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Double-Wire Technique for Access Into a Protruding Aorto-Ostial Stent for Treatment of In-Stent Restenosis

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We report a case of restenosis following ostial stenting of the right coronary artery with protrusion of the stent into the aorta. Treatment was only possible after a guidewire advanced through a lower strut was used to lever the guide, and a second guidewire was advanced through the true lumen. *Catheter Cardiovasc Interv 2004;62:214–217.*

Key words: stents; aorto-ostial stenosis; restenosis

INTRODUCTION

Elastic recoil is a common finding after angioplasty of aorto-ostial coronary artery or vein graft stenoses [1–4] and stenting is now commonly employed in an attempt to reduce this phenomenon [5,6]. Stenting in this location, however, is technically challenging, and it is associated with several risks, including retrograde dissection into the aorta, stent recoil, and stent loss or imprecise positioning. We report a patient with restenosis of an aorto-ostial stent and protrusion of the stent into the aorta, preventing intubation of the ostium with the guide catheter, and the technique that was used to overcome this difficulty.

CASE REPORT

A 76-year-old female presented to the cardiac catheterization laboratory following a non-ST segment elevation myocardial infarction. She had known coronary artery disease, having undergone PTCA of her proximal LAD 5 years earlier. Cardiac catheterization revealed a 60% ostial RCA stenosis and a 90% distal RCA stenosis with thrombus. The ostium of the RCA was easily engaged with an 8 Fr JR4 guiding catheter with side holes. Rheolytic thrombectomy was performed in the distal RCA. A 3.0 mm × 18 mm ACS Duet stent was then deployed in the distal RCA and a 3.5 mm × 13 mm ACS Duet stent (Guidant, Santa Clara, CA) was deployed at the ostium. The ostial stent was expanded and then flared with the delivery balloon inflated to a maximum of 16 atm. Seven months later, she presented with recurrent angina. Coronary angiography showed the left main coronary artery to be without any significant angiographic disease. The left anterior descending coronary artery had a proximal 50% stenosis and a distal 50% stenosis. The left circumflex had an ostial 60% stenosis. Attempts to intubate selectively the ostium of the right coronary with a diagnostic JR4 catheter were unsuccessful. Therefore, nonselective angiography was performed. The ostial stent was slightly extending into the aortic sinus. This stent had 60% in-stent restenosis. The distal stent had 70% in-stent restenosis. Attempts to engage the right coronary artery for percutaneous intervention, using multiple 6 Fr guiding catheters including a JR4, Hockey Stick 1, an Amplatz right 1 and 2, and an Amplatz left 1 were unsuccessful. The 6 Fr Hockey Stick guiding catheter, however, permitted the best proximity to the stent ostium. Through this guiding catheter, a Balance Heavy Weight (BHW; Guidant) guidewire was passed into the stent via a lower stent strut and was then used as support to lift the guiding catheter and make it more coaxial with the stent ostium. A Balance Middle Weight wire (BMW; Guidant) was then successfully advanced through the stent central lumen into the distal vessel (Figs. 1–4, 7). The distal and proximal restenotic lesions were then dilated using a 3.5 and a 4.0 mm Coyote balloons, respectively (Boston Scientific). Before the first balloon dilatation, the uninflated balloon was advanced and retracted multiple times through the stent to confirm lack of entrapment. After the last balloon inflation, there was a $<$ 30% residual stenosis in the proximal lesion and a 0%

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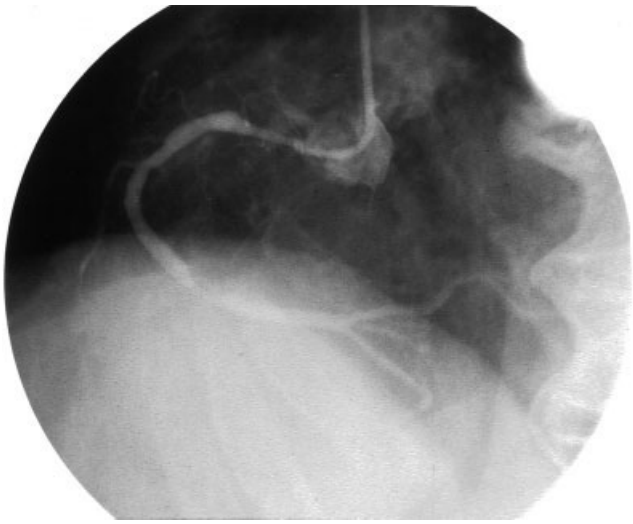

Fig. 1. Right coronary artery (RCA) in left anterior oblique (LAO) view. The guiding catheter is positioned slightly below the origin of the RCA. There is a 70% distal in-stent restenosis and a 60% ostial in-stent restenosis.

Fig. 3. RCA in LAO view. The guiding catheter is now coaxial with the origin of the RCA, and a second guidewire has been advanced to the distal third of the RCA.

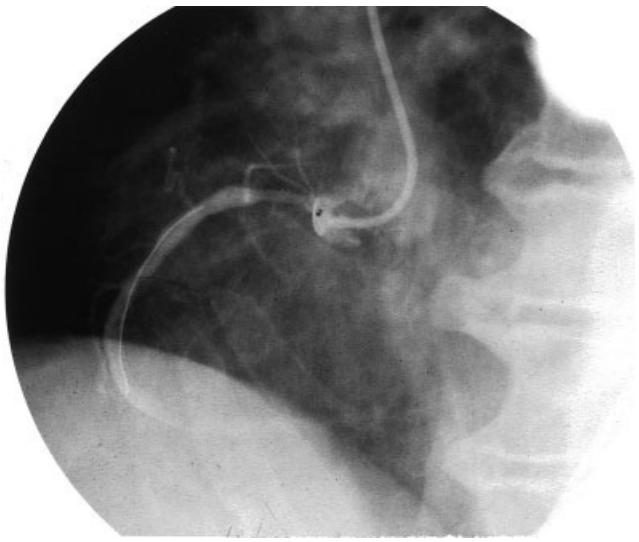

Fig. 2. RCA in LAO view. The guiding catheter is below the origin of the coronary ostium. The BHW guidewire has been advanced to the mid RCA through a lower stent strut.

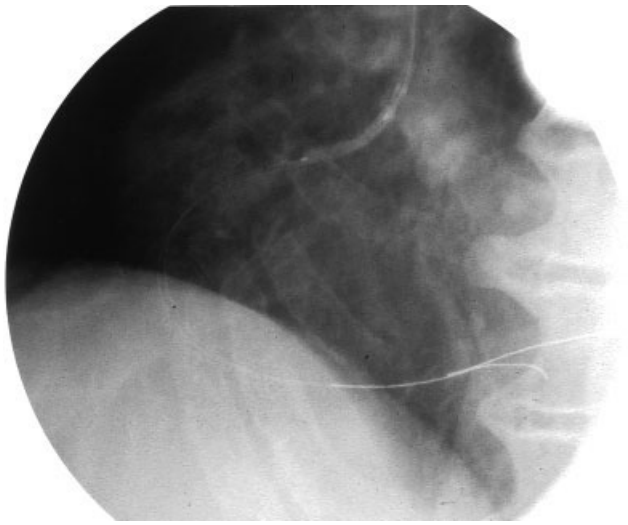

Fig. 4. Inflation of the balloon inside the ostial stent. The distal ends of both guidewires can be visualized in the distal RCA.

residual stenosis in the distal lesion with TIMI 3 flow (Figs. 5–6). There were no postprocedure complications and the patient was discharged home the next day. The patient has remained free of any anginal symptoms 19 months postprocedure.

DISCUSSION

Strategies used for the treatment of aorto-ostial stenosis include directional atherectomy [7–9], laser angioplasty [10], rotational atherectomy [11,12], and cutting balloon angioplasty [13]. More recently, coronary stenting alone or in combination with plaque modification techniques has emerged as the dominant procedure for the treatment of aorto-ostial stenosis [14–16]. The endoluminal scaffolding provided by stents results in a reduction in adventitial contraction [17,18] and elastic recoil [19,20], probably accounting for the observed reduction in angiographic restenosis. However, stenting in the aorto-ostial position is technically challenging and fraught with difficulty. Precise placement to ensure adequate covering of the ostium without excessive extrusion

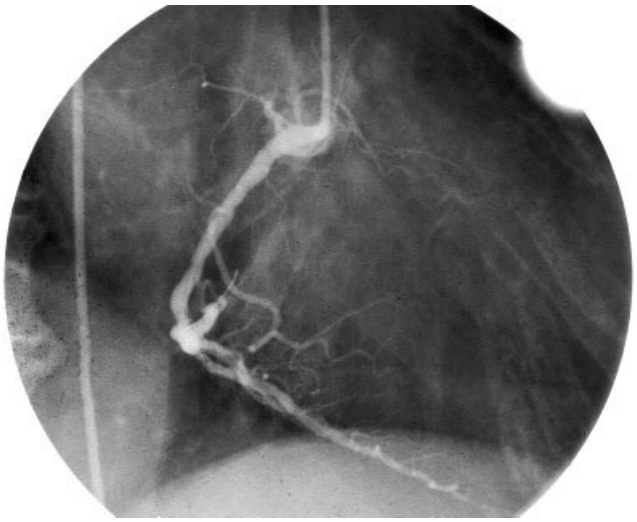

Fig. 5. RCA in RAO view. There is no residual stenosis in the distal stent and < 30% residual stenosis in the ostial stent.

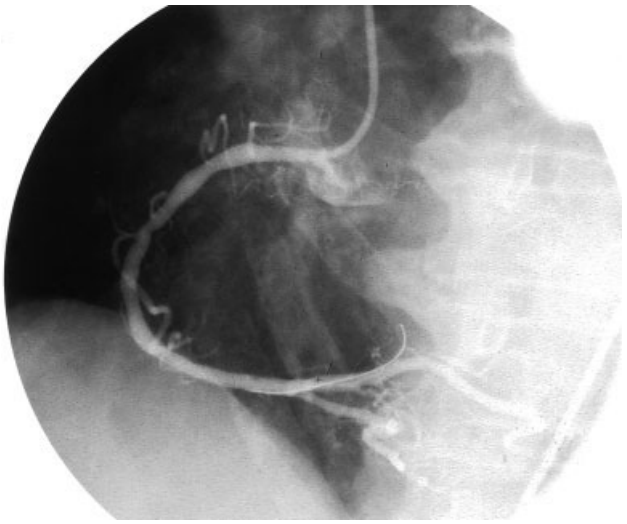

Fig. 6. RCA in LAO view. There is no residual stenosis in the distal stent and < 30% residual stenosis in the ostial stent.

of the stent into the aorta is paramount. This is made more difficult by the fact that the guiding catheter must be completely removed from the ostium to avoid it being trapped by the stent while keeping it close enough to allow visualization of the aorto-ostial area. Mild anomalies of the origin of coronary arteries will enhance the complexity of stenting of aorto-ostial lesions. These difficulties were clearly recognized in the early stent era and ostial lesions were excluded from the two randomized studies that showed improved restenosis rates of stenting versus balloon angioplasty [21,22].

Our case illustrates two of the complications of aorto-ostial stenting: in-stent restenosis and protrusion of the stent into the aorta. Stent protrusion cannot be easily seen angiographically and may make coaxial alignment of a cardiac catheter difficult. It may be clearly documented at the end of a procedure with intravascular ultrasound, and it might result in damage of the stent struts and crush of the origin at the time of subsequent cardiac catheterization. Failure to allow for coaxial alignment may also result in advancement of a guidewire through a stent strut. Although treatment of restenosis through stent struts has been reported [23], this may result in device entrapment [24,25] and even in stent extraction [26]. In our case, we made use of the guidewire advanced through a stent strut to support and lift our guiding catheter in a maneuver to align it in a coaxial position and allow the passage of a second guidewire through the true lumen. This maneuver was successful in allowing repeat target lesion revascularization. We did not perform an intravascular ultrasound to confirm advancement of the second guidewire through the true lumen. However, before balloon dilatation, the balloon was advanced multi-

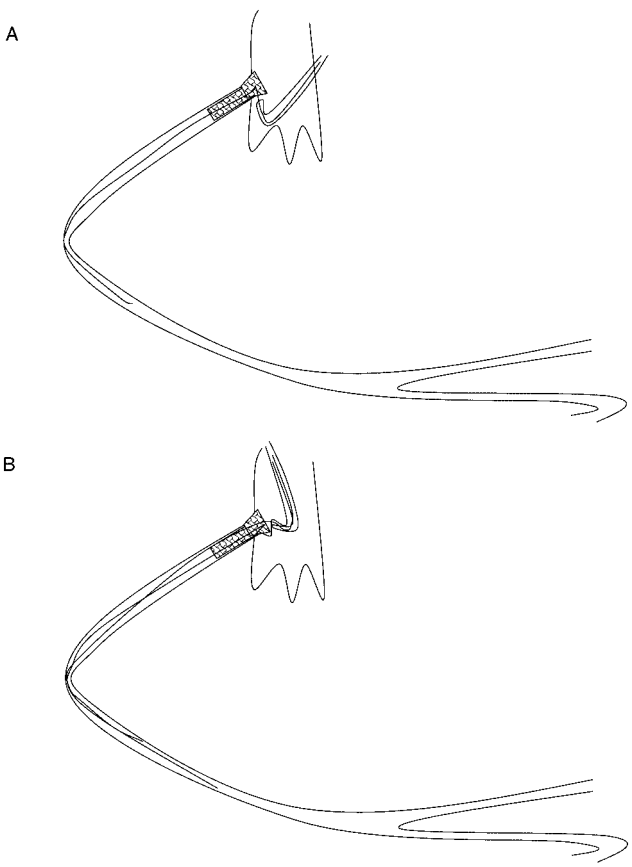

Fig. 7. Schematic representation of the position of the stent and of the relationship between guiding catheter, ostial stent, and the two guidewires. In A, the first guidewire has been advanced through a lower stent strut. In B, the guiding catheter has been lifted and a second guidewire has been advanced through the central lumen of the stent.

ple times through the stent to confirm lack of entrapment. In addition, no resistance was encountered in withdrawing the rewrapped balloon in the guiding catheter, thus supporting our conviction of advancement of the second guidewire through the true lumen of the stent.

In conclusion, our case illustrates a potential limitation of aorto-ostial stenting, and how a double-wire technique might help in overcoming this limitation.

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