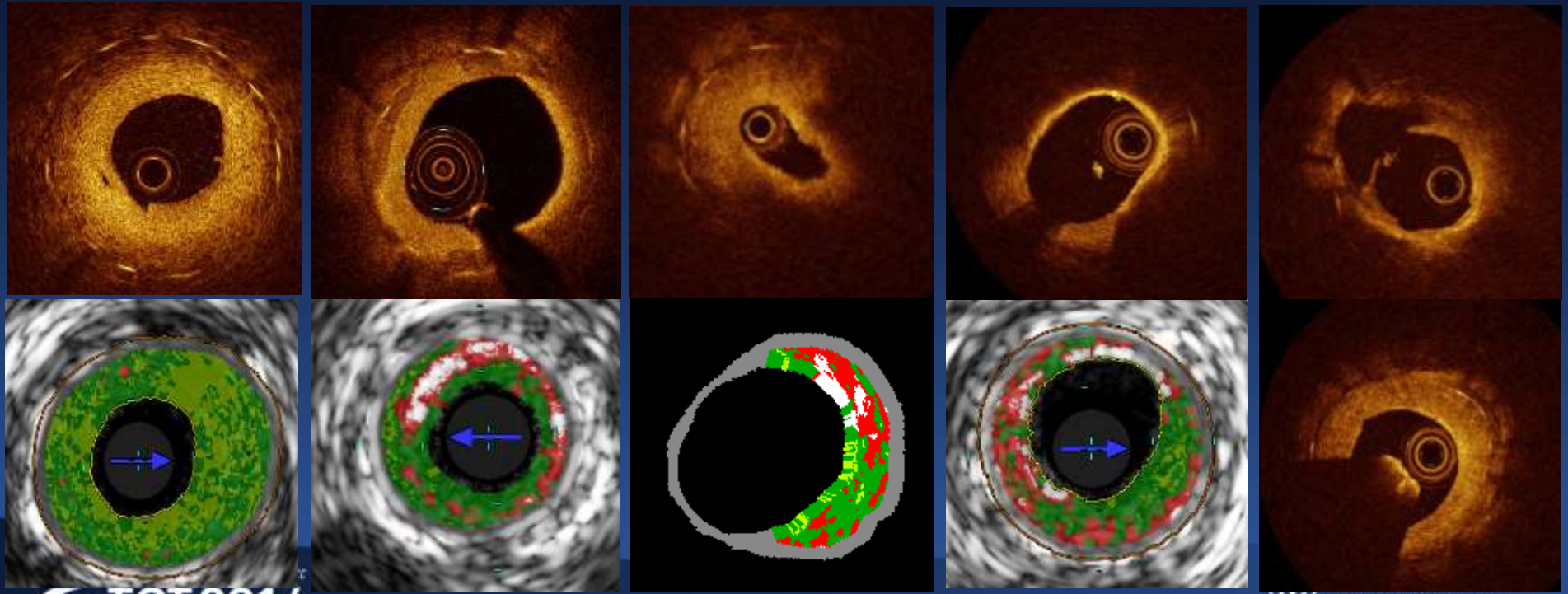
# Disclosure Statement of Financial Interest

I, Soo-Jin Kang DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation

Early neointima    Fibrocalcific    ThCFA    TCFA    Intimal rupture



*Nakazawa et al. JACC Cardiovasc Imaging 2009;2:625-8*



# Late ISR

63-year old male  
Stable angina

# VLST

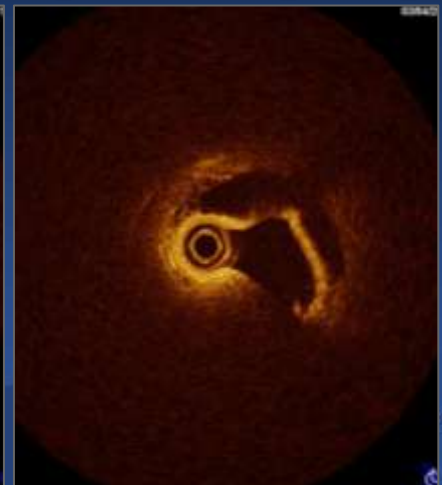
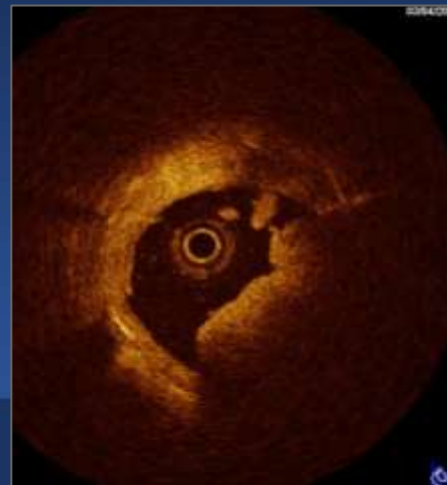
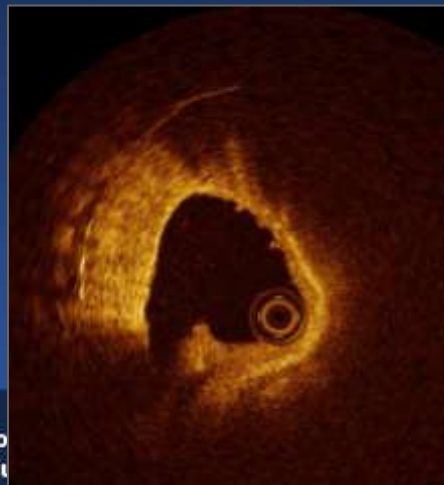
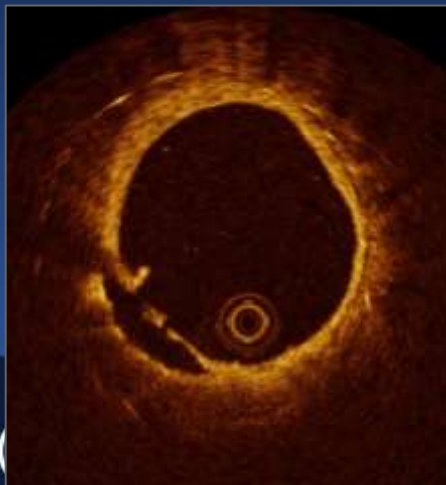
60-year old male  
AMI with VLST

## IMAGES IN CARDIOLOGY

### Neoatherosclerosis:

### The Missing Link Between Very Late Stent Thrombosis and Very Late In-Stent Restenosis

Fernando Alfonso, MD, Federico Fernandez-Viña, MD, Miguel Medina, MD, Rosana Hernandez, MD  
*Madrid, Spain*





# How Frequent is Neoatherosclerosis the Mechanism of Stent Failure?

Stent failure OCT data from AMC

	DES-ISR <sup>1</sup>	BMS-ISR <sup>2</sup>	VLST <sup>3</sup>	
Lesion	50 DES	51 BMS	6 BMS	27 DES
Median F/U	32 Mo	132 Mo	109 Mo	62 Mo
Lipid or NC	90%	100%	100%	100%
<b>OCT-TCFA</b>	<b>52%</b>	<b>68%</b>	<b>100%</b>	<b>56%</b>
<b>OCT-rupture</b>	<b>58%</b>	<b>59%</b>	<b>100%</b>	<b>63%</b>
TLR	98%	all	all	all

1. Kang et al. *Circulation* 2011;123:2954-63

2. Kang et al. *JACC Cardiovasc Imaging* 2012;5:1267-8

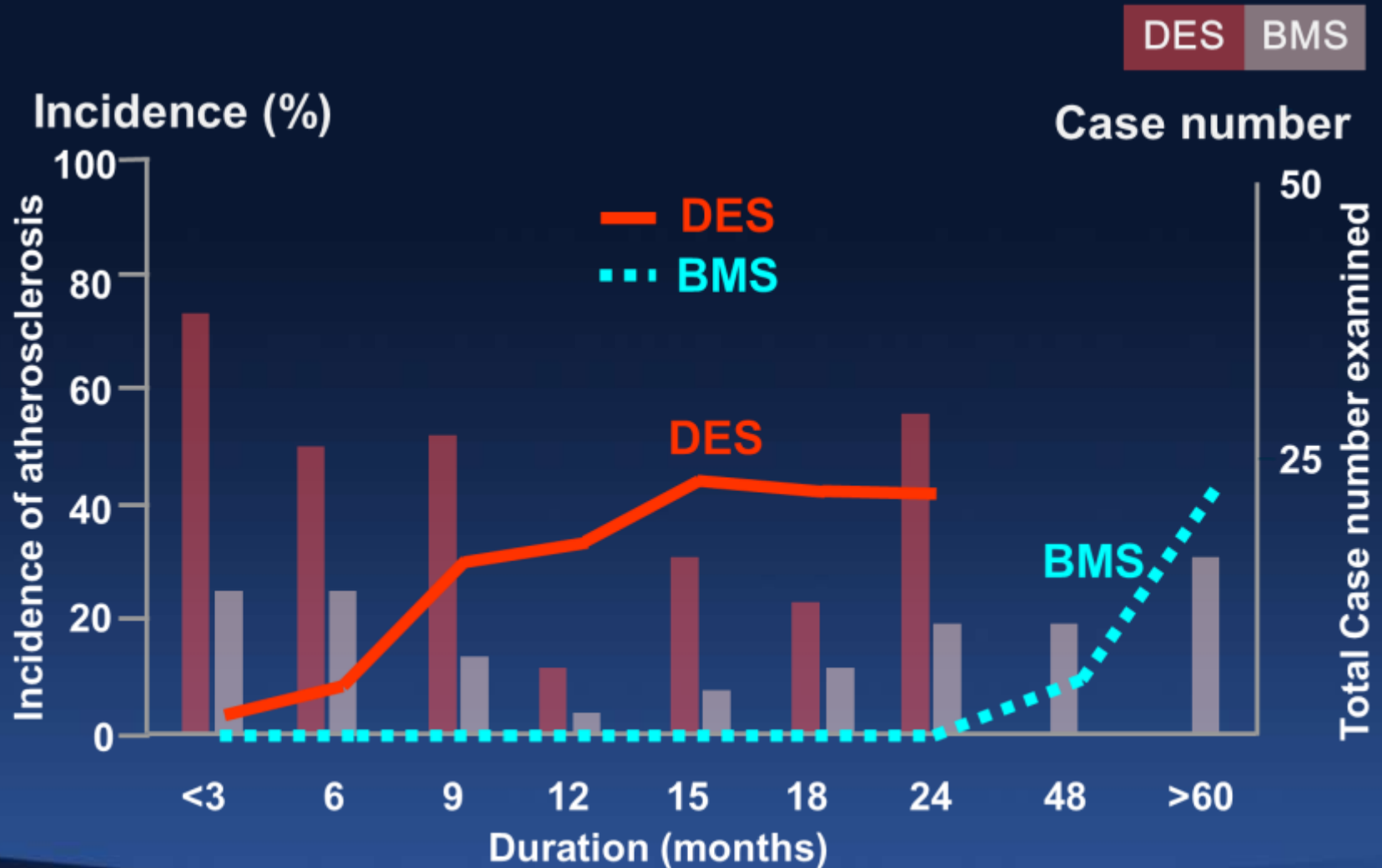
3. Kang et al. *JACC Cardiovasc Imaging* 2013;6:695-703

# Neointermediosclerosis

## **BMS vs. DES**

# Incidence and Time Course

Autopsy data from CVpath



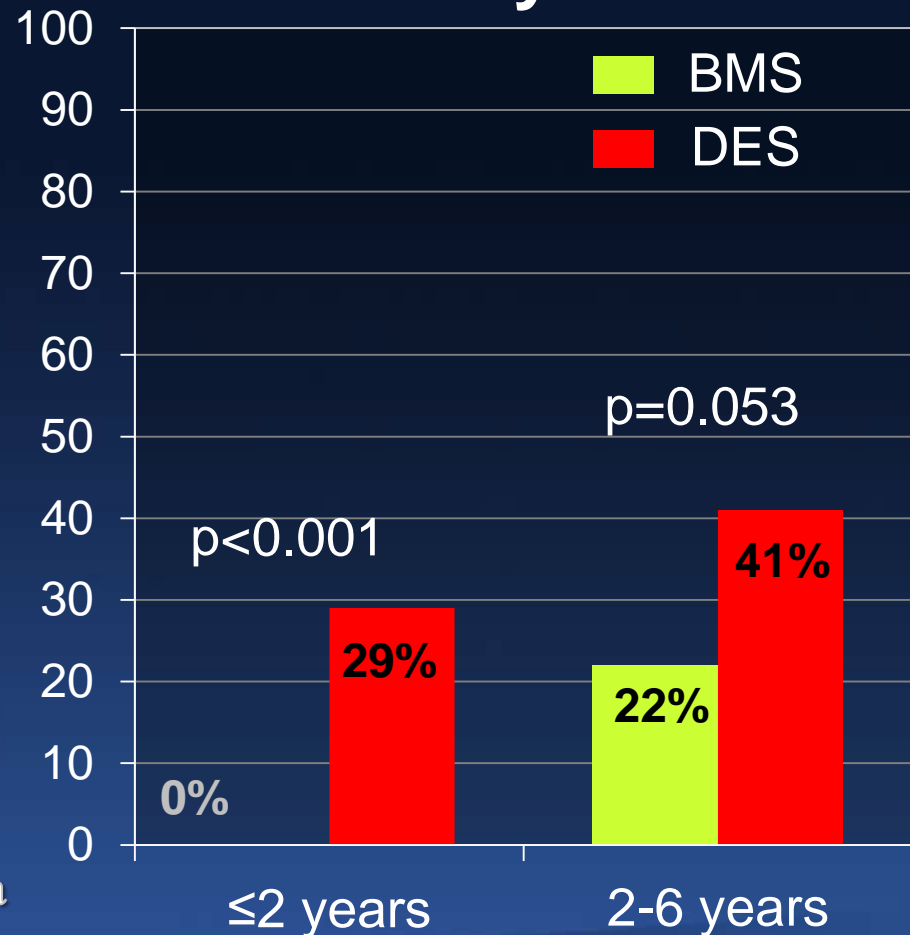
# Frequency of Neoatherosclerosis

## Autopsy Data from CVpath

	Nakazawa (CVPath) <sup>1</sup>	
Lesion	197 BMS	209 DES
F/U duration	72 Mo	14 Mo
Stent failure	ISR 27% ST 4%	ISR 6% ST 20%
Neoatherosclerosis*	16%	31%

\* foamy macrophage infiltration within intima

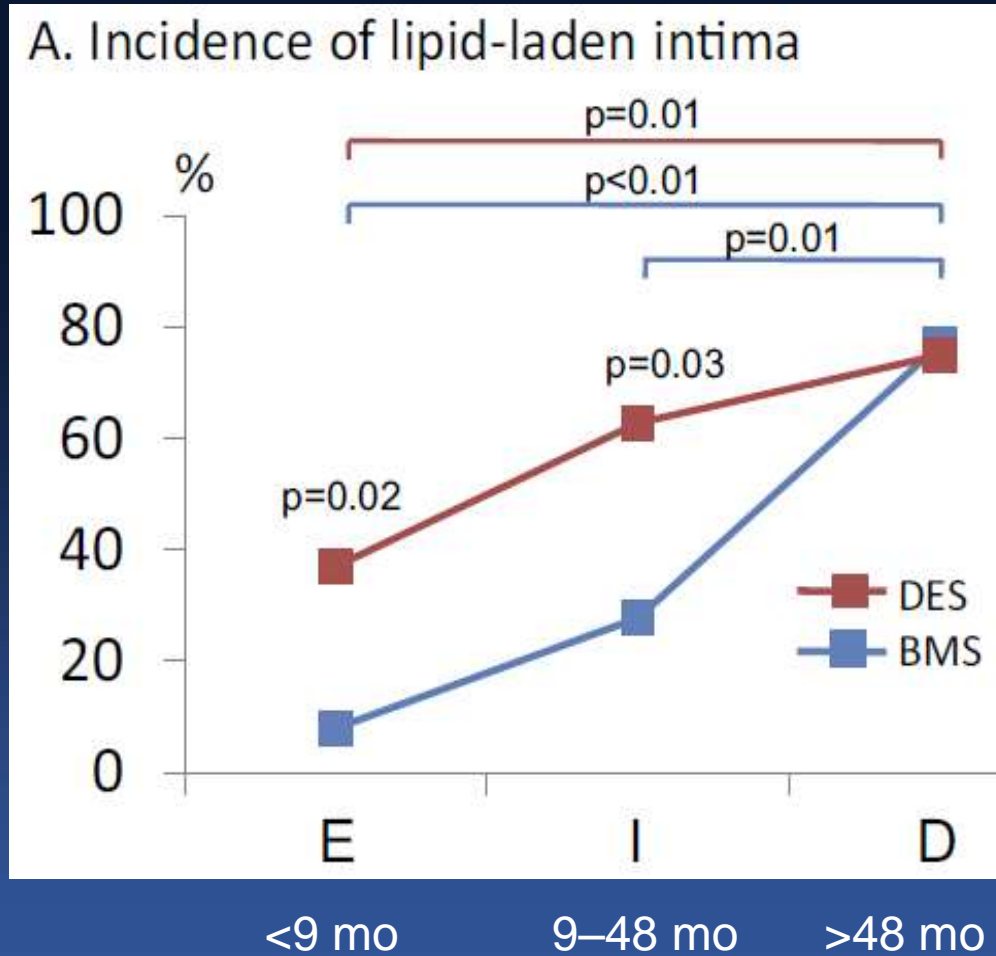
### Stratified by Duration





# Incidence and Time Course

In Vivo data from MGH OCT registry



*Yonetsu et al. Am J Cardiol 2012;110:933-9*

# Neoatherosclerosis

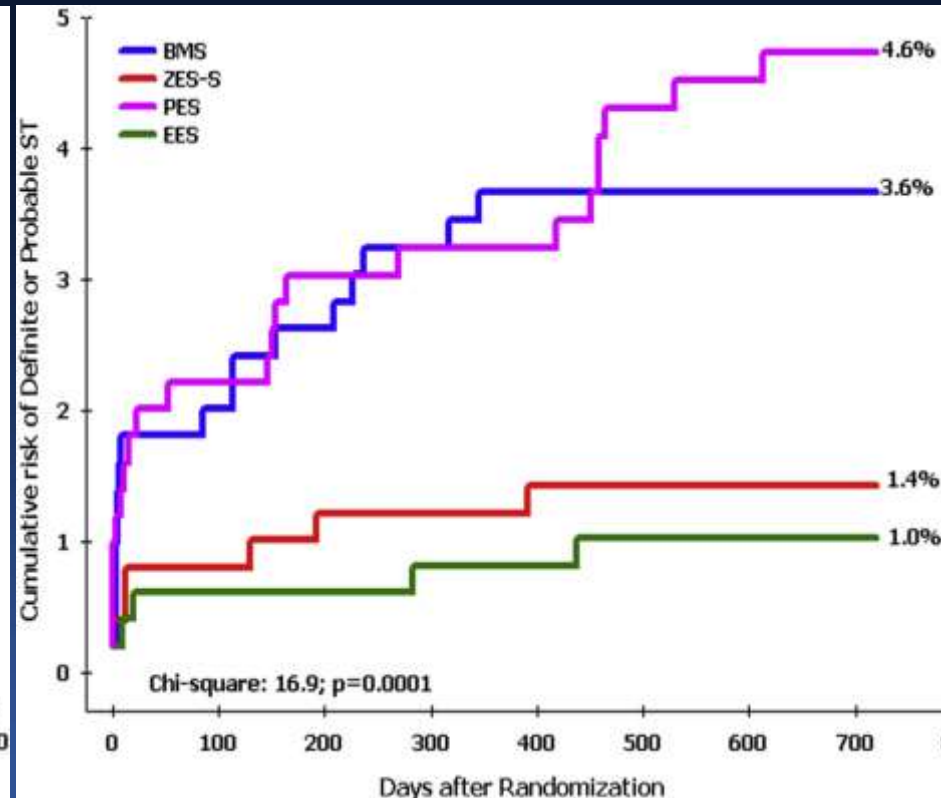
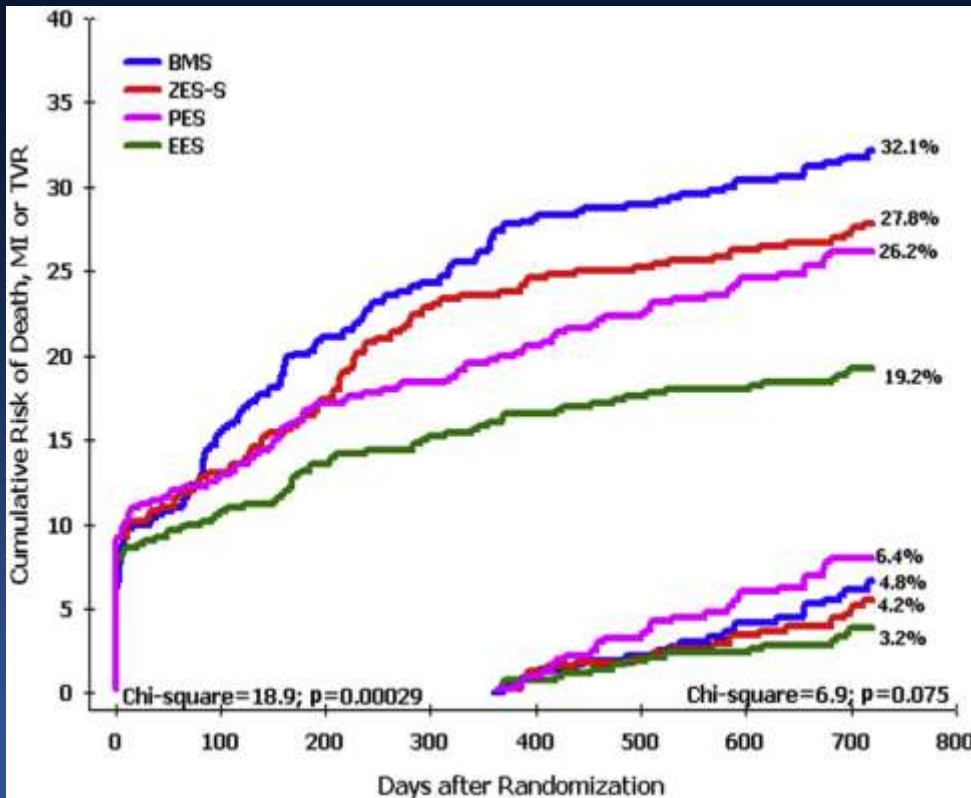
## Old vs. Newer DES

- New anti-proliferative drugs
  - Biodegradable polymer
  - Thinner struts
  - Associated with better strut coverage
- *Expected to reduce neoatherosclerosis...*

# BMS vs. Old- vs. Newer-Generation DESs in All-Comers Undergoing PCI (PROGIDT)

Cumulative MACE at 2 years

Cumulative ST at 2 years



EES showed the lowest rate of MACE and ST

Valgimigli et al. *J Am Coll Cardiol Intv* 2014;7:20-8

# Frequency of Neoatherosclerosis Pathology of EES vs. SES vs. PES

	<b>73 SES</b>	<b>85 PES</b>	<b>46 EES</b>	P vs. SES	P vs. PES
Median F/U	9 months	7 months	7 months		
Uncovered strut, %	18.0 (0-51.4)	18.7 (7.1-44.4)	2.6 (0-7.1)	<0.001	<0.001
Fibrin deposition,%	29.9 (12.1–59.9)	51.1 (36.9–72.9)	8.5 (0-28.2)	0.001	<0.001
Inflammatory score	1.0 (0.3–2.0)	1.0 (0.1–1.4)	0.26 (0-0.6)	<0.001	0.006
<b>Neoatherosclerosis</b>	<b>25 (35%)</b>	<b>15 (19%)</b>	<b>12 (29%)</b>	<b>0.91</b>	<b>0.19</b>

*Otsuka, Virmani et al. Circulation 2014;129:211-23*

# Optical Coherence Tomographic Observation of In-Stent Neointimal Area Stenosis in Lesions With More Than 50% Neointimal Area Stenosis After Second-Generation Drug-Eluting Stent Implantation

Seung-Yul Lee, MD\*; Seung-Ho Hur, MD\*; Sang-Gon Lee, MD; Sang-Wook Kim, MD; Dong-Ho Shin, MD, MPH; Jung-Sun Kim, MD; Byeong-Keuk Kim, MD; Young-Guk Ko, MD; Donghoon Choi, MD; Yangsoo Jang, MD; Myeong-Ki Hong, MD

212 DESs with IH>50% from Korean multicenter OCT registry

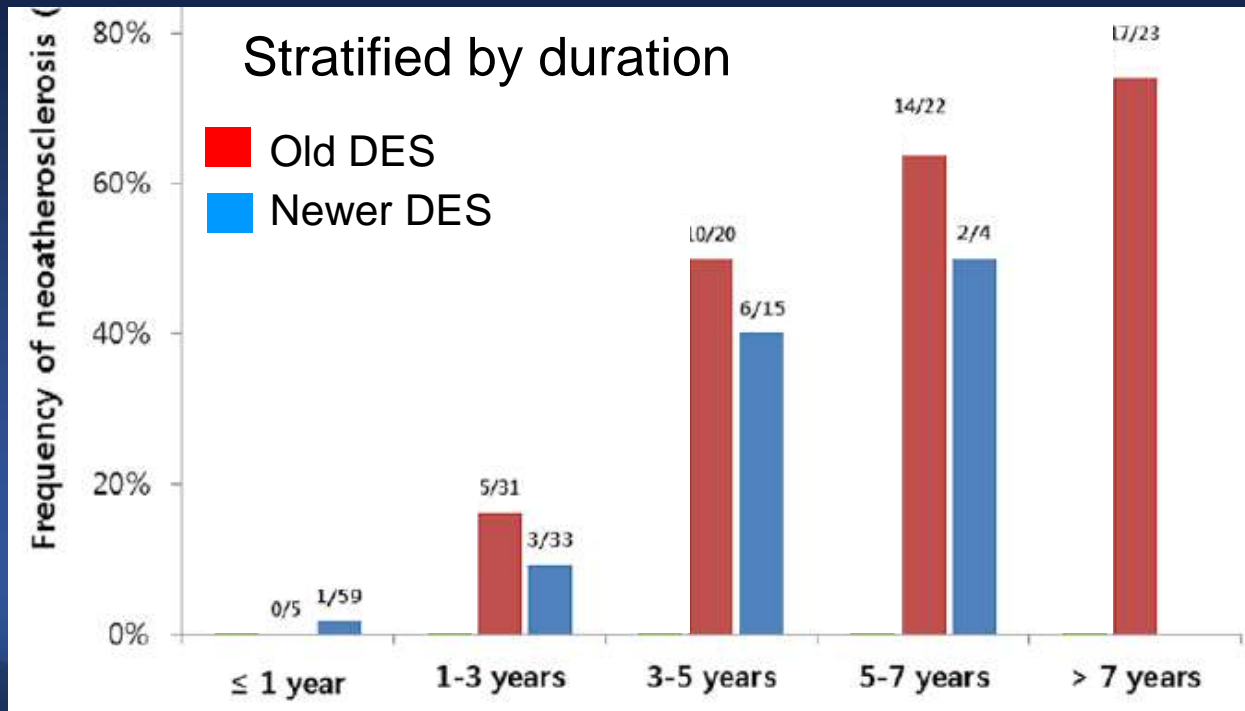
	1 <sup>st</sup> DES	2 <sup>nd</sup> DES	p value
N	101	111	
Age, years	66 (59–72)	62 (55–70)	0.002
LDL >70mg/dl	55 (55%)	40 (36%)	0.007
Use of ACE-inh/ARB	55 (55%)	77 (70%)	0.025
Use of statin	92 (91%)	97 (87%)	0.39
ACS as clinical presentation	12 (12%)	5 (5%)	0.048

Lee SY, Hong MK et al. *Circ Cardiovasc Interv* 2015;8:e001878



# OCT Findings: Old vs. Newer DES

	1 <sup>st</sup> DES	2 <sup>nd</sup> DES	p value
Stent duration, months	55 (34–80)	12 (11–21)	<0.001
NA (lipid or calcium)	46 (46%)	12 (11%)	<0.001
In-stent TCFA	21 (21%)	6 (5%)	0.001
Neointimal rupture	7 (7%)	1 (1%)	0.005



# Predictors of Neoatherosclerosis

	OR	95% CI	p value
Stent duration, months	1.7	1.4 – 2.1	<0.001
LDL >70 mg/dl	2.5	1.0 – 6/1	0.038
Chronic renal disease	4.1	1.1 – 15.6	0.037
Diabetes	1.0	0.4 – 2.4	0.99
Use of newer DES	0.5	0.2 – 1.5	<b>0.23</b>
ACE inh/ARB	1.6	0.6 - 3.9	0.33
Statin	0.5	0.1 – 1.8	0.29

Use of newer DES is not more protective against neoatherosclerosis compared with old DES  
Endothelial maturation is still insufficient in both

Lee SY, Hong MK et al. *Circ Cardiovasc Interv* 2015;8:e001878

# Old vs. Newer Generation DES-ISR

## Propensity matching

	Old DES (n=51)	Newer DES (n=35)	p
Age	61.80±10.82	61.03±8.93	0.727
Sex	41 (80.4%)	26 (74.3%)	0.502
DM	21 (41.2%)	13 (37.1%)	0.707
HTN	28 (54.9%)	25 (71.4%)	0.122
Dyslipidemia	42 (82.4%)	30 (85.7%)	0.678
ACS	10 (29.4%)	3 (20.0%)	0.130
DES types	SES 31%, PES 69%	ZES 11%, ZES-R 14%, EES 60%, Nobori 6%	

*AMC preliminary*

# Old vs. Newer Generation DES-ISR

## Propensity matching

	Old DES (n=51)	Newer DES (n=35)	p
Stent duration, days	693±447	546±339	0.087
Lipidic neointima	47 (92.2%)	30 (85.7%)	0.338
Calcific neointima	5 (9.8%)	2 (5.7%)	0.847
In-stent TCFA	18 (35.3%)	4 (11.4%)	<b>0.013</b>
Intimal rupture	23 (45.1%)	8 (22.9%)	<b>0.035</b>
Intimal rupture at MLA	17 (33.3%)	5 (14.3%)	<b>0.047</b>

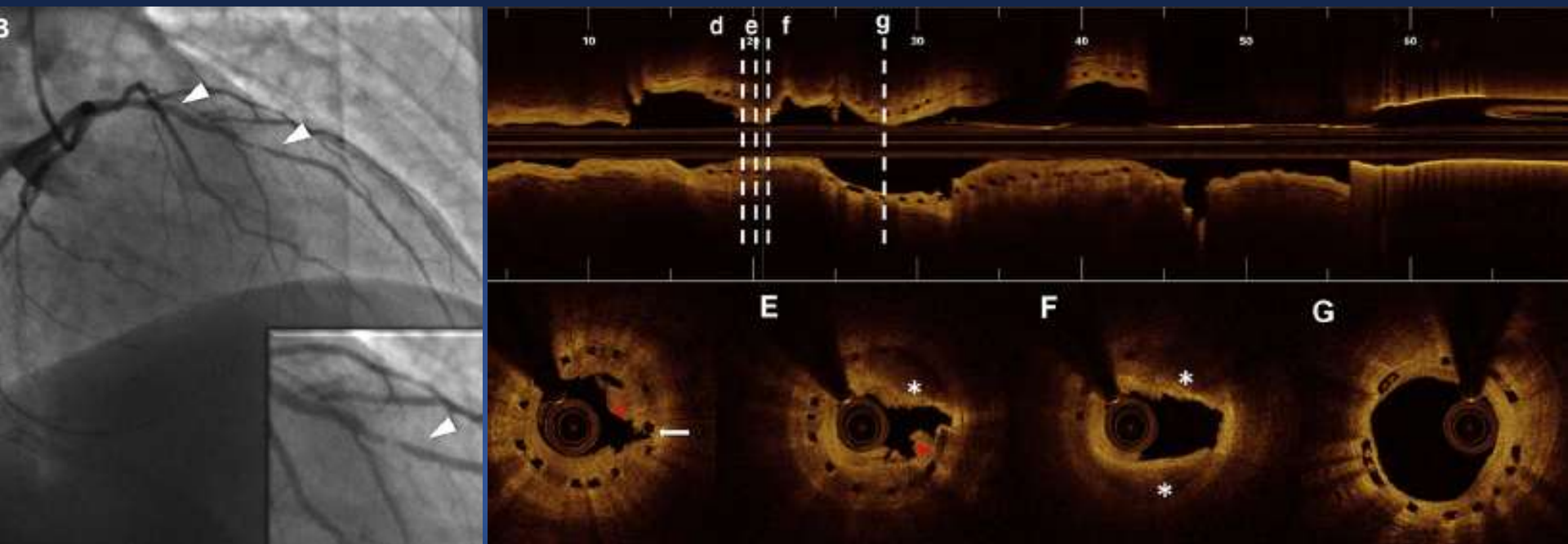
Stent failure cohort  
 Much longer follow-up duration

*AMC preliminary*

# Neoatherosclerosis as the Cause of Late Failure of a Bioresorbable Vascular Scaffold



Andrea Mangiameli, MD,\* Yohei Ohno, MD,\* Guilherme F. Attizzani, MD,\*† Davide Capodanno, MD, PhD,\*  
Corrado Tamburino, MD, PhD\*‡



48-year-old man with UA, 3.0 x 28mm BVS 15 months ago



# Effects of BVS

- Eliminate permanent vessel caging
- Promote late lumen enlargement
- Stabilize vulnerable plaques by providing uniform neointimal layers

BVS have not eliminated the early- and mid-term presence of polymer and anti-proliferative drugs with a pro-inflammatory action

*Mangiameli et al. JACC Cardiovasc Interv 2015*

# Summary

- Intravascular imaging is useful for assessing neointimal characteristics
- Neoatherosclerosis is a common mechanism of very late stent failure
- Newer generation DES and even BVS failed to fully protect the vessel from neoatherosclerosis
- Further studies are necessary to clarify the incidence and long-term clinical implication of neoatherosclerosis after DES/ BVS implantation