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Coil Embolization of Left Coronary Artery Pseudoaneurysms Arising as a Complication of Percutaneous Coronary Intervention

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Abstract

Coronary aneurysms and pseudoaneurysms have been described as rare complications following percutaneous coronary intervention (PCI). There is limited data available on the optimal treatment strategy for these conditions. Use of noninvasive techniques including covered stents has been described as a potential therapeutic strategy. We report a case of percutaneous coil embolization of two enlarging left anterior descending pseudoaneurysms arising as a complication of PCI.

Keywords

embolization; aneurysm – coronary; complications adult cath/intervention

INTRODUCTION

A coronary artery aneurysm is defined as coronary dilation which exceeds the normal adjacent segment or diameter of largest vessel by 1.5 times [1]. This is a rare disease with incidence varying from 1.5 to 5% [1]. Causes include atherosclerosis, congenital lesions, Kawasaki disease, connective tissue disorders, and arteritis [2–4]. More recently, coronary artery aneurysms have been described as a consequence of coronary angioplasty particularly after percutaneous transluminal coronary angioplasty (PTCA) complications [1]. A pseudoaneurysm is a pathologic condition where the wall of the artery has been torn through to the adventitia; however, the extravasated blood is momentarily contained within a sac that communicates with the arterial lumen. Angiographically, it may be difficult to distinguish true aneurysms from pseudoaneurysms. True aneurysms tend to be more fusiform and pseudoaneurysms tend to have a narrow neck at the site of the arterial tear; however, both are at risk for rupture or thrombosis [5]. Intravascular ultrasound may be useful to distinguish true aneurysms from pseudoaneurysms [5]. Surgical intervention has been the treatment of choice based on anecdotal reports. We report a case of percutaneous coil embolization of two enlarging left anterior descending pseudoaneurysms that developed as a complication of a previous percutaneous coronary intervention (PCI).

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Conflict of interest: Nothing to report.

Additional Supporting Information may be found in the online version of this article.

CASE REPORT

A 67-year-old man was admitted to the hospital for severe heart failure with pulmonary edema. There was improvement in symptoms in response to medical therapy. An echocardiogram showed severely depressed ejection fraction (calculated at 25%) with global hypokinesis and akinesis of the apex. Coronary angiography showed a left dominant coronary artery with severe proximal left anterior descending (LAD) stenoses and appearance of a filling defect consistent with a thrombus (Fig. 1). The LAD was occluded after the first septal branch. A diagonal artery provided left to left collaterals that filled the distal LAD. Based on the angiogram, a 4 × 12 mm Vision stent (Abbot Medical) was inserted and deployed at pressures greater than 20 mm Hg in the proximal LAD. At the final balloon inflation, the artery ruptured just distal to the stent which led to the emergency placement of a polytetrafluoroethylene (PTFE)-covered stent JOSTENT (Abbott Medical) (Figs. 2 and 3). This diminished flow through the perforation; however, contrast extravasation did not completely resolve and the patient was referred urgently for bypass surgery. A left internal mammary artery (LIMA) graft was placed to the LAD, and saphenous vein grafts were placed to the first diagonal, the acute marginal of the right coronary artery (RCA), as well as to the left circumflex artery. On postoperative day 6, a CT scan of the chest was obtained for persistent shortness of breath. This showed evidence of pneumonia as well as an unexpected finding of one, or possibly two, proximal LAD pseudoaneurysm(s). The total area of aneurysmal dilation encompassed 20 × 17 mm. The patient was discharged and follow-up CT scan 1 month later showed that the area of the LAD pseudoaneurysms was enlarging and now measured 24 × 19 mm.

Coronary angiography showed two contiguous pseudoaneurysms in the proximal LAD arising from the area of the previous coronary rupture (Fig. 4 and Supporting Information Video 1). The pseudoaneurysms measured 12 × 10 mm and 11 × 8.5 mm individually, which combined approximated the size estimate by CT. After discussion with the surgical team, it was decided to attempt percutaneous coil embolization of the pseudoaneurysms to prevent further expansion or rupture of the LAD.

A 6-F XBLAD-4 guide catheter (Cordis) was used to engage the left coronary artery. A BMW guide wire was loaded into a Renegade STC 18 subselective coronary delivery catheter (Boston Scientific). The BMW guidewire was advanced into the LAD and into the opening of the more distal of the two pseudoaneurysms. The angled Renegade delivery catheter was advanced over the guidewire and positioned at the distal aspect of the pseudoaneurysm (Fig. 5). Using the Renegade catheter, a series of five Interlock feathered coils (Boston Scientific) were introduced into the distal pseudoaneurysm. The five coil sizes were 20 cm × 14 mm, 30 cm × 10 mm, 20 cm × 10 mm, 20 cm × 8 mm, and 20 cm × 6 mm. Angiography revealed the pseudoaneurysm to be densely packed with coils with only trivial residual flow into the pseudoaneurysm (Fig. 6).

The Renegade catheter was withdrawn into the LAD. The BMW wire shape was angulated to enter the retroflexed mouth of the proximal pseudoaneurysm. Although the retroflexed wire entered the proximal pseudoaneurysm, the Renegade catheter would not advance over it. The guidewire was loaded into a Transit catheter (Cordis), which is a softer, more flexible catheter. Both were advanced to the distal guide and into the LAD. The Transit was advanced into the pseudoaneurysm with an angle of about 140 degrees (Fig. 7). A series of five interlocked feathered coils were paced in the proximal pseudoaneurysm including a 20 cm × 14 mm, 30 cm × 12 mm, 20 cm × 10 mm, 20 cm × 10 mm, and a 20 cm × 8 mm coil. The Transit catheter was removed and angiography revealed reduced flow into the proximal pseudoaneurysm (Fig. 8 and Supporting Information Video 2). There was no change in the remainder of the LAD itself. The patient tolerated the procedure and had an uneventful post

procedure course. Follow-up surveillance CT angiography demonstrated the coils to be in stable position within the pseudoaneurysms and with no progression of either aneurysm. The patient refused another cardiac catheterization and coronary angiography. Five months following the procedure, the patient continues to feel well without any recurrent angina or heart failure.

DISCUSSION

Coronary artery aneurysms or pseudoaneurysms can arise as a complication of PTCA with an incidence ranging from 0.3 to 3.9% [6]. The arterial rupture in our case probably was caused by using a compliant balloon (instead of a non-compliant balloon) at high pressures to expand the stent. Although no controlled trials have evaluated the incidence of aneurysmal rupture and sudden death, these potential complications remain a major concern. For this reason, surgical management has been recommended for most cases [1]. Medical therapy involves the use of antiplatelet or anticoagulation medications to minimize the risk of thrombus formation, but there is concern that this will prevent the pseudoaneurysm from clotting and sealing itself. Calcium channel blockers or nitrates have been used in cases of vasospasm [1]. Due to the low frequency of this complication, there are no trials comparing medical and surgical management.

Advances in PCI have led to the use of PTFE covered stents for coronary aneurysms [6,7]. There are a handful of cases in the literature describing coil embolization of coronary aneurysms involving native coronary arteries usually secondary to atherosclerosis [8–12]. This report describes the first case in which coil embolization was used to treat coronary pseudoaneurysms arising as a complication of PTCA. This provides a less invasive technique than surgery for treatment of coronary pseudoaneurysms particularly if covered stenting is not an option or has failed. Advances in interventional radiology and neurointerventional radiology have produced microcatheters and embolic technologies that are applicable to the management of coronary pseudoaneurysms. There is not enough evidence to recommend this as the preferred treatment strategy, but it is a technically feasible option in the appropriate clinical setting and with the appropriate expertise.

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Fig. 1.
Angiography showing severe proximal LAD stenosis (arrow).

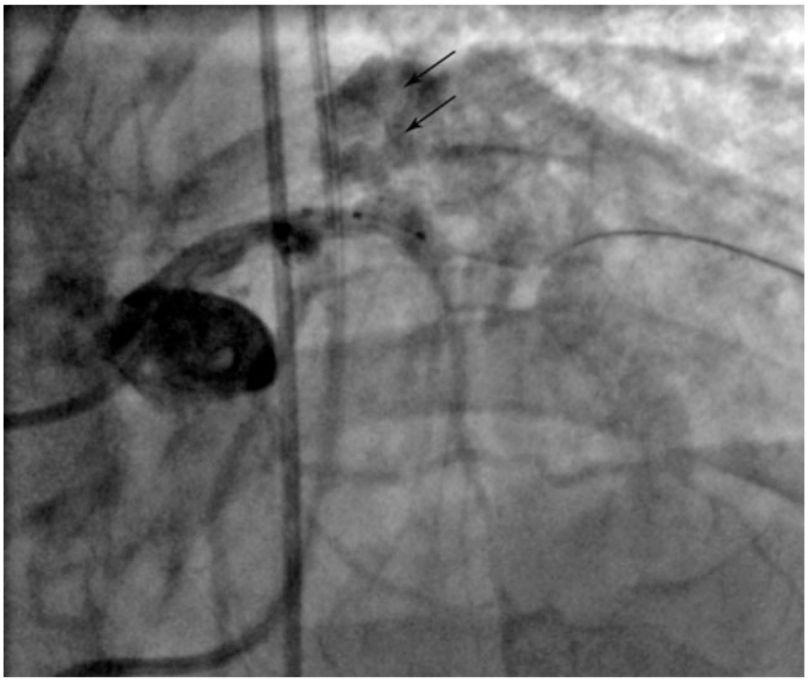

Fig. 2.
LAD rupture post stent with extravasation of contrast (arrows).

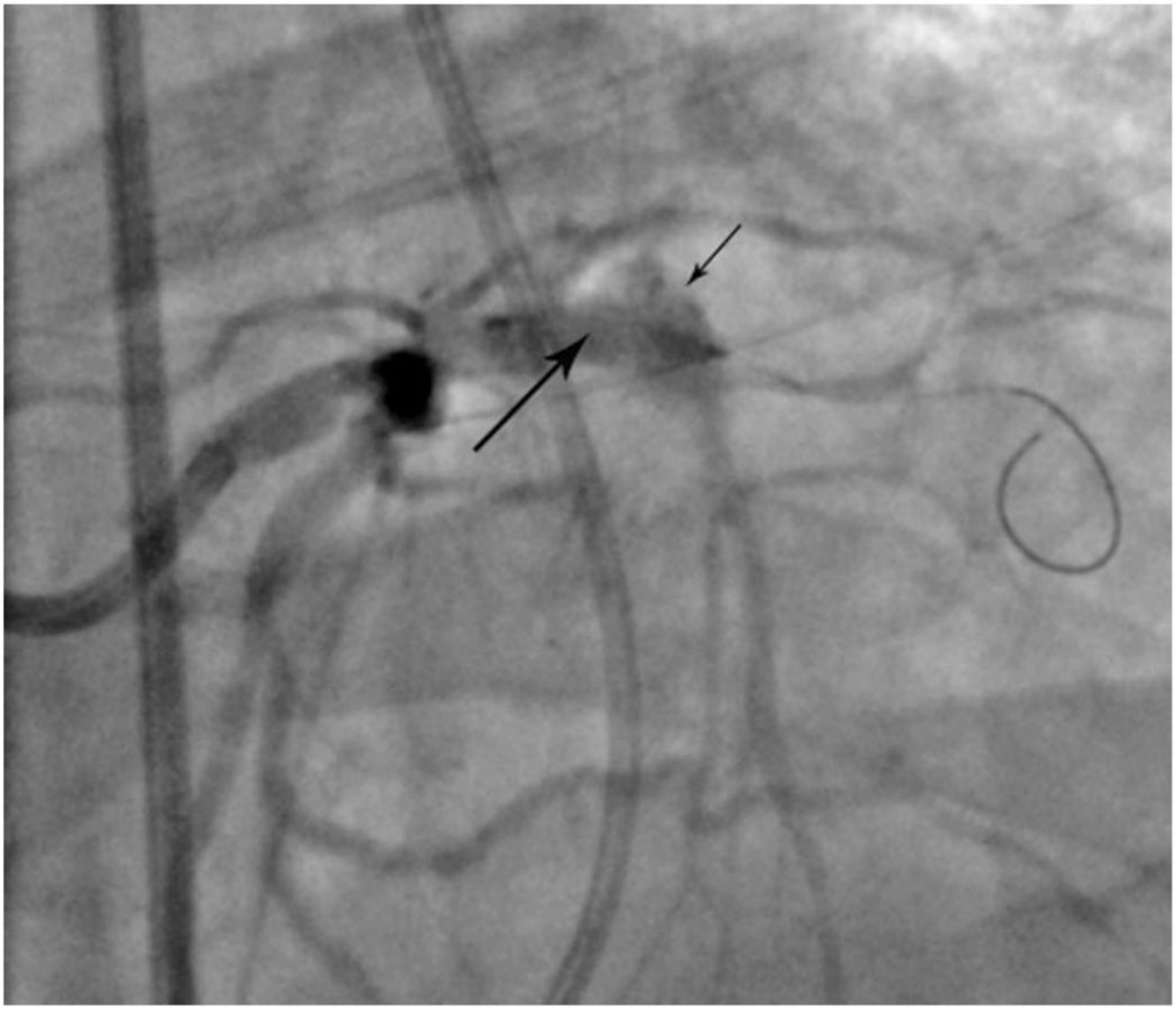

Fig. 3.
Emergent placement of a PTFE-covered stent JOSTENT (long arrow) with improved but persistent contrast extravasation (short arrow).

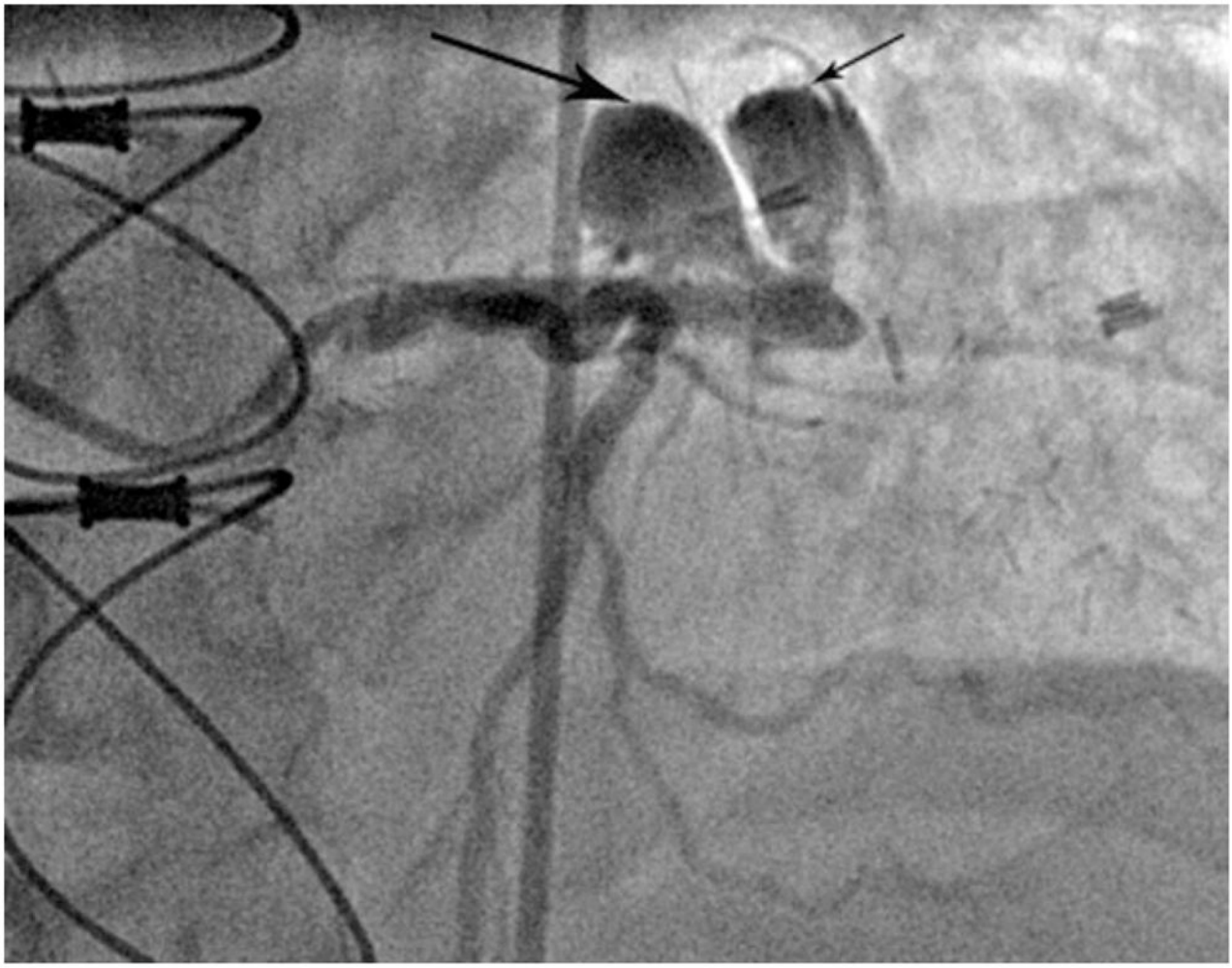

Fig. 4.
Angiography showing 12 × 10 mm proximal retroflexed (long arrow) and 11 × 8.5 mm distal (short arrow) pseudoaneurysms involving the LAD.

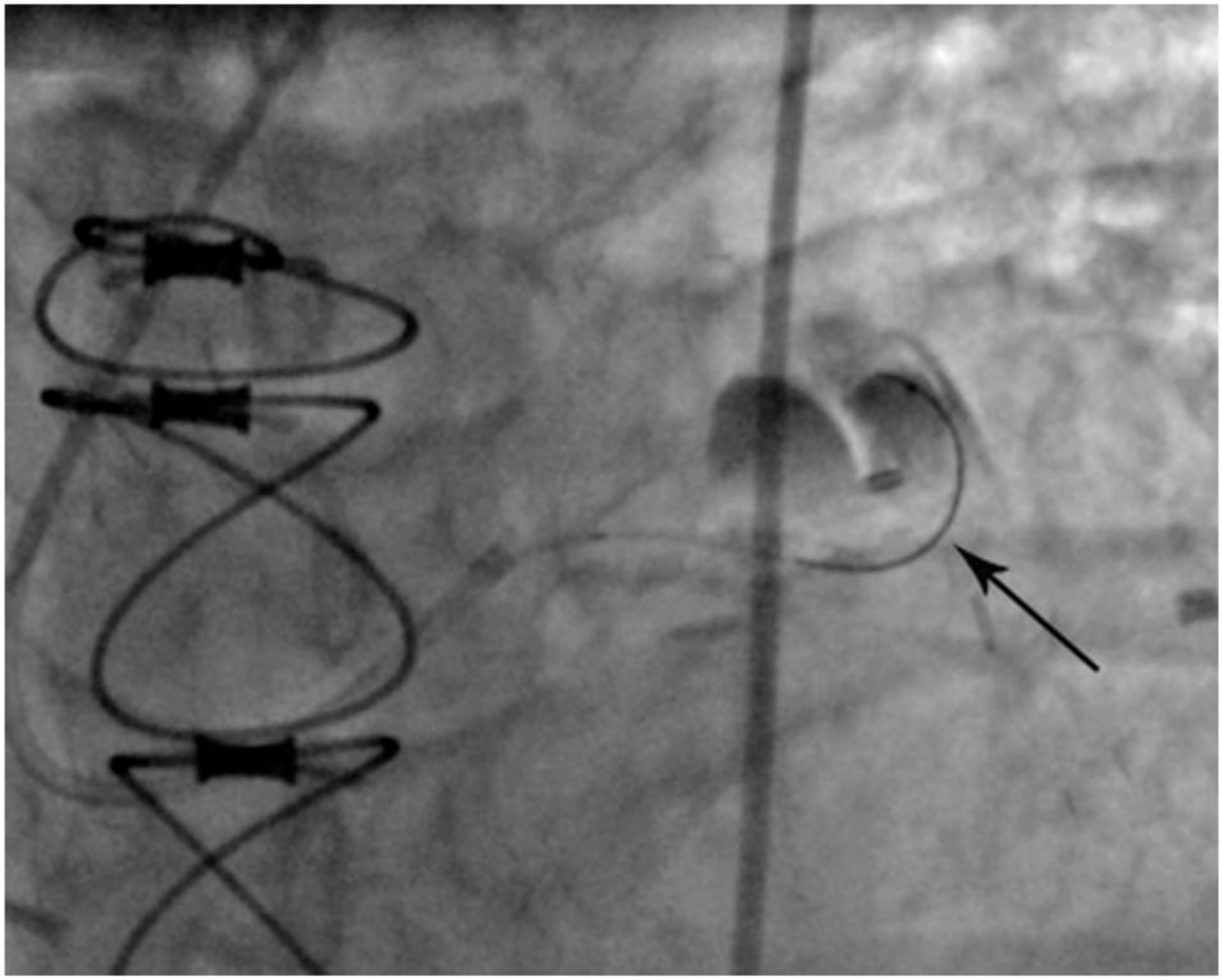

Fig. 5.
Renegade delivery catheter (Boston Scientific) positioned into the distal pseudoaneurysm with introduction of the first interlock (arrow) feathered coil (Boston scientific).

Fig. 6.
Distal pseudoaneurysm filled with five coils shows decreased flow of contrast into the pseudoaneurysm.

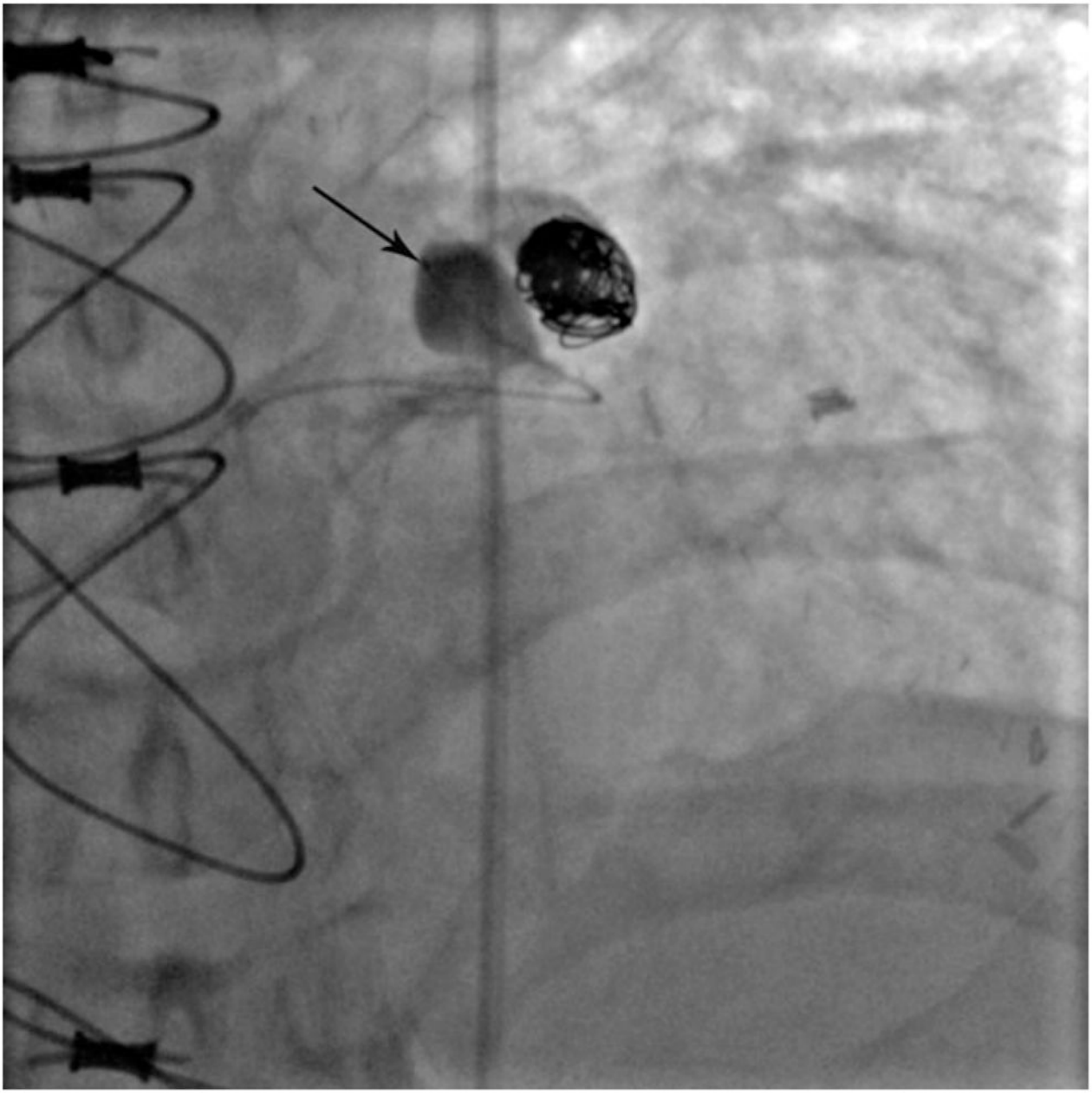

Fig. 7.
Transit catheter (Cordis) negotiated into retroflexed proximal pseudoaneurysm with placement of the first interlock feathered coil (arrow shows the tip of the Transit catheter).

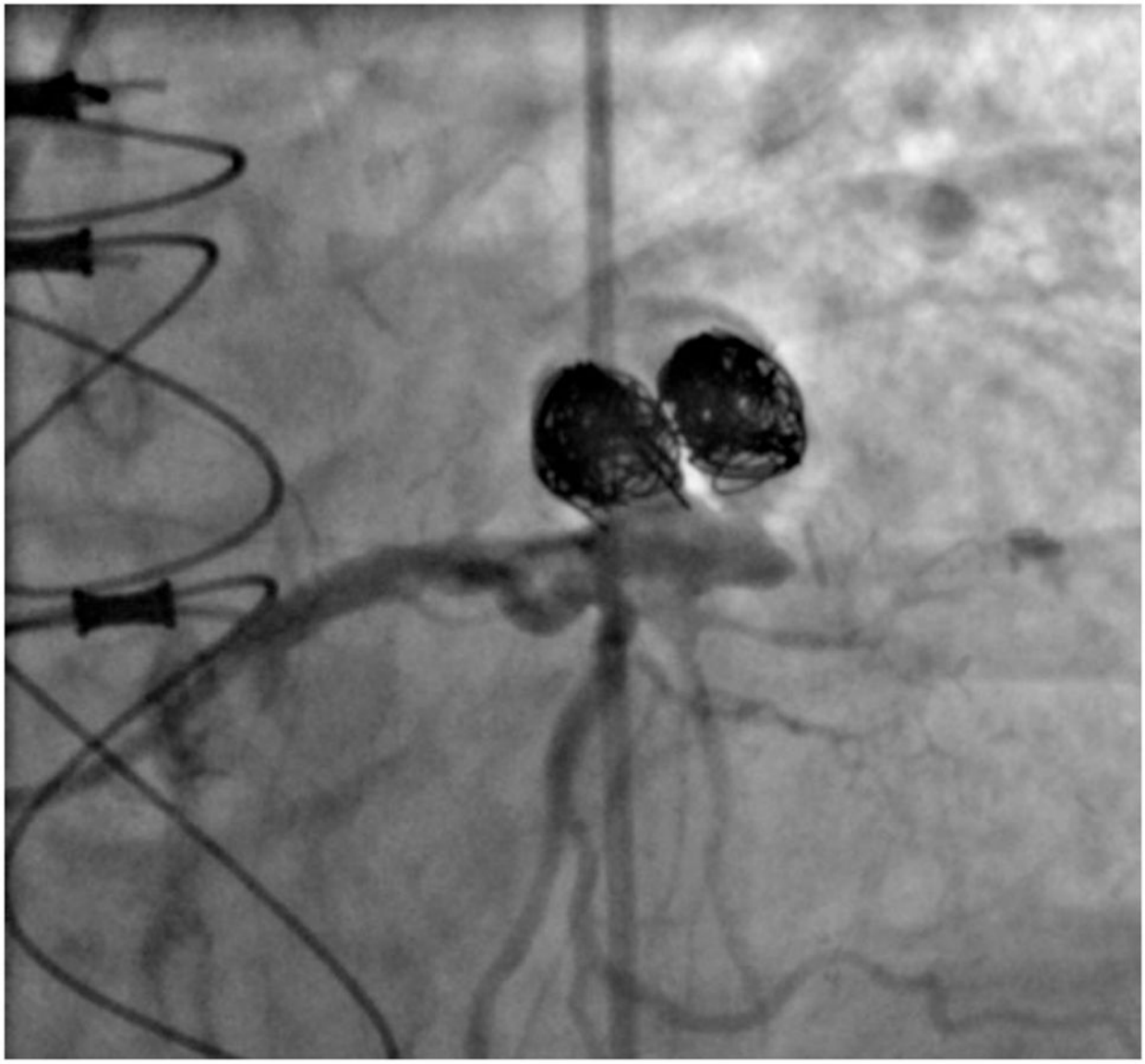

Fig. 8.
Final angiographic result showing decreased flow into both pseudoaneurysms without impingement of flow into the native coronary arteries.