

Percutaneous drainage of a localized biatrial haematoma causing regional tamponade in a patient with prior coronary artery bypass graft surgery: a case report

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Background

Regional cardiac tamponade presented as posterior extrapericardial haematomas compressing both atria, with cardiogenic obstructive shock due to inflow abolition is a rare cause of post-percutaneous coronary intervention vascular collapse.

Case summary

We present such a case where computed tomography-guided anterior pericardiocentesis decompressed the atria and restored cardiac output.

Discussion

Prior coronary artery bypass grafting should not be considered protective from cardiac tamponade in patients in whom perforation occurs, because loculated effusions can develop beneath adhesions of the pericardium and compress various cardiac structures (such as the left atrium or the right ventricle); they appear several hours after the intervention and cause atypical haemodynamic manifestations.

Keywords

Regional cardiac tamponade • Atrial haematoma • Obstructive shock • Dry tamponade • Cardiogenic shock • Complication • Case report

ESC Curriculum

2.2 Echocardiography • 2.4 Cardiac computed tomography • 3.1 Coronary artery disease • 6.6 Pericardial disease • 7.1 Haemodynamic instability

Learning points

- Regional cardiac tamponade in a post-coronary artery bypass grafting patient is not harmless and it is difficult to recognize and treat.
- Left atrial inflow and outflow obstruction as a complication of chronic total occlusion-percutaneous coronary intervention can be caused either by intrinsic compression (intramural atrial haematoma) or extrinsic compression (extramural haematoma/regional cardiac tamponade). Computed tomography is the key for diagnosis and treatment.

Introduction

Regional cardiac tamponade, a variant of the classical cardiac tamponade, is a loculated, eccentric effusion, or localized haematoma in which

only selected chambers are compressed. As a result, the typical physical, haemodynamic, and echocardiographic signs of cardiac tamponade, including *pulsus paradoxus*, diastolic pressure equalization, and chamber compression in standard apical and parasternal views, may be absent

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or attenuated. Regional cardiac tamponade is most often seen after pericardiectomy or myocardial infarction.¹ Clinical suspicion should be heightened in these settings. Establishing the diagnosis is challenging and may require additional echocardiographic views and other imaging techniques (e.g. computed tomography). We report herein a case of percutaneous coronary intervention (PCI)-related bilateral retroatrial haematoma with complete inflow obstruction and malignant 'dry' tamponade physiology.

Timeline

Day 1	Admission for angina and myocardial lateral wall ischaemia
Day 2 Baseline	Native left circumflex chronic total occlusion (CTO)-PCI
Day 2 Time + 2 h	Shock; start intravenous fluids, inotropes. Transthoracic echocardiography (TTE): localized biatrial haematoma
Day 2 Time + 3 h	Thoracic computed tomography (CT): diagnosis call interventional radiologist
Day 2 Time + 4 h	CT-guided pericardiocentesis stabilization
Day 4	CT control: minimal residual pericardial collection
Day 7	Discharge
+6 months	Good clinical follow-up

Case presentation

A 77-year-old man, former smoker, dyslipidaemic, hypertensive, with a history of atrial fibrillation and a three-vessel coronary artery bypass grafting (CABG) was admitted to our clinic for a scheduled coronary angiogram due to symptoms and a positive stress-echocardiography with proof of lateral ischaemia and inferior scar. The physical examination on admission was normal. His left ventricular function was mildly impaired with an ejection fraction of 40%. The patient was under therapy with 20 mg Rivaroxaban (paused 2 days before the procedure). He also received a loading-dose of aspirin and clopidogrel ~2 h before the intervention.

The coronary angiography showed a proximal CTO of both the right coronary artery and the left anterior descending artery. All arterial grafts were patent and had good flow. The saphenous venous graft (SVG) to the chronically occluded obtuse marginal branch (OM) of the also highly stenosed left circumflex artery (LCX) was entirely degenerated. Revascularizing the native OM and LCX was successful using a primarily retrograde strategy via the degenerative SVG, using the 'reverse-controlled antegrade and retrograde tracking technique' (reverse CART), with two drug-eluting stents, in OM and LCX.

Approximately 2 h after the procedure, the patient developed haemodynamic collapse with dyspnoea and altered mental state. The patient had no chest pain. Intravenous fluids and inotropic support were started; however, with no significant haemodynamic improvement. The bedside TTE excluded pericardial effusion and could only intermittently show a compression of the left atrium (LA) (Figure 1). The small haematoma behind the LA disappeared shortly after the first TTE, with normalization of the blood pressure and reappeared with additional haematoma also behind the RA, with more severe hypotension (see Supplementary material online, Video S1, Figure 2). The CT

could exclude severe bleeding with haemorrhagic shock; however, it revealed a posterior bilobular pericardial effusion (right 7.5 × 5.9 cm and left 7.5 × 6.0 cm) with localized high-grade compression of both atria and of the superior vena cava most likely as a result of a coronary perforation of the LCX during the CTO-PCI (Figure 3A). A two-stage regional cardiac tamponade diagnosis was established, caused by sequential blood accumulation in the posterior pericardial sac adjacent to the LA, with late-rupture of the postoperative adhesions, overspill onto the right atrium, and finally compromising the entire filling of the ventricles.

With the help of our interventional radiology team, the diagnostic CT was directly followed by a CT guided pericardiocentesis using a ventrolateral entry site. The patient presented a large pericardial fat tissue that could be used as a puncture channel, avoiding any lung injury. Successful CT-guided puncture of the effusion behind the right atrium was possible using real-time CT, and release of the atrial compression was followed by immediate restoration of blood pressure. We could drain a total of 130 mL of blood with no further fluid over 24 h. The CT after the pericardiocentesis showed an obvious regress of the cardiac tamponade with a small remaining haematoma behind the LA and a small pneumomediastinum that was treated conservatively (see Supplementary material online, Video S1, Figure 3B). The CT after 4 days showed a minimum residual collection. The patient was discharged after 7 days. At 6-months follow-up, the patient was free of symptoms.

Discussion

Although in the past, prior CABG was considered protective from tamponade in patients in whom perforation occurred, we currently know that loculated effusions can develop beneath adhesions of the pericardium and compress various cardiac low pressure chambers. Localized effusions can be lethal as they appear several hours after the intervention and can be impossible to reach and drain percutaneously. They have unusually high pressures and cause atypical haemodynamic manifestations.

The peculiarities of our case were:¹ the compression involved both atria and the percutaneous drainage was performed from a right-parasternal approach, and² the two-step cardiac tamponade. Physiologically, the cardiogenic shock is due to no inflow into the ventricles and the pulmonary oedema due to inflow obstruction to the atria. This mechanism, called 'dry tamponade', is mostly seen in ventricular haematomas² but the physiology is similar. This is



Figure 1 Bedside echocardiography: posterior loculated pericardial effusion compressing the left atrium (arrow).

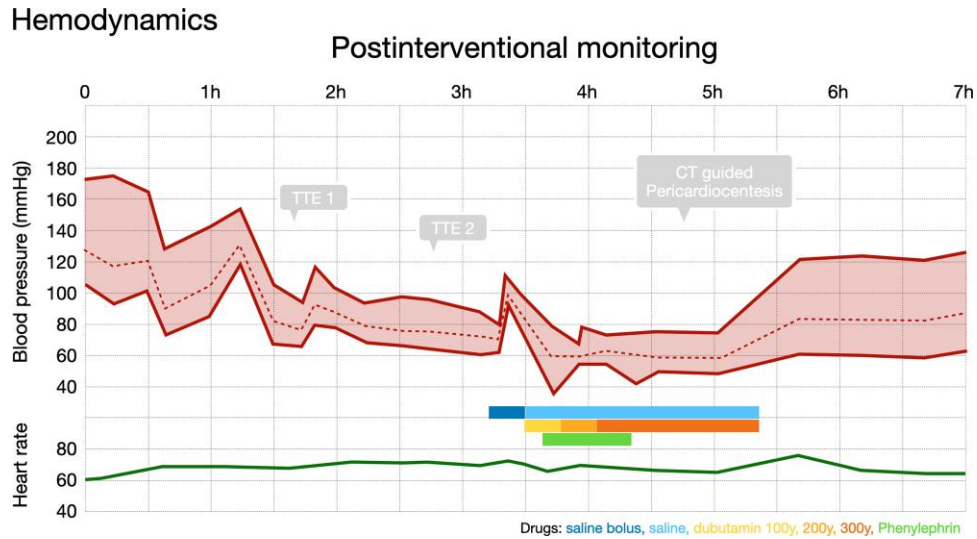


Figure 2 Postinterventional haemodynamic timeline (TTE, transthoracic echocardiography).

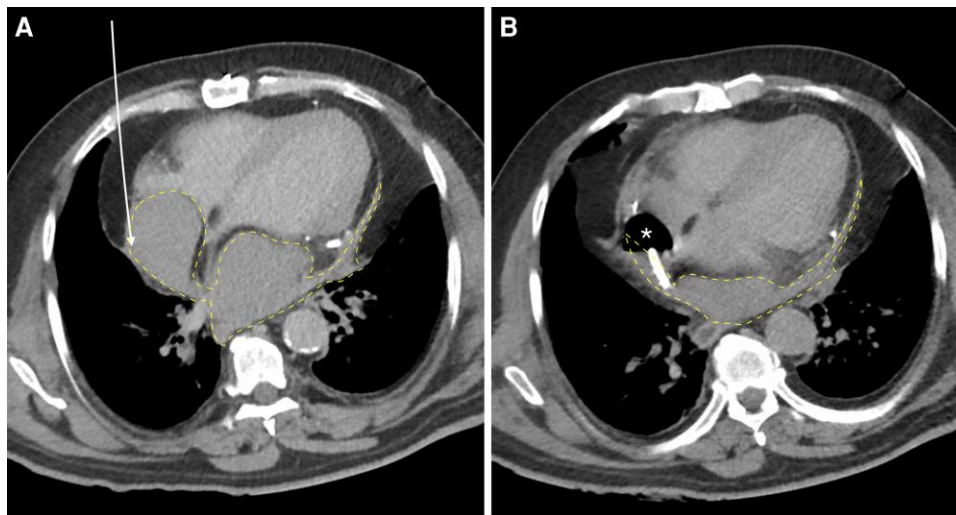


Figure 3 Thoracic computed tomography. (A) Bilobulated posterior cardiac tamponade compressing both atria; the long arrow indicates the direction of the puncture and the dashed lines delineate the haematoma. (B) Drainage tube in correct position with adjacent small pneumomediastinum (asterisk), minimal residual retroatrial haematoma.

interestingly seen on the haemodynamic timeline (Figure 2) where a short improvement is noticed between the two bedside echocardiographic examinations, when the left loculated effusion ruptured to the right side and the tamponade was temporarily released. Later, the cardiogenic shock reappeared, of note, the second illusory short improvement after the fluid bolus.

Most of the reports described in the literature are isolated left atrial compressions after open heart surgery and a few cases after PCI.^{1,3–10} Wherever possible, previously recorded cases were handled conservatively, with intravascular volume expansion and inotropic support,^{4,5} or with surgical evacuation in the situation of circulatory collapse^{6–10} (Table 1). Dorsal right pericardiocentesis of a compressive left atrial haematoma after CTO-PCI has been first described in 2015.¹ To our

knowledge, we present the first case of a two-stage biatrial haematoma and the first percutaneous drainage from a ventrolateral approach. We found this option attractive because cardiothoracic surgery was considered unrealistic: the patient was highly unstable, the operating room was located in another hospital, and a second and urgent sternotomy may have jeopardized the viable left internal mammary artery. The large pericardial fat was considered a favourable anatomical situation to introduce the needle parasternally and not interfere with the heart and, paradoxically, to direct it behind the atria. Technically, we could say that the puncture was performed extrapericardially.

Chronic total occlusion interventions are recognized to have a greater level of complexity and risk.¹¹ We have found 11 similar case reports describing regional tamponade as a PCI-related complication (Table 1).

Table 1 Regional atrial tamponade as a percutaneous coronary intervention-related complication, reported cases

Study	Vessel	Approach	Previous CABG	Location of the haematoma by CT	Pulmonary oedema	Cardiogenic shock	Surgical drainage	Percutaneous drainage	Survival
Current report	LCX	R	Y	LA and RA <i>Epicardial</i>	N	Y	N	Y	Y
Wilson et al. ¹	LCX, RCA	R	Y	LA <i>Epicardial</i>	N	Y	N	Y	Y
Reddy ³	RCA	A	N	LA <i>Intramural</i>	Y	N	Y	N	Y
Özpelit et al. ⁴	RCA	R	N	LA <i>Intramural</i>	N	N	N	N	Y
Solzbach et al. ⁵	RCA	A	N	LA <i>Intramural</i>	N	N	N	N	Y
Barbeau et al. ⁶	LCX	A	Y	LA <i>Epicardial</i>	N	Y	Y	N	Y
Krabatsch et al. ⁷	RCA	A	Y	LA <i>Epicardial</i>	N	Y	Y	N	Y
	SVG, LCX	A	Y	LA <i>Epicardial</i>	N	Y	Y	N	Y
Fukui et al. ⁸	LAD, LCX	A	N	LA <i>Intramural</i>	Y	Y	Y	N	Y
Dardas et al. ⁹	RCA	A	Y	LA <i>Epicardial</i>	Y	Y	Y	N	Y
Franks et al. ¹⁰	LCX	R	N	LA <i>Intramural</i>	N	Y	Y	N	Y

A, antegrade; LA, left atrial; LCx, circumflex; N, no; R, retrograde; RA, right atrial; RCA, right coronary artery; SVG, saphenous vein graft; Y, yes.

Inflow and outflow obstruction can also be seen in intramural atrial haematomas, causing mass obstruction and functional mitral stenosis. This can even happen without the post-pericardiotomy condition and percutaneous drainage is not feasible. Differentiation of the true location of the mass by echocardiography may not be clear, hence all patients require CT for clear delineation. Fukui et al.⁸ reported such a case of intramural haematoma of the LA that was surgically evacuated but with rapid relapse because the active bleeding could not be seen intraoperatively. Coil embolization was performed after surgery, and this highlights the role of the interventionist in sealing the bleeding because distal perforations are difficult to find within the haematoma. The presence of previous CABG was seen in 60-percent of the cases; in fact all of the non-CABG patients did not have loculated effusion but intraparietal haematomas, thereby confirming once again that previous CABG is needful for regional cardiac tamponade. Surprisingly, not all cases reported in the literature presented pulmonary oedema; this can be explained by the fact that the LA inflow obstruction might sometimes develop so rapidly that haemodynamic collapse and shock emerge before any signs of pulmonary oedema. Furthermore, in our case, the simultaneous RA compression may also have had a role in preventing pulmonary oedema.

Conclusion

Our encounter shows that before anything else, the indication in CTO PCI should be expertly assigned and the inherent risk weighed as well. Iatrogenic regional cardiac tamponade following complex interventions can be life threatening. Establishing the diagnosis is challenging and often delayed, and when drainage is indicated in the presence of circulatory collapse, the role of surgery is overrated and consideration should be given to a CT-guided pericardiocentesis as described in this case.

Lead author biography



Alexandru Achim is an interventional cardiology fellow and enthusiast, currently working in Basel, Switzerland.

Supplementary material

Supplementary material is available at *European Heart Journal – Case Reports* online.

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None.

Slide sets: A fully edited slide set detailing these cases and suitable for local presentation is available online as [Supplementary data](#).

Consent: The authors confirm that written consent for submission and publication of this case report, including images and associated text, has been obtained from the patient in line with COPE guidance.

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References

1. Wilson WM, Spratt JC, Lombardi WL. Cardiovascular collapse post chronic total occlusion percutaneous coronary intervention due to a compressive left atrial hematoma managed with percutaneous drainage. *Catheter Cardiovasc Interv* 2015;**86**:407–411.
2. Frisoli TM, Afana M, Mawri S, Hadid M, Sayed L, O'Neill WWW, Wang DD, Parikh S, Khandelwal A, Alaswad K. Respect the septal perforator: septal artery perforation during CTO PCI resulting in massive interventricular septal hematoma and biventricular cardiac obstructive shock. *JACC Cardiovasc Interv* 2017;**10**:e91–e92.
3. Reddy AR. Post PCI complication: left atrial intramural hematoma. *J Am Coll Cardiol* 2019;**73**:1392.
4. Özpelit ME, Pekel N, Yilmaz A, Topaloğlu C, Şahin E. A giant hematoma in the left atrial wall: a rare complication of percutaneous coronary intervention. *Int J Cardiovasc Acad* 2016;**2**:59–61.
5. Solzbach U, Beuter M, Haas H. Left atrial intramural hematoma after percutaneous hematoma. *Int J Cardiol* 2010;**141**:e37–e38.
6. Barbeau GR, Senechal M, Voisine P. Delayed abrupt tamponade by isolated left atrial compression following coronary artery perforation during coronary angioplasty. *Catheter Cardiovasc Interv* 2005;**66**:562–565.
7. Krabatsch T, Becher D, Schweiger M, Hetzer R. Severe left atrium compression after percutaneous coronary intervention with perforation of a circumflex branch of the left coronary artery. *Interact Cardiovasc Thoracic Surg* 2010;**11**:811–813.
8. Takaki J, Yoshinaga T, Nishigawa K, Okamoto K, Fukui T. Left atrial intramural hematoma after percutaneous coronary intervention. *Clin Case Rep* 2021;**9**:e04654.
9. Dardas PS, Tsikaderis DD, Makrigiannakis K, Saripoulos P, Toumbouras M. Complete left atrial obliteration due to localized tamponade after coronary artery perforation during PTCA. *Catheter Cardiovasc Diagn* 1998;**45**:61–63.
10. Franks RJ, de Souza A, Di Mario C. Left atrial intramural hematoma after percutaneous coronary intervention. *Catheter Cardiovasc Interv* 2015;**86**:E150–E152.
11. Achim A, Marc M, Ruzsa Z. Surgical turned-downed CHIP cases—can PCI save the day? *Front Cardiovasc Med* 2022;**9**:872398.