Case Report

Interventional Cardiology

An unusual presentation requiring an unusual intervention

Abstract

Stanford type A aortic dissection is associated with significant morbidity and mortality. Acute myocardial infarction is a rare complication and can occur in 3% of patients due to retrograde extension of the dissection leading to coronary malperfusion. Involvement of the right coronary artery is more common. On the other hand, Left Main Coronary Artery (LMCA) occlusion is unusual and if unrecognised, can result in rapid hemodynamic deterioration with cardiogenic shock and eventually death. Emergent surgical repair is the definitive treatment. Intra-Aortic Balloon Pump (IABP) is frequently used in the setting of cardiogenic shock due to LMCA stenosis. In this case it was inserted before the diagnosis of type A aortic dissection was made. This represents a unique case of type A aortic dissection resulting in severe ostial left main coronary artery stenosis in which the IABP was successfully used as a bridge therapy to definitive surgical repair.

Keywords: Aortic dissection • Cardiogenic shock • Balloon pump • Left main occlusion

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Case Vignette

A 51-year-old male with history of alcohol abuse and no previous cardiac history presented to our facility complaining of severe intermittent retrosternal chest pain few hours after smoking marijuana. His chest pain was localized with no radiation. This was associated with shortness of breath. Any other cardiac symptoms were denied. The patient was not taking any medication on regular basis and also denied cocaine abuse. Shortly upon his arrival to the emergency department, the patient became hypoxic and hypotensive. He was intubated and vasopressors were initiated.

On examination, our patient was intubated and ventilated. The blood pressure remained 80/40 mmHg on vasopressors and heart rate was 90 beats per minute. There was no blood pressure difference between the upper limbs. His cardiorespiratory examination revealed jugular venous distension, diffuse crackles, normal first and second heart sounds and a grade II/VI systolic murmur, best heard at right lower sternal border.

The chest X-ray showed increased reticular interstitial markings in keeping with pulmonary edema (Figure S1). His initial Electrocardiogram (ECG) revealed diffuse ST depression in the precordial and lateral leads and ST elevation in AVR (Figure S2). The blood work showed a leukocyte count of 27 × 109/L, and creatinine of 143 µmol/L. Hemoglobin and platelet count were within normal limits. Troponin levels were not yet available.

Presuming a cardiogenic shock secondary to possible left main disease, we consequently transferred the patient to the catheterization lab. The coronary angiography (Figure 1, Video 1) showed moderate to severe stenosis in the proximal right coronary artery and confirmed severe ostial left main stenosis (Figure 1B, Video 2). Left ventricular angiography showed moderately depressed left ventricular function. An IABP was emergently inserted and the cardiac surgeon on call was contacted, in order to discuss the best management of this hemodynamically unstable patient.

After successful insertion of the IABP, we were unable to angiographically visualise the left main and its branches (Figure 1C). The consecutive aortic angiograms revealed a type A dissection at the origin of the aorta (Figure 1D), which was interfering with the flow to the left main and also extending to both femoral arteries. We were aware that an aortic dissection represents a contraindication for an IABP, and attempted to wean the patient off it. While IABP weaning was attempted the patient experienced pulseless electric activity and required Cardiopulmonary Resuscitation (CPR) including chest compressions. Therefore, we decided to leave the IABP in place, while transferring the patient to the Operation Room (OR) for surgical repair of the aortic dissection.

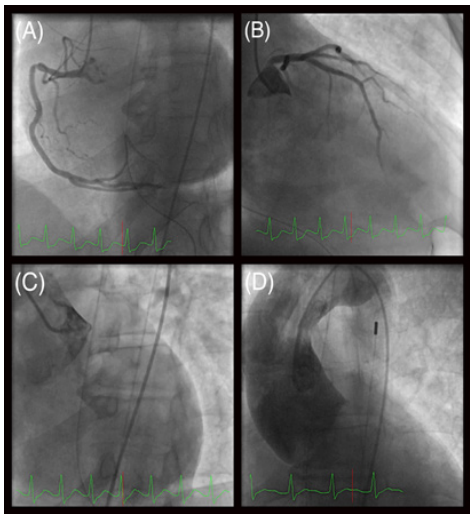
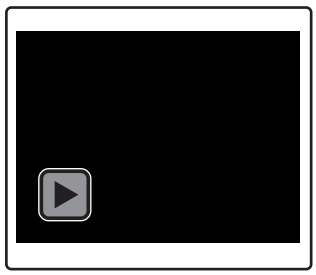
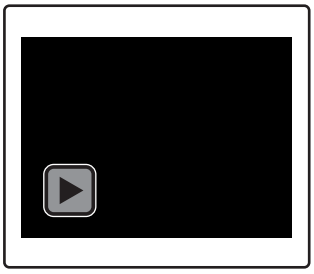


Figure 1: 1A: Coronary angiogram showing moderate to severe proximal RCA stenosis; 1B: Coronary angiogram showing severe ostial LM stenosis; 1C: Subsequent injection showing interruption of flow to the LMCA; 1D: Aortic root angiogram showed a type A dissection at the origin of the aorta..

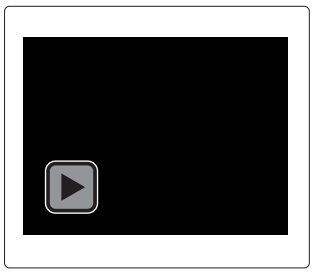


Video 1: Coronary angiogram showing moderate to severe stenosis of the proximal RCA.



Video 2: Initial coronary angiogram showed severe ostial LM stenosis.

He was hypoxemic going to the operating room with saturation around 80% despite FiO_2 of 100% and maximum Peak End Expiratory Pressure (PEEP). The IABP was removed intra-operatively to avoid the risk of rupture of the dissected thoracic aorta by prolonged use. Intra-operative findings demonstrated compression of the LMCA by dissection flap, and absence of tear close to the coronaries. The patient then underwent total arch replacement with re-implantation of the great vessels as these were dissected and torn at their origin from the arch. The procedure went well. The patient recovered and was discharged home a week from initial presentation. An early follow up echocardiogram showed preserved ejection fraction of 53% with only mild global hypokinesis of the left ventricle and no evidence of aortic regurgitation.



Video 3: An aortic root angiogram showed a type A dissection at the origin of the aorta, which was interfering with flow to the LM and extending inferiorly to both femoral arteries on peripheral femoral angiography.

Discussion

We present a dramatic case of type A aortic dissection complicated by left main occlusion and cardiogenic shock, which was managed with IABP support and urgent replacement of the aortic arch. This case highlights several educational points: always consider aortic dissection in patients presenting with chest pain and rapid hemodynamic deterioration; second, early evaluation and triage of patients with cardiogenic shock by a multidisciplinary team expedites therapy and improves outcomes; finally, although we were fortunate that insertion of IABP may not have altered our patient´s outcome; this cases has clearly indicated how important it is to rule out major vascular pathologies (e.g. obstructive peripheral arterial disease and aortic dissection) before implanting hemodynamic support devices requiring arterial access, like the IABP or impella device.

Dissection of the ascending aorta often presents with tearing chest or back pain and associated hypertensive crisis [1,2]. As shown in our case, rapid hemodynamic deterioration is almost always a predictor for a dramatic course including major complications, like acute aortic regurgitation, involvement of the coronary arteries or pericardial effusion with tamponade [3]. Also having difficulty engaging the coronary ostia with a catheter should give rise to a strong suspicion for aortic dissection.

Deteriorating hemodynamics requiring urgent mechanical support is a common issue in patients with cardiogenic shock. Nowadays, several percutaneous systems as well as extracorporeal membrane oxygenation are commonly used at sites managing cardiogenic shock patients [4]. However, usage of any mechanical support device needs always to be well considered and contraindications or possible complications should be anticipated. Despite the advent of modern circulatory support devices, like impella, and the evidence of the recently published IABP-SHOCK II trial [5], the IABP remains the most frequently used support device for shock patients. This seems attributable to the longstanding clinical experience, its small profile (7 to 8 french diameter) allowing rapid insertion and its comparatively low price [5]. It is well known that cardiac catheterization and/or insertion of large caliber percutaneous hemodynamic devices entails the risk of entering the false lumen or propagating the aortic dissection, and should be either avoided or only performed under special circumstances. Particularly, IABP counterpulsation is contraindicated in patients with a high-index of suspicion or proven aortic dissection and/or aortic regurgitation. In fact, its use could aggravate the hemodynamic instability. Overall, this case had immediate impact on our practice in managing cardiogenic shock patients requiring mechanical support. Although, time is pressing in those patients, we now routinely perform peripheral angiograms and have a low threshold to also image the aorta in patients requiring percutaneous hemodynamic support. By doing so, we hope to avoid major vascular and other potentially lethal complications.

Conclusion

Acute aortic dissection with involvement of the coronary arteries is a dramatic vascular complication, which generally results in rapid hemodynamic instability and cardiogenic shock. Those patients require rapid assessment and transfer to a dedicated surgical facility. Percutaneous mechanical support devices, particularly the IABP, should generally be avoided during initial management.

Disclosures

None of the authors have any conflicts of interest in relation with this case.

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Author Contribution

H.A and M.B contributed equally to this manuscript

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