Acute type A dissection without intimal tear in arch: Proximal or extensive repair?

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Objective: For acute type A dissection without an intimal tear in the arch, the optimal surgical strategy is unknown. The present study was designed to clarify the issue by comparing the early and late outcomes of proximal (PR) and extensive repair (ER).

Methods: From January 2002 to June 2010, 331 patients with acute type A dissection were treated surgically at our institute. Of these 331 patients, 197 were identified without an arch tear on the preoperative imaging examination and by intraoperative inspection. Of these 197 patients, 74 underwent proximal repair, including the aortic root, ascending aortic, or hemiarch repair, and 88 underwent extensive repair, including proximal repair, total arch replacement and a stented elephant trunk technique. The perioperative variables and late results were statistically analyzed.

Results: No significant difference was found in the rates of early mortality and morbidity between the 2 groups, despite the shorter duration of circulatory arrest in the PR group. During long-term follow-up (mean, 55.7 ± 33.1 months; maximum, 129), the overall survival rate in the whole cohort was 100%, 90.8%, and 71.1% at 1, 5, and 8 years, respectively. No difference was found in survival between the 2 groups ($P > .05$). However, complete thrombosis of the false lumen in the proximal descending aorta was achieved in 100% of the ER group and 24.6% of the PR group ($P < .001$). For patients with a patent false lumen in the PR group, distal anastomosis leakage and unclosed small intimal tears were identified in 53.3% and 35.6% patients, respectively. The reintervention rate was also lower in the ER group than in the PR group (4.9% vs 15.9%, $P < .05$) during follow-up. Moreover, the reintervention rate for patients with Marfan syndrome was 9.5% in the ER group and 38.5% in the PR group ($P < .05$).

Conclusions: For patients with acute type A dissection without an intimal tear in the arch, extensive repair could promote the occlusion of distal false lumen and decrease the reintervention rate without increasing the operative risk. (J Thorac Cardiovasc Surg 2014;147:1251-5)

ACD

Of the cases of acute type A dissection (ATAD), only 10%-30% will include intimal tears in the arch[1-3]; thus, 70%-90% of patients with ATAD will have no tear in the arch. For this majority of patients with ATAD and an intact intimal, but dissected, aortic arch, the optimal surgical strategy for the aortic arch is still under debate. Proximal repair (PR) or extensive repair (ER) has been adopted by different centers; however, which one is optimal is unknown to date. PR consists of ascending aorta and hemiarch replacement, and ER is a more extensive strategy involving the aortic arch and descending aorta. It has traditionally been believed that PR will be sufficient for saving the patient's life.[4-6] However, it leaves the residual dissection in the distal aorta untreated, exposing patients to the risk of aortic rupture or reoperation.[7-10] In contrast, ER could obliterate the false lumen and decrease late aortic events.[11-13] Nevertheless, ER has been considered to carry increased operative risk.[4-6,14]

The present retrospective study was designed to clarify this issue by comparing the early and late results of the 2 strategies for patients with ATAD without an arch tear (ATAD-wat).

METHODS

From January 2002 to June 2010, 331 patients with ATAD were treated surgically in our division. Of the 331 patients, 197 were identified without an arch tear using preoperative computed tomographic angiography, echocardiography, and intraoperative inspection under direct vision. Of the 197 patients, 74 underwent proximal aortic repair (PR), including aortic root, ascending aortic, or hemiarch repair, and 88 underwent extensive repair, including PR, total arch replacement, and a stented elephant trunk technique. The data were retrospectively collected from the database for the Division of Cardiothoracic Surgery, which was approved by the institutional review board of Changhai Hospital. The need for informed consent was waived for the present retrospective study. The surgical procedures were performed by 2 of us (Z.X. and L.H.).

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Abbreviations and Acronyms

ATAD = acute type A dissection
ATAD-wat = ATAD without an arch tear
DAL = distal anastomosis leakage
ER = extensive repair
FL = false lumen
MFS = Marfan syndrome
PR = proximal repair

Surgical Procedure

A median sternotomy was used in all patients. Cannulation of femoral artery was used for cardiopulmonary bypass, the right axillary artery for antegrade cerebral perfusion, and the superior vena cava for retrograde cerebral perfusion. Cardioplegia was perfused through the coronary ostia after crossclamping. If necessary, aortic root procedures were performed subsequently.

Once an adequate core temperature was reached (20°C-22°C before 2004 and 26°C-28°C from 2004 to the end of the study period), circulatory arrest was initiated, with cerebral perfusion administered by retrograde cerebral perfusion before 2003 or antegrade cerebral perfusion after 2003. The arch, the origins of the 3 branch arteries, and the proximal descending aorta were inspected for an intimal tear under direct vision after removing the aortic clamp.

For patients undergoing PR, a prosthetic graft was used for ascending aorta or hemiarch replacement. For patients undergoing ER, the trunk of a 4-branch prosthetic graft (Boston Scientific Inc, Boston, Mass) was anastomosed to the proximal end of the native aorta. Next, a stent graft (MicroPort Medical, Co, Ltd, Shanghai, China) was inserted into the true lumen of the distal aorta through the arch incision. To determine the appropriate size of the stent graft, a ball-shaped valve sizer was inserted into the true lumen of the proximal descending aorta from the transverse incision to measure the exact inner diameter of the true lumen. The distal aorta incorporating the stent graft was securely anchored to the distal trunk of the 4-branch prosthetic graft, with antegrade blood perfusion of the lower body by way of 1 of the branches. During rewarming, the brachiocephalic arteries were anastomosed in an orderly fashion to the branches of the prosthetic graft.

Follow-up

The follow-up data were obtained by clinical interviews and a postal questionnaire. To evaluate the residual false lumen of the downstream aorta, contrast computed tomography of the aorta was obtained before discharge and during the follow-up period.

Statistical Analysis

Categorical variables are presented as frequencies and were analyzed using the chi-square test. Continuous variables are expressed as the mean ± standard deviation, and normally distributed variables were analyzed using the Student *t* test. Non-normal continuous variables were analyzed using the Kruskal-Wallis nonparametric test. Long-term survival was analyzed using the Kaplan-Meier method. Comparisons between groups were made using the log-rank test. $P < .05$ was considered significant.

RESULTS

Preoperative Demographics

The preoperative demographics of the 2 groups were similar and are listed in Table 1.

Intra- and Postoperative Details

The intra- and postoperative variables of the 2 groups are listed in Tables 2 and 3. The duration of crossclamping and circulatory arrest was shorter in the PR group than in the ER group ($P < .05$). No differences were seen in the cardiopulmonary bypass duration or the incidence of blood transfusion. No differences were found in the number of concomitant procedures between the 2 groups. No intraoperative deaths occurred in the whole cohort. A total of 4 (5.4%) and 5 (5.7%) in-hospital deaths occurred in the PR and ER groups, respectively ($P = .94$). No significant differences were found in the rates of perioperative re-exploration for bleeding, prolonged ventilation, heart arrest, stroke, or renal failure between the 2 groups. No spinal cord injury was observed in any patient.

Long-Term Results

Survival. Of the cohort, 154 patients were discharged, and the follow-up data were complete for 139 (90.3%). The mean follow-up period was 55.7 ± 33.1 months (maximum, 129). During the follow-up period, 3 and 0 aortic-related deaths occurred in the PR and ER groups, respectively ($P = .06$). Other deaths were attributed to noncardiac diseases. The survival function (excluding in-hospital deaths) of the whole cohort is shown in Figure 1. The overall survival was 100%, 90.8%, and 84.5% at 1, 5, and 8 years, respectively. The corresponding survival rates were 100%, 85.6%, and 80.5% in the PR group and 100%, 95.0%, and 87.7% in the ER group. No difference was found in survival function between the 2 groups ($P = .11$; Figure 2).

Behavior of false lumen. Computed tomographic images were obtained before discharge and 6-12 months after surgery in 69 patients in the PR group and 82 in the ER group. The computed tomographic findings at 6-12 months postoperatively revealed complete thrombosis in the false lumen (FL) at the level of proximal descending aorta in all patients in the ER group. However, complete thrombosis was observed in only 24 (34.8%) and 17 (24.6%) of the FLs at the level of the arch and proximal descending aorta in the patients in the PR group, respectively. At the diaphragmatic level, 14 (20.3%) in the PR and 41 (50%) in the ER group showed complete thrombosis, respectively ($P < .001$; Table 4).

For 45 patients without thrombosis formation in the FL at the arch in the PR group 6-12 months after surgery, distal anastomosis leakage (DAL) was identified by computed tomography of the aorta in 24 patients (53.3%) and an intimal tear of a residual FL was found in 7 and 3 patients with an intimal tear at the origin of the innominate artery and left subclavian artery, respectively. Six patients presented with an intimal tear at the proximal descending aorta (Table 5). In addition, multiple intimal tears were detected in 5 patients.

Reintervention

During follow-up, 11 of 65 patients (16.9%) in the PR group underwent total arch replacement and the stented