

CASE REPORT

Open Access



# Loculated pericardial hematoma compressing the right atrium post mechanical aortic valve replacement and the role of point-of-care echocardiography: a case report

Mira Hamdan<sup>1</sup>, Fady Khoury<sup>1</sup> and Antoine Kossaify<sup>1\*</sup> 

## Abstract

**Background** Bleeding in the postoperative period after cardiac surgery is relatively frequent, especially in patients with early anticoagulant therapy, as in the case of mechanical valve replacement. Diffuse hemopericardium is relatively easy to diagnose; however, loculated pericardial hematomas leading to hemodynamic collapse are relatively rare and their diagnosis is more challenging.

**Case presentation** This report is of a 75-year-old Asian woman who presented dyspnea, confusion and hemodynamic collapse related to loculated pericardial hematoma compressing the right atrium 3 days after mechanical aortic valve replacement. Urgent transthoracic echocardiogram performed as point-of-care approach showed right atrial compression, the aortic valve prosthesis had normal function. Surgical removal of the hematoma resulted in complete recovery.

**Conclusion** Loculated pericardial hematoma might lead to hemodynamic collapse. Close monitoring of hemodynamic parameters is essential, also point-of-care echocardiography is essential for early recognition and prompt management in patients with critical hemodynamic condition.

**Keywords** Echocardiography, Cardiac tamponade, Point-of-care ultrasound (POCUS), Hematoma removal, Case report

\*Correspondence:

Antoine Kossaify

antoinekossaify@yahoo.com

Full list of author information is available at the end of the article



© The Author(s) 2023. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated in a credit line to the data.

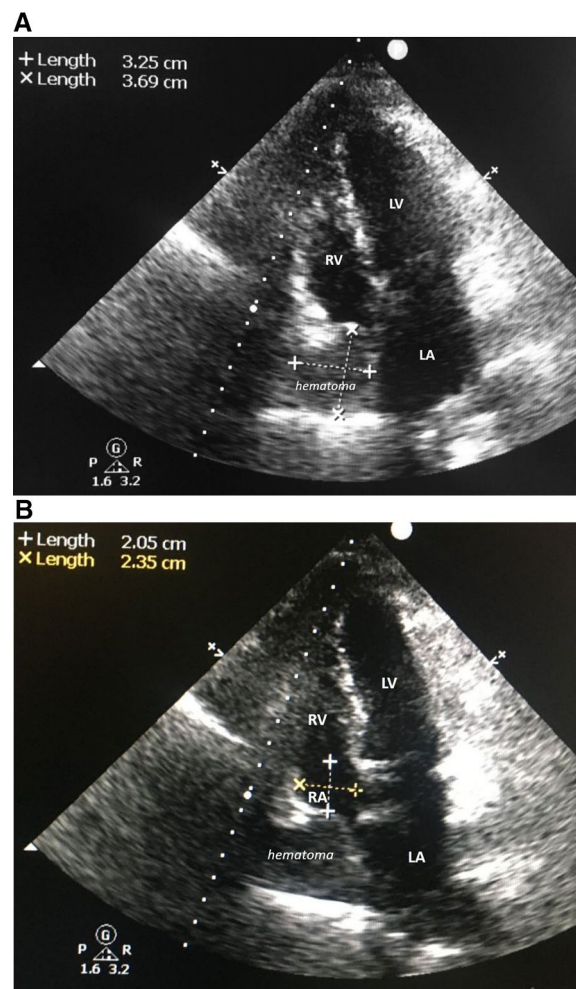
## Introduction

Cardiac surgery is a relatively safe procedure when tailored patient preparation is made preoperatively, along with careful follow-up in the immediate postoperative phase [1]. However, bleeding in the postoperative period after cardiac surgery is still relatively frequent, especially in patients for whom early anticoagulant therapy is required like in the case of mechanical valve replacement [2]. Diffuse hemopericardium is relatively easy to diagnose; however, loculated pericardial hematomas leading to hemodynamic collapse are relatively rare and their diagnosis more challenging. This report is of a 75-year-old Asian woman with loculated pericardial hematoma compressing the right atrium, 3 days after mechanical aortic valve replacement, and identified by point-of-care ultrasonography (POCUS). In case of postoperative hemodynamic collapse, early detection and prompt management are mandatory for saving patients and bringing better outcome.

## Case presentation

A 75-year-old Asian woman with severe aortic stenosis was admitted for surgical aortic valve replacement, she had been experiencing exertional chest pain and dyspnea for more than 6 months. The patient's medical history includes mild chronic obstructive pulmonary disease, type II diabetes and hypothyroidism; also she has not had any prior cardiothoracic surgery. Preoperative transthoracic echocardiography showed severe aortic valve stenosis (classical type with normal flow, high gradient), mean transaortic gradient of 55 mmHg, calcified aortic cusps with tri-leaflet morphology, diastolic dysfunction grade 1, normal left ventricular systolic function, and moderate left ventricular hypertrophy. Coronary angiogram showed normal coronaries.

After discussing the proposed procedure, along with alternative options, the decision was made to replace the aortic valve with a mechanical prosthesis, in agreement with the patient. The patient underwent mechanical aortic valve replacement without any complications. Anticoagulant therapy was initiated 12 h postoperatively, after ensuring no active bleeding. Anticoagulant therapy consisted of Enoxaparin 40 mg twice a day along with Acenocoumarol 4 mg (half tablet/day). During the first 48 h postoperatively, the patient was asymptomatic, with stable hemodynamic condition. On day three postoperatively, the international normalized ratio (INR) was 2.2, and the patient started to manifest hemodynamic dysfunction with hypotension (average blood pressure 70/40 mmHg, taken via intra-arterial probe) and oliguria. Physical examination showed tachycardia (average 120–130 bpm) with normal heart sounds intensity, jugular venous distension, and



**Fig. 1** **A** Transthoracic echocardiography with apical four-chamber view, showing a round shaped 32 × 37 mm hematoma compressing the right atrium (systolic view). *LV* left ventricle, *RV* right ventricle, *LA* left atrium. **B** Transthoracic echocardiography with apical four-chamber view (after minor probe tilt) showing right atrial dimensions (20 × 23 mm) with compression by adjacent hematoma (systolic view). *LV* left ventricle, *RV* right ventricle, *LA* left atrium, *RA* right atrium (compressed)

tachypnea with normal breathing sounds. The patient started deteriorating rapidly, developed hemodynamic instability and respiratory failure requiring immediate intubation and mechanical ventilation along with volume expansion, vasopressors and inotropic support.

Urgent transthoracic echocardiogram (CX50 *xMATRIX* ultrasound system, Philips Medical Systems, Andover, MA, USA) adopting mainly a qualitative approach and implemented as POCUS exam with semi-portable echo machine showed normal pericardium, no pericardial echo free space, normal function of aortic prosthesis, preserved left ventricular systolic function (as per visual

estimate) with right atrial compression by a localized mass identified as probable hematoma of 32×37 mm; the right atrial dimensions were reduced to 20×23 mm (Fig. 1A, B). The right ventricle was mildly undersized compared to the preoperative dimensions, no septal bounce was documented. The patient was on respiratory machine and assessment of the inferior vena cava dimensions and compliance was difficult; similarly, evaluation of respiratory variations of the Doppler flow velocities were judged unreliable.

The patient was taken rapidly to the operative room, there was a loculated pericardial hematoma compressing the latero-anterior wall of the right atrium and prompt evacuation of the hematoma was performed, there was no active bleeding site identified. The volume of the hematoma (a mixture of coagulum and clots) was roughly estimated to be around 50 to 60 cc. Thereafter, the patient became asymptomatic, restored normal hemodynamics with normal sinus rhythm and was discharged few days later.

## Discussion

Loculated pericardial hematoma occurring after cardiac surgery might lead to hemodynamic collapse. This article presents a case of hemodynamic collapse early after aortic valve replacement, and shows the valuable advantage of teamwork and prompt intervention. Cases of hematoma compressing the atria post cardiac surgery have been reported almost 30 years ago, also hematomas with right atrial compression were reported more frequently than hematomas compressing the left atrium [3, 4]. Loculated pericardial hematoma compressing the atria might be difficult to diagnose and might lead to severe hemodynamic collapse [5].

Bleeding and hematoma are more common in case of early anticoagulant therapy as it was the case in this patient who required anticoagulation because of the mechanical aortic valve. The HAS-BLED score was initially developed to predict the risk of potential bleeding in anticoagulated patients affected by atrial fibrillation, however, recent study showed that it was associated with increased risk of major bleeding events after cardiac surgery procedures [6]. In this patient, the HAS-BLED score was 1 and therefore the bleeding risk was estimated relatively low.

In case of hemodynamic collapse consecutive to cardiac cavities compression by hematoma, early detection is mandatory, and POCUS is crucial in this regard for prompt and efficient management [7]. In this patient, POCUS was useful for diagnosis of a compressive hematoma, also to rule out aortic prosthesis dysfunction. While the preliminary echo diagnosis was a compressive hematoma, the presence of foreign body post

thoracotomy was raised. When transthoracic echocardiographic findings are suboptimal, transesophageal approach is required [4]. It is noteworthy that in such scenario, most patients are in intensive care, in dorsal supine position, with chest dressing and possibly intubated, making the POCUS via transthoracic approach a challenging exam [7]. Therefore, multimodality imaging including computed tomography is necessary when transthoracic or transesophageal echo findings are suboptimal or non conclusive [5, 7].

## Conclusion

A loculated and compressive pericardial hematoma that occurs after cardiac surgery may lead to hemodynamic collapse. Therefore, close monitoring of hemodynamic parameters is essential during the postoperative period. Additionally, performing POCUS is essential for early recognition and prompt management of this potentially life-threatening condition.

## Acknowledgements

Not applicable.

## Author contributions

MH made the document concept and first draft; FK and AK contributed to first draft, and made first revision; MH prepared the figures; AK verified the figures; FK acquired the consent from the patient. All authors made the bibliography search. All authors reviewed the manuscript. All authors read and approved final manuscript.

## Funding

None received.

## Availability of data and materials

Non applicable.

## Declarations

### Ethics approval and consent to participate

Institutional Ethical committee approved the study. Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

### Consent for publication

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

### Competing interests

The authors declare no competing interests.

### Author details

<sup>1</sup>Cardiology Division, Saint Esprit Kaslik University USEK, Hospital Notre Dame des Secours, PO Box # 3, Saint Charbel Street, 12345 Byblos, Lebanon.

Received: 13 March 2023 Accepted: 16 May 2023

Published online: 25 June 2023

## References

1. Chaney MA, Il C. Outcome after cardiac surgery: the devil is in the details. *J Cardiothorac Vasc Anesth.* 2022;36:91–2.

2. Matejic-Spasic M, Hassan K, Thielmann M, *et al.* Management of perioperative bleeding risk in patients on antithrombotic medications undergoing cardiac surgery—a systematic review. *J Thorac Dis.* 2022;14:3030–44.
3. Barbosa MM, Reis G, Oliveira EC, *et al.* Echocardiographic diagnosis of hematoma compressing the right atrium in post-operative heart surgery. *Arq Bras Cardiol.* 1993;60:261–3.
4. Ortega JR, San Román JA, Rollán MJ, *et al.* Atrial hematoma in cardiac postoperative patients and the diagnostic use of transesophageal echocardiography. *Rev Esp Cardiol.* 2002;55:867–71.
5. Fernandes A, Cassandra M, Pinto C, *et al.* Loculated cardiac hematoma causing hemodynamic compromise after cardiac surgery. *Rev Port Cardiol.* 2015;34(561):e1-3.
6. Santise G, Nardella S, Migliano F, *et al.* The HAS-BLED score is associated with major bleeding in patients after cardiac surgery. *J Cardiothorac Vasc Anesth.* 2019;33:1601–6.
7. Arntfield RT, Millington SJ. Point of care cardiac ultrasound applications in the emergency department and intensive care unit—a review. *Curr Cardiol Rev.* 2012;8:98–108.

### Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Ready to submit your research? Choose BMC and benefit from:

- fast, convenient online submission
- thorough peer review by experienced researchers in your field
- rapid publication on acceptance
- support for research data, including large and complex data types
- gold Open Access which fosters wider collaboration and increased citations
- maximum visibility for your research: over 100M website views per year

At BMC, research is always in progress.

Learn more [biomedcentral.com/submissions](https://biomedcentral.com/submissions)

