Use of a New Thrombus Extraction Catheter (The Pronto®) in the Treatment of Acute Myocardial Infarction

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The finding of an intracoronary thrombus at the time of coronary angiography is common in patients presenting with an acute coronary syndrome. Pharmacologic and mechanical treatment strategies have been developed and reported to facilitate the treatment of the thrombus along with a percutaneous coronary intervention. We report a case in which a Pronto™ thrombectomy catheter was utilized to facilitate thrombus removal prior to the placement of a coronary stent in a patient who developed postinfarct angina and pulmonary edema after successful thrombolytic therapy for a acute ST segment elevation myocardial infarction. (J Interven Cardiol 2005;18:189–192)

Introduction

Angiographic findings of intracoronary thrombi are common in patients with acute coronary syndromes, prompting treatments aimed at their resolution in addition to the percutaneous treatment of the culprit intracoronary lesion.[1–3] Standard treatment for patients with acute coronary syndromes includes anticoagulation with heparin or low molecular weight heparin and glycoprotein IIb/IIIa receptor antagonists to decrease the overall intracoronary thrombus burden.[4–8]

Mechanical treatment of intracoronary thrombi involves the use of specially designed catheters to perform thrombectomy[9–11] and/or the use of distal protection devices to prevent the thrombus from embolizing to the distal coronary bed.[12,13] In this report, we describe the first case of a patient with acute myocardial infarction and angiographic thrombus in whom intravenous anticoagulation, intracoronary stenting, and a newly released intracoronary thrombus extraction catheter were utilized.

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Case Description

The patient was a 75-year-old man with hyperlipidemia and tobacco use, who presented to an outside hospital with sudden onset of chest pressure and an ECG showing an anterior ST segment elevation myocardial infarction (STEMI). He was treated with intravenous Retavase and enoxaparin with resolution of his symptoms and ST segments on his electrocardiogram (ECG) and transferred for further assessment and care. During the first 24 hours, he developed recurrence of his chest pressure without subsequent changes on his ECG, decrease in his oxygen saturations and bibasilar rates. Urgent cardiac catheterization was recommended for postinfarct angina complicated by pulmonary edema.

Prior to arrival in the catheterization lab, the patient received captopril (6.25 mg po) metoprolol (XL (25 mg po), simvastatin (40 mg po), enoxaparin (80 mg sc), and intravenous nitroglycerine.

Coronary angiography showed that the left anterior descending artery (LAD) had a proximal thrombus associated with a subtotal occlusion involving the area adjacent to the first diagonal branch with TIMI-1 flow (Fig. 1A). The circumflex coronary artery was nondominant with mild luminal irregularities. The right coronary artery was a dominant vessel with no significant stenoses.

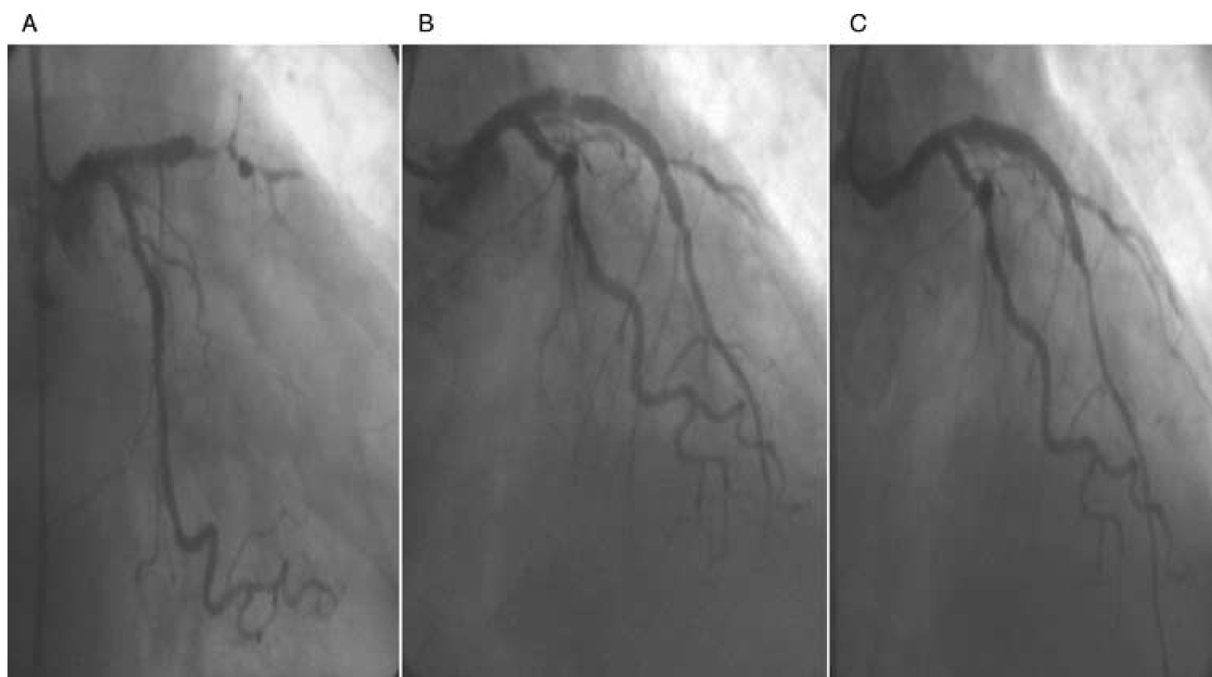

Figure 1. Serial angiograms from the case. (A) Right anterior oblique angiogram with caudal angulation showing the initial angiogram. There is a subtotal occlusion of the mid-portion of the LAD. (B) Right anterior oblique angiogram with cranial angulation after placement of a coronary stent in the LAD showing a filling defect consistent with thrombus proximal to the stent. (C) Right anterior oblique with cranial angulation showing final angiogram after thrombectomy and second stent placement.

Intravenous abciximab and an intravenous bolus dose of enoxaparin at 0.3 mg/kg was given. Balloon angioplasty was performed on the left anterior descending coronary lesion followed by a 3.5 × 28 mm Zeta stent. Following the stent deployment, the proximal border of the stent was obscured angiographically with a filling defect consistent with the thrombus (Fig. 1B).

At this point, the patient was given an additional 325 mg of aspirin by mouth (chewed) as well as rebolused with 0.3 mg/kg of enoxaparin. A Pronto™ (Vascular Solutions, Minneapolis, MN) extraction catheter (Fig. 2) was then introduced into the proximal LAD over the guidewire. While applying a vacuum syringe to the Pronto Catheter, multiple passes across the thrombus were made. The retrieved fluid was then filtered through a straining device. The extracted thrombus is shown in Figure 3. Angiographically, there was marked resolution of the thrombotic filling defect. A 3.5 × 13 mm Zeta stent was deployed proximal to the initial stent. Subsequent angiography revealed 0% residual stenosis without residual thrombus and TIMI-III distal flow (Fig. 1C). Intravascular ultrasound imaging showed no evidence for a dissection flap and that the stents were fully opposed to the vessel walls.

The patient was then continued on an abciximab drip, loaded with clopidogrel, and sent to the coronary care unit for monitoring. His pulmonary edema resolved and he was discharged home on the fifth hospital day without subsequent complications.

Discussion

Recurrent angina and pulmonary edema represent complications after acute STEMI often related to incomplete reperfusion. The angiographic findings of a thrombus are not a surprising feature in such patients. The challenge in these patients is thrombus resolution and restoration of the infarct-related artery lumen. In this patient, despite aggressive anticoagulation with low molecular weight heparin and the glycoprotein IIb/IIIa receptor antagonist, abciximab, an intracoronary technique to treat the mass of intracoronary thrombus was needed. Several options are available

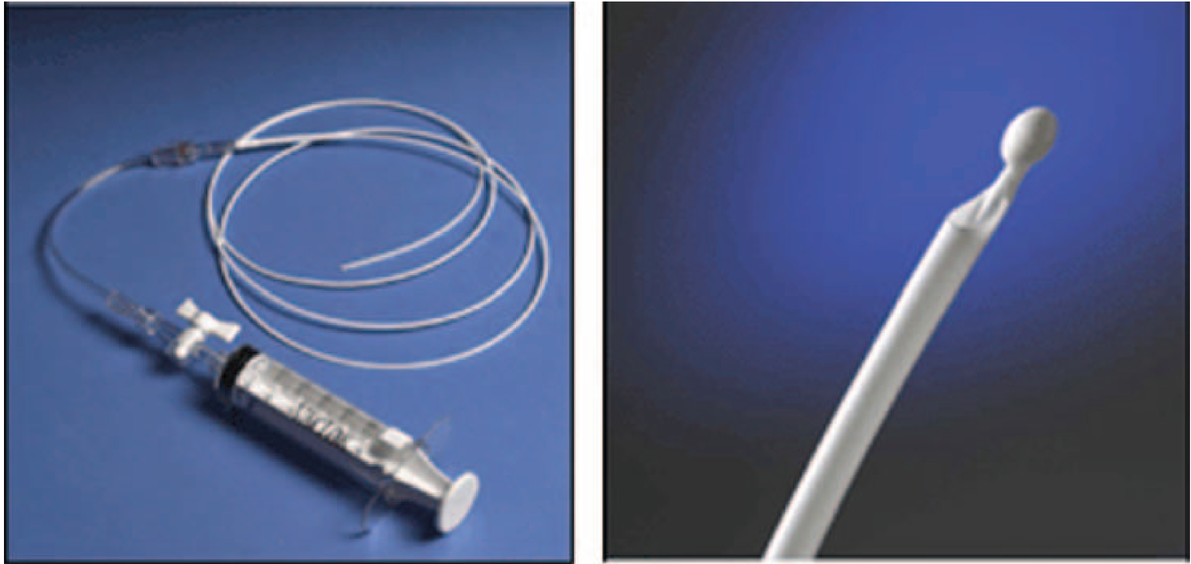

Figure 2. The Pronto^{TM} extraction catheter.

to the operator, which include direct stenting with or without distal embolic protection, or thrombectomy. Thrombectomy may be achieved by specially designed mechanical devices (AngioJet device, Possis Medical, Minneapolis, MN; or the X-SIZER system, EV3, Plymouth, MN)[9–11] or by aspiration through a catheter (Export Catheter, Medtronic Vascular, Santa Rosa, CA; Keberos Rinspiration System, Kerberos Proximal Solutions, Inc., Cupertino, CA; Pronto catheter, Vascular Solutions). While the dedicated mechanical devices may offer some advantages in overall thrombus reduction, the aspiration catheters offer a simple-to-use alternative for operators. The Pronto^{TM} thrombus aspiration system is a simple monorail extraction catheter employing suction with a large (20 cc) syringe allowing aspiration of the thrombus during passage of the catheter tip across the arterial segment.

Figure 3. Filtered blood showing the extracted thrombus from the LAD.

Operators should bear in mind that a differential for angiographic filling defect also includes proximal coronary artery dissection, thrombus in an aneurysmal segment of coronary artery, or calcified extruded plaque after stenting.

In this case, a multifaceted approach was taken to address all three aspects of the differential diagnosis. Adequate anticoagulation was assured with an additional chewed dose of aspirin and another intravenous bolus of enoxaparin. The Pronto extraction catheter was utilized to decrease the overall thrombus burden and thereby to decrease the likelihood of downstream embolization of this thrombus. Intravascular ultrasound imaging was then performed and showed that there was no dissection flap at the treated sites. The Pronto catheter facilitated normal antegrade coronary flow without complication and has the potential to remove thrombus in a rapid and simple manner.

The major advantage of the Pronto catheter is the simplicity of design with only a single catheter and suction syringe, that does not necessitate an aspiration unit, complex tubing and pump set, or the placement of a temporary pacemaker or intravenous (IV)

aminophylline. As occurred in this case, the Pronto catheter easily achieved extraction of large segments of thrombotic debris.

We believe this is the first described case with the utilization of this catheter and offer this technique as a potential alternative to the above listed thrombus removal devices.

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