# Intracoronary Imaging Versus Coronary Angiography Guidance for Percutaneous Coronary Intervention: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

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**Background:** Intracoronary imaging (ICI) facilitates stent implantation by characterizing lesion calcification, providing accurate vessel dimensions, and optimizing stent results. We sought to investigate the outcomes of ICI versus coronary angiography (CA) to guide percutaneous coronary intervention (PCI) with 2<sup>nd</sup> and 3<sup>rd</sup>-generation drug eluting stents.

**Methods:** A systematic search of PubMed, Medline, and Cochrane databases was conducted from their inception to July 16, 2022 for randomized controlled trials (RCTs) comparing ICI to CA. Outcomes of interest included target lesion revascularization (TLR), target vessel revascularization (TVR), major adverse cardiovascular events (MACE), myocardial infarction (MI), stent thrombosis (ST), and cardiac and all-cause mortality. A random effects model was used to calculate pooled incidence and relative risk (RR) with 95% confidence intervals (CIs). **Results:** Nine RCTs with 5,879 patients met the inclusion criteria. The ICI and CA groups were similar in demographic and comorbidity characteristics. Compared to CA, patients in the ICIguided PCI group had lower rates of TLR (RR 0.60, 95% CI 0.43-0.83, p=0.002), TVR (RR 0.72, 95% CI 0.51-1.00, p=0.05), MACE (RR 0.61, 95% CI 0.48-0.78, p<0.0001), and MI (RR 0.48, 95% CI 0.25-0.95, p=0.03). There were no significant differences in ST or cardiac or allcause mortality between the two strategies.

# Conclusion: ICI-guided PCI, compared with CA guidance alone, is associated with improved

clinical outcomes, largely driven by lower repeat revascularization.

### (A) TLR

	Intracoronary imaging		Angiography			<b>Risk Ratio</b>		Risk Ratio			
Study or Subgroup	Events To		Events	Total	Weight	M-H, Random, 95% CI	Year		M-H, Random, 95% CI		
Kim et al, 2015	2	50	2	51	3.0%	1.02 [0.15, 6.96]	2015				
CTO-IVUS, 2015	5	201	8	201	9.2%	0.63 [0.21, 1.88]	2015			_	
IVUS-XPL, 2015	17	700	33	700	33.5%	0.52 [0.29, 0.92]	2015				
Kala et al, 2017	2	105	1	96	2.0%	1.83 [0.17, 19.85]	2017				
iSIGHT, 2021	1	101	0	49	1.1%	1.47 [0.06, 35.46]	2021		-		
ULTIMATE, 2021	27	714	45	709	51.2%	0.60 [0.37, 0.95]	2021				
Total (95% CI)		1871		1806	100.0%	0.60 [0.43, 0.83]			+		
Total events	54		89								
Heterogeneity: $Tau^2 = 0.00$ ; $Chi^2 = 1.71$ , $df = 5$ (P = 0.89); $I^2 = 0\%$							F.			1	100
Test for overall effect: Z = 3.02 (P = 0.002)								0.01	Favours [IC imaging]	Favours [Angiography]	100

#### (B) TVR

	Intracoronary imaging		Angiography		Risk Ratio				Risk Ratio		
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI	Year		M-H, Rand	om, 95% CI	
Kim et al, 2013	12	297	18	246	20.4%	0.55 [0.27, 1.12]	2013			-	
RESET, 2013	14	662	14	912	19.2%	1.38 [0.66, 2.87]	2013				
Kim et al, 2015	2	50	2	51	3.0%	1.02 [0.15, 6.96]	2015				
CTO-IVUS, 2015	5	201	10	201	9.7%	0.50 [0.17, 1.44]	2015			-	
ULTIMATE, 2021	32	714	49	709	47.6%	0.65 [0.42, 1.00]	2021				
Total (95% CI)		1924		2119	100.0%	0.72 [0.51, 1.00]			•		
Total events	65		93								
Heterogeneity: Tau <sup>2</sup> =	= 0.01; Chi <sup>2</sup> = 4.34	4, df = 4	(P = 0.36)	); $l^2 = 8$	%		F		, l	1	100
Test for overall effect	:: Z = 1.94 (P = 0.0	)5)					C	0.01	Favours [IC imaging]	Favours [Angiography]	100

## (C) MACE

	Intracoronary in	naging	Angiography			<b>Risk Ratio</b>		Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI	Year	M-H, Random, 95% CI
Kim et al, 2013	12	297	20	246	11.4%	0.50 [0.25, 1.00]	2013	
<b>RESET</b> , 2013	15	662	19	912	12.3%	1.09 [0.56, 2.12]	2013	
Kim et al, 2015	2	50	3	51	1.8%	0.68 [0.12, 3.90]	2015	
OCTACS, 2015	0	40	2	45	0.6%	0.22 [0.01, 4.54]	2015 -	
CTO-IVUS, 2015	5	201	14	201	5.5%	0.36 [0.13, 0.97]	2015	
IVUS-XPL, 2015	19	700	39	700	19.0%	0.49 [0.28, 0.83]	2015	
Kala et al, 2017	3	105	1	96	1.1%	2.74 [0.29, 25.92]	2017	· · · · · · · · · · · · · · · · · · ·
iSIGHT, 2021	6	101	3	49	3.1%	0.97 [0.25, 3.72]	2021	
ULTIMATE, 2021	47	714	76	709	45.3%	0.61 [0.43, 0.87]	2021	
Total (95% CI)		2870		3009	100.0%	0.61 [0.48, 0.78]		•
Total events	109		177					
Heterogeneity: Tau <sup>2</sup> =	= 0.00; Chi <sup>2</sup> = 7.59	9, df = 8	(P = 0.47)	); $I^2 = 0$	%		F	
Test for overall effect	Z = 4.09 (P < 0.0)	0001)					0.	Favours [IC imaging] Favours [Angiography]

# (D) MI

	Intracoronary imaging		Angiography			<b>Risk Ratio</b>			Risk	Ratio	
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% CI	Year		M-H, Ran	dom, 95% CI	
Kim et al, 2013	0	297	2	246	5.0%	0.17 [0.01, 3.44]	2013	+			
RESET, 2013	1	662	3	912	8.9%	0.46 [0.05, 4.40]	2013			+	
CTO-IVUS, 2015	0	201	2	201	5.0%	0.20 [0.01, 4.14]	2015	+		<u>+</u>	
IVUS-XPL, 2015	0	700	1	700	4.5%	0.33 [0.01, 8.17]	2015	-		<u> </u>	
Kala et al, 2017	1	105	0	96	4.5%	2.75 [0.11, 66.59]	2017		-	· ·	-
ULTIMATE, 2021	7	714	15	709	57.4%	0.46 [0.19, 1.13]	2021			+	
ISIGHT, 2021	3	101	2	49	14.8%	0.73 [0.13, 4.21]	2021				
Total (95% CI)		2780		2913	100.0%	0.48 [0.25, 0.95]			•		
Total events	12		25								
Heterogeneity: Tau <sup>2</sup>	= 0.00; Chi <sup>2</sup> = 2.2	2, $df = 6$	(P = 0.90)	); $I^2 = 0$	%			-		1 10	100
Test for overall effect: Z = 2.12 (P = 0.03)									0.1 Favours [IC imaging	I 10 ] Favours [Angiography]	100

**Figure 1.** Forest plot of studies comparing outcomes; Legend: 1A: Target lesion revascularization, 1B: Target vessel revascularization, 1C: Major adverse cardiovascular events, 1D: Myocardial Infarction. Abbreviations: IC= Intracoronary.