Aortic Wrapping for Stanford Type A Acute Aortic Dissection: Short and Midterm Outcome

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Background. **Conventional surgical treatment of Stanford type A acute aortic dissection (AAD) is associated with considerable in-hospital mortality. As regards very elderly or high-risk patients with type A AAD, some may meet the criteria for less invasive surgery likely to prevent the complications associated with aortic replacement.**

Methods. **We have retrospectively analyzed a cohort of patients admitted to our center for Stanford type A AAD and having undergone surgery between 2008 and 2012. The outcomes of the patients having had an aortic replacement under cardiopulmonary bypass (group A) have been compared with the outcomes of the patients who underwent off-pump wrapping of the ascending aorta (group B).**

Results. **Among the 54 patients admitted for Stanford type A AAD, 15 with a mean age of 77 years [46 to 94] underwent wrapping of the aorta. Regarding the new standard European system for cardiac operative risk evaluation (EuroSCORE II), the median result in our group B patients was 10.47 [5.02 to 30.07]. In-hospital mortality was 12.80% in group A and 6.6% in group B ($p = 0.66$). For patients who underwent external wrapping of the ascending aorta, follow-up mortality rate was 13.3% with a median follow-up of 15 months [range 0 to 47].**

Conclusions. **The gold standard in cases of Stanford type A AAD consists of emergency surgical replacement of the dissected ascending aorta. In some cases in which the aortic root is not affected a less invasive surgical approach consisting of wrapping the dissected ascending aorta can be suggested as an alternative.**

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Surgical treatment of Stanford type A acute aortic dissection (AAD) is associated with a high incidence of postoperative complications and considerable in-hospital mortality. The risk is greater when the primary tear is not located in the ascending aorta as the repair requires more extensive aortic arch replacement. Furthermore, because patient age is a significant and independent determinant of overall mortality, operative risk is higher in elderly patients. On the other hand, conservative treatment is associated with poor outcome and a high risk of aortic rupture. Indeed, the mortality rate of untreated type A acute aortic dissection (TAAAD) increases 1% to 2% every hour after first presentation, and immediate emergent surgical intervention is indicated after diagnosis of type A AAD. Currently, the in-hospital mortality rate of TAAAD is 15% to 30% [1–5] and this outcome appears generally unimproved over time [3]. Increased age has been shown to function as a strong independent predictor of in-hospital mortality [6–9]. Piccardo and colleagues [10] recently reported in-hospital mortality of 44.3% in octogenarians with type A AAD. For very elderly or high-risk patients, emergency conventional surgery remains controversial and medical conservative management may be an alternative treatment with poor outcome and a high risk of aortic rupture. To reduce the risk of rupture, some patients may meet the criteria for less invasive surgery likely to prevent the complications associated with aortic replacement under cardiopulmonary bypass (CPB).

We previously reported our experience with regard to wrapping the ascending aorta in cases of type A AAD [11]. The aim of this study was to describe the continuation of our experience and to assess the efficacy of this less invasive surgical approach consisting of off-pump wrapping the dissected ascending aorta in patients with Stanford type A AAD and major comorbidities for whom conventional surgery was risky and questionable.

Material and Methods

We retrospectively analyzed a cohort of patients admitted to our center for Stanford type A AAD and having undergone surgery. The outcomes of the patients who had a conventional aortic replacement CPB (group A) were

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compared with the outcomes of the patients who underwent off-pump external wrapping of the aorta (group B).

The internal Ethics Board granted their approval. Inclusion criteria were presence of a type A AAD and the following: a preoperative European system for cardiac operative risk evaluation II (EuroSCORE II) score higher than 10%; a chronic respiratory insufficiency with forced expiratory volume in the first second of expiration lower than 30% or long-term home oxygen therapy; a left ventricular ejection fraction lower than 0.30; a metastatic cancer; or a preoperative coma. The presence of 1 of these criteria had defined an excessive operative risk to undergo a conventional aortic replacement under CPB. Patients presenting with aortic root dissection or significant aortic insufficiency (aortic insufficiency equal to or higher than mild), or coronary ostia dissection were contraindicated for the wrapping procedure.

Data Collection

We report data on all consecutive patients operated on between October 1, 2008 and December 31, 2012. Among patients who underwent external wrapping of the ascending aorta, median follow-up time was 15 months [range 0 to 47]. Only 1 patient had follow-up of zero months.

Chest Computed Tomography (CT) Scanning Protocol

Computed tomography protocol consisted of initial spiral acquisition after injection of a contrast product and acquisition in the systemic arterial phase on the aorta taken as a whole. In order to determine where the "primary" intimal tear was located (even if it is generally difficult to define the primary tear by CT scan), we estimated that when there was no entry or reentry point at the level of the ascending aorta, then the primary intimal tear was located in the aortic arch. On the other hand, if an entry or reentry point existed at the level of the ascending aorta, then the primary intimal tear was considered to be in the ascending aorta.

Surgical Procedure

Emergent off-pump surgery was performed through a median sternotomy. The cardiopulmonary bypass pump was available in the operating room. Drainage of the pericardium was carried out gradually so as to avoid sudden blood pressure fluctuations leading to aortic rupture. The ascending aorta was carefully separated from the pulmonary artery trunk and the right pulmonary artery. Care was taken during the dissection to avoid tearing the false lumen of the dissected aorta. A Teflon plaque (15 × 15 cm) (Bard Inc, Murray Hill, NJ) was tailored, placed around the aorta from the coronary ostia up to the innominate artery, and approximated with a running suture of 3-0 Prolene (Ethicon, Somerville, NJ) to tightly wrap the dissected ascending aorta. We calculated the size of the Teflon plaque so that the diameter of the wrapped aorta would measure between 35 and 45 mm according to the dimensions of the patient and the preoperative CT scan. The aim was to significantly reduce the diameter of the aorta and maximize opposition between the false and the true lumen. Transient compression of the pulmonary artery to reduce blood pressure can facilitate approximation of the edges of the plaque around the aorta. The snug fitting secures the plaque around the aorta and prevents migration. In order to wrap the hemi-aortic arch or total aortic arch, we carefully dissected the total aortic arch and thereby liberated the supraaortic trunks while taking care not to wound the left recurrent nerve. Once the trunks are liberated a felt strip was tailored so that the opening allows them to pass. The plaque was then tightened around the hemi-aortic arch or total aortic arch and the supra-aortic trunks, with separate 3-0 Prolene sutures (Fig 1) (Video).

Statistical Analysis

Continuous data were expressed as medians (range) and categoric variables were expressed by percentage. Measures of variation were expressed as range. Continuous variables were compared with the Mann-Whitney *U* test; categoric variables were compared with χ^2 tests. Difference was considered statistically significant with a p value lower than 0.05. Analyses were performed using SPSS 11.5 (SPSS Inc, Chicago, IL) software.

Results

Characteristics of Study Patients

Between 2008 and 2012, among the 54 patients admitted to our center for a Stanford type A AAD, 15 (27.8%) with a mean age of 77 years [46 to 94] underwent an off-pump external wrapping of the aorta (group B). The patients undergoing aortic replacement under CPB were significantly younger (median 55 years [35 to 80] $p < 0.0001$).

Tables 1 and 2 show the baseline characteristics of the 15 patients in group B. A CT scan showed that the "primary" intimal tear was located in the ascending aorta in 6 cases and between ascending aorta and arch for the others (n = 9). Eleven patients had pericardial effusion, including 2 with a cardiac tamponade. Echocardiography excluded significant aortic valve regurgitation. In the group B patients, the median result according to the EuroSCORE II was 10.47 [5.02 to 30.07].

Surgical Data and Early Outcome

For the group B patients, mean overall operation time was 90 [70 to 120] minutes, with no conversion to CPB. Ascending aorta wrapping was performed in 5 patients, ascending aorta and partial arch wrapping in 9 patients, and ascending aorta and total arch wrapping in 1 patient (Table 2). One patient, who had a retrograde aortic dissection with an intimal tear in the aortic arch, underwent postoperative percutaneous stenting of the ascending aorta due to the persistence of a circulating false lumen in the ascending aorta threatening proximal extension to the Valsalva sinus in spite of the wrapping. There was only 1 intraoperative complication related to a wound of the ascending aorta occurring at the moment of its separation from the pulmonary artery trunk. The