Outcomes of Open Repair for Chronic Descending Thoracic Aortic Dissection

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Background. **This study analyzed early and late outcomes after open repair of descending thoracic aortic aneurysms with chronic aortic dissection.**

Methods. **We retrospectively reviewed our cases of open repair of descending thoracic aortic aneurysms with chronic dissection from 1991 to 2011. Patient comorbid conditions and operative details were analyzed to determine risks for adverse outcome. Long-term survival and aortic reinterventions were analyzed.**

Results. **We repaired 519 patients with descending thoracic aortic aneurysms during the study period, and 209 (40%) had chronic dissection. Mean age was 59 years, with 74% (154 of 209) men. Previous ascending repair was performed in 41% (85 of 209), and the second-stage elephant trunk was performed in 10% (21 of 209). Adjunctive distal aortic perfusion with cerebral spinal fluid drainage was used in 90% (188 of 209) of patients, and circulatory arrest with bypass in 1% (3 of 209). The 30-day mortality was 8.6% (18 of 209). Immediate neurologic deficit occurred in 0.95% (2 of 209) and only with extent C resection. Delayed neurologic deficit occurred in 1.4% (3 of 209), 1 patient in each extent. Because 66% (2 of 3) of the patients with delayed neurologic deficit recovered function, permanent deficit occurred in 1.4% (3 of 209). Stroke occurred in 2.4% (5 of 209) and dialysis on discharge in 5% (11 of 211). The only risk factor for 30-day mortality was preoperative glomerular filtration rate of less than 60 mL/min (odds ratio, 4.2; $p < 0.006$). Survival at 5, 10, and 15 years was 72%, 60%, and 49%, respectively. Freedom from reoperation on the operated-on segment was 98%, 96.5%, 96.5%, and 96.5% at 5, 10, 15, and 20 years.**

Conclusions. **Open repairs of chronic descending thoracic aortic aneurysm dissections can be performed with respectable morbidity and mortality. Neurologic deficit remains low with the use of adjuncts, and early deaths are directly related to preoperative renal status. Reintervention on the involved aortic segment is low. These results allow comparisons with endovascular repair for chronic aortic dissection.**

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The management of thoracic aortic dissection has evolved over several decades and depends on the location of involvement, acuity of presentation, and the presence of complications [1–3]. Recent guidelines have recommended medical management for cases of acute uncomplicated descending thoracic aortic dissection, and endovascular intervention, if anatomically suitable, for complicated cases involving rupture and malperfusion [4–6]. These recommendations were made based on improved early results compared with open surgical repair in complicated dissection. Although medical management for uncomplicated descending thoracic aortic dissection remains the mainstay, recent studies have recommended a change in the standard for thoracic endovascular aortic repair (TEVAR) in the acute setting, even when uncomplicated [7, 8].

The management of chronic descending thoracic aortic dissection (CDTAD) has also experienced a recent shift toward endovascular repair. Although uncomplicated CDTAD is primarily managed medically, movement toward endovascular treatment for CDTAD is occurring, despite the anatomic challenges of multiple reentry sites, inability to completely thrombose the false channel, and lack of long-term outcomes. A recent interdisciplinary consensus statement recommended that complicated CDTAD be managed by TEVAR unless "TEVAR was contraindicated" [9]. The consensus statement further suggested TEVAR as first-line treatment based on the review of recent series of open and endovascular repair of CDTAD. Although data on TEVAR for CDTAD are accumulating, uncertainty about the durability remains because most reports have limited follow-up. Similarly,

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few studies have reported long-term results from open repair of CDTAD. Thus, the aim of this study was to report early and late outcomes after open repair of CDTAD.

Material and Methods

The Committee for Protection of Human Subjects, the local institutional review board, approved this study. Between 1991 and 2011, open repairs of the descending thoracic aorta were retrospectively identified from the departmental database. Indications for intervention included aneurysmal enlargement exceeding 5 cm, rapid enlargement (>5 mm per year), and fistulization (bronchial or esophageal). Descending thoracic aortic aneurysms were classified and distributed according to Figure 1 [10].

We considered aneurysms with dissection acute if the operation was performed in less than 14 days from the onset of pain and chronic if performed after 14 days. Acute dissection was not included in this analysis. Patients who presented from 15 days to 3 months were considered subacute and were included in the analysis. Operative mortality included in-hospital death and death occurring within 30 days of the repair.

Postoperative immediate neurologic deficit was defined as paraplegia or paraparesis observed upon the patient awakening from anesthesia, regardless of severity. Delayed neurologic deficit was defined as new paraplegia or paraparesis occurring postoperatively in a previously neurologically intact patient. Patients with stroke, identified by a thorough neurologic examination and computed tomography or magnetic resonance imaging of the head, were excluded from the neurologic deficit group so that neurologic deficit refers only to paraplegia and paraparesis.

Reintervention pertained to involved and also uninvolved aortic segments. An uninvolved segment referred to any aortic segment other than the descending thoracic segment repaired at the index operation. The glomerular filtration rate (GFR) was calculated by the Cockcroft-Gault method, and definitions of other variables were described in previous reports [10, 11].

Surgical Approach

After general anesthesia, the patient was placed in the right lateral decubitus position, and a cerebrospinal fluid (CSF) catheter was placed to allow CSF drainage and monitoring of CSF pressure. A neurophysiologist monitored somatosensory and motor-evoked potentials. After exposure of the descending thoracic aorta, the patient was administered sodium heparin (0.5 to 1 mg/kg body weight), maintaining an activated clotting time between 180 and 250 seconds. The left inferior pulmonary vein was cannulated and a Bio-Medicus (Medtronic, Minneapolis, MN) pump with an in-line heat exchanger was attached. The arterial inflow was established through an 8-mm Dacron graft (DuPont, Wilmington, DE) sutured end-to-side to the left common femoral artery or through the descending thoracic aorta once the distal anastomosis was been completed first (distal-first approach). The use of the distal-first approach originated in cases in which the left common femoral artery was not easily accessed for cannulation (ie, previous aortobifemoral bypass, severely diseased vessel). That a potential benefit might arise from eliminating retrograde arterial flow to the visceral and renal vessels was also hypothesized, although this has not been proven.

Distal aortic perfusion began as the cross-clamp was applied or after the distal anastomosis was completed in the case of the distal-first approach. The aorta was opened longitudinally and separated from the esophagus.

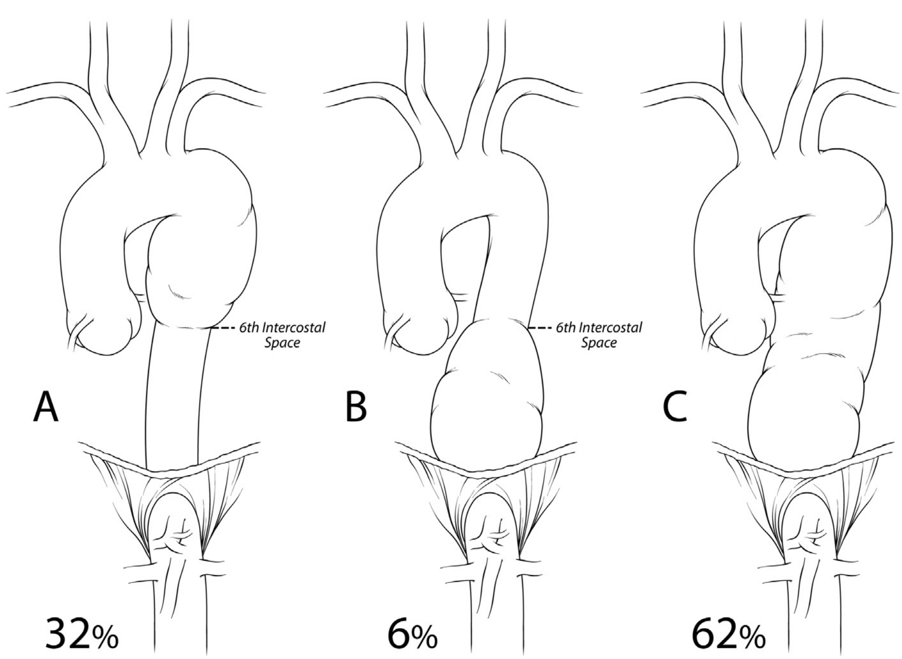

Fig 1. Distribution of open repairs by descending thoracic aneurysm extent. (A) Extent A: left subclavian artery (LSCA) to T6. (B) Extent B: T6 to T12. (C) Extent C: LSCA to T12.