

# The incidence of LV thrombus post STEMI in the current era of PPCI

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REVIEW

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# Incidence and predictors of left ventricular thrombus by cardiovascular magnetic resonance in acute ST-segment elevation myocardial infarction treated by primary percutaneous coronary intervention: a meta-analysis

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# LV thrombus by CMR

- Background
- Methods
- Results
- Conclusion

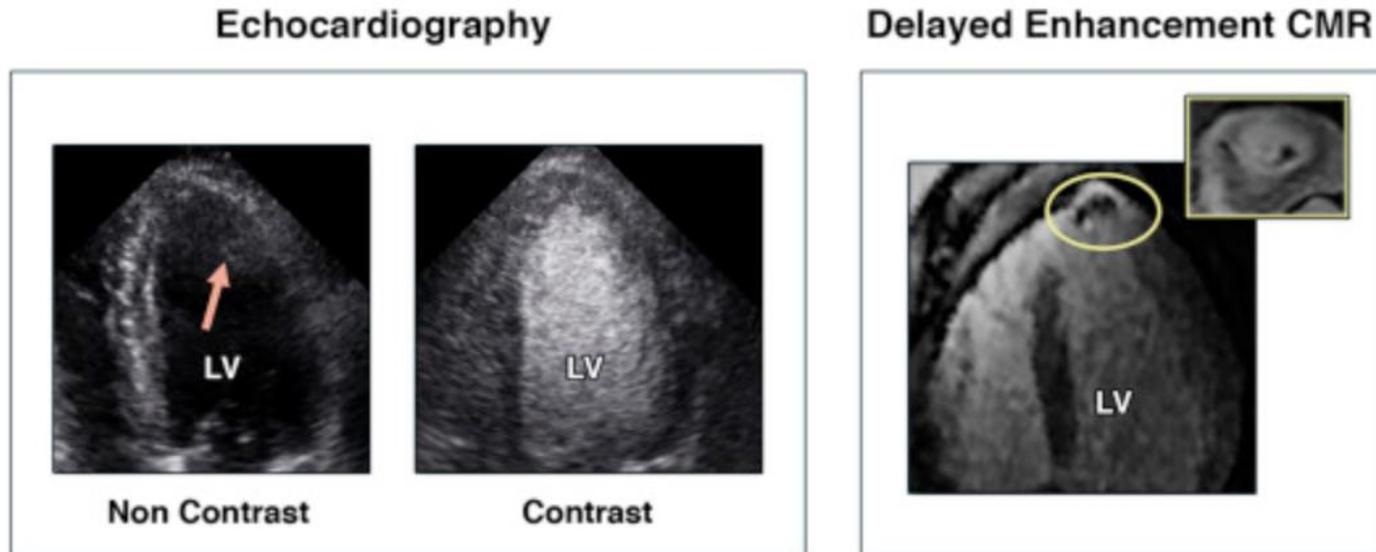
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# Background

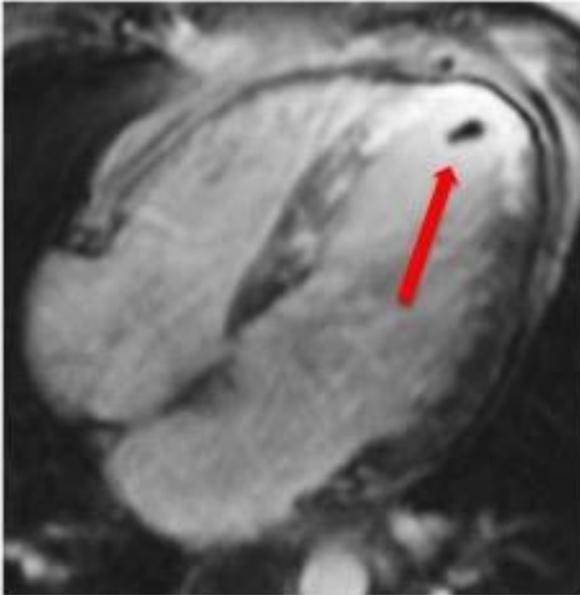
- The incidence of LV thrombus in STEMI patients in the current era of PPCI is not well established
- LV thrombus by TTE in the PPCI era was 2.7% for all STEMI patients (9.1% for anterior STEMI)
- TTE and contrast TTE known to have low sensitivity (35% and 64%, respectively) for detecting LV thrombus, when compared to CMR
- We performed a meta-analysis to assess the actual incidence and predictors of LV thrombus by CMR in STEMI treated by PPCI

# CMR for the detection of LV thrombus

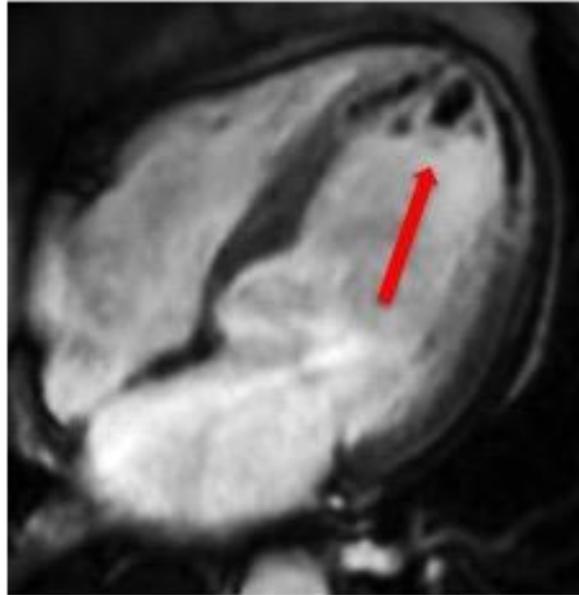


Weinsaft et al, Jacc Imaging 2015

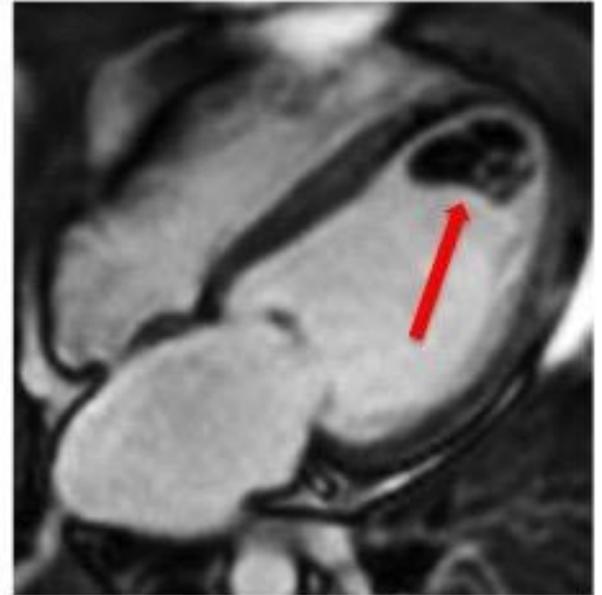
**Patient 1**



**Patient 2**



**Patient 3**

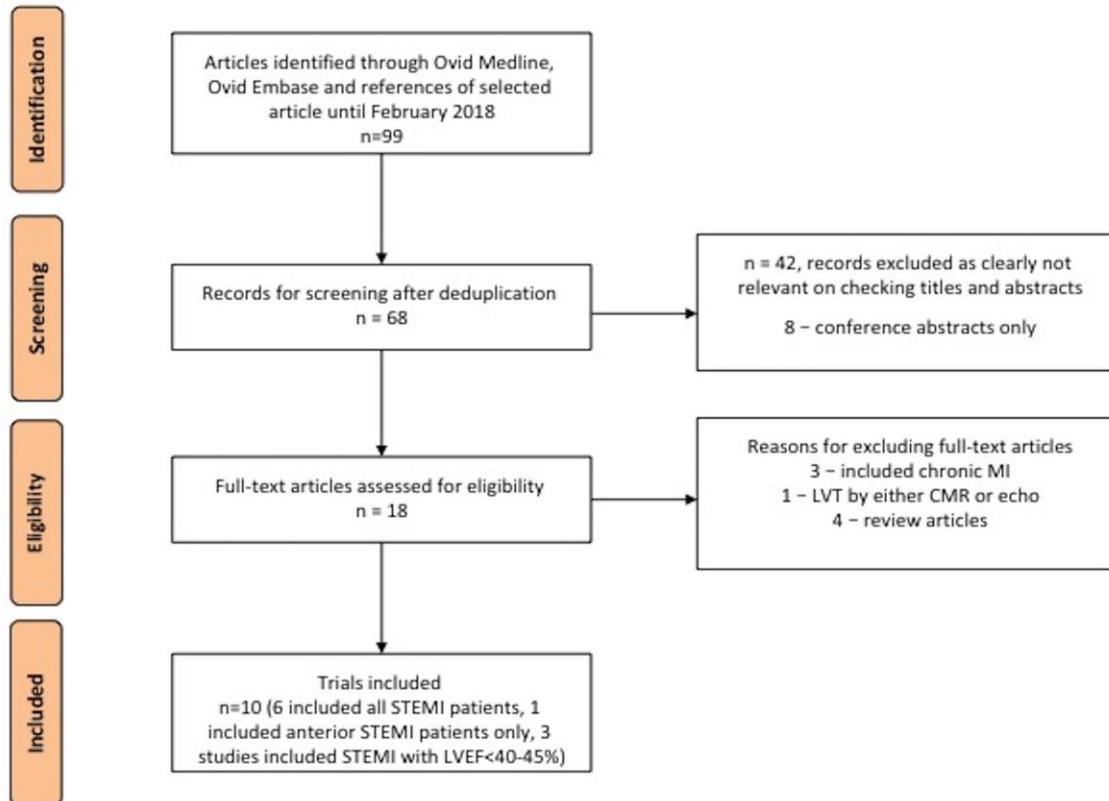


# LV thrombus by CMR

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# Methods

PRISMA 2009 Flow Diagram



# LV thrombus by CMR

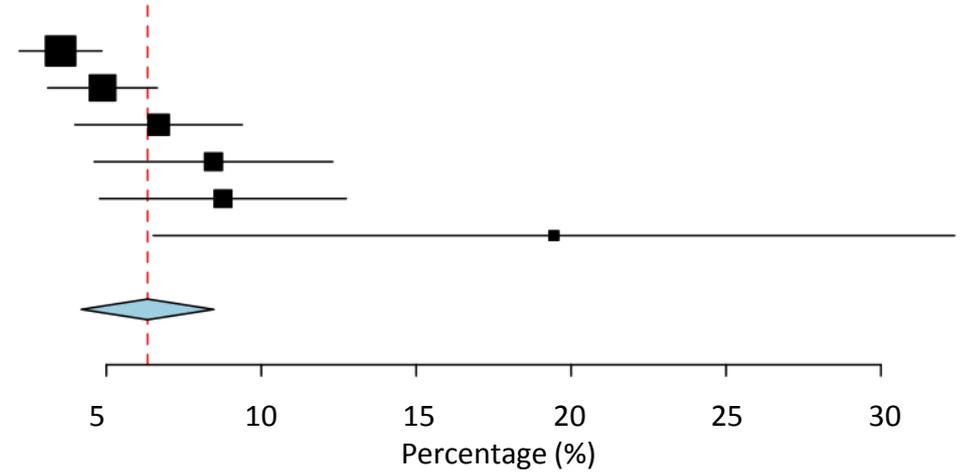
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**Studies**                      **Estimate (95% CI)**   **Events/ Total**

**All STEMI**

Poss 2015	3.5 (2.2-4.9)	26/738
Cambronero-Cortinas 2017	4.9 (3.1-6.6)	28/574
Biere 2016	6.7 (4.0-9.4)	22/329
Weinsaft 2016	8.5 (4.6-12.3)	17/201
Delewi 2012	8.8 (4.8-12.7)	17/194
Lanzillo 2013	19.4 (6.5-32.4)	7/36

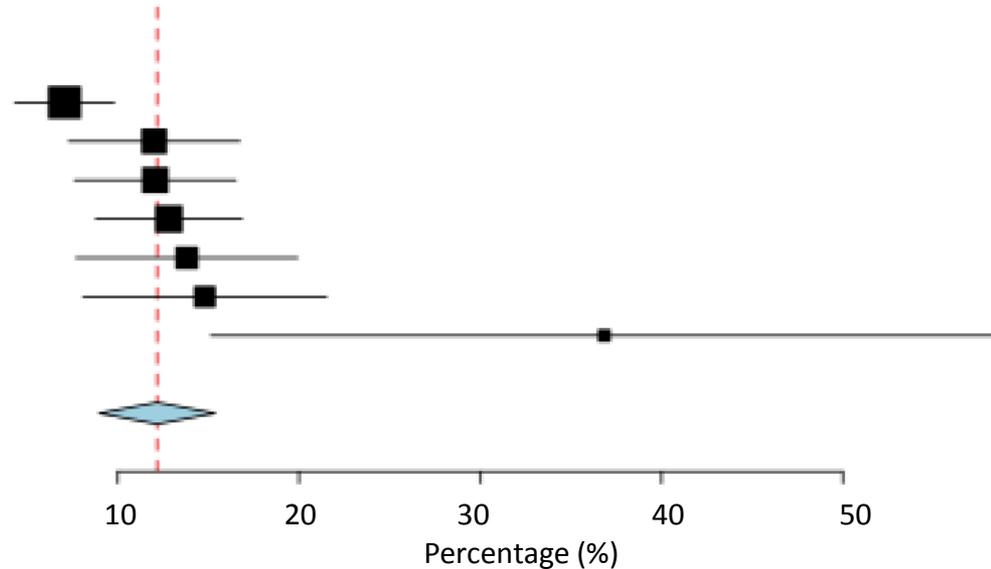
**Overall (I<sup>2</sup>=72%, P=0.004)**    **6.3 (4.2-8.5)**    **117/2072**



**Anterior STEMI**

Poss 2015	7.1 (4.3-9.8)	24/339
Biere 2016	12.0 (7.3-16.7)	22/183
Cambronero-Cortinas 2017	12.1 (7.6-16.5)	25/207
Gellen 2016	12.8 (8.8-16.9)	34/265
Delewi 2012	13.8 (7.7-19.9)	17/123
Weinsaft 2016	14.8 (8.1-21.5)	16/108
Lanzillo 2013	36.8 (15.2-58.5)	7/19

**Overall (I<sup>2</sup>=64%, P=0.011)**    **12.2 (9.0-15.4)**    **145/1244**



# Results

- 96% of cases of LV thrombus occurred in those with anterior STEMI
- When only anterior STEMI with LVEF<50% were considered (n=447), the incidence of LV thrombus was 19.2%
- Compared with CMR, the sensitivity of TTE to detect LV thrombus was 29% and the specificity was 98%
- The sensitivity of TTE increased to 70% in those with anterior STEMI and reduced LVEF
- LV thrombus resolved in 88% of cases by 3 to 6 months

# Results

- After 1-2 years follow-up, embolic complication rate was similar at 1.5% ( $P=0.25$ ) but the bleeding complication rate was significantly higher (8.8% versus 0.5%,  $P<0.001$ ) in the triple therapy group

# Results

- Risk factors for LV thrombus formation:
  - Apical wall motion abnormality
  - Anterior STEMI
  - LVEF<50%
  - Presence of MVO

# Optimal timing of imaging

Clinical Review & Education

JAMA Cardiology | Review

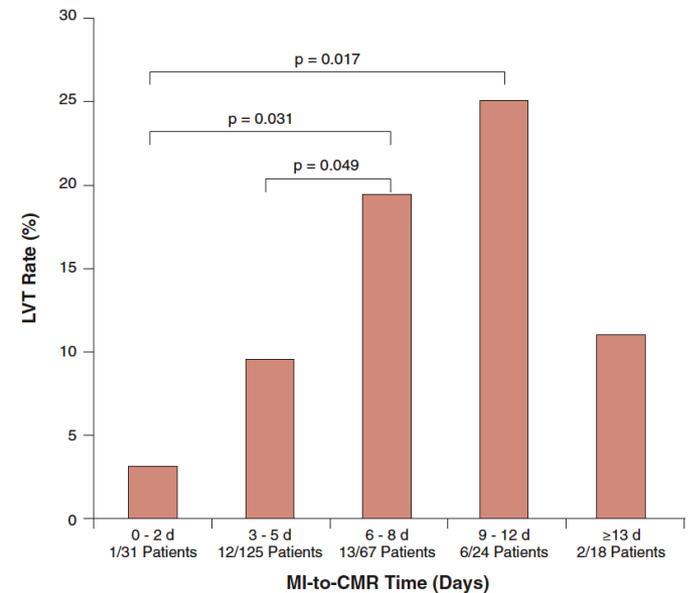
## Left Ventricular Thrombus After Acute Myocardial Infarction Screening, Prevention, and Treatment

Cian P. McCarthy, MB, BCh, BAO; Muthiah Vaduganathan, MD, MPH; Killian J. McCarthy, MB, BCh, BAO;  
James L. Januzzi Jr, MD; Deepak L. Bhatt, MD, MPH; John W. McEvoy, MB, BCh, MHS

### Screening

Cardiac magnetic resonance imaging remains the criterion standard diagnostic modality; however, cost and availability limit its widespread utility. As such, standard TTE is typically the screening modality of choice and should be performed within 24 hours of admission in those at high risk for apical LV thrombus (eg, those with large or anterior MI or those receiving delayed reperfusion). If (1) the LV apex is poorly visualized, (2) anterior or apical wall motion abnormalities are present, or (3) high apical wall motion scores are cal-

FIGURE 1 LVT Rate According to the MI-to-CMR Time



Gellen et al, JACC Imaging 2017

## COMMENT & RESPONSE

### Optimizing the Detection of Left Ventricular Thrombus Following Acute Myocardial Infarction in the Current Era

**To the Editor** We read with great interest the review article on left ventricular (LV) thrombus after acute myocardial infarction by McCarthy et al.<sup>1</sup> As the authors have highlighted, transthoracic echocardiography (TTE) is the first-line imaging modality used in the clinical setting to screen for LV thrombus. However, TTE has a low sensitivity compared with cardiac magnetic resonance imaging (CMR) (approximately 35% vs 64%).<sup>2</sup> Cardiac magnetic resonance imaging not only has the strength to provide better spatial resolution for morphological definition but also can characterize and differentiate the avascular LV thrombus from neighboring structures after contrast administration. We agree with the authors that CMR is not yet widely available, remains an expensive tool, and precludes those with contraindications. Nevertheless, lessons can be learned from prior studies using CMR for the detection of LV thrombus. Known risk factors for LV thrombus formation confirmed by such studies are anterior ST-segment elevation myocardial infarction (STEMI), which accounts for more than 90% of all LV thrombi,<sup>3</sup> LV ejection fraction less than 50%,<sup>4</sup> the presence of microvascular obstruction,<sup>3</sup> and apical wall motion abnormality.<sup>2</sup>

We would like to highlight the study by Gellen et al<sup>5</sup> with regards to the timing of imaging for the detection of LV thrombus. Of 265 patients with anterior STEMI, the incidence of LV thrombus among those undergoing the CMR scan within 2 days was only 3%, and the peak incidence (25%) occurred during the second week post-STEMI.<sup>5</sup> Therefore, we do not agree with the suggestion by McCarthy et al<sup>1</sup> that TTE should be performed within 24 hours of admission in those at high risk of LV thrombus. It may be more appropriate to perform the TTE at a later stage prior to discharge (usually after 72 hours for patients with an uncomplicated course, per current guidelines) to improve the detection of LV thrombus.

Second, McCarthy et al<sup>1</sup> proposed repeated imaging at 1 to 3 months in those with apical akinesis/dyskinesis (Figure 2<sup>1</sup>). Given that the incidence of LV thrombus seems to peak during the second week,<sup>5</sup> whether screening those patients sooner than 1 to 3 months might be more beneficial and cost-effective in the long term and warrants further investigation.

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**Marina Vincent, MBBS**

**Derek J. Hausenloy, PhD**

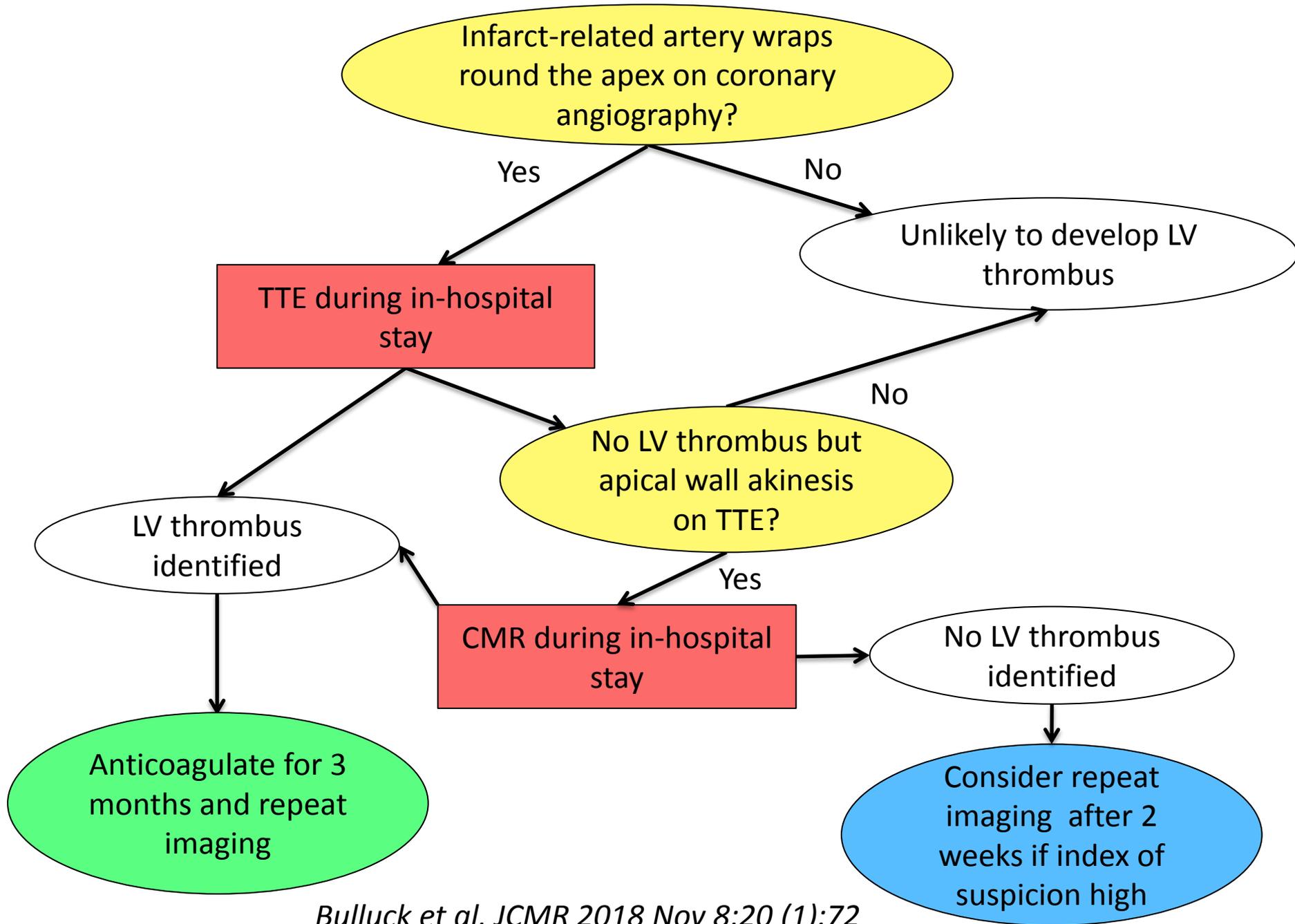
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**Conflict of Interest Disclosures:** All authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

1. McCarthy CP, Vaduganathan M, McCarthy KJ, Januzzi JL Jr, Bhatt DL, McEvoy JW. Left ventricular thrombus after acute myocardial infarction: screening, prevention, and treatment. *JAMA Cardiol*. 2018;3(7):642-649. doi:10.1001/jamacardio.2018.1086
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# Summary

- The incidence of LV thrombus remains clinically high at 6% for all STEMI, 12% for anterior STEMI and 19% for anterior STEMI patients with reduced LVEF
- We propose that CMR may have a role in high-risk STEMI patients (akinetic apex) and in patients with inconclusive TTE
- Those with LV thrombus treated with triple therapy had similar embolic complication rates but higher bleeding complication rates than those with no LV thrombus and on dual antiplatelet therapy only
- A repeat scan performed at 3 months to guide duration of anticoagulation might help to avoid unnecessary bleeding risk to patients

# Thanks

- Questions?



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Day 2 programme at a glance #JCRBusan

FFR, CFR and IMR on Acute

[Morning Session II]

Final Round Table