Original Article

The prognosis of preoperative preemptive intubation for acute type A aortic dissection patients: a retrospective propensity score matching study

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Background: Acute type A aortic dissection (AADA) is a life-threatening cardiovascular disease, and improving perioperative mortality remains a significant challenge. The purpose of this study is to investigate the impact of preemptive intubation under adequate sedation and analgesia on the prognosis of AADA patients under the high rupture risk.

Methods: The medical records of patients diagnosed with AADA and admitted to Changhai Hospital from January 2019 to January 2020 were retrospectively reviewed. Patients were divided into two groups based on whether they received preoperative preemptive intubation in the cardiac intensive care unit (ICU) before surgery. We used propensity score matching (PSM) analysis to conduct statistical analyses on the preoperative, intraoperative, and postoperative clinical data of the two groups.

Results: A total of 134 patients were eventually included in the study. One patient (3.8%) in the pre-intubation group and 15 (13.9%) in the control group died of dissection rupture before surgery. After excluding patients with dissection rupture, there were 25 patients in the pre-intubation group and 93 patients in the non-intubation group. After PSM, there were 17 patients in the pre-intubation group and 68 patients in the non-intubation group. Baseline data analysis showed that the pre-intubation group had a higher Sequential Organ Failure Assessment (SOFA) score (10.2±3.9 *vs.* 8.0±4.7, P=0.036) and a higher proportion of patients with coronary artery disease (16.0% *vs.* 1.1%, P=0.007). The rate of massive pericardial effusion was also higher in the intubation group (28.0% *vs.* 10.8%, P=0.049), and preoperative oxygenation index was lower (273.2±97.3 *vs.* 322.1±100.9, P=0.032) compared to the control group. The results showed no significant differences in intraoperative and postoperative data for the two groups. Kaplan-Meier survival curves indicated a trend towards a more favorable prognosis for patients in the preemptive intubation group, but this difference was not significant either before or after PSM.

Conclusions: Preemptive pre-intubation may benefit high-risk patients with factors such as hypoxia, massive pericardial effusion, and agitation, improving the more critically AADA patients' perioperative outcomes.

Keywords: Acute type A aortic dissection (AADA); preemptive intubation; prognosis; surgery; cardiovascular disease

Submitted Jul 16, 2023. Accepted for publication Nov 10, 2023. Published online Dec 14, 2023.
doi: 10.21037/jtd-23-1105
View this article at: https://dx.doi.org/10.21037/jtd-23-1105

Introduction

Acute type A aortic dissection (AADA) is a medical emergency characterized by rapid onset, progress, with multiple complications and of high early mortality. Previous studies have reported an increase of 1–2% in hourly fatality rate following the onset of AADA. Within 48 hours, the mortality rate can reach up to 30–68% (1). Despite advancements in perioperative management and cardiovascular, endovascular, and hybrid surgical techniques (2,3), in-hospital mortality remains high (4,5). Patients may have delayed in diagnosis, comorbidities, or advanced age, leading to a lack of timely surgery. Some patients may be planned for surgery but undergo preoperative resuscitation or experience hypotension/shock, which are significant predictors of surgical mortality that can prevent or delay repairing of dissection (6,7). The purpose of this study is to investigate the impact of preemptive intubation under adequate sedation and analgesia on the prognosis of patients with AADA who have the high-risk factors. We present this article in accordance with the STROBE reporting checklist (available at https://jtd.amegroups.com/article/view/10.21037/jtd-23-1105/rc).

Methods

Study design

We conducted a retrospective review of the medical records of patients diagnosed with AADA and admitted to Changhai Hospital from January 2019 to January 2020. The diagnosis of AADA was confirmed using enhanced computed tomography. Patients were divided into two groups based on whether they received preemptive intubation before surgery. We then conducted statistical analyses on the preoperative, intraoperative, and postoperative clinical data of the two groups. Preoperative preemptive intubation was performed in cardiac intensive care unit (ICU) rather than the anesthesia room before surgery. The inclusion criteria mainly included: (I) patients with hypoxemia, dyspnea, and other respiratory system conditions requiring emergency intubation; (II) patients with pericardial effusion affecting circulation, as shown on echocardiography; (III) patients with dysphoria that could not be alleviated by sedative and analgesic therapy, and were at a higher risk of dissection rupture, after full evaluation by clinicians; and (IV) if patients first admitted to medical institutions with no surgical capacity and need to be transferred to a higher-level hospital for long distance. The exclusion criteria are as follows: (I) patients under the age of 18 years old; and (II) after evaluation, patients with cerebrovascular accidents and other complications are not suitable for surgical treatment.

> **Highlight box**
>
> **Key findings**
> - For perioperative management of acute type A aortic dissection (AADA), preemptive pre-intubation may result in a good prognosis for patients who suffer a higher risk of rupture risk, such as hypoxia, massive pericardial effusion, and agitation.
>
> **What is known and what is new?**
> - AADA has a high mortality rate before surgery, and existing preoperative management methods including sedation and analgesia are limited in reducing the rupture risk.
> - Therefore, this study proposes the use of preemptive pre-intubation to improve preoperative management, which may bring significant clinical benefits to patients at high risk of rupture.
>
> **What is the implication, and what should change now?**
> - In this study, for AADA patients with high rupture risk such as hypoxia, massive pericardial effusion, and agitation before surgery, preemptive pre-intubation can be used as an option under full sedation and analgesia.

Ethical statement

The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This study was approved by the Ethics Committee of Biomedical Research at The Naval Medical University, Shanghai (No. SMMUEC2022-010). Given the retrospective observational nature of the study, individual patient consent was waived by the Ethics Committee.

Data collection

We collected data on patients' age, sex, body mass index (BMI), comorbidities (e.g., hypertension, diabetes), history of smoking, and blood gas analysis, as well as preoperative laboratory test results, left ventricular ejection fraction (LVEF) (%), the presence of coronary heart disease, preoperative shock, preoperative moderate/severe pericardial effusion, and intraoperative conditions.

We also collected data on postoperative complications, such as duration of postoperative mechanical ventilation exceeding 72 hours (%), renal insufficiency, postoperative stroke, paraparesis, infection, and hospital mortality.

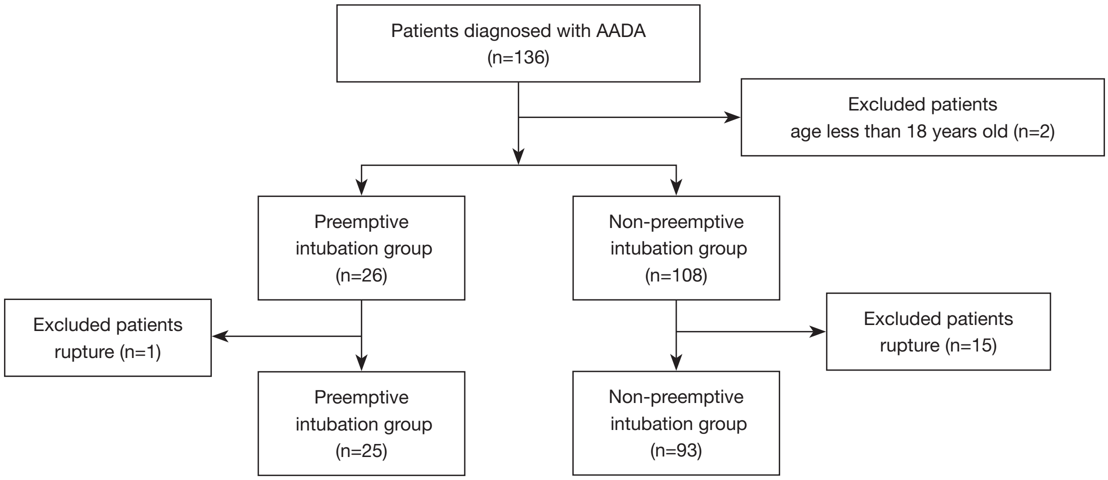

Figure 1 The flow chart of patient screening. AADA, acute type A aortic dissection.

Statistical analysis

Propensity score matching (PSM) analysis is a method used to reduce selection bias between the two groups of patients. We used a 1:4 matching protocol without replacement (greedy-matching algorithm), with a caliper width of 0.2 standard deviations (SDs). In the multivariate Cox regression analysis, age and gender were used as covariates. Baseline demographic, preoperative data, intraoperative data, and postoperative data were compared between the two groups both before and after PSM.

The results were presented as the mean ± SD or median [interquartile range (IQR)] for continuous variables as appropriate and as the total number (%) for categorical variables. Comparisons between groups were made using the χ^2 test or Fisher exact test for categorical variables and the Student *t*-test or Mann-Whitney *U* test for continuous variables as appropriate. Univariate and multivariate analyses using the Cox proportional hazard regression model were conducted to identify independent risk factors for 28-day mortality. The 28-day survival curve was plotted using the Kaplan-Meier method. P value <0.05 was set as statistical significance. All analyses were performed using R Statistical Software (https://www.r-project.org/; The R Foundation, Vienna, Austria) and Free Statistics analysis platform (Beijing, China).

Results

Baseline demographic and clinical data of patients included in primary analysis

The flow chart of patient screening is shown in *Figure 1*. A total of 136 patients were initially included in the study, two patients were excluded according to the exclusion criteria, and 134 patients were eventually included in the study. One patient (3.8%) in the pre-intubation group and 15 (13.9%) in the control group died of dissection rupture before surgery. After excluding the ruptured patients, 118 patients were included in the final analysis. Before PSM, there were 25 patients in the pre-intubation group and 93 patients in the non-intubation group. After PSM, there were 17 patients in the pre-intubation group and 68 patients in the non-intubation group.

The clinical characteristics of initially enrolled patients are shown in *Table 1*.

Baseline data analysis is shown in *Table 2*. Before PSM, the pre-intubation group had a higher Sequential Organ Failure Assessment (SOFA) score (10.2±3.9 *vs.* 8.0±4.7, P=0.036) and a higher proportion of patients with coronary artery disease (16.0% *vs.* 1.1%, P=0.007). The rate of massive pericardial effusion was also higher in the intubation group (28.0% *vs.* 10.8%, P=0.049), and preoperative oxygenation index was lower (273.2±97.3 *vs.* 322.1±100.9, P=0.032) compared to the control group. After PSM, there was no statistical difference between the two groups except PaO_2 (77.5±21.7 *vs.* 102.5±48.7, P=0.042) before surgery.

Intraoperative data and postoperative data between the groups included in the final analysis

Intraoperative and postoperative data for the two groups included in the final analysis were compared. Either

Table 1 Baseline demographic and clinical data of patients included in primary analysis

Patients' characteristics	Total (n=134)	Non-preemptive intubation group (n=108)	Preemptive intubation group (n=26)	P value
Age (years)	52.6±12.5	52.6±12.7	52.5±11.8	0.908
Gender (female)	35 (26.1)	27 (25.0)	8 (30.8)	0.548
BMI (kg/m^2)	25.3±4.0	25.2±3.9	25.7±4.7	0.627
Rupture	16 (11.9)	15 (13.9)	1 (3.8)	0.308

Data are presented as mean ± SD or n (%). BMI = weight (kg)/height (m)^2. BMI, body mass index; SD, standard deviation.

Table 2 Baseline demographic and preoperative data in full and PSM cohorts

Patients' characteristics	Full cohort				Propensity score-matched cohort			
	Total (n=118)	Non-preemptive intubation group (n=93)	Preemptive intubation group (n=25)	P value	Total (n=85)	Non-preemptive intubation group (n=68)	Preemptive intubation group (n=17)	P value
Age (years)	51.6±12.3	51.1±12.4	53.4±12.1	0.426	53.8±11.1	53.8±11.3	53.8±10.9	0.988
Gender (female)	30 (25.4)	22 (23.7)	8 (32.0)	0.395	21 (24.7)	17 (25.0)	4 (23.5)	>0.99
BMI (kg/m^2)	25.6±4.1	25.5±3.9	26.1±4.8	0.481	25.6±4.0	25.4±3.7	26.4±5.0	0.330
SOFA score	8.4±4.6	8.0±4.7	10.2±3.9	0.036*	9.0±4.6	8.6±4.7	10.2±4.1	0.207
Marfan syndrome	5 (4.2)	3 (3.2)	2 (8.0)	0.286	3 (3.5)	2 (2.9)	1 (5.9)	0.493
Bicuspid aortic valve	1 (0.8)	0 (0.0)	1 (4.0)	0.212	0 (0.0)	0 (0.0)	0 (0.0)	>0.99
Coronary heart disease	5 (4.2)	1 (1.1)	4 (16.0)	0.007*	3 (3.5)	1 (1.5)	2 (11.8)	0.101
LVEF (%)	60.0±8.1	59.5±7.9	61.3±8.9	0.357	60.1±7.9	59.6±7.3	61.8±9.9	0.321
Aortic root diameter (cm)	2.4±0.4	2.4±0.4	2.5±0.5	0.288	2.4±0.2	2.4±0.1	2.4±0.3	0.187
Cerebrovascular disease	7 (5.9)	4 (4.3)	3 (12.0)	0.163	3 (3.5)	2 (2.9)	1 (5.9)	0.493
Smoking	28 (23.7)	21 (22.6)	7 (28.0)	0.572	21 (24.7)	17 (25.0)	4 (23.5)	>0.99
Hypertension	74 (62.7)	57 (61.3)	17 (68.0)	0.538	56 (65.9)	45 (66.2)	11 (64.7)	0.909
Diabetes	7 (5.9)	4 (4.3)	3 (12.0)	0.163	3 (3.5)	2 (2.9)	1 (5.9)	0.493
Renal failure	23 (19.5)	17 (18.3)	6 (24.0)	0.572	16 (18.8)	13 (19.1)	3 (17.6)	>0.99
Creatine (μmol/L)	88.4±35.1	89.0±35.1	86.0±35.8	0.706	88.8±33.0	89.5±31.2	85.9±40.4	0.693
PaO_2 (mmHg)	98.8±40.8	102.3±43.4	85.1±24.1	0.041*	97.5±45.6	102.5±48.7	77.5±21.7	0.042*
Lactate (mmol/L)	1.5±1.0	1.5±1.0	1.5±0.8	0.818	1.6±1.0	1.6±1.1	1.5±0.7	0.695
Large pericardial effusion	17 (14.4)	10 (10.8)	7 (28.0)	0.049*	13 (15.3)	8 (11.8)	5 (29.4)	0.124
P/F ratio (mmHg)	311.8±101.7	322.1±100.9	273.2±97.3	0.032*	310.7±102.8	321.4±101.4	267.8±100.0	0.054
Onset to surgery time (h)	30.0±10.9	30.3±11.8	28.2±6.5	0.544	29.3±11.5	29.4±12.5	28.7±6.5	0.826

Data are presented as mean ± SD or n (%). *, P<0.05. BMI = weight (kg)/height (m)^2. PSM, propensity score matching; BMI, body mass index; SOFA, sequential organ failure assessment; LVEF, left ventricular ejection fraction; PaO_2, arterial partial pressure of oxygen; P/F ratio, oxygenation index; SD, standard deviation.

Table 3 Intraoperative data and postoperative data in PSM cohorts

Patients' characteristics	Full cohort				PSM cohort			
	Total (n=118)	Non-preemptive intubation group (n=93)	Preemptive intubation group (n=25)	P value	Total (n=85)	Non-preemptive intubation group (n=68)	Preemptive intubation group (n=17)	P value
Intraoperative period								
Duration of CPB (min)	148.5±46.9	148.8±49.3	147.3±37.5	0.887	147.8±48.2	149.3±51.1	141.6±34.6	0.557
Aortic cross-clamping time (min)	86.0±32.7	86.1±32.8	85.7±32.7	0.956	84.3±33.3	84.0±33.9	85.5±31.5	0.867
ScO_2 of left side pre-CPB (%)	63.5±10.8	63.1±10.9	65.3±10.3	0.361	62.9±10.5	62.6±10.8	64.2±9.1	0.565
ScO_2 of right side pre-CPB (%)	61.7±10.0	61.6±10.0	62.1±10.0	0.848	61.0±9.6	60.5±9.7	63.1±8.9	0.318
ScO_2 of left side during CPB (%)	57.1±9.2	56.5±8.4	59.2±11.7	0.184	56.2±9.0	56.3±8.6	56.0±10.9	0.91
ScO_2 of right side during CPB (%)	56.5±9.3	56.2±8.6	57.5±11.6	0.532	55.6±9.4	55.5±8.7	56.0±12.1	0.855
ScO_2 of left side after CPB (%)	61.5±9.9	61.5±9.5	61.2±11.7	0.902	60.9±9.1	61.2±9.4	59.8±7.9	0.556
ScO_2 of right side after CPB (%)	60.3±10.4	60.3±9.8	60.2±12.6	0.941	59.5±9.8	59.5±10.2	59.6±7.9	0.965
Blood cell transfusion (mL)	527.1±508.8	541.9±532.1	472.0±415.9	0.544	562.4±541.2	567.6±570.5	541.2±416.9	0.858
Plasma transfusion (mL)	445.4±897.2	481.3±998.3	312.0±283.3	0.405	371.3±299.2	378.8±297.2	341.2±314.4	0.645
Platelet transfusion (units)	10.8±9.2	11.2±10.1	9.2±4.0	0.339	11.2±10.5	11.5±11.6	10.0±3.5	0.609
Cryoprecipitate transfusion (units)	10.2±5.4	10.3±5.7	10.0±4.1	0.818	10.4±4.7	10.4±4.8	10.6±4.3	0.872
ABG results before leaving the operating room								
PaO_2 (mmHg)	120.1±35.2	120.5±29.5	118.6±52.1	0.805	121.6±37.8	122.1±29.5	119.5±62.1	0.800
$PaCO_2$ (mmHg)	36.0±5.3	36.1±5.4	35.8±4.8	0.801	35.9±5.5	36.0±5.6	35.8±4.9	0.908
Lactate (mmol/L)	6.2±3.2	6.2±3.4	6.1±2.7	0.862	6.1±2.9	6.1±3.0	5.8±2.2	0.722
Postoperative period								
Duration of postoperative MV more than 72 h	86 (72.9)	69 (74.2)	17 (68.0)	0.536	61 (71.8)	50 (73.5)	11 (64.7)	0.55
Postoperative renal failure	17 (14.4)	12 (12.9)	5 (20.0)	0.353	13 (15.3)	10 (14.7)	3 (17.6)	0.718
Postoperative stroke	5 (4.2)	4 (4.3)	1 (4.0)	>0.99	4 (4.7)	4 (5.9)	0 (0.0)	0.579
Paraparesis	1 (0.8)	1 (1.1)	0 (0.0)	>0.99	1 (1.2)	1 (1.5)	0 (0.0)	>0.99
Infection	19 (16.1)	15 (16.1)	4 (16.0)	>0.99	13 (15.3)	11 (16.2)	2 (11.8)	>0.99

Data are presented as mean ± SD or n (%). PSM, propensity score matching; CPB, cardiopulmonary bypass; ScO_2, cerebral regional oxygen saturation; ABG, arterial blood gas; PaO_2, arterial partial pressure of oxygen; $PaCO_2$, partial pressure of carbon dioxide; MV, mechanical ventilation; SD, standard deviation.

before and after PSM, the results showed no significant differences in the duration of cardiopulmonary bypass (CPB), aortic cross-clamping time, or intraoperative cerebral regional oxygen saturation (ScO_2) between the two groups. Furthermore, there were no significant differences in postoperative complications such as the duration of mechanical ventilation over 72 hours, renal failure, or infection (P>0.05) (*Table 3*).

Univariable and multivariable analyses of factors affecting 28-day mortality

Univariate and multivariate analyses were performed to identify factors associated with 28-day mortality. Either

Table 4 Univariable analysis of factors affecting 28-day mortality

Variables	Full cohort		PSM cohort	
	HR (95% CI)	P value	HR (95% CI)	P value
Age (cont. var.)	1 (0.98–1.02)	0.886	1 (0.97–1.03)	0.976
Sex: female *vs.* male	1 (0.56–1.76)	0.987	0.99 (0.5–1.96)	0.981
BMI (cont. var.)	1 (0.94–1.05)	0.868	0.99 (0.92–1.06)	0.79
Preemptive intubation: yes *vs.* no	1.06 (0.64–1.78)	0.812	1.12 (0.61–2.08)	0.711
Marfan syndrome: yes *vs.* no	1.29 (0.43–3.91)	0.651	1.6 (0.37–7.03)	0.532
Coronary heart disease: yes *vs.* no	0.96 (0.27–3.35)	0.949	1.09 (0.23–5.19)	0.91
LVEF (cont. var.)	1.01 (0.63–1.6)	0.968	1 (0.97–1.03)	0.939
Aortic root diameter (cont. var.)	1.19 (0.58,2.45)	0.976	2.44 (0.48–12.32)	0.281
Cerebrovascular disease: yes *vs.* no	0.95 (0.36–2.53)	0.917	0.92 (0.26–3.3)	0.903
Smoking: yes *vs.* no	1.04 (0.61–1.76)	0.891	0.97 (0.5–1.86)	0.923
Hypertension: yes *vs.* no	1.02 (0.66–1.59)	0.914	1.1 (0.63–1.92)	0.74
Diabetes: yes *vs.* no	0.99 (0.33–2.95)	0.983	1 (0.1–9.77)	0.998
Renal failure: yes *vs.* no	0.88 (0.33–2.33)	0.794	0.8 (0.24–2.62)	0.71
Creatine (cont. var.)	1 (0.99–1.01)	0.83	1 (0.99–1.02)	0.827
Large pericardial effusion: yes *vs.* no	1.02 (0.58–1.78)	0.957	1.13 (0.56–2.28)	0.724
Duration of postoperative MV more than 72 h: yes *vs.* no	1 (0.6–1.67)	0.998	1.09 (0.53–2.22)	0.821

BMI = weight (kg)/height (m)^2. PSM, propensity score matching; HR, hazard ratio; CI, confidence interval; cont., continuous; var., variables; BMI, body mass index; LVEF, left ventricular ejection fraction; MV, mechanical ventilation.

before or after PSM, there was no significant differences between the two groups (*Table 4*).

Survival Kaplan-Meier survival curves

Kaplan-Meier survival curves indicated a trend towards a more favorable prognosis for patients in the preemptive intubation group, but this difference was not statistically significant either before or after PSM (P>0.05) (*Figures 2,3*).

Discussion

AADA is a life-threatening cardiovascular disease, and improving perioperative mortality remains a significant challenge. Although surgical treatment is the preferred approach, aortic rupture is the most perilous cause of mortality, accounting for one-third of deaths in conservatively-treated patients without surgery (8). Aortic rupture accounted for 47% of all in-hospital deaths among patient with AADA (9). The latest studies report a high rate of early mortality of 23.7% within the first 48 hours for non-operatively managed AADA, corresponding to approximately 0.5% per hour over this critical period (10). Despite surgical advancements and efforts to expedite surgery, a significant number of patients still die from dissection rupture, particularly those at high risk of rupture due to factors such as pericardial tamponade, hypoxemia, and irritability during preparation for surgery (11,12). Additionally, there is also a considerable risk of rupture when patients are first admitted to medical institutions with no surgical capacity and need to be transferred long distance. Previous study showed that patients with a pericardial hematoma could not even survive the transfer (13). In light of this, our study proposes preemptive endotracheal intubation for patients at high risk of rupture before surgery, such as those with pericardial tamponade, hypoxemia, or irritability, under adequate sedation and analgesia. Preemptive intubation can mitigate the risk of rupture, potentially increasing the number of patients who can safely undergo surgical intervention.

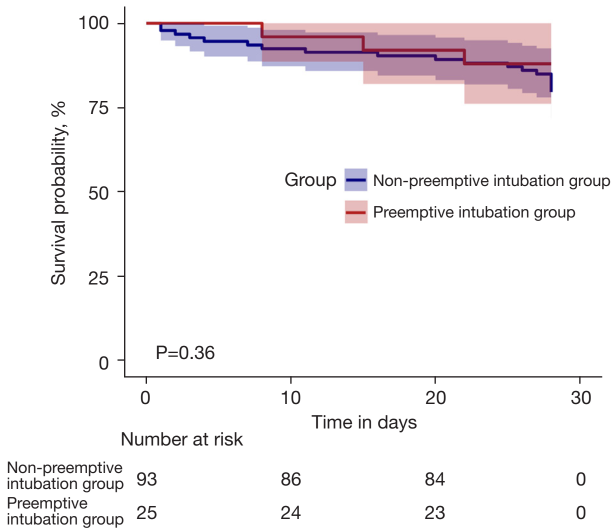

Figure 2 Kaplan-Meier survival curves for 28-day survival comparison between groups before PSM analysis. PSM, propensity score matching.

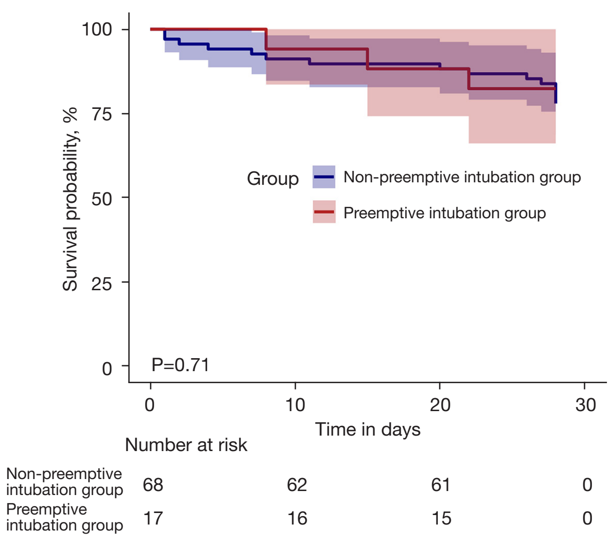

Figure 3 Kaplan-Meier survival curves for 28-day survival comparison between groups after PSM analysis. PSM, propensity score matching.

Of course, preemptive endotracheal intubation in high-risk patients before surgery for AADA carries the potential risk of dissection rupture. Therefore, in our study, we carefully managed the procedure with the combined application of midazolam and ketamine under the premise of complete sedation, analgesia, and muscle relaxation. Previous studies have shown that ketamine can increase cardiac output, systemic vascular resistance, and heart rate through central and peripheral sympathetic effects. It can also maintain the contractility of the heart, perfusion pressure, and provide hemodynamic stability for patients with cardiac tamponade (14). After completing relevant preoperative examinations, patients were timely transferred to the operating room for surgical intervention.

Previous studies have confirmed pericardial effusion, shock, and pain requiring medication are independent risk factors for preoperative aortic rupture in AADA patients (9). Patients enrolled in the preemptive intubation group in this study had higher SOFA score, higher rate of coronary artery disease, lower oxygenation index, and higher proportion of medium-gravity effusion. Patients are more likely to suffer the higher risk of rupture. After preemptive intubation, the perioperative prognosis can be improved. Pericardial effusion occurred in 46.3% of AADA patients (15). AADA with cardiac tamponade is clinically critical. The previous study showed that preoperative cardiac tamponade is a perioperative risk factor for delayed extubation (16). Otherwise, latest study has proven that cardiac compression is associated with preoperative intubation and mechanical resuscitation (17). The pressure-volume curve in the pericardium determines hemodynamics in patients with pericardial effusion. Rapid fluid accumulation may lead to pericardial tamponade, resulting in ventricular compression, atrium collapse, and obstruction of venous return. Hemorrhagic pericardial effusion can quickly form blood clots, often indicating an increased risk of dissection rupture, indicating poor clinical outcome (18). The preoperative management of patients with severe pericardial effusion AADA before surgery is still controversial. Controlled pericardial drainage is one of the more commonly used methods, which can reduce the early in-hospital mortality of patients with AADA complicated with cardiac tamponade before surgery to 16% and the 5-year cumulative survival rate to 63.4%, with satisfactory short-term and long-term efficacy (19). But at the same time, due to uncontrolled drainage, improper operation will strongly stimulate the sympathetic nerve, increase blood pressure, and lead to dissection rupture (20).

Upon evaluating the patient's surgical indications, early preemptive intubation with full sedation and analgesia can effectively prevent unexpected conditions, such as anxiety or severe cough, that may lead to increased blood pressure and increase the risk of dissection rupture. Moreover, the use of mechanical ventilation can improve the patient's oxygenation status, reducing the risk of organ ischemia and hypoxia. In addition, maintaining proper circulation is crucial, and appropriate fluid resuscitation and the use of vasoactive drugs such as norepinephrine can be considered to maintain adequate perfusion pressure. Controlled pericardial puncture and drainage may be performed if the perfusion pressure cannot be maintained. After completing preoperative transport and relevant examinations, patients should be promptly sent to the operating room for surgical treatment.

Limitation

This study has several limitations, including its retrospective design and limited sample size. The clinical data may not be comprehensive enough, and the results may not be generalizable to other populations. Larger randomized controlled trials are needed to confirm the findings of this study.

Conclusions

In conclusion, AADA remains a critical condition in cardiovascular surgery, and early preemptive intubation may benefit high-risk patients with factors such as hypoxia, massive pericardial effusion, and agitation, improving the more critically AADA patients' perioperative outcomes. Clinicians should pay attention to these risk factors in the management of patients with AADA. Further studies are warranted to validate these findings and develop effective strategies for improving the prognosis of patients with AADA.

Acknowledgments

We would like to thank Dr. Yang Liu from department of Critical Care Medicine, Naval Medical Center of People's Liberation Army of China (PLA) for his help in polishing our paper.
Funding: This study was supported by the Pudong New Area Health Commission Clinical Peak Discipline Construction (Emergency and Critical Care Unit, No. PWYgf2021-03)

Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at https://jtd.amegroups.com/article/view/10.21037/jtd-23-1105/rc

Data Sharing Statement: Available at https://jtd.amegroups.com/article/view/10.21037/jtd-23-1105/dss

Peer Review File: Available at https://jtd.amegroups.com/article/view/10.21037/jtd-23-1105/prf

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://jtd.amegroups.com/article/view/10.21037/jtd-23-1105/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). This study was approved by the Ethics Committee of Biomedical Research at The Naval Medical University, Shanghai (No. SMMUEC2022-010). Given the retrospective observational nature of the study, individual patient consent was waived by the Ethics Committee.

References

1. Gudbjartsson T, Ahlsson A, Geirsson A, et al. Acute type A aortic dissection - a review. Scand Cardiovasc J 2020;54:1-13.
2. Hiratzka LF, Bakris GL, Beckman JA, et al. 2010 ACCF/AHA/AATS/ACR/ASA/SCA/SCAI/SIR/STS/SVM guidelines for the diagnosis and management of patients with thoracic aortic disease: executive summary. A report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, American Association for Thoracic Surgery, American College of Radiology, American Stroke Association, Society of Cardiovascular Anesthesiologists, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of Thoracic Surgeons, and Society for Vascular Medicine. Catheter

Cardiovasc Interv 2010;76:E43-86.
3. Bonser RS, Ranasinghe AM, Loubani M, et al. Evidence, lack of evidence, controversy, and debate in the provision and performance of the surgery of acute type A aortic dissection. J Am Coll Cardiol 2011;58:2455-74.
4. Pape LA, Awais M, Woznicki EM, et al. Presentation, Diagnosis, and Outcomes of Acute Aortic Dissection: 17-Year Trends From the International Registry of Acute Aortic Dissection. J Am Coll Cardiol 2015;66:350-8.
5. Wong DR, Lemaire SA, Coselli JS. Managing dissections of the thoracic aorta. Am Surg 2008;74:364-80.
6. Hagan PG, Nienaber CA, Isselbacher EM, et al. The International Registry of Acute Aortic Dissection (IRAD): new insights into an old disease. JAMA 2000;283:897-903.
7. Chiappini B, Schepens M, Tan E, et al. Early and late outcomes of acute type A aortic dissection: analysis of risk factors in 487 consecutive patients. Eur Heart J 2005;26:180-6.
8. Mehta RH, Suzuki T, Hagan PG, et al. Predicting death in patients with acute type a aortic dissection. Circulation 2002;105:200-6.
9. Li ZD, Liu Y, Zhu J, et al. Risk factors of pre-operational aortic rupture in acute and subacute Stanford type A aortic dissection patients. J Thorac Dis 2017;9:4979-87.
10. Harris KM, Nienaber CA, Peterson MD, et al. Early Mortality in Type A Acute Aortic Dissection: Insights From the International Registry of Acute Aortic Dissection. JAMA Cardiol 2022;7:1009-15.
11. Zhao H, Ma W, Wen D, et al. Computed tomography angiography findings predict the risk factors for preoperative acute ischaemic stroke in patients with acute type A aortic dissection. Eur J Cardiothorac Surg 2020;57:912-9.
12. Most H, Reinhard B, Gahl B, et al. Is surgery in acute aortic dissection type A still contraindicated in the presence of preoperative neurological symptoms? Eur J Cardiothorac Surg 2015;48:945-50; discussion 950.
13. Bayegan K, Domanovits H, Schillinger M, et al. Acute type A aortic dissection: the prognostic impact of preoperative cardiac tamponade. Eur J Cardiothorac Surg 2001;20:1194-8.
14. Rawlinson E, Bagshaw O. Anesthesia for children with pericardial effusion: a case series. Paediatr Anaesth 2012;22:1124-31.
15. Imazio M. Ten questions about cardiac tamponade. G Ital Cardiol (Rome) 2018;19:471-8.
16. Maisat W, Siriratwarangkul S, Charoensri A, et al. Perioperative risk factors for delayed extubation after acute type A aortic dissection surgery. J Thorac Dis 2020;12:4796-804.
17. Kaufeld T, Beckmann E, Rudolph L, et al. Preoperative pericardial hematoma in patients with acute type A aortic dissection (AAAD): Do we need an adjusted treatment? J Cardiothorac Surg 2023;18:67.
18. Feng YM, Wan D, Guo R. A case report of hemorrhagic cardiac tamponade with rapid blood clot formation: A serious complication of acute type a aortic dissection. Medicine (Baltimore) 2018;97:e13699.
19. Nakai C, Izumi S, Haraguchi T, et al. Long-term Outcomes After Controlled Pericardial Drainage for Acute Type A Aortic Dissection. Ann Thorac Surg 2020;110:1357-63.
20. Erbel R, Alfonso F, Boileau C, et al. Diagnosis and management of aortic dissection. Eur Heart J 2001;22:1642-81.

Cite this article as: Zhou W, Du Z, Wang QX, Liu Y, Han L, Xu ZY, Ma SL, Li BL. The prognosis of preoperative preemptive intubation for acute type A aortic dissection patients: a retrospective propensity score matching study. J Thorac Dis 2023;15(12):6752-6760. doi: 10.21037/jtd-23-1105

