

Circumferential Acute Type an Aortic Dissection with Intimo-Intimal Intussusception: The Efficacy of Central Aortic Cannulation

Keigo Yamashita^{1*}, Nobuoki Tabayashi¹, Takehisa Abe¹, Yoshihiro Hayata¹, Tomoaki Hirose¹, Rei Tonomura¹, Shinya Yokoyama¹, Yamato Tamura² and Shigeki Taniguchi¹

¹Department of Thoracic and Cardiovascular Surgery, Nara Medical University School of Medicine, Kashihara, Nara, Japan

²Department of Cardiovascular Surgery, Nara Prefectural Seiwa Medical Center, Ikoma, Nara, Japan

Abstract

An 80-year-old woman suffered from acute chest pain and then exhibited cardiogenic shock. Transthoracic echocardiography revealed severe aortic regurgitation due to the intussusception of the intima. Computed tomography also showed the intussusception of the intima into the left ventricular outflow tract over the aortic valve and dissection involving the aortic root, aortic arch, and descending thoracic aorta. During surgery, echocardiography-guided central aortic cannulation was performed for the prompt establishment of cardiopulmonary bypass. The complete intimal tear was circumferentially located in the middle level of the ascending aorta. The proximal flap was inverted into the left ventricle, and the distal flap had been pushed into the aortic arch. Graft replacement of the ascending aorta was performed successfully, and the patient had an uneventful postoperative course.

Keywords: Acute aortic dissection; Circumferential aortic dissection; Intimo-intimal intussusception; Central aortic cannulation

Introduction

Preoperative hemodynamic compromise is well known as a robust predictor of operative death in patients with acute type A aortic dissection [1]. Complete circumferential acute type A aortic dissection can cause intimo-intimal intussusception, which may rapidly lead to devastating hemodynamic instability due to acute severe aortic regurgitation (AR), even without cardiac tamponade or aortic rupture. Retrograde intussusceptions of the intimal flap into the left ventricular outflow tract (LVOT) cause closing failure of the aortic valve, resulting in acute severe AR. Here, we report a patient with acute type A aortic dissection presenting with precipitated circulatory collapse due to severe AR. The prompt establishment of cardiopulmonary bypass (CPB) with safe and secure strategies for arterial cannulation is mandatory.

Case Report

An 80-year-old woman with a history of cerebral infarction was admitted to our hospital because of the sudden onset of severe chest pain. Her blood pressure was 64/25 mmHg, and her heart rate was 96 beats per minute. A shock state, clouded consciousness, and anuria persisted. Moist rales in bilateral lung fields and a Levine III/VI to-and-fro murmur along the left sternal border were noted. The electrocardiogram did not show any ischemic changes. Transthoracic echocardiography revealed aortic dissection and intussusceptions of the intimal flap into the LVOT, leading to severe AR. Computed tomography demonstrated that the intima was divided into two segments in the middle level of the ascending aorta. The proximal flap was within the left ventricle, and the distal flap was within the aortic arch. These findings explained the sudden circulatory collapse due to acute severe AR, and the patient underwent emergency surgery. Intraoperative transesophageal echocardiography showed that the cylinder-shaped intimal flap flailed into the left ventricle during diastole, causing severe AR, and was pushed back into the ascending aorta during systole (Figures 1 and 2). CPB was quickly established with separate venous cannulas placed in the superior and inferior vena cavae, and an arterial cannula was placed in the ascending aorta. Echocardiography-guided central aortic cannulation using the Seldinger technique was performed for safe and secure aortic cannulation. No cerebral desaturation events occurred based on the results of monitoring with cerebral oximeters after the initiation of CPB. After clamping the ascending aorta under retrograde cardioplegic

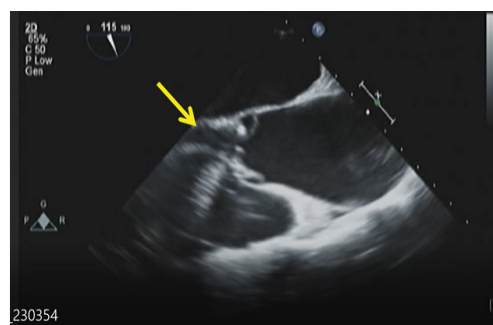


Figure 1: Intimal flap (arrow) pulled into the left ventricle during diastole.

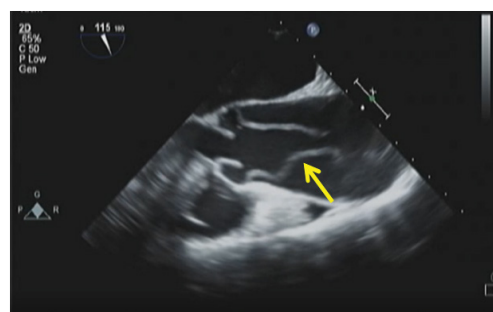


Figure 2: Intimal flap (arrow) pushed back into the ascending aorta during systole.

***Corresponding author:** Keigo Yamashita, Department of Thoracic and Cardiovascular Surgery, Nara Medical University School of Medicine, Kashihara, Nara, Japan, Tel: +81-744-22-3051 (ext. 3423); Fax: +81-744-24-8040; E-mail: ke-igo@umin.ac.jp

Received October 20, 2017; Accepted November 18, 2017; Published November 22, 2017

Citation: Yamashita K, Tabayashi N, Abe T, Hayata Y, Hirose T, et al. (2017) Circumferential Acute Type an Aortic Dissection with Intimo-Intimal Intussusception: The Efficacy of Central Aortic Cannulation. J Clin Case Rep 7: 1042. doi: 10.4172/2165-7920.10001042

Copyright: © 2017 Yamashita K, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

cardiac arrest, the ascending aorta was incised. A total circumferential intimal tear was located in the middle level of the ascending aorta. The aortic valve leaflets were visually normal. The intimal flaps were kept in place and tailored with glue. When the patient's eardrum temperature dropped to 25°C, an open distal anastomosis was created with a 22-mm Dacron prosthetic graft with selective antegrade cerebral perfusion. No other tears of the intima were identified in the aortic arch. After the anastomosis, antegrade systemic circulation was initiated from the side arm of the prosthesis, and rewarming was started. Then, the proximal anastomosis was constructed. The patient's postoperative course was uneventful, and she was transferred to another hospital for rehabilitation.

Discussion

The operative strategy for acute type A aortic dissection has improved, and in-hospital mortality has decreased significantly over a 20-year timespan [1,2]. Okita reported that 4,444 patients with acute type A aortic dissection underwent surgical procedures in Japan, and the overall hospital mortality was 9.1% in 2013 [3]. However, end-organ malperfusion was reported to occur in 16% to 33% of patients with acute type A aortic dissection, representing a significant cause of operative death [4]. The rapid maintenance of hemodynamics can result in improved outcomes in patients with critical complications.

Cases of complete circumferential detachment of the intima in the ascending aorta and inversion of the intimal flap are very rare. This type of dissection was first reported by Bostroen in 1887 and was described as "inversion of the inner cylinder" by Chiari in 1909. Hufnagel named it "intimo-intimal intussusception" in 1962 [5] and since then cases have been reported in approximately 40 articles [6-8]. A preoperative shock state and acute severe AR have been frequently reported in patients with intimo-intimal intussusception. The published reports on circumferential acute type A aortic dissection with intimo-intimal intussusception indicate that the operative mortality is 22%. Because the unique change in the intima may cause hemodynamic devastation, this condition could be fatal. Therefore, the prompt establishment of CPB is required to prevent extensive organ damage.

When the rapid establishment of CPB is mandatory, one important issue is the cannulation strategy. Femoral artery cannulation, axillary artery cannulation, and central aortic cannulation are the three major cannulation strategies that have been adopted in many centers worldwide. Femoral cannulation has been selected in most institutes based on previous reports of circumferential acute type A aortic dissection. Although femoral cannulation is considered easy and advantageous in hemodynamically unstable patients, embolic complications caused by atheromatous emboli are possible. Severe atherosclerosis in the distal arch, thoracoabdominal

aorta, or iliofemoral system on preoperative computed tomography may be a reason to avoid femoral cannulation [9].

Conclusion

In our case, femoral artery cannulation was not chosen due to severe atherosclerosis and a small femoral diameter; instead, we selected central aortic cannulation. Central aortic cannulation to the ascending aorta in acute type A aortic dissection was introduced in the 2000s [10]. The theoretical advantages of this strategy are the achievement of antegrade perfusion and the short amount of time required to establish CPB [4]. Although the major concerns regarding the use of this technique are the rupture of the cannulation site and false lumen cannulation, it is safe and secure with the use of transesophageal echocardiography and direct epiaortic echocardiographic guidance. Based on the relatively consistent results of retrospective studies, many surgeons are switching from a retrograde perfusion strategy to an antegrade perfusion strategy [4]. We believe that echocardiography-guided central aortic cannulation using the Seldinger technique, as used in this patient, is a safe and secure aortic cannulation strategy for prompt CPB.

References

1. Long SM, Tribble CG, Raymond DP, Fiser SM, Kaza AK, et al. (2003) Preoperative shock determines outcome for acute type A aortic dissection. *Ann Thorac Surg* 75: 520-524.
2. Parikh N, Trimarchi S, Gleason TG, Kamman AV, Di Eusanio M, et al. (2017) Changes in operative strategy for patients enrolled in the International registry of acute aortic dissection interventional cohort program. *J Thorac Cardiovasc Surg* 153: S74-S79.
3. Okita Y (2016) Current surgical results of acute type A aortic dissection in Japan. *Ann Cardiothorac Surg* 5: 368-376.
4. Abe T, Usui A (2017) The cannulation strategy in surgery for acute type A dissection. *Gen Thorac Cardiovasc Surg* 65: 1-9.
5. Touati G, Carmi D, Trojette F, Jarry G (2003) Intimo-intimal intussusception: a rare clinical form of aortic dissection. *Eur J Cardiothorac Surg* 23: 119-121.
6. Shah PJ, Singh SS, Chaloob SS, Lang C, Taylor J, et al. (2006) Intimo-intimal intussusception of the aorta. *Ann Thorac Surg* 82: 2274-2276.
7. Niino T, Unosawa S, Shimura K (2012) Stanford type A aortic dissection with intimal intussusception. *Gen Thorac Cardiovasc Surg* 60: 578-580.
8. Thunberg CA, Ramakrishna H (2015) Echocardiographic detection of intimo-intimal intussusception in a patient with acute Stanford type A aortic dissection. *Ann Card Anaesth* 18: 227-230.
9. Tsiouris A, Elkinany S, Ziganshin BA, Elefteriades JA (2016) Open seldinger-guided femoral artery cannulation technique for thoracic aortic surgery. *Ann Thorac Surg* 101: 2231-2235.
10. Reece TB, Tribble CG, Smith RL, Singh RR, Stiles BM, et al. (2007) Central cannulation is safe in acute aortic dissection repair. *J Thorac Cardiovasc Surg* 133: 428-434.