Sex-specific 1-year Outcomes in Coronary Intravascular Lithotripsy

Patient-level Pooled Analysis of Disrupt CAD Studies

Alexandra J. Lansky, MD

Professor of Medicine, Section of Cardiology

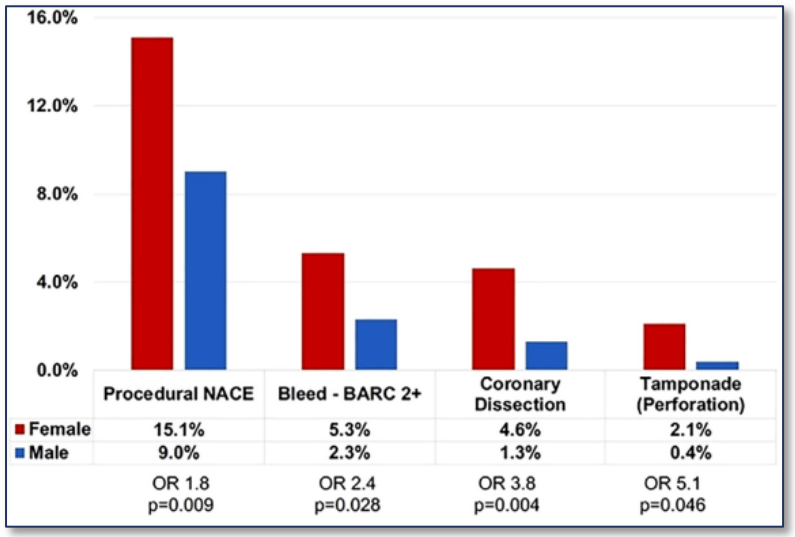
Yale School of Medicine, New Haven, Connecticut

SCAI
Society for Cardiovascular Angiography & Interventions

Background

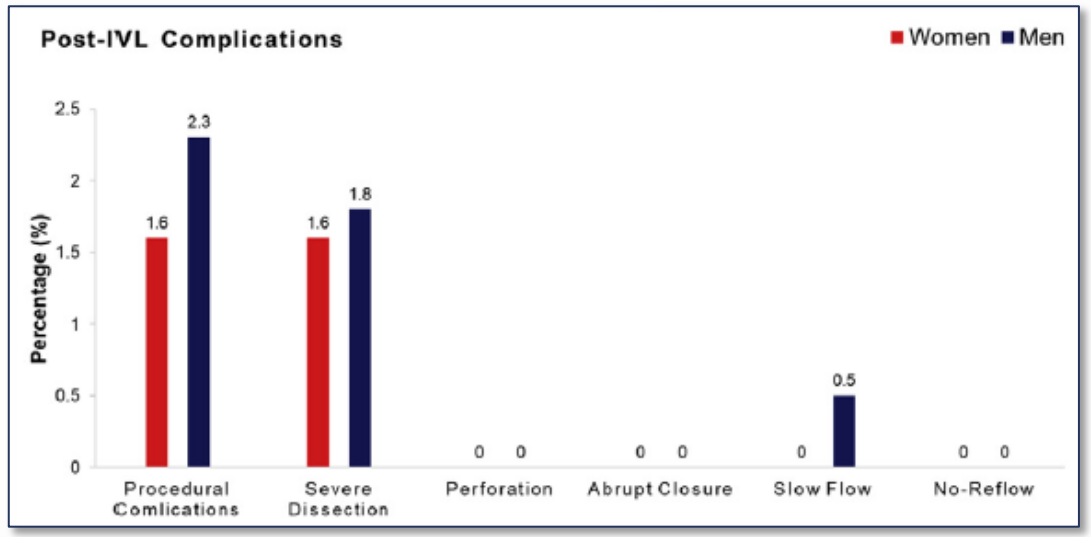
- Women with coronary artery calcification (CAC) undergoing PCI are at increased risk for adverse clinical outcomes[1]
- Women have high procedural complications following atheroablative treatment of calcified lesions[2]
- In contrast, IVL is associated with low procedural complication rates in both women and men[3]
- However, longer-term clinical outcomes in women following coronary IVL treatment have not been reported

RA: Increased complication rate in women



[1]Giustino et al., *JACC Cardiovasc Int* 2016; [2]Ford et al., *Catheter Cardiovasc Interv* 2020

Coronary IVL: Low complication rates in women and men

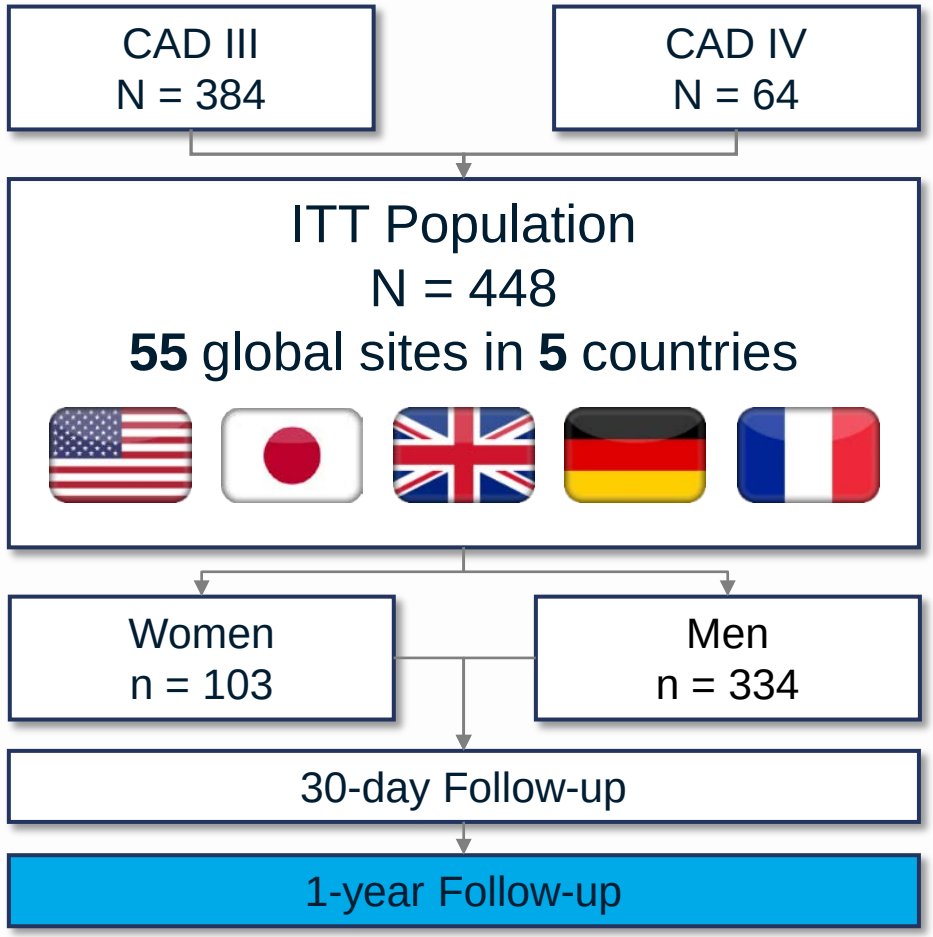


[3]Hussain et al., *JSCAI* 2022

SCAI
Society for Cardiovascular Angiography & Interventions

Patient-Level Pooled Analysis Design

- **Objective:** To compare sex-based outcomes of Intravascular Lithotripsy (IVL) to treat *de novo* calcified coronary lesions
- **Population:** Patient-level pooled analysis of the Disrupt CAD III-IV studies
  - Uniform study criteria, endpoints, adjudication, follow-up at 1-year
- Primary safety endpoint:
  - **30-day MACE:** Cardiac death, MI, TVR
- Primary effectiveness endpoint:
  - **Procedural success:** Successful stent delivery with residual stenosis ≤ 30% without in-hospital MACE
- Secondary endpoints at 1-year:
  - MACE
  - TLF
  - Stent thrombosis (definite or probable)



SCAI
Society for Cardiovascular Angiography & Interventions

Disrupt CAD Study Characteristics

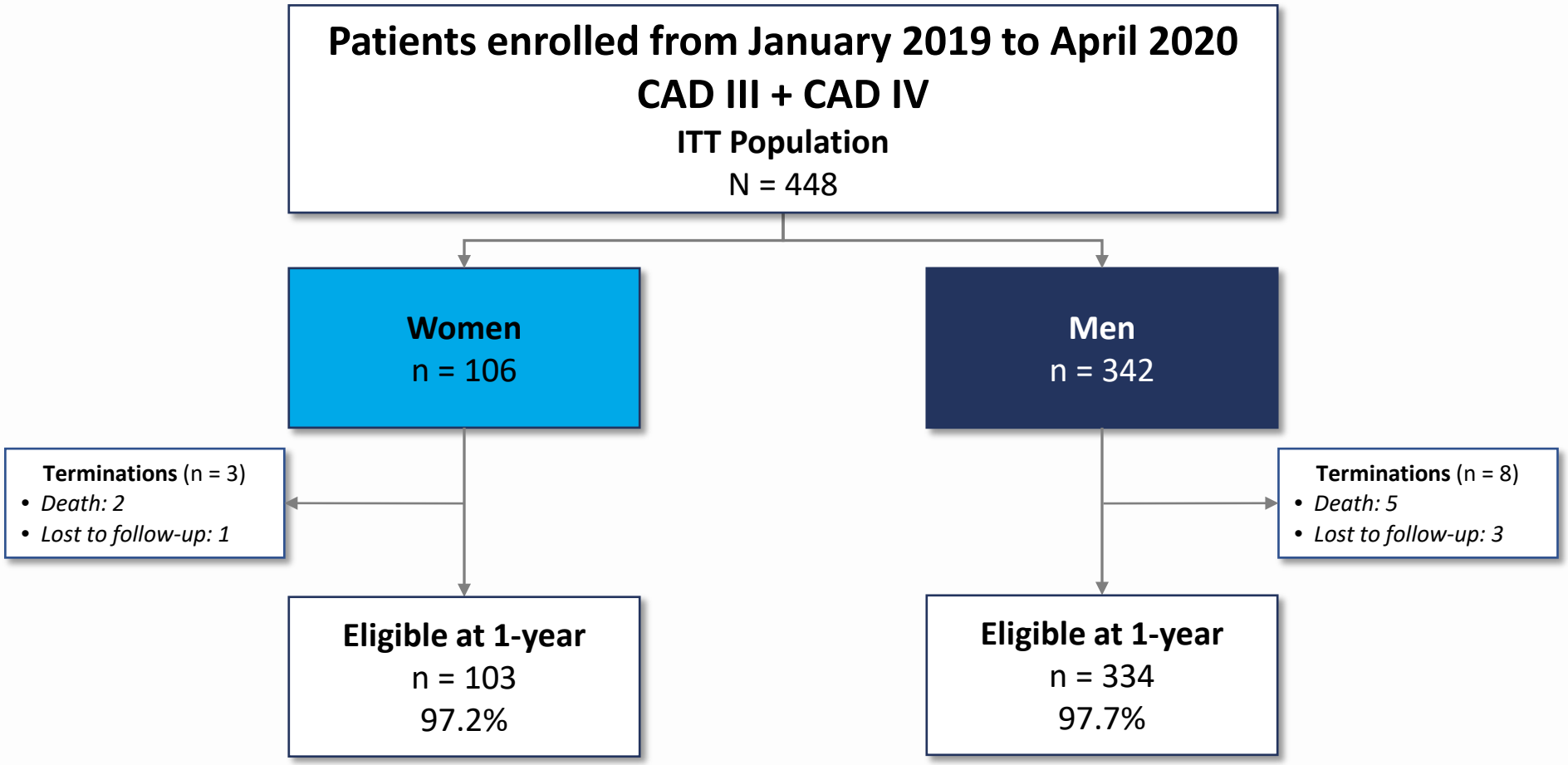
Uniform study criteria, endpoints, adjudication, angiographic core analysis, follow-up

Characteristic	CAD III[1]	CAD IV[2]
ClinicalTrials.gov	NCT03595176	NCT04151628
Study design	Prospective, multi-center, single-arm	
Enrollment period	Jan 2019 – Mar 2020	Nov 2019 – Apr 2020
Number of patients	384	64
Number of centers	47	8
Participating regions	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*, *de novo* coronary artery lesions	
Target lesion RVD	2.5mm – 4.0mm	
Target lesion length	≤ 40 mm	
Target lesion stenosis	≥70% and <100%	
Patients eligible at 1-year	373/384 (97.1%)	64/64 (100%)

*Radio-opacities both sides of vessel ≥15 mm length by angiography or calcium angle ≥270° by OCT or IVUS. [1]Hill et al., 2020; [2]Saito et al., 2021

SCAI
Society for Cardiovascular Angiography & Interventions

Study Flow and Follow-up



Patient Characteristics

Characteristic	Women N=106	Men N=342	P value
Age	73.9 ± 8.6	71.0 ± 8.5	0.002
Hypertension	90%	88%	0.72
Hyperlipidemia	91%	88%	0.58
Diabetes mellitus	44%	40%	0.54
Current or former smoker	45%	60%	0.002
Prior MI	14%	20%	0.26
Prior CABG	6%	9%	0.32
Prior Stroke	10%	9%	0.83
Renal insufficiency*	28%	25%	0.60

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

Angiographic Characteristics

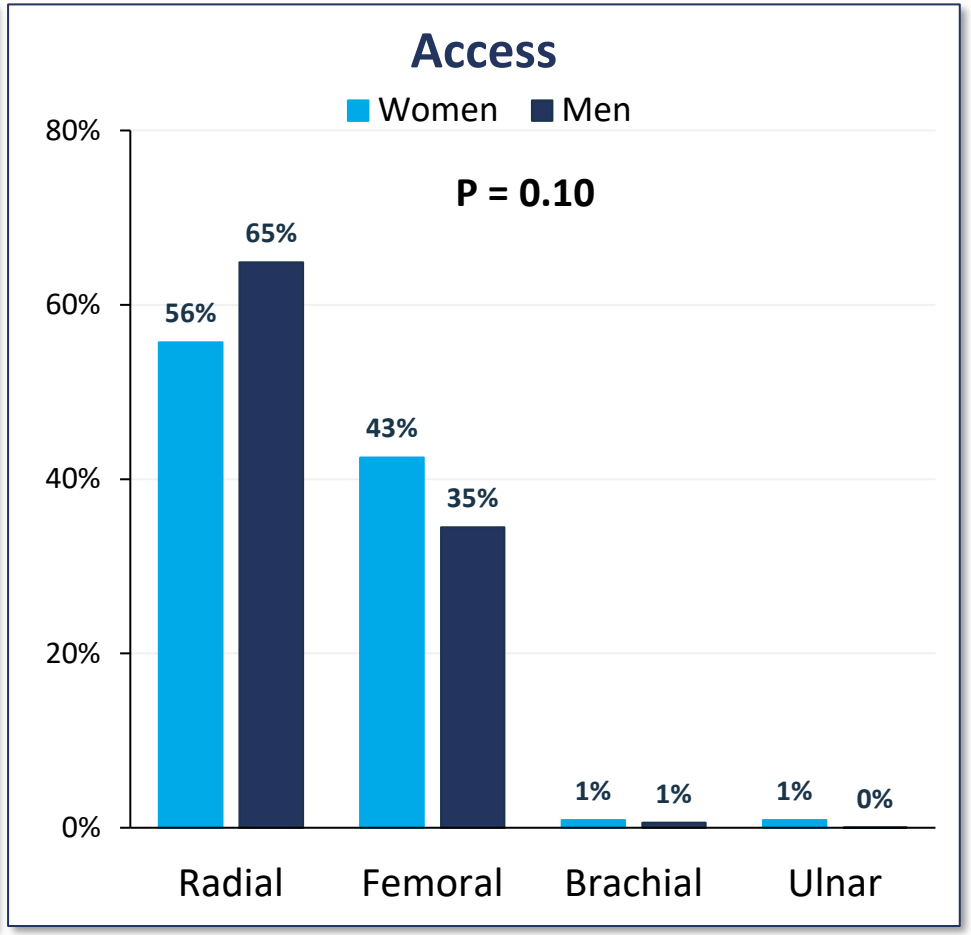
Core lab adjudicated

Characteristic	Women N=106	Men N=342	P value
Target vessel			0.69
LAD	63%	58%	
LCx	11%	12%	
RCA	26%	28%	
LM	0%	2%	
Reference vessel diameter, mm	2.8 ± 0.4	3.1 ± 0.5	<0.001
Minimum lumen diameter, mm	1.0 ± 0.4	1.1 ± 0.4	0.16
Diameter stenosis	64.5 ± 11.5%	65.5 ± 10.6%	0.43
Lesion length, mm	23.6 ± 10.2	27.1 ± 11.8	0.006
Calcified length, mm	44.5 ± 16.7	49.3 ± 18.7	0.02
Severe calcification*	100%	100%	1.0
Bifurcation lesion	24%	32%	0.10

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

Procedural Characteristics

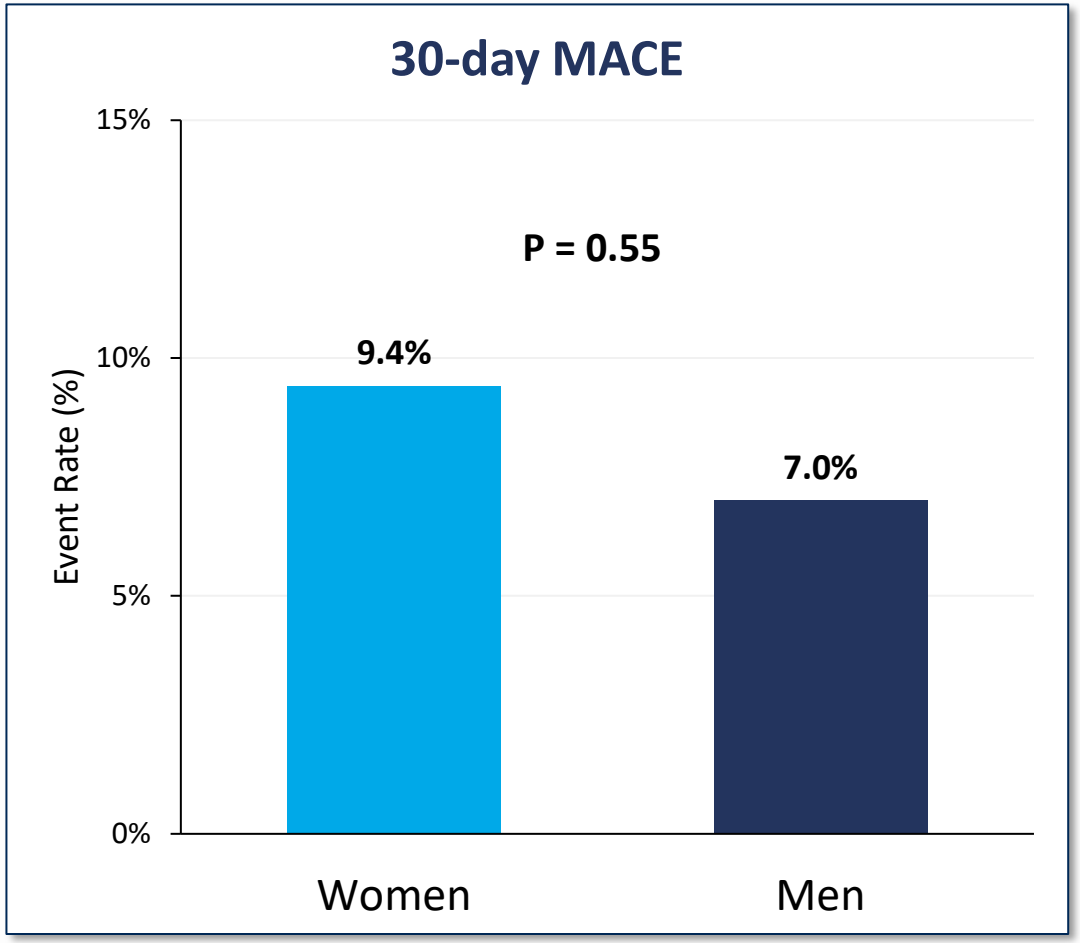
Characteristic	Women N=106	Men N=342	P value
Total procedure time, min	53 ± 24	62 ± 30	0.006
Pre-dilatation	45%	52%	0.29
IVL catheters	1.1 ± 0.4	1.3 ± 0.5	0.009
IVL balloon to RVD ratio	1.2 ± 0.1	1.2 ± 0.2	0.53
IVL pulses	62 ± 34	78 ± 39	<0.001
Max IVL inflation pressure, atm	6.0 ± 0.2	6.0 ± 0.4	0.85
Post-IVL dilatation	14%	19%	0.35
Number of stents	10%	9%	0.83
Stent delivery	99%	99%	0.78
Post-stent dilatation	97%	99%	0.45

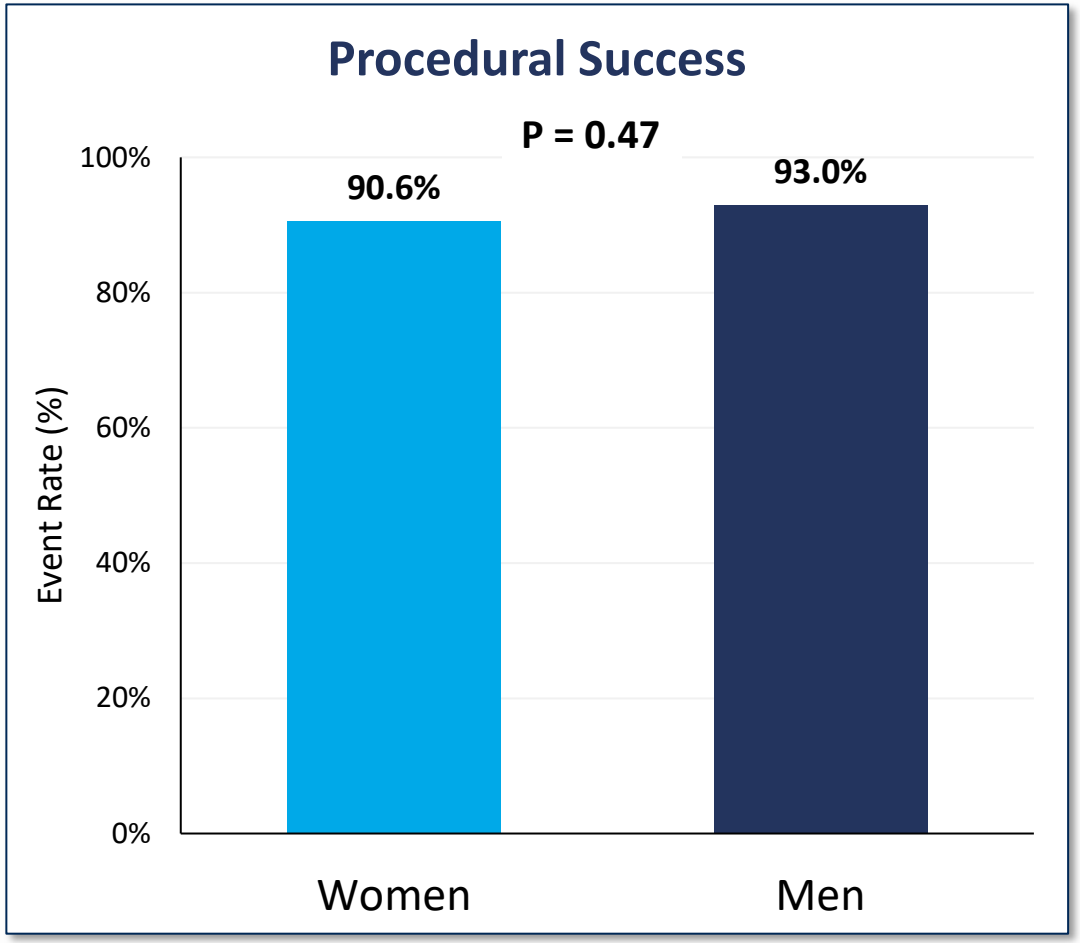


SCAI
Society for Cardiovascular Angiography & Interventions

Primary Endpoints

Core lab and CEC adjudicated



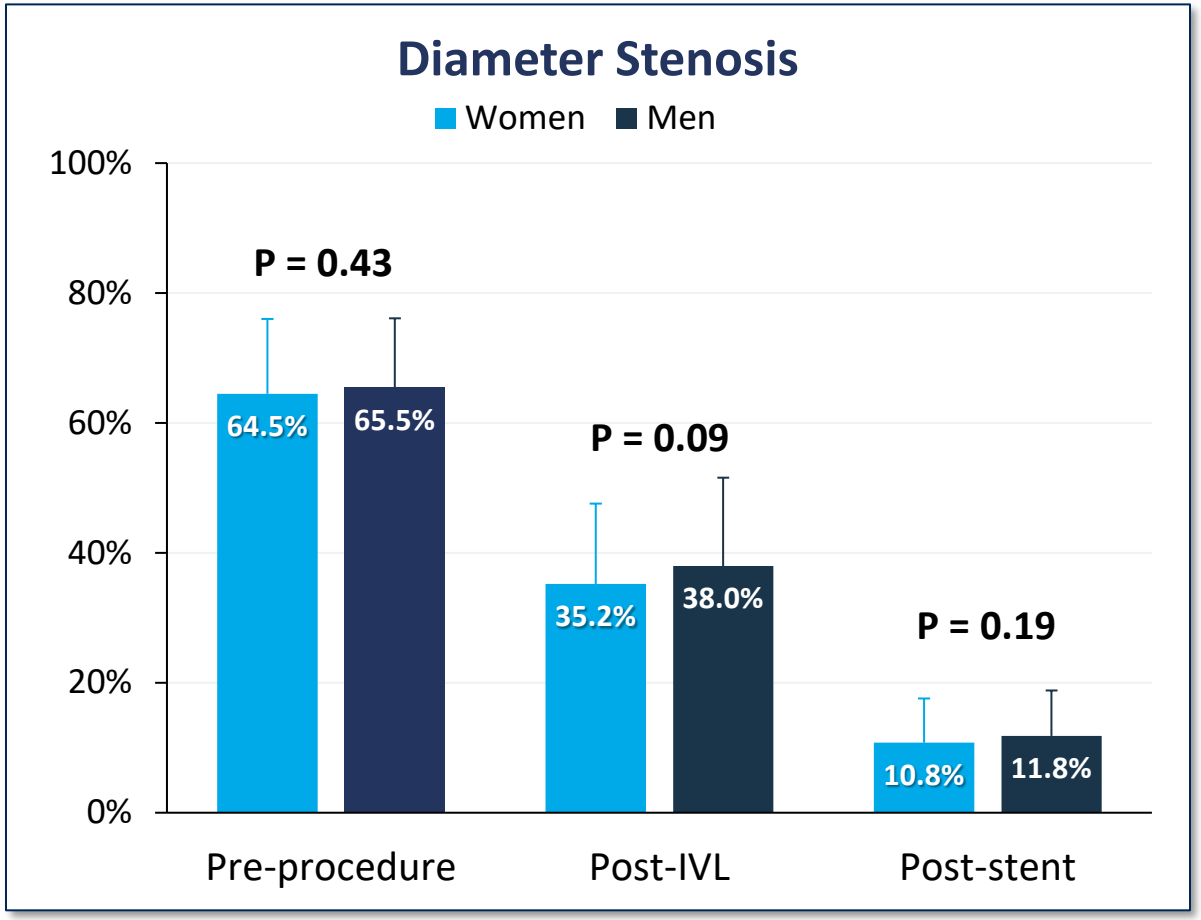


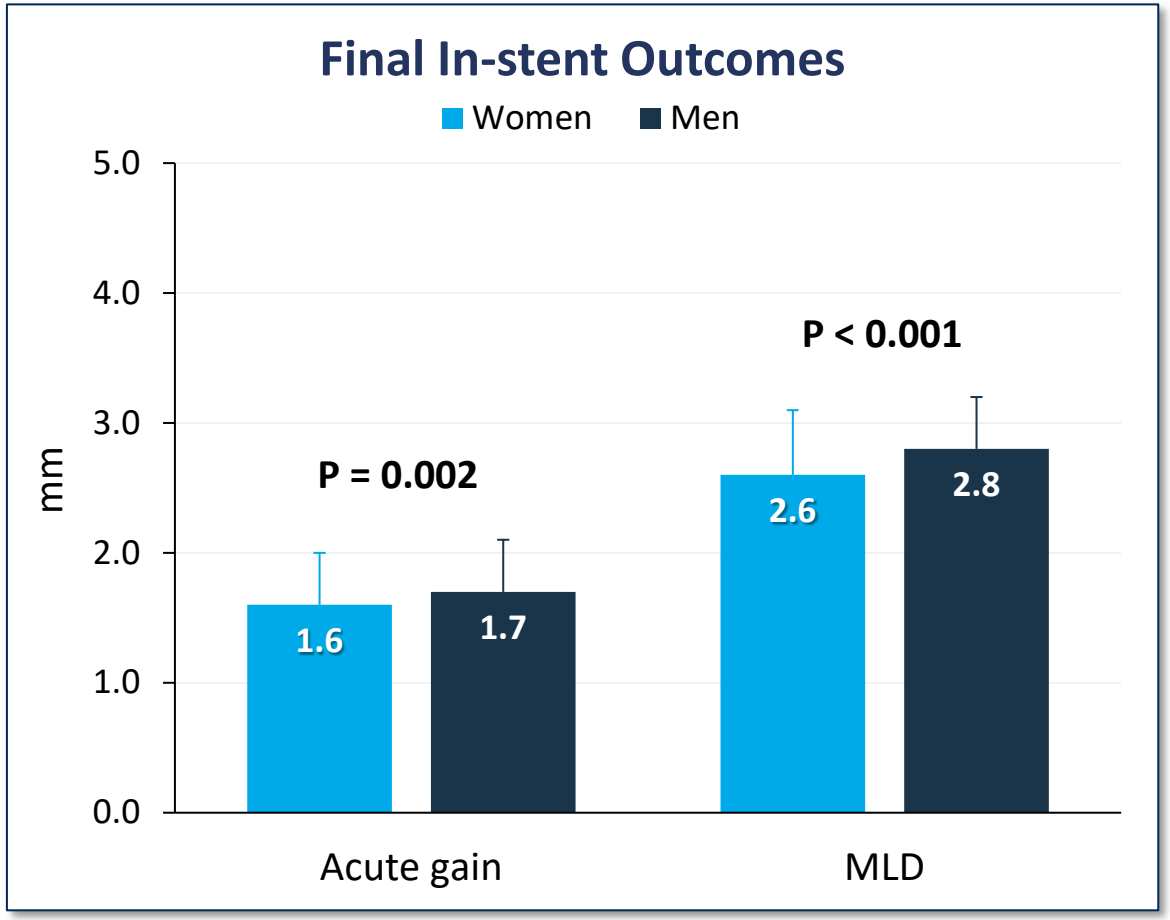
Similar outcomes between women and men

SCAI
Society for Cardiovascular Angiography & Interventions

Angiographic Outcomes

Core lab adjudicated





Similar residual stenosis outcomes between women and men

Greater in-stent outcomes in men driven by larger RVD

SCAI
Society for Cardiovascular Angiography & Interventions

Angiographic Complications

Core lab adjudicated

	Immediately Post-IVL			Final Post-stent		
Complication	**Women**	**Men**	**P value**	**Women**	**Men**	**P value**
Any serious angiographic complication	2.2%	2.6%	0.85	**0.0%**	0.6%	0.96
Severe dissection (Type D-F)	1.6%	1.9%	0.80	**0.0%**	0.3%	0.53
Perforation	**0.0%**	**0.0%**	---	**0.0%**	0.3%	0.53
Abrupt closure	**0.0%**	**0.0%**	---	**0.0%**	0.3%	0.53
Slow flow	**0.0%**	0.6%	0.93	**0.0%**	**0.0%**	---
No-reflow	**0.0%**	**0.0%**	---	**0.0%**	**0.0%**	---

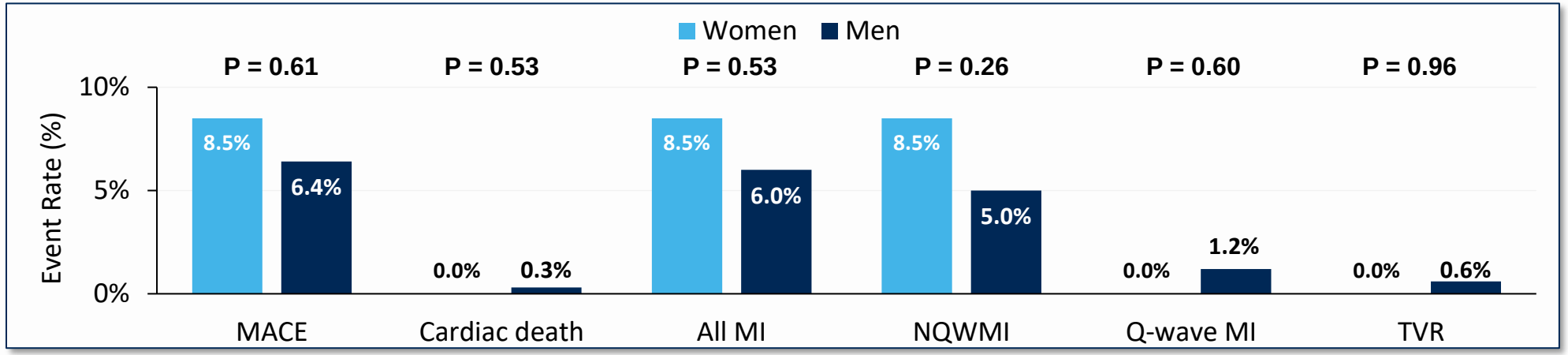
Similar outcomes between women and men

SCAI
Society for Cardiovascular Angiography & Interventions

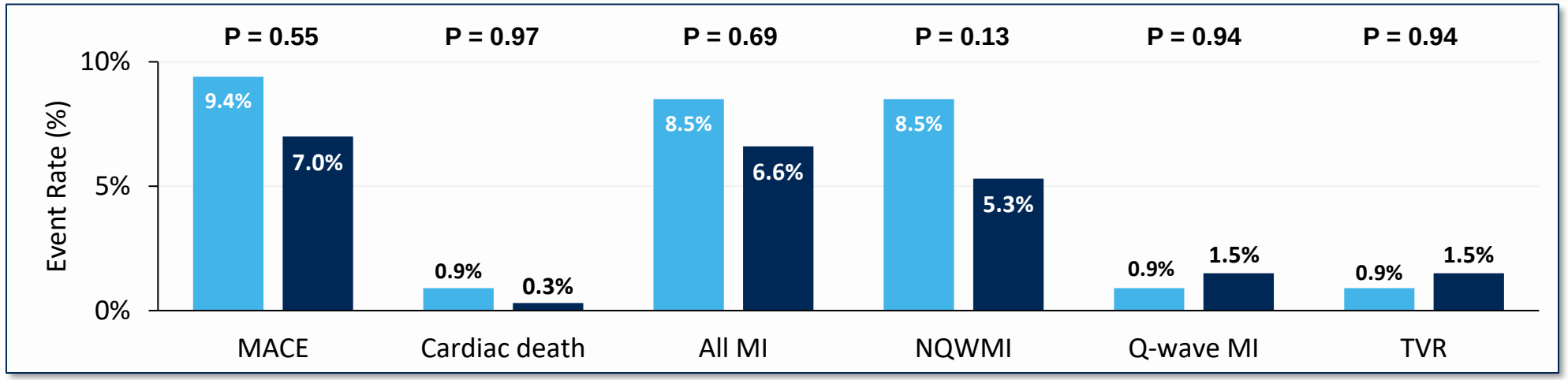
In-hospital & 30-day Outcomes

CEC adjudicated

In-hospital MACE



30-day MACE

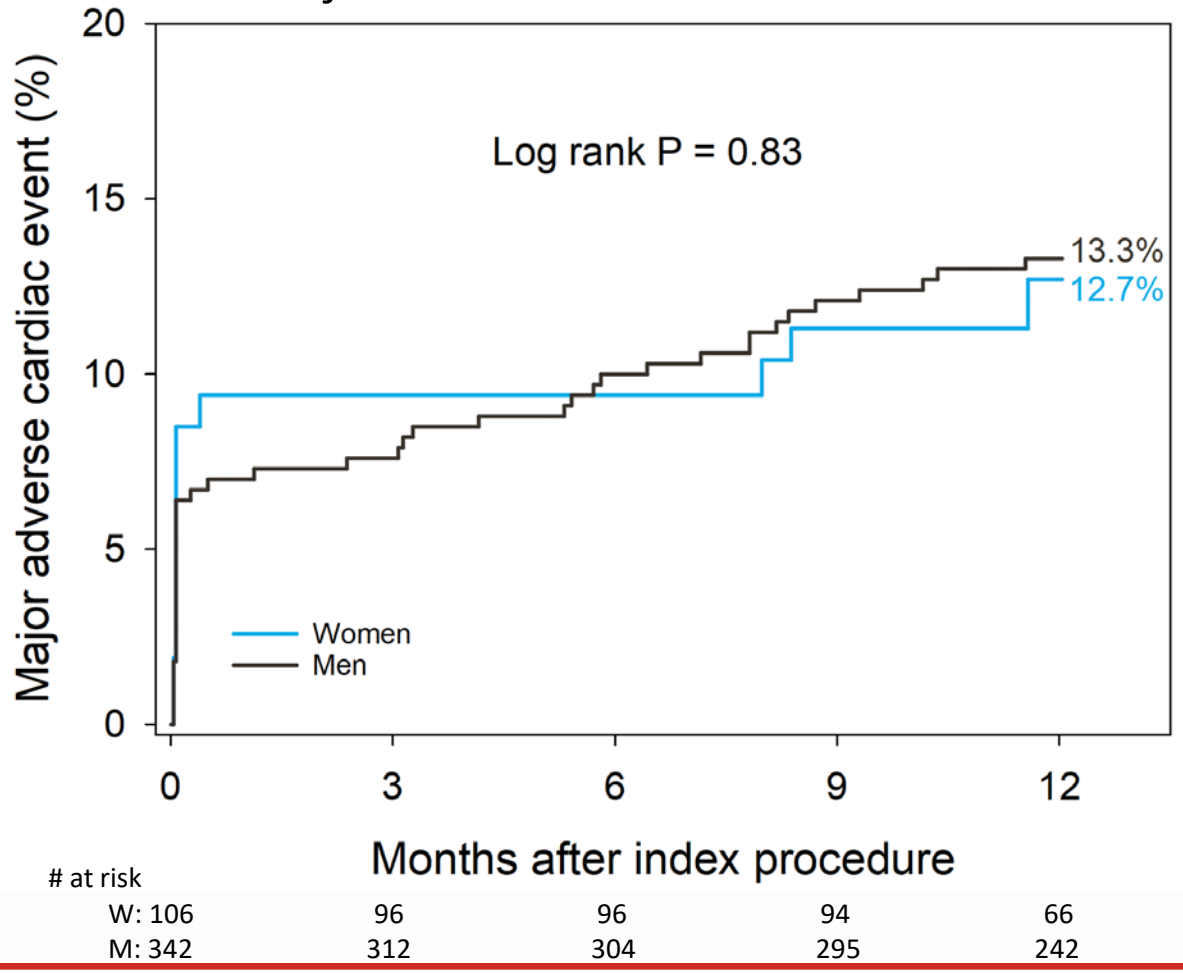


Similar outcomes between women and men

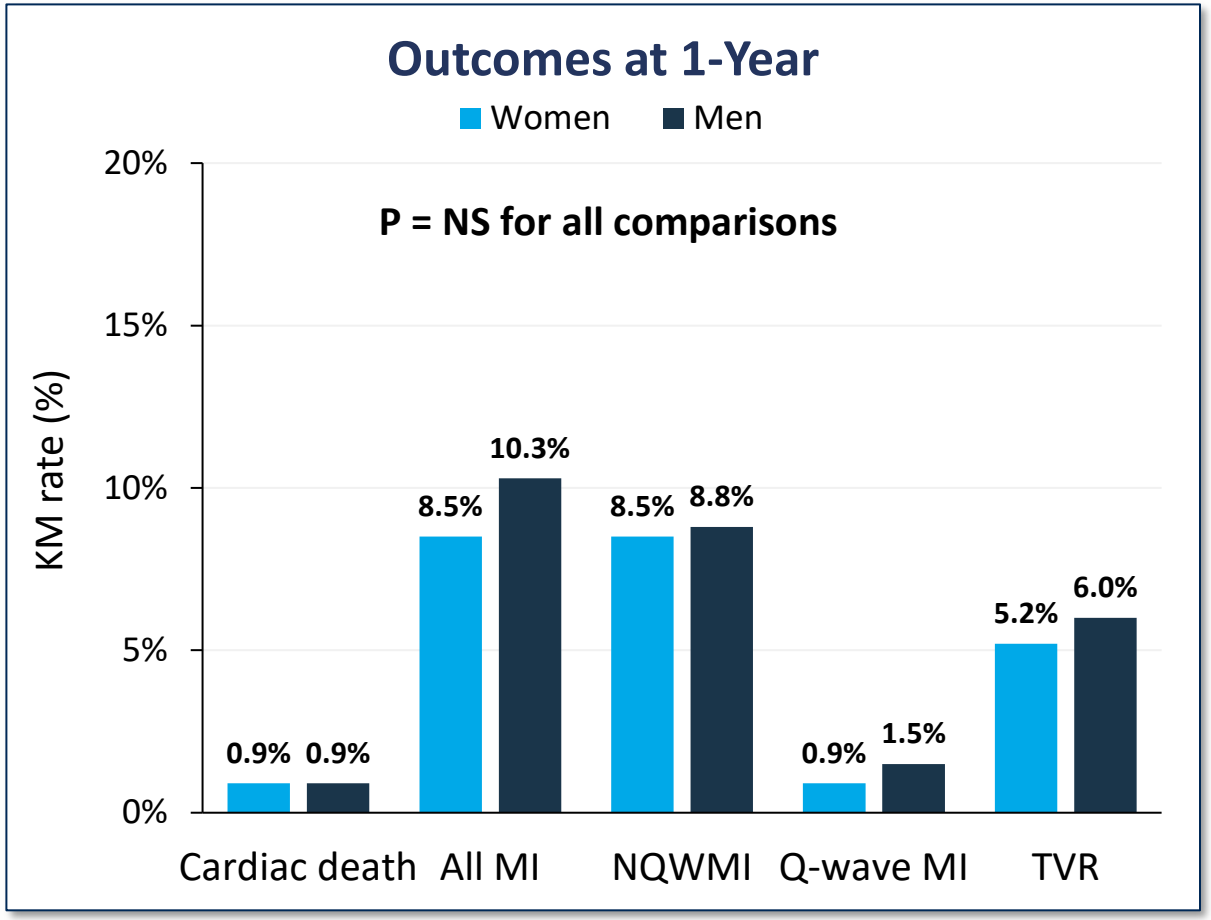
SCAI
Society for Cardiovascular Angiography & Interventions

MACE at 1-Year

CEC adjudicated



# at risk					
W: 106	96	96	94	66
M: 342	312	304	295	242

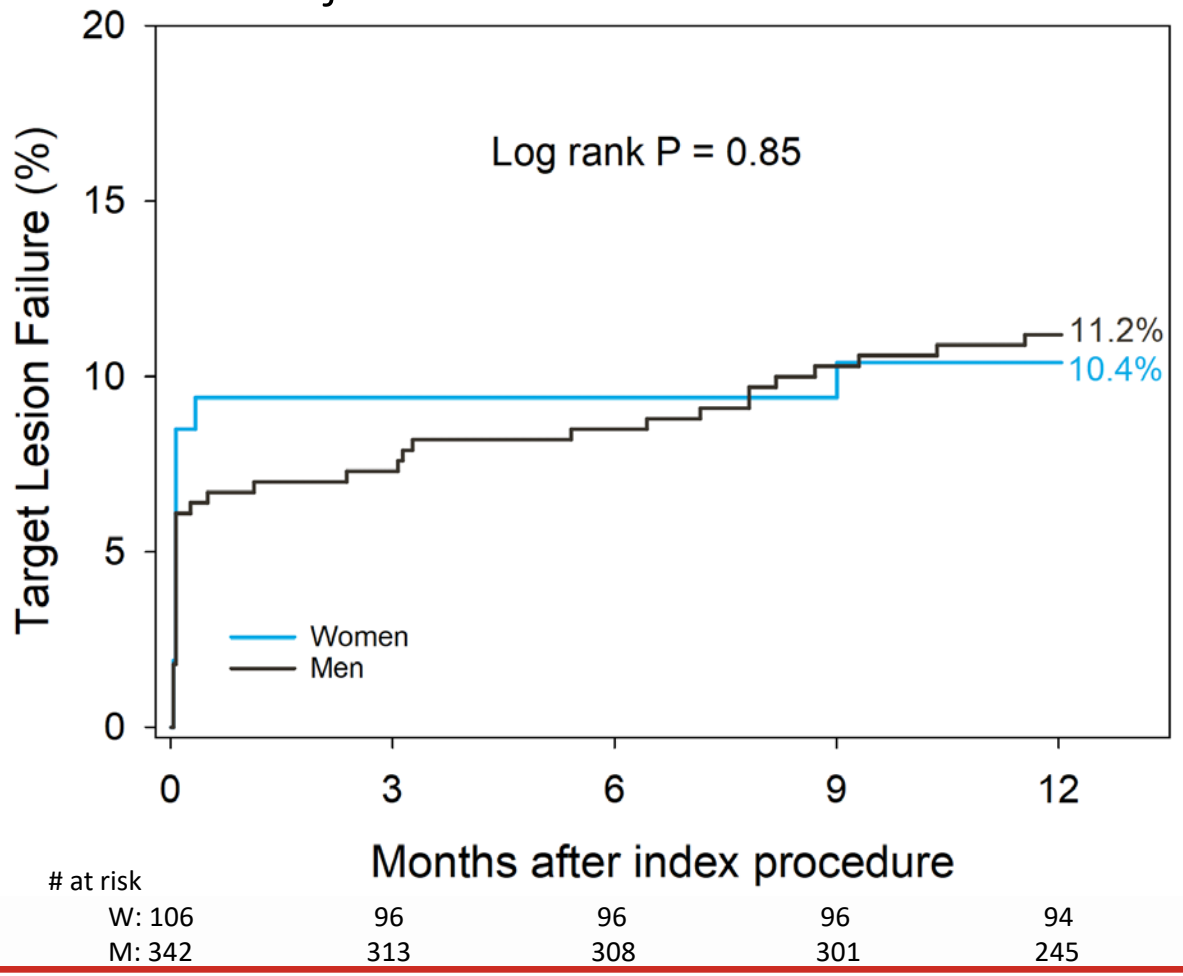


Similar outcomes between women and men

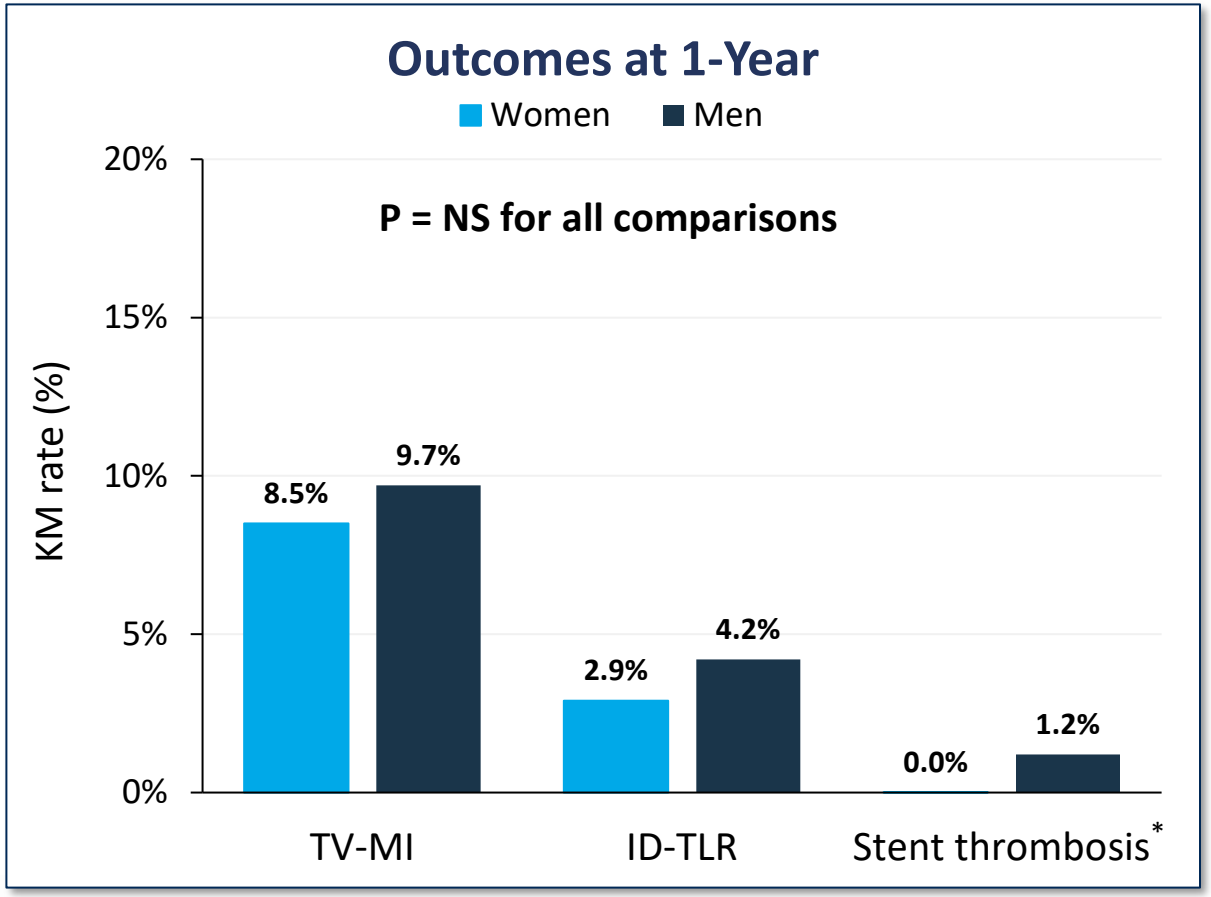
SCAI
Society for Cardiovascular Angiography & Interventions

Target Lesion Failure at 1-Year

CEC adjudicated



# at risk					
W: 106	96	96	96	94
M: 342	313	308	301	245



*definite or probable

Similar outcomes between women and men

SCAI
Society for Cardiovascular Angiography & Interventions

Conclusions

- This Disrupt CAD patient-level pooled analysis is the largest sex-based report of IVL treatment of *de novo*, calcified lesions to facilitate stent implantation with 1-year FU
- Excellent procedural safety and effectiveness outcomes to 1 year were achieved in both women and men following coronary IVL treatment
- These results contrast prior reports of high peri-procedural complications and adverse clinical outcomes in women with CAC undergoing PCI
- While additional data are needed, these results suggest that IVL can be considered first-line therapy for calcified plaque modification in women