Case reports

A case of life-saving pharmacologic and mechanical coronary dethrombosis

Alessandro Colombo, Paolo Danna, Emanuela Piccaluga, Maurizio Viecca

Catheterization Laboratory, Cardiology Department, L. Sacco Hospital, Milan, Italy

Key words:
Acute coronary syndrome; Dethrombosis.

The present report refers to a case of life-threatening acute myocardial infarction due to thrombotic occlusion of the left main stem, in which an aggressive dethrombotic intervention (pharmacologic and mechanical) was totally successful, thanks to a well developed right coronary system and the use of intra-aortic balloon pump.

(Ital Heart J 2004; 5 (11): 864-868)

Received December 19, 2003; revision received August 23, 2004; accepted August 30, 2004.

Address:

Dr. Alessandro Colombo

Emodinamica
Ospedale L. Sacco
Via G.B. Grassi, 74
20157 Milano
E-mail:
emodinamica@hsacco.it

A 54-year-old man – a heavy smoker with an uneventful previous history – presented to the emergency room of our hospital with severe chest pain and shock, and an ECG pattern of a large anterior acute myocardial infarction (AMI) (Fig. 1). His blood pressure was 80/60 mmHg and his heart rate 50 b/min. The patient was conscious, had mild metabolic acidosis and did not need intubation. An invasive revascularization strategy was immediately chosen and coronary angiography was carried out 90 min after the onset of symptoms. It showed a normal, highly dominant right coronary artery and extensive thrombosis of the left main trunk with almost no antegrade flow (Fig. 2). The patient had ventricular fibrillation, was DC-shocked 3 times and was given intravenous amiodarone.

An intra-aortic balloon pump (IABP) was immediately placed and this helped stabilize the patient. Our experience as interventionists suggests that massive coronary thrombosis may barely be overcome by balloon-based intervention. Hence, pharmacologic dethrombosis was our first choice: alteplase 20 mg was injected directly into the left main trunk and intravenous heparin 5000 IU, alteplase 30 mg

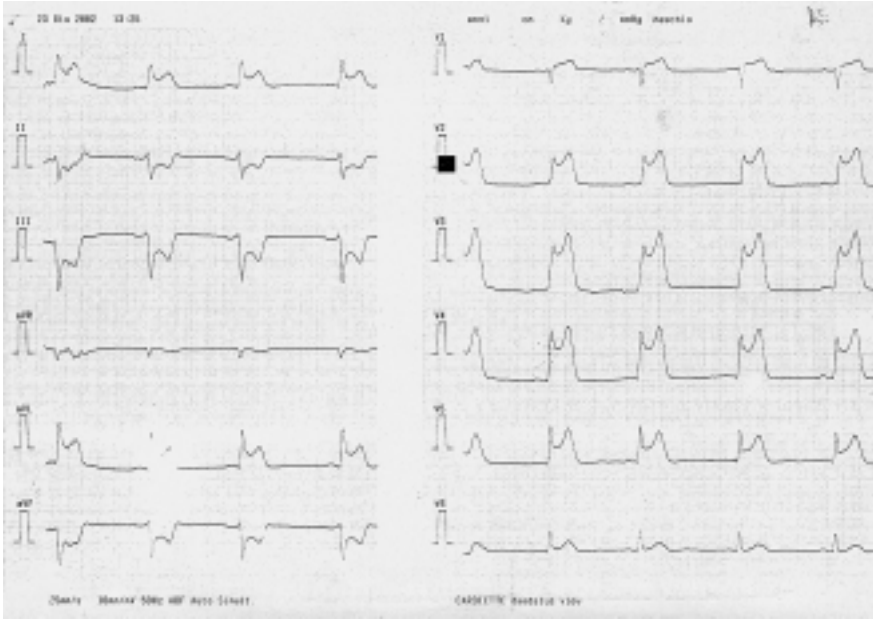
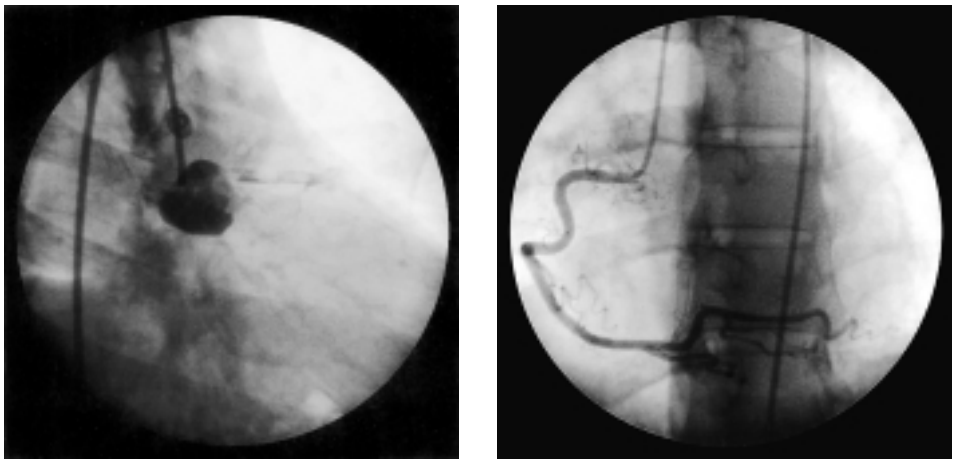


Figure 1. *ECG at the time of admission.*



A B

Figure 2. *Extensive left coronary thrombosis causing acute myocardial infarction and shock* (A) *and a highly dominant, normal right coronary artery* (B).

and eptifibatide 180 μg/kg double bolus + 2 μg/kg/min were started. The patient's hemodynamic status rapidly improved (blood pressure 130/70 mmHg, pulse 75 b/min) and repeat angiography performed 30 min after the initiation of drug therapy showed marked lysis of the thrombus with restoration of coronary flow (Fig. 3).

At this point, mechanical thrombectomy was carried out using an X-Sizer™ catheter (ev3, Plymouth, MN, USA). Following this procedure, a further, sizable reduction of the clot and a visually normal (i.e. TIMI 3) coronary flow velocity were observed (Fig. 4). The patient's chest pain had resolved almost completely and ECG showed a significant reduction of the ST-segment elevation.

A 3.5 × 15 mm angioplasty balloon was then inflated within the left main stem, at the site of the residual coronary obstruction (Fig. 5), and this was followed by total disappearance of the tiny thrombus terminations that protruded into the major branches (Fig. 6), while the main part of the thrombus was left unaltered and no flow deterioration was observed. Figure 7 shows the ECG at the end of the procedure and 2 days afterwards.

The patient was IABP-assisted for 2 days and dopamine was infused for a further 2 days. The clinical signs of low output gradually disappeared and the subsequent hospital stay was uneventful, apart from moderate blood loss at the arterial catheterization site that required transfusion. Creatine kinase-MB mass raised to 1095 ng/ml (normal value < 5) 11 hours after the onset of symptoms.

Intravenous eptifibatide and heparin were infused until day 2. Aspirin 160 mg daily and ticlopidine 250 mg bid were started and continued thereafter. The patient was also submitted to thrombophilic screening which excluded coagulopathy.

Echocardiographic evaluation performed on day 1 showed normal left ventricular volumes, marked antero-lateral hypokinesia, and mild mitral regurgitation.

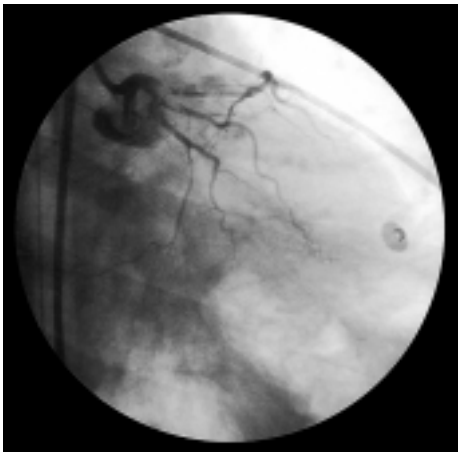


Figure 3. *The left coronary system 30 min after intracoronary alteplase and intravenous eptifibatide.*

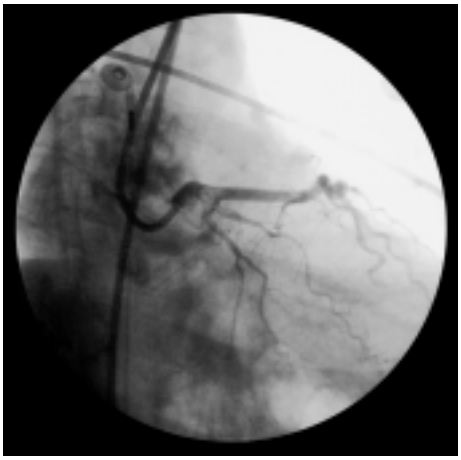


Figure 4. *The left coronary system after thrombus aspiration with the X-Sizer™ catheter.*

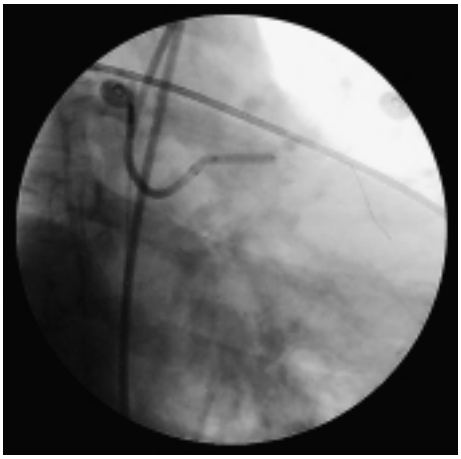


Figure 5. *A 3.5 × 15 mm balloon inflated within the left main stem.*

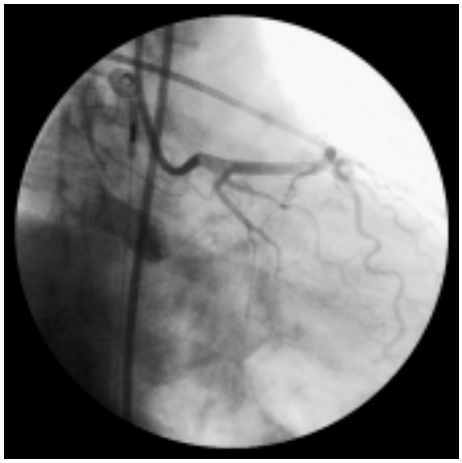
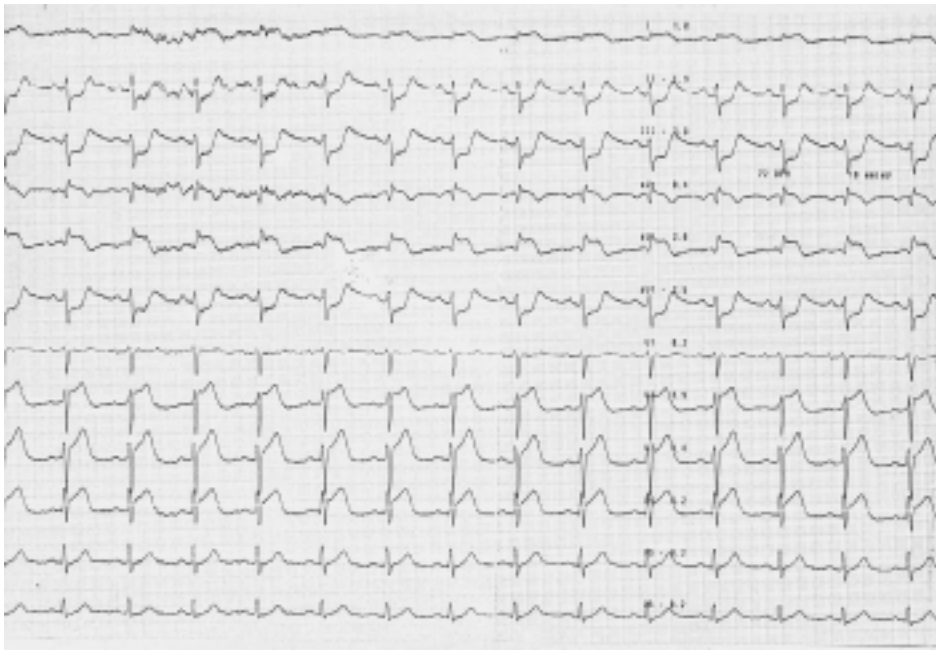


Figure 6. *The left coronary system after balloon inflation.*

A



B

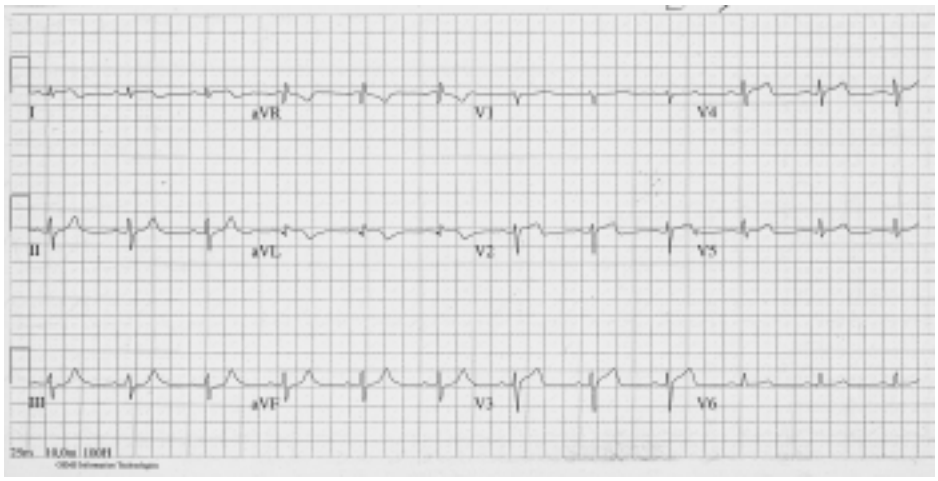


Figure 7. *ECG at the end of the procedure* (A) *and 2 days afterwards* (B).

The left ventricular ejection fraction was 40%, increasing to 50% on day 16.

The patient underwent control coronary angiography on day 9. A small, rounded thrombus was still present within the left main trunk (Fig. 8). Coronary flow velocity was visually normal. At this time it was not possible to retrieve the thrombus with the X-Sizer™ catheter. We considered, discussed and finally concluded that coronary bypass grafting was to be recommended, because the threat of a new, extensive thrombotic relapse was thought to be too high.

A few days later the patient was submitted to off-pump surgery; the left thoracic artery was anastomosed to the left anterior descending coronary artery. He was discharged in good conditions 6 days after surgery.

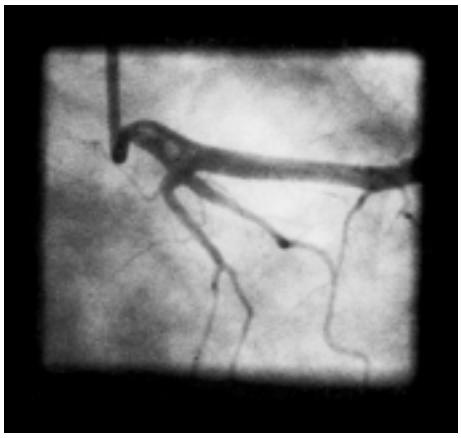


Figure 8. *Control angiogram 9 days after the procedure.*

Discussion

The first lesson we learned from this case is that ST-elevation anterior AMI with shock entails the possibility that abrupt thrombotic occlusion of the left main coronary stem is occurring. This reinforces the concept that an invasive strategy is to be immediately undertaken in such cases. The second lesson is that complete thrombosis of the left main stem may be temporarily tolerated if the right coronary artery is very well developed. Indeed, our patient's left circumflex artery was hypoplastic, and the posterior and lateral segments of the left ventricle were largely supplied by a highly dominant, stenosis-free right coronary artery. Moreover, the patient was taken to the catheterization laboratory 90 min after symptom onset. Here, the acceptable circulatory function obtained with an IABP afforded sufficient time to attempt a strategy based on pharmacologic dethrombosis. Our experience with extensive thrombosis convinced us that coronary dilation and/or stenting would not have been able to overcome the large thrombus obstructing the left coronary system. Moreover, downstream dislodgment of such a huge thrombus could have precipitated irreversible no-reflow.

Alteplase was injected directly into the left main trunk because we were concerned that systemic administration would not have resulted in significant drug delivery at the target site. Eptifibatide was intravenously infused – along with heparin – as soon as some blood flow was restored in the thrombosed coronary artery.

Abciximab is the IIb/IIIa glycoprotein receptor antagonist most extensively investigated and validated in catheter-based treatment of AMI[1]. An impressive case report which demonstrates its rapid activity in thrombosed coronary arteries has been published in 1999[2] and a synergistic action of abciximab and alteplase in reducing angiographically evident thrombosis in AMI has been shown in an ample case-control study[3].

We chose eptifibatide instead of abciximab because of its shorter half-life, which would have allowed a quicker recovery of platelet function in case emergency coronary surgery was necessary. Substantial equivalence of eptifibatide and abciximab in inhibiting platelet aggregation has been demonstrated *ex-vivo* in the blood of patients with unstable angina[4]. Moreover, eptifibatide was shown to inhibit platelet aggregation to a greater degree than both abciximab and tirofiban during percutaneous interventions in acute coronary syndromes[5].

The drugs we used were clearly beneficial. However, since the clot burden was still massive 30 min after the beginning of the intervention, we proceeded to catheter aspiration. A distal protection filter was not used because our interventional strategy in AMI is preferentially oriented toward thrombus aspiration rather than distal protection devices. Our group has conducted a small sized trial of the X-Sizer™ aspiration catheter in the setting of ST-elevation AMI with favorable results[6]. Beran et al.[7] and Napodano et al.[8] have published randomized trials of coronary thrombectomy with the same device, both of them reporting improved myocardial reperfusion compared to conventional coronary dilation and stenting.

With regard to the final decision to operate the patient, it was entirely based on clinical judgment. A different option, i.e. long-term warfarin and aspirin treatment, would have been possible. The aim of our treatment strategy was to offer the patient the most effective prevention against possible acute worsening of the residual left main thrombosis.

Acknowledgments

The authors wish to thank Mr. Renzo Pench for his skillful assistance with the preparation of the pictures.

References

1. Stone GW, Grines CL, Cox DA, et al, for the Controlled Abciximab and Device Investigation to Lower Late Angioplasty Complications (CADILLAC) Investigators. Comparison of angioplasty with stenting, with or without abciximab, in acute myocardial infarction. N Engl J Med 2002; 346: 957-66.
2. Rerkpattanapipat P, Kotler MN, Yazdanfar S. Rapid dissolution of massive intracoronary thrombosis with platelet glycoprotein IIb/IIIa receptor inhibitor. Circulation 1999; 99: 2965.
3. Gibson CM, de Lemos JA, Murphy SA, et al, for the TIMI Study Group. Combination therapy with abciximab reduces angiographically evident thrombus in acute myocardial infarction: a TIMI 14 substudy. Circulation 2001; 103: 2550-4.
4. Kereiakes DJ, Broderick TM, Roth EM, et al. Time course, magnitude, and consistency of platelet inhibition by abciximab, tirofiban, or eptifibatide in patients with unstable angina pectoris undergoing percutaneous coronary intervention. Am J Cardiol 1999; 84: 391-5.
5. Batchelor WB, Tolleson TR, Huang Y, et al. Randomized comparison of platelet inhibition with abciximab, tirofiban and eptifibatide during percutaneous coronary intervention in acute coronary syndromes: the COMPARE trial. Comparison of Measurements of Platelet Aggregation with Aggrastat, Reopro, and Eptifibatide. Circulation 2002; 106: 1470-6.
6. Colombo A, Danna P, Piccaluga E, Seregni R, Viecca M. Trombectomia coronarica selettiva nella fase acuta dell'infarto miocardico. (abstr) Ital Heart J 2001; 2 (Suppl 6): 47.
7. Beran G, Lang I, Schreiber W, et al. Intracoronary thrombectomy with the X-sizer catheter system improves epicardial flow and accelerates ST-segment resolution in patients with acute coronary syndrome: a prospective, randomized, controlled study. Circulation 2002; 105: 2355-60.
8. Napodano M, Reimers B, Pasquetto G, et al. Intracoronary thrombectomy improves myocardial reperfusion in patients undergoing direct angioplasty for acute myocardial infarction. J Am Coll Cardiol 2003; 42: 1395-402.