原 著

Postoperative Intensive Management of Patients After Emergency Surgery for Ruptured or Acute Dissecting Thoracic Aortic Aneurysms.

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Abstract

Surgical, anesthetic and postoperative management for ruptured or acute dissecting thoracic aortic aneurysms still remains a challenge because of its high mortality rate especially in emergency surgery. We retrospectively reviewed 14 postoperative patients with emergency reconstruction of aortic arch and/or descending aorta in our intensive care unit. Patients consisted of 5 males and 9 females with mean age of 61 years old. Mortality rate of 14% in our series clearly demonstrated that highly qualified patient care could achieve good outcome after emergency surgery for ruptured or acute dissecting thoracic aortic aneurysms. Accurate assessment of patient's condition and protecting the function of vital organs are keys to successful management of patients in this category.

Key words : Thoracic aortic aneurysm, Emergency surgery, Anesthesia, Intensive Care

Introduction

A high mortality rate has been reported in the patients with emergency aortic surgery for ruptured or acute dissecting thoracic aortic aneurysms[1~8]. The preoperative conditions such as hypotension, anuria and hemorrhagic shock still aggravate the postoperative course that should be required early diagnosis and surgical intervention[1,3,4].

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The present study reviews our results of Intensive Care Unit (ICU) management in 14 patients with emergency aortic surgery for ruptured or acute dissecting thoracic aortic aneurysms in the past 2 years.

Materials

Fourteen patients who were managed postoperatively in the ICU for ruptured or acute dissecting thoracic aortic aneurysms were included in this study. Their mean age was 61.6 years old with a range of 38 to 78. Table 1 is a summary of the 14 cases. Most of the patients had the following preexisting diseases. Fifty-seven % of the patients complained unremitting pain with abrupt onset that was the most common clinical manifestation. Other included dyspnea (19%), hypotension (21%), anuria (21%), vomiting (14%), disturbance of consciousness (14%), clammy sweat (7%), abdominal distention (7%), and hemoptysis (7%), aphasia (7%), paraplegia (7%). Emergency surgery was performed within 2 days after the onset of symptoms in all patients.

Anesthesia Management

Five patients who were in shock transferred to the ICU from the ward or emergency unit. Before arrival to the operating room, we took intensive care of the patients and prepare for operation. A radial artery catheter, a pulmonary artery catheter through the right internal jugular vein, and large-bore intravenous lines were placed in the ICU or operating room. One patients was intubated in the ICU. General anesthesia

Table1. Demographic and clinical charactaristics of patients

Case No	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Age	53	63	54	65	68	54	38	70	63	56	57	73	71	78
Sex	F	F	M	M	M	M	F	M	F	F	F	F	F	M
DeBakey Classification	I	IIIb	IIIb	IIIb	I	IIIa	IIIb	I	IIIa	I	IIIa	IIIb	IIIa	IIIb
Preoperative shock					+	+			+		+			+
Tracheal tube	SLT	DLT	DLT	DLT	DLT	DLT	DLT	DLT	SLT	DLT	DLT	SLT	SLT	DLT
Operation time (min)	180	465	645	520	425	660	698	220	680	508	640	874	565	645
CPB time (min)	167	95	113	224	298	142	320	321	40	237	490	245	298	298
Cardiac ischemia time (min)	90			110	163	74	171	178		122	122	104	26	26
Cerebral perfusion time (min)				120	120	78		98		110	128	114		
ICU stay time (hours)	89	39	58	84	365	37	75	36	314	240	84	776	200	256
Blood loss (ml)	480	495	1900	1930	4800	2625	2295	135	2285	4955	4385	10430	375	1110
Blood transfusion (ml)	880	720	2640	640	2520	1480	2365	130	3080	3660	2390	5700	1740	
Respiratory failure	+				+	+			+	+	+	+		+
Cardiac failure					+	PCPS			+		LOS			PCPS
Renal failure					CVVH	kayexalate			CVVH					
Cerebral dysfunction				coma	cerebral infarction	coma		semi coma	+		semi coma		coma	+
Hepatic dysfunction					+	+			+		+			
Coagulation disorder					+	+			+					+
Other complication		ileus			MNMS				mediastinitis	glottitis				
Survival / Non-survival	S	S	S	S	S	NS	S	S	S	S	S	S	S	NS

CPB : Cardio pulmonary bypass SLT : Single lumen endotracheal tube DLT : Double lumen endotracheal tube
PCPS : Percutaneous cardio-pulmonary support system LOS : Low output syndrome CVVH : Continuous veno-veno hemofiltration
MNMS : Myonephropathic metabolic syndrome

was induced with intravenous 2.5-5 mg of midazolam and 20-30 μg/kg of fentanyl followed by 0.1 mg/kg of vecuronium for tracheal intubation. Either a single lumen or a double lumen endotracheal tube was applied depending on the surgical procedure (Table 1). Anesthesia was maintained with oxygen-isoflurane and incremental doses of fentanyl (total dose of 75-125 μg/kg) to keep blood pressure around 100 mmHg. Pa_{O_2} more than 100 mmHg was kept by adjusting F_{IO_2}. Muscular relaxation was supplemented by 0.2-0.4 mg/kg of vecuronium as needed. All patients were monitored blood pressure,pulmonary capillary wedge pressure, central venous pressure, cardiac output, ECG, urine output, and esophageal and/or bladder temperature.

Surgical Procedure

Four patients had graft replacement for the diseased aorta under aortic clamping combined with the femoro-femoral bypass. (case 2, 3, 8, 10). In the other 10 patients, extracorporeal circulation were applied to replace the diseased aorta. Extracorporeal circulation was initiated by feeding the blood to the femoral artery and draining it from the right atrium after systemic heparinization. Cerebral protection during aortic arch reconstruction was obtained with deep hypothermia (20°C to 22°C) with or without selective cerebral perfusion (SCP). The mean anesthesia time, operation time and perfusion data according to the methods used in these patients were shown in the table. The intraoperative blood loss was between 135 and 10430 ml (mean 2935 ml).

All patients were transferred to the ICU after surgery keeping the endotracheal tube in place. The double lumen endobronchial tube was changed to a single lumen endotracheal tube before sent to the ICU in all patients. PCPS (Percutaneous Cardio-Pulmonary Support System) was necessary to cope with low

output syndrome after termination of extracorporeal circulation in 2 patients.

Clinical Course in the ICU

Overall mortality in the ICU was 14 % (2/14). Two patients were unable to be weaned from PCPS (percutaneous Cardio-Pulmonary Support System). One resulted in multiple organ failure (MOF) at the 19th postoperative day, and the other died of postoperative massive bleeding from the site of surgery. In one patient, surgery had been performed with profound hypothermia and circulatory arrest. Mortality rate was clearly dependent upon a number of damaged vital organs, (Table 2).

Of 8 patients who showed neurological damage in the ICU, two died and other 2 patients (25 %) still remained comatose at the time of discharge from the ICU. The other one had a preoperative history of neurological deficit caused by circulatory collapse and aspiration pneumonia after rupture of the aneurysm that persisted at discharge from the ICU. Eight patients (76 %) with neurologic disorders had been operated under profound hypothermia and circulatory arrest. Seven (50 %) patients required long-term mechanical ventilation possibly due to lung damage and massive transfusion, (Fig. 1). Of the 7 (50 %) patients suffered postoperative renal failure, 3 (21 %) patients received continuous veno-veno hemodialo filtration and except one death the remains were treated successfully in the ICU.

Table 2. Mortality rate in the patients with respiratory failure and accompanied organ failure

Organ failure	Mortality rate (%)
Respiratory failure without organ failure	0%
Respiratory failure with 1 organ failure	0%
Respiratory failure with 2 organ failure	0%
Respiratory failure with 3 organ failure	14%
Respiratory failure with 4 organ failure	43%

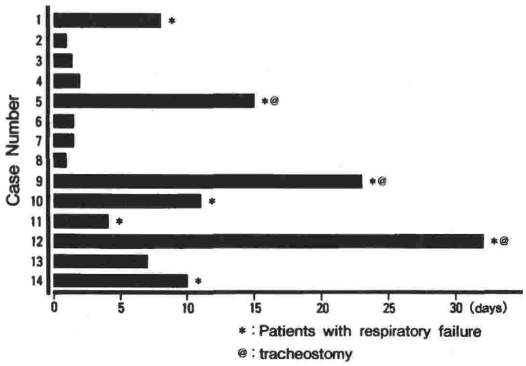

Fig.1 Periods of mechanical ventilation during ICU stay

Discussion

Early mortality rate after emergency surgery for ruptured or dissecting aortic aneurysms has decreased, 3) but still high[1,4,5]. Our mortality rate of 14 % is almost same in comparison with the reported ones after emergency operation for ascending and/or descending aortic dissection. The cause of death in our series were closely related to myocardial failure. Difficulty to wean from the CPB was the main reason to apply the PCPS in these patients. Subsequent coagulation disorder associated with PCPS in the ICU caused uncontrolled bleeding and MOF. In addition to the technical problems related to the dissection, other factors contribute to produce myocardial failure and associated bleeding tendency[1,5,6]. Duration of preoperative shock, and circulatory arrest during CPB play an important role as a predisposing factor to cause myocardial dysfunction at the end of CPB[1]. If once encountered the cardiac pump failure,PCPS was the only intervention to wean from the CPB. In this situation, conventional therapy for systemic bleeding disorder in no way could be life-saving as shown in our study.

It is well known that the preoperative critical condition of patients greatly influence the outcome of surgery[1]. We managed 5 preoperative patients in the ICU who were in shock. In these 5 patients, only 2 patients died after surgery. More titrative patient care or preoperative preparation including the evaluation of the disease could be done depending on the condition. We strongly recommended that the patients who were in shock or vital organ dysfunction must be quickly transferred to the ICU. This arrangement could con-

tribute to the good outcome after emergency surgery for aortic dissection[2].

The incidence of cerebral complication after the aortic arch repair in acute aortic dissection under circulatory arrest is reported to be 7% to 35%[6,7], even if profound hypothermia is combined. In our case, of 8 patients who showed a cerebral complication after surgery, 4 was in shock state before surgery. Of these patients who revealed a neurological damage in the ICU, two died and other 2 patients (33 %) still remained comatose at the time of discharge from the ICU. Though selective cerebral perfusion including the retrograde cerebral perfusion that has the advantage of less restricted cerebral protection was applied to all our patients with aortic dissection requiring arch replacement, its incidence in this series was still high. So other factors including preoperative condition may contribute to the etiology of neurologic sequel. We emphasize that critically ill patients before surgery have a high risk of neurological damage by circulatory arrest, so SCP could be the choice.

All our patients needed postoperative mechanical ventilatory therapy, but the duration was dependent on the patient's condition. If there were other coincident organ dysfunctions, mortality rate gradually increased. Respiratory failure was the most common complication after this type of surgery, so ICU physicians must remove the factor to deteriorate other organ function who were under mechanical ventilation after ruptured or dissecting aortic aneurysm. If urinary flow ceased suddenly, dissection of renal artery must be considered. If not so,conservative or blood purification will be the choice according to the patient's condition. CHDF (continuous hemo-dialofiltration) is popular in such a situation because it rarely disturb the cardiovascular dynamics.

We emphasize that outcome after emergency surgery for ruptured or acute dissecting thoracic aortic aneurysm is not only dependent on the early recognition, diagnosis and surgical intervention but also postoperative ICU care. Also it should be remembered that diagnosis and treatment for neurological deficit recognized after surgery still remains a serious problem to be resolved.

Summary

1. We lost two patients in ICU who were out of 14 emergency cases of ruptured or acute dissecting thoracic aneurysms.The survival rate was 85.7%.

2. Uncontrolled bleeding and MOF who need PCPS for myocardial failure was the major factor to cause death in ICU.

3. Postoperative mechanical ventilation was mandatory in ICU, and care of vital organs such as the heart, kidney, liver surely increased the survival rate.

4. Postoperative neurological damage caused the long ICU stay, and all patients who were in shock showed severe neurological deficits in ICU.

5. Preoperative care of the patient in shock state in ICU could improve the surgical outcome.

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