

Effect of waiting time for COVID-19 screening on postoperative outcomes of type A aortic dissection: An institutional study

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Takanori Hishikawa¹ , Takeki Ohashi¹, Masao Tadakoshi¹,
Yuji Kamikawa¹, Soichiro Kageyama¹, Akinori Kojima¹,
Kaoru Hioki¹ and Hirotaka Yamauchi¹

Abstract

Background: Since November 2020, all patients undergoing emergency surgery at our hospital have been subjected to preoperative reverse transcription polymerase chain reaction (RT-PCR) screening to prevent nosocomial COVID-19 infection, with admission to the operating room requiring a negative result. Herein, we compared the pre- and postoperative outcomes of acute type A aortic dissection surgery before and after implementing the RT-PCR screening for all patients.

Methods: We compared the postoperative results of 105 patients who underwent acute type A aortic dissection emergency surgery from January 2019 to October 2020 (Group I) and 109 patients who underwent the surgery following RT-PCR screening from November 2020 to March 2022 (Group II).

Results: The average waiting time from arrival at the hospital to admission to the operating room was 36 and 81 min in Groups I and II, respectively. Ruptured cardiac tamponade was observed preoperatively in 26.6% and 21.1% of Groups I and II patients, respectively. The preoperative waiting time due to RT-PCR screening did not contribute to the cardiac tamponade. Surgical complications such as bleeding (reopened chest), respiratory failure, cerebral neuropathy, or mediastinitis did not increase significantly. The number of deaths 30 days after surgery (Group I = 13 and Group II = 3) showed no significant difference between the groups. There were no cases of nosocomial COVID-19 infections.

Conclusions: Preoperative COVID-19 screening is an important method to prevent nosocomial infections. The associated waiting time did not affect the number of preoperative ruptures or affect postoperative complications or mortality.

Keywords

Acute type A aortic dissection, COVID-19 screening, nosocomial, RT-PCR

Introduction

To prevent nosocomial COVID-19 infection, screening tests, such as reverse transcription polymerase chain reaction (RT-PCR), are necessary at the time of admission. However, in emergency diseases requiring cardiovascular surgery, the time from admission to the start of surgery is crucial. The Japanese Surgical Association has suggested that if COVID-19 cannot be ruled out before emergency surgery, surgery should be performed after waiting for the maximum possible time for the RT-PCR results. However, in detrimental cases caused by the patients' preoperative condition, our hospital policy is to perform the surgery in a negative pressure room while wearing personal protective equipment. Our hospital provides a 24-h

RT-PCR service, but results are released after an hour. Even after November 2020, surgeries were postponed with the aim of waiting for patients' RT-PCR results. In this study, we compared the pre- and postoperative outcomes in patients who underwent acute type A aortic dissection emergency surgery before and after implementing the RT-PCR screening for all patients.

¹Cardiovascular Surgery, Nagoya Tokushukai General Hospital, Kasugai, Aichi, Japan

Corresponding author:

Takanori Hishikawa, Cardiovascular Surgery, Nagoya Tokushukai General Hospital, 2-52 Kozoji-cho kita, Kasugai City, Aichi 487-0016, Japan.
Email: ublb_mpwf_sfob@yahoo.co.jp

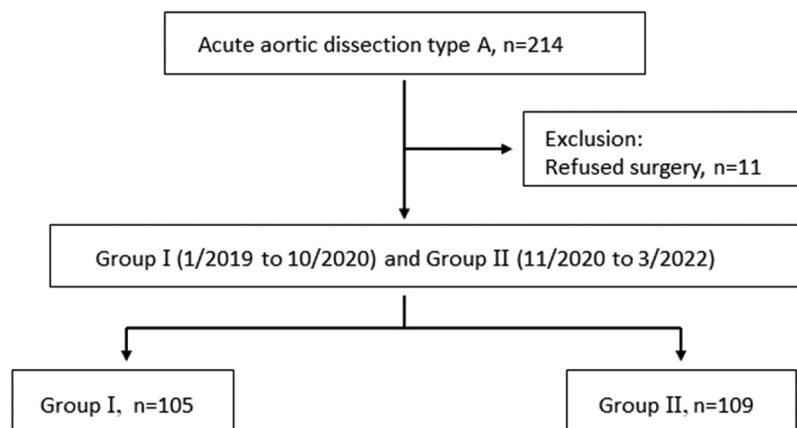


Figure 1. Patient selection chart. The number of patients with type A acute aortic dissection who presented to our hospital between January 2019 and March 2022 was 214. Eleven patients who refused surgery because of their advanced age or hindrance in their activities of daily living were excluded from the study while the rest were divided into two groups (Group I, 105 patients; Group II, 109 patients) as part of the study.

Material and methods

We compared the pre- and postoperative results of 105 patients who underwent emergency surgery for acute type A aortic dissection from January 2019 to October 2020 (Group I) and 109 patients who underwent the same procedure from November 2020 to March 2022 (Group II), only after preoperative COVID-19 RT-PCR results were available. Basically, all patients with acute type A aortic dissection are treated with emergency surgery in our hospital (if they do not agree to surgery, they are treated conservatively). The flow of patient selection is shown in Figure 1. To adjust for confounding factors other than preoperative RT-PCR testing, we ensured that the surgical team (including the cardiovascular surgery medical specialist) and surgical procedure used for both groups were identical. In our hospital, we performed ascending aorta replacement if the entry tear is in the ascending aorta and total arch replacement if it is in the aortic arch. If the dissection involves a coronary artery, coronary artery bypass surgery is added. In moderate or severe cases of aortic regurgitation, aortic valve replacement is performed simultaneously. In cases of aortic root aneurysm, Bentall's procedure is also performed. If the aortic leaflet quality and shape are basically normal and only the sinus expands by more than 4.5 cm, we consider David's surgery. In this study, we also defined cardiac tamponade as a case of shock vitality in the presence of hemopericardium due to pericardial membrane collapse. We evaluated the time from arrival at the hospital to admission to the operating room, preoperative cardiac tamponade, postoperative chest reopening, respiratory failure, cerebral neuropathy, mediastinitis, and mortality. Respiratory failure was defined as the need for tracheal intubation for more than 1 week after surgery. Neurological disorders were defined as abnormal neurological or imaging findings within 1 week after surgery. Mediastinitis was defined as an infection extending down the sternum. Fisher's exact test was used to compare

the variables between the two groups. Statistically significant differences were considered at $p < 0.05$.

Results

Groups I and II included 105 (49 men, 56 women) and 109 (51 men, 58 women) patients, respectively. Although it is well known that the proportion of men with acute type A dissection is about 2–3 times higher than that of women, the proportion of men and women in this study was similar. The results of the pre- and postoperative findings are presented in Table 1. No patient tested positive for COVID-19 preoperatively. There were no nosocomial infections with COVID-19 during the observation period. The average waiting time from arrival at the hospital to admission to the operating room was 36 and 81 min in Groups I and II, respectively. Preoperative ruptured cardiac tamponade was observed in 28 (27%) patients in Group I and 23 (21%) patients in Group II. Fisher's exact test showed that the preoperative waiting time associated with RT-PCR testing did not contribute to the ruptured cardiac tamponade in Group II patients ($p = 0.42$). No cases of cardiac tamponade occurred during the preoperative waiting period in Group II. Seven patients in Group I and 13 patients in Group II were on catecholamine preoperatively. There was no significant difference between the two groups ($p = 0.24$). Catecholamine was administered to some patients with cardiac tamponade to allow a certain degree of hypotension and prevent the progression of cardiac tamponade if the patients maintained consciousness, and there was no progression of organ ischemia. In Group I and Group II, 87 and 79 patients underwent ascending aortic artery replacement, respectively, 8 and 20 patients underwent ascending arch aortic replacement, respectively, 2 and no patients underwent redo ascending aortic artery

Table 1. Pre- and postoperative findings.

	Group I	Group II	
Number of cases	105 (49 men, 56 women)	109 (51 men, 58 women)	
Time to operating room admission	36 min	81 min	<i>p</i> value
Cardiac tamponade	28 (27%)	23 (21%)	0.42
Preoperative catecholamine use	7 (6.7%)	13 (12%)	0.24
Bleeding (reopened chest)	2 (1.9%)	6 (5.5%)	0.28
Respiratory failure	14 (13%)	6 (5.5%)	0.06
Cerebral neurological disorders	15 (14%)	10 (9.2%)	0.29
Mediastinitis	1 (0.95%)	1 (0.92%)	1
30-day mortality	13 (12%)	13 (12%)	1

The average time to enter the operating room has been delayed by 45 min owing to the mandatory COVID-19 PCR test. No significant increase in preoperative cardiac tamponade, preoperative catecholamine use, and postoperative complications was seen.

replacement, respectively. In each group, four patients underwent coronary artery bypass surgery in addition to ascending aortic artery replacement. Three cases of Bentall surgery and two cases of ascending aortic artery replacement were performed, while ascending aortic artery replacement plus aortic valve replacement was performed in one and four cases, respectively. Regarding post-surgical complications, bleeding (reopened chest) occurred in two patients in Group I (1.9%) and six patients in Group II (5.5%), with no significant difference between the two groups ($p=0.28$). Respiratory failure was observed in 14 patients (13%) in Group I and six patients (5.5%) in Group II, but the difference between the two groups was not significant ($p=0.06$). A total of 15 (14%) patients in Group I and 10 patients (9.2%) in Group II developed cerebral neurological disorders, with no significant difference between the two groups ($p=0.29$). The number of patients that developed mediastinitis was also not significantly different ($p=1$) between Groups I (0.95%) and II (0.92%). Although the proportion of patients who died 30 days post-surgery was 12% (13 patients) each in Groups I and II, with no significant difference between the two groups ($p=1$).

Discussion

Considering the recent spread of COVID-19, it is necessary to control nosocomial infections. Since RT-PCR screening was implemented, there has been no nosocomial COVID-19 transmission in our hospital from patients to medical staff, suggesting that RT-PCR COVID-19 testing at the time of scheduled admission may be effective in controlling nosocomial infections. However, RT-PCR testing before emergency admission

may not be available at some facilities. Despite the usefulness of RT-PCR screening, the prognosis of patients with type A acute aortic dissection, who must wait for an hour for RT-PCR test results, needs to be examined. Furthermore, anti-hypertensive rest and analgesia are important for managing any preoperative complications.¹ In our hospital, intravenous calcium channel blockers are used to strictly maintain systolic blood pressure below 120 mmHg, while fentanyl, an analgesic, is administered continuously for pain relief. However, sudden changes may occur during the waiting period, including cardiac arrest associated with (1) acute myocardial infarction due to closure of the coronary artery as the aortic dissection progresses, (2) cardiac tamponade due to rupture of the ascending aorta, and (3) rupture of the descending or abdominal aorta due to vulnerability associated with the dissection.^{2,3} To date, we have not experienced a case of cardiac arrest in our hospital while waiting for COVID-19 RT-PCR test results. Previous studies have shown that the one-step reverse transcription loop-mediated isothermal amplification (RT-LAMP) test is comparable to RT-PCR. Yu et al.⁴ showed that the RT-LAMP test could detect synthesized RNA equivalent to 10 copies of the SARS-CoV-2 virus, with a clinical sensitivity of 97.6%. In addition, RT-LAMP test provides results in 40 min. This may be a useful method for shortening the preoperative waiting time. Overall, although COVID-19 RT-PCR screening significantly prolonged preoperative waiting time, it did not contribute to postoperative mortality in our study. However, it is established that aortic type A dissection is the most dangerous cardiovascular disease, which can occur with pericardial tamponade, arterial rupture, or coronary myocardial infarction, leading to patient mortality. Furthermore, even if the patient does not die, delayed surgery leads to impaired ischemic function, which affects patient recovery. Therefore, it is necessary to devise alternatives for prompt transfer to the operating room, which will facilitate early surgical intervention.

Conclusion

Although COVID-19 RT-PCR screening increases the preoperative waiting time, it does not contribute to postoperative mortality. To prevent nosocomial infections, it is advisable to perform RT-PCR before surgery. However, some patients with poor preoperative condition can suffer adverse events, and precautions, such as preoperative anti-hypertensive rest, may be necessary to prevent cardiac tamponade rupture.

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Ethical approval

The Tokushukai Group Ethics Committee approved this study (REC number: TGE01911-016).

Informed consent

Informed consent was obtained from all individual participants included in this study.

ORCID iD

Takanori Hishikawa  <https://orcid.org/0000-0002-2746-7407>

References

1. Erbel R, Aboyans V, Boileau C, et al. 2014 ESC guidelines on the diagnosis and treatment of aortic diseases: document covering acute and chronic aortic diseases of the thoracic and abdominal aorta of the adult. The task force for the diagnosis and treatment of aortic diseases of the European Society of Cardiology (ESC). *Eur Heart J* 2014; 35: 2873–2926. Erratum in: *Eur Heart J* 2015; 36: 2779.
2. Tyson MD. Dissecting aneurysms. *Am J Pathol* 1931; 7: 581–604.
3. Zull DN and Cydulka R. Acute paraplegia: a presenting manifestation of aortic dissection. *Am J Med* 1988; 84: 765–770.
4. Yu L, Wu S, Hao X, et al. Rapid detection of COVID-19 coronavirus using a reverse transcriptional loop-mediated isothermal amplification (RT-LAMP) diagnostic platform. *Clin Chem* 2020; 66: 975–977.