ENDOVASCULAR STENT-GRAFT REPAIR WITH A FLEXIBLE STENT-GRAFT AND A SIMPLE APPLICATOR PREPARED FROM A SYRINGE

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The optimal treatment for patients with recurrent aortic disease after prior operations remains controversial. Despite its many limitations, endovascular stent-graft repair seems to be a

reasonable option in redo aortic surgery for patients at higher operative risk.^{1,2} We report herein a new device prepared from a syringe to be used as an applicator of the flexible stent-graft.

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Fig 1. Preoperative and postoperative imaging study. Preoperative aortography (A) and CT (B) revealed a pseudoaneurysm with leakage from the distal anastomosis (arrows) of the previous aortic operation. Postoperative aortography (C) and CT (D) demonstrated complete elimination of a pseudoaneurysm.

Clinical summary. A 62-year-old man was admitted to our institution with a ruptured aneurysm in the aortic arch. Total arch repair was done with a 24-mm collagen-impregnated woven Dacron graft (Meadox Medicals, Inc, Oakland, NJ) in April 1999. Bacteriologic study of the specimen taken from the excised aortic wall and blood sample revealed *Salmonella enteritidis*. The diagnosis was ruptured mycotic aneurysm. His initial postoperative course seemed uneventful, although he had the insidious onset of massive effusion in the mediastinum. Digital subtraction angiography and computed tomography (CT) revealed a pseudoaneurysm with leakage from the distal anastomosis of the previous aortic operation (Fig 1, A and B). The patient had several risk factors—emphysema, decreased renal reserve, and multiple saccular aneurysms in the abdominal aorta—in addition to reoperation. We decided to treat him with endovascular stent-graft repair and omental flap implantation after debridement of the mediastinum. A stent-graft, 28 mm in diameter and 10 cm in length, was constructed from a self-expanding Gianturco stainless steel Z stent (Cook, Inc, Bloomington, Ind) and a thin-walled woven Dacron vascular graft (Ubekosan, Inc, Ube, Japan). A middle segment of the vascular graft was free of stent to maintain its flexibility to be tailored to the curve of the distal aortic arch (Fig 2, A). The stent-graft was introduced into an applicator that was prepared from a syringe with the tip of its outer barrel cut (Fig 2, B). After re sternotomy, a massive hematoma was removed and the mediastinum was irrigated with a large amount of saline solution. Then cardiopulmonary bypass was begun and the patient was cooled to an esophageal temperature of 20°C. After introduction of hypothermic circulatory arrest, the aortic graft was opened just distal to the orifice of the left subclavian artery, and the stent-graft was accurately deployed, excluding the distal anastomotic site under direct vision with the guidance of transesophageal echocardiography. The proximal end of the stent-graft was sutured circumferentially to the inside of the aortic graft.

The postoperative course was uneventful. Aortography and contrast-enhanced CT 1 month after the operation revealed that a pseudoaneurysm was completely eliminated with no leakage, and the flow through the graft was normal (Fig 1, C and D). The patient was alive and well 7 months after the endovascular stent-graft repair.

Comment. Although endovascular stent-graft repair for thoracic aortic aneurysm is less invasive than open surgical procedures, the presence of a curve and branch vessels in the aortic arch makes it difficult to apply this method in aortic arch disease. Our patient had several risk factors including multiple aneurysms in the abdominal aorta. Moreover, the patient required mediastinal debridement with omental flap implantation. Hence we have used hypothermic circulatory arrest during cardiopulmonary bypass and have placed a stent-graft via the aortic graft. For the purpose of accurate

Fig 2. Flexible stent-graft and applicator. A middle segment of the vascular graft was free of stent to maintain its flexibility to fit the curve of the distal aortic arch (A). The stent-graft was introduced into an applicator prepared from a syringe with the tip of its outer barrel cut (B).

deployment, a middle segment of the graft was free of the stent so that it could fit the curve of the aortic arch, and a syringe was used as a large-caliber applicator to release this specially designed graft with ease.

So far we have used this applicator and stent-graft in 4 patients with aortic arch disease during the past year and have found them to provide a good outcome. This method has been very effective and we have encountered no complications related to the device itself. We believe this technique will be a useful tool for cardiovascular surgeons working in this field.

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