Successful endovascular repair of aortic rupture caused by axillary intra-aortic balloon insertion for a Jehovah's witness patient with situs inversus anomaly

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Abstract

We report the successful endovascular repair of a rare case of aortic rupture caused by axillary intra-aortic balloon pump insertion failure. A 38-year-old Jehovah's Witness female with situs inversus totalis was referred to our hospital for acute decompensated heart failure. We placed an axillary intra-aortic balloon pump for circulatory support. However, an exchange was required due to balloon malfunction (kinked driveline). Unfortunately, the exchange was complicated by an iatrogenic aortic rupture along with large hematoma compressing the trachea. Emergent endovascular repair was performed successfully without any blood transfusion. Postoperative computed tomography showed a successfully repaired aorta and resolving hematoma.

Introduction

Axillary intra-aortic balloon pump(IABP) has been reported as an effective mechanical circulatory support for heart failure patients. Unlike femoral IABP, it allows patients to ambulate with an IABP support console. There have been reports of complications associated with axillary IABP insertion, but none describing aortic injury requiring intervention.

Case

A 38-year-old Jehovah's Witness female with situs inversus totalis, restrictive cardiomyopathy and end stage renal failure was referred to our hospital for evaluation for heart failure therapy. She complained of progressive dyspnea on exertion, palpitations and orthopnea. Her condition was diagnosed as acute decompensated biventricular heart failure. Her hemodynamic data was as follows. Central venous pressure was 18 mmHg, mean pulmonary artery pressure was 50 mmHg, pulmonary capillary wedge pressure was 38 mmHg and her cardiac index was 1.7 L/min/m2. An axillary IABP was considered to be a good option for circulatory support, which would allow her to perform physical therapy actively during evaluation for the next phase of her care. Initially, her IABP insertion was successfully performed through her right axillary artery in a percutaneous fashion (Figure 1A). Of note, her right axillary artery is the third cervical branch from aorta(first branch; left brachiocephalic artery, second branch; right common carotid artery). However, the IABP kinked and ruptured three days later(Figure 1B). While we tried to exchange it in the operating room, she suddenly complained of acute back pain and difficulty breathing. She remained hemodynamically stable, but we were concerned about a possible aortic complication. The IABP insertion was deferred and she was taken for a computed tomography angiography(CTA). CTA demonstrated a descending thoracic aortic

rupture and contrast extravasation at the take-off of the right vertebral artery from the right axillary resulting in a large hematoma behind the trachea(Figure 2A,B,3A,B). The trachea was significantly compressed by the hematoma(Figure 2A). Open descending aorta replacement was considered to be too invasive as she refused any blood transfusion and was anemic(10.5mg/dl). Therefore, thoracic endovascular aortic repair(TEVAR) was felt to be a reasonable treatment modality. Under general anesthesia, a 22×100 mm Valiant Navion Covered Seal device(Medtronic Corp,Santa Rosa,CA) was selected and deployed from just distal to the right subclavian artery. Moreover, coiling of the right vertebral artery and placement of a 7mm×50mm Viabahn covered stent(WL Gore & Associates,Flagstaff,Ariz) into the right axillary artery was successfully performed without any need for blood transfusion. Her postoperative course was stable and her heart failure improved as well.

Although her hemoglobin level decreased to 6.7mg/dl four days after the rupture, it returned to baseline one month later. A postoperative CTA demonstrated resolution of the extravasation and improvement of the hematoma behind the trachea(Figure 2C,D, 3C,D).

Discussion

To the best of our knowledge, this is the first case report of a successful thoracic endovascular repair of an aortic rupture caused by axillary IABP insertion. Moreover, this patient had a challenging medical background including situs inversus totalis with dextrocardia anomaly and refusal of blood transfusions.

Currently, there are several options for mechanical circulatory support for heart failure. However, an IABP is still the most frequently used circulatory support device in the United States[1]. A femoral IABP is easy to place and is a minimally invasive procedure. In our institution, we commonly place axillary IABPs for selected heart failure patients. The axillary IABP has some advantages over the traditional femoral IABP, especially in regard to patient mobility. Unlike femoral IABP, patients can ambulate with an axillary IABP console. Because physical therapy has been recognized as one of the most important therapies for heart failure, maintaining patient mobility is a huge advantage[2]. As the clinical benefits of axillary IABP have been reported in some papers[3,4], axillary IABP is considered a safe and effective circulatory support. However, we have safely performed axillary IABP over the last 10 years, and this is the first case of iatrogenic aortic rupture in our experience.

Although some centers report excellent surgical outcomes for Jehovah's witness patients, there are few reports about emergent and complex aortic surgery in this patient group[5,6]. It is a formidable challenge to perform emergent open aortic surgery without any blood transfusions. In contrast, endovascular surgery is less invasive and can be performed without the need for blood transfusion[7]. Therefore, endovascular repair should be considered as first-line therapy for selected patients with a complicated background, including Jehovah's witness patients.

Conclusion

In conclusion, we present a unique case of an iatrogenic aortic rupture caused by axillary IABP in a Jehovah's witness patient with situs inversus anomaly. Endovascular repair was successfully performed without the need for any blood transfusions.

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Disclosures;

Ross Milner; consultant for Endospan, Medtronic and WL Gore

Author contributions;

Hidefumi Nishida; concept, drafting article

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Ross Milner, MD; Concept, Critical revision of article, Approval of article

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Figure legends

Figure 1A. Chest X-ray after the axillary IABP placement. The proximal IABP radiopaque marker is seen in the descending aorta(Black arrow head). The distal marker is not seen because it is down in the abdominal aorta. The IABP is positioned slightly more distal compared to transfemoral approach, to lower risk of migration into the aortic arch.

Figure 1B. Chest X-ray after axillary IABP malfunction. The IABP has folded, and both the proximal and distal radiopaque markers are seen. The proximal marker(Black arrow head) and the edge of balloon(Black arrow) should be straight but they are not because of a kink.

Figure 2A: Coronal view of CTA. White arrow shows extravasation from axillary artery and large hematoma. Black arrow shows the compressed trachea.

Figure 2B: Axial view of CTA. White arrow shows extravasation from axillary artery and large hematoma. Black arrow shows descending aorta.

Figure 2C: Coronal view of CTA after endovascular repair. The extravasation and hematoma have resolved, and the trachea is no longer compressed(black arrow).

Figure 2D: Axial view of CTA after endovascular repair with covered stent and coiling (white arrow).

Figure 3A: Coronal view of CTA, showing extravasation(white arrow) and large hematoma around the descending aorta(Black arrow).

Figure 3B: Axial view of CTA. White arrow shows extravasation from descending aorta.

Figure 3C: Coronal view of CTA after endovascular repair. The extravasation and hematoma have resolved.

Figure 3D: Axial view of CTA after endovascular repair.