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Dual-Sheath Delivery System for Vessel Stabilization Using the Bolton Relay® Thoracic Stent-Graft

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Endovascular intervention for complex aortic pathology is an evolving field, and as a consequence, interventionists are confronted with patients who have challenging vascular access. The inherent large bore of thoracic endovascular aortic repair (TEVAR) delivery sheaths as well as the relative motion during stent-graft deployment pose additional risks in marginal vasculature. The following case illustrates the benefits of a sheath-in-sheath system in small, fragile, and highly calcified iliofemoral vessels in a patient requiring TEVAR.

CASE DISCUSSION

A 71-year-old woman with a 59 pack-year smoking history presented with stabbing persistent retrosternal chest pain. She underwent a CT angiogram and was found to have a saccular aneurysm measuring 2.2 X 2.7 cm with an associated penetrating atherosclerotic ulcer (PAU) along the inner curve of the aorta at the level of the junction of the left common carotid artery and left subclavian artery, in addition to a 5-cm proximal descending aorta (Figure 1). Transthoracic echo (TTE) revealed a normal ventricular function (55%–60%) with no valvular disease. Finally, a left heart catheterization (LHC) revealed triple-vessel disease.

The preoperative plan was a total arch repair with resection of the aortic tissue involving the aneurysm and ulcer. The coronary bypass was completed first after cardioplegic arrest and cooling to 24°. Next, under circulatory arrest and perfusion to the individual head vessels, the aorta was opened and the ulcer was found to be extending deep into the descending aorta and full resection was not possible.

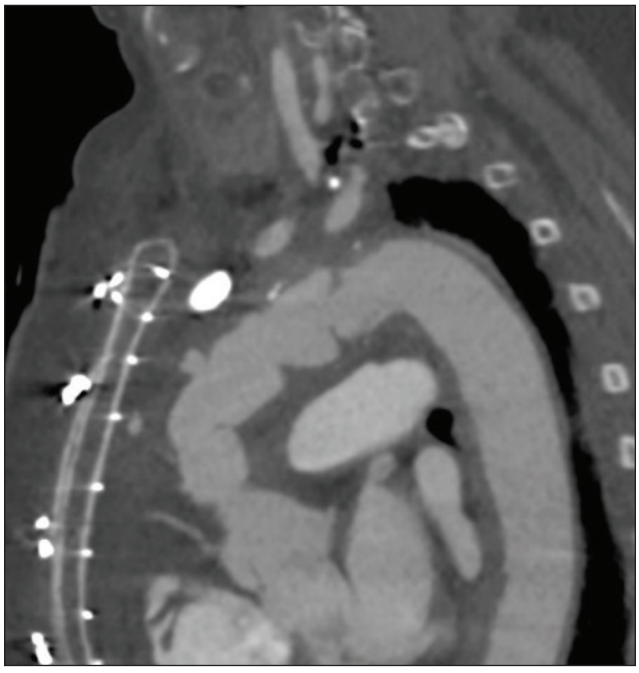

Figure 1. Sagittal CT scan of the thoracic aorta after total arch repair before TEVAR.

Therefore, an elephant trunk procedure was performed using a #26 Gelweave graft (Vascutek), with the distal anastomosis constructed just proximal to the ulcer and just distal to the left subclavian artery; 8 cm of graft was positioned in the descending aorta while under circulatory arrest. The arch vessels were then each sewn to side arms of the aortic graft after the distal anastomosis and after resuming full cardiopulmonary bypass. Given that the ulcer was not resected, a second stage procedure with TEVAR was needed to adequately seal off the lesion.

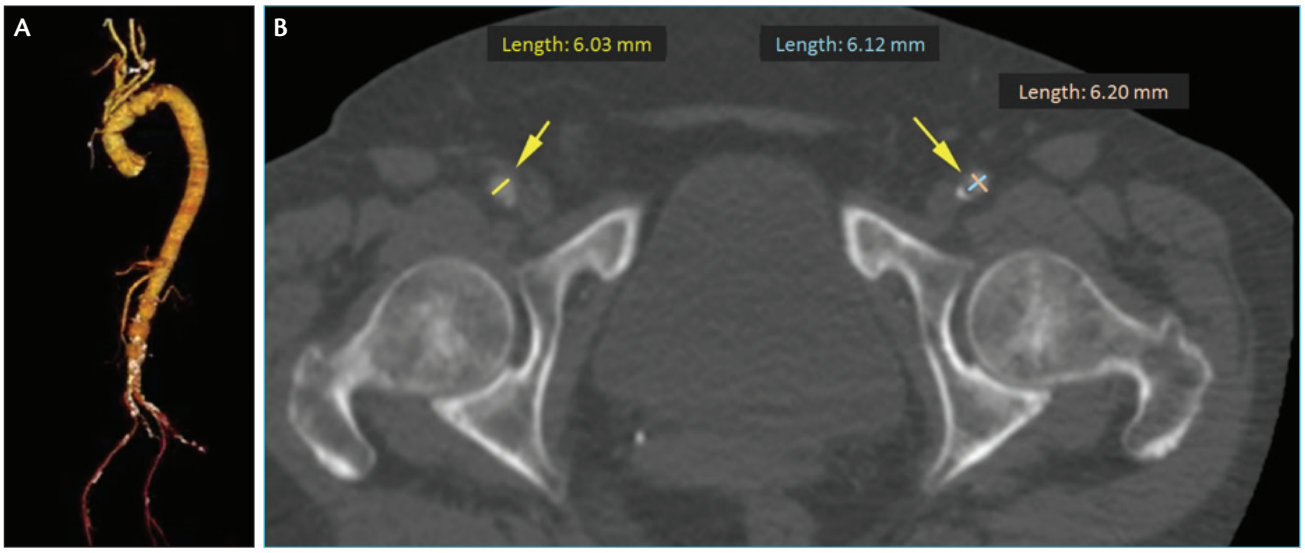

Figure 2. Reconstruction of the aorta as well as the iliofemeral vessels (A). CT scan highlighting access vessel size (B).

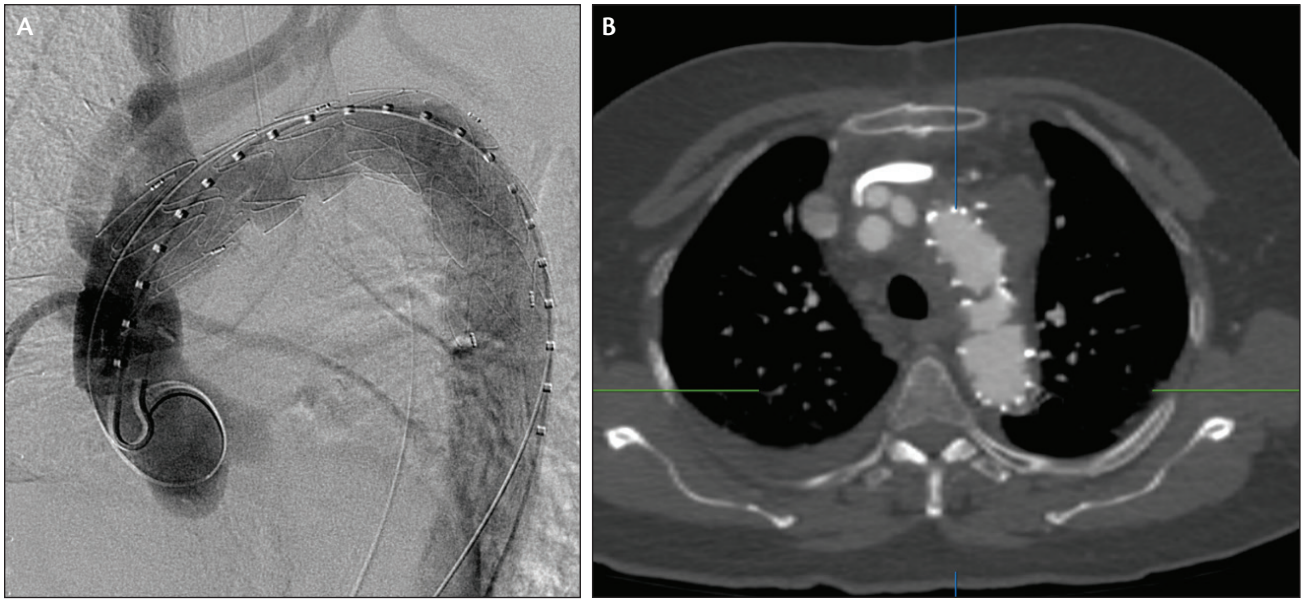

Figure 3. After stent-graft deployment. Complete angiogram (A) and CT scan (B) showing exclusion of the aneurysm by the stent-graft.

Ten days after the aortic arch procedure, the patient underwent TEVAR. During planning for this second operation, iliofemoral vessels were found to be small and highly calcified on CT angiography (Figure 2), with maximal right external iliac diameter of 6 mm and left external iliac diameter of 6.1 mm, and femoral diameters of 6.4 mm and 6.7 mm, respectively. The Relay®Plus system (Bolton Medical) was chosen due to its hydrophilic coating and dual-sheath design. The dual-sheath system allows for one sheath to maintain primary vascular access, and the other to be used as a working sheath for the procedure, thus limiting the movement within the access vessels. This may serve to minimize trauma, particularly when vessel diameter is small and calcified. The LFA was accessed and preclosed, and a tapered 34- X 30- X 150-mm Bolton stent-graft was selected for the procedure.

The device was advanced into position after a diagnostic angiogram confirmed proximal and distal landing zones. Once positioning was confirmed, the graft was deployed using the left subclavian artery takeoff as the proximal marker. A completion angiogram revealed exclusion of the aneurysm and ulcerated areas without endoleak, with over 5 cm of graft-graft overlap. The delivery system was then removed without issue, the preclose

sutures were tied without incident, and a peripheral angiogram confirmed patency (Figure 3). The patient was extubated in the operating room and discharged in good condition 3 days postoperatively.

CONCLUSION

The Bolton Relay's hydrophilic dual-sheath delivery system affords distinct advantages in challenging peripheral access in TEVAR, namely by stabilizing the primary access vessel, straightening tortuosity, and minimizing sheath motion relative to the vessel. This in-line design also stabilizes the inner sheath that contains the stent-graft, and thus allows for extremely precise deployment. These features making it an attractive TEVAR option in situations with tight, tortuous access and in complex aortic arch anatomy that necessitate precise positioning. ■

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