

CASE REPORT

Type A Aortic Dissection during therapeutic coronary intervention in acute coronary syndrome: case report

Dissecção de Aorta Tipo A durante intervenção coronariana terapêutica na síndrome coronariana aguda: relato de caso

Bruno Laurenti Janella^{1,2,*} , Lara de Oliveira Gouveia² , Sara Aguiar Mendonça² , Thais Reaidi El Tawil³ , Isadora Spinelli³ , Camila Naomi Matsuda¹ 

¹Itajubá Clinics Hospital - Interventional Cardiology Division. Itajubá, Minas Gerais, Brasil.

²Faculty of Medicine of Itajubá. Itajubá, Minas Gerais, Brazil.

³Faculty of Medicine, Pontifical Catholic University. Campinas, São Paulo, Brazil.

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ABSTRACT

Iatrogenic aortic dissection during coronary interventions is a rare complication and has heterogeneous management in the reviewed literature. We report a case of acute aortic syndrome of traumatic etiology, during a percutaneous coronary procedure, with its management, intra-hospital evolution, and one-year follow-up. A 65-year-old female who, during a percutaneous coronary intervention, presented an endothelium trauma of the left main artery's aorta-ostial transition by the tip of the guide catheter, leading to aortic dissection and occlusion of the left main artery with hemodynamic deterioration of the patient. The left main artery's flow was restored with drug-eluting stent implantation leading to a successful sealing of the false lumen with consequent hemodynamic stabilization. Immediate post-procedure transthoracic echocardiography showed a competent aortic valve. The patient evolved favorably and remains asymptomatic after one year.

PALAVRAS-CHAVE

Cateterismo cardíaco
Doenças da aorta
Síndrome coronariana aguda

RESUMO

A dissecção iatrogênica de aorta durante intervenções coronarianas é rara e de manejo heterogêneo. Relatamos um caso de síndrome aórtica aguda de origem traumática, durante procedimento coronariano percutâneo, com seu manejo e evolução. Mulher de 65 anos que durante intervenção coronariana o endotélio na transição aorto-ostial do tronco da artéria coronariana esquerda (TCE) sofreu traumatismo pela ponta do cateter guia produzindo linha de dissecção aórtica e oclusão do TCE causando sua deterioração hemodinâmica. Realizada a recanalização do TCE com implante de *stents* farmacológicos com êxito na restauração do fluxo coronariano e selamento da falsa luz, com consequente estabilização hemodinâmica. Ecocardiografia transtorácica pós-procedimento imediato mostrou valva aórtica competente. A paciente evoluiu favoravelmente e encontra-se assintomática após 1 ano.

*Corresponding author:

Hospital de Clínicas de Itajubá. Addr.: Rua Miguel Viana, 420. Bairro: Morro Chic. Itajubá, MG, Brasil | CEP: 37.500-080
Phone: +55 (35) 3629-7626 E-mail: brunolaurentijanella@gmail.com (Janella BL)

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INTRODUCTION

Acute aortic syndrome (AAS) primarily consists of diseases of the aorta with high mortality¹. Iatrogenic aortic dissection, related to cardiac catheterization, is a rare condition with an incidence of 0.07% in diagnostic procedures and up to 0.19% in acute coronary syndrome (ACS) and therapeutic procedures^{2,3}. Most cases reported in the literature are related to percutaneous treatment of chronic total occlusions located in proximal segments of the right coronary artery (RCA)^{4,5}.

Because it is a rare complication, its management is heterogeneous in the literature, ranging from surgical, percutaneous, to merely conservative approaches, depending on the presence of haemodynamic instability, dissection progression, and significant impairment of the aortic valve^{1,6}.

CASE REPORT

A 65-year-old female with hypothyroidism, systemic arterial hypertension, smoker (100 packs/year), and chronic obstructive pulmonary disease, with a previous invasive coronary study without obstructive coronary artery disease, in irregular use of acetylsalicylic acid (ASA), captopril and anxiolytic. She was admitted with typical angina associated with increased cardiac markers (ultrasensitive troponin: 956 - 1390 - 1488 ng/L; reference value < 40 ng/L) and changes in the electrocardiogram compatible with extensive anterior subepicardial ischemia (inversion symmetric T waves in precordial leads, DI and aVL), which led to the diagnostic hypothesis of acute myocardial infarction without ST-segment elevation.

She was initially submitted to drug treatment for ACS using parenteral nitroglycerin, morphine, dual antiplatelet agents (ASA and clopidogrel), cardio-selective beta-blockers, and inhaled corticosteroids.

Coronary angiography

An early invasive strategy was performed with coronary angiography via the right transfemoral approach, showing a single-arterial obstructive pattern characterized by an obstructive lesion of 95% in the middle third of the anterior descending artery (ADA) (Figure 1).

Coronary transluminal angioplasty

At the time of the selective catheterization of the left main coronary artery (LMA) with a 3.5 Launcher EBU guide catheter (Medtronic, Minneapolis, USA), LMA aorta-ostial transition traumatic dissection by the guiding catheter was observed, extending to the ascending aorta, and occluding the LMA as well (Figure 2). The LMA occlusion resulted in the patient's hemodynamic instability with the need for orotracheal intubation and the initiation of vasoactive drugs (noradrenaline). To avoid further dissection, we exchanged the initial guide catheter for a Launcher JL 3.5 guide catheter (Medtronic, Minneapolis, USA) to change the position of the catheter in the LMA ostium. Then we navigated 0.014" HI-Torque Balance Middleweight guide-wires (Abbott Cardiovascular, Minnesota USA) through the true lumen directed to the distal part of the LAD and circumflex artery (CX), and balloon conventional angioplasty was performed using a semi-compliant balloon catheter in the LMA with successful coronary flow restoration and subsequent hemodynamic stabilization (Figures 3A and B). Finally, drug-eluting stents were implanted, covering the proximal and middle thirds of the LAD (treatment of the culprit lesion) and the ostium to the middle third of the LMA, aiming to seal the dissection orifice (Figures 4A and B). The procedure was completed with the proximal optimization technique (POT) in the LMA with a 4.0 x 8 mm non-compliant balloon (18 atm).

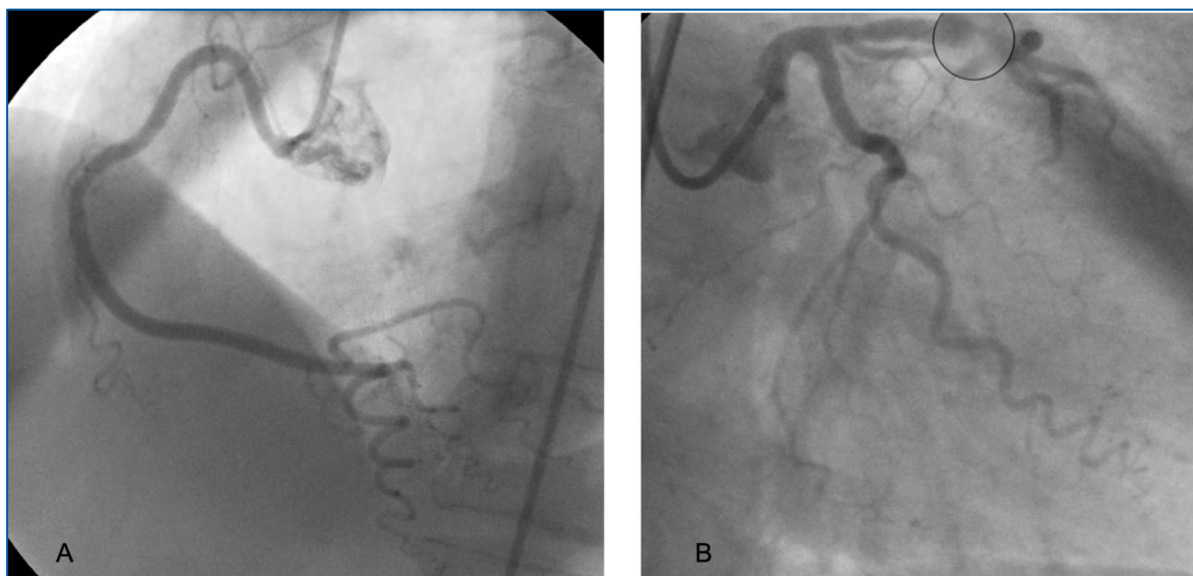


Figure 1 – Diagnostic coronary angiography by the transfemoral approach. A. Right coronary artery; B. Left coronary artery with an evident obstructive lesion in the left anterior descending artery (projection: right anterior oblique and caudal).

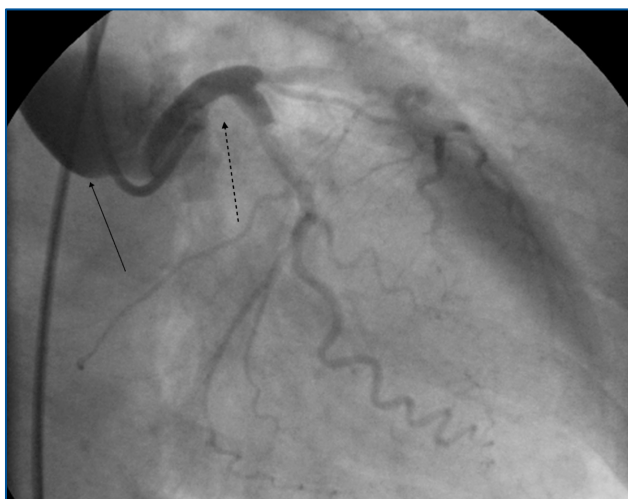


Figure 2 – Type A aortic dissection with occlusion of the left main coronary artery. Dotted arrow: dissection of the left coronary artery trunk extending to the anterior descending and circumflex arteries. Straight arrow: dissection of the ascending aorta.

Control angiographies showed adequate coronary flow and no impairment of the origin of the CX (Figure 4C). The patient was referred to the intensive care unit

(ICU) already weaning from noradrenaline and with baseline parameters of mechanical ventilation assistance.

Post-procedure evolution and diagnostic-evolutionary support imaging methods

The post-procedure ECG showed a reduction in subepicardial ischemia, and the transthoracic echocardiogram showed a slight reduction in the left ventricular ejection fraction (LVEF) of 45%, with apical akinesia (related to a previously ischemic insult due to ADA obstructive lesion) and a normal functioning aortic valve. She evolved well in the following 24 h, with extubating. An aortic angioCT study on the fifth day after the procedure showed a small residual dissection of the ascending aorta (sealing of the false lumen with the disappearance of the flapping) (Figure 5). She was discharged asymptomatic on the sixth day of hospitalization, using double platelet anti-aggregation, statins, cardio-selective beta-blockers, angiotensin-converting enzyme inhibitors, levothyroxine, and inhaled corticosteroids. She returned for consultation five days after discharging asymptomatic and with good adherence to drug treatment and remained so at the 1-year follow-up.

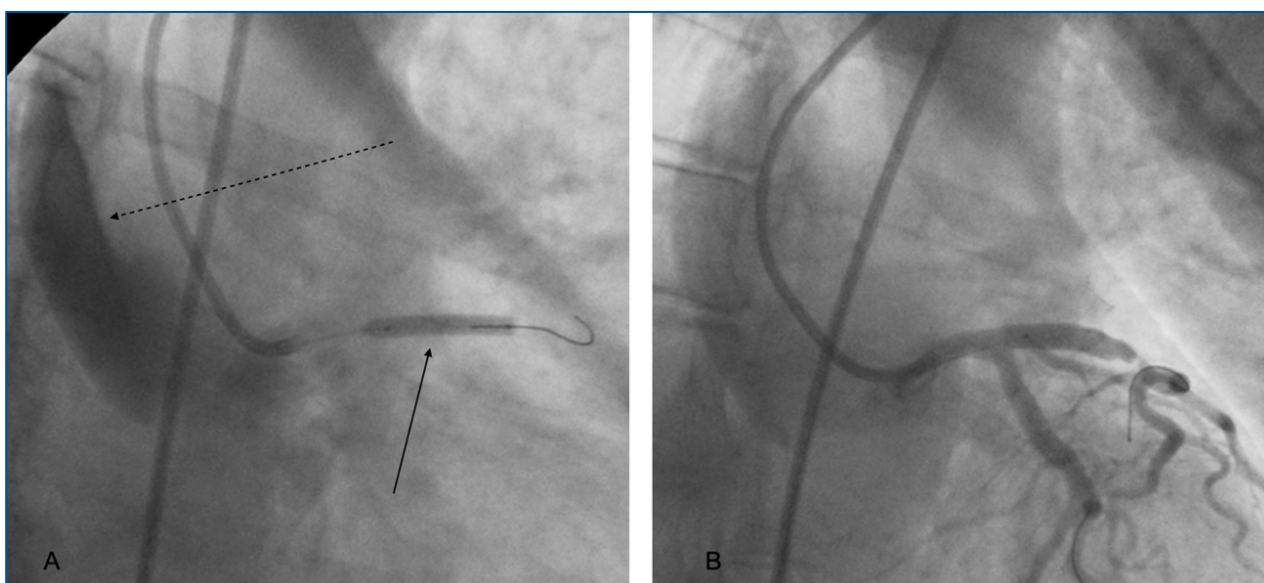


Figure 3 – Percutaneous treatment of the target vessel and the iatrogenic dissection: A. Conventional angioplasty with a balloon catheter in the anterior descending artery (solid arrow: balloon catheter in the anterior descending artery; dotted arrow: dissection of the ascending aorta); B. Flow was restored with 0.014" guidewires directed to the distal beds of the anterior descending and circumflex arteries.

DISCUSSION

Spontaneous Type A aortic dissection (sAD) is characterized by separating the intima from the media caused by intramural bleeding, which leads to the formation of two lumens (true and false) with or without communication between both. This process often culminates in aortic rupture due to a solution of

continuity in the adventitia or re-entry into the true lumen in the most distal segment of the false lumen. Therefore, it translates into a surgical emergency with high mortality, reaching 50% in the first 48 h¹. In the last four decades, endovascular and percutaneous coronary procedures have grown exponentially, bringing to light an acute aortic scenario that is still little known and whose management remains uncertain

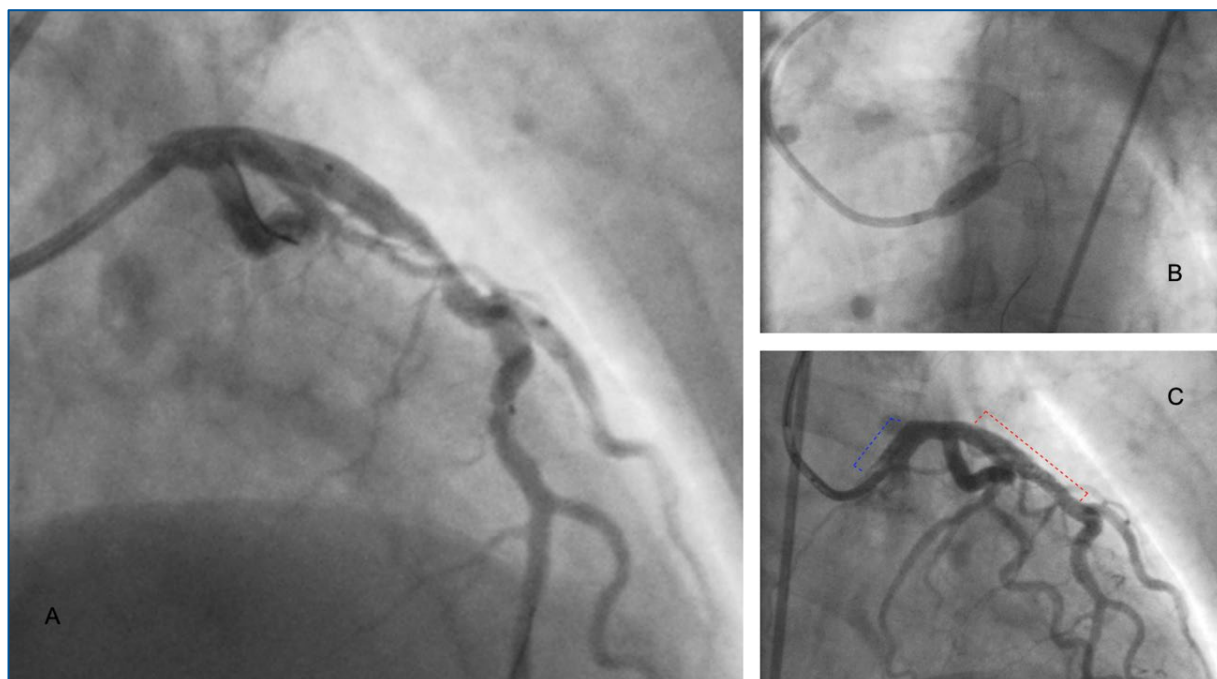


Figure 4 – A. Stent deployment in the left anterior descending artery (LAD); B. Stent deployment in the left main coronary artery (LMA); C. Final angiographic result (red dotted: stent in LAD; blue dotted: stent in LMA).

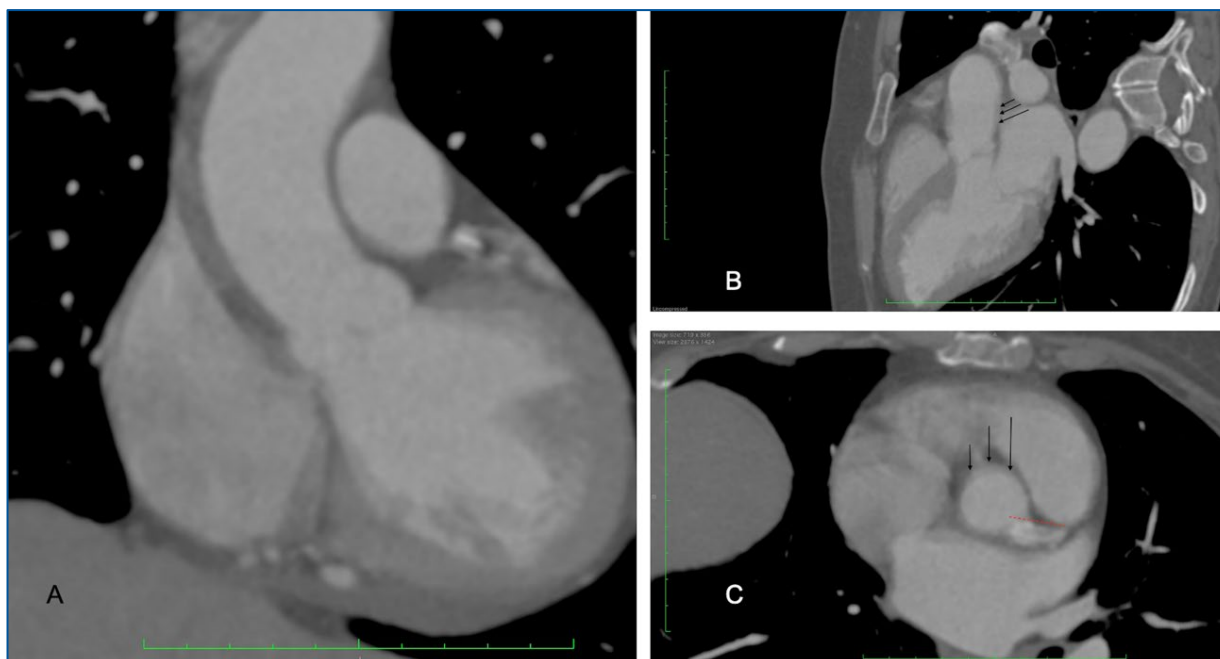


Figure 5 – Control CT angiography of the aorta five days after the procedure: A (coronal), B (sagittal), and C (axial) showing minimal residual dissection with almost complete sealing of the flapping. Arrows: minimum dissection area; red dotted line: stent in the left main coronary artery.

due to its low incidence: 0.07% to 0.19%^{2,3}. Among the forms of acute aortic injury presentation, iatrogenic aortic dissection (iAD) is the most representative. Due to its low incidence (< 0.1%), iAD has little scientific support in the literature. According to the IRAD (International Registry of Aortic Dissection)⁷, iAD was present in 5% of the cases that made up the registry; of

these, 76% had Stanford Type A. Most patients with Type A iAD were associated with cardiac surgical procedures, whereas most type B cases were associated with cardiac catheterization and endovascular procedures. The group of patients with iAD in the registry was older, with a higher incidence of diabetes mellitus and systemic atherosclerotic burden compared

to those with sAD.

iAD's clinical presentation differs from sAD because it is more asymptomatic and, when symptomatic, is more frequently associated with hemodynamic instability due to the impairment of noble structures such as the origins of the coronary arteries, the competence of the aortic valve and cardiac tamponade^{8,9}.

Mortality, statistically, does not differ between the spontaneous and iatrogenic forms, reaching 35%. However, the population of this registry is heterogeneous, coming from tertiary centers and, therefore, does not reflect the behavior of iAD in the general population.

Here, the dissection occurred in the LMA aorta-ostial transition by the guide catheter tip (Launcher EBU 3.5) traumatic action in the endothelium and subsequent manual injection of iodinated contrast. As a result, there was an occlusion of the LMA by the false lumen and extension of the dissection line toward the ascending aorta. Our case differs from most iAD reported in the literature, which is often related to the percutaneous treatment of RCA, especially in chronic total occlusion scenarios⁴, explained by the higher concentration of smooth muscle cells and the dense matrix of type 1 collagen fibers in the LMA¹⁰, which would make the right coronary artery more susceptible to retrograde dissections.

The LMA occlusion explained the circulatory collapse in our case. Moreover, in more than 40% of the cases, the dissection has progressive growth along the

length of the aorta; therefore, watchful waiting is theoretically risky, and sealing the entry hole was mandatory¹¹. Here, sealing was performed employing a stent in the LMA ostium with the restoration of coronary flow and haemodynamic stabilization. Dunning et al.¹² proposed an angiographic classification for iAD: Class 1 limited to the ipsilateral sinus of Valsalva; Class 2 extends to the ascending aorta with < 40 mm; and Class 3 > 40 mm in length. In their manuscript, patients with Class 2 iAD could be successfully treated with stent implantation, and surgical correction would be limited to those with Class 3, which corroborates the approach taken in our case. However, other studies support percutaneous conduct even in cases of extensive dissection of the ascending aorta^{11,13-15}.

CONCLUSION

The presented case reflects the complexity of managing iatrogenic aortic dissection related to percutaneous procedures and adds information to the preexistent reports and studies in the current literature. Additionally, our report reinforces the facticity of the strategy of sealing the traumatic entry orifice with stents as the initial approach in cases with the compromised origin of the coronary arteries and the safety of the strategy with favorable in-hospital evolution.

REFERENCES

- Erbel R, Aboyans V, Boileau C, Bossone E, Di Bartolomeo R, Eggebrecht H, et al. 2014 ESC guidelines on the diagnosis and treatment of aortic diseases. *Eur Heart J*. 2014;35(41):2873-926. <https://doi.org/10.1093/eurheartj/ehu281>
- Carter AJ, Brinker JA. Dissection of the ascending aorta associated with coronary angiography. *Am J Cardiol*. 1994;73(12):922-3. [https://doi.org/10.1016/0002-9149\(94\)90830-3](https://doi.org/10.1016/0002-9149(94)90830-3)
- Moles VP, Chappuis F, Simonet F, Urban P, De La Serna F, Pande AK, et al. Aortic dissection as complication of percutaneous transluminal coronary angioplasty. *Cathet Cardiovasc Diagn*. 1992;26(1):8-11. <https://doi.org/10.1002/ccd.1810260103>
- Shorrock D, Michael TT, Patel V, Kotsia A, Rangan BV, Abdullah SA, Grodin JM, Banerjee A, Brilakis ES. Frequency and outcomes of aortocoronary dissection during percutaneous coronary intervention of chronic total occlusions: a case series and systematic review of the literature. *Catheter Cardiovasc Interv*. 2014;84(4):670-5. <https://doi.org/10.1002/ccd.25338>
- Doutriaux M, Pariente B, Zahnan J, Marchand X. Conservative Treatment of Iatrogenic Ascending Aortic Hematoma Post-Rotablator Coronary Procedure. *Thorac Cardiovasc Surg Rep*. 2020;9:47-50. <https://doi.org/10.1055/s-0040-1715431>
- de Barros e Silva PG, Aquino T, Resende MV, Richter I, Barros CM, Andrioli VG, Baruzzi AC, Medeiros CC, Furlan V. Resolution of an acute aortic syndrome with aortic valve insufficiency post-PCI. *Am J Case Rep*. 2014;15:508-13. <https://doi.org/10.12659/AJCR.891301>
- Hagan PG, Nienaber CA, Isselbacher EM, Bruckman D, Karavite DJ, Russman PL, et al. The International Registry of Acute Aortic Dissection (IRAD): new insights into an old disease. *JAMA*. 2000;283(7):897-903. <https://doi.org/10.1001/jama.283.7.897>
- Fiddler M, Avadhani SA, Marmur JD. Guide catheter-induced aortic dissection complicated by pericardial effusion with pulsus paradoxus: a case report of successful medical management. *Case Rep Med*. 2015;2015:480242. <https://doi.org/10.1155/2015/480242>
- Sekiguchi M, Sagawa N, Miyajima A, Hasegawa S, Yamazaki M, Kurabayashi M. Simultaneous right and left coronary occlusion caused by an extensive dissection to the coronary sinus of Valsalva during percutaneous intervention in right coronary artery. *Int Heart J*. 2009;50(5):663-7. <https://doi.org/10.1536/ihj.50.663>
- Yip HK, Wu CJ, Yeh KH, Hang CL, Fang CY, Hsieh KY, et al. Unusual complication of retrograde dissection to the coronary sinus of Valsalva during percutaneous revascularization: a single-center experience and literature review. *Chest*. 2001;119(2):493-501. <https://doi.org/10.1378/chest.119.2.493>
- Carstensen S, Ward MR. Iatrogenic aortocoronary dissection: the case for immediate aortoostial stenting. *Heart Lung Circ*. 2008;17(4):325-9. <https://doi.org/10.1016/j.hlc.2007.11.140>
- Dunning DW, Kahn JK, Hawkins ET, O'Neill WW. Iatrogenic coronary artery dissections extending into and involving the aortic root. *Catheter Cardiovasc Interv*. 2000;51(4):387-93. [https://doi.org/10.1002/1522-726X\(200012\)51:4<387::AID-CCD3>3.0.CO;2-B](https://doi.org/10.1002/1522-726X(200012)51:4<387::AID-CCD3>3.0.CO;2-B)
- Park I-W, Min P-K, Cho D-K, Byun K-H. Successful endovascular treatment of iatrogenic coronary artery dissection extending into the entire ascending aorta. *Can J Cardiol*. 2008;24(11):857-9. [https://doi.org/10.1016/S0828-282X\(08\)70196-X](https://doi.org/10.1016/S0828-282X(08)70196-X)
- 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;31(3):320-7. <https://doi.org/10.1016/j.cjca.2014.11.030>

15. Núñez-Gil IJ, Bautista D, Cerrato E, Salinas P, Varbella F, Omedè P, et al. Incidence, management, and immediate- and long-term outcomes after iatrogenic aortic dissection

during diagnostic or interventional coronary procedures. *Circulation*. 2015;131(24):2114-9. <https://doi.org/10.1161/CIRCULATIONAHA.115.015334>

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