Case report

Transcatheter mechanical thrombus aspiration for stent thrombosis

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Coronary stent; Thrombosis; Acute myocardial infarction.

Currently, in-stent thrombosis is a rare but serious clinical event. The mechanical or pharmacological approach has not totally solved this problem. In this report we describe the treatment of in-stent thrombosis with a new device for mechanical thrombus aspiration. We used the Rescue catheter (Rescue Catheter System, Boston Scientific), a new 4.5F dual lumen monorail catheter that was able to break and aspirate thrombus without evidence of distal embolization. In this case the procedure was quickly performed with good angiographic results after mechanical aspiration and additional traditional coronary angioplasty. Moreover, the excellent clinical outcome confirmed the efficacy of the technique in the percutaneous treatment of this late complication of stent implantation.

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Introduction

New techniques of stent implantation and aggressive antiplatelet therapy have reduced the incidence of acute and subacute stent thrombosis[1-3]. Currently, the frequency rate of stent thrombosis is reported in less than 2% of cases even in high risk coronary and clinical situations (acute myocardial infarction, unstable angina). However, stent thrombosis is a serious complication with significant morbidity and mortality[4-6]. When this event is suspected, emergent coronary angiography should be performed to confirm the diagnosis and, if possible, to treat the occlusion and to correct potential technical problems related to suboptimal stent implantation. The disappointing acute results of balloon angioplasty with or without delivery of thrombotic agents led to a search for and development of various revascularization methods[7,8].

Mechanical thrombus aspiration with Rescue catheter (Rescue Catheter System, Boston Scientific, La Garenne Colombes Cedex, France) is a novel percutaneous catheter-based technique that removes endoluminal thrombus employing a direct negative pressure. The catheter creates a vacuum that aspirates the endoluminal material through a 4.5F dual lumen catheter.

This case reports the first experience with this device in the treatment of stent thrombotic occlusion.

Case report

The patient was a 62-year-old male with a history of coronary artery disease and hypertension. In September 1999, in another hospital he underwent direct coronary angioplasty and stent implantation on the proximal left anterior descending coronary artery during anterior acute myocardial infarction complicated by cardiogenic shock. The procedure was performed with an intra-aortic balloon pump assistance that was stopped after 5 days for residual severe left ventricular dysfunction. The patient was anticoagulated with warfarin plus antiplatelet therapy, aspirin (325 mg) and ticlopidin (500 mg). For 1 month he remained asymptomatic and 3 days before admission the patient stopped antiplatelet therapy for gastrointestinal intolerance. On admission he reported several episodes of severe chest pain and arrived in moderate distress. Upon his admission, the ECG showed an ST-T segment elevation in the anterior-lateral leads. An echocardiography evaluation revealed a severe left ventricular dysfunction with ejection fraction 25%. He was taken directly to the catheterization laboratory for coronary angiography. Initial angiography revealed a 70% distal stenosis of the marginal branch, diffuse disease of the right coronary artery and a total occlusion of the proximal left anterior descending coronary artery with angiograph-

ic images of in-stent thrombosis. For a rapid deterioration of the hemodynamic parameters an 8F aortic balloon pump was inserted via the same femoral artery and activated. As we prefer in high risk patients, when possible (ALLEN test positive), coronary angioplasty with a 7F JR4 guiding catheter was performed via the right radial artery, in order to reduce the incidence of vascular complications. Heparin (10 000 IU) was given when arterial accesses were secured. The lesion was crossed with a floppy guide wire (Hunter super soft, Biocompatible) and because of the presence of filling defects suggestive of thrombi we decided to perform mechanical thrombolysis avoiding or reducing distal embolization (Fig. 1). The rescue catheter was introduced with the monorail technique into the occluded vessel and the device was activated when the tip was positioned at the proximal end of the thrombus, and a careful, slow antegrade and retrograde aspiration was performed along the course of the stent (Fig. 2). After two additional passes of the devices repeated angiography demonstrated significant evacuation of occlusive thrombus, with a TIMI 3 flow and no evidence of distal embolization. Subsequently, an adjunctive balloon angioplasty was then performed, neither distal embolism nor no-reflow phenomenon was observed after the procedure (Figs. 3 and 4). At this point a bolus of 15 mg of ReoPro was administered in order to reduce the risk of a new thrombotic occlusion. The radial sheath was removed after the procedure. The patient was transferred to the Coronary Care Unit where continuous infusion of ReoPro 10 γ/min and heparin was given for 12 hours and oral antiplatelet regimen, including aspirin 175 mg/die and ticlopidin 500 mg/die without coumadin, was instituted. The patient improved clinically and intra-aortic balloon pump support was maintained for 24 hours and then the vascular sheath was removed with no complications. Creatine phosphokinase peaked at only 590 IU/l (creatine kinase-MB 13%). During his hospitalization, there were no recurrent ischemic events or other complications and the patient was discharged at 9 days.

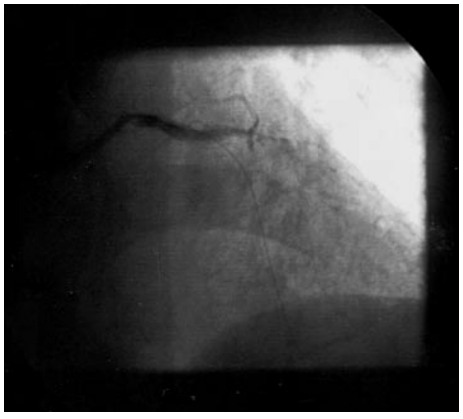

Figure 1. *Angiogram with total occlusion of the proximal left anterior descending coronary artery (right cranial view).* Arrows *in the site of stent.*

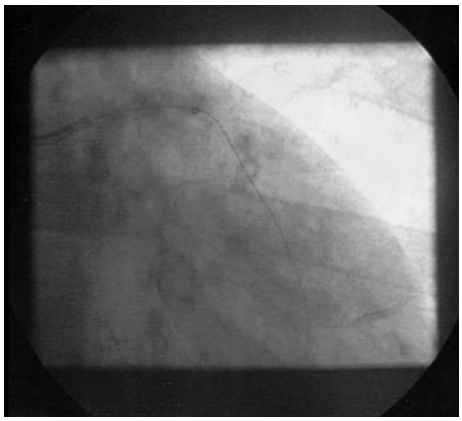

Figure 2. *Rescue catheter in operation at the proximal end of the thrombus.*

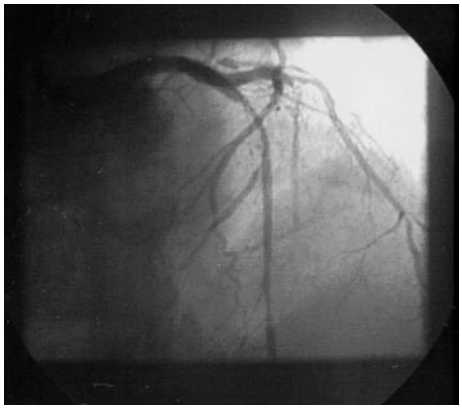

Figure 3. *Angiographic result immediately after thrombus aspiration.*

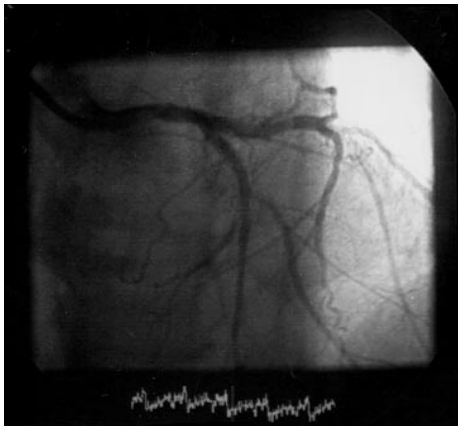

Figure 4. *Angiographic result after coronary angioplasty with 3.0 balloon at 6 atm.*

Discussion

Despite improvements of technical stent implantation and new pharmacological antithrombotic regimens, acute or subacute stent thrombosis can rarely occur and with severe clinical consequences[9,10]. The most commonly used coronary treatments for this adverse event are me-

chanical with balloon angioplasty or pharmacological with thrombolytic agents. Moreover, both approaches provide less than satisfactory angiographic and clinical results mainly due to the lack of reflow, distal embolization and myocardial infarction.

Recently, glycoprotein IIb/IIIa inhibitor receptors like abciximab are proposed as an adjunctive treatment in percutaneous procedures in thrombus containing lesions. In fact, the efficacy of this pharmacological approach in the setting of this angiographic situation has been confirmed by the results of recent clinical trials[11,12]. However, its use to treat in-stent thrombosis has not been tested.

To date, a number of different mechanical devices have been used in order to perform thrombus extraction with promising results. However, these devices are often complex and cost expensive and have not totally solved the problem of thrombus fragmentation and evacuation without distal embolization or deterioration of coronary flow[13,14].

In this report we used a new device for mechanical thrombus removal: the rescue catheter. The system is made of two components. A pump set that is able to create a vacuum to aspirate and break the clot or atheroma into small pieces and withdraws the pieces into the catheter. The second part is the catheter, a dual lumen monorail, with the catheter tip angled back from the guide wire lumen to allow the catheter to follow a 0.014 guide wire. The 4.5F device, compatible with a 7F guiding catheter, incorporates a radio-opaque marker at the distal tip to allow proper axial positioning.

Recently, in our center we have obtained promising results using this device in adjunction with balloon angioplasty during direct or rescue coronary angioplasty in the mechanical revascularization in acute myocardial infarction. This is the first report of its use in in-stent thrombosis, a platelet-mediated phenomenon (white thrombus). The patient arrived at our hospital with clinical evidence of acute myocardial infarction. Subsequent emergent coronary angiography revealed thrombotic intrastent occlusion with TIMI 0 flow. In this patient we did not use thrombolytic agents, because these agents have a limited effect on platelet rich thrombus such as in the case of stent thrombosis and might have had a paradoxical effect due to their well-known platelet proaggregant effect[15]. Conversely, we treated the patient with abciximab only after evidence of good results of the planned percutaneous intervention (restoration of TIMI 3 flow), because in case of an unsuccessful procedure surgical revascularization should be performed without any additional risk of bleeding.

After probing the occlusion with the guide wire, thrombus aspiration with the Rescue catheter was successfully performed and mechanical aspiration was able to restore TIMI 3 flow and reduce the thrombus burden without evidence of distal embolization or no-reflow phenomenon. Additional coronary angioplasty was necessary to accomplish optimal results, as previously reported with other mechanical devices[16,17]. The advantage of this technique over coronary angioplasty alone lies in removing the thrombus rather than in displacing it with a consequent reduction in incidence of microembolization. Another potential advantage is quicker re-establishment of coronary flow, myocardial perfusion and an exact morphologic evaluation of the lesion, which allows for immediate assessment of adjunctive therapy like a new stent implantation for correction of mechanical problems or complications. In this case we have not reported the potential but rare complications related to mechanical thrombolysis like transient complete heart block, coronary vasospasm, coronary dissections and hemolysis and the procedure was successful even in a complicated and high risk clinical situation.

In conclusion, in this experience we have reported on the successful application of rescue catheter in a case of stent thrombosis. This simple technique was safe and had a procedural success and good in-hospital outcome in two high risk clinical situations. This device has the potential to be considered as a treatment to improve clinical outcome in coronary stent thrombosis.

References

1. Shaknovich A. Complications of coronary stenting. Coron Artery Dis 1994; 5: 583-9.
2. Colombo A, Hall P, Nakamura S, et al. Intracoronary stenting without anticoagulation accomplished with intravascular ultrasound guidance. Circulation 1995; 91: 1676-88.
3. Shomig A, Neumann FJ, Kastrati A, et al. A randomised comparison of antiplatelet and anticoagulant therapy after the placement of coronary-artery stents. N Engl J Med 1996; 334: 1084-9.
4. Mak KH, Belli G, Ellis SG, Moliterno DJ. Subacute stent thrombosis: evolving issues and current concepts. J Am Coll Cardiol 1996; 27: 494-503.
5. La Vecchia L, Bedogni F, Martini M, Sartori M, Paccanaro M, Vincenzi M. Subacute thrombosis after stenting in acute myocardial infarction: four-year experience in a low-volume center. Coron Artery Dis 1999; 10: 521-4.
6. Neumann FJ, Gwanz M, Ott I, et al. Prospective evaluation of hemostatic predictors of subacute stent thrombosis after coronary Palmaz-Shatz stenting. J Am Coll Cardiol 1996; 27: 15-21.
7. Hasdai D, Garrat KN, Holmes DR Jr, et al. Coronary angioplasty and intracoronary thrombolysis are of limited efficacy in resolving early intracoronary stent thrombosis. J Am Coll Cardiol 1996; 28: 361-7.
8. Muhlestein JB, Karagounis LA, Treehan S, Anderso JL. Rescue utilization of abciximab for the dissolution of coronary thrombus developing as a complication of coronary angioplasty. J Am Coll Cardiol 1997; 30: 1729-34.
9. Parma A, Lioy E, Loschiavo P, et al. The clinical, angiographic and procedural predictors of thrombosis and restenosis in Micro stent II (AVE) coronary stents. G Ital Cardiol 1998; 28: 1238-46.
10. De Servi S, Repetto S, Klugmann S, et al. Stent thrombosis: incidence and related factors in the R.I.S.E. Registry. Catheter Cardiovasc Interv 1999; 46: 13-8.
11. Baley SR, O Leary E, Chilton R. Angioscopic evaluation of site-specific administration of ReoPro. Cathet Cardiovasc Diagn 1997; 42: 181-4.

12. The EPISTENT Investigators. Randomised placebo-controlled and balloon-angioplasty-controlled trial to assess safety of coronary stenting with use of platelet glycoprotein-IIb/IIIa blockade. Lancet 1998; 352: 87-92.
13. Nakagawa Y, Matsuo S, Kimura T, et al. Thrombectomy with angiojet catheter in native coronary arteries for patients with acute or recent myocardial infarction. Am J Cardiol 1999; 83: 994-9.
14. Silva JA, Ramee E, Kunz R, Dandreo K, Popma J. Mechanical thrombectomy using the angiojet catheter in the treatment of acute myocardial infarction. (abstr) J Am Coll Cardiol 1998; 31 (Suppl A): 521A.
15. Gwanz M, Neumann FJ, Ott I, et al. Platelet activation and coronary stent implantation: effect of antithrombotic therapy. Circulation 1996; 94: 279-85.
16. Van den Boss AA, Van Ommen V, Corbeij HMA. A new thrombosuction catheter for coronary use: initial results with clinical and angiographic follow-up in seven patients. Cathet Cardiovasc Diagn 1997; 40: 192-7.
17. Scott RP, Silva JA, White C, Collins TJ. Rheolytic thrombectomy. A new treatment for stent thrombosis. Cathet Cardiovasc Diagn 1999; 47: 97-101.