

# **Sex-Specific Characteristics and Outcomes in Coronary Intravascular Lithotripsy**

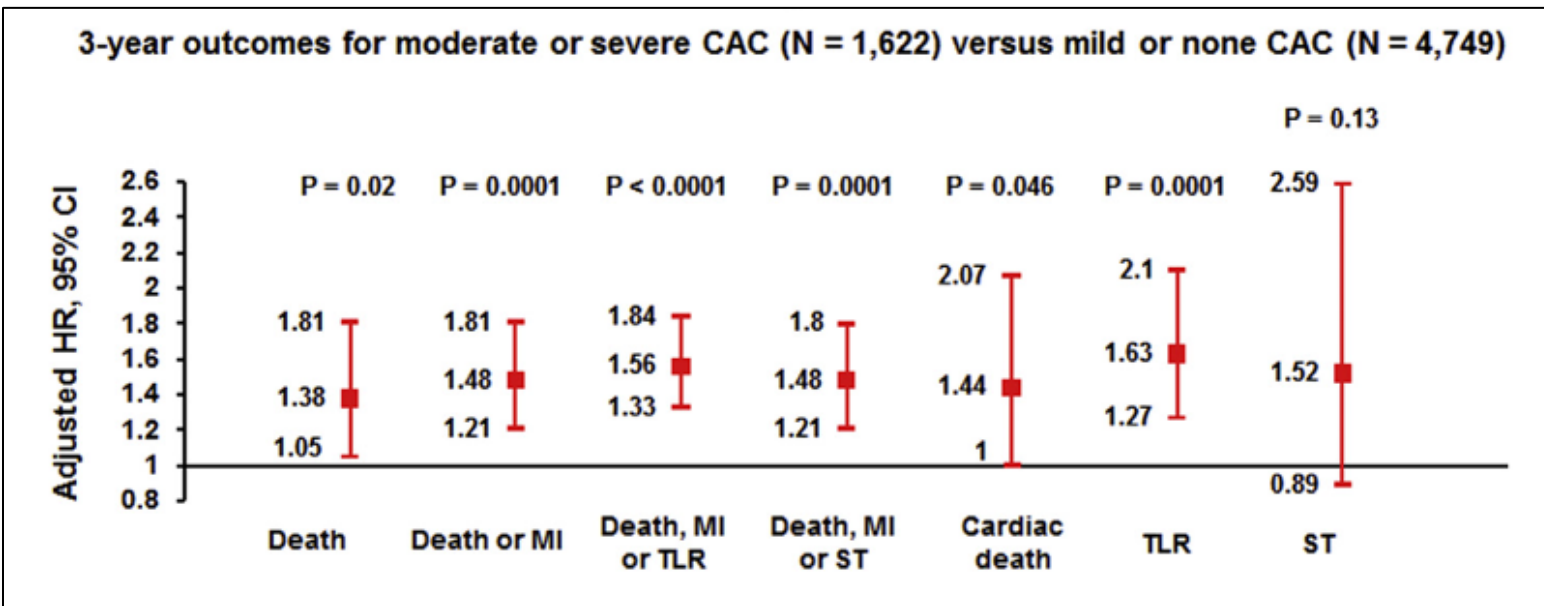
## **Patient-level Pooled Analysis of the Disrupt CAD Studies**

**Alexandra J. Lansky, MD**

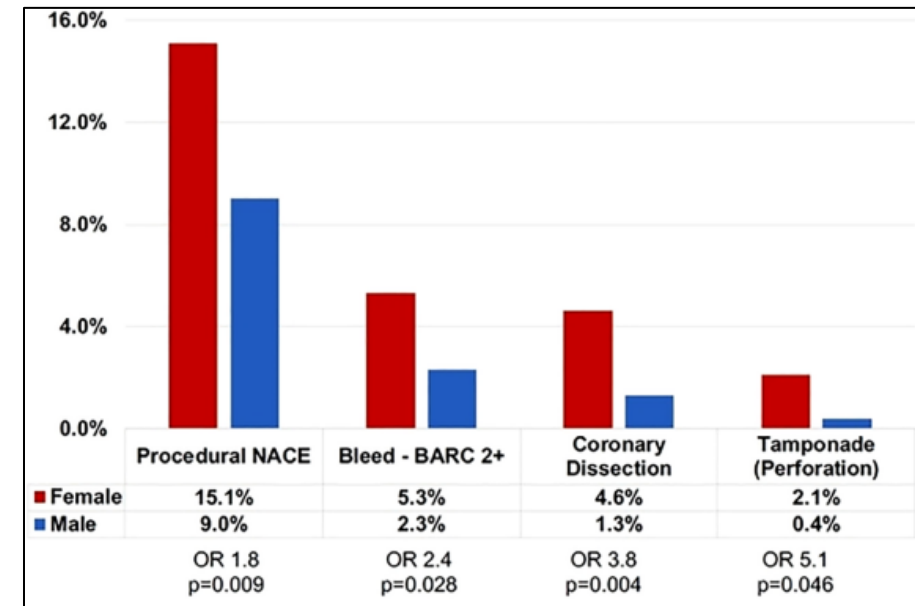
Division of Cardiology, Yale School of Medicine  
New Haven, Connecticut

# Background

- Female gender is an independent predictor of adverse clinical events after PCI of lesions with coronary artery calcification (CAC)
- Women may be particularly susceptible to complications following atherectomy due to gender-specific differences in coronary pathophysiology



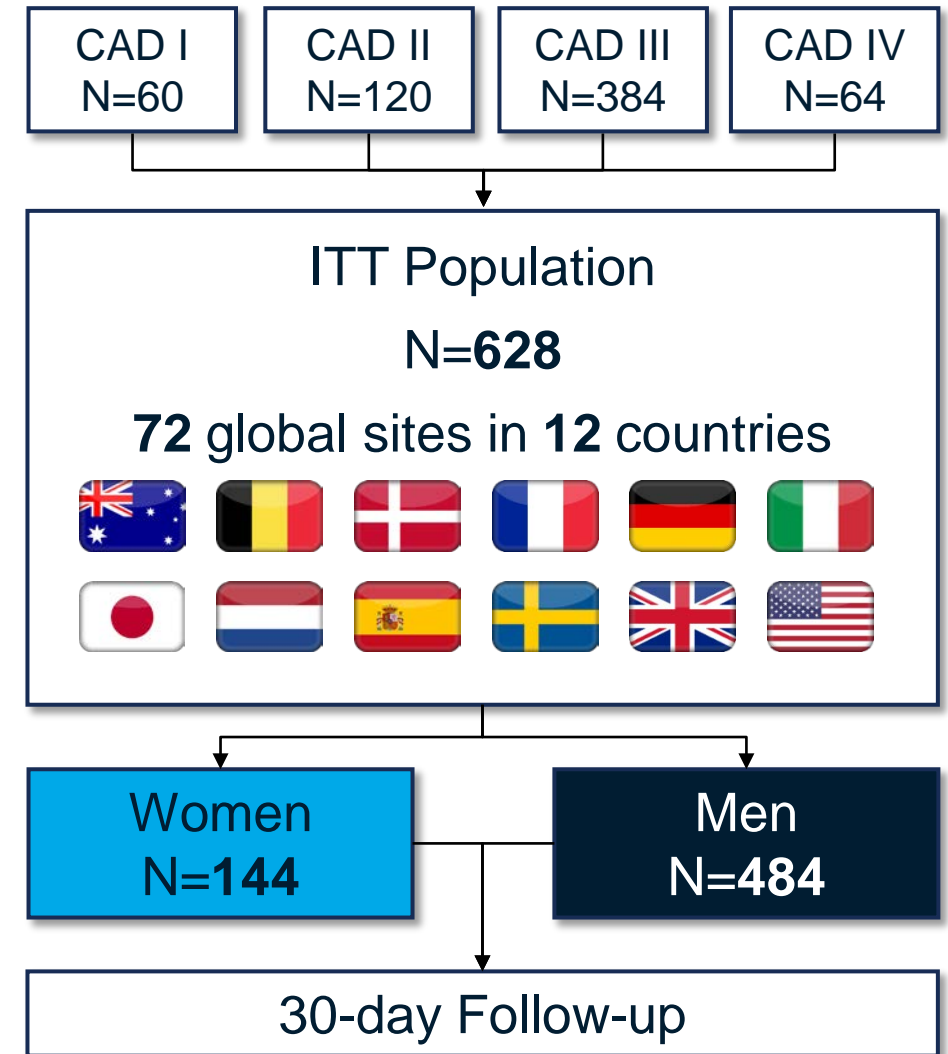
Increased risk for women with mod-severe CAC



N=765 patients treated with RA

# Pooled Analysis Study Design

- **Objective:** To compare outcomes between women and men following treatment of *de novo* calcified coronary lesions with Shockwave Intravascular Lithotripsy (IVL)
- Perform sex-based sub-analysis of the individual patient-data (IPD) pooled analysis of the Disrupt CAD I-IV studies<sup>1</sup>
  - Uniform study criteria, endpoints, adjudication, follow-up
- Primary safety endpoint:
  - **30-day MACE:** Cardiac death, MI, TVR
- Primary effectiveness endpoint:
  - **Procedural success:** Successful stent delivery with residual stenosis  $\leq 30\%$  without in-hospital MACE
- Secondary endpoints:
  - Target lesion failure
  - Ischemia-driven target lesion revascularization
  - Stent thrombosis (definite or probable)



# Disrupt CAD Study Characteristics

Uniform study criteria, endpoints, adjudication, follow-up

Characteristic	CAD I <sup>1</sup>	CAD II <sup>2</sup>	CAD III <sup>3</sup>	CAD IV <sup>4</sup>
ClinicalTrials.gov	NCT02650128	NCT03328949	NCT03595176	NCT04151628
Study design	Prospective, multi-center, single-arm			
Enrollment period	Dec 2015 – Sep 2016	May 2018 – Mar 2019	Jan 2019 – Mar 2020	Nov 2019 – Apr 2020
Number of patients	60	120	384	64
Number of centers	7	15	47	8
Participating regions	AU, EU	EU	U.S., EU	Japan
Independent ACL and CEC	Yes			
Peri-procedural MI definition	CK-MB >3x ULN with or without new pathologic Q-wave			
Target lesions	Severely calcified*, <i>de novo</i> coronary artery lesions			
Target lesion RVD	2.5mm – 4.0mm			
Target lesion length	≤ 32 mm	≤ 32 mm	≤ 40 mm	≤ 40 mm
Target lesion stenosis	≥50% and <100%	≥50% and <100%	≥70% and <100%	≥70% and <100%
30-day follow-up complete	60/60 (100%)	119/120 (99.2%)	383/384 (99.7%)	64/64 (100%)

\*Radio-opacities both sides of vessel ≥15 mm length by angiography or calcium angle ≥270° by OCT or IVUS

# Patient Characteristics

Characteristic	Women N=144	Men N=484	P value
Age	74.2 ± 9.0	71.8 ± 8.8	<0.001
Hypertension	86%	86%	0.91
Hyperlipidemia	90%	83%	0.03
Diabetes mellitus	41%	38%	0.47
Current or former smoker	43%	62%	<0.001
Prior MI	16%	24%	0.053
Prior CABG	6%	11%	0.12
Prior Stroke	9%	9%	0.83
Renal insufficiency*	32%	23%	0.046

\*Defined as eGFR <60ml/min/1.73m<sup>2</sup>; eGFR=estimated glomerular filtration rate using the MDRD formula

# Angiographic Characteristics

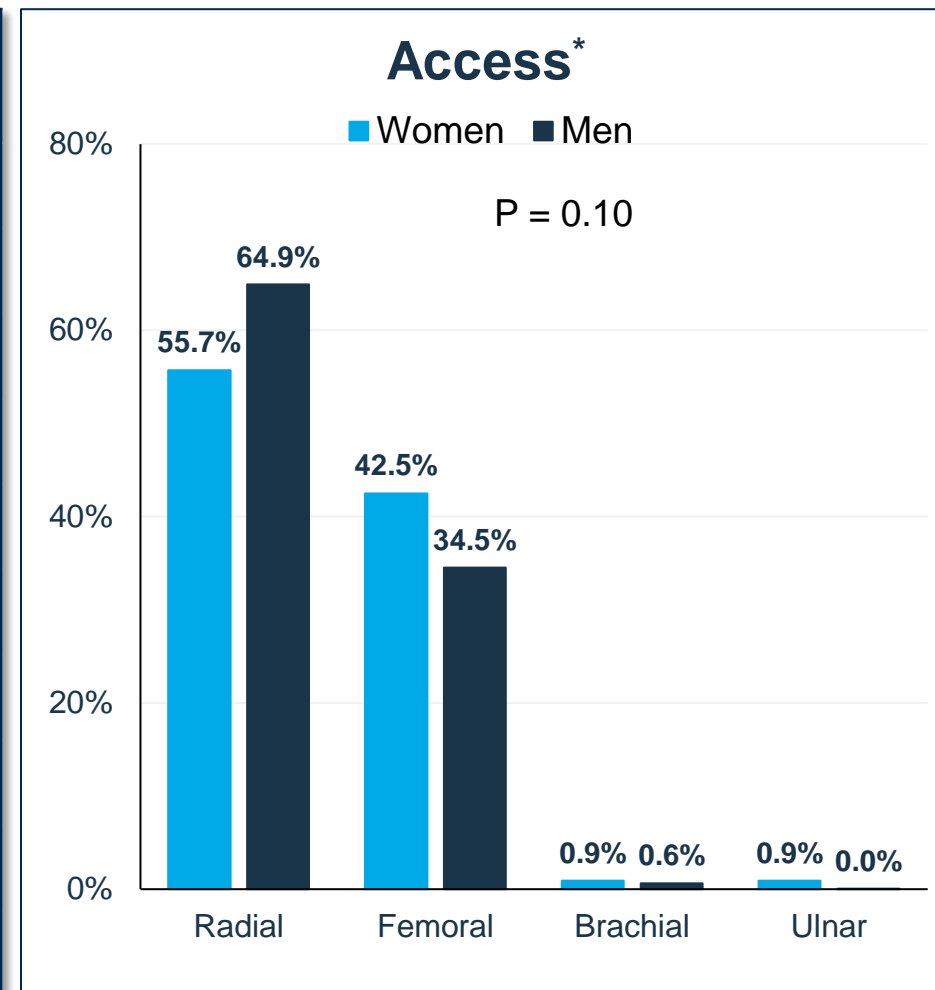
Core lab adjudicated

Characteristic	Women N=144	Men N=484	P value
Target vessel			0.43
LAD	60.4%	58.1%	
LCx	11.8%	12.0%	
RCA	27.8%	28.1%	
LM	0.0%	1.9%	
Reference vessel diameter, mm	2.7 ± 0.4	3.0 ± 0.5	<0.001
Minimum lumen diameter, mm	1.0 ± 0.4	1.1 ± 0.4	0.04
Diameter stenosis	63.2 ± 12.2%	63.9 ± 11.7%	0.52
Lesion length, mm	22.4 ± 10.3	25.0 ± 11.7	0.01
Calcified length, mm	38.7 ± 18.1	42.4 ± 20.4	0.052
Severe calcification*	95.8%	97.3%	0.08
Bifurcation lesion	22.9%	32.4%	0.03

\*Defined as radiopaque densities noted without cardiac motion generally involving both sides of the arterial wall

# Procedural Characteristics

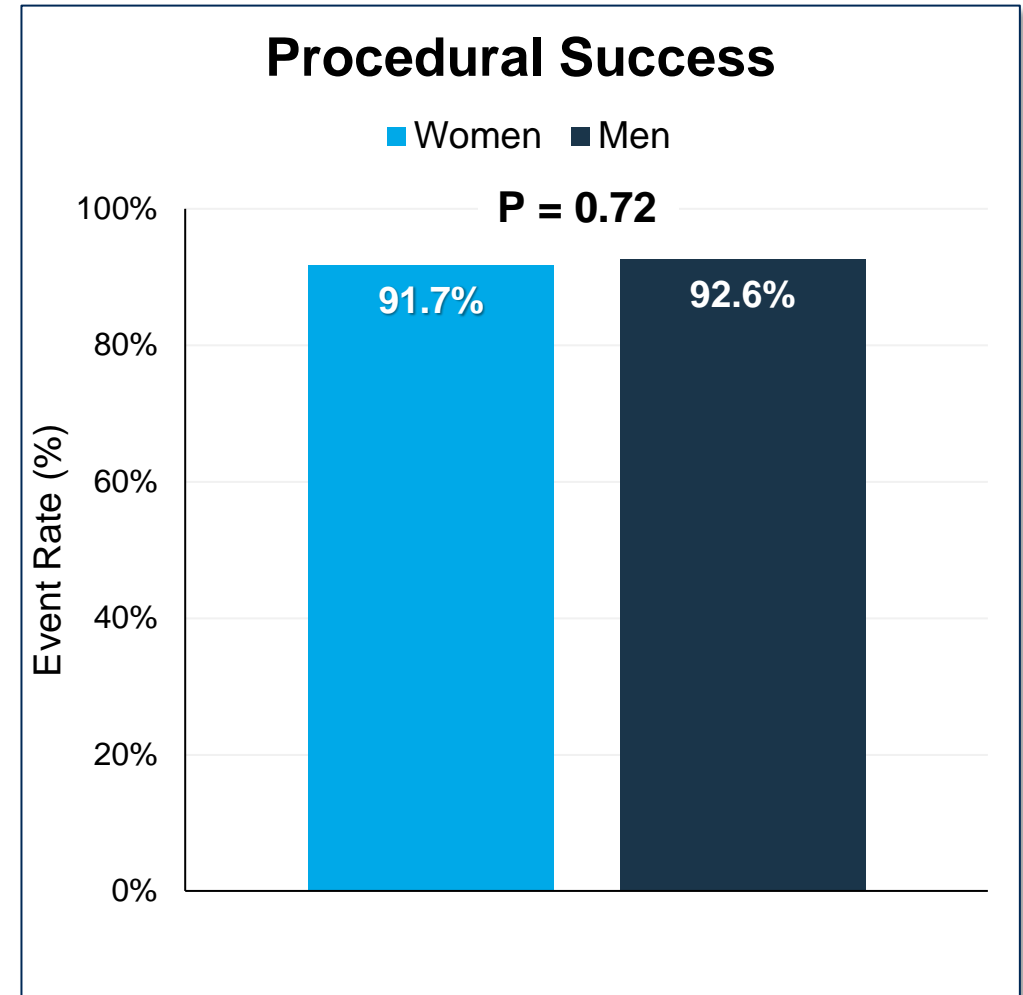
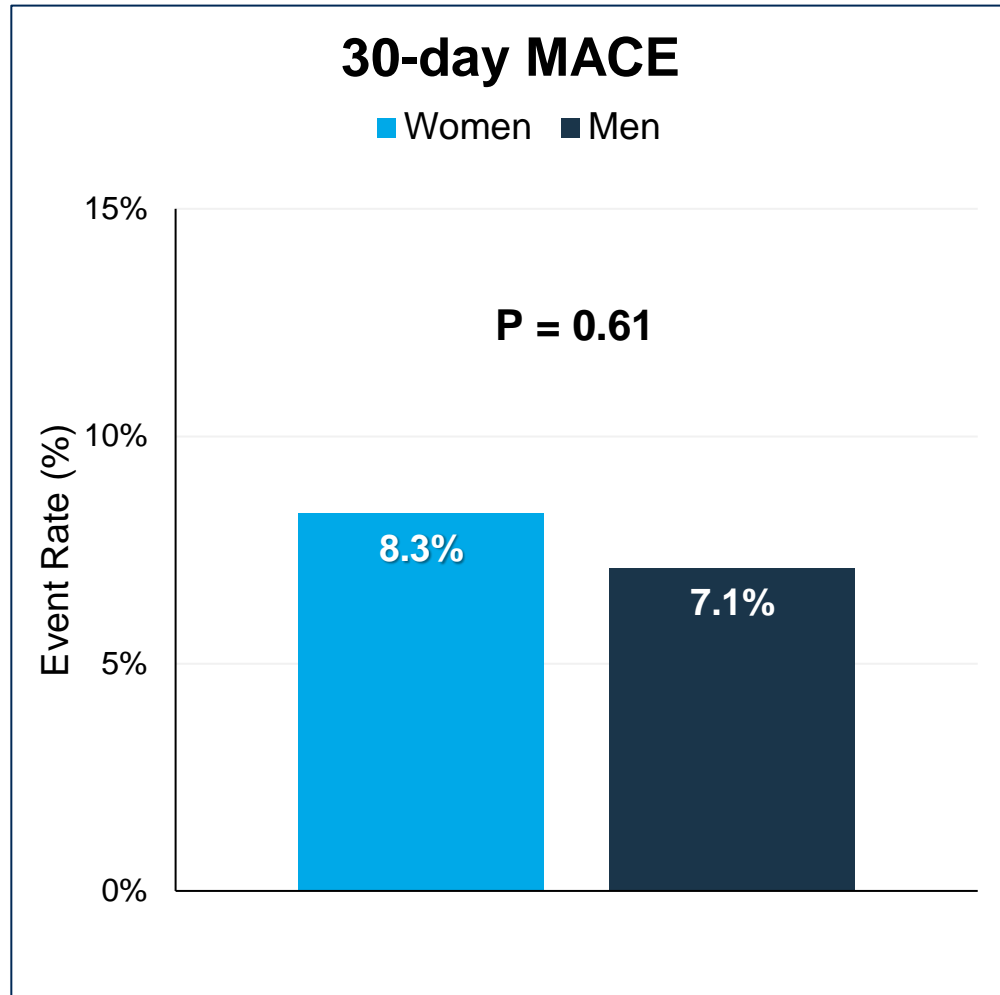
Characteristic	Women N=144	Men N=484	P value
Total procedure time, min	58 ± 27	66 ± 34	0.004
Pre-dilatation	45%	48%	0.50
IVL catheters	1.2 ± 0.4	1.4 ± 0.7	<0.001
IVL balloon to RVD ratio	1.3 ± 0.2	1.2 ± 0.2	0.049
IVL pulses	63 ± 35	78 ± 44	<0.001
Max IVL inflation pressure, atm	5.9 ± 0.4	6.0 ± 0.5	0.26
Post-IVL dilatation	13%	18%	0.24
Number of stents	1.2 ± 0.5	1.3 ± 0.5	0.24
Stent delivery	99.3%	99.6%	1.0
Post-stent dilatation	93.1%	93.8%	0.75



\*Access data collected in Disrupt CAD III and IV

# Primary Endpoints

No difference in primary safety and effectiveness endpoints between women and men

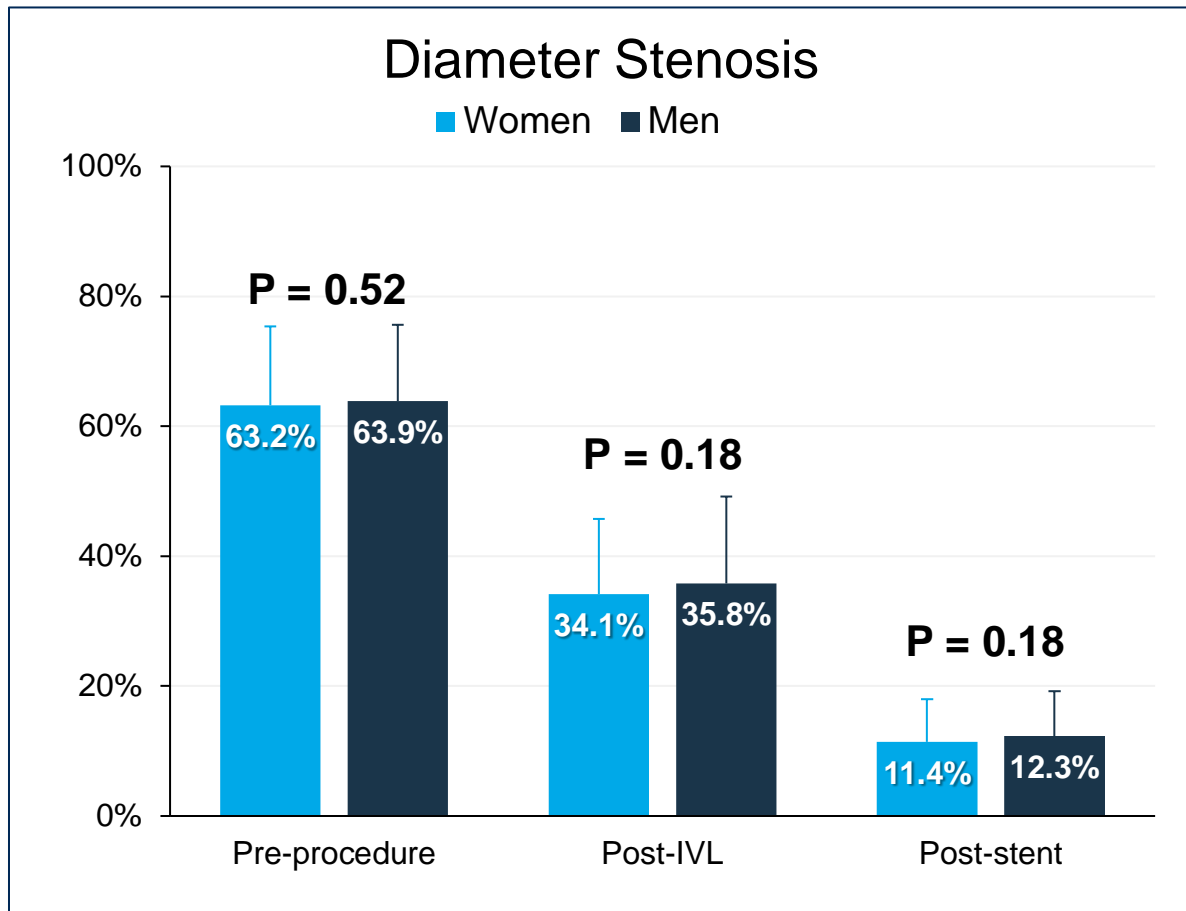




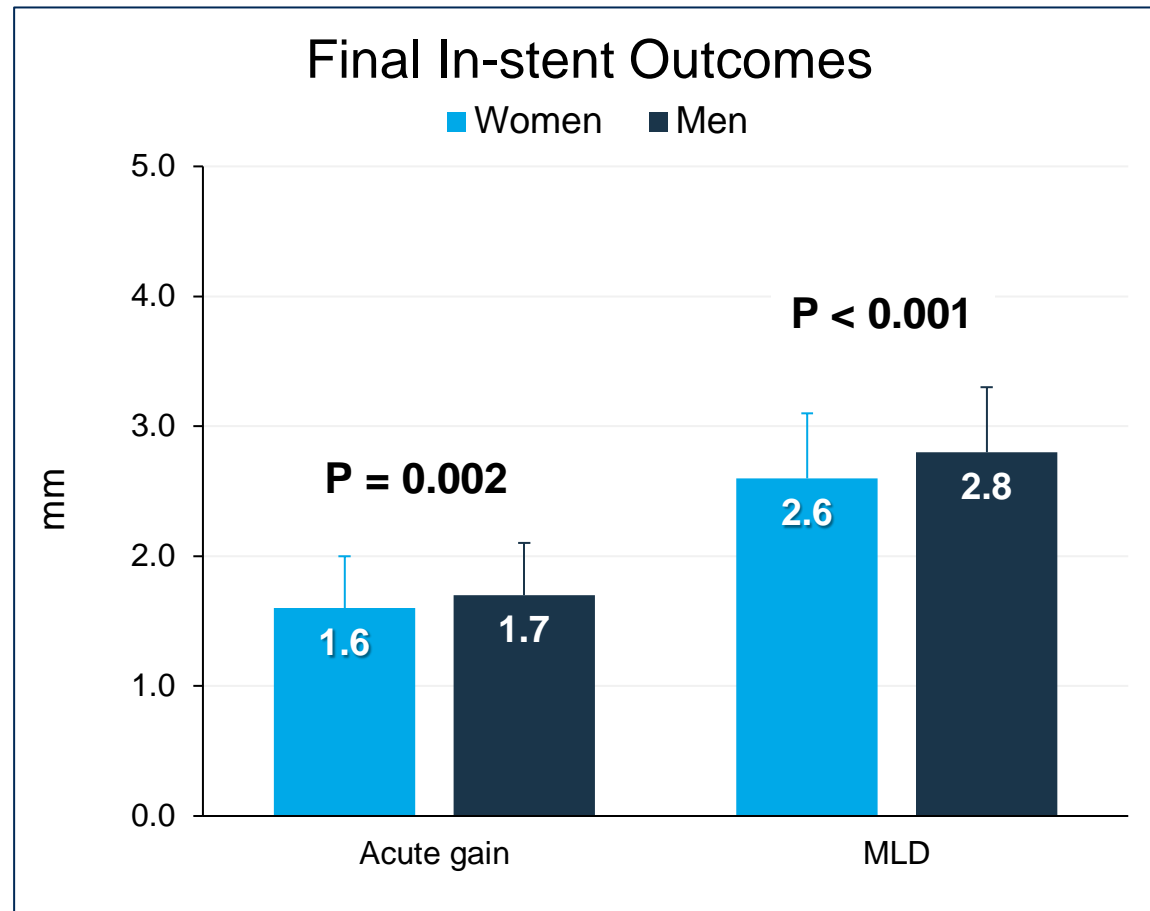
# Angiographic Outcomes

Core lab adjudicated

Similar reduction in stenosis



Greater acute gain and larger MLD in men



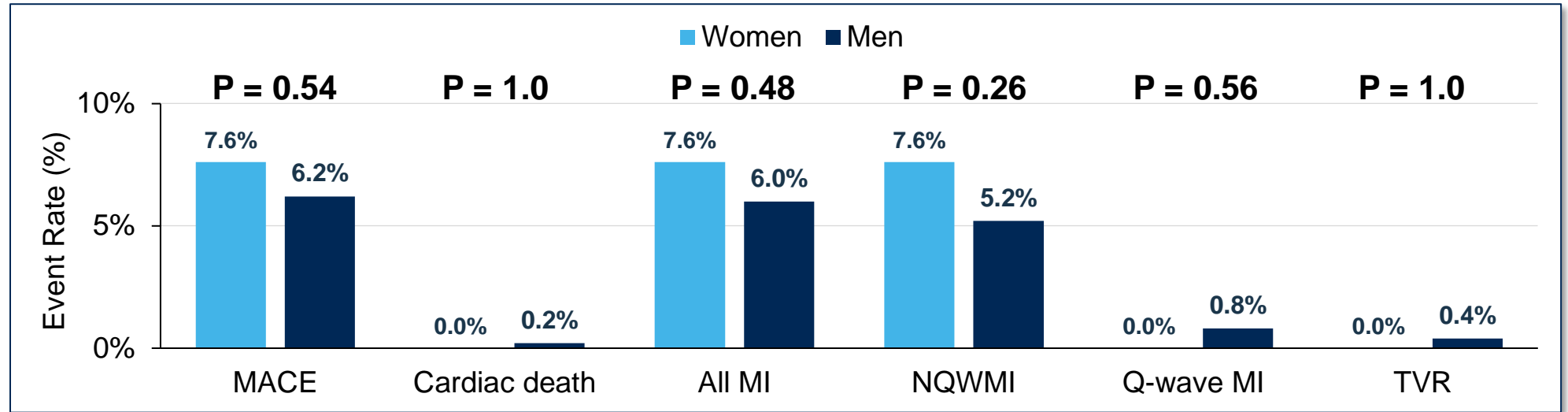
# Angiographic Complications

Core lab adjudicated

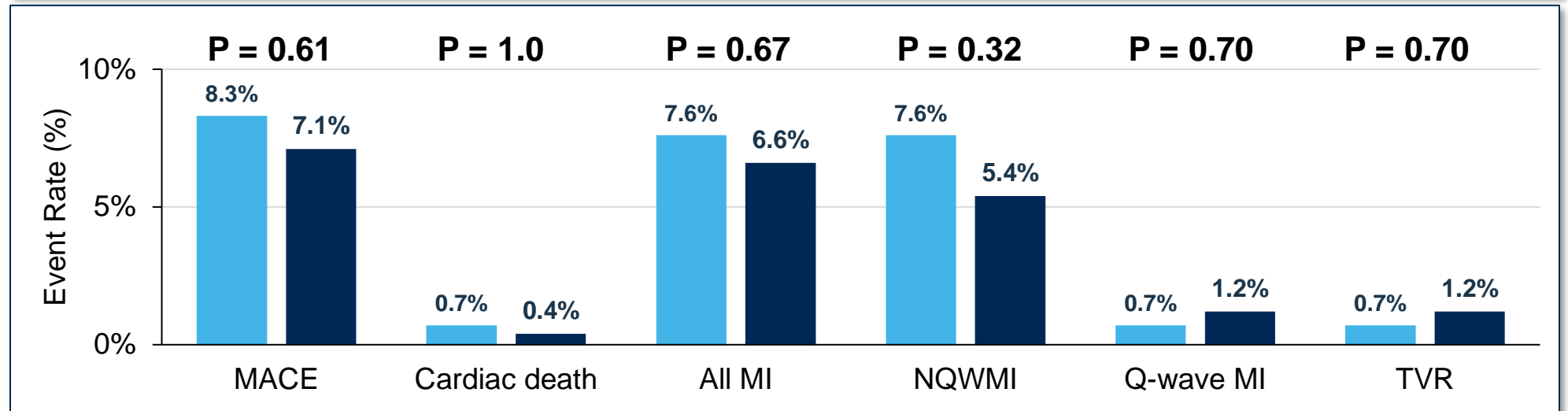
	Immediately Post-IVL			Final Post-stent		
Complication	Women	Men	P value	Women	Men	P value
Any serious angiographic complication	1.6%	2.3%	0.75	<b>0.0%</b>	0.4%	1.0
Severe dissection (Type D-F)	1.6%	1.8%	0.53	<b>0.0%</b>	0.2%	0.51
Perforation	<b>0.0%</b>	<b>0.0%</b>	---	<b>0.0%</b>	0.2%	1.0
Abrupt closure	<b>0.0%</b>	<b>0.0%</b>	---	<b>0.0%</b>	0.2%	1.0
Slow flow	<b>0.0%</b>	0.4%	1.0	<b>0.0%</b>	<b>0.0%</b>	---
No-reflow	<b>0.0%</b>	<b>0.0%</b>	---	<b>0.0%</b>	<b>0.0%</b>	---

# No Difference in In-hospital and 30-day MACE

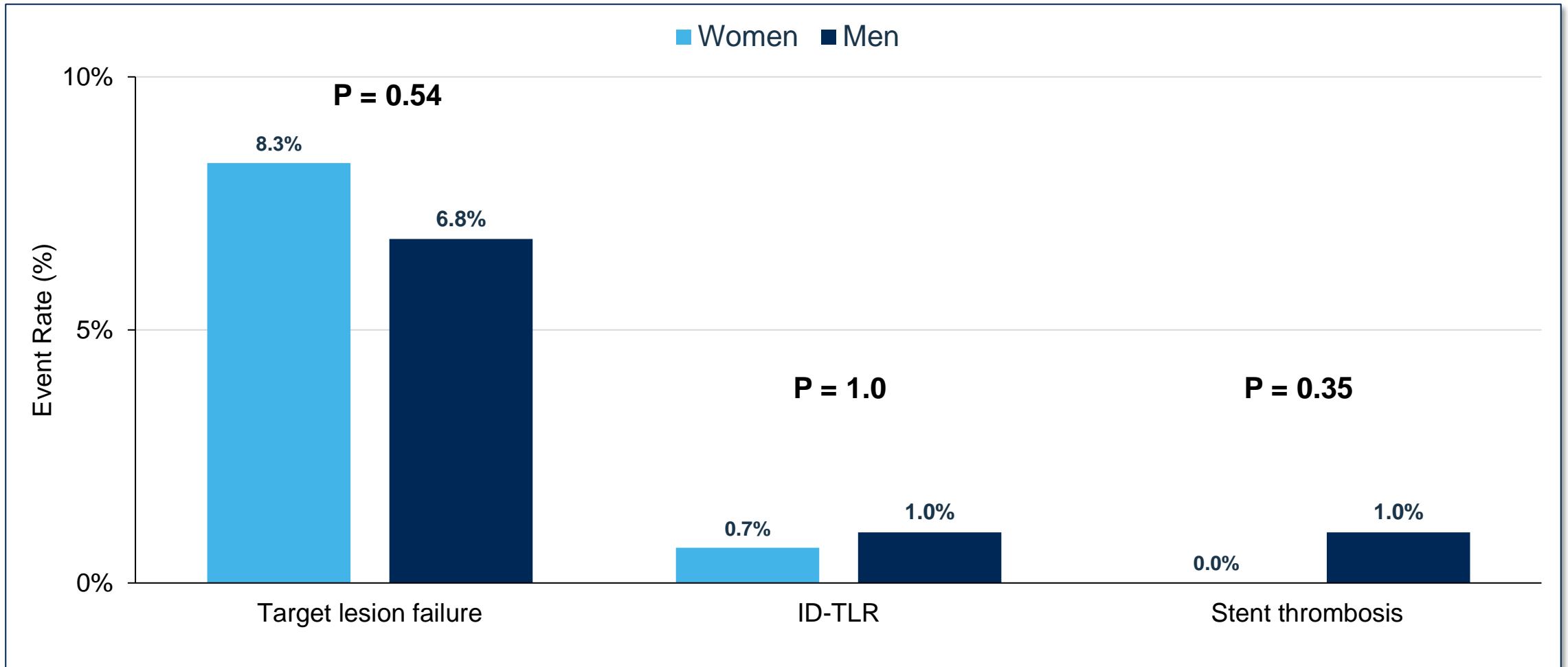
In-hospital MACE



30-day MACE



# Secondary Endpoints



# Conclusions

- The current Disrupt CAD IPD pooled sub-analysis represents the largest assessment to-date of sex-based IVL treatment in *de novo*, calcified arteries to facilitate stent implantation
- Excellent safety and effectiveness outcomes to 30 days were achieved in both women and men following IVL treatment
  - This is in contrast to prior reports of increased risk of peri-procedural complications and adverse clinical outcomes in women undergoing PCI
- On-going follow-up is needed to assess the long-term safety and effectiveness of IVL in women