

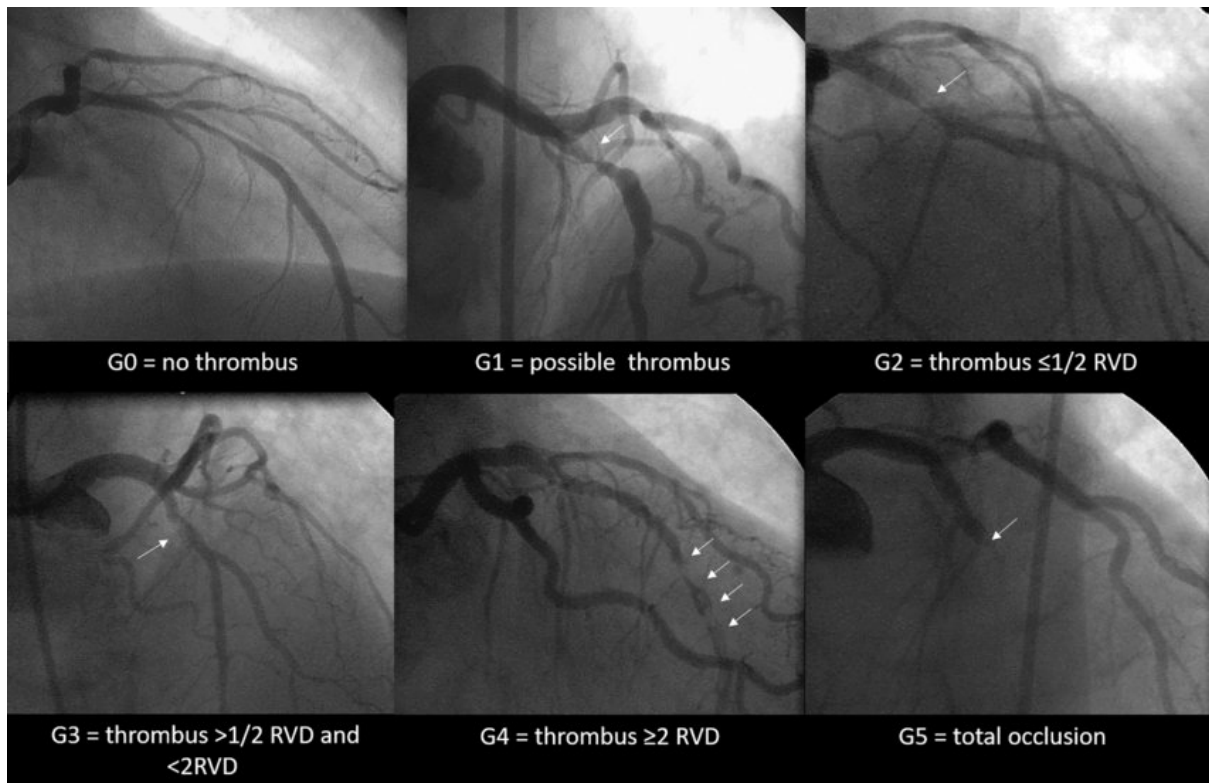
CORONARY THROMBUS ASPIRATION IN ACUTE CORONARY SYNDROMES

Abstract

Coronary thrombus aspiration during percutaneous coronary intervention (PCI) has been evaluated in numerous studies to determine its effectiveness and safety in patients with acute coronary syndromes, particularly ST-segment elevation myocardial infarction (STEMI). Although thrombus aspiration can improve immediate procedural outcomes by reducing thrombus burden, it does not consistently improve long-term cardiovascular outcomes and is associated with an increased risk of stroke. Consequently, major cardiovascular guidelines generally recommend against routine thrombus aspiration.

Classification of Coronary Thrombus

Grade	Description	Angiographic Features	Clinical Implications
0	No Thrombus Visible	Clear coronary arteries without any visible thrombus	Thrombus aspiration generally not indicated
I	Possible Thrombus	Hazy or irregular lesion without definite thrombus	Aspiration may not be beneficial; further diagnostic evaluation recommended
II	Definite Thrombus, $\leq 0.5x$ vessel diameter	Small, well-defined thrombus	Aspiration might be considered; low thrombus burden
III	Definite Thrombus, $>0.5x$ vessel diameter	Large thrombus occupying more than half the vessel diameter	Aspiration recommended if associated with significant flow impairment
IV	Occlusive Thrombus	Complete vessel occlusion due to thrombus	Aspiration strongly considered to restore flow, especially in STEMI
V	Old, Organized Thrombus	Angiographic characteristics of older, fibrotic thrombus	Aspiration less likely to be successful; mechanical intervention or surgery might be required



Additional Notes:

- **Grade I and II thrombi** often represent situations where pharmacological therapy with antiplatelet and anticoagulant agents may suffice, reserving mechanical interventions for failure of medical management.
- **Grade III and IV thrombi** are typically where thrombus aspiration can be most beneficial, especially when combined with stenting and post-dilation to ensure adequate myocardial perfusion.
- **Grade V thrombi** are challenging due to their older, more organized nature, which makes them resistant to both pharmacological and mechanical interventions.

Procedural Details

Thrombus aspiration during PCI is performed using a catheter specifically designed to extract thrombus from the coronary arteries. The procedure typically follows these steps:

1. **Access:** Vascular access is obtained, commonly via the radial or femoral artery.
2. **Catheter Placement:** A guide catheter is introduced to the site of the occlusion under fluoroscopic guidance.
3. **Thrombus Aspiration:** An aspiration catheter is advanced through the guide catheter to the thrombus site. The operator then manually aspirates the thrombus by applying suction to the catheter.

4. **Assessment:** After aspiration, angiography is performed to assess flow improvement and ensure no significant residual thrombus is left that might impede flow or cause distal embolization.
5. **Additional Interventions:** Depending on the angiographic result, further interventions such as balloon angioplasty or stent placement may be required to optimize blood flow and support the vessel.

Complications

While thrombus aspiration can be beneficial in selected cases, it carries risks and potential complications, which include:

1. **Vascular Injury:** The catheter can cause damage to the vessel wall, leading to dissections or perforations.
2. **Distal Embolization:** Paradoxically, the procedure intended to prevent distal embolization can itself cause embolization of thrombotic material, leading to new occlusions downstream.
3. **No-Reflow Phenomenon:** Despite successful removal of the thrombus, some patients may experience insufficient reperfusion due to microvascular damage or persistent blockage.
4. **Stroke:** Aspiration can dislodge material that may travel to the cerebral circulation, leading to ischemic strokes.
5. **Bleeding and Access Site Complications:** These are common with any invasive cardiovascular procedure, especially if anticoagulation or antiplatelet therapies are used aggressively.

Indications for Thrombus Aspiration

Patient Condition	Indication for Thrombus Aspiration	Guideline Recommendation	Level of Evidence
STEMI with Visible High Thrombus Burden	Considered in cases where the thrombus burden is likely to impede stent delivery or result in significant distal embolization	Class IIb (Selective Use)	C-LD
STEMI without High Thrombus Burden	Not recommended due to lack of demonstrated benefit on mortality and increased risk of stroke	Class III (No Benefit)	A
Non-STEMI with Thrombus-Containing Lesions	Not recommended as routine practice; may be considered on a case-by-case basis in specific clinical scenarios	Class III (No Benefit)	A
Unstable Angina with Thrombus-Containing Lesions	Generally not recommended; limited data available	No specific recommendations	-
Failed Initial PCI Attempt due to Thrombus	May be considered as a bailout strategy to achieve reperfusion if initial PCI does not improve flow due to obstructive thrombus	Class IIb (Selective/Bailout Use)	C-LD

Results from Major Trials and Meta-Analyses

1. **TAPAS, TASTE, and TOTAL Trials:** These trials indicated no significant benefit in reducing death or major adverse cardiovascular events (MACE) from routine thrombus aspiration in STEMI patients, with some trials suggesting an increased risk of stroke.
2. **Patient-level Meta-analysis:** A comprehensive analysis found no overall benefit in clinical outcomes with routine thrombectomy, although subgroups with high thrombus burden showed a potential reduction in cardiovascular death at the cost of increased stroke risk.

Guideline Recommendations

- **American College of Cardiology/American Heart Association (ACC/AHA):**
 - **STEMI:** Class III (no benefit) for routine aspiration.
 - **Selective Use:** Class IIb; not well established.
- **European Society of Cardiology (ESC):** Similar recommendations, emphasizing no routine use.
- **Japanese Cardiological Society:** Offers a more lenient recommendation for selective use in primary PCI.



Table 1: Summary of Guideline Recommendations

Condition	Guideline	Recommendation	Class of Recommendation	Level of Evidence
STEMI	ACC/AHA, ESC, JCS	Routine aspiration not recommended	III	A
Non-STEMI and Unstable Angina	No specific recommendations	-	-	-

Conclusions

Thrombus aspiration should not be performed routinely in patients undergoing PCI for STEMI due to lack of mortality benefit and increased stroke risk. Selective use may be considered in high thrombus burden cases, but careful patient selection and technique are critical to avoid adverse outcomes.

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