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Commentary

Should Thrombus Aspiration be Routinely used in STEMI with TIMI 0 Flow?

Bambang Budiono*

Department of Heart and Vascular Center, Primaya Hospital, Makassar, Sulawesi Selatan, Indonesia

STUDY DESCRIPTION

Patients with pre-procedural TIMI flow grade 0 had a higher incidence of myocardial blush grade ≤ 1 and no reflow and had greater myocardial damage as assessed by peak creatine kinase-MB fraction value compared with those with pre-procedural TIMI flow grade 2 to 3 [1]. Several explanations may account for the potential significance of pre-procedural TIMI flow grade on clinical outcomes in patients with STEMI undergoing primary PCI. Prolonged ischemia and late reperfusion can impair endothelial function and cause myocardial tissue edema and hemorrhage. It might explain why optimal epicardial recanalization, primary angioplasty for STEMI is still associated with suboptimal reperfusion in a relatively large proportion of patients, especially with late onset [2]. Therefore, rapid restoration of the infarct-related coronary artery has become a main goal in patients with ST-segment–elevation myocardial infarction (STEMI) [3,4]. Distal embolization of atherothrombotic material during primary percutaneous coronary intervention for ST-elevation myocardial infarction is an important cause of (partly) unsuccessful reperfusion [5]. Reducing the thrombus burden by using thrombus aspiration catheter is rational concept in primary PCI. A study showed that distal embolization was associated with a 5-fold increase in 5-year mortality [6]. However, the use of routine thrombus aspiration called into a question by data indicating not only a lack of efficacy but a risk of potentially deleterious complications [7].

Intra coronary thrombus in acute STEMI may vary from minimal to high thrombus burden, which is difficult to define when encounter TIMI-0 flow. There is a suggestion to use deflated balloon to reestablish blood flow to evaluate thrombus burden, as well as length of lesion if distal to occluded segment remain unseen after wiring [8]. Balloon pre-dilatation with slow inflation time is preferred, but the risk of distal embolization which may cause Microvascular Obstruction (MVO) and associated with unfavorable outcomes should be kept in mind [9]. With this regard, routine thrombus aspiration in this specific clinical setting might be considered to reduce thrombus burden.

Two large randomized controlled trials questioned the effectiveness (TASTE trial) and the safety (TOTAL trial) of this technique [10]. Recent published data comparing the use of thrombus aspiration with standard primary angioplasty remain demonstrated no significant benefit of thrombus aspiration concerning mortality rate or any other clinical outcomes at 1-year in STEMI patients [11].

However, there are some questions arise regarding the result. Firstly, In the TASTE study, 35.5% had a thrombus burden of grade G0 or G1, in other words there was no clear angiographic evidence of thrombus in the culprit lesion [7]. In such circumstances, aspiration thrombectomy may have no value and may cause harm (e.g., vessel dissection) [12].

Secondly, In the TASTE trial, the use of balloon angioplasty before or after thrombectomy or the use of direct stenting was not described. Balloon angioplasty may cause distal embolization and microvascular obstruction leading to limit the benefit of concomitant aspiration thrombectomy [13].

Thirdly, no data about how frequent (total 'runs') of TA were done to suck out the thrombus. Given these reservations, we are very concerned that the negative results of these studies may militate against the appropriate use of thrombectomy in high-risk patients with STEMI [14,15].

Concerning the higher incidence of stroke which was reported in patients who are using thrombus aspiration, a safe technical trick should be performed apropriately. When performing aspiration thrombectomy, it is critical to monitor flow through the aspiration syringe; reduced or absent flow may indicate thrombotic obstruction in the aspiration catheter. Special care should be taken to prevent embolization: 1) insert the tip of guide catheter deeply into the coronary artery so that if thrombus dislodges from the aspiration catheter when it is withdrawn, it will not enter the aorta; 2) provide continuous suction to the aspiration catheter as it is withdrawn so that the negative pressure may avoid dislodge thrombus into the guide catheter; 3) aspirate a few CC of blood from the guide

Correspondence to: Bambang Budiono, Department of Heart and Vascular Center, Primaya Hospital, Makassar, Sulawesi Selatan, Indonesia, Email: bambangbudiono@yahoo.com

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catheter after withdrawal of the aspiration catheter to remove any thrombus in case any thrombus or debris dislodged during catheter withdrawal; and 4) flush the Tuohy connector backward after aspiration catheter withdrawal. With these efforts, potential stroke complication due to clot emboli could be avoided [16].

Ischemic time was hypothesized to be among the strongest independent correlates of thrombus architecture. Old or organized thrombus is more likely difficult to aspirate compared with young thrombus. In an attempt to enhance its effectiveness, thrombus aspiration is often coupled with glycoprotein IIb/IIIa (GP IIb/IIIa) inhibitors, although conflicting results with this strategy have been reported. However, they are unable to modify the morphologic characteristics of older thrombi which are found in nearly 50% of patients with STEMI [17]. Fibrinolytic agents, in contrast, can weaken the structure of older thrombi and therefore have the potential to facilitate manual aspiration [18]. In the case with huge residual thrombus despite the use of thrombus aspiration, when TIMI ≥ 2 flow is achieved, deffered stenting strategy to avoid microvascular obstruction is a reasonable option, despite negative result [19].

Recent decades have seen improvements in the prognosis of ST-segment Elevation Myocardial Infarction (STEMI), mainly due to generalization of primary Percutaneous Coronary Intervention (PCI) and organization of STEMI networks to provide rapid and effective care. We realize that thrombus is not the only important factor for having hazardous complication during primary PCI. Plaque composition, inflammatory response, haemorheology even spontaneous distal embolization before the PCI procedure, and many more factors may involve as a complex interplay that influence the clinical outcome. The anatomical risk of embolisation could be assessed by using thrombus aspiration in STEMI with TIMI-0 flow before deciding further therapeutic strategy. Either way, this sweet spot for comparing the effect of thrombus aspiration on myocardial microvascular perfusion using Index Microcirculatory Resistance (IMR) and Single Photon Emission Computed Tomography (SPECT) in this clinical setting is still interesting to be found.

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