

## ***Editorial Comment***

### **Acute Thrombosis of a Coronary Artery Aneurysm: Toughing it Out With the Poor Man's Thrombectomy Catheter Technique**

**Antonio L. Bartorelli, MD, FESC, FACC**  
Centro Cardiologico Monzino  
Institute of Cardiology  
University of Milan  
Milan, Italy

The first pathologic description of a coronary artery aneurysm was published in 1761 by Giovanni Battista Morgagni, the Italian anatomist defined by Rudolf Virchow as “the father of modern pathology” [1]. Indeed, before the advent of coronary angiography made possible in vivo diagnosis, coronary aneurysms were primarily incidental findings on postmortem examination, with up to half of the patients dying from their rupture [2].

Acquired coronary aneurysms are the result of enlargement and remodeling of an arterial segment that is weakened by atherosclerosis, the main underlying etiology in Western populations [3], or by inflammatory, infectious, or connective tissue diseases, or, more rarely, by blunt trauma to the chest [4–6]. This pathologic entity may be localized, or it can affect the entire length of one or more coronary artery, a condition for which the term “diffuse ectasia” seems more appropriate [7,8]. Angiographically, the dilatation is classified as fusiform, when the transverse diameter is less than the longitudinal dimension, or saccular, when the transverse diameter is greater than the longitudinal dimension. Although a considerable number of cases have been published, treatment of coronary artery aneurysms with or without coexisting obstructive disease is still controversial. Oral anticoagulants or antiplatelet agents are the most frequently prescribed drugs. Systemic anticoagulation is based on observations of thrombus formation within the aneurysm and distal embolization which may lead to myocardial ischemia or infarction. However, data supporting its use are lacking. Indeed, given the low incidence of major cardiac events associated with this coronary pathology [9,10], a large number of patients followed long term would be required to demon-

strate a beneficial effect of systemic anticoagulation in order that it may justify the risk of hemorrhagic complications, as well as its superiority in relation to antiplatelet therapy. On the other hand, the finding of coronary aneurysms is not an indication per se for surgical or interventional treatment unless the aneurysm is very large and may be considered at high risk for rupture, has shown predisposition for thrombosis and distal embolization, or there is the coexistence of significant obstructive disease.

Although findings from the Coronary Artery Surgery Study suggest that the prognosis in cases secondary to atherosclerosis is that of the underlying obstructive disease [3], the case reported by Madsen et al. in this issue [11] clearly indicates that a large saccular aneurysm is not necessarily benign and may confer an extra risk. In their patients, non-ST-elevation myocardial infarction, associated with hemodynamic compromise, prompted an urgent coronary angiography that showed almost total obliteration, due to fresh thrombus, of a giant saccular aneurysm involving the mid left circumflex coronary artery. This complication, whose incidence is unknown, has been described on postmortem examination [2,12] and before death [13,14]; but data on its medical or interventional treatment are lacking. Previously reported failure of thrombolytic agents [13] may favor an interventional strategy. This was the approach chosen by Madsen et al. They used a simple and effective technique that was previously described for the treatment of embolized and organized thrombus during percutaneous coronary interventions for acute coronary syndromes [15]. This technique consists in advancing, into the coronary artery, a guiding catheter over a balloon catheter, positioned distal to the thrombus. In some cases, the balloon catheter may be inflated at low pressure and a gentle push-and-pull maneuver is used, applying traction on the balloon catheter while slowly advancing the guiding catheter into the coronary artery. The balloon catheter and guidewire are then withdrawn,

Correspondence to: Antonio L. Bartorelli, Centro Cardiologico Monzino, Institute of Cardiology, University of Milan, Milan, Italy.  
E-mail: albartorelli@ccfm.it

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the guiding catheter is disconnected from the Y-adaptor, a luer lock syringe is connected to the hub of the guiding catheter, and suction aspiration to remove the thrombus is started. Finally, the guiding catheter is withdrawn from the coronary artery and out of the femoral sheath while maintaining constant negative suction with the syringe. In this case, the maneuver was repeated until thrombus material was seen in the syringe and until no residual thrombus could be identified angiographically inside the aneurysm. Implantation of two stents in the distal part of the aneurysm and in an adjacent coronary artery stenosis obtained restoration of normal flow in the distal vessel. It is likely that other conventional strategies (thrombolysis, balloon angioplasty, aspiration with small diameter aspiration catheters) would have failed to debulk such a large amount of thrombotic material, whereas direct suction aspiration with the 7-Fr guiding catheter was successful, uncomplicated, and translated into a clinically significant improvement. Although more technologically sophisticated devices, such as the angiojet rheolitic thrombectomy catheter, could have been used, the treatment modality employed by Madsen et al. is readily available, inexpensive, and user friendly. However, we should also be aware of the potential risks of this technique. The first is guiding catheter-induced trauma, or dissection of the proximal vessel, particularly in case of a tortuous or diffusely diseased coronary artery. Use of a soft-tip guiding catheter and its cautious advancement over a balloon catheter rather than over the bare wire, as was done in this case, may reduce this risk. The second is the advancement of the guiding catheter into fresh thrombus which may lead to distal embolization. Use of distal protection devices, such as filter or balloon occlusion systems, may prevent its occurrence. The third is in the removal of the guiding catheter which may cause systemic embolization of the thrombotic material. This hazard may be minimized if the interventionist maintains continuous negative suction on the syringe while withdrawing the guiding catheter from the systemic circulation.

Another aspect that deserves some comment regarding this case is patient treatment following successful reperfusion. Madsen et al. chose a life-long double antiplatelet therapy (aspirin and clopidogrel) for the prevention of recurrent thrombosis. Interestingly, at the two-month follow-up, angiography patency and normal flow of the left circumflex coronary artery were demonstrated. They also observed that the aneurysm had changed from a saccular to a spindle shape, reducing its size from 9–12 mm to 7 mm. They interpreted these changes as an indication of aneurysm regression. They used intravascular ultrasound to exclude the presence of thrombus inside the aneurysm. However, the inability to

visualize the arterial wall of the aneurysm with intravascular ultrasound, due to the low spatial resolution of this imaging technique, and the relative echolucency of thrombus may suggest that thrombotic material could have accumulated again at the lesion site, modifying the angiographic appearance of the aneurysm. Recently, coronary angiography with multislice spiral computed tomography has shown high accuracy in evaluating complex coronary pathology, and in cases such as this may allow for a clear imaging of the entire aneurysm and eventual thrombotic deposition [16,17]. Slow or turbulent flow in a large saccular aneurysm might be expected to lead to re-thrombosis despite double antiplatelet therapy. Therefore, a definitive treatment of the aneurysm could have been proposed to prevent re-occlusion or distal embolization by liberation of thrombotic material. Stent grafts covered by a synthetic membrane have been used to successfully seal coronary aneurysms which may have a propensity for rupture or thrombotic occlusion, offering a less invasive alternative than coronary bypass surgery in symptomatic patients [18,19]. However, long-term results of membrane-covered stents for treatment of coronary aneurysms are very limited, and some concern has been raised by reports of severe restenosis [20] and late thrombo-occlusive events [21] with these devices.

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