Case Report

Transcatheter Stent Implantation for the Treatment of Abdominal Aortic Coarctation and Right Renal Artery Stenosis in Takayasu's Arteritis: A Case with a 4-Year Follow Up

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We describe a Takayasu arteritis patient who was admitted because of an abdominal aortic stenosis, further complicated by the presence of a stenotic right renal artery located in the area of the aortic stenosis. After treatment of the renal stenosis with a 4 × 15 mm Driver stent, a 16 × 60 self-expandable nitinol stent (OptiMed) was deployed through the stenosis of the abdominal aorta. Even though the right renal artery was initially compromised after stent deployment through the aortic stenosis, the patient was successfully treated with renal artery re-dilation by a balloon passed through open cells of the aortic stent. During follow up, the patient suffered no procedure-related complications.

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Abdominal aortic coarctation is a rare disease that may result from diverse etiologies, among which Takayasu arteritis has been reported as one of the common causes that may affect the aorta and also its branches.[1-6] There are several reported methods for treatment of abdominal aortic coarctation, including patch aortoplasty and thoracoabdominal bypass (surgical),[3-7] as well as endovascular options, including balloon angioplasty alone[8] or with stenting.[9-12]

We described here our experience with endoluminal stenting of an abdominal aorta stenosis in a Takayasu arteritis patient, who had a past surgical history of aortobiiliac and left renal artery bypass grafting, the procedure being further complicated by the presence of the right renal artery stenosis.

Case presentation

A 27-year-old woman was admitted to our hospital complaining of exertional leg fatigue and hypertension refractory to medication. She had a past surgical history of aortobiiliac and left renal artery bypass grafting two years previously, associated with reimplantation of the left renal artery. Five years prior to her admission, she had been diagnosed by means of angiography as having Takayasu arteritis. Physical examination on admission showed systemic hypertension, differences between upper and lower limb blood pressure values (170/100 vs. 120/90 mmHg) and pulse deficit in the lower extremities. In view of her recent symptoms, she was re-evaluated by angiography. The aortography and selective right renal angiogram revealed a 70% stenosis of the abdominal aorta (above the previous graft) as well as a 90% stenosis involving the proximal renal artery (the diameter of the stenotic right renal artery was 1 mm) (Figure 1A). Renal function was normal, as shown by levels of blood

urea nitrogen and creatinine. She was a candidate, first, for right renal artery angioplasty with stenting, and then for endovascular treatment of the abdominal aorta stenosis with a self-expandable nitinol stent. Informed consent was obtained and the patient was referred to the catheterization laboratory. She underwent retrograde femoral artery catheterization under local anesthesia using the Seldinger technique. A 7 F arterial sheath was inserted into the right femoral artery. Next, a renal guiding catheter was placed at the right renal artery ostium. A BMW guidewire was then passed through the stenotic renal artery.

After predilation with a 3 × 15 mm balloon, arterial stenting was successfully carried out using a 4 × 15 mm Driver stent (Medtronic Corporation, USA). After post-dilation with a 5 × 15 mm balloon, control angiography showed a satisfactory result, with good patency of the right renal artery (Figure 1B & C). Afterwards, the 7 F arterial sheath was exchanged for a 12 F sheath. According to the abdominal aortography measurements, the stenotic area was 7 mm in minimum diameter and 30 mm in length, located below the superior mesenteric artery and at the level of the right renal artery. The diameters of the abdominal aorta above and below the coarcted segment were 14 and 20 mm, respectively and the peak systolic pressure gradient was 50 mmHg (170/100 vs. 120/90 mmHg). The technique of stent implantation has been well described previously.[12-13] A 16 × 60 mm self-expandable nitinol aortic stent (Sinus-Aorta/Optimed, Germany) was selected and successfully deployed (Figure 1D). The transcoarctation pressure gradient decreased from 50 to 16 mmHg (148/90 vs. 132/90 mmHg) after stent deployment. Then, post dilation was performed with a 12 × 30 mm balloon (Figure 1E). According to control aortography, the final gradient decreased to 3 mmHg (140/90 vs. 137/90 mmHg) and the diameter of the isthmus increased from 7 to 12 mm. On the other hand, it seemed that the right renal artery had been compromised after stent deployment (Figure 1F). Therefore, the right renal artery was then re-crossed and successfully redilated by a 5 × 15 mm balloon passed through the aortic stent (Figure 1G).

Final angiography revealed adequate patency of the abdominal aorta and right renal artery, associated with correct device positions without any arterial dissection or perforation (Figure 1H). No heparin or anticoagulation was given after completion of the procedure. The patient had been prescribed aspirin 80 mg per day, which was started 2 days before the interventional procedure, and was continued for 6 months.[13] The patient was followed for 48 months. Follow up was performed at 1, 3 and 6 months after procedure and was then continued at 6-month intervals. Multislice spiral CT angiography was performed 48 months after the procedure and revealed no restenosis within the stents, occlusion of abdominal aorta branches, aneurysm formation, or other related complications (Figure 2). The patient's hypertension was controlled using antihypertensive medications on follow up and her symptoms ameliorated dramatically.

Discussion

Coarctation of the abdominal aorta is an uncommon disease that may result from a congenital anomaly in the development of the aorta or from acquired causes.[9-12] The acquired causes consist of retroperitoneal fibrosis, mucopolysaccharidosis, neurofibromatosis, fibromuscular dysplasia and Takayasu arteritis (TA). TA is an inflammatory disease of unknown etiology that affects the aorta and its branches. In other words, an autoimmune process causes an inflammatory process that destroys the elastic media of the aorta and its main branches.[1,3] Open intervention is the gold standard for treating occlusive aortic lesions, yet postoperative morbidity and mortality have remained quite high.[7] In Taketani's study,[3] 33 patients with abdominal aorta coarctation resulting from TA over a 44-year period underwent surgical treatment (aorto-aortic bypass). Of 29 initial survivors (four hospital deaths due to bleeding, pneumonia and renal failure), 22 patients had complications during follow up, including anastomotic aneurysm (10 patients), heart failure (3 patients), cerebrovascular accident (3 patients), abdominal aortic aneurysm (2 patients), graft deterioration (2 patients), anastomotic stenosis and renal failure (2 patients).

On the other hand, endoluminal stenting of aortic stenosis is less invasive compared to surgical options or balloon angioplasty alone, resulting in fewer procedural complications and lower mortality.[12,14] Nevertheless, open surgical repair seems to be the first choice in the treatment of abdominal aortic coarctation when associated with aneurysmal degeneration, unfavorable anatomy (such as severe occlusion of the aorta or extension to the aortic bifurcation) and severe hypertension.[15] Some authors believe that endovascular treatment of the abdominal aortic stenosis is not effective or safe for lesions located near the renal arteries and may not have long-term benefits.[7] Moreover, the majority of

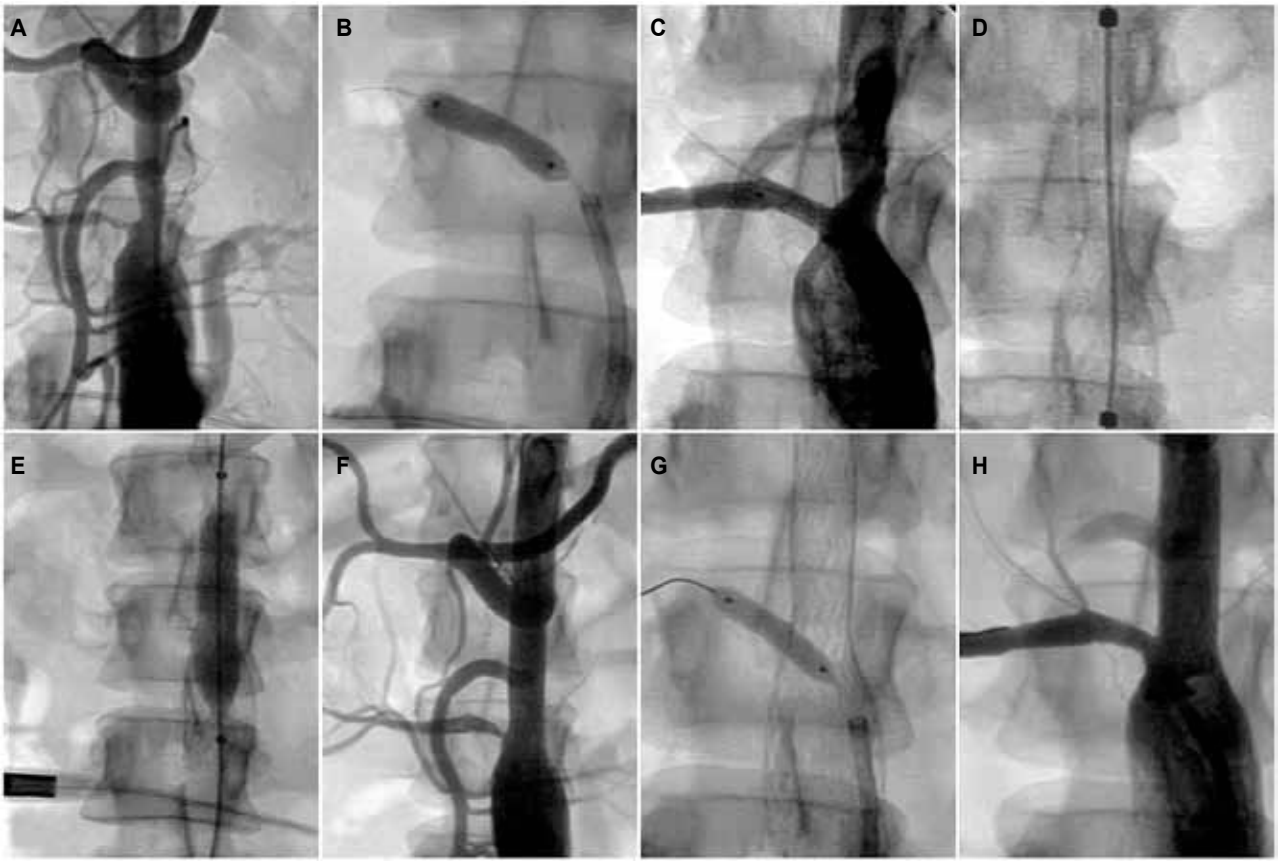

Figure 1. Serial angiography of the abdominal aorta and right renal artery showing: A, a 70% stenosis of the abdominal aorta located below the superior mesenteric artery and a 90% stenosis of the right renal artery; B, postdilation angioplasty with a 5 × 15 mm balloon after renal artery stenting with a 4 × 15 mm Driver stent; C, good patency of the right renal artery; D, deployment of a 16 × 60 mm nitinol self-expandable stent (OptiMed) through the abdominal aortic stenosis, involving the origin of the right renal artery; E, postdilation angioplasty with a 12 × 30 mm balloon; F, right renal artery compromise after treatment of aortic stenosis; G, re-dilation of right renal artery with passage of a 5 × 15 mm balloon through open cells of the OptiMed stent; H, no residual narrowing of the right renal artery nor any procedure-related complications.

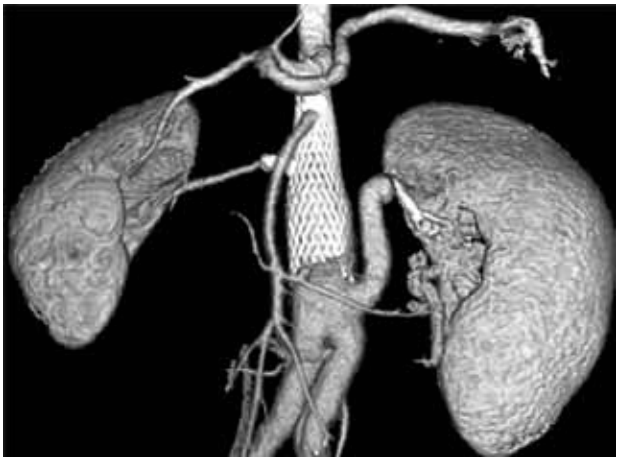

Figure 2. Computed tomographic angiography of the abdominal aorta and its main branches 36 months after the procedure reveals two deployed stents through the abdominal aorta and right renal artery, with no restenosis within the stents, no occlusion of abdominal aorta branches, nor any other related complications.

patients with abdominal aortic coarctation also have renal or splanchnic arterial stenosis.[6,7,12]

In this patient, with abdominal aortic stenosis complicated by the presence of a stenotic right renal artery located in the area of the aortic stenosis, and a past surgical history of aortobiiliac and left renal artery bypass grafting, we preferred to attempt endovascular treatment using stenting in both stenotic areas in one session. Even though the right renal artery was initially compromised after the OptiMed stent was deployed through the aortic stenosis, it was successfully treated by balloon re-dilation. In other words, even if there is any arterial compromise after stent deployment, the shape of the framework of OptiMed stent allows the passage of a balloon through its open cells to dilate any compromised branches (Figure 1G). Even though we were able to treat both stenoses using endoluminal stenting, there was the

possibility of complications, including renal or aortic dissection, distal embolization and stent migration.[13] Moreover, there were concerns about the increased risks of restenosis within the stents, stent thrombosis, aneurysm formation, or other procedural complications. However, none of these complications were observed during follow up (Figure 2).

In conclusion, endovascular treatment of abdominal aortic stenosis not distant from the renal arteries, even in the presence of occlusive disease of such arteries, can be successfully performed using a self-expandable nitinol stent (OptiMed), with a satisfactory outcome.

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