

Guiding Catheter Thrombectomy During Percutaneous Coronary Interventions for Acute Coronary Syndromes

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Despite the advancements in the pharmacological and mechanical treatment of acute coronary syndromes, intracoronary thrombus and distal embolization remain among the major limitations of percutaneous transluminal coronary interventions. We describe three cases in which intragraft or intracoronary thrombus was completely aspirated during PTCI using the guiding catheter. In the first case, a 4-cm-long unfragmented embolized thrombus was effectively and completely aspirated from a saphenous vein graft, with immediate restoration of normal flow. In the second case, multiple fragments of embolized thrombus were aspirated from a large right coronary artery, while in the third case, intragraft thrombus was electively aspirated. In each case, the index lesions were then successfully stented without complications. *Cathet. Cardiovasc. Intervent.* 49:192–196, 2000. © 2000 Wiley-Liss, Inc.

Key words: coronary thrombus; thrombectomy; saphenous vein graft; stents; percutaneous transluminal coronary angioplasty; acute coronary syndromes

INTRODUCTION

Despite the advancements in the pharmacological and mechanical treatment of acute coronary syndromes, intracoronary thrombus and distal embolization remain among the major limitations of percutaneous transluminal coronary interventions [1]. Extractional atherectomy [2] and intracoronary urokinase [3,4] are two strategies that have been extensively used to treat thrombus. Direct aspiration of thrombus from native coronary arteries [5–10] and more recently the use of the Angiojet Rheolytic Thrombectomy catheter and of ultrasound thrombolysis have also been reported [11–13].

We describe here a simple modality that was successfully used to treat embolized and organized thrombus. In the first two cases, guiding catheter aspiration of large amount of embolized thrombus resulted in immediate resolution of chest pain, electrocardiographic changes, and in normalization of TIMI flow. In the third case, organized thrombus was successfully and electively aspirated from a saphenous vein graft. In each case, the index lesions were then successfully stented.

CASE REPORTS

Case 1

A 77-year-old woman with a past medical history significant for hypertension, diabetes mellitus, and 8-year status postcoronary artery bypass surgery presented to an outside hospital 24 hr from onset of symptoms with an evolving inferior wall myocardial infarction. Cardiac

catheterization revealed three-vessel disease with a patent left internal mammary artery graft to the left anterior descending artery, and patent saphenous vein grafts (SVG) to the diagonal and obtuse marginal branches. The vein graft to the right coronary artery (RCA) had a critical stenosis in the mid segment and TIMI 2 flow. The patient was referred to our institution for emergency percutaneous revascularization of the vein graft to the RCA.

At the time of arrival to the cardiac catheterization laboratory, the patient was complaining of continuing substernal chest pain. The 12-lead electrocardiogram showed an evolving inferior wall myocardial infarction. The initial CPK were 207 with an MB fraction of 16%. Bypass graft angiography revealed a subtotal occlusion in the vein graft to the RCA with a filling defect and TIMI 2 flow (Fig. 1, panels 1 and 2). The patient was pretreated with abciximab (Elli Lilly, Indianapolis, IN). An 8 Fr short-tip JR4 Brite Tip (Cordis, Miami Lakes, FL) guiding catheter was used to intubate the vein graft, and the stenosis was crossed with a 0.014" exchange length Hi Torque Floppy Wire (Advanced Cardiovascular Systems, Santa Clara, CA). A 3.0-mm Bandit balloon (Scimed,

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Received 7 April 1999; Revision accepted 9 August 1999

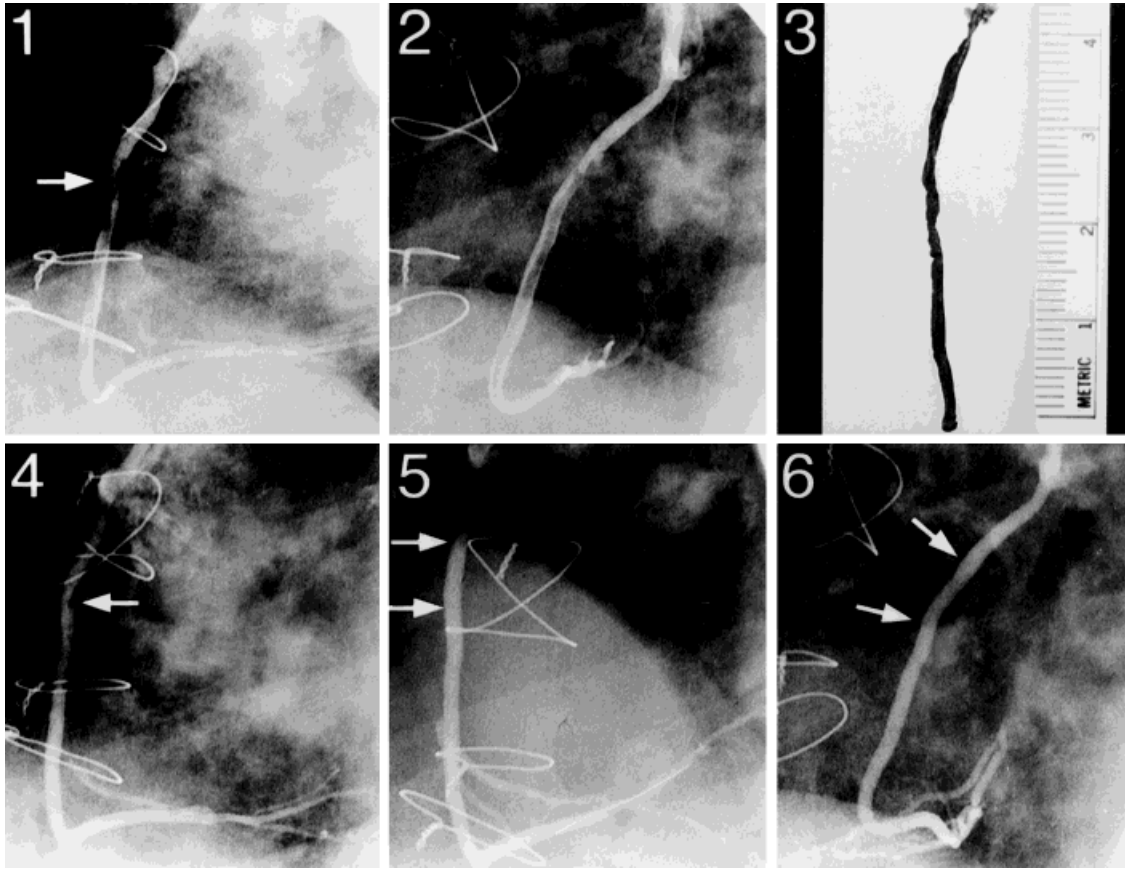


Fig. 1. Panels 1 and 2: Angiography of the SVG to the RCA in LAO projections showing a tight stenosis in the mid shaft segment of the graft with a filling defect distally. Panel 3: Aspirated thrombus from the graft, which matches the angio-

graphic filling defect. Panel 4: Angiography following aspiration of the thrombus shows no filling defect. Panels 5 and 6: LAO projections following stent deployment showing no residual stenosis and complete filling of the graft and of the RCA distally.

Maple Grove, MN) was used to dilate the stenosis at 6 atm. Following the first inflation there was worsening of chest pain associated with marked ST segment elevation in the inferior leads of the electrocardiogram. Repeat angiography revealed no flow past the midsegment. Administration of intracoronary verapamil at a dose of 200 μg did not improve flow in the graft. A Tracker perfusion catheter with sideholes (Target Therapeutics, Fremont, CA) was advanced to the mid third of the vein graft. Contrast injection through the Tracker catheter revealed a patent graft in the mid third and a distal cut-off consistent with distal embolization. The Tracker catheter was advanced further into the distal third of the graft. The guiding catheter was then slowly advanced over the Tracker catheter to the distal third of the vein graft. The Tracker catheter and the guidewire were both removed. The hub of the guiding catheter was disconnected from the Y-connector and a 60-ml luer lock syringe was attached. Maintaining constant negative suction, the guiding catheter was slowly with-

drawn from the vein graft and out of the femoral sheath. Flushing the guiding catheter revealed an intact thrombus > 4 cm long (Fig. 1, panel 3) that matched the filling defect. There was complete resolution of chest pain and electrocardiographic changes. The guiding catheter was reinserted and angiography revealed a widely patent graft with TIMI 3 flow and no evidence of filling defect (Fig. 1, panel 4). The index lesion was recrossed using a 0.014" High Torque Floppy Extra Support wire (Advanced Cardiovascular Systems) and a 3.5-mm Palmaz-Schatz coronary stent (Johnson & Johnson, NJ) was deployed at the site of the original stenosis. The stent was postdilated using a 3.5-mm NC Bandit balloon (Scimed) at 18 atm. Final angiography revealed full stent expansion, 0% residual stenosis, and TIMI 3 flow (Fig. 1, panels 5 and 6). The histopathological examination of the aspirated material revealed a predominantly platelet-rich thrombus attached to a possibly ruptured plaque with cholesterol clefts at the frayed end.

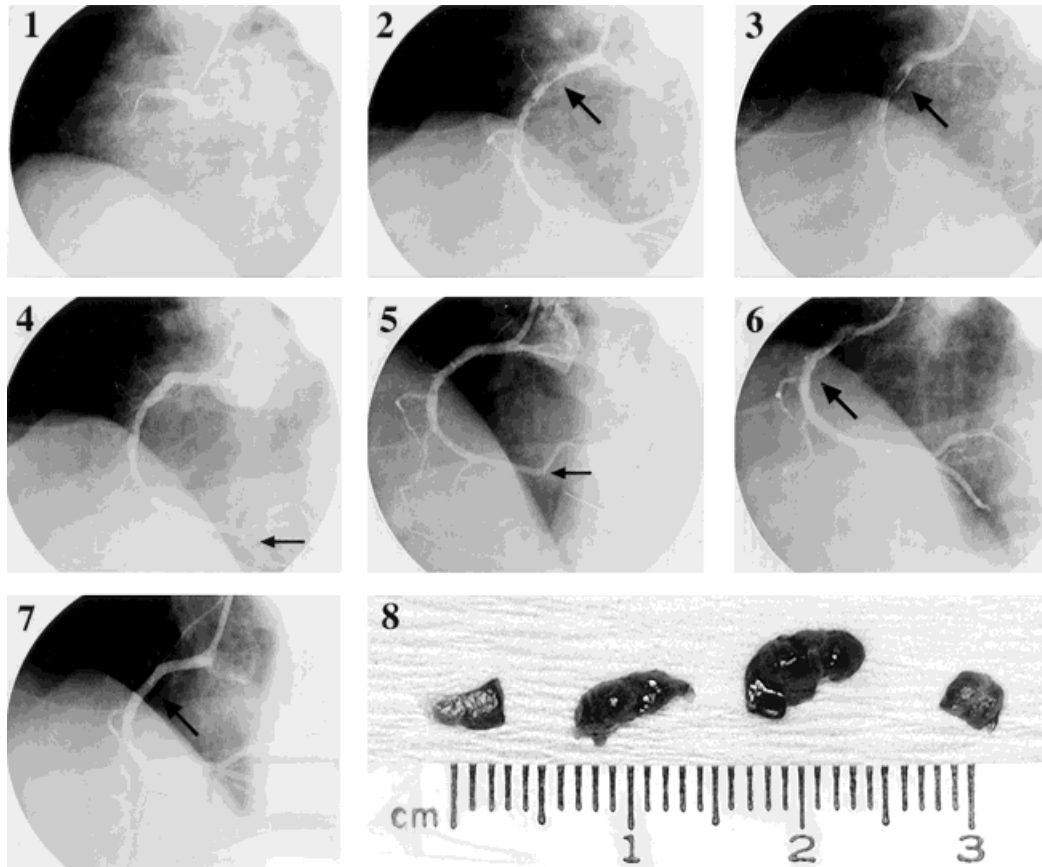


Fig. 2. Panel 1: Angiography in left anterior oblique projection revealing total occlusion of the RCA in its proximal third, with a filling defect suggestive of thrombus. Panel 2: Angiography performed after the first balloon inflation: there is a large amount of thrombus at the index lesion. Panel 3: There are no changes in thrombus burden after additional inflations performed with a 3.0 mm \times 20 mm Bandit balloon. Panel 4: There is

marked improvement in angiographic appearance after thrombus aspiration. The PDA is now totally occluded. Panel 5: Lack of reperfusion of the PDA after inflation of a 2.5 \times 20 mm balloon (arrow). Panel 6: Two additional thrombi were aspirated with the guiding catheter (panel 8, outer specimens). Repeat angiography reveals patency of the PDA with TIMI 3 flow. Panel 7: Final angiography after stenting of the index lesion (arrow).

The patient postprocedure hospital course was uncomplicated, and she was discharged 4 days later on aspirin 325 mg daily and ticlopidine 250 mg twice daily. She was free of cardiac symptoms at 1-year follow-up.

Case 2

A 54-year-old male with a past medical history significant for hypertension and hypercholesterolemia was admitted to an outside hospital with unstable angina. He was evaluated with a stress test during which he developed chest pain associated with hypotension and bradycardia. Therefore, he was referred for emergency cardiac catheterization. The left main coronary artery, the left anterior descending artery, and the left circumflex artery were free of disease. The left anterior descending artery supplied collateral flow to the right coronary artery

(RCA). The RCA was totally occluded in its proximal third, with a filling defect suggestive of thrombus (Fig. 2, panel 1). In view of the patient's symptoms, it was decided to proceed with PTCA of the occluded RCA. Abciximab was administered intravenously. The RCA was engaged with an 8 Fr VectorX JR4 guiding catheter (Medtronic, MA), and the occlusion was crossed with a 0.014" Standard wire (Advanced Cardiovascular Systems). Angiography performed after the first balloon inflation revealed a large amount of thrombus at the index lesion (Fig. 2, panel 2). Additional inflations performed with a 3.0 mm \times 20 mm Bandit balloon did not result in any changes (Fig. 2, panel 3). The balloon was therefore advanced to the distal third of the vessel. The guiding catheter was then advanced over the balloon to the mid third of the vessel. The balloon and the guidewire were removed, the guiding catheter was disconnected from the

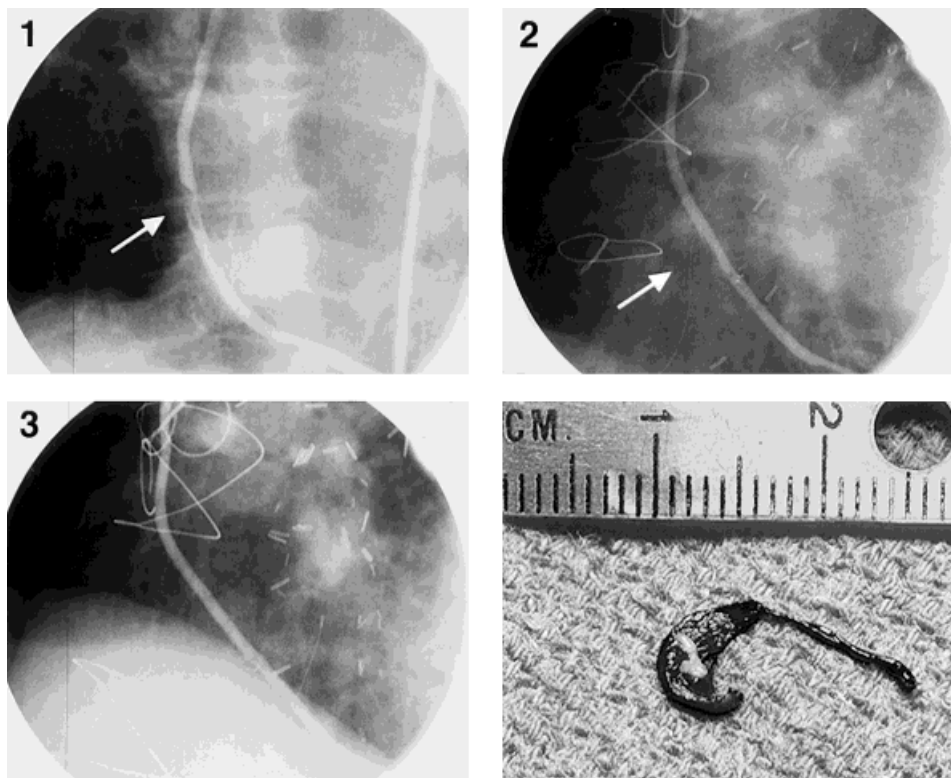


Fig. 3. Panel 1: Angiography of the saphenous vein graft to the PDA in LAO projection showing a filling defect in the mid third of the vein graft. Panel 2: Angiography after aspiration of the organized thrombus, which is shown in the last panel. Panel 3: Final angiography after stenting of the index lesion.

Y-adaptor, and a 60-cc luer lock syringe was connected to the hub of the guiding catheter. Maintaining constant negative suction, the guiding catheter was slowly withdrawn from the RCA and out of the femoral sheath. Flushing the guiding catheter revealed two large thrombi (Fig. 2, panel 8, middle specimens). On coronary angiography, there was marked improvement in angiographic appearance, with new total occlusion of the posterior descending artery (PDA) branch (Fig. 2, panel 4). The PDA occlusion was unchanged after inflation of a 2.5 mm \times 20 mm Bandit balloon (Fig. 2, panel 5). The guiding catheter was therefore advanced with the same technique to the distal third of the vessel, and two additional thrombi were aspirated with the 60-cc syringe (Fig. 2, panel 8, outer left and right specimens). Repeat angiography revealed patency of the PDA with TIMI 3 flow (Fig. 2, panel 6). The index lesion was then stented using a PS-204 Biliary stent mounted on a 4.0 mm \times 20mm NC bandit balloon (Fig. 2, panel 7). Postprocedure CPK peaked at 532, with an MB fraction of 7.2%. He was discharged 4 days later on aspirin 325 mg qd, ticlopidine 250 mg bid, metoprolol 50 mg bid, captopril 6.25 mg tid,

and atorvastatin 10 mg qd. He was free of cardiac symptoms at 6-month follow-up.

Case 3

A 60-year-old male with a past medical history significant for three-vessel coronary artery bypass surgery in 1988 and aortofemoral bypass surgery was admitted with unstable angina. Cardiac catheterization revealed a filling defect in the saphenous vein graft to the posterior descending artery (Fig. 3, panel 1). Abciximab bolus was administered intravenously. The vein graft was engaged with an 8 Fr short-tip JR4 Brite Tip guiding catheter (Cordis). The guiding catheter was advanced over a 3.0 mm \times 20 mm balloon to the filling defect and the filling defect was aspirated with the same technique described above. Flushing of the guiding catheter resulted in retrieval of organized thrombus (Fig. 3). The index lesion was then successfully stented with a 3.0 \times 15 mm Palmaz-Schatz coronary stent. The stent was postdilated with a 3.0 \times 20 mm NC Bandit balloon (Scimed) inflated to a maximum of 16 atm (Fig. 3, panel 3). Final

angiography revealed no residual stenosis and TIMI 3 flow (Fig. 3, panel 3).

DISCUSSION

Treatment strategies that have been used with varying success to treat thrombus in native coronary arteries and in vein grafts have included intracoronary lytic infusions [3,4], transluminal extraction atherectomy, and, more recently, ultrasound frequency [12,13] and rheolytic thrombectomy [11]. However, even with the more recent techniques, distal embolization continues to be a relatively frequent complication that is difficult to manage [11]. Catheter aspiration of thrombus from coronary arteries and vein grafts has been previously reported [5–10], and, in the cases described here, it was used successfully to treat distal embolization. In the first two cases, the decision to proceed with conventional balloon angioplasty was made because of the patients' unstable symptoms. The unique characteristic of both cases is represented by the prompt restoration of normal flow with aspiration of embolized thrombus and by the removal of large particles. It is unlikely that any other conventional technique would have achieved a similar result so promptly.

Potential risks of catheter aspiration include guiding catheter-induced dissection and systemic embolization. We believe that advancement of the soft-tip guiding catheter over a tracker catheter or over a balloon catheter rather than over the bare wire can minimize the risk of guiding catheter-induced dissection. In addition, maintaining continuous negative suction on the syringe while removing the guiding catheter out of the body should decrease the risk of systemic embolization. However, given its potential risks, we also believe that this technique should be used only in extreme situations when other approaches fail. In fact, with the recent introduction of the Angiojet Rheolytic Thrombectomy catheter, it is currently our policy to use this device in the presence of visible thrombus, or as a rescue device after failed thrombolysis in patients referred for rescue angioplasty.

The cases described here demonstrate that with a suitable anatomy, guiding catheters can be cautiously advanced to the distal segments of vein grafts or native coronary arteries over a supportive intracoronary catheter, thus allowing successful aspiration of embolized material.

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