Tandem Wire Angioplasty

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Stenotic lesions at vessel branch points are not uncommon. In arteries, sheer stress is thought to be atheroprotective, and disturbances in flow at ostia or bifurcations predispose to atherogenesis. When angioplasty of such stenotic lesions is necessary, “kissing balloon” or “tandem (buddy) wire” techniques are often employed.

CASE REPORT

A 65-year-old man who had undergone cadaveric renal transplantation 1 year earlier presented with hypertension and worsening renal function. A Doppler ultrasound exam revealed high-grade stenosis of the right external iliac artery at the transplant artery anastomosis. The patient was referred for balloon angioplasty of the stenotic lesion.

The right femoral artery was catheterized using Seldinger technique and a 6-Fr sheath was placed. Pelvic arteriography was then performed, revealing a short segment stenosis of the external iliac artery at the transplant renal artery anastomosis (Fig. 1A). The stenosis involved either side of the anastomosis but the transplant artery itself appeared unaffected. The patient was given 5000 U of heparin intra-arterially, and the catheter used for arteriography was removed over a 0.035-inch guide wire. A second 0.035-inch guide wire (Bentson, Boston Scientific, Natick, MA) was advanced through the sheath into the abdominal aorta. The transplant renal artery was selectively catheterized using this second guide wire and a VS-1 catheter (Boston Scientific) was positioned in a proximal branch vessel (Fig. 1B). The catheter was then removed and a 7 × 4 mm angioplasty balloon (Ultrathin, Boston Scientific) was advanced over the guide wire positioned in the abdominal aorta to the site of the stenosis. The lesion was dilated for 30 seconds at ~8 atm (Fig. 1C). The angioplasty balloon was then

removed. Repeat angiography revealed resolution of the stenosis (Fig. 1D). The patient's renal function and hypertension improved. Follow-up Doppler examinations at 6 and 12 months revealed no evidence of residual or recurrent stenosis.

DISCUSSION

Lesions at arterial bifurcations or ostia may involve the main vessel alone, the branch vessel, or some combination of both. When one artery is involved, plaque shift into the uninvolved vessel after angioplasty is a well-recognized phenomenon. If the branch vessel is being dilated, plaque shift into the main artery is rarely a problem (e.g., ostial renal artery stenting). However, when the main vessel is being dilated, plaque shift can lead to side branch occlusion.

In the case described above, “tandem” or “buddy” wire technique was used to maintain access to the transplant renal artery in the event of a dissection, plaque shift, or branch thrombosis. Maintaining access to both vessels does not prevent these untoward events but enables adjunctive measures to be pursued if a complication occurs. In other situations, “kissing balloon” angioplasty may be beneficial. This technique is favored when both vessels are similar in size such as at the aortic bifurcation. Simultaneous inflation of two balloons may also prevent plaque shift into the other vessel. The drawback of “kissing angioplasty” is that two access sites are typically required in larger vessels, and even if compliant or semicompliant balloons are used, these are often undersized to prevent overdilatation and rupture of the main artery. In the case described above, it would have not been possible to use a 7-mm balloon with a second balloon in the transplant renal artery because this would have likely resulted in overdilatation

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Figure 1 Angioplasty of right external iliac artery using tandem wire technique. (A) Pelvic angiogram showing high-grade stenosis of right external iliac artery. (B) Fluoroscopic image showing guide wires in the right iliac arteries and in the transplant artery. (C) Fluoroscopic image showing balloon angioplasty of stenotic lesion. (D) Final angiogram showing alleviation of stenosis.

of the external iliac stenosis. If branch vessel angioplasty is performed in organs such as the kidney, use of coronary systems that track over smaller guide wires (such as 0.014-inch wires) is advisable.

In the event that stent insertion is necessary, a variety of strategies may be employed but none appear ideal in all circumstances and most experience is anecdotal. A large stent can be deployed in the main vessel,

"jailing" the smaller vessel with subsequent recanalization through the stent interstices and dilation of the interstices with or without additional stent insertion. This has been termed "T" configuration of stenting. Two stents can be deployed simultaneously or sequentially in a "Y" configuration (e.g., aortic bifurcation lesions), although they must be positioned such that they are aligned in the correct orientation of blood flow. In the cardiology literature, this is described as the "Culotte" technique, although the same technique has been used throughout the body such as in the biliary system. In the case described above, placement of stents in a "Y" configuration would have required a contralateral approach. Dedicated bifurcated stents have been used in the coronary arteries and in treatment of abdominal aortic aneurysms but are not widely available for peripheral interventions. Newer protection devices may play a role in this type of intervention. Instead of simply placing a "buddy" wire, a protection device can be used to capture embolic fragments dislodged during angioplasty.

A second guide wire can also be helpful in other situations. In short focal stenoses, occasionally, attempted angioplasty is handicapped by balloon slippage on the lesion. A second nonhydrophilic wire across the lesion helps the balloon to maintain position. A second

guide wire can help to gain mechanical advantage in problematic situations. For example, it is occasionally difficult to advance catheters distal to very tortuous or angulated vessels. A second wire can be used to straighten out tortuous vessels thus improving mechanical advantage. Finally, a second wire can be used to improve mechanical advantage by buttressing a guiding sheath.

In summary, one of the basic dictums of peripheral arterial angioplasty is that wire access must be maintained at all times across an area of dilation. Tandem wire technique allows adherence to this tenet.

SUGGESTED READINGS

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