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Case Report

Thrombus aspiration during primary percutaneous coronary intervention – Where are we now?

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Abstract

Introduction. thrombus aspiration is not recommended as a routine procedure considering the results of large randomised trials. It is necessary to define new indications for thrombus aspiration in myocardial infarction and to conduct appropriate trials.

The aim of this paper was to report a patient with succesfful aspiration of large thrombus mass from right coronary artery made after primary balloon angioplasty, and to consider which patients could benefit with this procedure.

Case report. a male, 80 years old, has been admitted to a catheterisation laboratory with clinical, biochemical and electrocardiographic signes of acute myocardial infarction with ST segment elevation (STEMI) of inferoposterolateral localisation along with sinus bradycardia and profound arterial hypotension, which all are characteristic for inferior myocardial wall infarction with right ventricular involvement. Two hours after pain onset the patient was admitted to hospital in Bjeljina and sent to catheterisation laborathory straight after. All branchies of left coronary artery were well visualized and without significant stenosis. Right coronary artery was occluded in proximal segment. Predilatation was performed with SC Sprinter legend 2,0x20mm balloon. After predilatation thrombus burden is still large, blood flow was slow with significante residual stenosis. Than, BMS Pro-kinetick energy 3,5x20mm stent was implanted. After stent implantation thrombus burden existed and there was no flow in PLV branch. Thrombus mass was 2 cm long and succesffully aspirated with Export aspiration catheter. Control coronarography showed no residual stenosis and normal blood flow was restored through branches of right coronary artery.

Conclusion. Procedure must be gradual, carefully planned and aspiration of thrombus should be taken only after initial balloon angioplasty with flow evaluation. Large thrombus burden or several smaller thrombi with clear flow obstruction and poor periferal flow could be the reason for aspiration of thrombus along with possible intracoronary administration of GP IIbIIIa inhibitors. If conducted cautiously, aspiration of thrombus may still be considered as a valuable techique in selected patients with a large angiographic thrombus burden.

Key words acute myocardial infarction STEMI, primary percutaneous coronary intervention, aspiration technique

Introduction

Thrombus aspiration during primary percutaneous coronary intervention (pPCI) has been used to improve myocardial perfusion through a reduction of the thrombotic burden eventually resulting with better clinical outcomes.[1,2] After the initial enthusiasm derived from the mortality reduction shown in early randomized and observational studies,[3-7] disappointing results have been yielded in more recent larger scale trials testing the routine use of thrombus aspiration in pPCI.[8-12] As a consequence, this technique has lost its initial appeal and currently is often neglected or even considered as a useless by the interventional cardiologists. The recent meta-analysis by Jolly *et al*.[13] conducted in more than 18,000 patients once again reinforces the evidence that overall there is no benefit in the routine use of thrombus aspiration during pPCI. However, it has the merit to shed light on the residual potential of this technique, which has probably been dismissed too quickly. First, there were no significant differences in the occurrence of cardiovascular events up to 1-year post-pPCI between patients treated conventionally versus those treated with routine adjunctive thrombus aspiration. Of interest, in the subgroup of patients with large angiographic thrombus burden (i.e., TIMI thrombus grade ≥3), thrombus aspiration was associated with a significant reduction in cardiovascular death [2.5 % *vs.* 3.1 %; hazard ratio 0.80, 95 % confidence interval (CI), 0.65–0.98, P=0.03]. This meta-analysis in fact assessed data from the three largest randomized trials on this topic, namely Thrombus Aspiration during Percutaneous coronary intervention in Acute myocardial infarction Study (TAPAS),[4,5] Thrombus Aspiration in ST elevation Myocardial Infarction in Scandinavia (TASTE)[8,9] and

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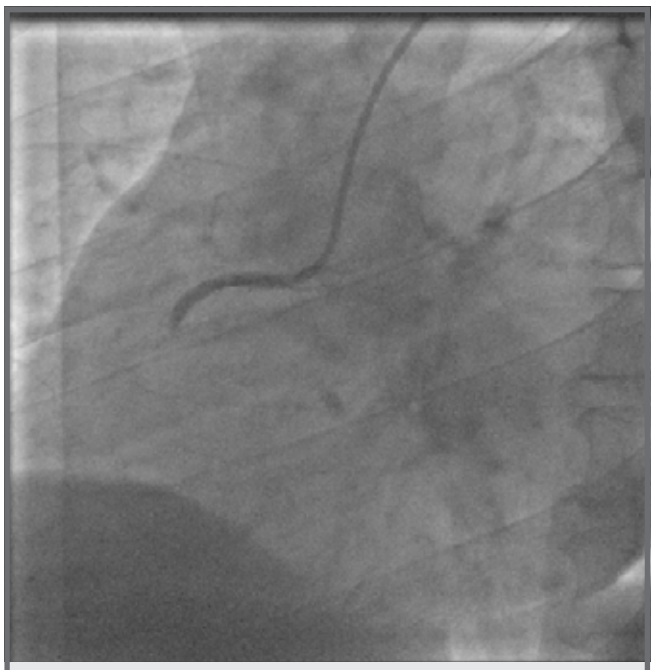

Figure 1. RCA proximally occluded

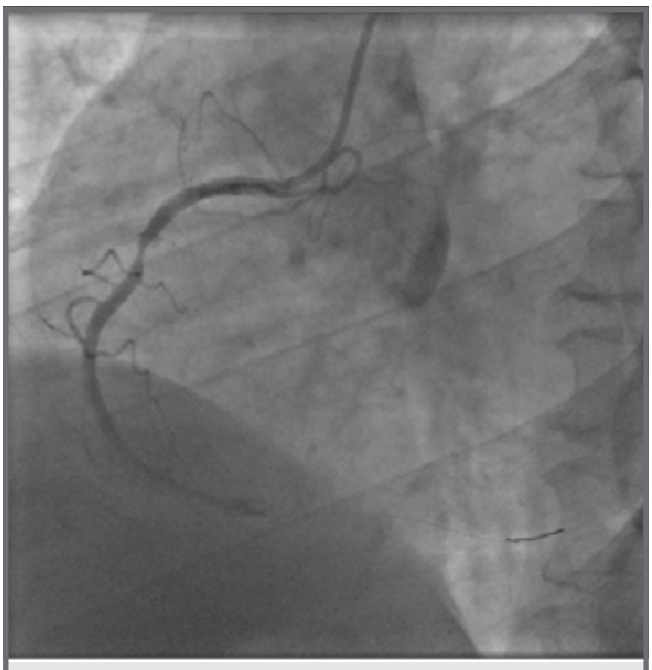

Figure 2. Recanalized RCA (BMW guidwire and predilatation balloon SC Sprinter legend 2,0x20mm insufflation to 16atm). Visible intracoronary thrombus distal in PL branch

Figure 3. Implanted stent BMS Pro kinetick energy 3.5x20mm insufflation to 16atm. Visible thrombus in the PL branch.

Figure 4. Aspirated thrombus with aspiration Export catheter

Thrombectomy with PCI versus PCI Alone in Patients with STEMI (TOTAL.)[11,12] While in TAPAS and TOTAL patients were randomized to thrombus aspiration or conventional PCI prior to coronary angiography, in TASTE the randomization was performed after angiography, potentially introducing heterogeneity in coronary anatomy between the studies. Moreover, thrombus grade was evaluated before wire crossing in TAPAS and TOTAL and after wiring in TASTE. This explains the 74 % rate of patients with thrombus grade 4 or 5 in TOTAL trial, whereas this rate was only 32 % in TASTE. Other differences might concern the data collection (e.g., cerebrovascular accidents were not recorded in TAPAS, and no distinction reported between stroke or TIA in TASTE) and adjudication of clinical endpoints (independent adjudication in TAPAS and TASTE, monitoring as part of an institutional registry in TASTE). In addition, some differences between the two pooled groups of patients are worth mentioning. First, patients treated with thrombus aspiration showed a longer interval from symptom onset to hospital arrival (190 *vs.* 185.5 min; P=0.025). While this difference might seem to be trivial, on a larger scale pain-to-needle time is still considered as one of the major determinants of prognosis in STEMI patients.[14] Furthermore, in the thrombus aspiration group a higher frequency of direct stenting (39.5 % *vs.* 21.1 %, P<0.001) and lower use of glycoprotein IIb/IIIa

inhibitors (32.3 % *vs.* 35.1 %, P<0.001) was recorded. Thrombus aspiration has been consistently shown to affect procedural strategies in terms of balloon dilatation and stent selection.[4,6,8,15,16] In particular, it is associated with higher rate of direct stenting, lower rate of post-dilatation, with the implantation of less stents but of larger size as compared with conventional PCI[15,16]. Whether these technical differences in PCI might have a substantial impact on clinical outcome is still controversial[17,18]. As to the use of glycoprotein IIb/IIIa, previous evidence suggested that thrombus aspiration is of particular benefit in patients treated with glycoprotein IIb/IIIa inhibitors.[19] Such synergistic effect was also confirmed by Pyxaras *et al*,[20] where the combination of manual thrombus aspiration with intravenous abciximab resulted into a significantly lower incidence of adverse cardiovascular events at 1 year compared with the single strategies. In a small randomized study, intracoronary applied tirofiban combined with thrombus aspiration in STEMI patients undergoing pPCI, was associated with improved angiographic and clinical outcomes compared with thrombus aspiration alone or conventional PCI.[21] Similar evidence derives from the Intracoronary Abciximab Infusion and Aspiration Thrombectomy in Patients Undergoing Percutaneous Coronary Intervention for Anterior ST Segment Elevation Myocardial Infarction (INFUSE-AMI) trial[22] that showed in a post hoc analysis how median infarct size was lowest in the intracoronary abciximab plus aspiration group.The clinical benefit shown with thrombus aspiration in terms of decreased cardiovascular death in the subgroup of patients with large angiographic thrombus burden was partly offset by an increased rate of stroke or transient ischemic attack (TIA) (0.9% *vs.* 0.5 %; odds ratio 1.56, 95 % CI, 1.02–2.42; P=0.04). The latter could be attributed to technical issues both operator- and device-related. These include catheter-induced embolization of the thrombus into the systemic vasculature, aggressive guiding catheter manipulation required to advance the aspiration catheter and displacing aortic atheroma, and longer procedure time resulting from the aspiration procedure.[23] The risk of systemic embolization can be reduced with improved technique. For instance, a thrombus that cannot be fully aspirated is at risk of fracturing and shedding fragments or entering still intact into the systemic vasculature, particularly if suction is not maintained in the aspiration catheter, and the guiding catheter is not engaged in the artery as the aspiration catheter is withdrawn.[24]

Interestingly, all three trials included in the meta-analysis only evaluated manual thrombus aspiration. While more complex (i.e., mechanical) devices might be more effective in extracting atherothrombotic particles from the coronary arteries, they are bulkier and require selected coronary anatomies. No consistent clinical benefit has been shown with these devices over PCI alone,[19] however, potential benefits from these apparently more effective thrombectomy devices need to be tested in adequately powered ad hoc prospective studies.

Case presentation

A patient, male, 80 years old, has been admitted to a laboratory for a catheterization with clinical, biochemical and ECG signs of an acute myocardial infarction without ST elevation of an inferoposterolateral region, 2 hours after the occurrence of pain with clinical signs and symptoms of heart failure. TA: 80/60mmHg, Killip IV. Non smokers, does not consume alcohol and without a disease of significance for heredity and chronicity.

Coronary angiography: LM proper deviate, direction, lumen without stenosis, is divided into LAD and LCx. LAD proper deviate, direction, lumen without stenosis. LCx proper deviate, direction, lumen without stenosis. RCA: proper deviate, proximally occluded 100% (figure 1).

pPCI RCA: we set SH guiding catheter in the RCA ostium. BMW coronary wire was placed in the periphery of the RCA. We performed predilatation occluded segment with balloon SC Sprinter legend 2,0x20 mm insufflation to 16atm, followed by establishing flow through the artery (figure 2). Implanted stents medial BMS Pro-kinetick energy 3,5x20mm insufflation to 16atm. (figure 3). On the control coronarography, a thrombus is seen in the direction of the PL branch which is successfully aspirated by the Export catheter (figure 5). Thereafter flow in all branches of TIMI III, without residual stenosis and without dissection (figure 4).

Discussion

The patient was admitted to the catheterization laboratory with clinical, biochemical and electrocardiographic signs of acute myocardial infarction with ST elevation of the inferoposterolateral region with sinus bradycardia, 2 hours after the onset of pain with clinical signs and symptoms of cardiac failure, TA: 80/60 mmHg, Killip IV. After the described intervention, the patient was hemodynamically stable, compensated with electrocardiographic signs of ischemia in inferior leads of ECG. The aim of the case is to indicate its significance in the primary PCI of acute myocardial infarction with ST elevation. Overall, the lesson derived from the meta-analysis by Jolly *et al*., and in general from the literature produced over the last 10 years and the case itself, is that performing thrombus aspiration routinely during pPCI does not result into substantial clinical benefit and in some situations, might be potentially harmful. However, thrombus aspiration if carefully performed may still be considered as a valuable technique in selected patients with large angiographic thrombotic burden.

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Sažetak

Aspiracija tromba tokom primarne perkutane koronarne intervencije - gde smo sada?

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Uvod. *Aspiracija tromba u akutnom infarktu miokarda, s obzirom na rezultate velikih randomizovanih studije se ne preporučuje kao rutinska metoda. Potrebno je definisati nove indikacije za tromboaspiraciju u infarktu miokarda i sprovesti odgovarajuće studije u tom pravcu.*
Cilj ovog rada je da se prikaže bolesnik kod koga je nakon primarne balon angioplastike urađena uspešna aspiracija velike trombne mase iz desne koronarne arterije uz razmišljanje kod koji bolesnika bi ova metoda imala koristi.
Prikaz slučaja. *Muškarac, životne dobi od 80 godina, primljen je u laboratoriju za keteterizaciju sa kliničkim, biohemijskim i elektrokardiografskim znacima infarkta miokarda sa ST elevacijom (STEMI) inferoposterolateralne lokalizacije uz sinusnu bradikardiju i tešku hipotenziju što karakteriše infarkte donjeg zida sa zahvatanjem desne komore. Dva sata nakon pojave bolova bolesnik je primljen u bolnicu u Bjeljini i odmah po prijemu je upućen u kateterizacionu salu. Sve grane leve koronarne arterije su dobro prikazane i na njima nije nađeno prisustvo značajnih stenoza. Desna koronarna arterija je bila visoko okludirana. Nakon postavljanja uvodnika u ostijum desne koronarne arterije, lako se prošlo kroz trombnu masu koronarnom BMW žicom u distalni deo arterije. Potom je učinjena predilatacija balonom SC Sprinter legend 2,0x20 mm. Nakon predilatacije, trombno opterećenje je i dalje veliko, usporen je protok kroz arteriju uz značajnu rezidualnu stenozu. Potom je proksimalno na leziju gde je najveća stenoza implantiran stent BMS Pro-kinetick energy 3,5x20 mm. Nakon implantacije stenta stenta bilo je i dalje prisutno veliko trombno opterećenje i nije bilo protoka u PLV grani, tako da je odlučeno da se uradi aspiracija tromba. Velika trombna masa dužine 2 cm je uspešno aspirirana aspiracionim Export kateterom. Na kontrolnoj koronarografiji nije bilo rezidualne stenoze uz normalan protok i kroz distalne grane desne koronarne arterije.*
Zaključak. *Procedura mora biti postupna, pažljivo planirana i da tek nakon inicijalne balon angioplastike uz procenu protoka, se treba pristupiti odluci o tromboaspiraciji. Velika trombna masa, ili više manjih trombnih masa uz jasnu obstrukciju protoka i lošiji protok na periferiji bi mogao biti razlog za trombospiraciju uz eventualnu intrakoronarnu primenu GP IIbIIIa inhibitora. Ako se pažljivo izvodi, aspiracija tromba se i dalje može smatrati dragocenom tehnikom kod odabranih pacijenata sa velikim angiografskim trombotičnim opterećenjem.*
Ključne reči: *akutni infarkt miokarda STEMI, primarna perkutana koronarna intervencija, aspiraciona tehnika*