Dubai Medical Journal
Volume 7, Issue no. 3, DOI 10.18502/dmj.v7i3.17734
Production and Hosting by KnE Publishing

Case Report

Acute Aortic Dissection Complicating Emergency Coronary Intervention for Hyperacute Stent Thrombosis

Nadia Nadeem[1], Vetha Irene Sanjana[1]*, Geili Abdalla[2], and Anas Musa[2]

[1]Department of Internal Medicine, Rashid Hospital, Dubai Health Authority, Dubai, United Arab Emirates
[2]Cardiology Interventional Department, Rashid Hospital, Dubai Health Authority, Dubai, United Arab Emirates

Abstract

Introduction: Iatrogenic acute aortic dissection resulting from coronary interventions can have fatal consequences. Although it is an uncommon complication during percutaneous coronary interventions (PCI), it can arise from various factors. Our case report aims to address this rare presentation further, seeking to enhance pre-procedural planning which can result in better outcomes.

Case Report: We describe an intriguing case of an elderly female patient with multiple cardiovascular risk factors who came to our emergency department presenting with chest pain. Her Electrocardiogram revealed an inferior ST-elevation myocardial infarction (STEMI) for which she underwent successful primary PCI of the right coronary artery (RCA). Four days later, she had an infero-posterior STEMI, which necessitated immediate coronary angiography. Angiography revealed thrombosis of the stent placed earlier in the RCA. On attempting recanalization of the vessel, an acute aortic dissection was identified and was successfully managed by ostial stenting. Follow-up imaging showed no residual dissection, and the patient was found to be comfortable and stable post-procedure.

Conclusion: We recommend optimizing blood pressure and performing rapid ostial stenting in these cases, irrespective of the dissection's origin. This will facilitate effective sealing of the entry site and prevent further progression of the dissection. Our report highlights the favorable results achieved with immediate ostial stenting while discussing the conservative approach to managing such cases.

Keywords: Stent thrombosis, hyperacute, stenting, coronary intervention, aortic dissection, acute coronary syndrome, interventional cardiology, pre-procedure planning

Corresponding Author:
Vetha Irene Sanja
Email: irenesanjana@gmail.com

Received: June 3, 2024
Accepted: October 13, 2024
Published: December 8, 2024

Production and Hosting by Knowledge E

OPEN ACCESS

How to cite this article: Nadeem N, Sanjana VI, Abdalla G, and Musa A. Acute Aortic Dissection Complicating Emergency Coronary Intervention for Hyperacute Stent Thrombosis. *Dubai Medical Journal*. 2024;7(3):193–200. DOI 10.18502/dmj.v7i3.17734

1. Introduction

Iatrogenic acute aortic dissection complicating coronary intervention can lead to a fatal outcome. It is a rare complication encountered during percutaneous coronary intervention (PCI). It can be attributed to intraoperative factors including the complexity of the procedure, the type of catheter used, the site of access, and operator experience. A patient's comorbidities and presence of right coronary artery (RCA) disease are important predisposing factors to consider while assessing a patient before cardiac intervention. Pre-procedure planning, emergent treatment, and early detection are essential in determining a good prognosis for such cases as the risk of postoperative mortality may rise significantly if not recognized in due time. Treatment of such cases will depend on the extent of the dissection and whether it is anterograde or retrograde; management can involve a conservative approach, PCI under fluoroscopic guidance, intravascular ultrasound (without contrast use), or by surgical repair.

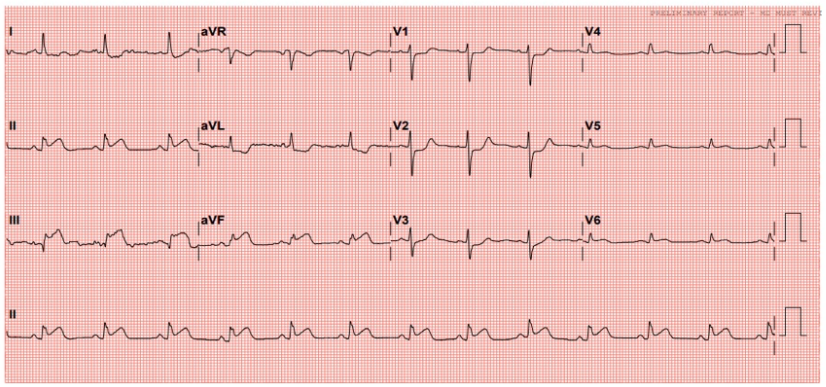
2. Case Report

A 69-year-old female presented to our emergency department with a 3-day history of worsening central chest pain associated with dizziness. She was known to have uncontrolled type 2 diabetes mellitus managed by Empagliflozin-Metformin, Gliclazide, and Linagliptin. Hypertension was well controlled with Perindopril-Amlodipine and was compliant with a moderate-intensity statin. She had no significant family history of coronary artery disease and her social history was unremarkable.

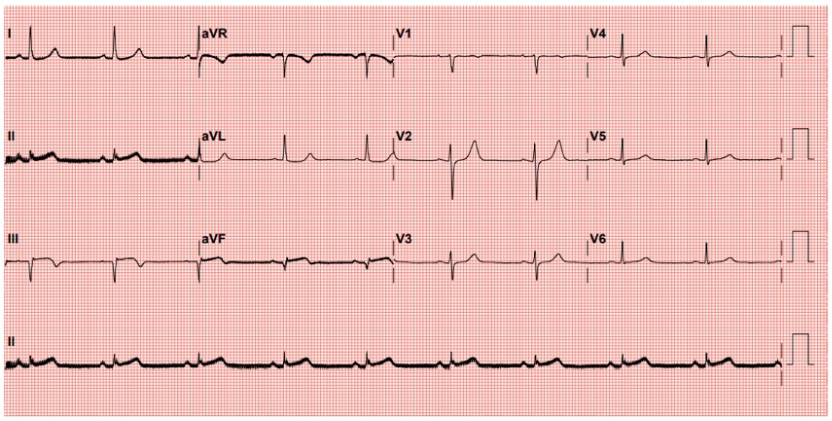
The patient was vitally stable with a blood pressure of 141/71 mmHg, pulse of 77 beats per minute, respiratory rate of 20 breaths per minute, oxygen saturation of 99%, temperature of 36.5˚C, and physical examination was within normal limits.

An electrocardiogram (ECG) showed an Inferior ST-elevation myocardial infarction (STEMI) (Figure **1**). Laboratory investigations on admission were as follows: Hemoglobin: 9.2 g/dl, platelet count: 369 x 10^3/µl, white cell count: 15.7 x 10^3/µl, sodium: 132 mmol/L, potassium: 5.2 mmol/L, creatinine: 0.5, estimated glomerular filtration rate: 101.5, troponin T: 136 ng/L, low-density lipoprotein: 114 mg/dl, hemoglobin A1c: 8.3%, triglyceride: 187 mg/dl, high-density lipoprotein: 34 mg/dl.

Although she expressed a history of melena, she was found to have stable hemoglobin on presentation. She was taken for primary PCI in view of benefits outweighing its risks. The culprit RCA was successfully stented with a drug-eluting stent (DES) (Figure **2**). Another severe calcified left anterior descending disease was identified and planned to be treated medically without further intervention as it was of small calibre and with diffuse involvement. She was clinically stable post-procedure and was treated with Aspirin and Ticagrelor.

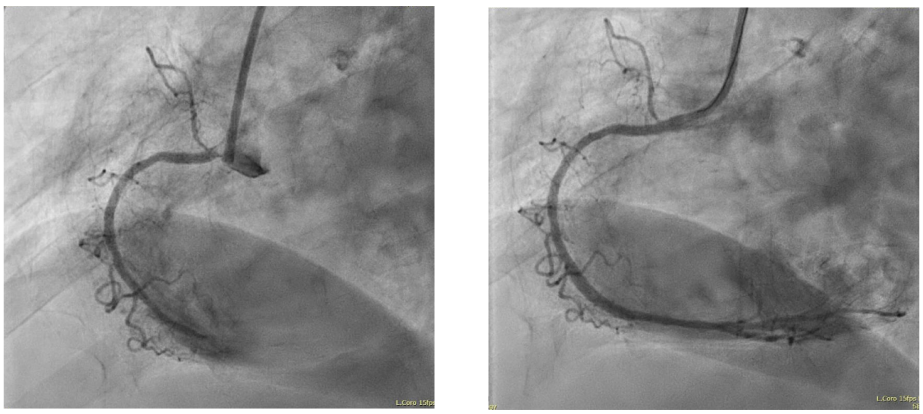


(a)



(b)

Figure 1: **12 lead ECG.** Showing (a) ST-segment elevation in inferior leads with reciprocal ST depressions in lateral leads (b) Follow-up ECG after primary PCI showing more than 50% resolution of ST elevation in inferior leads ((a) is initial ECG and (b) is post-primary PCI).



(a) (b)

Figure 2: (a) First diagnostic angiogram of right coronary artery (RCA) showing normal ostia with no plaques, no stenosis. (b) Final view of the RCA after first percutaneous transluminal coronary angioplasty (PTCA) which did not show any dissection flap.

She remained in the coronary care unit where she was further worked up with iron studies, which revealed iron deficiency anemia and she was treated with intravenous iron accordingly. Four days later, she developed severe retrosternal chest pain mimicking the previous episode and ECG showed an infero-posterior STEMI (Figure **3**). She was stabilized, given 1 unit of packed red blood cells in view of a drop in hemoglobin from 8.1 to 7.5 g/dl and taken for emergency percutaneous intervention. Angiography revealed an acute thrombotic occlusion of the recently deployed DES in mid-RCA. While attempting recanalization, no flow was detected in the RCA with stagnation of the contrast in the aortic wall which implied the presence of a complete coronary dissection of the RCA ostium with extension to the aortic wall. Having no time to spare, the ostium of RCA was re-crossed with a run-through wire in the true lumen, and a DES was placed - XIENCE Skypoint 3 x 23 mm (Abbott). This was followed by mid-RCA dilatation using a TREK NC 2.75 X 15 mm balloon (Abbott) resulting in TIMI 3 flow (Figure **4**).

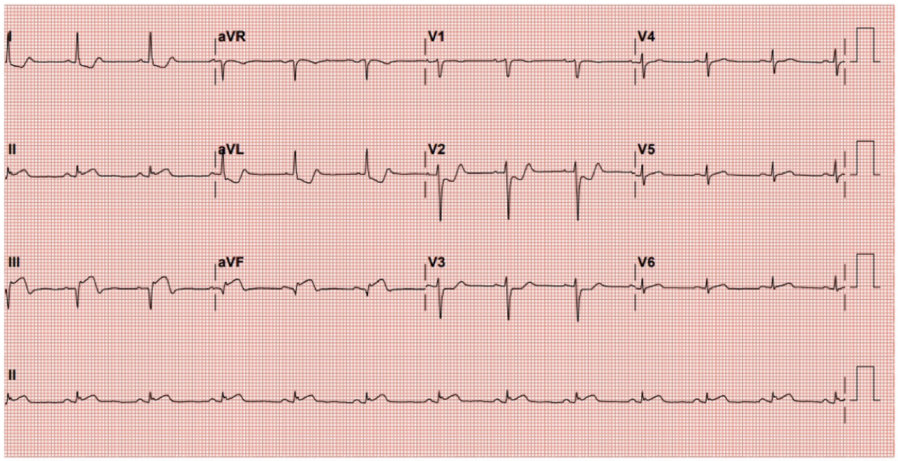


Figure 3: **Repeat ECG.** Demonstrating development of ST-elevation and Q waves representing hyperacute stent thrombosis in the inferior leads.

The patient remained pain-free, clinically stable, and comfortable after the procedure.

A thin rim of pericardial effusion was seen laterally on transthoracic echo and remained static. Computed tomography aortogram showed no evidence of aortic dissection. No further drop in hemoglobin was observed post-procedure, and she did not have any further episodes of melena, so she was discharged three days later with optimization of her medications for her comorbidities. She lived with her daughter, who was willing to take care of her everyday needs and assist with her daily activities. A follow-up visit to the cardiology clinic was arranged after 1 week, safety netting advice was given, and she was scheduled for an elective upper gastrointestinal endoscopy as an outpatient by the gastroenterologist.

3. Discussion

Encountering an unexpected acute aortic dissection during a seemingly straightforward percutaneous coronary intervention is an event every interventional cardiologist dreads, especially if it were to occur

toward the end of a shift, which is exactly what transpired in our case. It is a matter of great concern because the interventionist's immediate next steps might determine the fate of the patient.

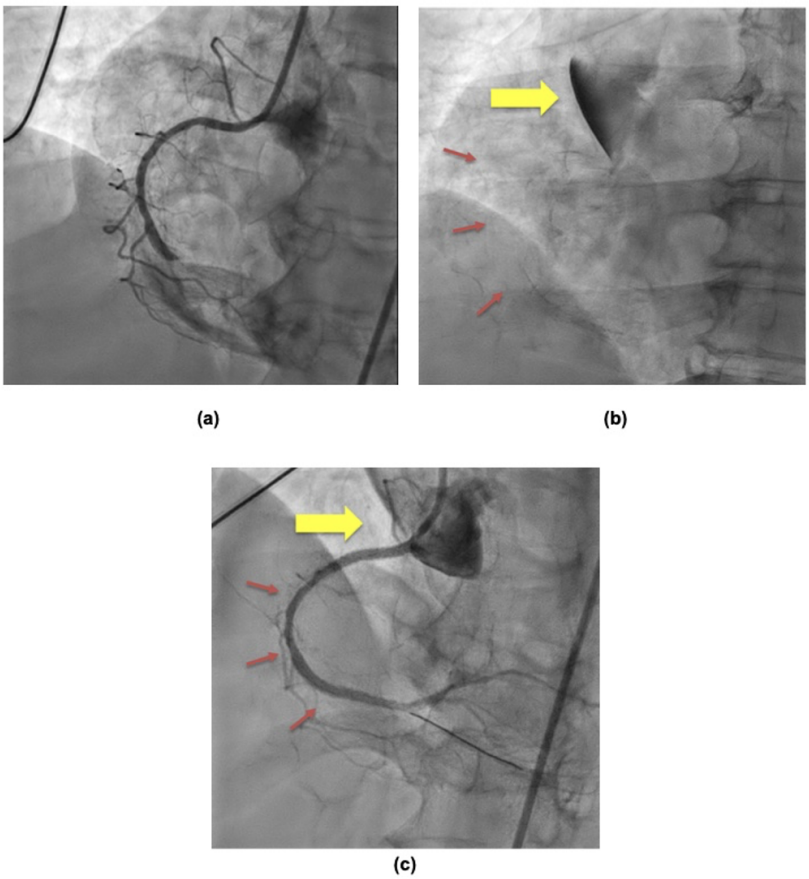


Figure 4: (a) Acute thrombotic occlusion of DES in mid-RCA. (b) Big Arrow: Acute aortic root dissection, Small Arrows: Course of RCA barely seen tracking down. (c) Big arrow: Sealing of dissection flap, small arrows: Successful recanalization of RCA.

We are aware that iatrogenic aortic dissection is a rare complication, occurring in an estimated 0.02% of cases, with a high mortality rate of 43% for Type A dissections alone, according to a popular series, surpassing the mortality rate for spontaneous dissection by almost double [1, 2].

However, given the rarity of the condition, it has been observed frequently that interventionists are taken by surprise when faced with an aortic dissection intraoperatively and are noted to be under-confident in their methods of dealing with it. Making major decisions instinctively can potentially lead to irrecoverable consequences, therefore it is crucial that the operator is cognizant of this complication and is able to engage in pre-procedural planning, identifying beforehand the patients who are at a higher risk of its development as well as being extremely cautious during the intervention itself.

Aortic involvement can be assessed using the Dunning Criteria, which was designed for classifying aortocoronary dissection based on conventional angiography. The grading system determines the extent of aortic extension by identifying the highest level reached by the intimal flap. Aortic dissection is categorized as grade 1 if the dissection flap affects only the ipsilateral sinus of Valsalva; grade 2 if it

involves the sinus of Valsalva and up to 4 cm or less of the tubular portion of the ascending aorta; and grade 3 if the dissection flap extends more than 4 cm into the ascending aorta [3].

When approaching such a scenario, firstly, it is essential to analyze the patient's demographics and comorbidities as well as their vascular anatomy as there are factors that increase one's prospects of developing secondary aortic dissection. Our patient's risk factors included her old age, comorbidities such as type 2 diabetes mellitus, hypertension, and the presence of extensive atherosclerosis with an acute coronary occlusion of the RCA. Interestingly, involvement of the RCA in particular is a significant predisposing factor, when occluded it can be difficult to recanalize on account of its tortuous anatomy and narrower lumen, the RCA ostium being at an even greater risk of dissection as the hemodynamic force vector is aimed at the right side convexity of the ascending aorta [4].

Several Iatrogenic factors might also lead to this adverse outcome and range from operator experience to the intention of the procedure, selection of vascular access, the type of catheter, right down to the curve of the catheter [5]. For our patient, the right femoral artery was the site of vascular access, the same being used in the majority of interventions complicated by iatrogenic aorto-coronary dissections [5], However, no causal association has been linked to it.

Re-perfusing the RCA with the thrombosed stent amidst diffuse arteriosclerosis made the procedure extremely challenging and necessitated aggressive maneuvering with the guiding-catheter, which might have been conducive to the resulting breach in the aorta, the guiding catheter notorious for being the leading etiology of iatrogenic aortic dissection [6, 7, 8]. Furthermore, intervening for stent thrombosis specifically has not been known to increase the risk of aorto-coronary injury. It is worth emphasizing that although the procedure was performed by another operator, we are undoubtful that both being equally experienced and skilled, allowed no compromise in technique at any stage and thus seek to highlight that the change in operator did not influence or lead to the final outcome.

The 6F 3RDC catheter with the Judkins curve was utilized during the intervention and has been associated with the majority of catheter-related dissections (90.5%) in the RAID analysis, as it is comparatively smaller [5]. Our patient suffered from hyperacute stent thrombosis although she was on optimal antiplatelet as well as anticoagulation. We were unable to attribute this to a specific cause. She received a unit of packed red blood cells; however, we are not entirely convinced that the transfusion of a single unit of blood can cause early stent thrombosis, and as for the intravenous iron injection, more studies are required to find its association with hyperacute stent thrombosis.

4. Conclusion

We recommend optimization of blood pressure with rapid ostial stenting in such cases, regardless of where the dissection begins, whether at the ostium or further distally in the coronaries. This will aid in the successful sealing of the entry site, leading to thrombosis of the false lumen, and will help prevent

further propagation of the dissection; thus, eliminating the need for emergent surgical intervention. The literature review revealed that immediate ostial stenting has a favorable safety profile and yields satisfactory results. In contrast, emergency surgery for dissection repair might prove to be perilous, especially given that patients with acute coronary syndrome are typically on optimal antiplatelet therapy; therefore, we suggest this approach be undertaken in the rare event of stent failure. On the other hand, a "wait and watch" strategy carries significant risks including the potential for severe irreparable aortic dissection.

Author Contributions

Nadia Nadeem and Vetha Irene Sanjana prepared the manuscript. Geili Abdalla and Anas Musa supervised and reviewed the manuscript. All authors approved the final manuscript.

Ethical Statement

This manuscript complies with the guidelines for human studies in accordance with the World Medical Association Declaration of Helsinki.

Ethical Approval

The study was approved by MBRU IRB (MBRU IRB-2024-162).

Patient Consent Statement

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Conflicts of Interest

The authors declare that there is no conflict of interest.

Artificial Intelligence (AI) Disclosure Statement

AI-unassisted work.

Funding Sources

This study was not supported by any sponsor or funder.

Data Sharing Statement

Data set is not available publicly because of legal/security/privacy/policy reasons. However, it can be made available by request from the corresponding author.

References

[1] Carstensen S, Ward MR. Iatrogenic aortocoronary dissection: The case for immediate aortoostial stenting. Heart Lung Circ. 2008 Aug;17(4):325–329.

[2] Fleck T, Ehrlich M, Czerny M, Wolner E, Grabenwoger M, Grimm M. Intraoperative iatrogenic type A aortic dissection and perioperative outcome. Interact Cardiovasc Thorac Surg. 2006 Feb;5(1):11–14.

[3] Tanasie C, Chandonnet M, Chin A, Kokis A, Ly H, Perrault LP, et al. Catheter-induced aortic dissection after invasive coronary angiography: Evaluation with MDCT. AJR Am J Roentgenol. 2011 Dec;197(6):1335–1340.

[4] Santos M, Luz A, Silveira J, Antunes N, Vieira M, Anjo D, et al. Aortocoronary dissection complicating percutaneous angioplasty. Rev Port Cardiol. 2011 Sep;30(9):745–747.

[5] Nú nez-Gil IJ, Bautista D, Cerrato E, Salinas P, Varbella F, Omedè P, et al. Registry on aortic iatrogenic dissection (RAID) investigators. Incidence, management, and immediate- and long-term outcomes after iatrogenic aortic dissection during diagnostic or interventional coronary procedures. Circulation. 2015 Jun;131(24):2114–2119.

[6] Boukhris M, Tomasello SD, Marzà F, Azzarelli S, Galassi AR. Iatrogenic aortic dissection complicating percutaneous coronary intervention for chronic total occlusion. Can J Cardiol. 2015 Mar;31(3):320–327.

[7] Gennari M, Mastroiacovo G, Polvani G, Fabbiocchi F, Agrifoglio M. Management of iatrogenic aortic dissections during percutaneous right coronary artery interventions. Braz J Cardiovasc Surg. 2022 Aug;37(4):595–598.

[8] Gryko BA, Chlabicz M, Jakim P, Nowak SK, Bachórzewska-Gajewska H, Dobrzycki S. Non-surgical management of iatrogenic aortic dissection (dunning class 3) caused by percutaneous coronary intervention. Adv Intervent Cardiol. 2021;17:423–424.