

Risk Factors for Prolonged Mechanical Ventilation After Total Aortic Arch Replacement for Acute DeBakey Type I Aortic Dissection[☆]



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Background

EuroSCORE II is an objective risk scoring model. The aim of this study was to assess the performance of EuroSCORE II in the prediction of prolonged mechanical ventilation following total aortic arch replacement for acute DeBakey type I aortic dissection and evaluate the risk factors for prolonged mechanical ventilation.

Methods

Between February 2009 to February 2012, data from 240 patients who underwent total aortic arch replacement for acute DeBakey type I aortic dissection were collected retrospectively. Mechanical ventilation after the surgery longer than 48 hours was defined as postoperative prolonged mechanical ventilation. EuroSCORE II was applied to predict prolonged mechanical ventilation. A C statistic (receiver operating characteristic curve) was used to test discrimination of the model. Calibration was assessed with a Hosmer-Lemeshow goodness-of-fit statistic. Multiple logistic regression analysis was used to identify the final risk factors of prolonged mechanical ventilation.

Results

The overall mortality was 10%. The mean length of mechanical ventilation after total aortic arch replacement was 42.72 ± 51.45 hours. Total 74 patients needed prolonged mechanical ventilation. EuroSCORE II showed poor discriminatory ability (C statistic 0.52) and calibration (Hosmer-Lemeshow, $p < 0.05$) in predicting prolonged mechanical ventilation. On multivariate analysis, independent risk factors for postoperative prolonged mechanical ventilation were age ≥ 48.5 years ($p < 0.001$, OR=3.85), preoperative leukocyte count $\geq 13.5 \times 10^9/L$ ($p < 0.001$, OR=4.05) and symptom onset before the surgery less than one week ($p = 0.002$, OR=3.75).

Conclusions

EuroSCORE II could not predict prolonged mechanical ventilation following total aortic arch replacement for acute DeBakey type I aortic dissection. Preoperative high level of leukocyte, age and surgical period from symptom onset are risk factors for prolonged mechanical ventilation.

Keywords

EuroSCORE II • Aortic dissection • Aortic arch replacement • Prolonged mechanical ventilation
• Leukocyte

[☆]The research was carried out at Beijing Anzhen Hospital. All authors work at the same hospital.

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Introduction

Acute DeBakey type I aortic dissection is a lethal illness that always needs emergency surgery. Total aortic arch replacement is performed for acute DeBakey type I aortic dissection in many large centres. However, the mortality and morbidity of this kind of surgery is still higher than other cardiac surgeries, such as valvular surgery and coronary artery surgery. Prolonged mechanical ventilation after total aortic arch replacement is common, which always leads to longer intensive care unit stay, higher in-hospital mortality and even poor long-term prognosis [1,2]. EuroSCORE is a widely used objective risk scoring model and the investigators recently developed a modified version of this risk scoring method [3]. The aim of this study was to assess the performance of EuroSCORE II in the prediction of prolonged mechanical ventilation following total aortic arch replacement for acute DeBakey type I aortic dissection and evaluate the risk factors for prolonged mechanical ventilation.

Patients and Methods

Patients

Between February 2009 to February 2012, total 240 patients with acute DeBakey type I aortic dissection underwent total

aortic arch replacement. Aortic dissection was defined as acute if chest pain or other related symptoms were present less than 14 days before operation. The data were collected retrospectively. The Ethics Committee of Anzhen Hospital approved this retrospective study and waived the need for individual patient consent for this study. EuroSCORE II was calculated according to previously published report [3].

Prolonged mechanical ventilation was diagnosed as intubation and ventilation requiring a period of 48 hours or more, at any time during the postoperative stay, while for patients who are placed on and taken off ventilation several times, the total of these episodes should be 48 hours or more.

Assessment of Leukocyte Count

For emergency surgery, leukocyte count was sampled before entering the operating room. For urgent surgery, leukocyte count was sampled at ward. Normal values for leukocyte in the haematology laboratory are 4 to $10 \times 10^9/L$.

Surgical Procedure

All procedures were carried out by a median sternotomy and total cardiopulmonary bypass (CPB) with antegrade selective cerebral perfusion (SCP). Cannulation of the right axillary artery was used for CPB and SCP. The arterial line was bifurcated for the right axillary artery perfusion and for

Table 1 Main clinical characteristics of patients with acute DeBakey type I aortic dissection (n=240).

Variable	Mechanical ventilation <48hours (n=166)	Mechanical ventilation ≥48hours (n= 74)	p value
Age (years)*	45.13 ±9.52	49.11±10.77	0.005
Gender (male)	140 (84.34)	57 (77.03)	0.17
Smoking history	70 (42.17)	38 (51.35)	0.19
Hypertension	112 (67.47)	57 (77.03)	0.17
Stroke	0 (0)	3 (4.05)	0.03
DM	6 (3.61)	4 (5.41)	0.50
Previous cardiac surgery	8 (4.82)	1 (1.35)	0.28
Albumin (g/L)*	36.96±5.19	38.06±5.77	0.14
Leukocyte ($\times 10^9/L$)*	11.34±3.53	12.67±4.00	0.02
Serum creatinine ($\mu\text{mol/L}$)*	97.12±50.71	110.01±67.41	0.14
LVEF (%)*	63.20±6.90	62.27±7.34	0.36
LVDd (mm)*	52.55± 6.29	51.36±5.73	0.18
Ascending aorta diameter ≥ 6 cm	5 (3.01)	3 (4.05)	0.71
Surgical period from symptom onset shorter than one week	110 (66.27)	65 (87.84)	0.001
Combined with CABG	10 (6.02)	5 (6.76)	0.78
CPB time (min)*	195.79±47.83	217.01±63.01	0.01
SCP time (min)*	24.22±7.51	24.78±8.97	0.62

DM, diabetes mellitus; LVEF, left ventricular ejection fraction; LVDd, left ventricular end diastolic diameter; CABG, coronary artery bypass grafting; CPB, cardiopulmonary bypass; SCP, selective cerebral perfusion.

*Values are mean ± SD.

Values in parentheses are percentage.

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