Management and prevention of thrombotic complication during primary PCI

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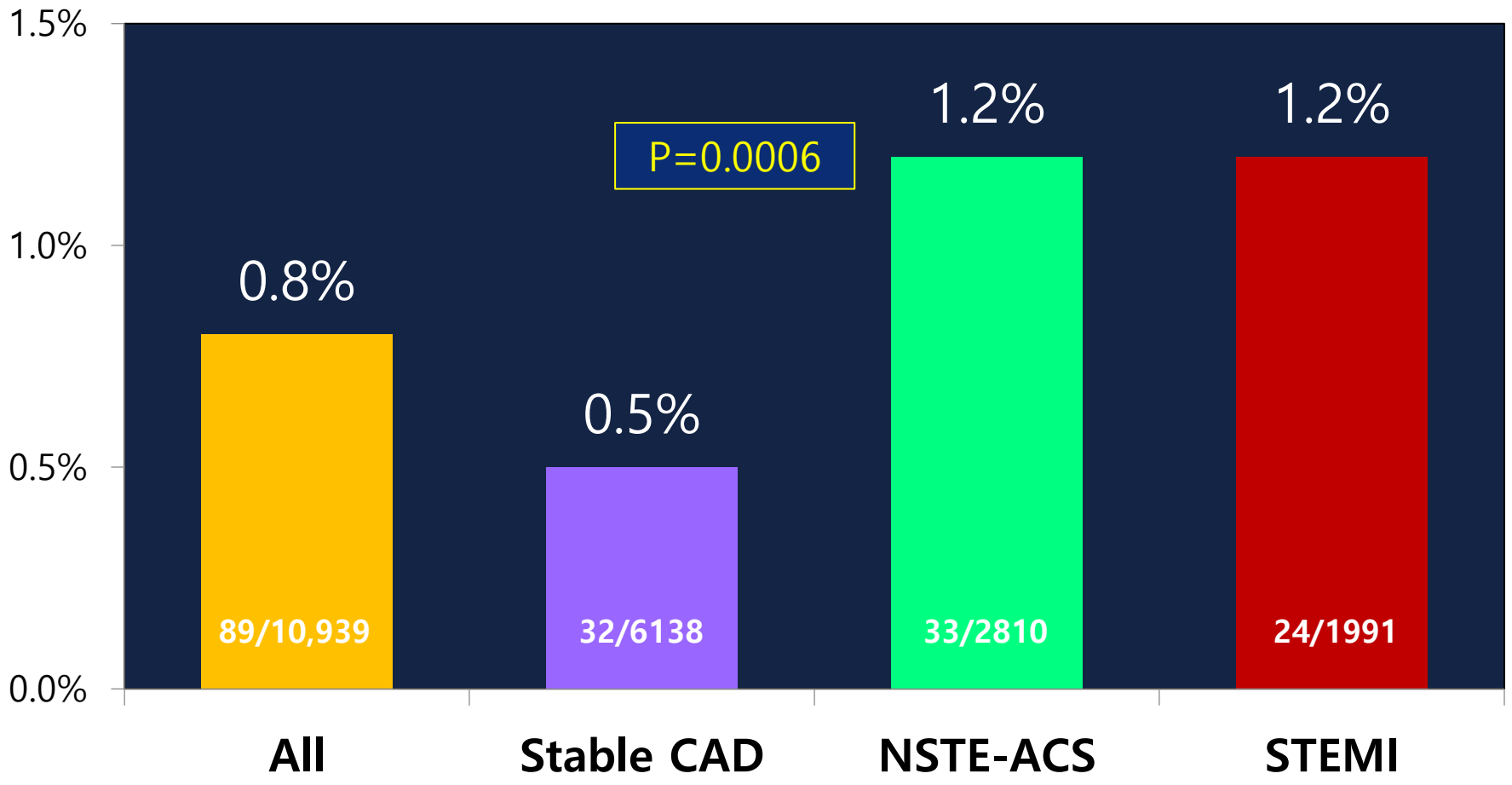
Disclosure Statement of Financial Interest

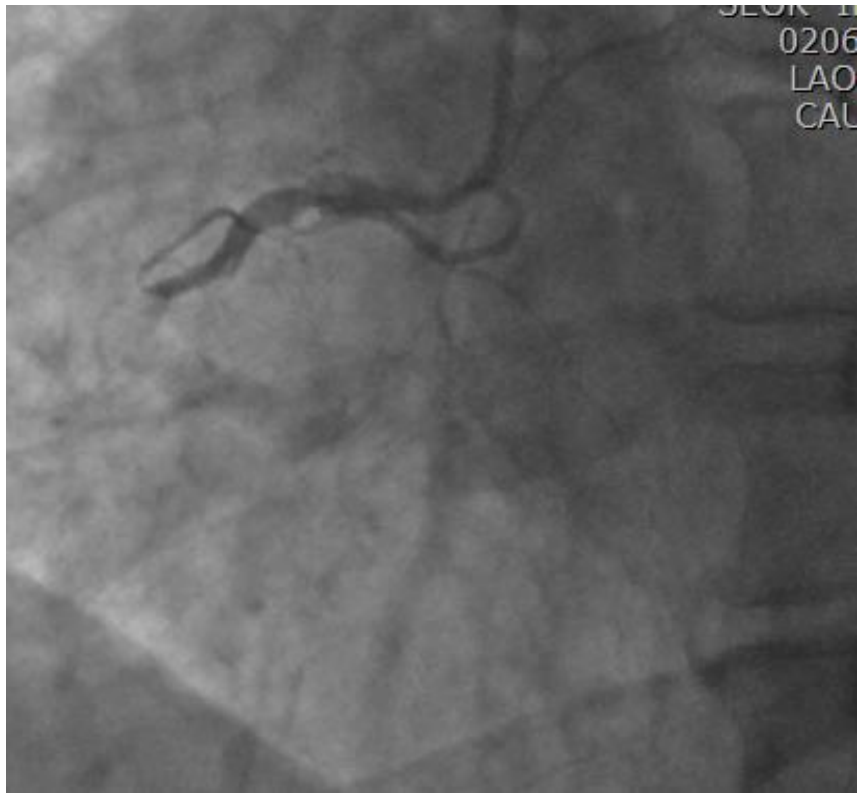
- I, Jaewoong Choi **DO NOT** have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the contest of the subject of this presentation

Thrombotic complication

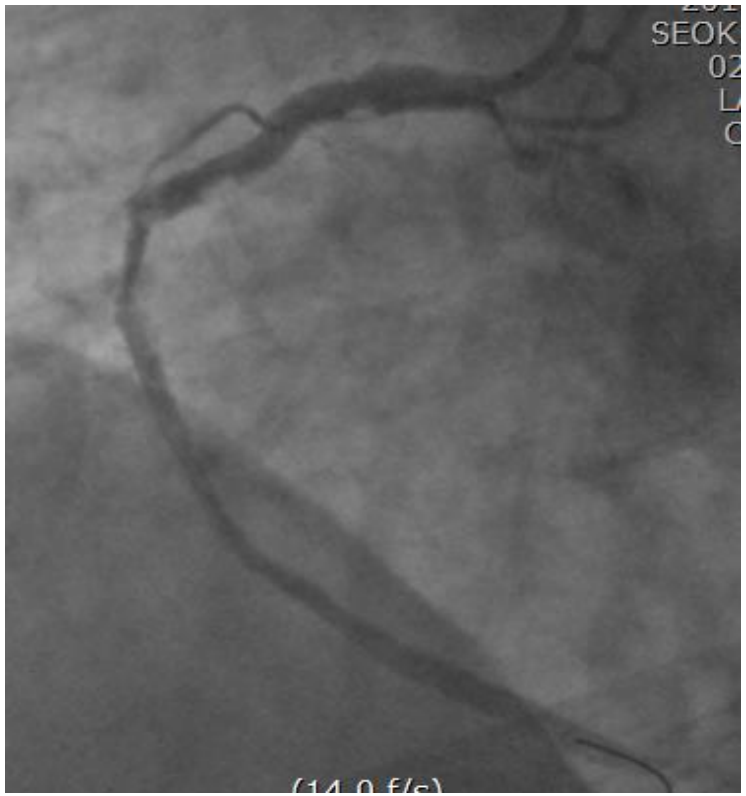


IPST in CHAMPION PHOENIX

STEMI Primary PCI: usual day practics

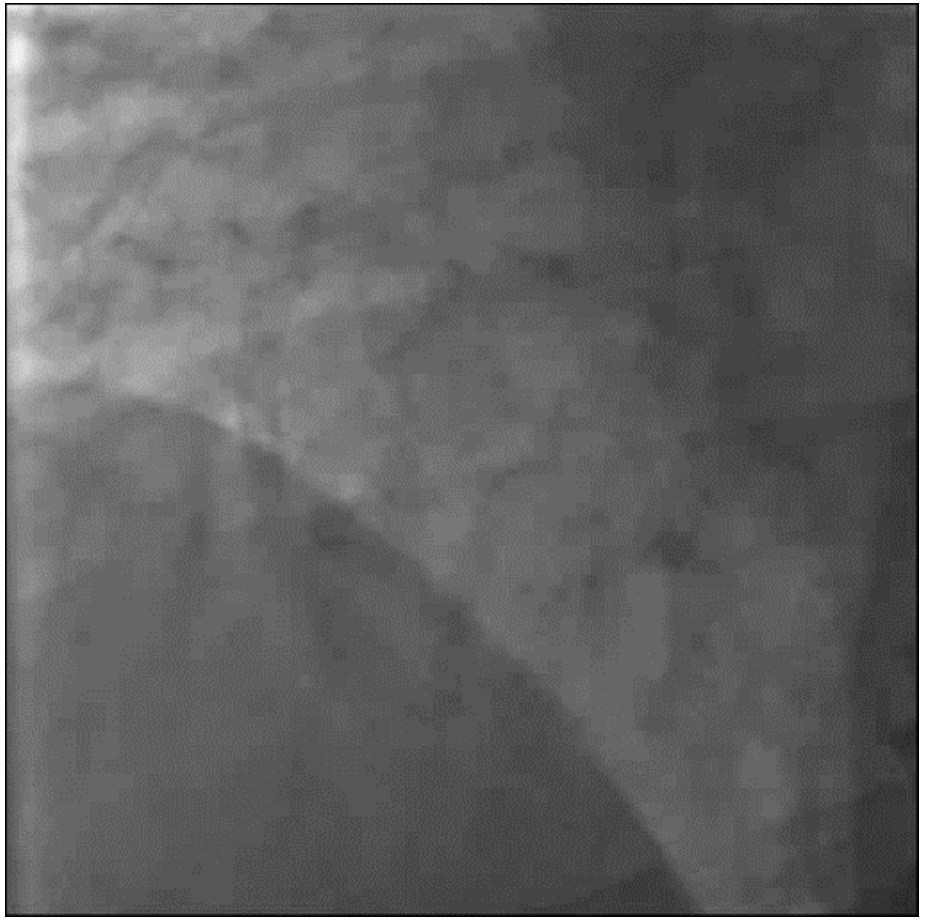


Mid-RCA total

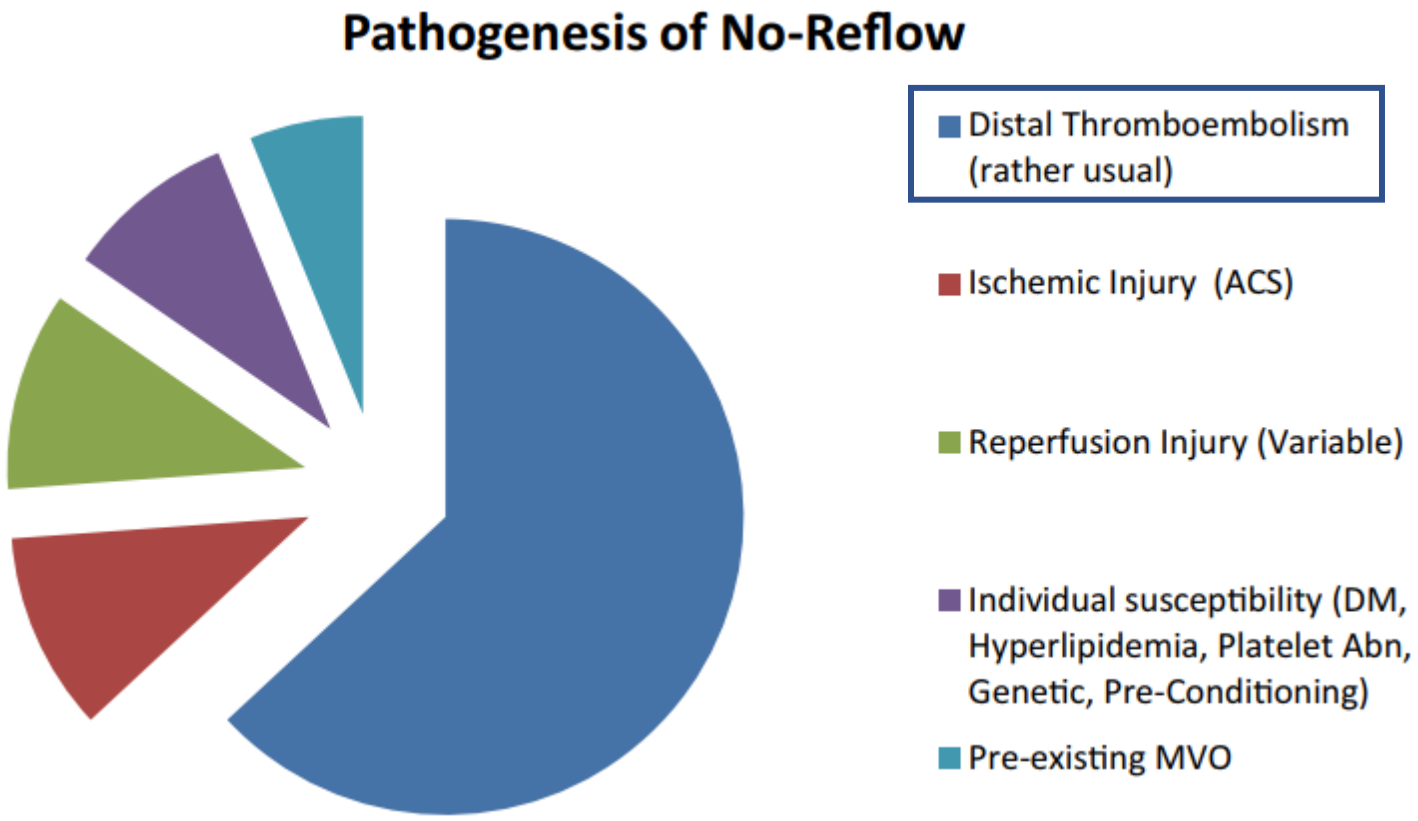


After balloon inflation: TIMI3

Post stent: No reflow



Pathogenesis of No-Reflow



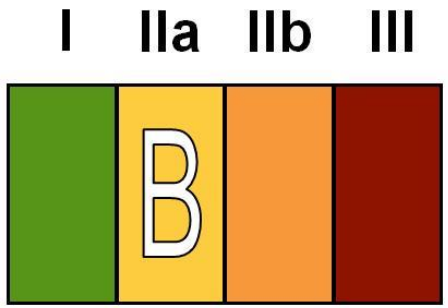
Niccoli G, Burzotta F, Galiuto L, Crea F. Myocardial no-reflow in humans. J Am Coll Cardiol. 2009;54:281–292.

Procedural Thrombotic complication prevention during primary PCI

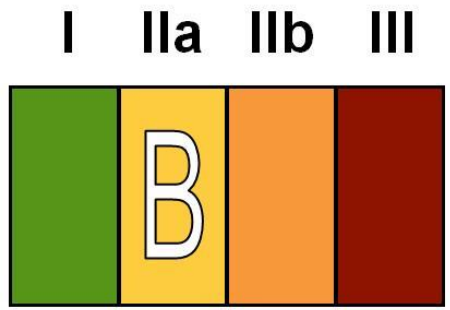
- Avoid long stent, stent overlap, high pressure inflation.
- Direct stent
- Deferred stent (large thrombus)
- Intracoronary thrombectomy

De Luca g et al. A meta-analystic overview of thrombectomy during primary angioplasty, Int J Cardio. 2013:166(3) 606-612
Iakovou I et al. *JAMA* 2005; Finn A et al. *Circulation* 2005; Airoldi F et al. *Circulation* 2007
Freixa X et al. Immediate vs delayed stenting in acute myocardial infarction: a systemic review and meta-analysis. EurioIntervention. 2013;8:1207-1216

2013 ACCF/AHA Guidelines[a] and 2012 ESC/EACTS Guidelines[b] for STEMI



Manual aspiration thrombectomy is reasonable for patients undergoing primary PCI.



Routine thrombus aspiration should be considered during primary PCI.

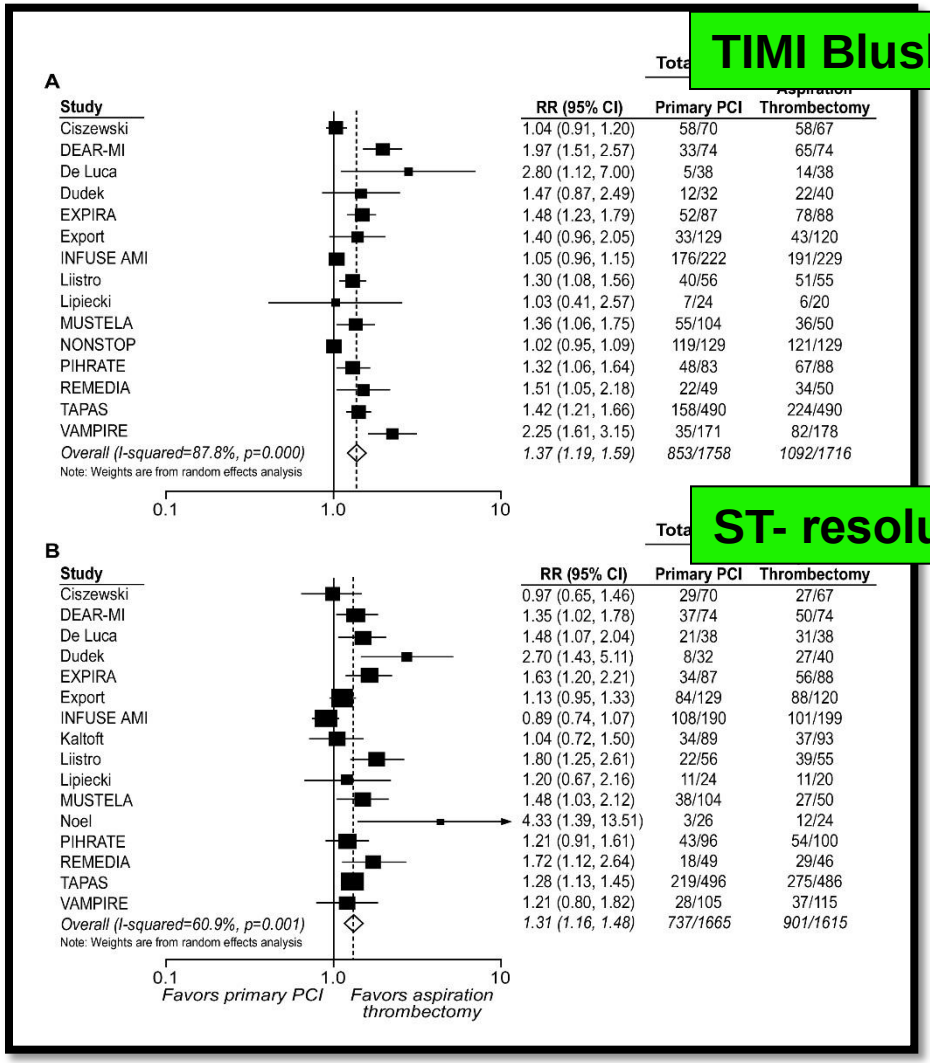
a. O'Gara PT, et al. *J Am Coll Cardiol*. 2013;61:e78-e140.[2]
b. Steg PG, et al. *Eur Heart J*. 2012;33:2569-2619.[7]

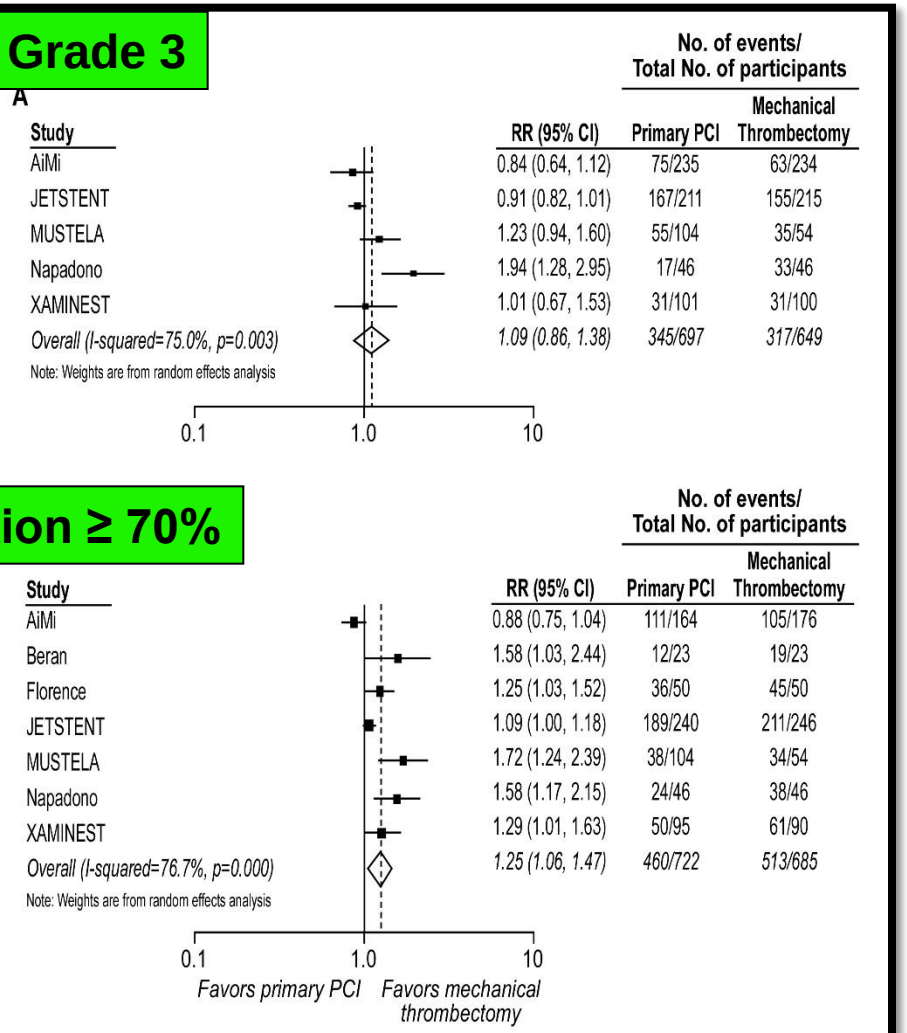
Reperfusion Markers: Thrombectomy

Aspiration

Mechanical

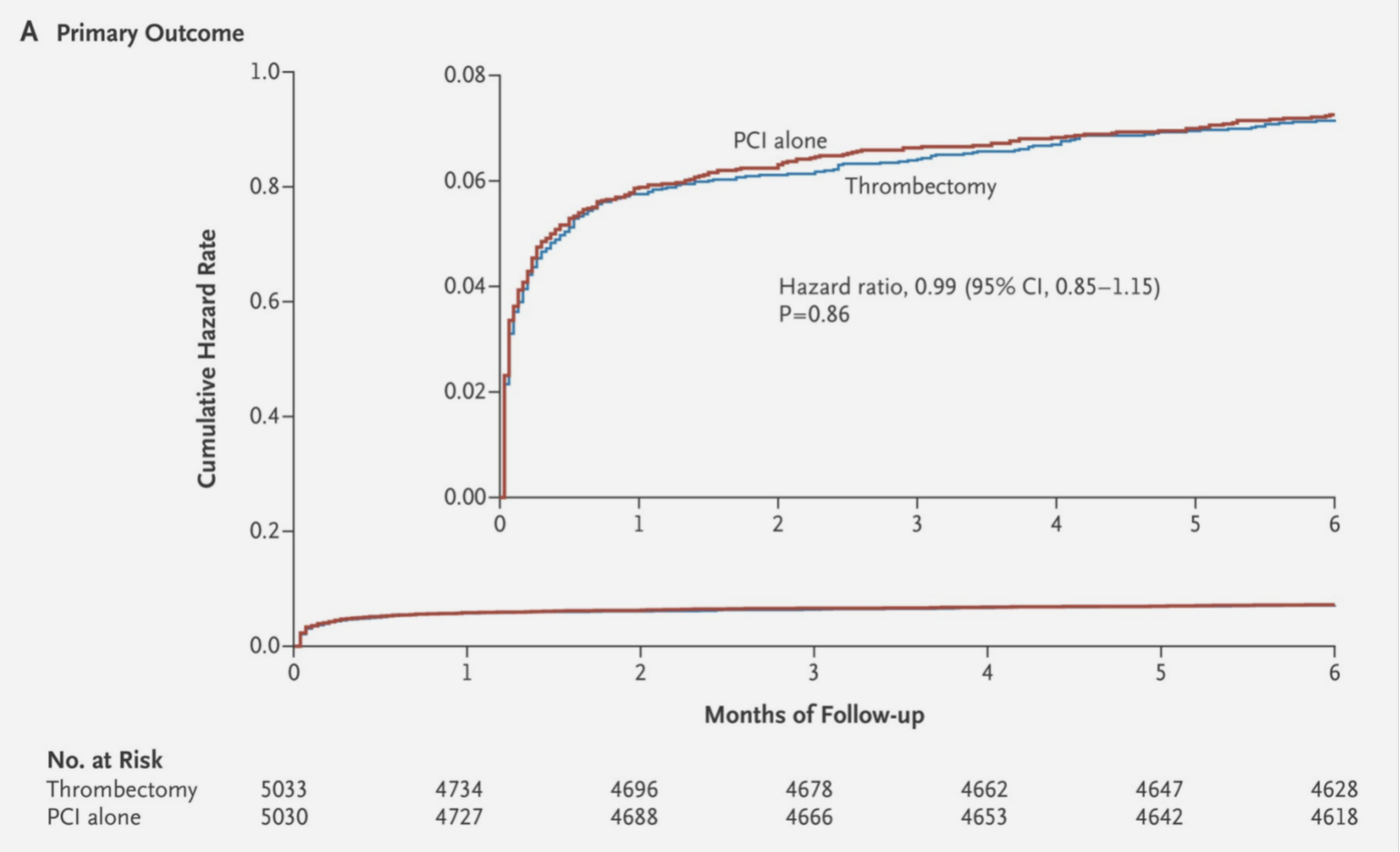
TIMI Blush Grade 3





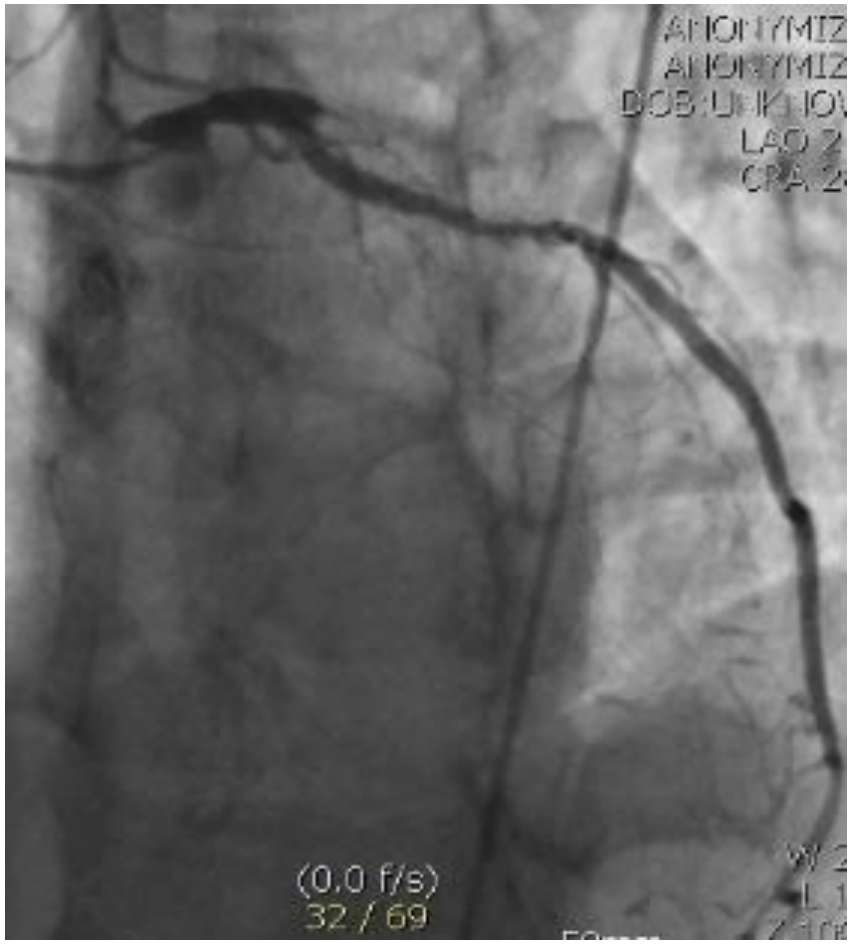
ST- resolution ≥ 70%

TOTAL Trial (Primary outcome)

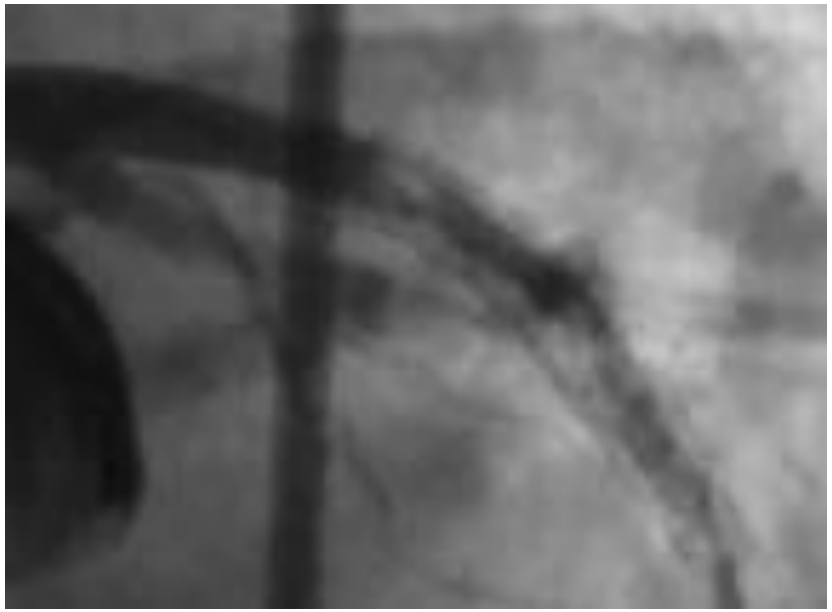


Sanjit S. Jolly, M.D., John A. Cairns, M.D., Salim Yusuf, M.D., D.Phil., et al., for the TOTAL Investigators N Engl J Med 2015; 372:1389-1398

Thrombus aspiration complication case
57/M. STEMI 2hr. prox LAD in-stent thrombosis (1/2)



During LAD aspiration: Cardiogenic shock(2/2)

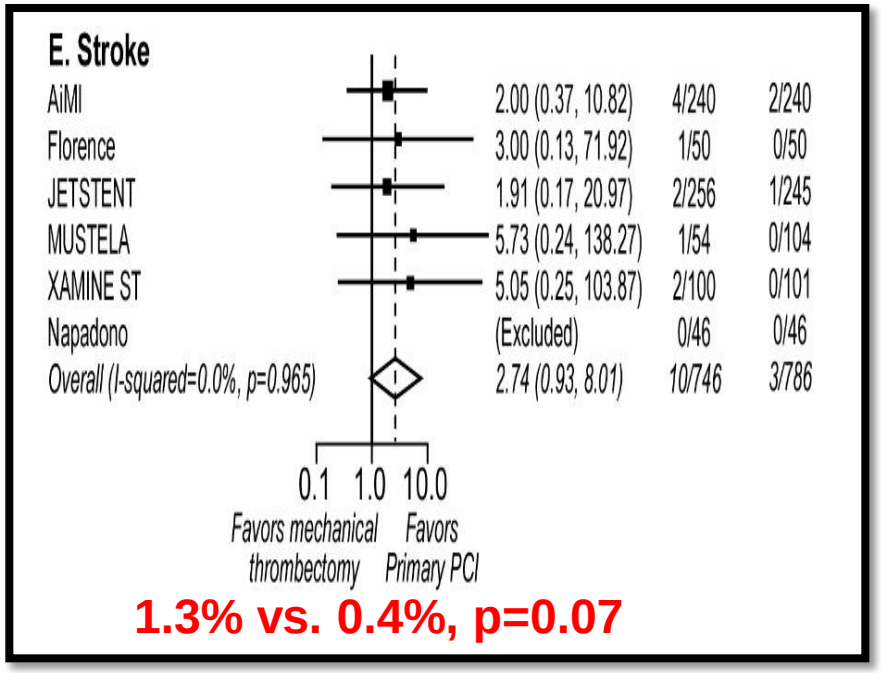


Suddenly, The patinets' BP was dropped to 80mmHg, and hypoxia was developed.

Mechanism: incomplete catheter aspiration after TA

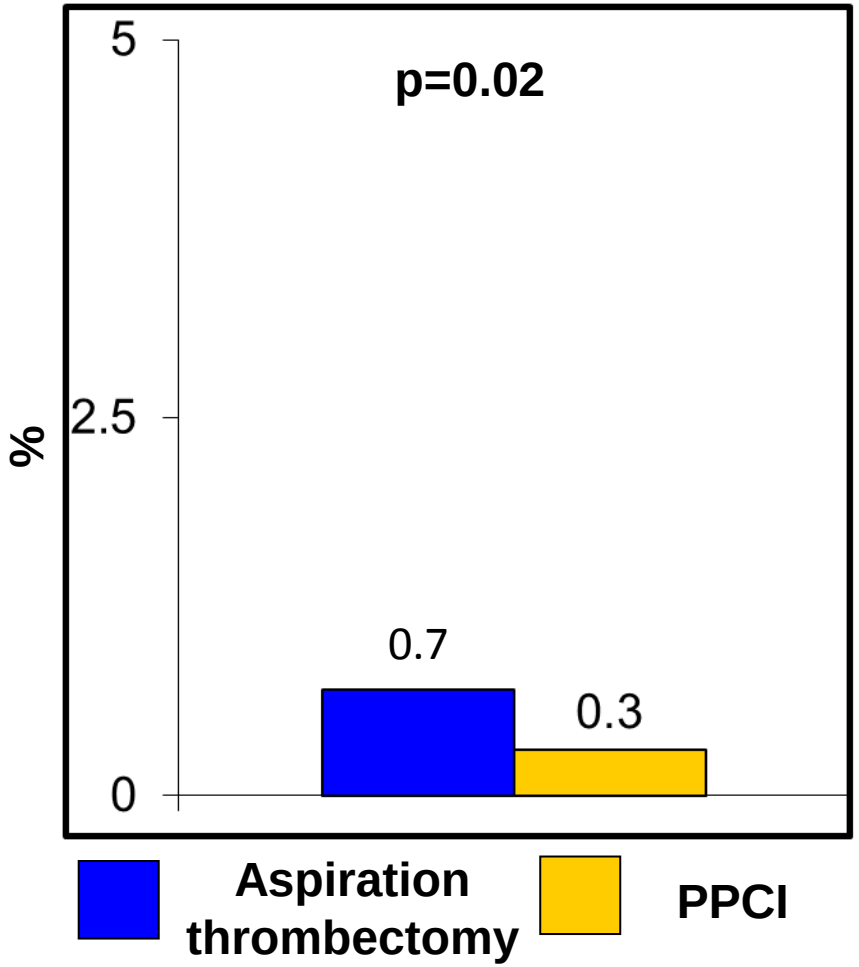
Stroke Risk: Thrombectomy

Mechanical thrombectomy

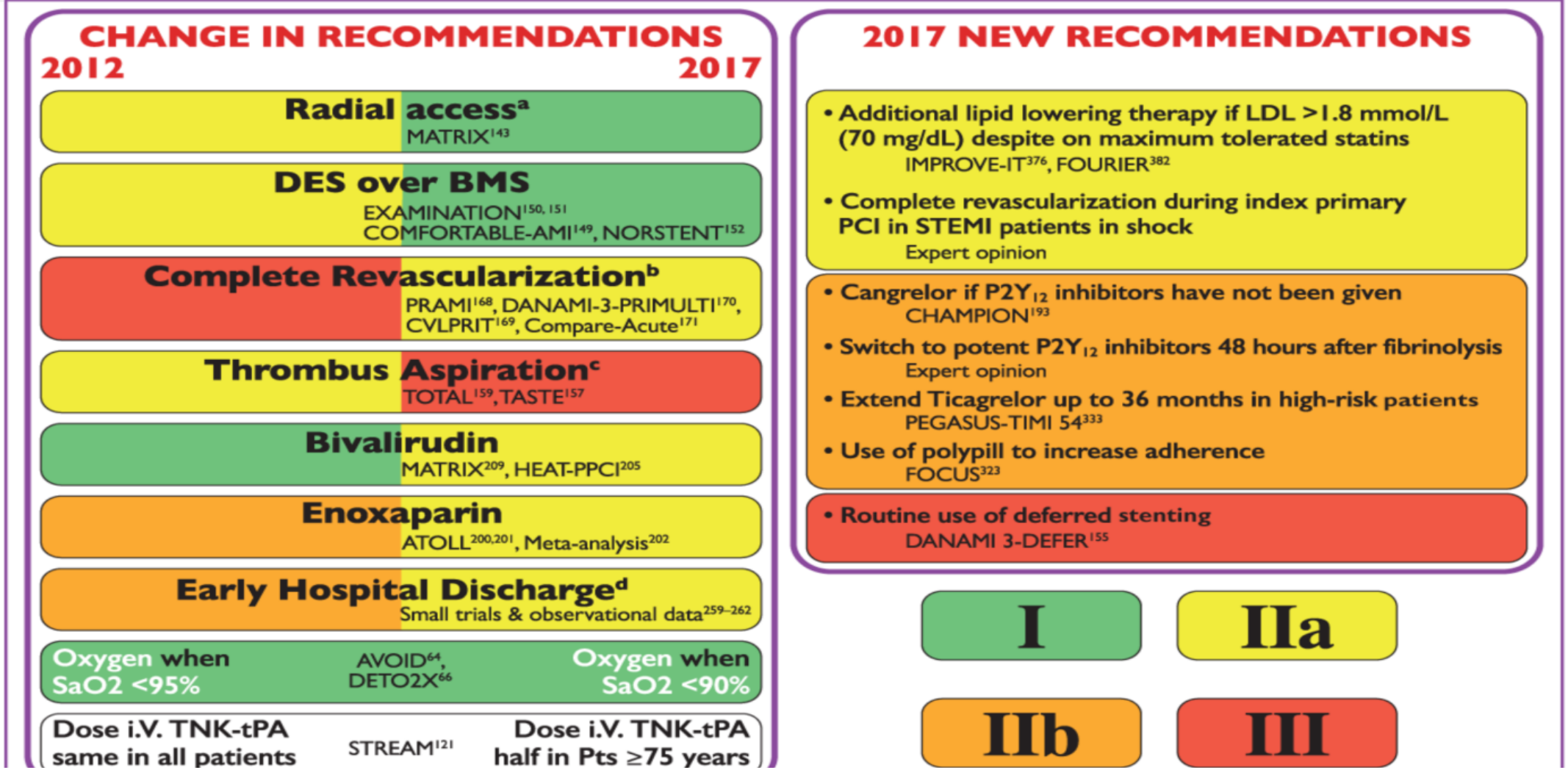


1.3% vs. 0.4%, p=0.07

TOTAL: Aspiration thrombectomy



Jolly SS. *NEJM* 2015 2015; 372:1389-1398



From: 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevationThe Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC)

Eur Heart J. 2017;39(2):119-177. doi:10.1093/eurheartj/ehx393

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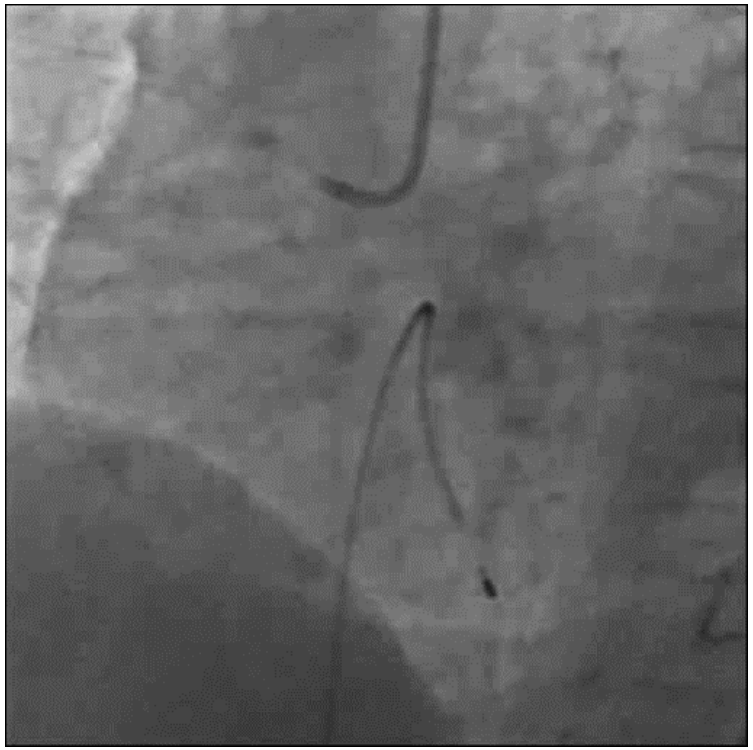
Thrombus aspiration: not recommend for routine primary PCI

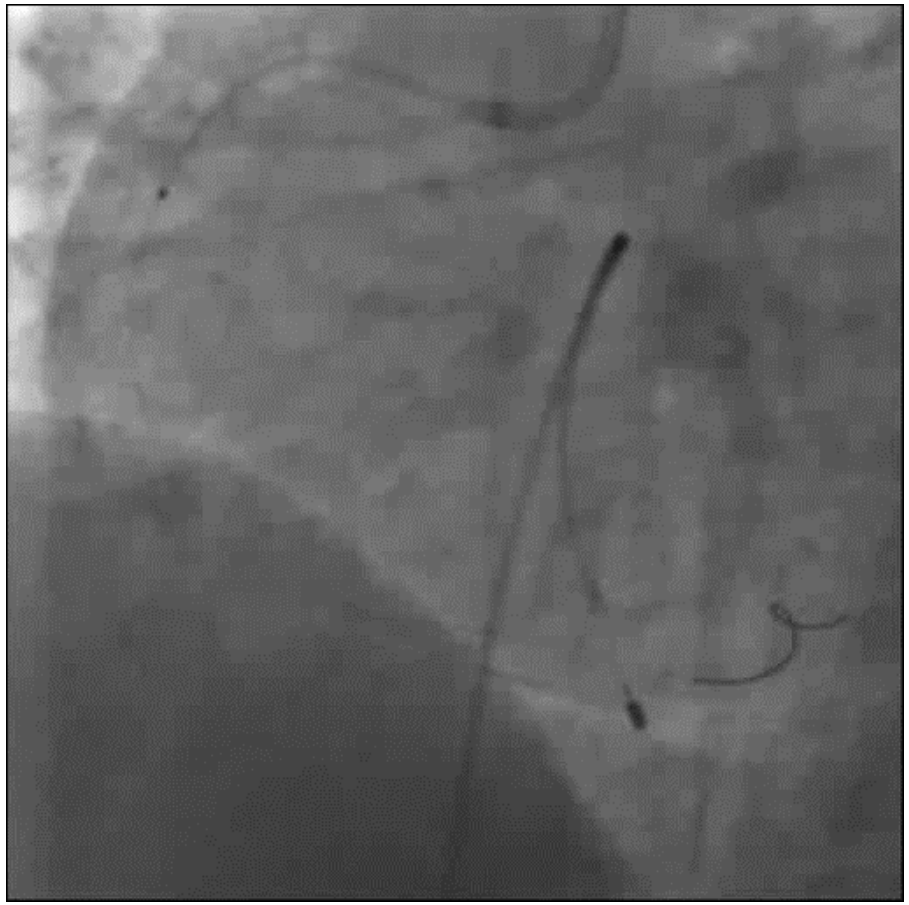
Standardized Technique?

Thrombectomy protocol in TOTAL trial

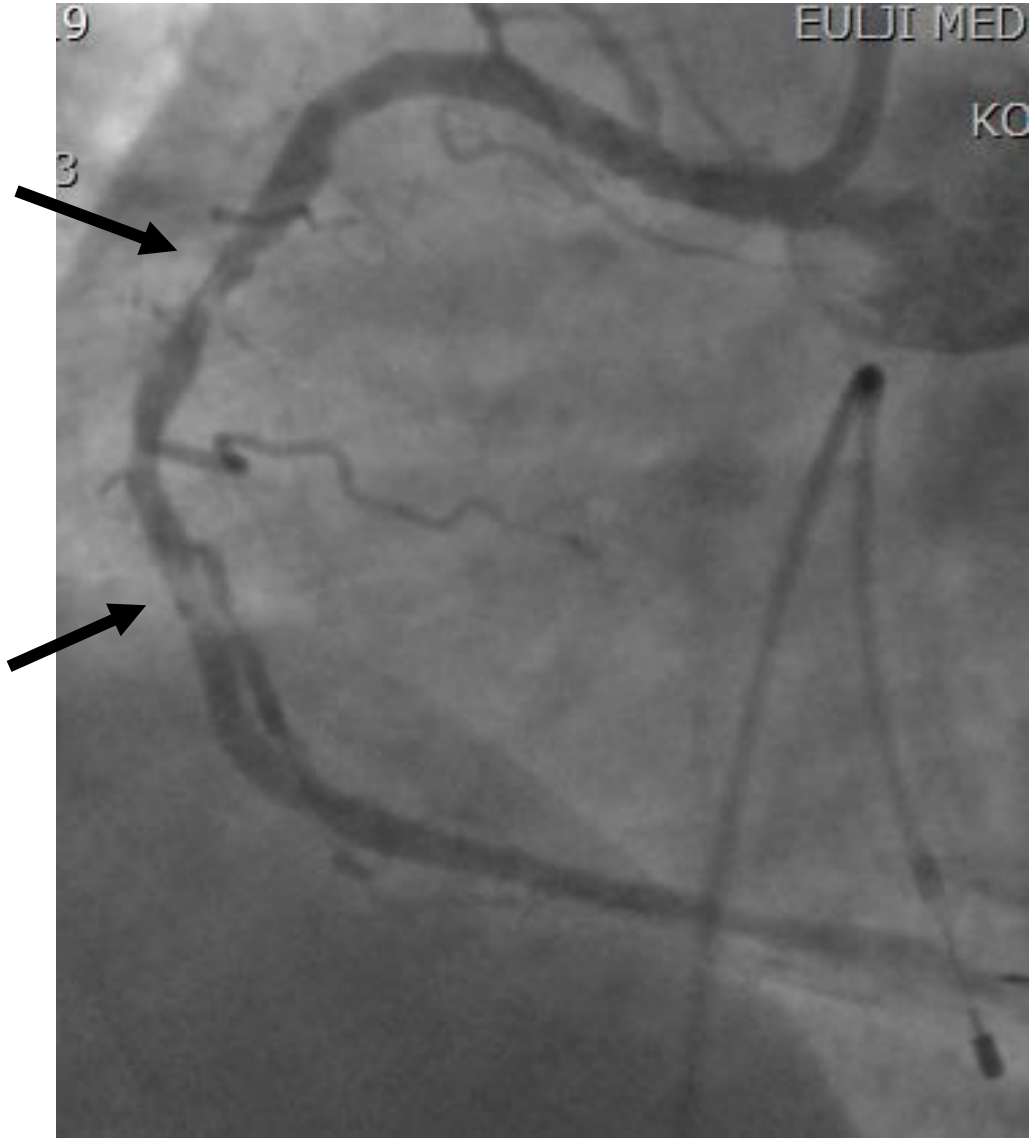
- Suction started before it crossed the lesion.
- Thrombectomy catheter be passed through the lesion multiple times such that a minimum of 40 ml blood aspiration.
- Guide catheter be fully engaged.
- After thrombectomy, the guide catheter was to be aspirated.

TOTAL. Multiple lesion pass. Forward aspiration

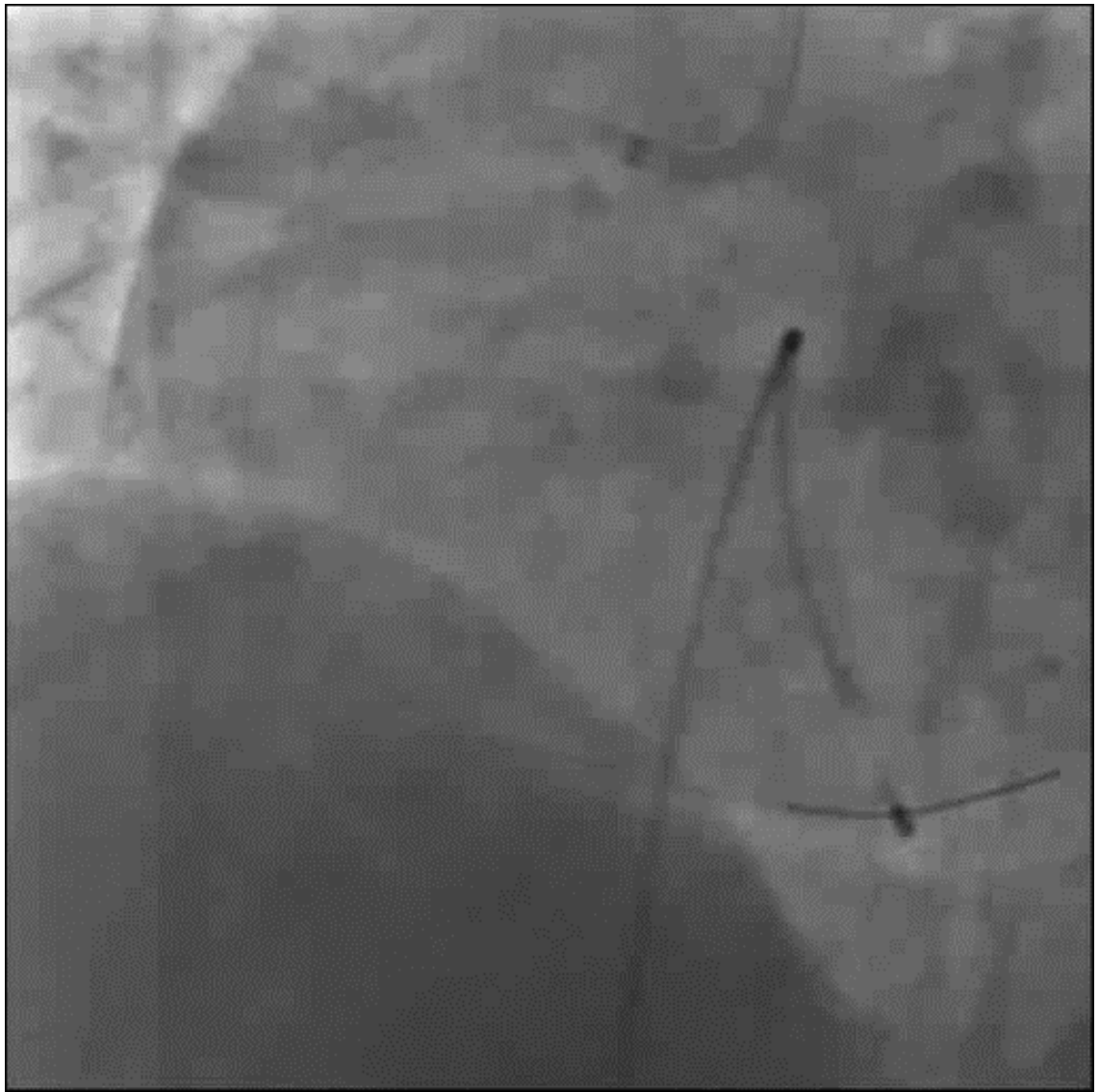




After aspiration: Distal embolization



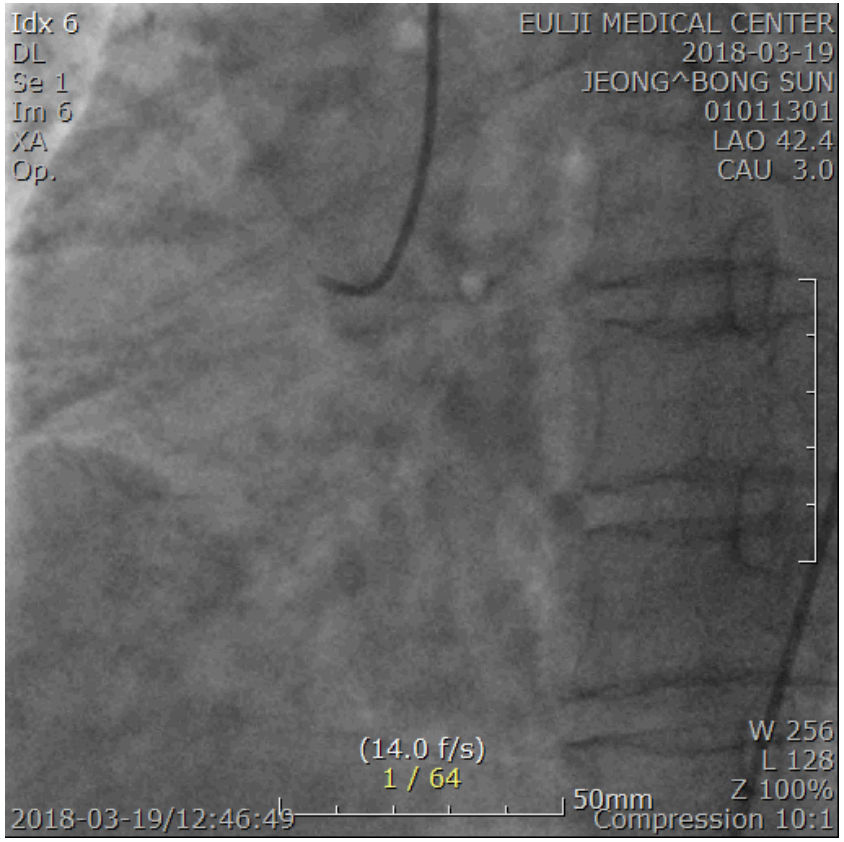
Final result after IIb/IIIa: MBG 2

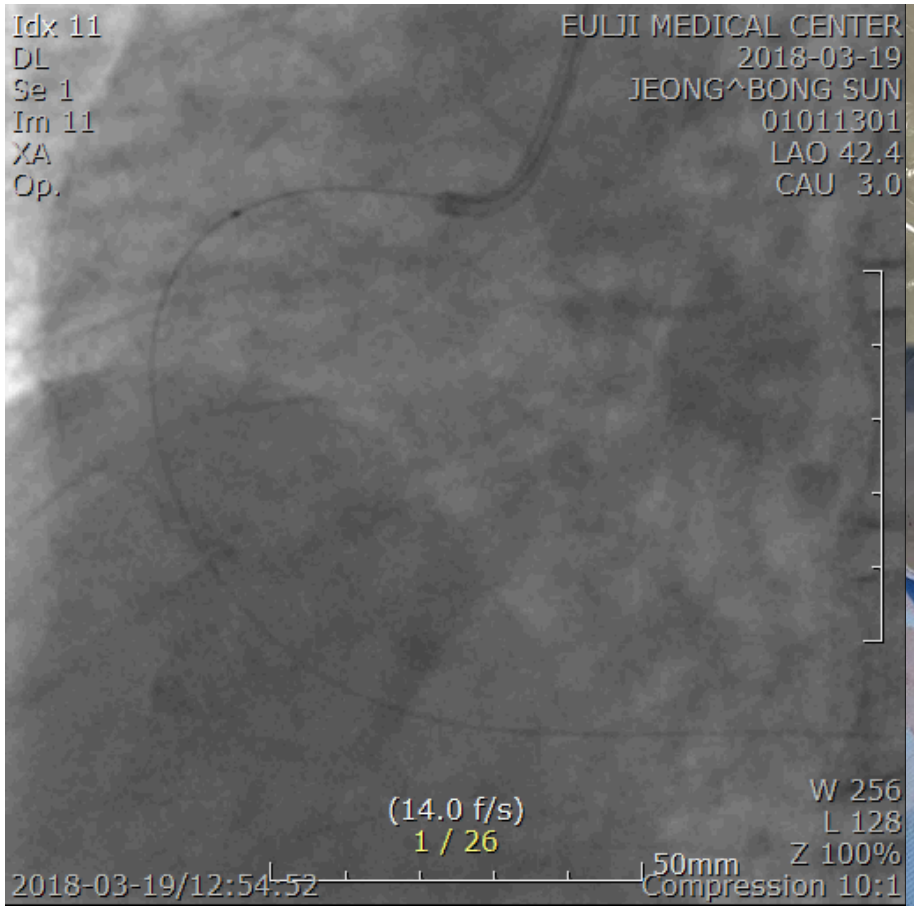


Modified Thrombus Aspiration Technique

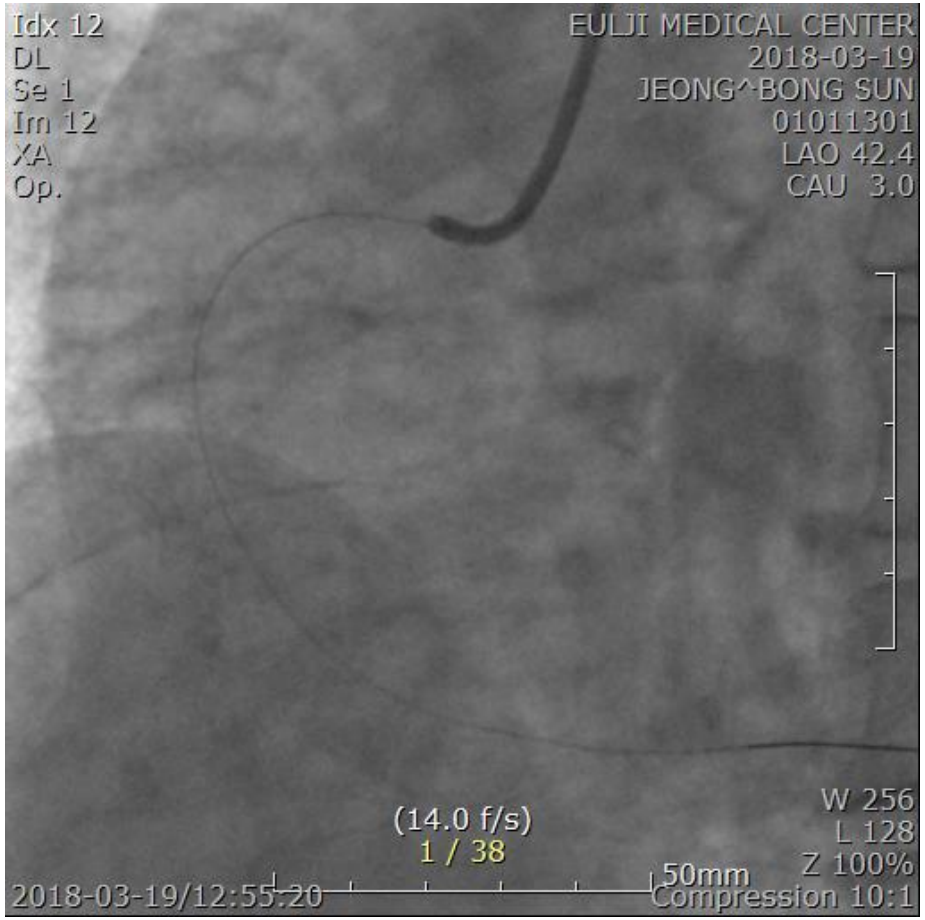
- ACT > 250
- Starting proximal to the occlusion
- Avoid forward lesion cross (no blood aspiration, no advance)
- Cather pull back and backward aspiration
- Removing aspiration catheter and flushing
- Guiding catheter aspiration.

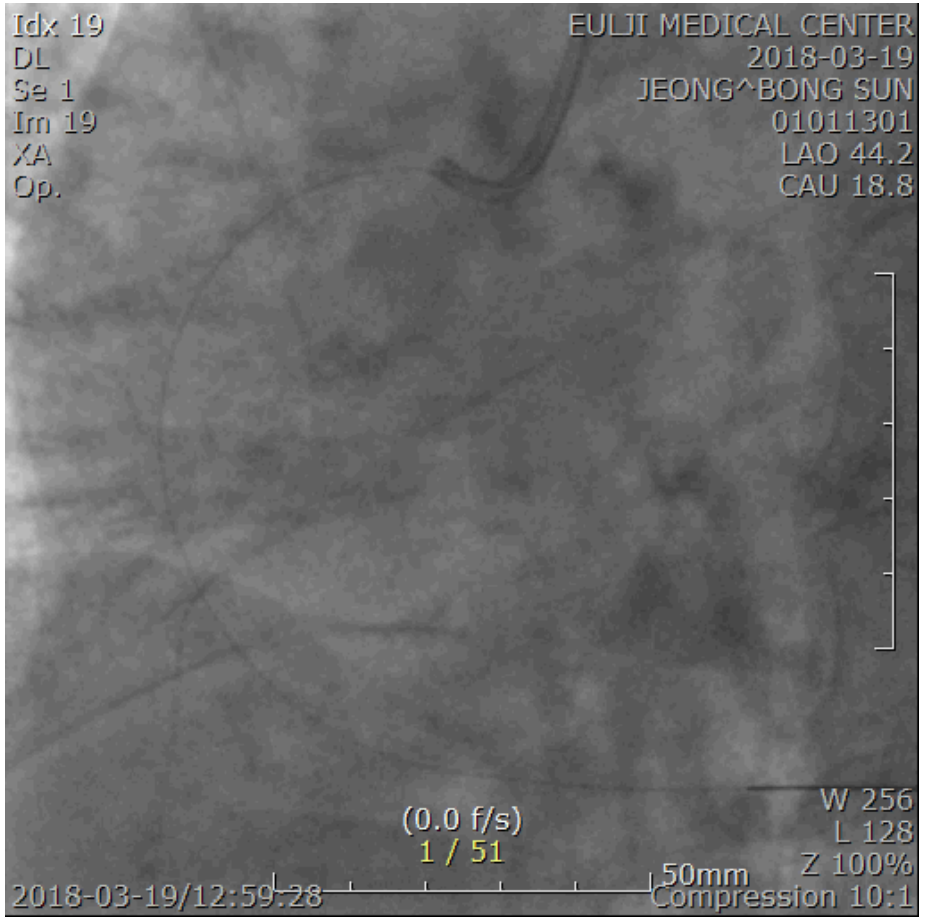
Aspiration catheter pull back: backward aspiration





Immediate after aspiration and stent: no embolization

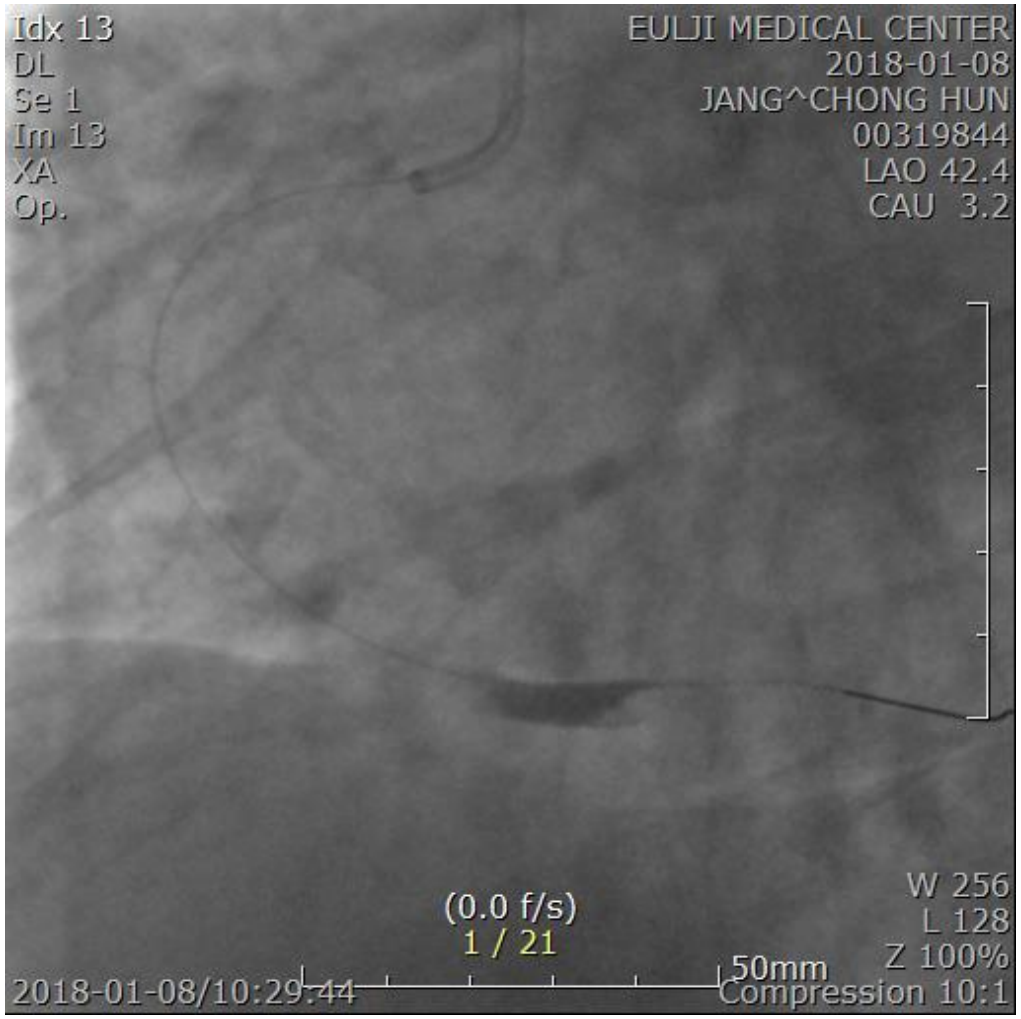




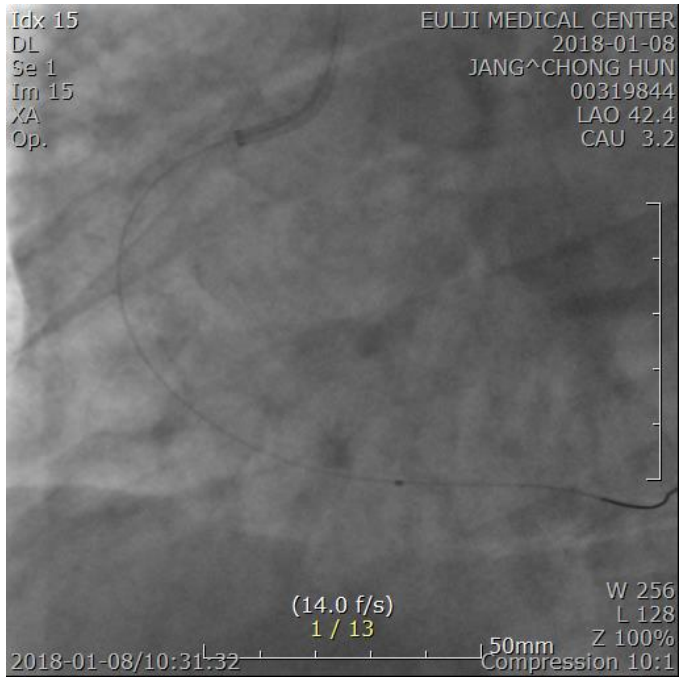
Post Balloon distal embolization:

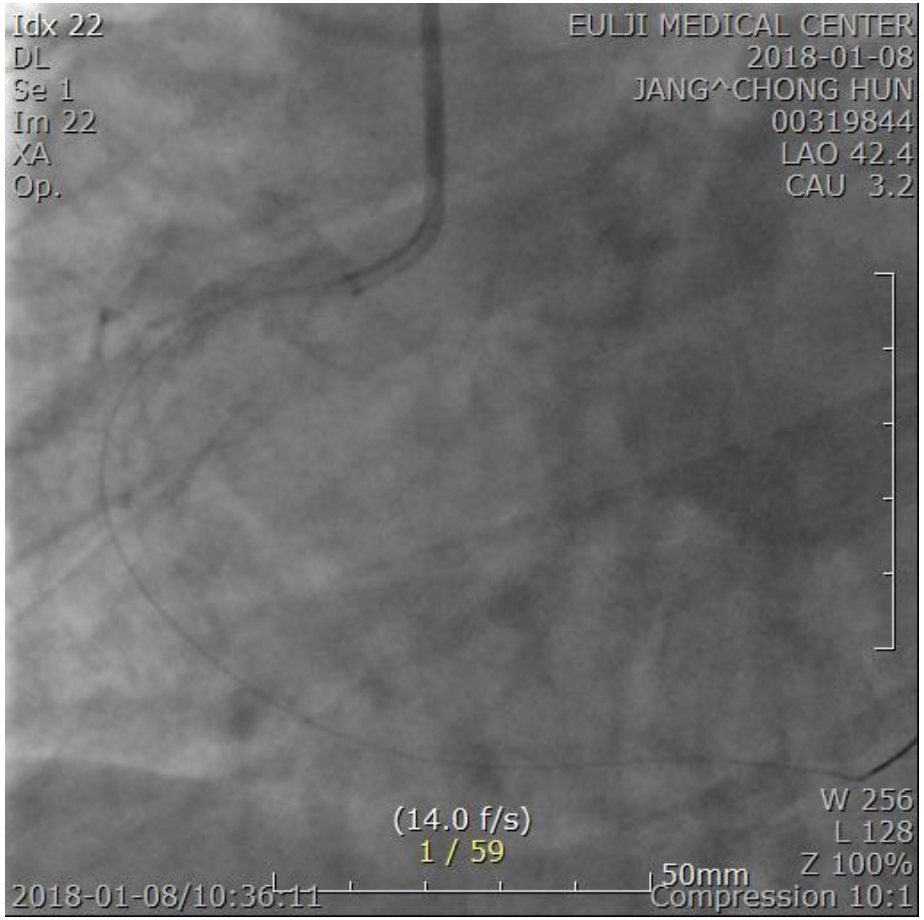
Backward aspiration

Huge thrombus migration



Backward Aspiration





Comparison between forward and backward thrombus aspiration in primary percutaneous coronary intervention

Single center propensity matched data

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Baseline characteristics

Variable	Forward (N=70)	Backward(N=70)	p-Value
Men	47(67.1%)	45(64.2%)	0.84
Age (years)	62.9 ± 11.8	61.5 ± 12.2	0.55
BMI(kg/m2)	24.33 ± 2.81	24.54 ± 2.5	0.76
Hypertension	28(40.0%)	30(42.8%)	0.85
Diabetes mellitus	20(28.6%)	21(30.0%)	1.00
Dyslipidemia	6(8.5%)	7(10.0%)	1.00
Chronic renal Insufficiency	14(10.2%)	13(18.5%)	0.81
Heart failure	2(2.8%)	5(7.1%)	0.68
Smoker ever	25(35.7%)	31(44.2%)	0.45

Baseline characteristics

Variables	Forward (N=70)	Backward (N=70)	p-Value
Glycoprotein IIb/IIIa inhibitor	38(54.2%)	30(42.8%)	0.18
Hemodynamically unstable status	12(17.1%)	10(14.2%)	0.43
IABP support	8(11.4%)	7(10.0%)	1.0

Angiographic and procedural characteristics

Variables	Forward(N=70)	Backward (N=70)	p-Value
Lesion length(mm)	20.1±5.1	20.0±6.2	0.60
No. of disease vessels			
1 Vessel	36 (51.4%)	34 (48.5%)	
2 Vessel	20 (28.2%)	21 (30.1%)	
3 Vessel	14 (20.5%)	15 (21.5%)	
High thrombus burden	59 (84.6%)	50 (71.0%)	0.12
Infarct related artery			
LAD	34 (48.7%)	35 (50.0%)	
LCX	5 (7.7%)	7 (15.1%)	
RCA	31 (43.6%)	27 (33.3%)	
LM	0 (0.0%)	1 (1.1%)	

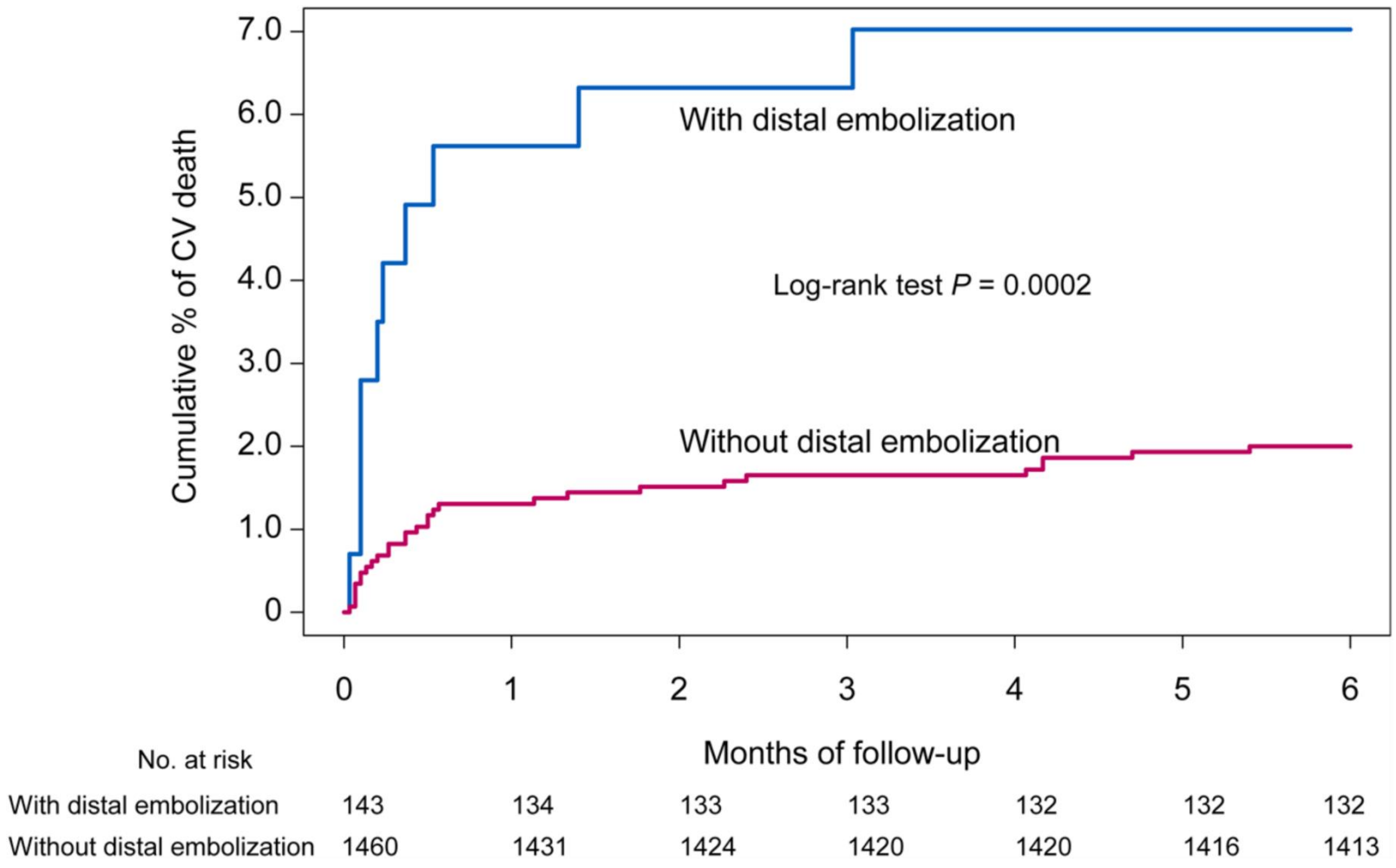
Thrombus Aspiration Result

Variable	Forward (N=70)	Backward (N=70)	p-Value
TIMI flow after PCI			
TIMI 0 flow	2 (2.8%)	0 (0.0%)	
TIMI 1 flow	4 (5.7%)	1 (1.4%)	
TIMI 2 flow	10 (14.2%)	4 (5.7%)	
TIMI 3 flow	57 (81.4%)	65 (92.8%)	0.21
Distal embolization	12 (17.1%)	2(2.8%)	0.50

Stroke or TIA

Variable	Forward(N=70)	Backward(N=70)	p-Value
Stroke or TIA			
30 days	0	0	
6 months	0	1	
1 year	1	0	
2 years	0	1	
Total	1 (1.4%)	2 (2.8%)	0.45

Insights from TOTAL (Distal embolization)



Distal embolization and mortality

Conclusion

- Comparing with conventional forward aspiration, backward aspiration thrombectomy technique shows trend toward decreased distal embolization.

- We should reevaluated thrombus aspiration in primary PCI under standardized technique to prevention and management of thrombotic complication.