

Endovascular graft exclusion for treating Stanford type B acute aortic dissection in aged population

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Abstract

The aim of this study was to investigate the efficiency of endovascular graft exclusion for treating Stanford type B acute aortic dissection (AAD) in aged population.

Forty-six consecutive patients aged ≥ 65 years with Stanford type B AAD underwent endovascular therapy in Tianjin Chest Hospital between 2010 and 2015 were included in this study. All patients received echocardiography, contrast-enhanced CT, hepatic and renal functions tests, and the blood and urine routine examinations. After the procedure, annual review of the whole aortic computed tomography (CT) was performed for all patients before discharge, as well as 3 months, 6 months and 12 months after surgery. All patients were followed up until December, 2015. The outcomes of the whole aortic CT and survival rate were analyzed.

Five patients (10.87%) died. Among the 5 cases, 2 showed perioperative death induced by cerebral infarction, 1 died because of newly developed AD 8 months after surgery, and 2 died because of acute myocardial infarction ($n = 1$) and renal/cardiac failure ($n = 1$). The other 41 patients (89.13%) were symptom-free with satisfactory conditions.

Endovascular stent-graft placement was effective for treating the senior patients with Stanford type B AAD.

Abbreviations: AAD = acute aortic dissection, AD = aortic dissection, CI = confidence interval, COPD = chronic obstructive pulmonary disease, CT = computed tomography.

Keywords: Clinical efficacy, Endovascular isolation, Stanford type B aortic dissection

1. Introduction

Stanford type B aortic dissection (AD) is a lethal condition affecting the public health worldwide. The long-term survival of patients with type B AD is rather poor with a mortality rate of up to 35% within 1 month in the medically managed patients.^[1,2] Artificial vessel replacement contributes to the treatment of this condition; however, it involves complex procedures, long surgical duration, trauma, perioperative hemorrhage, as well as more complications.^[3] Meanwhile, many patients show poor tolerance to the surgery, and the postoperative recovery is rather long. Furthermore, the mortality rate is high, and the postoperative paraplegia incidence shows an increasing trend.^[4,5]

To our best knowledge, very few studies have been published on the efficiency of endovascular graft exclusion on Stanford type B AD in the aged population.^[6,7] These patients are reported

to show concurrent diseases such as hypertension, coronary heart disease, and diabetes mellitus. In this study, we firstly investigated the efficiency of endovascular graft exclusion on Stanford type B acute aortic dissection (AAD) in the aged population.

2. Materials and methods

2.1. Subjects

Forty-six Stanford type B AAD patients (male: 33; female: 13; mean age: 70.03 ± 4.34 years) admitted to our department from January 1, 2010 to December 31, 2015 were included in this study. The inclusion criteria were as follows: geriatric patients (≥ 65 years) with acute Stanford type B AAD received endovascular graft exclusion for the treatment. The diagnosis of Stanford type B AAD was based on computed tomography (CT) angiography. Those with severe hepatic and/or renal failure not suitable to receive endovascular therapy were excluded from this study. Each patient signed the informed consent. The study protocols were approved by the Ethical Committee of Tianjin Thoracic Hospital.

2.2. Surgical procedures

After admission, endovascular graft exclusion was carried out within 24 hours. The blood pressure for each patient was maintained at 120 mmHg, and the heart rate was 60 to 80 bpm. Analgesia was performed, and then strict measurements were taken to monitor the blood pressure, blood oxygen, heart rate, consciousness, and urine volume. The incision position, aorta diameter, and involved tissues were measured using the contrast enhanced CT scan or ultrasonography.

Left brachial artery or radial artery puncture was given under systemic anesthesia. A Flexima ROTM (5F) was inserted into the ascending aorta using the aortography technique, together with

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the determination of aortic diameter. Then the right femoral artery was dissected, a hard guide wire was inserted followed by fixing on the ascending aorta. The covered stent was placed along the wire until reaching the orifice of the AD. The diameter of the stent was about 20% to 30% larger than that of the aortic dimension. Upon the overlapping of the stent labor and the external side of the AD, measures were taken to control the systolic pressure. After surgery, the systolic pressure was maintained (100–200 mmHg) and the covered stent was released under the aortography technique.

2.3. Follow up

All the patients were followed up by telephone, or email. The follow-up interval was 1 month, 3 months, 6 months, 1 year, and 2 years, respectively. The examinations included contrast-enhanced CT scan for the aorta and the outcome after surgery, as well as postoperative complications and survival rate.

2.4. Statistical analysis

SPSS 16.0 software (SPSS Inc, Chicago, IL) was used for the data analysis. Kaplan-Meier analysis was utilized to analyze the postoperative survival rates. Cox regression analysis was used to analyze the independent risk factors for the death in the follow-up. A *P* value of <0.05 was considered as statistically significant.

3. Results

3.1. Population characteristics

Forty-six patients were included in this study. All patients showed chest pain or back pain obviously. The time interval from onset of disease to surgery was 46.6 ± 23.1 hours. Three patients (6.52%) showed concurrent diabetes mellitus. Six patients (13.04%) showed coronary heart disease. Forty-one patients (89.13%) showed hypertension. Four patients (8.70%) showed chronic obstructive pulmonary disease. Two (8.70%) showed pulmonary tuberculosis (Table 1).

The majority of patients were male, with a mean body mass index of 25.09 kg/m^2 . The mean diameter of aortic aneurysm was 32.84 ± 6.22 mm. The mean ejection fraction was 58.10%. Meanwhile, a minority of patients showed coronary heart

Table 1

Preoperative features of patients with Stanford type B dissection.

Variables	Results
Age, y	70.03 ± 4.34
Male	73.91%
Body mass index	25.09 ± 2.69
Diabetes mellitus	6.52%
Coronary heart disease	13.04%
Hypertension	89.13%
Chronic obstructive pulmonary diseases	8.70%
Pulmonary tuberculosis	4.35%
Surgical history	6.52%
Maximal diameter of aortic aneurysm	32.84 ± 6.22 mm
Stroke	19.57%
Ejection fraction	58.10% ± 10.03%
Arrhythmia	8.70%
Renal insufficiency	2.17%
Gout	4.35%
Hepatic insufficiency	2.17%
Lymphedema in lower limbs	2.17%

disease, diabetes mellitus, cerebral infarction, chronic obstructive pulmonary disease, arrhythmia, renal insufficiency, hepatic insufficiency, pulmonary tuberculosis, gout, as well as swelling in the lymph node of lower extremity. Patients with concurrent renal insufficiency showed multiple intimal flaps in the abdominal aorta, which may affect the blood supply of the renal artery. Hepatic insufficiency may present coronary heart disease and/or chronic obstructive pulmonary disease (COPD). Preoperative contrast-enhanced CT showed no involvement of the abdomen. Hepatic insufficiency may not be related to the AD.

3.2. Perioperative conditions and postoperative survival

During the follow-up, 5 patients (10.87%) died. Among these patients, 2 showed perioperative death induced by cerebral infarction, 1 died because of newly developed AD 8 months after surgery, 2 died because of acute myocardial infarction (*n* = 1) and renal/cardiac failure (*n* = 1). The other 41 patients (89.13%) were symptom-free with satisfactory conditions.

Table 2 summarized the independent risk factors for the mortality. Hypertension, diabetes mellitus, cerebral infarction,

Table 2

Regression analysis for the independent risk factors for mortality during the follow-up.

	<i>P</i>	Exp (B)	95% CI Exp (B)	
			Lower part	Upper part
Hypertension	.099			
Hypertension (1)	.087	0.325	0.089	1.179
Hypertension (2)	.762	0.777	0.152	3.982
Hypertension (3)	.023	0.281	0.094	0.837
Diabetes mellitus	.144	0.362	0.093	1.414
Cerebral infarction	.231	2.017	0.641	6.35
Chronic obstructive pulmonary disease	.687	1.366	0.301	6.204
Coronary heart disease	.411	0.565	0.145	2.203
Body mass index	.154	1.148	0.949	1.389
Sex	.909	1.052	0.436	2.539
Maximal diameter of aneurysm	.037	0.893	0.803	0.993
EF (%)	.013	0.888	0.809	0.975

Note: Hypertension was divided into 3 grades according to the WHO proposals including hypertension (1), hypertension (2), and hypertension (3). Our data showed hypertension in and grade was not an independent risk factor for death. CI = confidence interval, EF = ejection fraction.

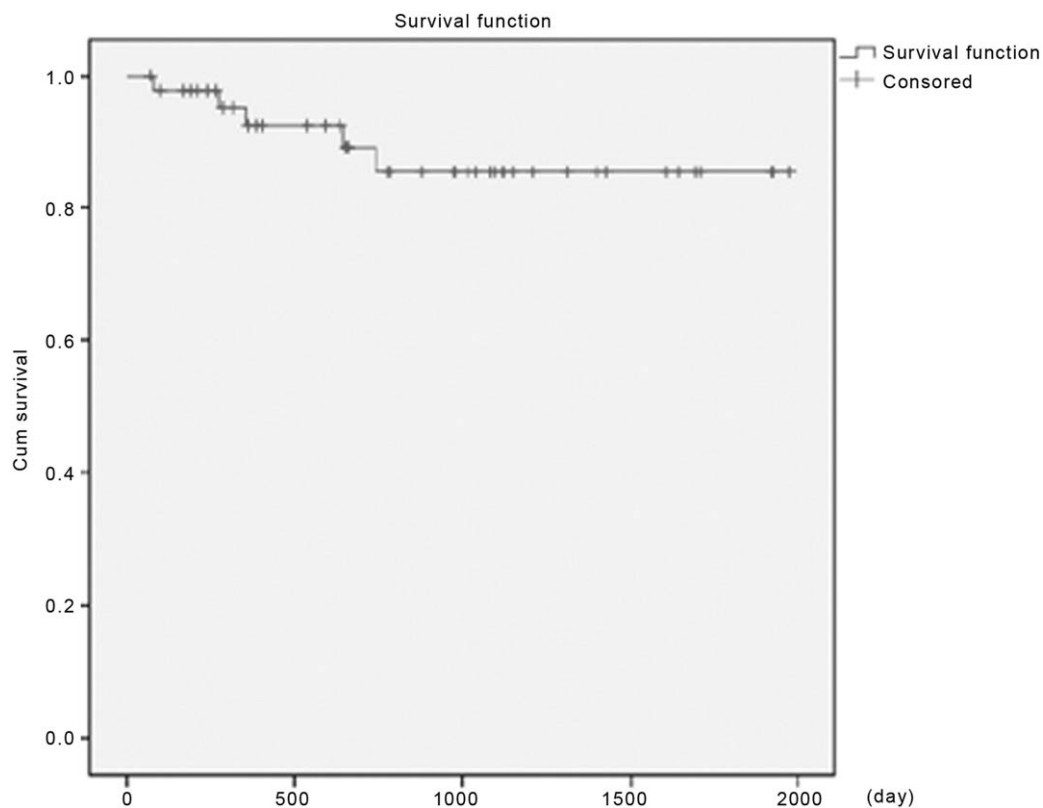


Figure 1. The survival duration of patients.

COPD, coronary heart disease, body mass index, and sex were not the independent risk factors for mortality ($P > .05$). In cases of α of 0.5 and 95% confidence interval (CI), the independent risk factors for mortality were preoperative ejection fraction ($P < .05$, 95% CI, 52.5–63.6) and maximal diameter of aneurysm ($P < .05$, 95% CI, 32.6–38.9, Fig. 1).

3.3. Intimal flap length, involved lesions, and distal dissection outcome

Among these patients, 43 showed single intimal flap, 2 showed multiple intimal flaps, and 1 with hematoma. The involved lesions included thoracic aorta ($n = 42$) and abdominal aorta ($n = 4$). Besides the 2 showed perioperative mortality, the other patients received contrast-enhanced CT for the aorta, among which 1 showed internal hemorrhage owing to trauma (type II) and newly developed dissection in the distal stent. No internal hemorrhage was noticed in the covered stent.

4. Discussion

There are still disputes on the treatment of Stanford B AAD.^[8] Our data showed that the 5-year survival rate of endovascular stent-graft placement was about 89.13%, which confirmed that this technique was effective for the senior patients with Stanford type B AAD. Endovascular isolation is superior to the conventional surgical methods and the conservative therapy.^[9–11]

In this study, we found 2 perioperative deaths induced by cerebral infarction combined with hypertension. Besides, the risk

of cerebral infarction was higher in the patients with a history of cerebrovascular disease. For these patients, special care should be paid to the blood pressure to avoid interruption of blood supply in brain. One case showed postoperative renal and cardiac failure. This may be related to the poor renal function and the long-term hypertension. On this basis, the dose of the perioperative contrast media should be reduced. Moreover, the duration of surgery was decreased compared with the other patients with endovascular stent-graft placement. Compared with the other patients with Stanford type B AD, the renal function of the senior patients was poor, which resulted in poor response to the hypotension. After the surgery, appropriate measures were necessary to control the blood pressure, to prevent hypotension. One case died from myocardial infarction after surgery, which was associated with AD combined with hypertension. For the Stanford type B AD patients, much attention should be given to the prevention of coronary heart disease in the senior people. In this study, 1 died from sudden AD rupture. The newly developed AD at the distal part of the stent was associated with the tortuous aorta in the diaphragma and hypertension. Compared with the other patients, despite these patient showed no involvement of AD in the diaphragma, the aorta should be covered by the covered stent to prevent the newly developed AD in the distal end. Our data showed that ejection fraction and maximal diameter of aneurysm were the independent risk factors for the perioperative death, which was in line with the previous findings.^[12,13] As the vascular fragility was too large in the senior people, the vessel diameter should be measured in cases of large aneurysm.^[14,15] Then covered stent with appropriate size was selected to ensure the long-term efficiency.

Indeed, there are limitations in this study. First, the sample size is not large. In future, multicentered, large-sample-sized studies are required. Secondly, the follow-up duration was not long enough, and we will extend the follow-up afterwards. Thirdly, the study is a single-center study with inadequate data.

5. Conclusions

In summary, endovascular stent-graft placement was effective for treating the senior patients with Stanford type B AD, which was featured by small incision, low mortality rate, and less postoperative complications and recovery. Such method is suitable for the treatment of postoperative complications in patients with poor tolerance to surgery.

Author contributions

Conceptualization: Nan Jiang.

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