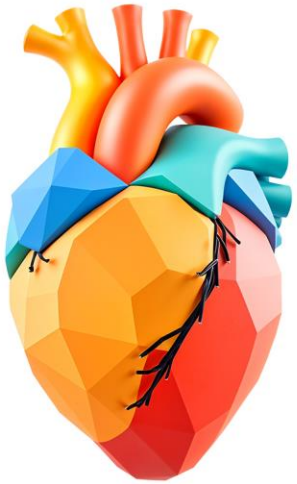


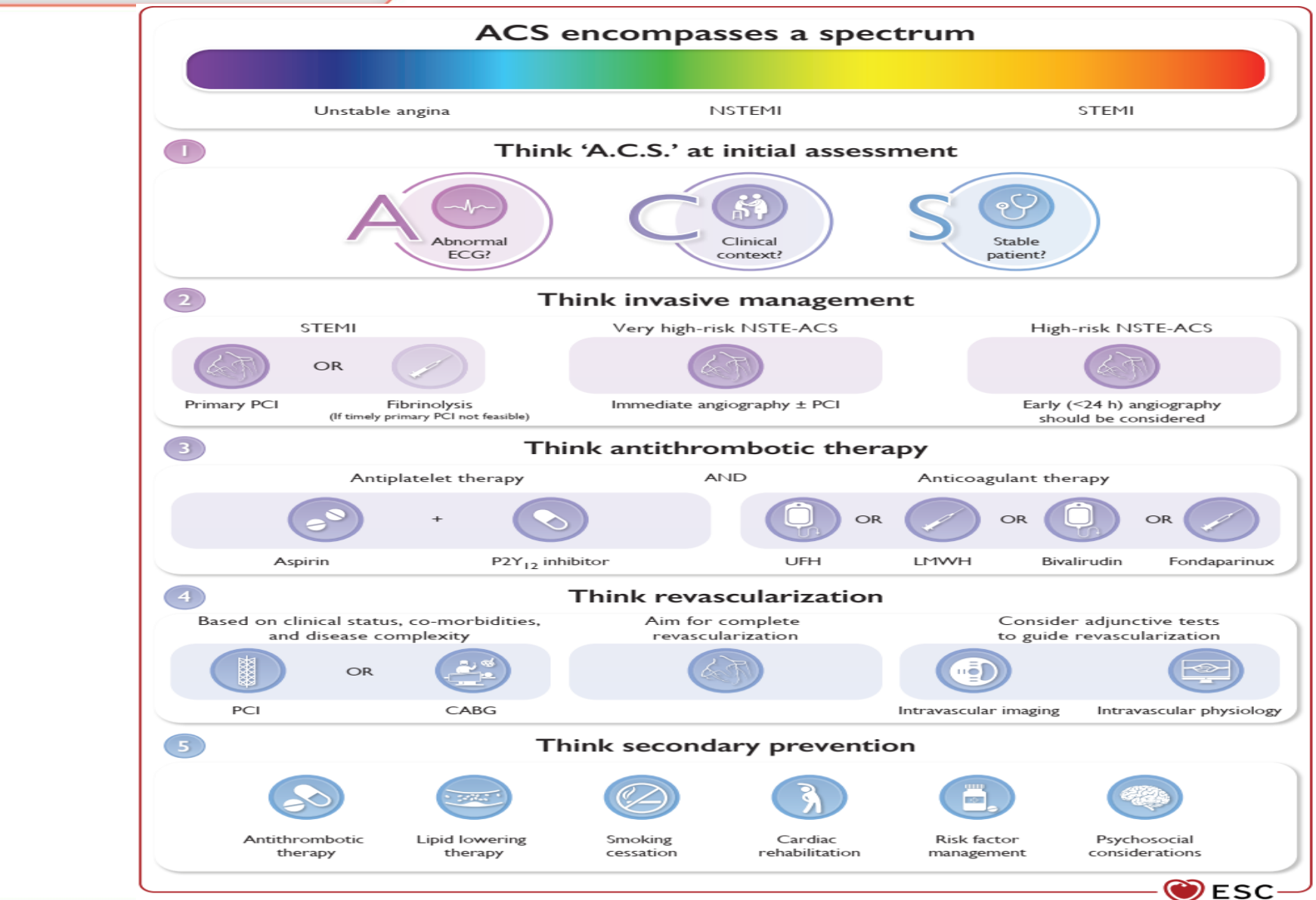
thc.tums.ac.ir
12th
Annual Tehran Heart Center Congress
7th CRITICAL CARDIOVASCULAR CARE
دوازدهمین کنگره سالیانه مرکز قلب تهران
2025
۲۵ و ۲۶ بهمن ماه ۱۴۰۳
13 & 14 February
Tehran Heart Center
Tehran, Iran

Deferred Stenting After MI

By: Saeed Nourian

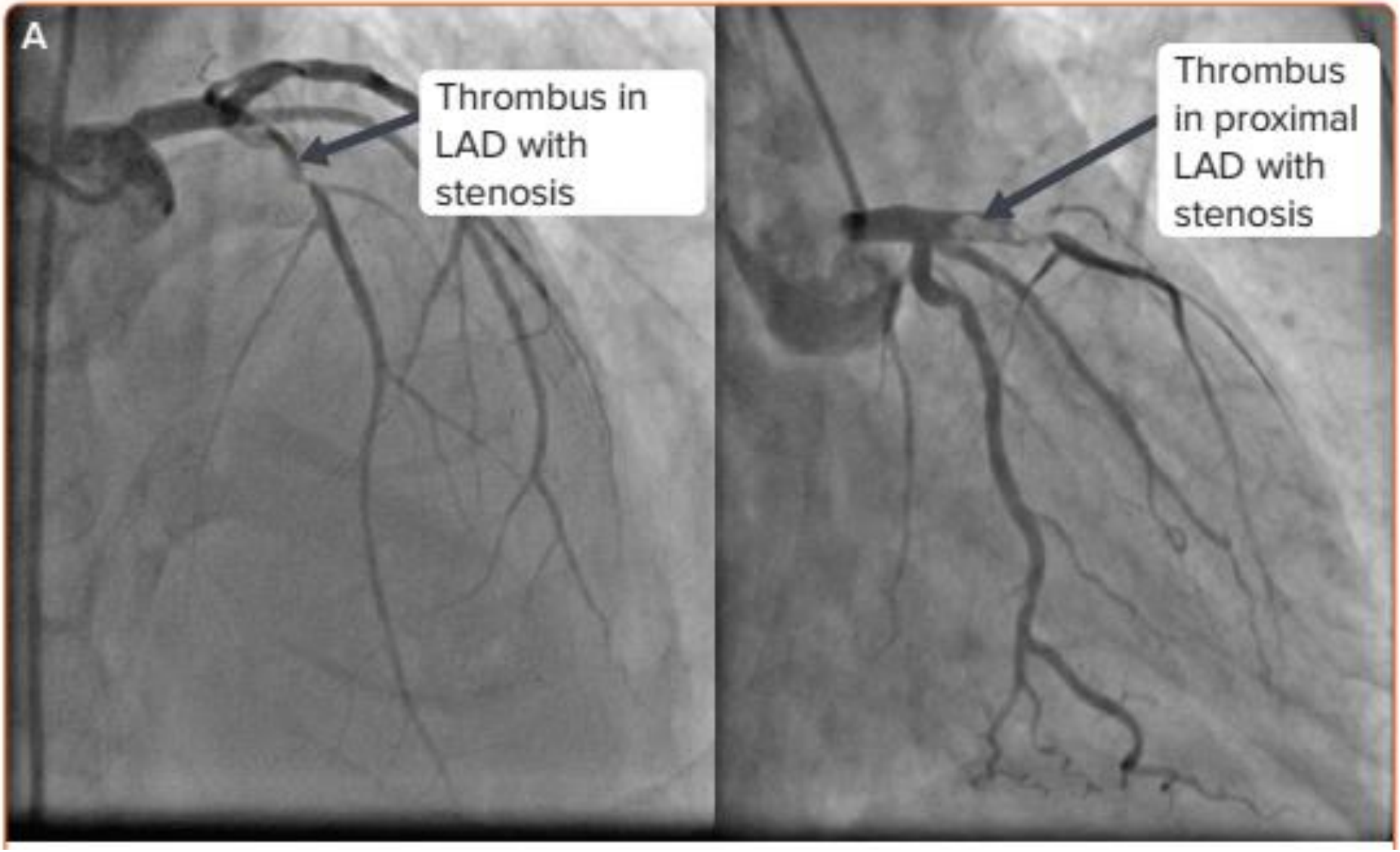
Endovascularist and Phlebologist

Assistant Professor of Iran UMS, Firoozgar Hospital

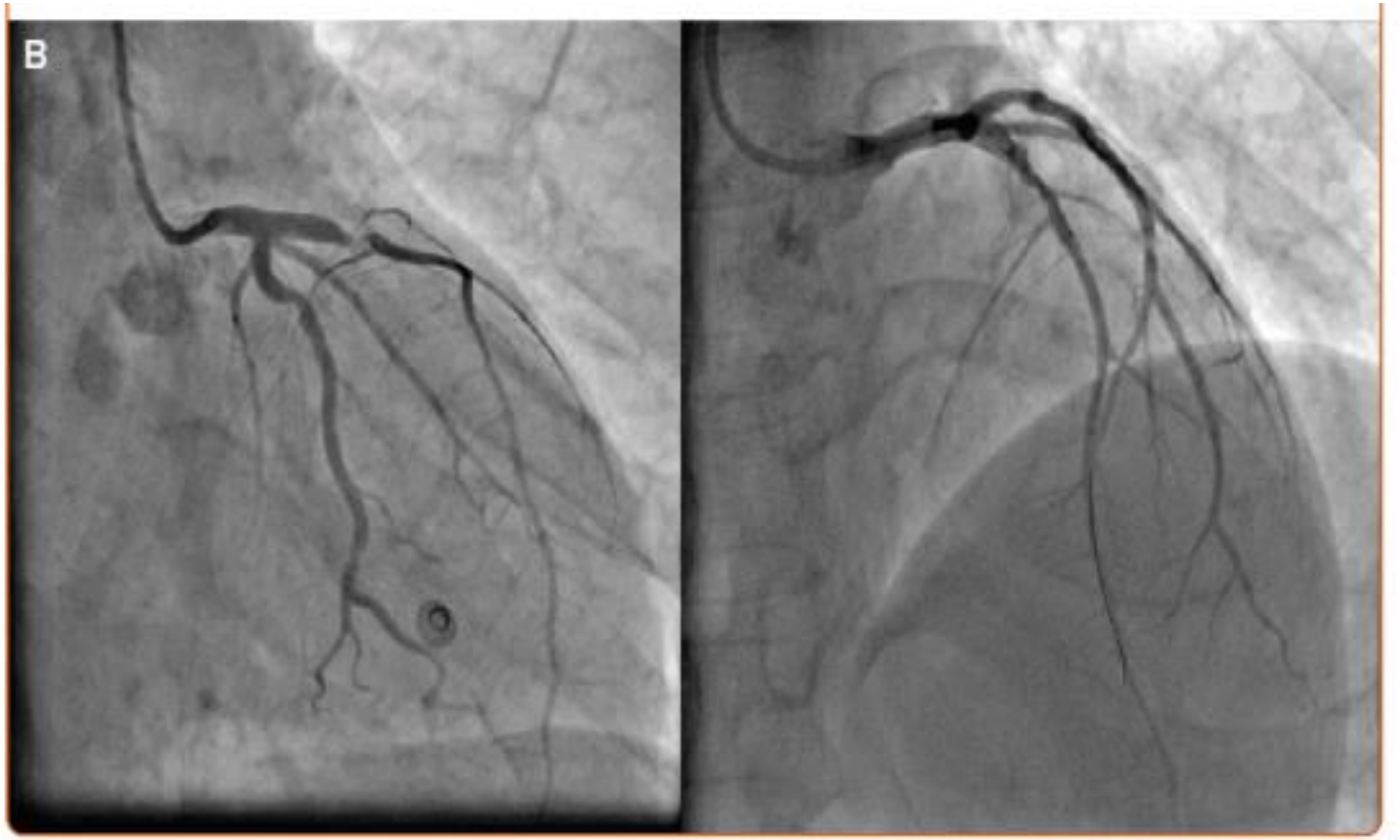

ACS encompasses a spectrum
Unstable angina
NSTEMI
STEMI
1
Think 'A.C.S.' at initial assessment
A
Abnormal ECG?
C
Clinical context?
S
Stable patient?
2
Think invasive management
STEMI
OR
Primary PCI
Fibrinolysis
(If timely primary PCI not feasible)
Very high-risk NSTE-ACS
Immediate angiography ± PCI
High-risk NSTE-ACS
Early (<24 h) angiography should be considered
3
Think antithrombotic therapy
Antiplatelet therapy
AND
Anticoagulant therapy
+
OR
OR
OR
Aspirin
P2Y12 inhibitor
UFH
LMWH
Bivalirudin
Fondaparinux
4
Think revascularization
Based on clinical status, co-morbidities, and disease complexity
Aim for complete revascularization
Consider adjunctive tests to guide revascularization
OR
PCI
CABG
Intravascular imaging
Intravascular physiology
5
Think secondary prevention
Antithrombotic therapy
Lipid lowering therapy
Smoking cessation
Cardiac rehabilitation
Risk factor management
Psychosocial considerations
ESC

Case Vignette

- A 45-year-old man presented to ED
- Acute anterior-wall MI of 8 hours duration
- HTN & C/S
- CAG showed a significant stenosis with grade IV thrombus in proximal LAD with TIMI 2 flow


A
Thrombus in LAD with stenosis
Thrombus in proximal LAD with stenosis

- Due to high thrombus burden, stenting was deferred and the patient was put on IV eptifibatide infusion for 18 hours followed by subcutaneous LMWH twice daily.
- Rescue PCI was planned in case the patient developed chest pain.
- After 5 days, his angiogram showed moderate stenosis and the thrombus in LAD was almost absent with improved TIMI 3 flow.


B

Introduction and Definition

- Deferred stenting is a strategy that aims to postpone stent placement for a fixed time window after stable distal flow has been achieved.
- Other terminology used in the literature for a procrastinated stenting approach include **delayed** PCI and **secondary** PCI.

Continue…

- In a fraction of patients reduced coronary blood flow (slow flow or no reflow) is seen despite epicardial vessel patency with PCI, and this is associated with a worse prognosis.
- Distal migration of thrombus and atherosclerotic debris are important contributors to interventional slow flow/no reflow.

Continue…

- Presence of residual thrombus even after manual aspiration is one of the pitfalls and it predicts poor outcomes.
- Thrombus grading on angiography is done by the Gibson's angiographic score/TIMI criteria.
- A thrombus grade higher than 3 is usually considered as high thrombus burden.

Table 1: Thrombolysis in MI Grading for Thrombus Burden

Grade	Characteristics
0	No angiographic evidence of thrombus
1	Possible thrombus: reduced contrast density or haziness, irregular lesion contour, a smooth convex meniscus at the site of a total occlusion suggestive but not diagnostic of thrombus
2	Definite thrombus, with greatest dimensions ≤1/2 the vessel diameter
3	Definite thrombus, with greatest linear dimension >1/2 but <2 vessel diameters
4	Definite thrombus, with the largest dimension ≥2 vessel diameters
5	Total thrombotic occlusion

Source: Gibson et al. 2001.[6]

Continue…

- This time of deferment has multiple benefits:
  - Gradual clearing of the thrombus,
  - Improvement of microvascular flow,
  - Reduction of vasospasm
  - Prevention of distal embolisation,
  - Avoidance of slow flow/no reflow
  - Attenuated periprocedural MIs.
- Indeed, data suggests the coexistence of thrombus and spasm and hence a deferred strategy can lead to better stent selection (large and short stents).

Approach

- There is a possible risk of reocclusion during the waiting period which can be mitigated by parenteral anticoagulants and GP IIb/IIIa inhibitors.
- A rescue PCI should be considered if necessary.
- A prolonged systemic anticoagulation can increase the risk of bleeding which can be detrimental.
- However, the use of the CRUSADE bleeding risk score can help to assess the baseline bleeding risk of the patient.

Predictor	Score
Baseline haematocrit, %	
<31	9
31–33.9	7
34–36.9	3
37–39.9	2
≥40	0
Creatinine clearance,[a] mL/min	
≤15	39
>15–30	35
>30–60	28
>60–90	17
>90–120	7
>120	0
Heart rate (b.p.m.)	
≤70	0
71–80	1
81–90	3
91–100	6
101–110	8
111–120	10
≥121	11
Sex	
Male	0
Female	8
Signs of CHF at presentation	
No	0
Yes	7
Prior vascular disease[b]	
No	0
Yes	6
Diabetes mellitus	
No	0
Yes	6
Systolic blood pressure, mmHg	
≤90	10
91–100	8
101–120	5
121–180	1
181–200	3
≥201	5

Used with permission of *Circulation* 2009.
CRUSADE = Can Rapid risk stratification of Unstable angina patients Suppress ADverse outcomes with Early implementation of the ACC/AHA guidelines

Continue…

- Scores <20 indicate a very low risk of in-hospital bleeding.
- Score >20 the use of GP IIb/IIIa inhibitor infusion should be avoided.
- Score >50 are at a very high risk of bleeding and the duration of LMWH duration should be reduced to 72 hours instead of the standard proposed duration of 5–7 days.

Continue…

- Minimally invasive mechanical intervention (MIMI) is an adjuvant technique during primary PCI before deferring stent placement in arteries with TIMI 0–1 flow.
- The strategy entails the use of a guidewire, an undersized balloon catheter and thrombus aspiration to establish distal coronary flow.
- The aim is to restore the flow with minimal forward propagation of thrombus.

Review of Literatures…

- Predictors of greater benefit from deferred stenting
  - Male sex,
  - younger age,
  - larger size of culprit artery
  - higher thrombus burden at baseline
- In a Danish pilot study, the need for subsequent stenting was reduced by 38% without any risk of reocclusion at 3 months with a deferred strategy.
- In Ke et al., subsequent stents were avoided in 23% of patients.

Continue…

- In a French study, Souteyrand et al. used OCT to guide deferred stenting.
- The study tested the safety of three different strategies – acute (<2 days), early (up to 7 days) and late deferral (up to 1 month) in the setting of STEMI with large thrombus burden on angiogram.
- There were no MACE recorded between initial and final procedure.
- The thrombus presence as assessed by OCT continued to diminish from acute phase (94.1%) to early phase (78%) to late phase (32%).
- This study demonstrated that OCT-guided postponement of stent implantation led to good procedural outcomes with 100% success and alleviation of no-reflow events.

Continue…

- The SUPER-MIMI study tested a longer deferral time of 7 days in 155 patients with STEMI.
  - There was an improvement in TIMI flow,
  - Decrease in thrombus burden
  - Stenosis severity diminished.
- More importantly, stenting was also avoided in 38% cases with a minimal chance of reocclusion (1.3%).

Continue…

- In the DEFER-STEMI study, patients were randomized to either conventional stenting or deferred stenting.
- Patients with STEMI along with angiographic or clinical features for risk of slow flow/no reflow were enrolled for the study.
- There was significant reduction in incidence of the primary endpoints in the deferred group.
  - Slow flow/no reflow
  - There were also fewer thrombotic events
  - Final TIMI flow was higher.
  - higher salvaged myocardium on CMR

Continue…

- On the contrary, the DANAMI 3-DEFER trial **failed** to show any benefit of deferred stenting on **clinical outcomes**.
- About 1,200 patients were randomised to a deferred stent strategy versus an immediate stenting technique.
- There was no significant difference in the primary outcome
- In addition, there was a slightly higher, although not significant, chance of reocclusion rates (2%) in the deferred stenting group.
- However, there was an insignificant improvement in LVEF in the deferred stenting group.
- An MRI sub-study also failed to find any benefit on myocardial infarct size, microvascular obstruction and myocardial salvage index.
- **However, in patients with lesion length/stent >24 mm, the deferred strategy significantly reduced infarct size.**

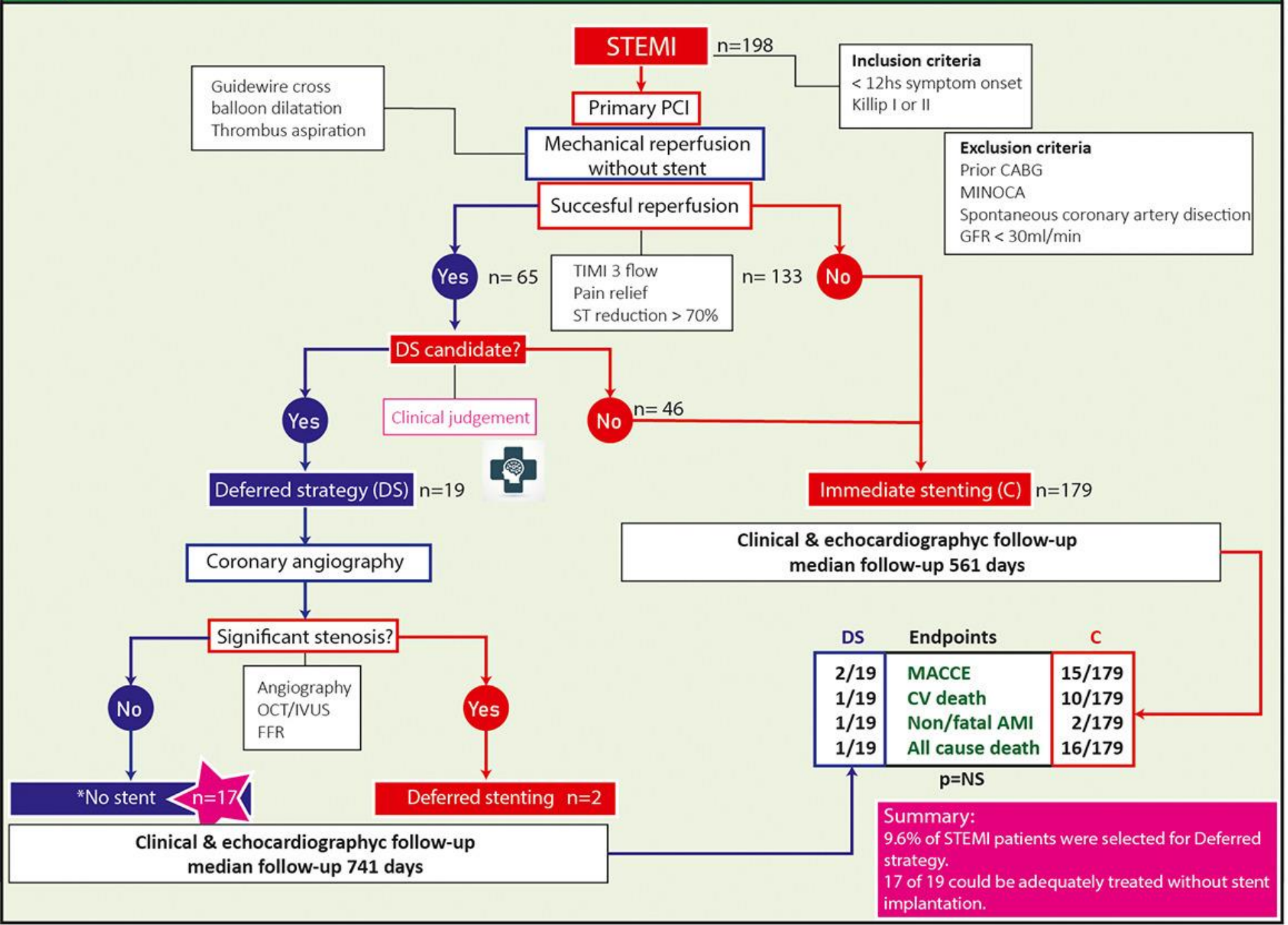
Continue…

- Why are there contrasting results from two large RCTs on deferred PCI?
  - First, the DEFER STEMI enrolled patients at high risk of slow flow based on clinical angiographic features, whereas DANAMI 3-DEFER was an all-comer primary PCI study. A deferral strategy should only be applied after careful angiographic selection.
  - Second, DEFER STEMI was an angiographic and MRI endpoint study whereas DANAMI 3-DEFER looked at clinical outcomes. We know that clinical outcomes are affected by many variables and imaging features are only one of the facets.
  - Third, DANAMI 3-DEFER was a larger, multicentre, randomised study, in contrast to DEFER, which was a small, single-centre, proof of concept study.
  - Fourth, the use of GPIIb/IIIa inhibitors in DANAMI 3-DEFER was significantly lower compared to DEFER STEMI.

Continue…

- The INNOVATION study did not find any merit in a routine defer strategy during primary PCI at two centres in South Korea.
- In the subset of anterior infarction, the primary endpoint – infarct size and microvascular obstruction – was significantly attenuated.

Graphical abstract

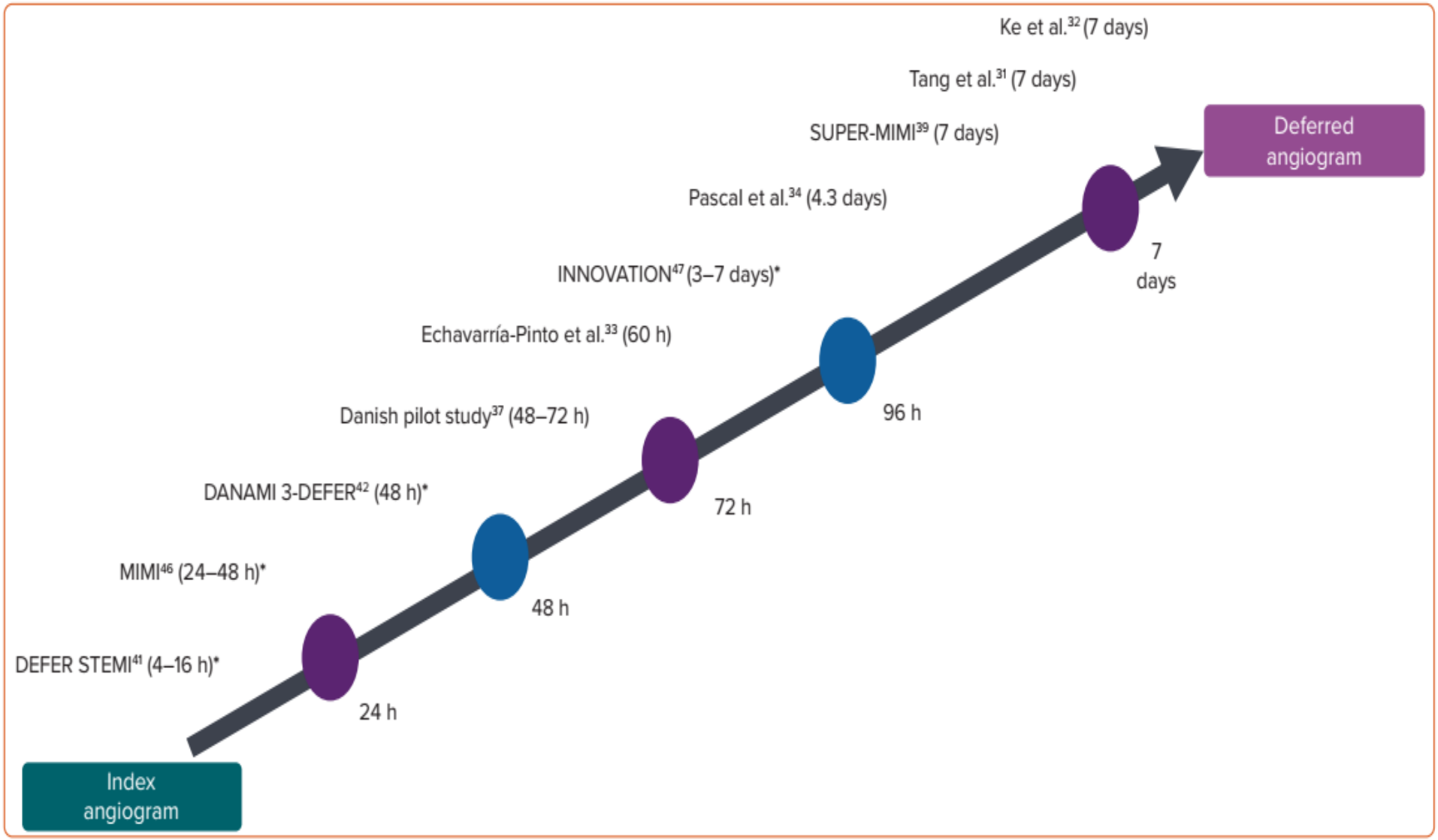


Continue…

- The DS group showed:
  - Significantly lower rate of stent implantation and a
  - Higher use of thrombus aspiration and
  - Higher use of GP IIb/IIIa inhibitors.
- No significant differences were observed between the groups in terms of all-cause mortality or MACCE.

Continue…

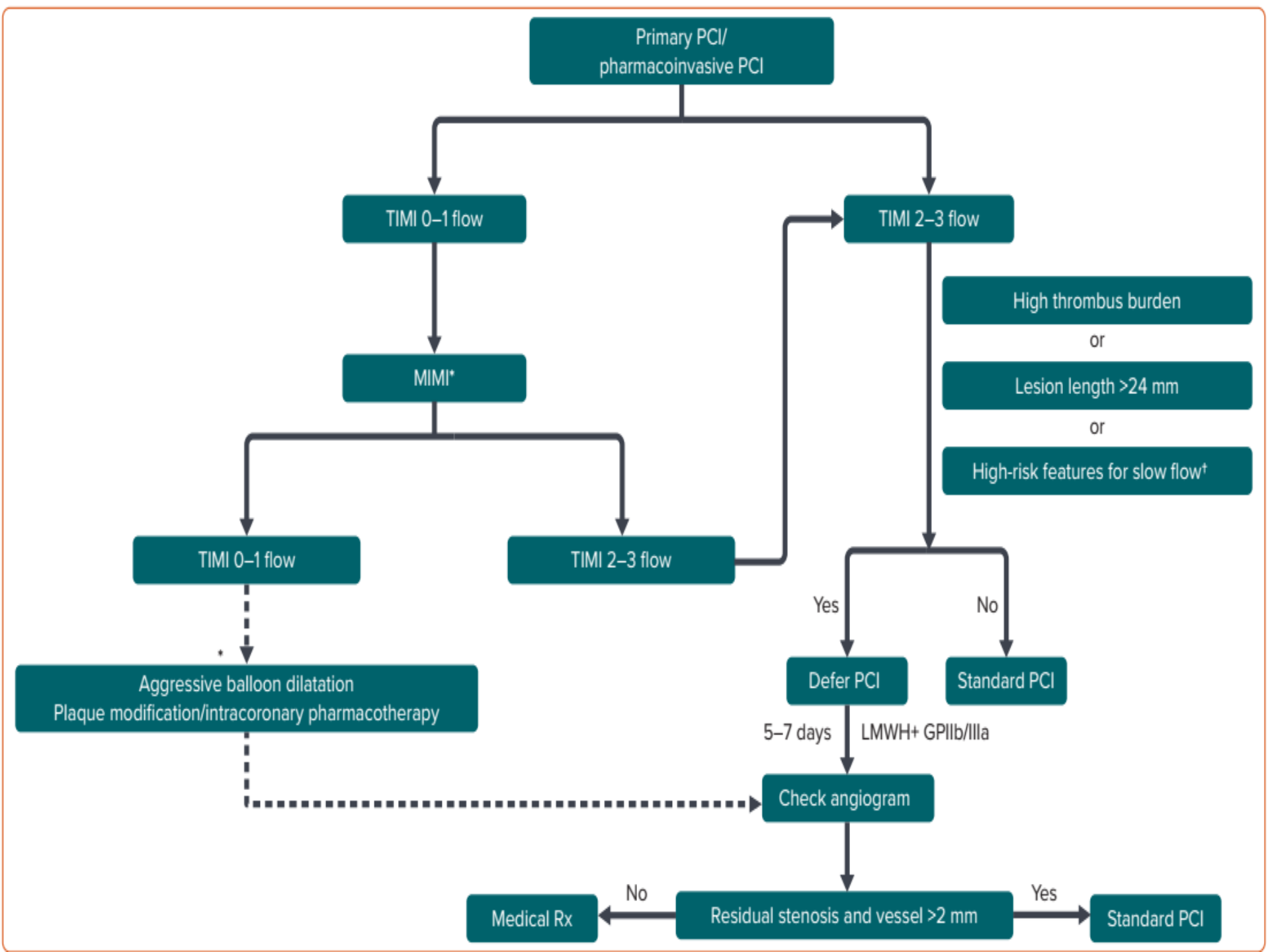
- A meta-analysis by Freixa et al., which encompasses six studies, 283 patients:
  - Three coronary reocclusions occurring
  - Improved left ventricular function
  - Lower MACE rate.
- Subsequently, Qiao et al. in their meta-analyses of nine studies found:
  - No difference in incidence of slow flow/no reflow
  - Improvement in LVEF in the long term
  - No difference in MACE.

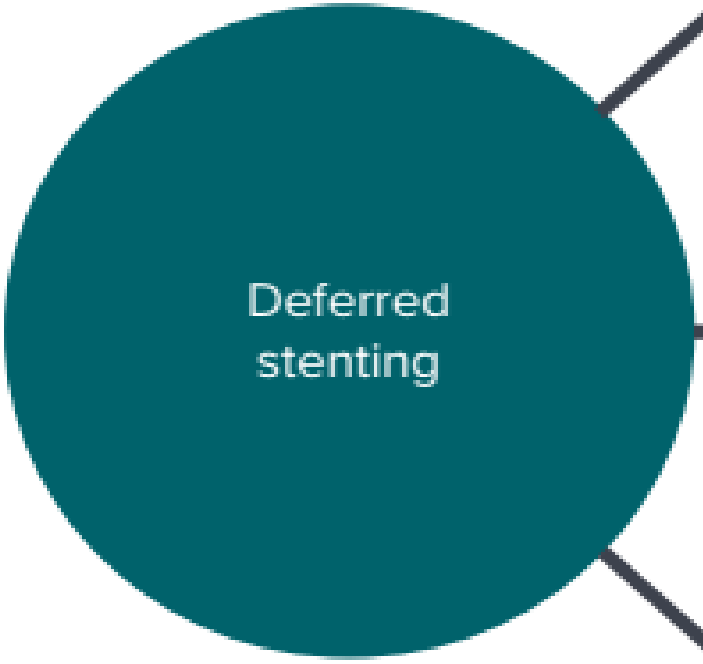


*Randomised trials

What Should Be the Ideal Deferral Time?

- A 7-day deferral is plausible with additional thrombus attenuation and improved periprocedural advantages though only a minority of RCTs enrolled such patients.
- Administer IV GPIIb/IIIa inhibitor for 12–16 hours after the procedure followed by low molecular weight heparin for 5–7 days or until the next angiogram depending upon the baseline CRUSADE score.
- In patients with a CRUSADE score >20, the GP IIb/IIIa infusion is avoided and only intracoronary bolus is provided.
- For those at score >50, the duration of heparin is also reduced.


Primary PCI/
pharmacoinvasive PCI
TIMI 0–1 flow
TIMI 2–3 flow
MIMI*
High thrombus burden
or
Lesion length >24 mm
or
High-risk features for slow flow†
TIMI 0–1 flow
TIMI 2–3 flow
Yes
No
Aggressive balloon dilatation
Plaque modification/intracoronary pharmacotherapy
Defer PCI
Standard PCI
5–7 days
LMWH+ GPIIb/IIIa
Check angiogram
No
Yes
Medical Rx
Residual stenosis and vessel >2 mm
Standard PCI



Disadvantages

- Reocclusion
- Unplanned revascularisation
- Increase bleeding from extended parenteral anticoagulation
- Increased medical expenses

Problems with immediate stenting

- Increased slow flow/no reflow
- Increased stent thrombosis
- Late stent malapposition
- Smaller stent sizes due to vasospasm

Advantages

- Low thrombus burden
- Decreased periprocedural MI
- Improved thrombolysis in MI flow
- Slow flow/no reflow prevented
- Larger stent size
- Lesser number of stents implantation
- Smaller infarct size

Future Directions

- INNOVATIONCORE (NCT03744000): 2024

To evaluate the impact of deferred versus immediate stenting in patients with acute ST-segment elevation anterior wall myocardial infarction (STEMI)

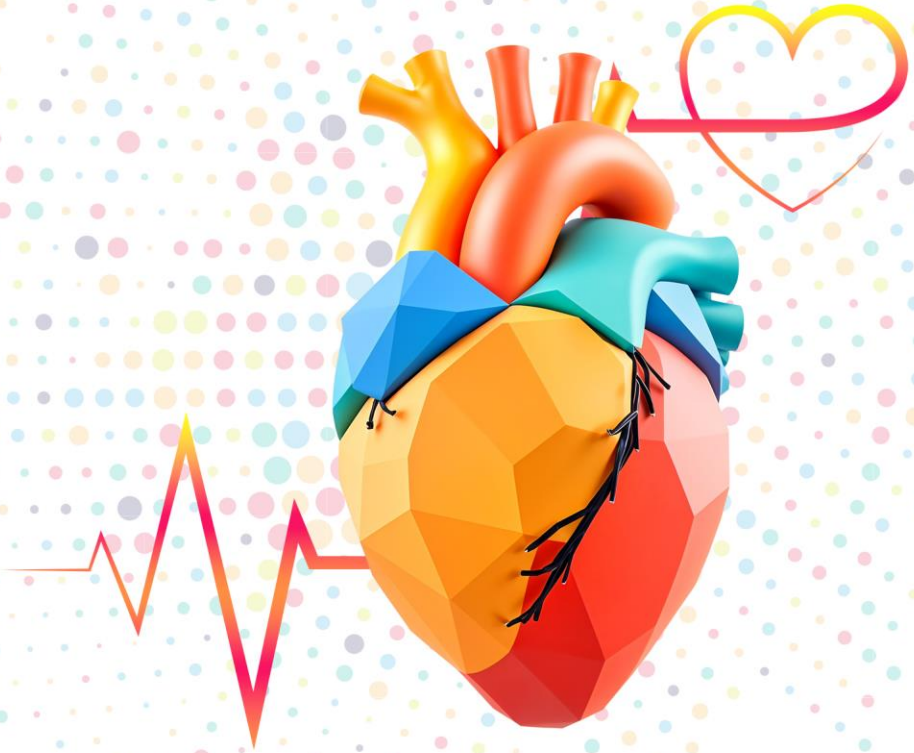
- OPTIMAL(NCT03282773): 2022

The OPTIMAL study is designed to compare the clinical performance of deferred stenting with that of immediate stenting for AMI caused by left main coronary artery occlusion.

مرکز قلب تهران

دانشگاه علوم پزشکی و خدمات
بهداشتی درمانی تهران

Critical Cardiovascular Care



thc.tums.ac.ir