

CASE REPORT

Open Access



Successful tricuspid valve repair and right atrial mass excision for calcified thrombus causing severe tricuspid regurgitation and near-occlusion of inferior vena cava

Caroline Pennacchio¹, Brad Rosinski¹, Richard Grimm² and Shinya Unai^{1*}

Abstract

Background Calcified right atrial thrombus is rare and commonly occurs secondary to atrial fibrillation and long-term central venous catheterization which present risk for embolization. Treatment typically involves anticoagulation and antiplatelet therapy but rarely surgical excision can be performed, especially in patients with venous obstruction or concomitant valvular dysfunction.

Case presentation We present the case of a 69 year old symptomatic female with a history of atrial fibrillation and long-term venous catheterization found to have a large calcified right atrial thrombus causing inferior vena cava obstruction and severe tricuspid regurgitation. Patient underwent full median sternotomy with ascending arterial cannulation with superior vena cava and femoral venous cannulation. Intraoperatively, extensive right atrial calcified thrombus was found extending into the inferior vena cava and involving the septal portion of the tricuspid valve annulus causing regurgitation. The calcified thrombus was removed which resolved the inferior vena cava obstruction and the tricuspid valve was repaired by transecting septal leaflet chordae, commissuroplasty, and ring annuloplasty. Postoperative course was uncomplicated and pathology confirmed a calcified right atrial thrombus. At 6 month follow up, the patient was asymptomatic with echocardiogram showing no inferior vena cava stenosis and trivial tricuspid regurgitation.

Conclusions Surgical excision of calcified right atrial thrombus is rare and is often indicated for symptomatic patients with extensive involvement causing venous inflow obstruction or valvular dysfunction. Sufficient preoperative imaging and a multi-disciplinary approach are essential for accurate diagnosis to guide targeted treatment. When the tricuspid valve is involved, repair is preferred over replacement in this patient population given their propensity for calcification and thrombus formation which may result in an increased risk of early bioprosthetic valve degeneration or mechanical valve thrombosis.

Keywords Right atrial thrombus, Right atrial mass, Tricuspid regurgitation

*Correspondence:
Shinya Unai
unais@ccf.org

¹Department of Thoracic and Cardiovascular Surgery, Heart, Vascular, and Thoracic Institute, Cleveland Clinic, 9500 Euclid Avenue, Cleveland, OH 44195, USA

²Department of Cardiovascular Medicine, Heart, Vascular, and Thoracic Institute, Cleveland Clinic, Cleveland, OH, USA



© The Author(s) 2024. **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.

Background

Calcified right atrial thrombus is rare and typically occur secondary to atrial fibrillation or long-term central venous catheterization which present risk for embolization [1, 2]. Treatment can range from antiplatelet, anticoagulation, or thrombolytic therapy to invasive options such as surgical or percutaneous removal [3, 4]. Invasive excision can be necessary for accurate diagnosis and prevention of embolic events [5, 6]. However, extensive calcified right atrial thrombus can result in inferior vena cava occlusion [5] and involvement of the tricuspid valve may precipitate tricuspid regurgitation which would necessitate surgical repair [7].

Case presentation

We present the case of a 69 year old female with history of atrial fibrillation and breast cancer status post mastectomy, radiation, and chemotherapy with worsening dyspnea on exertion found to have a calcified right atrial mass and severe tricuspid regurgitation likely secondary to eight-month duration of central venous access for chemotherapy twelve years prior.

Cross-sectional imaging displayed a calcified mass at the inferior vena cava/right atrial junction with extension into the intrahepatic portion of the inferior vena cava, and along the interatrial septum with additional calcifications of the right ventricle resulting in tethering of the septal leaflet of the tricuspid valve.

Transthoracic echocardiogram showed near-occlusion of the inferior vena cava and severe tricuspid regurgitation with a medially directed jet secondary to a restricted septal leaflet due to subvalvular calcium extending along the septum and involving the valve. A dilated right ventricle with normal right ventricular systolic function, and elevated right ventricular systolic pressure consistent with mild pulmonary hypertension were also observed.

Given the patient's age, coronary angiography was performed that did not identify coronary artery disease.

Right femoral venous access was obtained and patient underwent full median sternotomy. The distal ascending aorta was cannulated with a 21 French cannula. Due to inferior vena cava partial occlusion, a 24 French cannula was advanced from the right femoral vein to the inferior vena cava under transesophageal echocardiogram guidance with the tip of the cannula placed just distal to the inferior vena cava/right atrial junction. A 24 French right angle cannula was inserted into the superior vena cava. Once cardiopulmonary bypass was initiated, the aorta was crossclamped, a single dose of Del Nido cardioplegia was delivered to the aortic root, and superior vena cava and inferior vena cava were snared. The patient was maintained at normothermia. The right atrium was opened via transverse incision. Upon inspection, there was a large amount of calcified thrombus within the right atrium extending into the inferior vena cava and involving the septal portion of the tricuspid valve annulus which was removed via sharp and blunt dissection (Fig. 1). Of note, the calcified mass did not have the appearance of endocarditis. The inferior vena cava cannula was then clamped for approximately five seconds to flush any debris. Attention was then turned to the tricuspid valve which showed severely restricted motion of the septal leaflet due to thickening and tethering of the associated chordae secondary to calcification extending from the right atrium to the right ventricle. Three chordae were then transected to improve coaptation. The tricuspid annulus was sized for a 26 mm partial annuloplasty ring. The ring was then sewn to the tricuspid annulus using horizontal mattress sutures and septal-anterior leaflet commissuroplasty was performed. The valve was tested and was found to be competent. The right atrium was closed in the standard fashion. The patient was

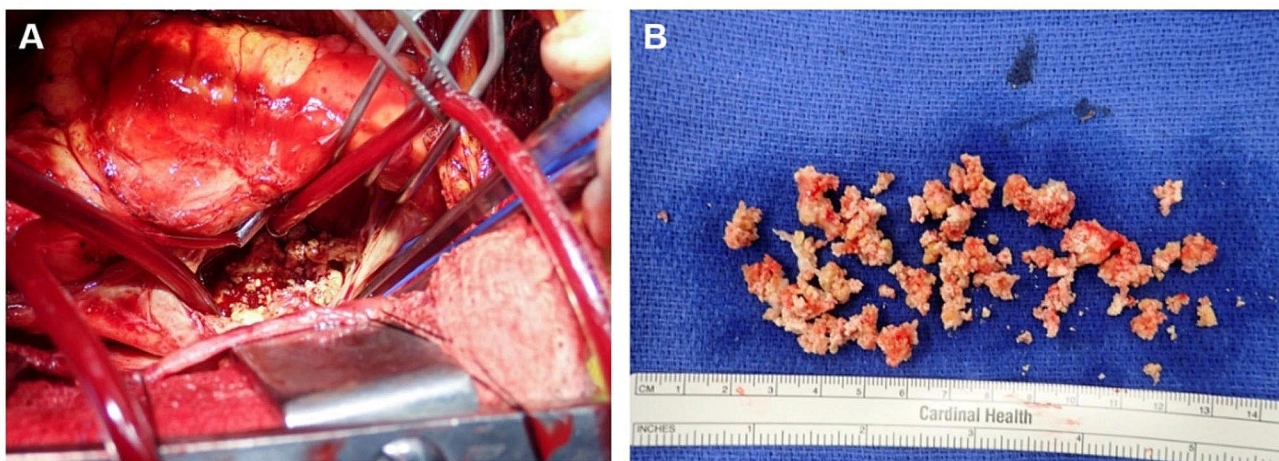


Fig. 1 Intraoperative images of calcified right atrial thrombus. **(A)** Right atrial exposure. Calcified right atrial thrombus with extensive involvement of tricuspid valve and near occlusion of the inferior vena cava. **(B)** Gross depiction of excised right atrial calcified thrombus

weaned from cardiopulmonary bypass with a crossclamp time of 40 min and total cardiopulmonary bypass time of 68 min. Intraoperative transesophageal echocardiogram showed trivial tricuspid regurgitation and normal biventricular function. The chest was closed in the standard fashion and patient was transported to the intensive care unit in stable condition. Pathology confirmed calcified thrombus.

Postoperative course was unremarkable and she was discharged on postoperative day 9. At 6-month follow up, she was asymptomatic with significantly improved exercise tolerance. Echocardiogram at this time again demonstrated trivial tricuspid regurgitation without evidence of inferior vena cava stenosis or occlusion.

Discussion/Conclusion

This case demonstrates the successful surgical treatment of calcified right atrial thrombus causing severe tricuspid regurgitation and near-occlusion of the inferior vena cava. Treatment of calcified right atrial thrombi has often involved the use of anticoagulation with surgical treatment reserved for the excision of large and/or mobile thrombi [1, 2, 8]. Sufficient cross-sectional imaging and a multi-disciplinary approach are essential for accurate diagnosis to guide targeted treatment. Surgical treatment is often necessary when the presence of the calcified thrombus results in venous obstruction and disrupts the function of the tricuspid valve. Venous cannulation should be tailored to the patient's specific anatomy and right atrial calcium burden. When the tricuspid valve is involved, repair is preferred over replacement in this patient population given the propensity for calcification and thrombus formation and thus may result in an increased risk of early bioprosthetic valve degeneration or mechanical valve thrombosis.

Acknowledgements

Not applicable.

Author contributions

C.P and B.R wrote the manuscript text and prepared the figure. S.U and R.G oversaw, provided guidance, and edited the manuscript All authors reviewed the manuscript.

Funding

Not applicable.

Data availability

Not applicable.

Declarations

Ethics approval and consent to participate

See consent for participation section.

Consent for publication

The patient provided written consent for the publication of this case report.

Competing interests

The authors declare that they have no competing interests.

Received: 24 May 2023 / Accepted: 30 January 2024

Published online: 19 February 2024

References

1. Prudhvi K, Kumar K, Jonnadula J, Janardhanan R. Right atrial thrombosis provoked by central venous catheter: a Case Report. *Cureus*. 2020;12. <https://doi.org/10.7759/cureus.9027>.
2. Spencer K, Weinert L, Pentz WH. Calcified right atrial mass in a woman receiving long-term intravenous phosphate therapy. *J Am Soc Echocardiogr*. 1999;12:215–7.
3. Fabi M, Gesuete V, Testa G, Balducci A, Picchio FM, Gargiulo G. Calcified Thrombus in right atrium: rare but treatable complication of long-term indwelling central venous catheter. *Cardiol Res*. 2011;2(4):189.
4. Branco L, Serra J, Martins S, Salomao S, Roquette J. Large calcified thrombus in the right heart chambers. *Portuguese J Cardiology: Official J Portuguese Soc Cardiol*. 2000;19(10):1051–4.
5. Cisico S, Vacirca SR, Basso C, Mangino D. A rare case of a cardiac calcified thrombus originating from right atrium and inferior vena cava. *J Card Surg*. 2020;35:703–5.
6. Brungardt JG, Kasi AK, Kramer JB. Surgical removal of a calcified right atrial Mass related to venous Access Port: a Case Report. *Int J Surg Case Rep*. 2020;69:44–7.
7. Arslan C, Arapi B, Seyahi E, Tel C, Tüzün KH. Case report right ventricular thrombus and tricuspid valve dysfunction in a patient with Behçet's syndrome. *Clin Exp Rheumatol*. 2014;32(84):109–11.
8. Zhang B, Tian ZW, Zhang J, Yuan KM, Yu H. Calcified ball Thrombus in the Right Atrium: a Case Report. *Iran J Radiol*. 2020;17(1):e95169.

Publisher's Note

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