Comparative Outcomes of New-Generation DES

Recent Academic

IRIS-DES Registry

Duk-Woo Park, MD, PhD
Heart Institute, University of Ulsan College of Medicine,
Asan Medical, Seoul, Korea

IRIS-DES Registry

- The IRIS-DES registry involves a prospective, multicenter recruitment of consecutive patients undergoing PCI with DES from academic and community hospitals in Korea from April, 1, 2008.
- This registry consists of several different DES arms of first-generation and newer-generation devices recruited in contemporary PCI situations.
- The major reason for the selection of DES was the physician or patient choice and some variation in acceptance of the indications for the devices among the hospitals and geographic regions.

IRIS-DES Registry

STENT type	Target (N)	Enrollment	1yr f/u	2yr f/u	3yr f/u
DESSIAN (CYPHER)	3000	completed	O	O	O
K-XIENCE	3000	completed	O	O	O
IRIS-ELEMENT	3000	completed	O	O	ongoing
IRIS-PRIME	2000	completed	ongoing		
IRIS-BIOMATRIX	1000	completed	ongoing		
IRIS-NOBORI	2000	completed	ongoing		
IRIS-GENOUS STEMI	500	completed	ongoing		
IRIS-INTEGRITY	3000	enrolling			
IRIS-CILOTAX	1000	enrolling			
IRIS-Xepedition	1500	enrolling			
IRIS-OSIRO	1000	enrolling			
IRIS-DESyne	1000	enrolling			
IRIS-PREMIR	2000	enrolling			

IRIS-DES Registry

STENT type	Target (N)	Enrollment	1yr f/u	2yr f/u	3yr f/u
DESSIAN (CYPHER)	**3000**	**completed**	**O**	**O**	**O**
K-XIENCE	**3000**	**completed**	**O**	**O**	**O**
IRIS-ELEMENT	3000	completed	O	O	ongoing
IRIS-PRIME	2000	completed	ongoing		
IRIS-BIOMATRIX	1000	completed	ongoing		
IRIS-NOBORI	2000	completed	ongoing		
IRIS-GENOUS STEMI	500	completed	ongoing		
IRIS-INTEGRITY	3000	enrolling			
IRIS-CILOTAX	1000	enrolling			
IRIS-Xepedition	1500	enrolling			
IRIS-OSIRO	1000	enrolling			
IRIS-DESyne	1000	enrolling			
IRIS-PREMIR	2000	enrolling			

Outcomes After Unrestricted Use of Everolimus-Eluting and Sirolimus-Eluting Stents in Routine Clinical Practice

A Multicenter, Prospective Cohort Study

Duk-Woo Park, MD; Young-Hak Kim, MD; Hae-Geun Song, MD; Jung-Min Ahn, MD; Won-Jang Kim, MD; Jong-Young Lee, MD; Soo-Jin Kang, MD; Seung-Whan Lee, MD; Cheol Whan Lee, MD; Seong-Wook Park, MD; Sung-Cheol Yun, PhD; Sung Ho Her, MD; Seung Ho Hur, MD; Jin Sik Park, MD; Myeong-Kon Kim, MD; Yun Seok Choi, MD; Hyun Sook Kim, MD; Jang-Hyun Cho, MD; Sang Gon Lee, MD; Yong Whi Park, MD; Myung-Ho Jeong, MD; Bong Ki Lee, MD; Nae-Hee Lee, MD; Do-Sun Lim, MD; Junghan Yoon, MD; Ki Bae Seung, MD; Won-Yong Shin, MD; Seung-Woon Rha, MD; Kee-Sik Kim, MD; Seung-Jea Tahk, MD; Byoung Eun Park, MD; Taehoon Ahn, MD; Joo-Young Yang, MD; Yong Seok Jeong, MD; Jay-Hyun Rhew, MD; Seung-Jung Park, MD; for the IRIS-DES Investigators*

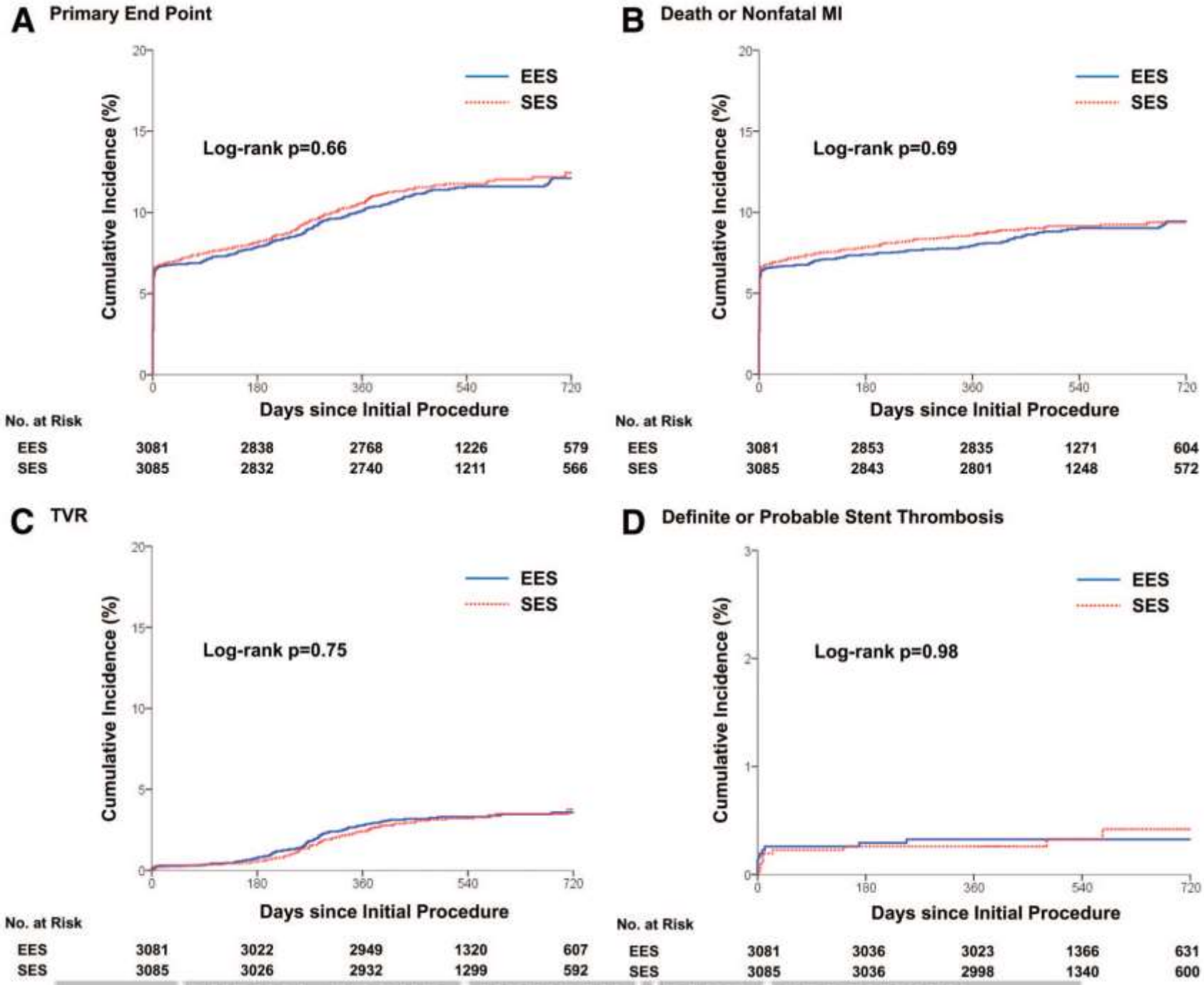
Background—It remains unclear whether there are differences in the safety and efficacy outcomes between everolimus-eluting stents (EES) and sirolimus-eluting stents (SES) in contemporary practice.

Methods and Results—We prospectively enrolled 6166 consecutive patients who received EES (3081 patients) and SES (3085 patients) between April 2008, and June 2010, using data from the Interventional Cardiology Research In-Cooperation Society-Drug-Eluting Stents Registry. The primary end point was a composite of death, nonfatal myocardial infarction (MI), or target-vessel revascularization (TVR). At 2 years of follow-up, the 2 study groups did not differ significantly in crude risk of the primary end point (12.1% for EES versus 12.4% for SES; HR, 0.97; 95% CI, 0.84–1.12, $P=0.66$). After adjustment for differences in baseline risk factors, the adjusted risk for the primary end point remained similar for the 2 stent types (HR, 0.96; 95% CI, 0.82–1.12, $P=0.60$). There were also no differences between the stent groups in the adjusted risks of the individual component of death (HR, 0.93; 95% CI, 0.67–1.30, $P=0.68$), MI (HR, 0.97; 95% CI, 0.79–1.18, $P=0.74$), and TVR (HR, 1.10; 95% CI, 0.82–1.49, $P=0.51$). The adjusted risk of stent thrombosis also was similar (HR, 1.16; 95% CI, 0.47–2.84, $P=0.75$).

Conclusions—In contemporary practice of percutaneous coronary intervention procedures, the unrestricted use of EES and SES showed similar rates of safety and efficacy outcomes with regard to death, MI, sent thrombosis, and TVR. Future longer-term follow-up is needed to better define the relative benefits of these drug-eluting stents.

Clinical Trial Registration—URL: http://www.clinicaltrials.gov. Unique identifier: NCT01070420. **(*Circ Cardiovasc Interv*. 2012;5:365-371.)**

Key Words: angioplasty ■ coronary disease ■ stents


A Primary End Point
Cumulative Incidence (%)
EES
SES
Log-rank p=0.66
Days since Initial Procedure
No. at Risk
EES 3081 2838 2768 1226 579
SES 3085 2832 2740 1211 566
B Death or Nonfatal MI
Cumulative Incidence (%)
EES
SES
Log-rank p=0.69
Days since Initial Procedure
No. at Risk
EES 3081 2853 2835 1271 604
SES 3085 2843 2801 1248 572
C TVR
Cumulative Incidence (%)
EES
SES
Log-rank p=0.75
Days since Initial Procedure
No. at Risk
EES 3081 3022 2949 1320 607
SES 3085 3026 2932 1299 592
D Definite or Probable Stent Thrombosis
Cumulative Incidence (%)
EES
SES
Log-rank p=0.98
Days since Initial Procedure
No. at Risk
EES 3081 3036 3023 1366 631
SES 3085 3036 2998 1340 600

IRIS-DES Registry

STENT type	Target (N)	Enrollment	1yr f/u	2yr f/u	3yr f/u
DESSIAN (CYPHER)	3000	completed	O	O	O
K-XIENCE	3000	completed	O	O	O
IRIS-ELEMENT	3000	completed	O	O	ongoing
IRIS-PRIME	2000	completed	ongoing		
IRIS-BIOMATRIX	1000	completed	ongoing		
IRIS-NOBORI	2000	completed	ongoing		
IRIS-GENOUS STEMI	500	completed	ongoing		
IRIS-INTEGRITY	3000	enrolling			
IRIS-CILOTAX	1000	enrolling			
IRIS-Xepedition	1500	enrolling			
IRIS-OSIRO	1000	enrolling			
IRIS-DESyne	1000	enrolling			
IRIS-PREMIR	2000	enrolling			

XIENCE vs. PROMUS ELEMENT

Parameter	CoCr-EES	PtCr-EES
Drug	Everolimus	Everolimus
Polymer	PBMA and PVDF-HFP	PBMA and PVDF-HFP
Polymer thickness (µm)	7	7
Metal composition	Cobalt Chromium	Platinum Chromium
Strut width (µm)	91	86
Strut thickness (µm)	81	81
Surface/artery ratio (%)	13.7	15.1
Scaffolding (mm)	1.07	0.91
Radial strength (N/mm)	0.14	0.23
Stent recoil (%)	4.6	3.6
Conformability (N·mm)	0.30	0.09
Radioopacity/density (g/cm^3)	9.1	9.9
Trackability (g·cm catheter)	158	133

Stone *et al. J Am Coll Cardiol. Vol. 57, No. 16, 2011*

Study Population

Inclusion Criteria

- Revascularization was clinically indicated
- All consecutive patients who have ≥1 significant coronary lesion eligible for PCI.

Exclusion Criteria

- Cardiogenic shock
- Life expectancy <12 months
- PCI with a mixture of different types of DESs
- A contraindication to the placement of DESs
- Patients that necessitated interruption of antiplatelet drugs within 6 months

Study Endpoints

Primary Endpoint

- Composite of death, nonfatal MI, or TVR

Secondary End Point

- Individual components of primary endpoints
- Cardiac and non-cardiac deaths.
- Periprocedural MI or spontaneous MI
- Composite of death or MI
- Repeat revascularization: TVR, TLR
- Stent thrombosis: ARC definite or probable ST

Baseline Characteristics

Characteristics	CoCr-EES (N=3080)	PtCr-EES (N=2985)	P value
Demographics			
Age	63.5±10.8	63.8±10.9	0.22
Male	2,078 (67.5%)	2,109 (70.7%)	0.008
BMI (kg/m^2)	24.7±3.2	24.7±3.3	0.98
Clinical history			
PCI	454 (14.7%)	317 (10.6%)	<0.001
CABG	62 (2.0%)	36 (1.2%)	0.014
MI	159 (5.2%)	149 (5.0%)	0.77
CHF	67 (2.2%)	81 (2.7%)	0.18
Renal failure	105 (3.4%)	95 (3.2%)	0.67
Cerebrovascular disease	252 (8.2%)	215 (7.2%)	0.16
Peripheral vascular disease	36 (1.2%)	62 (2.1%)	0.006
Chronic lung disease	92 (3.0%)	61 (2.0%)	0.022

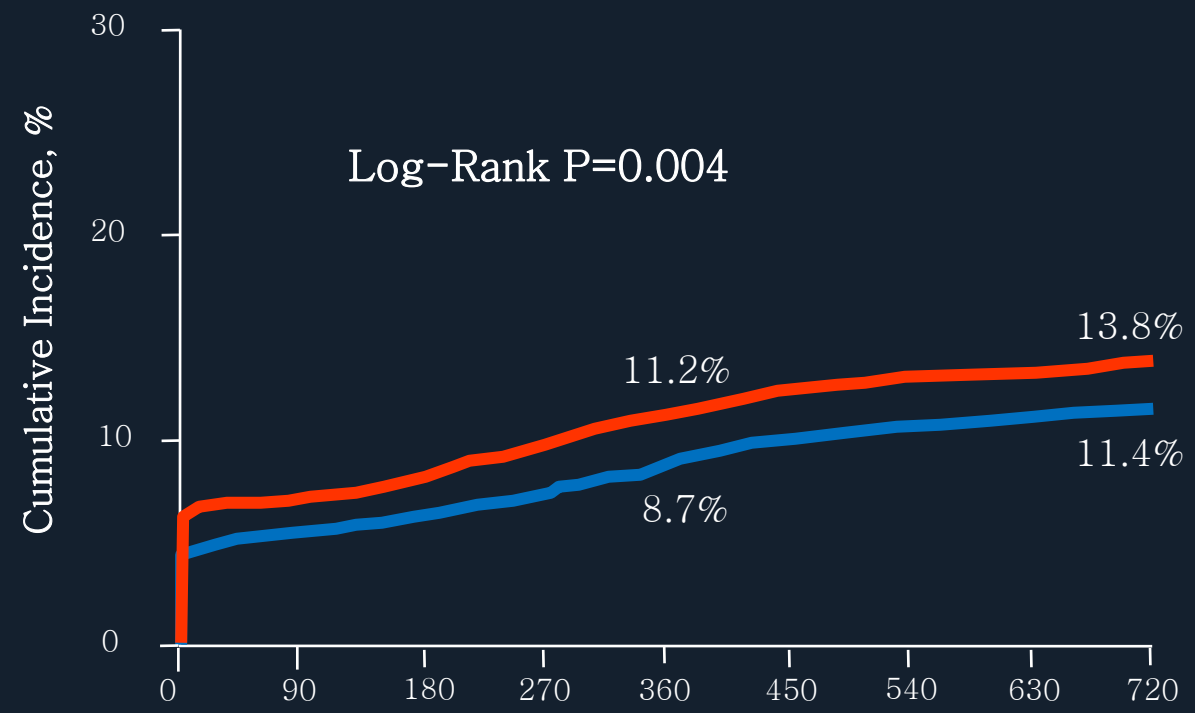
Baseline Characteristics

	CoCr-EES (N=3080)	PtCr-EES (N=2985)	P value
Risk factors			
DM	1,026 (33.3%)	1,011 (33.9%)	0.66
HTN	1,921 (62.4%)	1,824 (61.1%)	0.32
Hyperlipidemia	1,154 (37.5%)	1,088 (36.4%)	0.43
Current smoker	890 (28.9%)	872 (29.2%)	0.80
Family history of CAD	111 (3.6%)	199 (6.7%)	<0.001
Presentation			<0.001
Stable angina	1,275 (41.1%)	1,141 (38.2%)	
Unstable angina	1,057 (34.3%)	1,007 (33.7%)	
NSTEMI	339 (11.0%)	479 (16.0%)	
STEMI	409 (13.3%)	358 (12.0%)	
Left ventricular EF (%)	59.5±10.9	59.1±10.1	0.19

Lesion and Procedure Characteristics

	CoCr-EES (N=3080)	PtCr-EES (N=2985)	P value
Multivessel disease	1,635 (53.1%)	1,468 (49.2%)	0.002
LMCA disease	323 (10.5%)	213 (7.1%)	<0.001
LAD disease	2,335 (75.8%)	2,186 (73.2%)	0.022
Restenotic lesion	179 (5.8%)	114 (3.8%)	<0.001
No. of lesions	1.86±1.0	1.83±1.1	0.24
No. of stents per pt	1.82±1.2	1.62±0.9	<0.001
Stent length per pt	41.6±30.0	36.9±23.2	<0.001
Stent diameter per pt	3.22±0.41	3.17±0.43	<0.001

Unadjusted Kaplan-Meier Curve

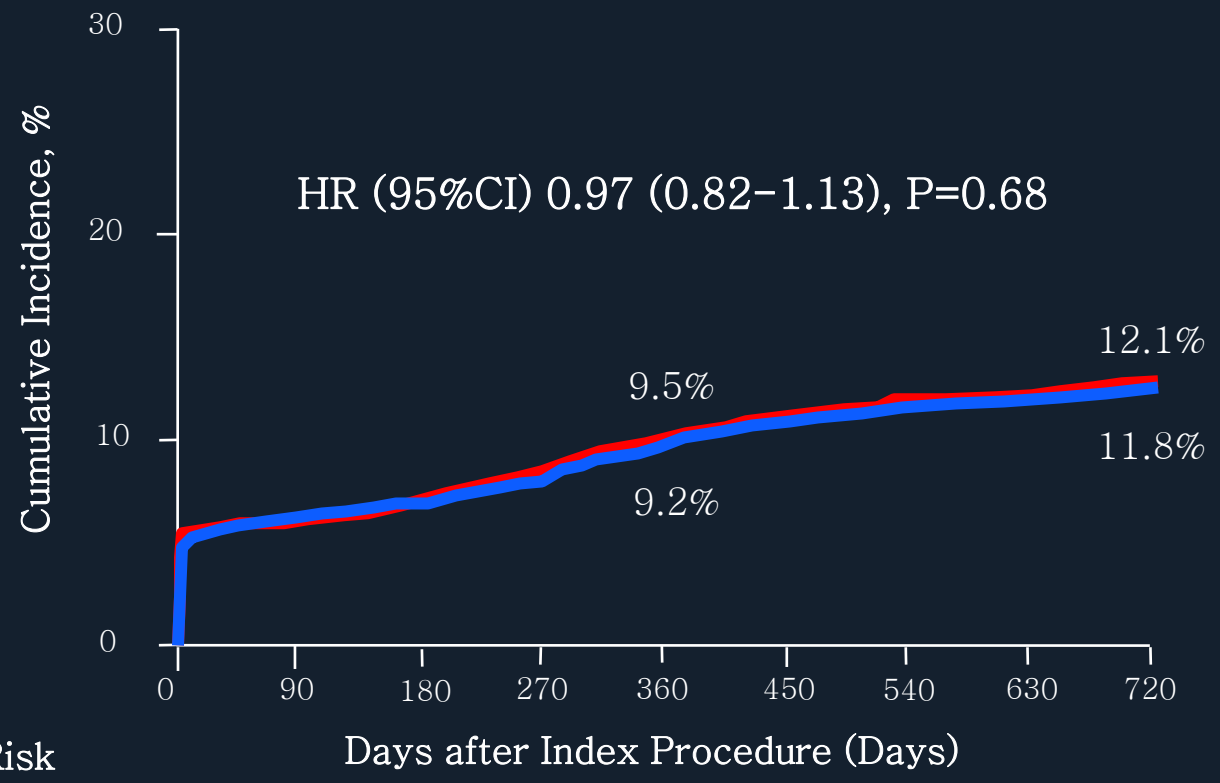


No. at Risk					
PtCr-EES	2985	2786	2639	2491	2133
CoCr-EES	3080	2804	2644	2527	2299

Observed 2-YR Event Rate

Outcomes	CoCr-EES (N=3080)	PtCr-EES (N=2985)	Unadjusted HR (95% CI)	P value
MACE	418 (13.9)	334 (11.4)	0.81 (0.70-0.94)	0.004
Death	98 (3.3)	97 (3.4)	1.03 (0.78-1.36)	0.85
Cardiac death	53 (1.8)	65 (2.3)	1.23 (0.86-1.76)	0.26
Non-cardiac death	43 (1.5)	32 (1.1)	0.77 (0.49-1.22)	0.27
Myocardial infarction	218 (7.1)	157 (5.3)	0.73 (0.60-0.90)	0.003
Periprocedural MI	183 (5.9)	128 (4.3)	0.72 (0.57-0.90)	0.004
Spontaneous MI	26 (0.9)	30 (1.1)	1.20 (0.71-2.02)	0.50
Death or MI	303 (10.0)	242 (8.3)	0.98 (0.83-1.17)	0.019
Stroke	41 (1.4)	39 (1.4)	0.99 (0.64-1.53)	0.95
Repeat Revascularization	214 (7.2)	173 (6.1)	0.83 (0.68-1.01)	0.063
TVR	147 (5.0)	107 (3.8)	0.75 (0.58-0.95)	0.019
TLR	115 (3.9)	75 (2.6)	0.67 (0.50-0.89)	0.006
Definite and probable ST	11 (0.4)	7 (0.2)	0.66 (0.26-1.67)	0.38
TIMI major bleeding	43 (1.4)	50 (1.7)	1.20 (0.80-1.81)	0.37

Adjusted KM Curve in Propensity Matched Cohort

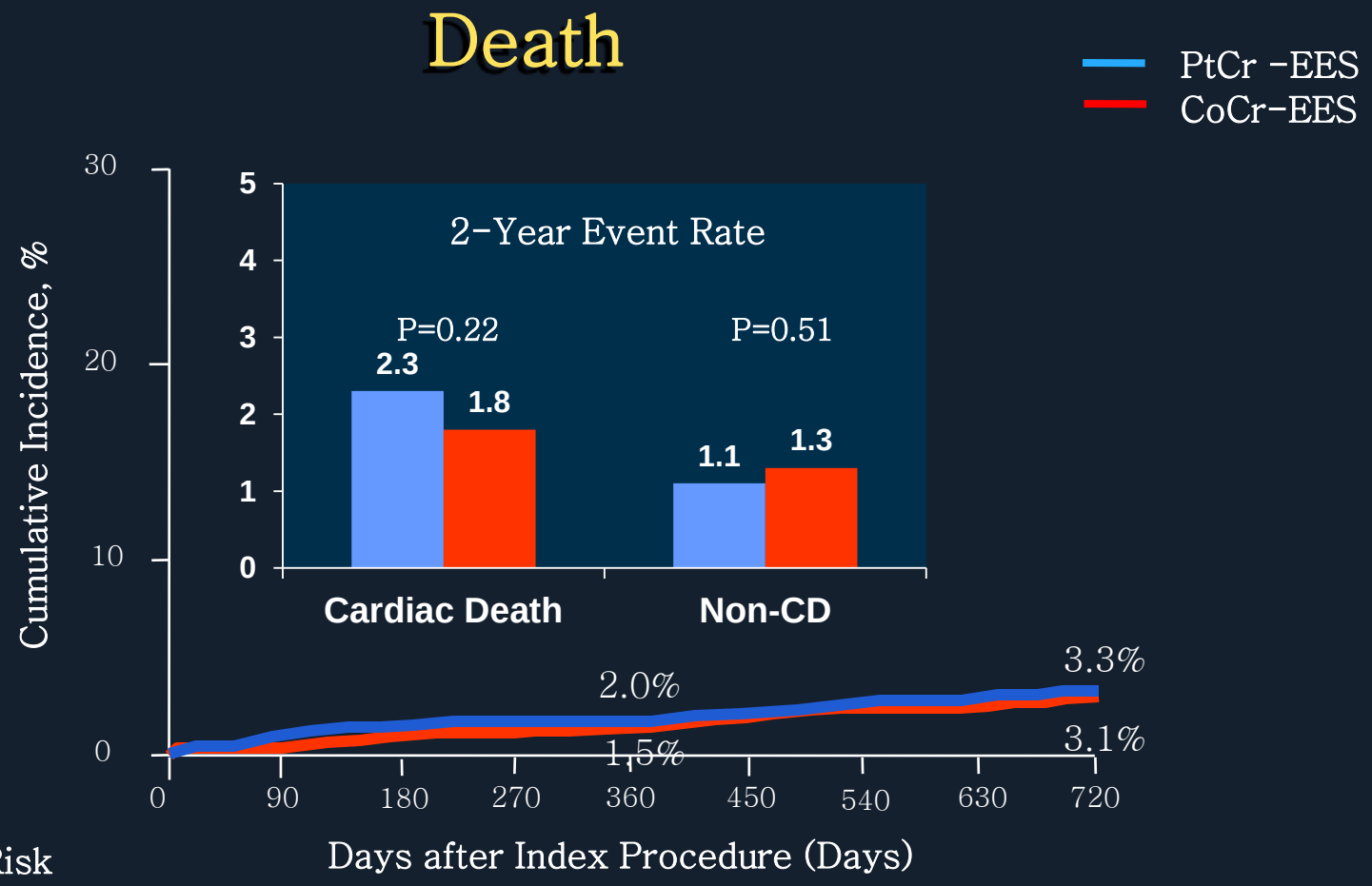


No. at Risk					
PtCr-EES	2510	2330	2207	2098	1796
CoCr-EES	2510	2316	2186	2090	1885

Adjusted Kaplan-Meier Curve

Propensity Score Matched Population

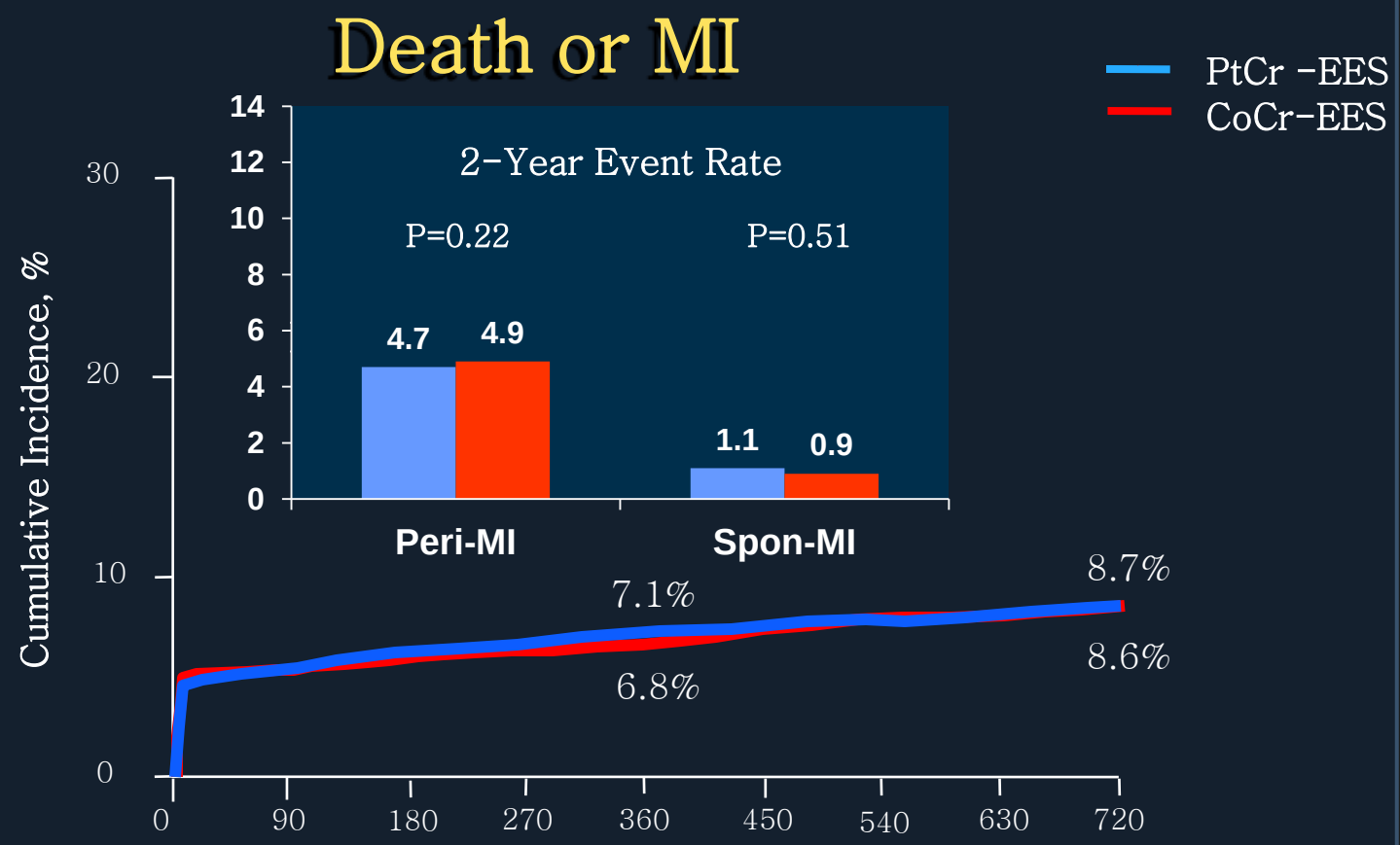
Death



No. at Risk					
PtCr-EES	2510	2460	2385	2293	1969
CoCr-EES	2510	2454	2382	2301	2084

Adjusted Kaplan-Meier Curve

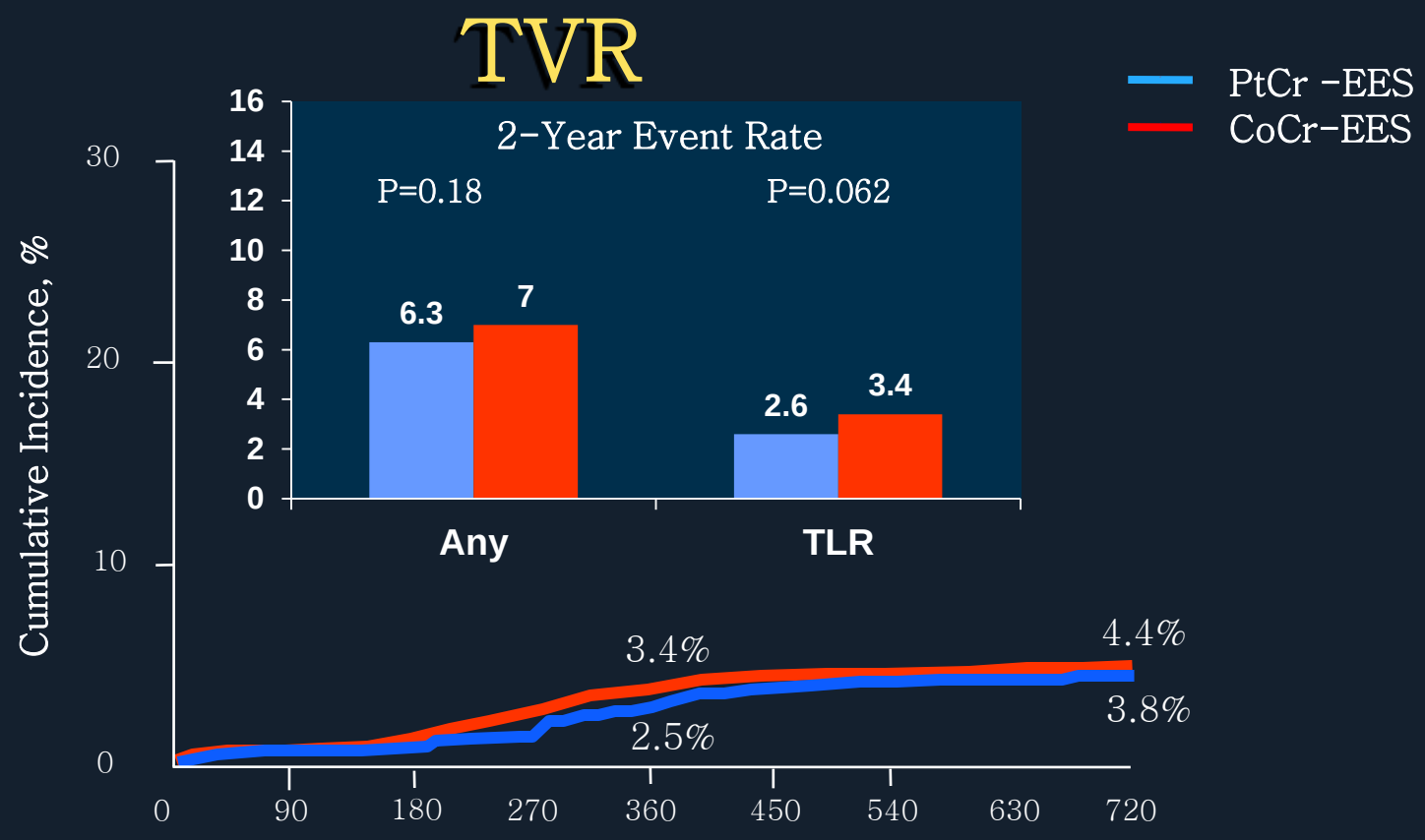
Propensity Score Matched Population



No. at Risk					
PtCr-EES	2510	2339	2259	2170	1863
CoCr-EES	2510	2329	2252	2168	1964

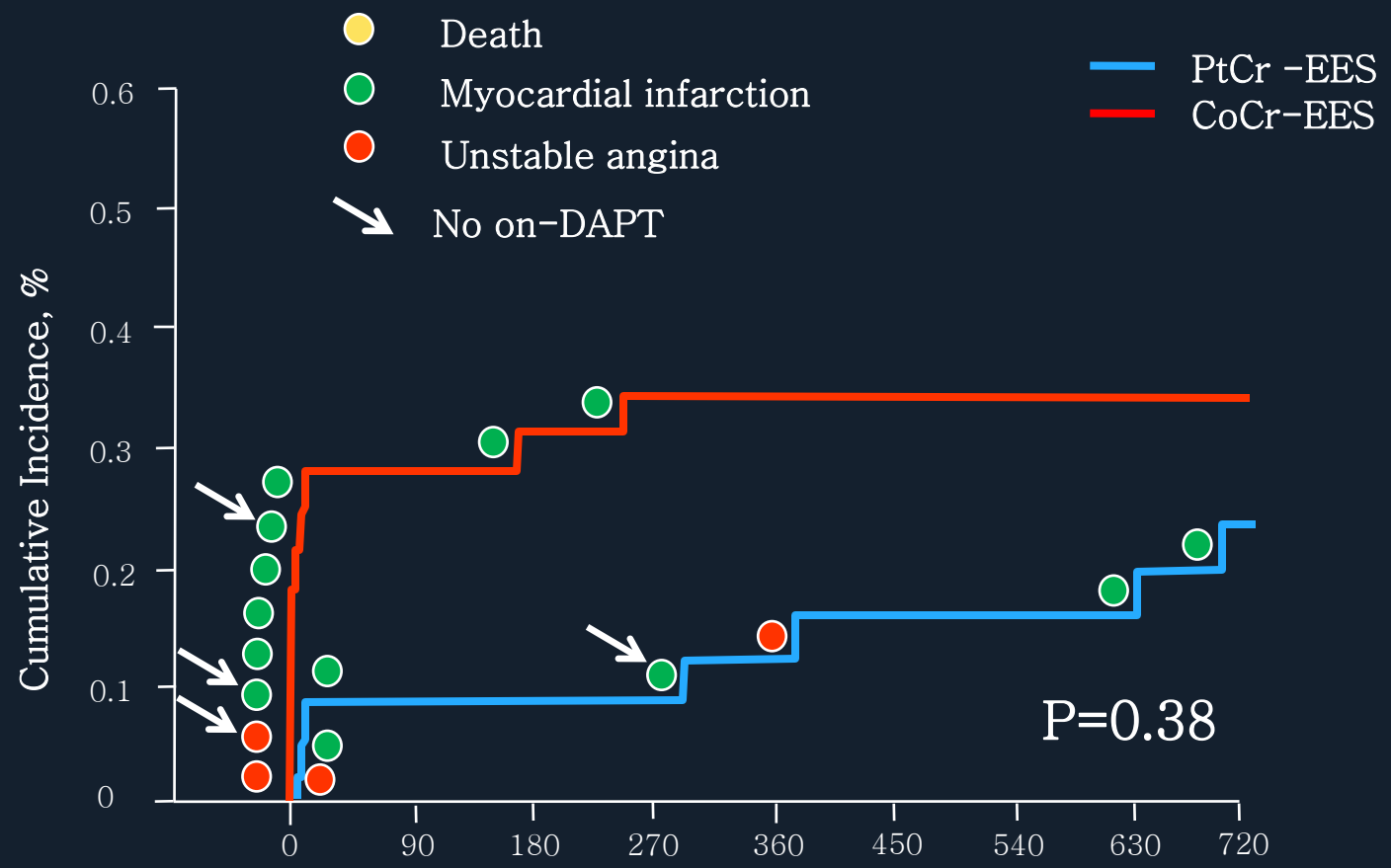
Adjusted Kaplan-Meier Curve

Propensity Score Matched Population



No. at Risk					
PtCr-EES	2510	2450	2328	2213	1899
CoCr-EES	2510	2433	2301	2204	1993

Cumulative Event Rate of Stent Thrombosis*



No. at Risk					
PtCr-EES	2985	2925	2832	2707	2324
CoCr-EES	3080	3002	2919	2818	2570

* ARC defined definite and probable stent thrombosis

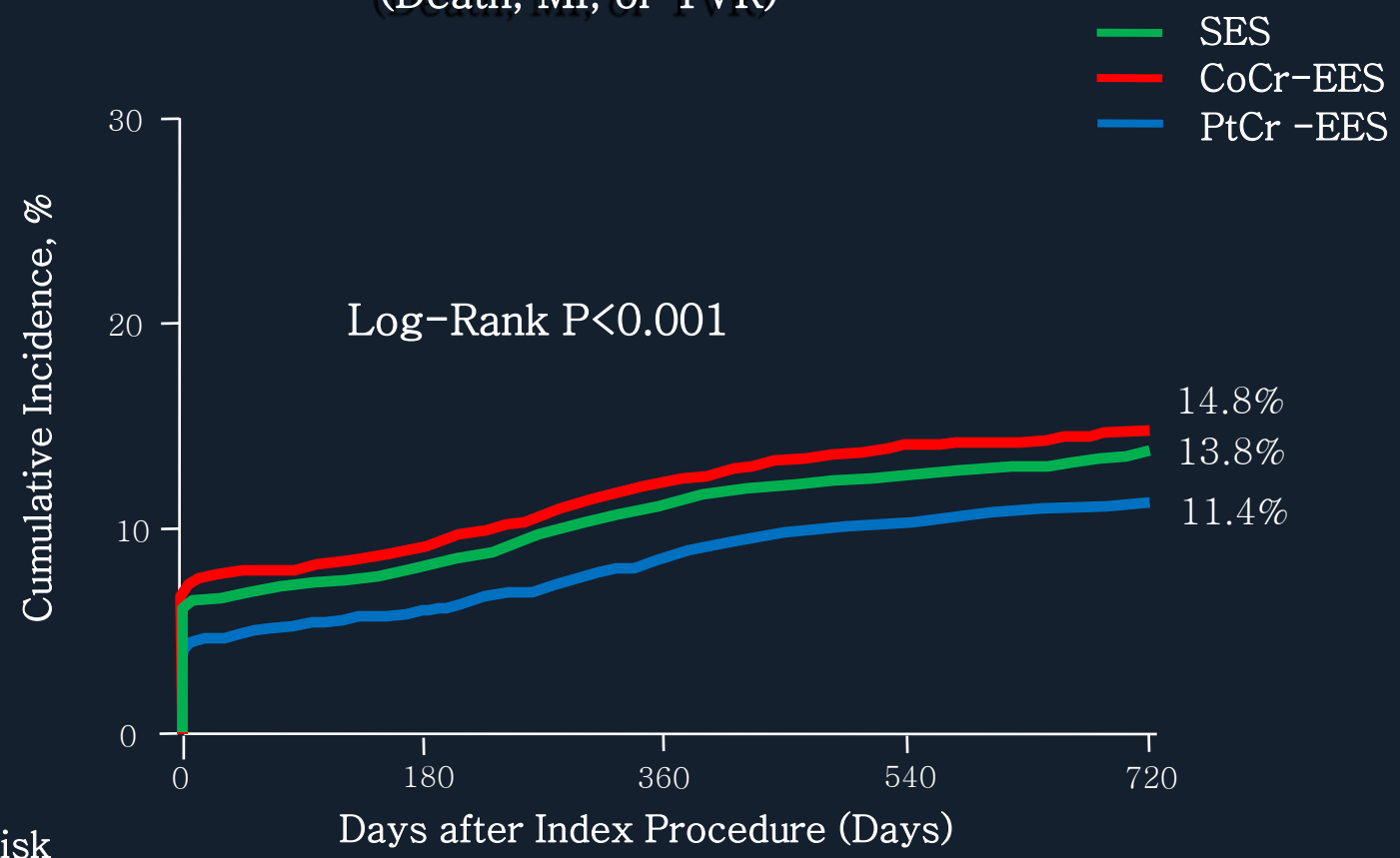
IRIS-DES Registry

STENT type	Target (N)	Enrollment	1yr f/u	2yr f/u	3yr f/u
DESSIAN (CYPHER)	3000	completed	O	O	O
K-XIENCE	**3000**	**completed**	**O**	**O**	**O**
IRIS-ELEMENT	**3000**	**completed**	**O**	**O**	**ongoing**
IRIS-PRIME	2000	completed	ongoing		
IRIS-BIOMATRIX	1000	completed	ongoing		
IRIS-NOBORI	2000	completed	ongoing		
IRIS-GENOUS STEMI	500	completed	ongoing		
IRIS-INTEGRITY	3000	enrolling			
IRIS-CILOTAX	1000	enrolling			
IRIS-Xepedition	1500	enrolling			
IRIS-OSIRO	1000	enrolling			
IRIS-DESyne	1000	enrolling			
IRIS-PREMIR	2000	enrolling			

Unadjusted Kaplan-Meier Curve

Primary End Point

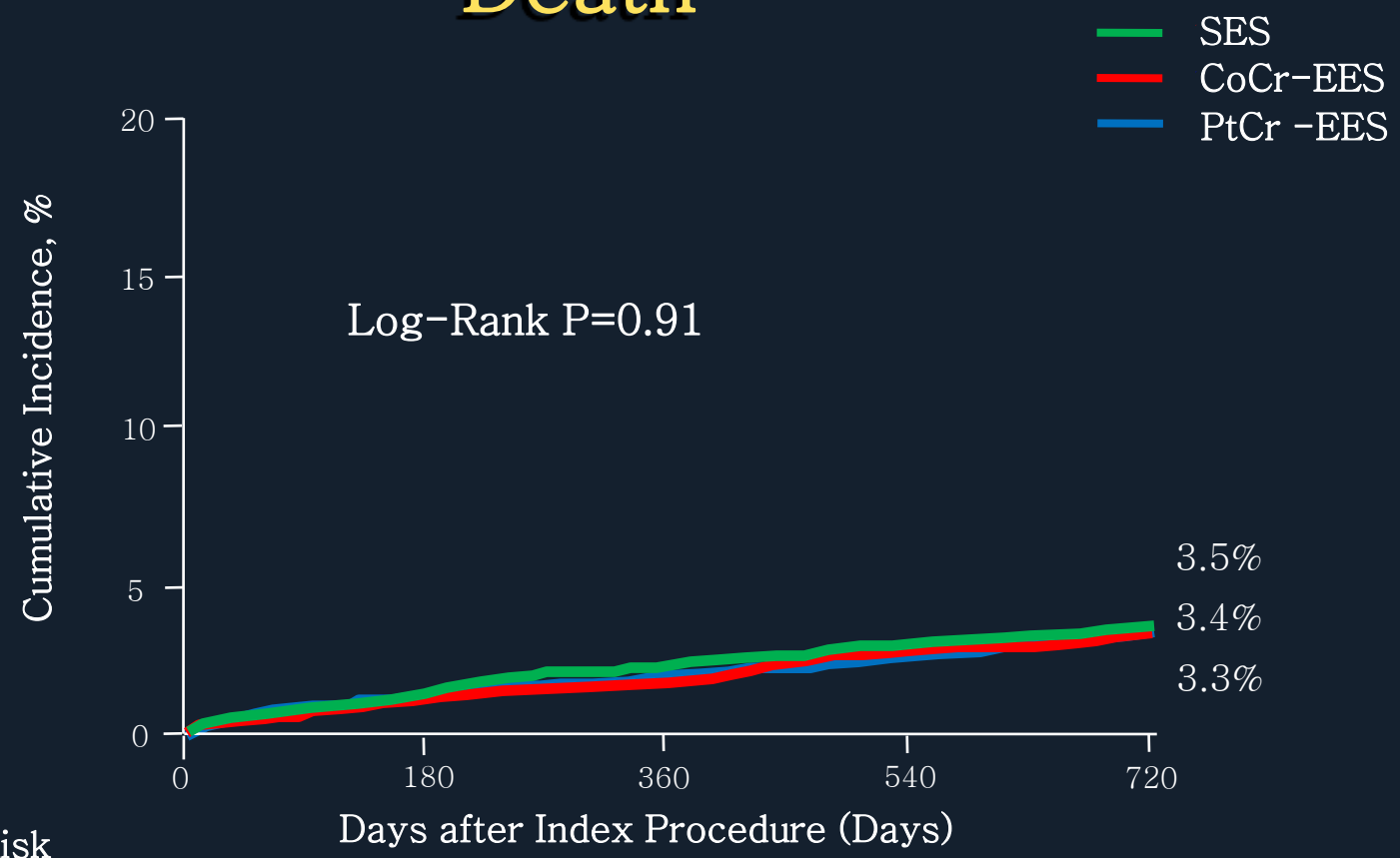
(Death, MI, or TVR)



No. at Risk					
SES	3586	3241	2986	2728	2347
CoCr-EES	3081	2774	2611	2499	2268
PtCr-EES	2986	2787	2638	2492	2128

Unadjusted Kaplan-Meier Curve

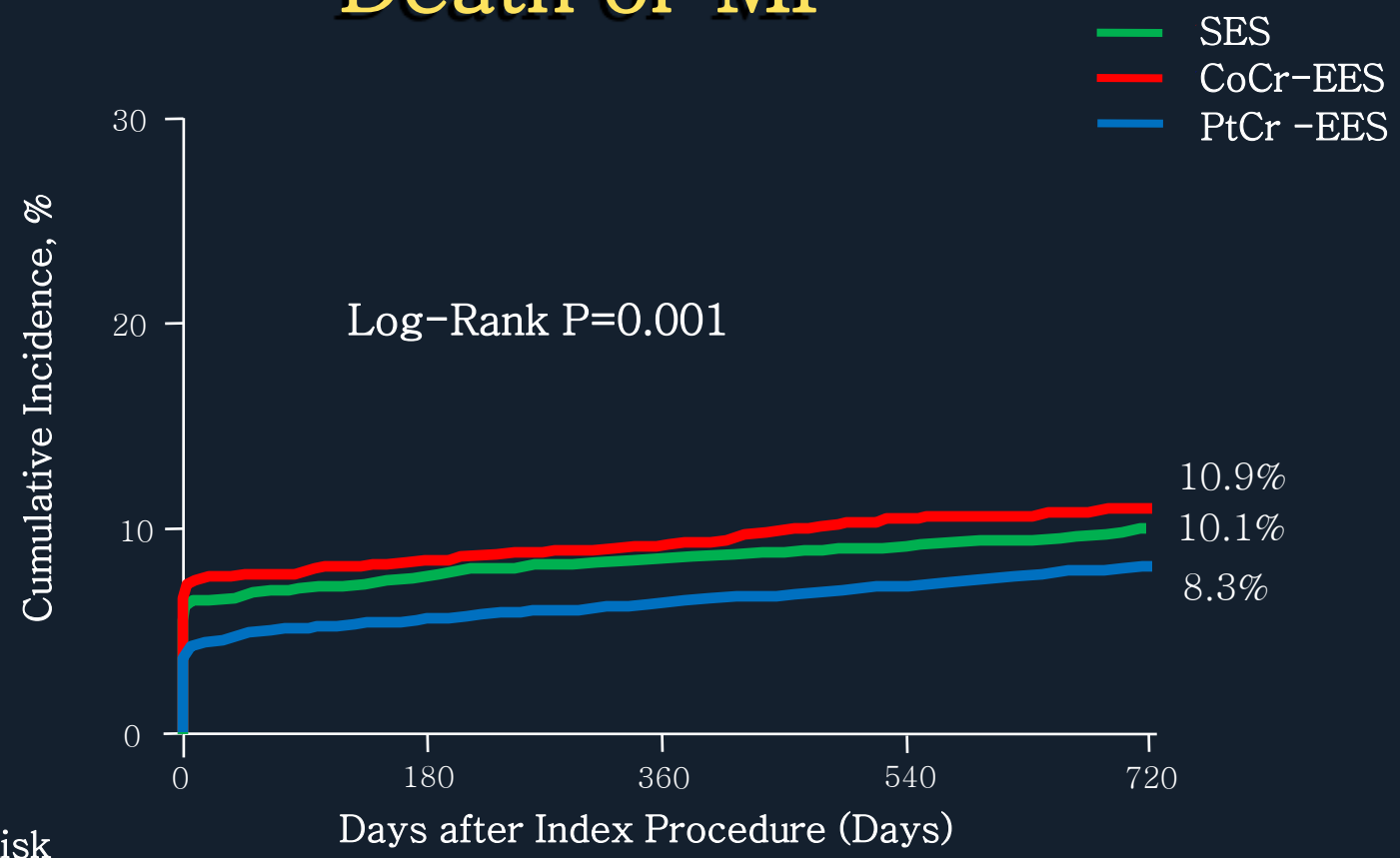
Death



No. at Risk					
SES	3586	3483	3288	3042	2649
CoCr-EES	3081	3012	2927	2829	2574
PtCr-EES	2986	2928	2834	2712	2323

Unadjusted Kaplan-Meier Curve

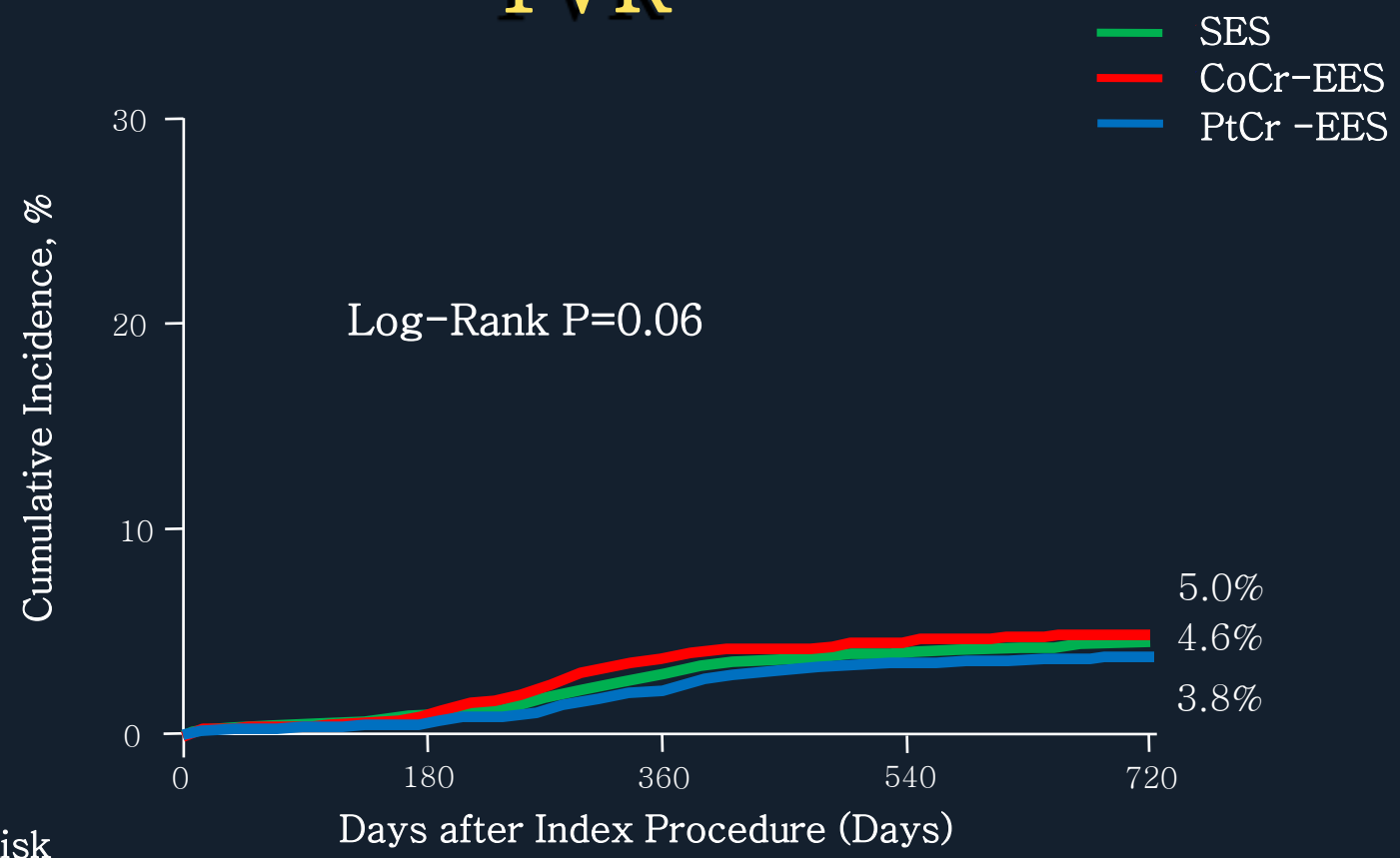
Death or MI



No. at Risk					
SES	3586	3254	3065	2833	2452
CoCr-EES	3081	2791	2699	2603	2371
PtCr-EES	2986	2798	2699	2578	2208

Unadjusted Kaplan-Meier Curve

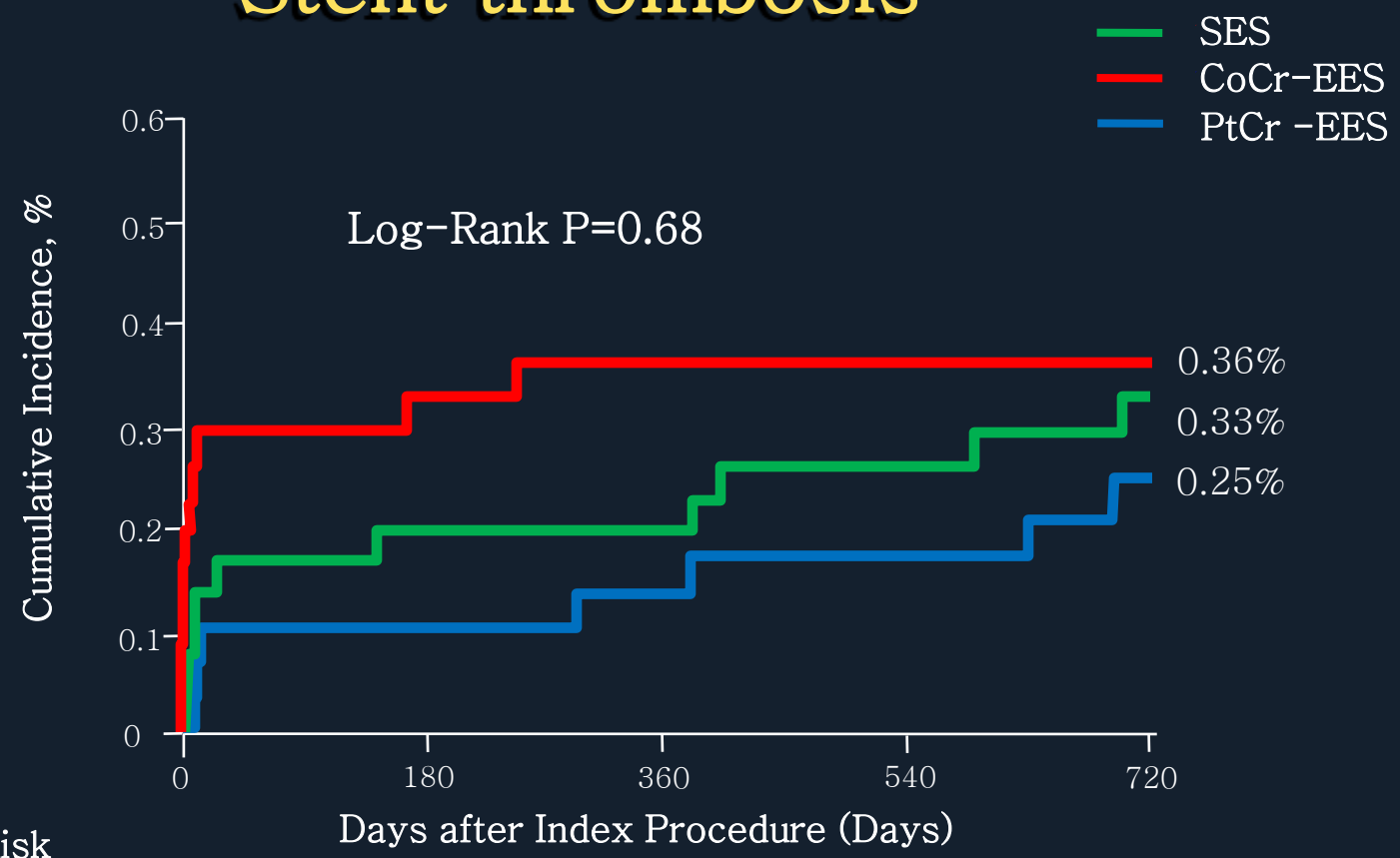
TVR



No. at Risk					
SES	3586	3462	3198	2923	2527
CoCr-EES	3081	2985	2816	2697	2446
PtCr-EES	2986	2916	2768	2618	2234

Unadjusted Kaplan-Meier Curve

Stent thrombosis



No. at Risk					
SES	3586	3478	3284	3038	2644
CoCr-EES	3081	3002	2916	2819	2564
PtCr-EES	2986	2926	2831	2708	2319

* ARC defined definite and probable stent thrombosis

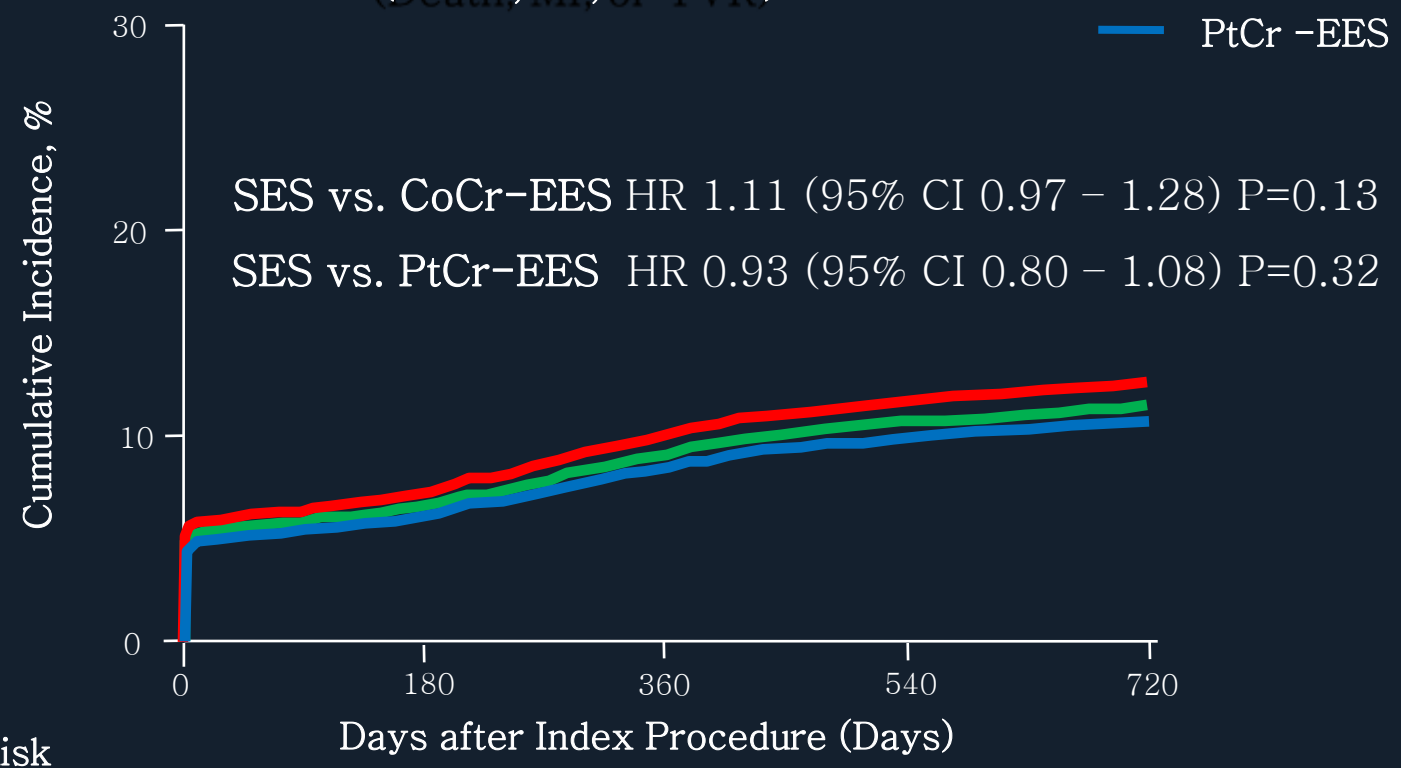
Adjusted Outcomes;
Multivariable Cox Regression Analysis for 3 Group Comparisons

Adjusted Kaplan-Meier Curve

Cox proportional hazard regression analysis

Primary End Point

(Death, MI, or TVR)

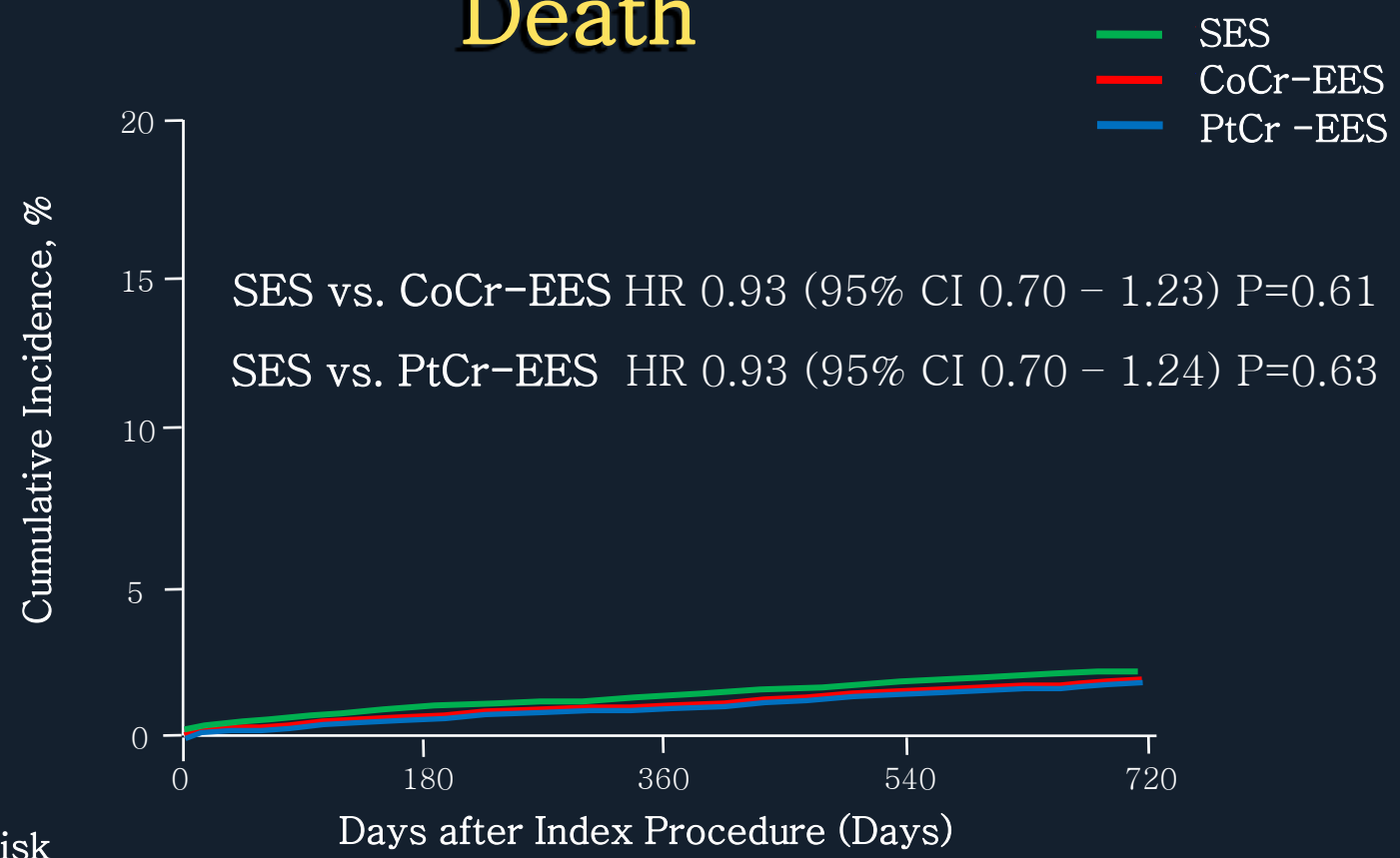


No. at Risk					
SES	3586	3241	2986	2728	2347
CoCr-EES	3081	2774	2611	2499	2268
PtCr-EES	2986	2787	2638	2492	2128

Adjusted Kaplan-Meier Curve

Cox proportional hazard regression analysis

Death

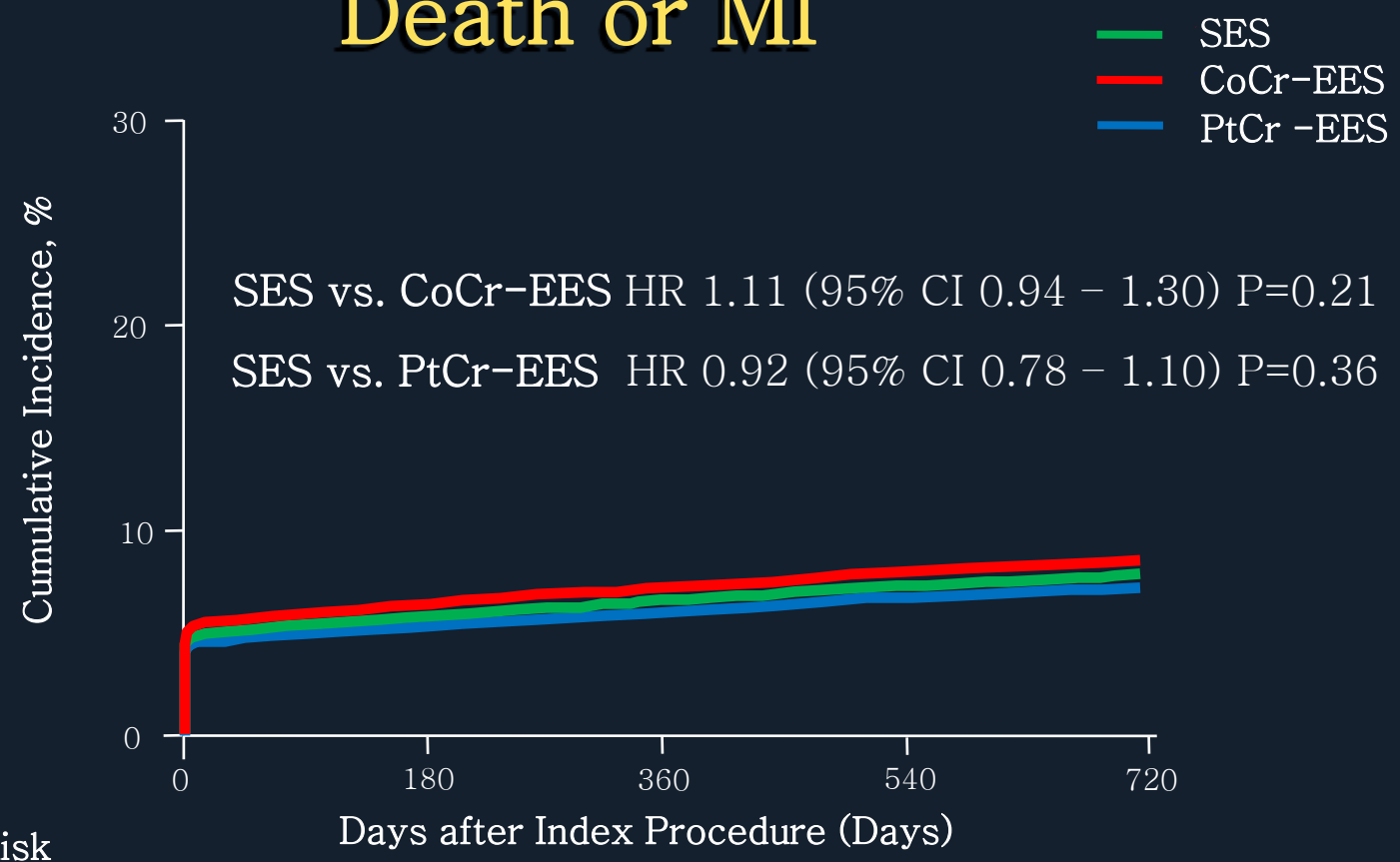


No. at Risk					
SES	3586	3483	3288	3042	2649
CoCr-EES	3081	3012	2927	2829	2574
PtCr-EES	2986	2928	2834	2712	2323

Adjusted Kaplan-Meier Curve

Cox proportional hazard regression analysis

Death or MI

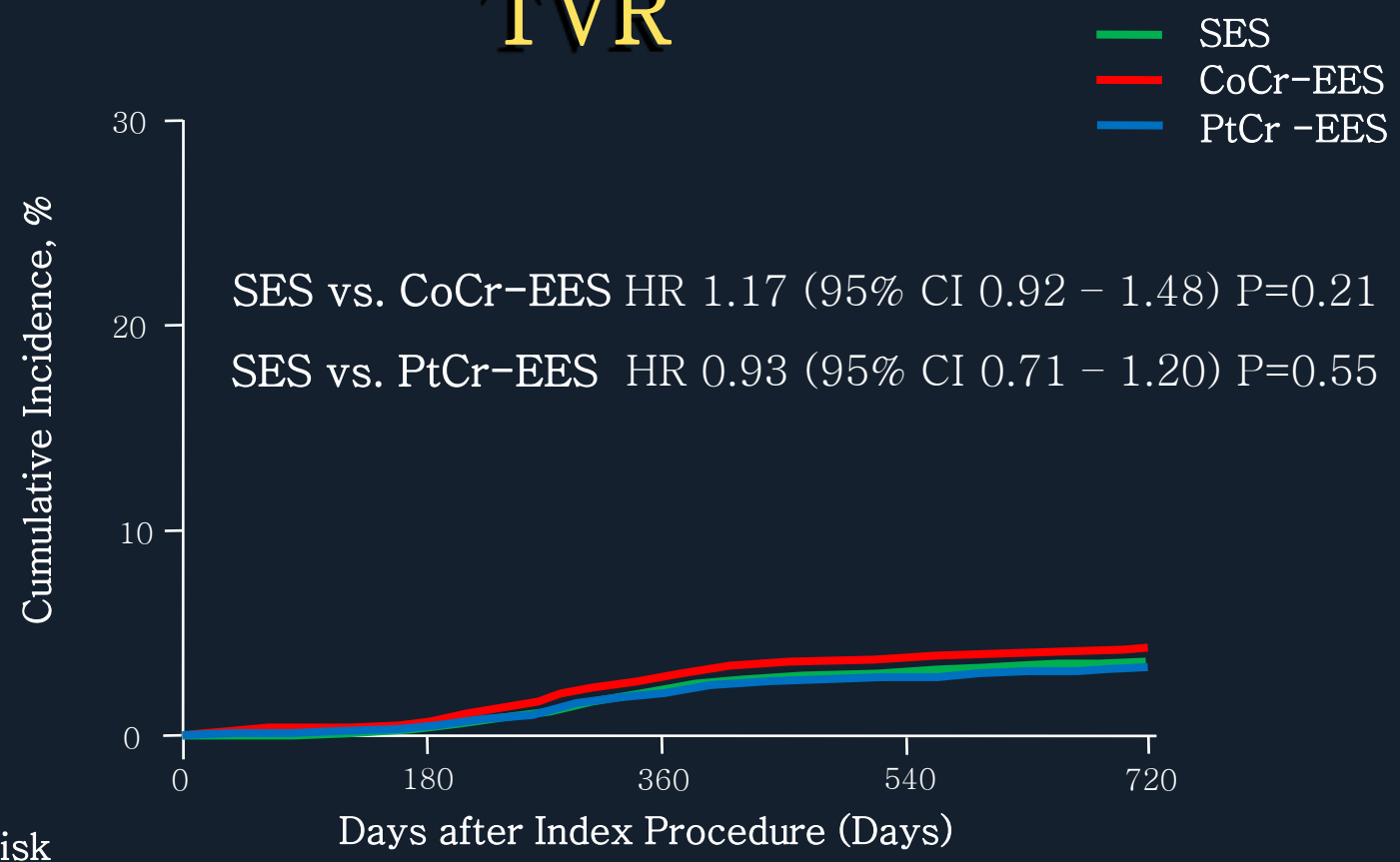


No. at Risk					
SES	3586	3254	3065	2833	2452
CoCr-EES	3081	2791	2699	2603	2371
PtCr-EES	2986	2798	2699	2578	2208

Adjusted Kaplan-Meier Curve

Cox proportional hazard regression analysis

TVR

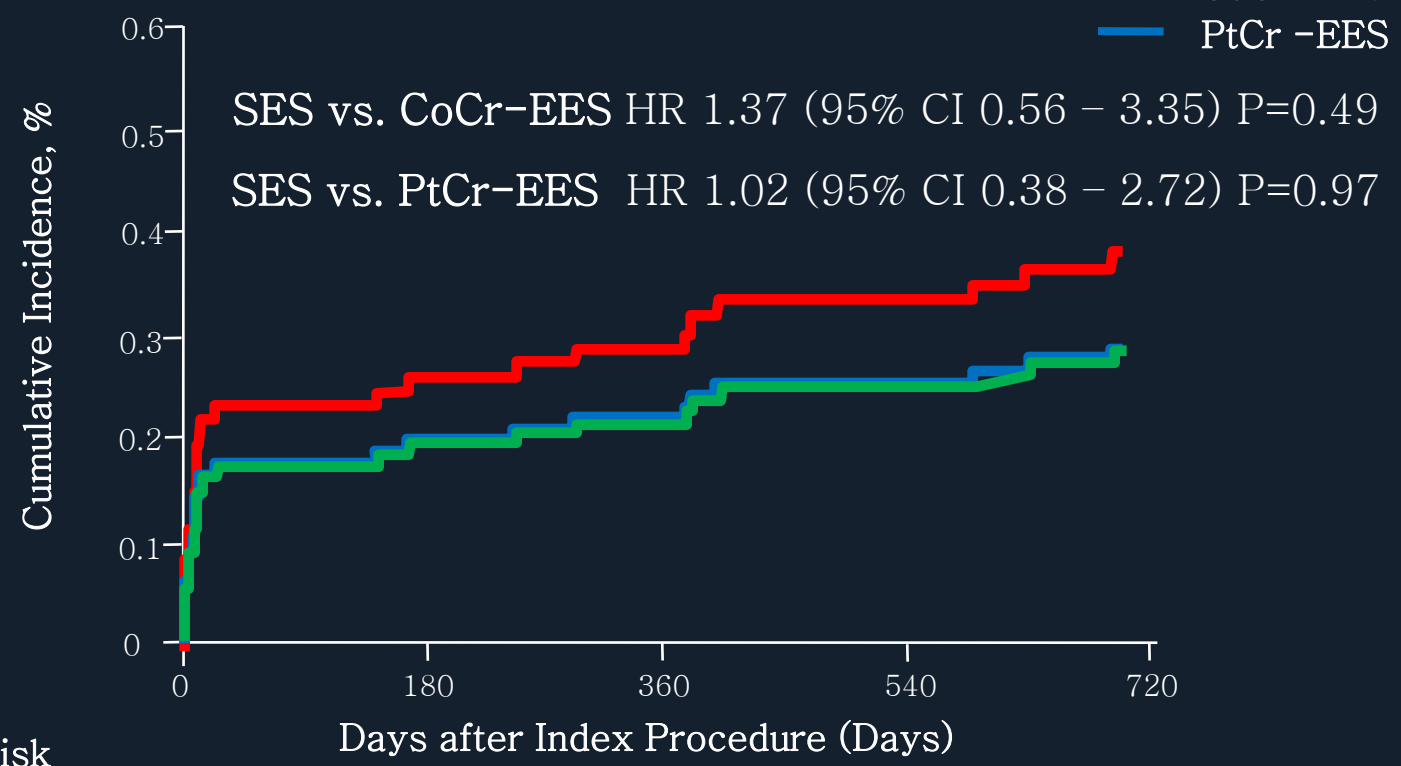


No. at Risk					
SES	3586	3462	3198	2923	2527
CoCr-EES	3081	2985	2816	2697	2446
PtCr-EES	2986	2916	2768	2618	2234

Adjusted Kaplan-Meier Curve

Cox proportional hazard regression analysis

Stent thrombosis



No. at Risk					
SES	3586	3478	3284	3038	2644
CoCr-EES	3081	3002	2916	2819	2564
PtCr-EES	2986	2926	2831	2708	2319

* ARC defined definite and probable stent thrombosis

Summary

- XIENCE and PROMUS ELEMENT showed similar 3-year rates of MACE (death/MI/TVR).
- Comparison with 1st Gen CYPHER showed similar results.
- Ongoing results from IRIS-DES registry will demonstrate comparative effectiveness of several current available DES (XIENCE PRIME, BIOMATRIX, NOBORI, RESOLUTE INTERGRITY, CILOTAX, OSIRO, DESYNE, XEPEDITION, PRIMIER, et al).