Thrombus aspiration for treating distal coronary macroemboli during primary percutaneous coronary intervention

Trombektomia aspiracyjna w zagrażającej dystalnej makrozatorowości podczas przezskórnej interwencji wieńcowej

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Abstract

Percutaneous coronary interventions (PCI) of thrombus-containing lesions are associated with increased risk of complications such as distal coronary embolisation and impaired coronary circulation. Although the use of thrombectomy devices to aspirate thrombus during primary PCI is currently not routinely recommended, there is growing evidence suggesting the use of thrombus aspiration catheters during PCI. Here, we report the case of a 70 year-old patient undergoing thrombus aspiration therapy because of the development of coronary bifurcation macroemboli during initial phase of primary PCI. After successful thrombus aspiration therapy, dramatic improvements in both coronary flow and ST-segment resolution were achieved.

Key words: coronary emboli, myocardial infarction, thrombus aspiration

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INTRODUCTION

Primary percutaneous coronary intervention (PCI) is an effective strategy in the opening of an infarct related artery in ST-segment elevation myocardial infarction (STEMI). Despite advances in the field of adjuvant medical therapy and PCI technique, distal embolisation is frequent, and may result in obstruction of the coronary flow, with subsequent reduction in the efficacy of reperfusion.

Therefore, thrombus aspiration therapy has been proposed to remove thrombi from coronary arteries and decrease the likelihood of distal embolisation during subsequent angioplasty and stent deployment. However, embolisation may occur predominantly at the time of the insertion of guidewire or initial balloon or stent inflation. We report the case of a 70 year-old patient undergoing thrombus aspiration therapy because of the development of coronary bifurcation macroemboli during initial phase of primary PCI.

CASE REPORT

A 70 year-old woman was admitted to our emergency department with chest pain ongoing for about four hours. She described a squeezing-like pain which was radiating through her left upper arm. She had no known risk factors for coronary artery disease, except hypertension. Physical examination revealed a blood pressure of 110/60 mm Hg and a regular heart rate of 46 bpm. Her cardiac and respiratory examinations were normal. The electrocardiogram taken in the emergency room showed nodal rhythm and ST-segment elevation on inferior and right precordial leads. Initial laboratory results were notable for haemoglobin 12.8 g/dL, leukocyte count 12.000/L, platelet count 240.000/L, serum glucose 113 mg/dL, and serum creatinine 1.25 mg/dL. Levels of creatine kinase MB isoenzyme and troponin T were 28.0 U/L (upper limit 25.0 U/L) and 0.23 μg/L (upper limit 0.01 μg/L), respectively. The patient was hospitalised with a diagnosis of

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inferior STEMI and loaded with 300 mg of both acetylsalicylic acid (ASA) and clopidogrel, prior to transfer to the catheterisation room for primary PCI.

During coronary angiography, complete atrio-ventricular block developed. Therefore, a temporary transvenous pacemaker electrode catheter was introduced via the right femoral vein into the right ventricular apex. Coronary angiography revealed total occlusion of the proximal right coronary artery (RCA) (Fig. 1A), and 90% stenosis of the left anterior descending after the first diagonal branch, total occlusion of non-dominant circumflex coronary artery, and normal intermediate coronary artery. Although coronary flow of RCA was

achieved after 0.014 inch floppy guidewire insertion, significant long-segment coronary artery stenosis of proximal RCA, and also coronary bifurcation thrombus, was seen in the acute marginal branch and distal RCA (Figs. 1B, C). Therefore, we decided to perform thrombus aspiration for coronary bifurcation thrombus because of the higher thrombus burden, large amount of myocardium in jeopardy, and the possibility of the development of no-reflow. However, the thrombus aspiration catheter would not cross the proximal culprit lesion. Because of the difficulties of advancing the thrombus aspiration catheter from the culprit lesion to the distal RCA, and also the higher likelihood of coronary
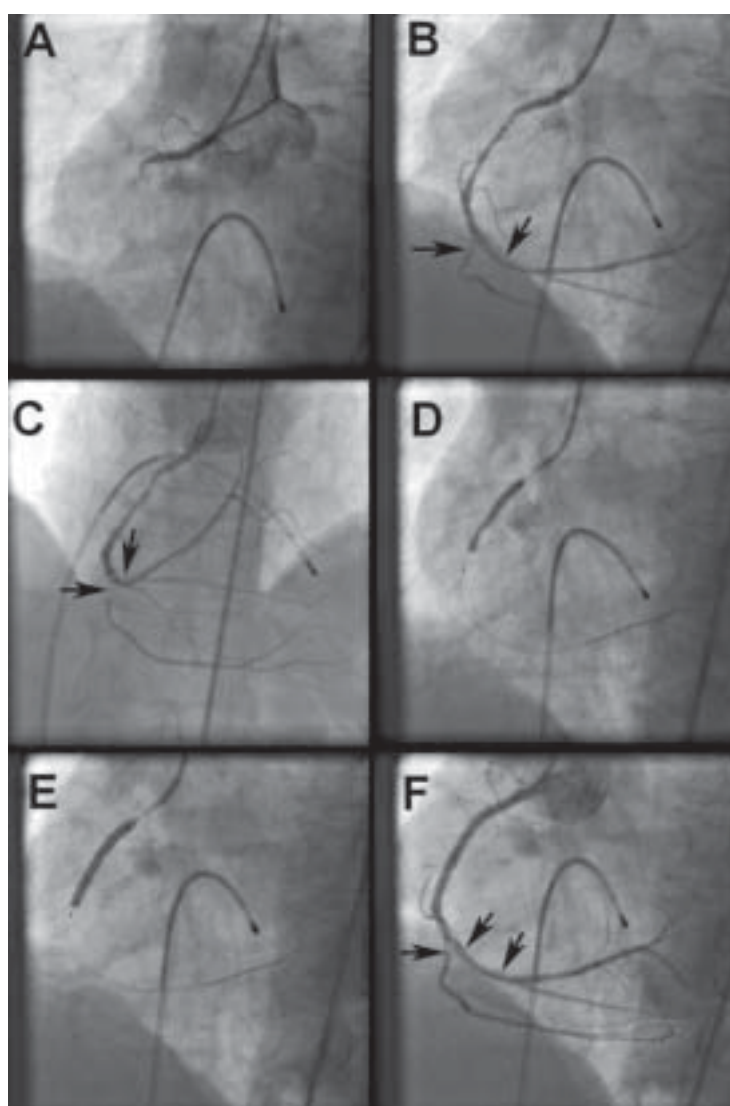
Figure 1. A. Angiographic view of the occluded right coronary artery (RCA); B. Angiographic view of the proximal long-segment coronary artery stenosis and coronary bifurcation macroemboli after insertion of the 0.014 inch floppy guidewire. Black arrows indicate coronary thrombosis of acute marginal branch and distal-RCA; C. Anteroposterior cranial angiographic view clearly demonstrates coronary bifurcation emboli. Black arrows indicate coronary thrombosis of acute marginal branch and distal-RCA; D. Angiographic view of the indentation of coronary stenosis during stent deployment; E. Resolution of indentation and successful deployment of 3.0 × 28 mm coronary stent; F. Angiographic view of the coronary flow and coronary bifurcation thrombus after stent deployment of RCA. Black arrows indicate coronary thrombosis of acute marginal branch and distal-RCA

dissection of the culprit lesion, we introduced a 3.0 × 28 mm bare-metal stent to the proximal RCA lesion without balloon predilatation (Figs. 1D–F).

After right coronary stenting, the proximal lesion was easily passed to the distal coronary artery by thrombus aspiration catheter to remove the coronary thrombus. A DIVER® thrombus aspiration catheter was employed to suck the coronary thrombus from the acute marginal branch and distal RCA (Fig. 2A). Final coronary angiography revealed no residual stenosis of RCA with TIMI III flow, and also no evidence of coronary thrombosis in either the acute marginal branch or the distal RCA with TIMI III flow (Figs. 2B, C).

After successful stent deployment of RCA and subsequent thrombus aspiration for coronary thrombus, chest pain and ST elevation on inferior leads were greatly diminished. She was followed up on medical therapy for left anterior descending and circumflex coronary artery lesions because of her inappropriate coronary anatomy for PCI and coronary bypass surgery. She was discharged five days later with a prescription of ASA 300 mg/day, clopidogrel 75 mg/day, metoprolol 25 mg/day, perindopril 5 mg/day and atorvastatin 40 mg/day.

DISCUSSION

Thrombus aspiration is a popular technique for removing thrombi from coronary arteries, especially in cases of acute coronary syndromes [1, 2]. The recently published Thrombus Aspiration during Percutaneous coronary intervention in Acute myocardial infarction Study (TAPAS), the largest randomised study of a thrombectomy device published to date, which includes 1,071 STEMI patients, has stimulated interest in this area [3]. The results of this trial demonstrated that thrombus aspiration therapy during primary PCI improved surrogate end-points, and also short-and long-term clinical end-points [3, 4]. Although there is some evidence against [5, 6], and in favour of, thrombus aspiration therapy in the setting of STEMI, based on recent large clinical studies and also meta-analyses [3, 4, 7–9], the American College of Cardiology Foundation/American Heart Association (ACC/AHA) has recommended the use of thrombus aspiration in STEMI patients with indications of Class IIa and level of evidence B [10]. However, to date, the clinical characteristics of STEMI patients that can modulate the treatment benefits of thrombus aspiration are not fully understood. Clinically, it is reasonable to assume that thrombus aspiration can be useful in STEMI patients with a large thrombus burden. Nevertheless, in the TAPAS trial, Svilaas et al. [3] concluded that thrombus aspiration can be performed in a large majority of patients with myocardial infarction, irrespective of their clinical and angiographic characteristics, such as gender, age, total ischaemic time, infarct related vessel, infarct related segment, TIMI flow grade before PCI, and presence of thrombus at baseline.
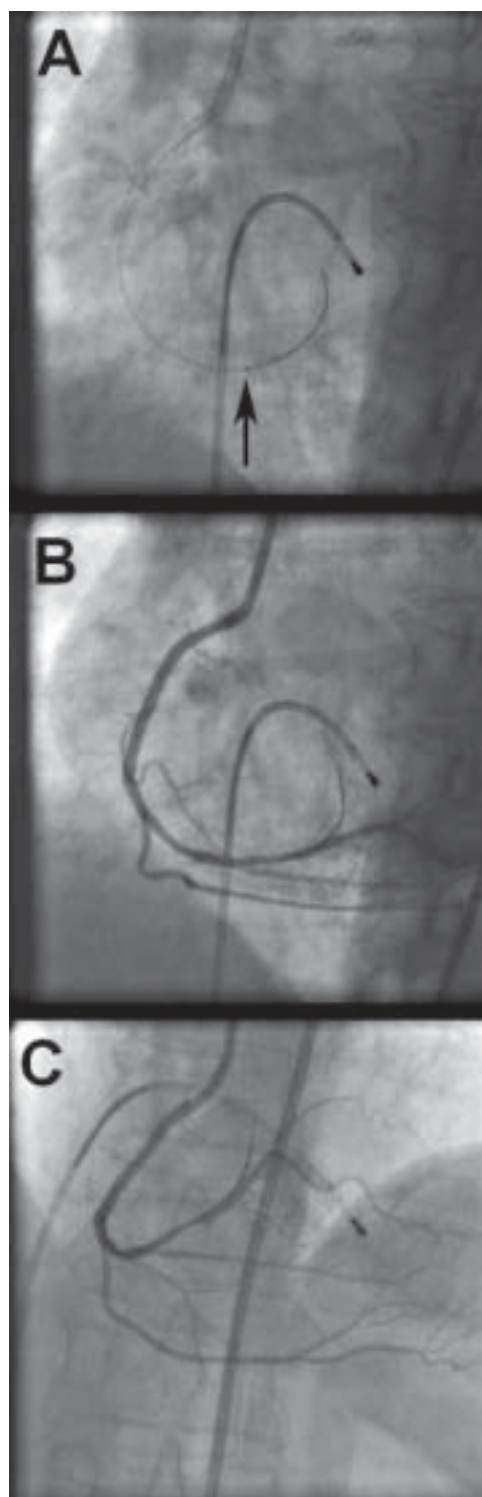
Figure 2. A. Insertion of the thrombus aspiration catheter. Black arrow indicates the tip marker of the thrombus aspiration catheter; B. Resolution of coronary thrombus after successful thrombus aspiration in cranial-right anterior oblique angiographic view; C. Final coronary angiogram demonstrates good distal coronary visualisation and no evidence of coronary bifurcation thrombus in anteroposterior cranial view

In our case report, distal macroembolisation occurred at the time of the insertion of the guidewire, and, based on the angiographic results, we decided to perform thrombus aspiration for distal coronary macroemboli because of the higher coronary thrombus burden, large amount of myocardium in jeopardy, and the possibility of the development of no-reflow. However, because of the difficulties of advancing the thrombus aspiration catheter from the culprit lesion to the distal RCA, and also the higher probability of coronary dissection of long-segment coronary artery stenosis, we decided to perform RCA stenting. After successful coronary artery stenting, the proximal lesion was easily passed to the distal coronary artery by thrombus aspiration catheter to remove the coronary thrombus.

Therefore, we believe that, pending the results of large-scale clinical trials to clarify the optimal clinical indications and applications for thrombus aspiration, treatment of these patients with thrombus aspiration should be individualised, as in our case.

CONCLUSIONS

In conclusion, distal embolisation is a frequent and cumbersome problem in STEMI patients undergoing PCI. Although thrombus aspiration therapy has been proposed to decrease the likelihood of distal embolisation during subsequent angioplasty and stent deployment, distal embolisation may also occur, predominantly during the initial phase of PCI before thrombus aspiration. Despite the use of aspiration catheters during primary PCI not being routinely recommended, it is reasonable to assume that thrombus aspiration can be useful in STEMI patients having a higher coronary thrombus burden and also distal coronary macroemboli. Considering the results of TAPAS, recent meta-analyses, and the latest recommendations of the ACC/AHA, the use of thrombus aspiration therapy might have an important role to play in improving myocardial perfusion and clinical outcomes. Additional large--scale clinical trials will further clarify the optimal clinical application for thrombus aspiration in STEMI patients.

Conflict of interest: none declared

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