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Clinical Research

Simultaneous Endovascular Repair for Thoracic and Abdominal Aortic Pathologies: Early and Midterm Results

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Background: To analyze information from a single clinical center, evaluating early and midterm results of simultaneous thoracic endovascular aortic repair (TEVAR) and endovascular aneurysm repair (EVAR) for coexisting thoracic and abdominal aortic pathologies.

Methods: From January 2005 to December 2014, 13 patients (8 men, 5 women; mean age, 75.3 years; range, 69–82 years) with concomitant thoracic and abdominal aortic disease (aneurysms, type B dissection, penetrating aortic ulcers) were treated with simultaneous TEVAR and EVAR. All patients had significant comorbidities. No preoperative cerebrospinal fluid drainage was performed. The follow-up rate was 100% during a period of 36 months (range, 1–60 months).

Results: Technical success was achieved in all 13 patients, including deliberate partial or total coverage of the left subclavian artery in 3 patients, coverage of both internal iliac arteries in 1 patient, and coverage of left subclavian artery and unilateral internal iliac artery in 1 patient. The average procedural time was 160 min (range, 120–200 min). Mean blood loss was 140 mL (range, 100–250 mL). Four types of commercially available stent grafts (SGs) were used. The lengths of the thoracic SGs were 150–200 cm. Overall survival was 92.3% at 1- and 3-year follow-ups. None of the patients developed stroke or paralysis. The average hospital stay was 9 days (range, 7–12 days). No patients developed endoleak or SG migration.

Conclusions: Combined TEVAR and EVAR can be performed successfully with minimal morbidity and mortality. When anatomically feasible, simultaneous TEVAR and EVAR is a viable alternative to staged or hybrid repair.

Despite being less invasive than open aortic repair, thoracic endovascular aortic repair (TEVAR), nonetheless, results in spinal cord ischemia (SCI) in 2–15% of patients.[1] It is more complicated when that patient's condition also includes an abdominal aortic aneurysm (AAA). It was reported that 10–20% of patients with AAA have concomitant thoracic aortic pathologies (type B dissection, penetrating aortic ulcer, thoracic aortic aneurysm).[2]

There is no consensus on whether 1- or 2-stage surgery is the optimal therapeutic strategy for patients with concomitant thoracic and abdominal aortic disease. Two-stage surgery may increase the danger of a residual AAA rupture and that of subjecting high-risk patients to 2 episodes of general anesthesia. Simultaneous TEVAR and endovascular abdominal aortic aneurysm repair (EVAR), however, have rarely been reported because of the potential risk of SCI, which may lead to paraplegia. Only a few studies reported simultaneous TEVAR and EVAR for patients with both thoracic and abdominal aortic disease.[3–6] The aim of this study was to present information from a single clinical center

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performing simultaneous endovascular repair for coexisting thoracic and abdominal aortic pathologies. Based on these findings, we evaluate the feasibility and safety of this combined surgical approach.

MATERIALS AND METHODS

Patients

From January 2005 to December 2014, 13 patients were simultaneously treated with TEVAR and EVAR at our center. Of these, 7 were admitted with acute severe back pain and were diagnosed with type B dissection (BAD, 2 patients) or thoracic aortic penetrating ulcer (PAU, 5 patients). The BAD involved the descending and abdominal aorta with celiac artery, superior mesenteric artery, and renal arteries arising from the true lumen. The 7 patients were also found to have an infrarenal AAA. The other 6 patients were each admitted with a pulsating mass in the abdomen, and computed tomography angiography (CTA) indicated an infrarenal AAA. The 6 patients were found to have PAU (1 patient) or thoracic aortic aneurysm (TAA, 5 patients). Although the patient had asymptomatic PAU on admission, he had a history of back pain 1 month before and released by oral analgesia. The PAU also combined with intramural hematoma which extended >10 cm. Therefore, TEVAR was also planned for him. All diagnoses were confirmed by CTA. All patients had significant comorbidities, with their characteristics summarized in Table I. The average diameters of AAA, TAA, and PAU were 65 mm (range, 56−80 mm), 65 mm (range, 55−72 mm), and 4 mm (range, 2.9−5.3 mm), respectively (Table II). In addition to aneurysm diameters, the morphology of the aortic pathology, the patient's condition, and other complications were also considered, resulting in decisions to perform the simultaneous procedure as the most desirable approach for these patients. During the period of our study, no patient had open repair. The procedures were approved by the Institutional Review Board of the First Affiliated Hospital of Kunming Medical University, and the required informed consent was obtained from all patients and their families.

Table I. Patient demographics and comorbidities

Variable	*n* (%) or mean (range)
Age, mean ± SD (range), years	74.9 (69−82)
Male gender	8 (57.1)
Hypertension	14 (100)
Diabetes	4 (28.6)
Coronary artery disease	6 (42.9)
Hyperlipoidemia	9 (64.3)
Chronic renal insufficiency	2 (14.3)
COPD	11 (78.6)
Peripheral vascular disease	7 (50)

COPD, chronic obstructive pulmonary disease.

Stent-Graft Implantation

Procedures were performed under general anesthesia with tracheal intubation. Preoperative cerebrospinal fluid drainage was not used. Arteriotomy was performed on both common femoral arteries. A 5F calibrated catheter and a 0.035-in guide wire were advanced into the ascending aorta via a femoral access. After angiography and measurement of the thoracic aortic lesions, a rear release thoracic aortic endograft was advanced into the proper position using a Lunderquist Extra Stiff Wire Guide (Cook Inc., Bloomington, IN). Blood pressure (BP) was maintained at 100−110/70−80 mm Hg when deploying the thoracic stent graft (SG) to avoid low BP, which may lead to SCI during this procedure. After removal of the thoracic SG system, the AAA was immediately repaired with an abdominal aortic SG system.

The thoracic aortic SGs used were the Captivia (Medtronic Inc., Minneapolis, MN; 7 grafts) or the Ankura (Lifetech Scientific, Shenzhen, China; 6 grafts). The lengths of thoracic aortic SGs were 150−200 mm. The abdominal aortic SGs used were the Ankura (6 grafts), Zenith (Cook Inc.; 2 grafts), and the Endurant (Medtronic Inc.; 5 grafts; Table II).

BP was maintained at a higher level (130−150/80−90 mm Hg; mean arterial pressure ≥75 mm Hg) after surgery to maintain spinal reflux pressure until the absence of SCI was confirmed.

Data Collection and Follow-up

The clinical data of preoperative comorbidities, indications, and postoperative conditions of both admitted patients and outpatients were collected retrospectively. Follow-up data were obtained from clinic visits and retrospective chart review. CTA was conducted 2 weeks after surgery and at least once per year after discharge to evaluate short-term and midterm efficacy. Follow-up rate was 100% during a mean period of 36 months (range, 1−60 month).