

CASE IMAGE

An imaging artifact unmasked by contrast-enhanced transesophageal echocardiography

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Yvoir, Belgium.
Email: julienhigny@hotmail.com**Key Clinical Message**

Performing transesophageal imaging of the left atrial appendage is key before cardioversion for atrial fibrillation. Ultrasound artifacts may induce misinterpretation and decrease in confidence for thrombus exclusion.

KEYWORDS

artifact, left atrial appendage, thrombus, transesophageal echocardiography, ultrasound-enhancing agent

1 | INTRODUCTION

Transesophageal echocardiography (TEE) represents the imaging modality of choice for the visual assessment of the left atrial appendage (LAA). In particular, transesophageal analysis of the LAA for thrombus exclusion or diagnosis is fundamental to improve the procedural confidence of electrical cardioversion for persistent atrial fibrillation. However, obtaining reliable image quality may sometimes be challenging because of anatomical variability and ultrasound artifacts.

2 | CASE PRESENTATION

A 62-year-old male patient was admitted to our cardiology department for the assessment of persistent atrial fibrillation. He was previously examined in another institution and dismissed for electrical cardioversion because of the presence of a bulky thrombus in the LAA. Regarding the CHA₂DS₂-VASc score calculation, we only assigned one point for hypertension, which represents a low risk for thrombosis, stroke, and systemic embolism. For this reason, we decided to control the LAA transesophageal examination. In our analysis, the biplane left ventricular ejection fraction (53.4%) and

the left atrial volume index (30 mL/m²) were normal. The LAA morphology was 'single lobe' with a large orifice (dotted line), a significant depth from the ostium (white line) and a prominent ridge between its orifice and the left-sided pulmonary vein ostium (arrowhead). Particularly, we observed a floating hyperechogenic structure (12×9 mm) in the middle part of the LAA, at the level of the ostium (arrow) (Figure 1). However, no smoke or spontaneous contrast was detected (Video S1). The color Doppler flow seemed to pass easily through this structure (Video S2). The LAA emptying velocities remained within normal values (45–50 cm/s). The hypothesis of an imaging artifact was reinforced after injection of an ultrasound-enhancing agent (UEA). We used a 0.5-mL bolus injection of SonoVue® followed by 5.0-mL saline flushes to enhance the endocardial border delineation. The opacification demonstrated an empty cavity, which confirmed a reverberation artifact generated by multiple reflections of the highly echogenic LAA ridge (Videos S3 and S4; Figure 2).

3 | DISCUSSION

Knowledge of ultrasound artifacts, pitfalls, and mimickers in two-dimensional transesophageal echocardiography is

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fundamental to avoid misinterpretation of LAA images. Understanding their mechanisms of appearance and how to avoid them with the optimal echo machine settings are fundamental to recognizing and differentiating them

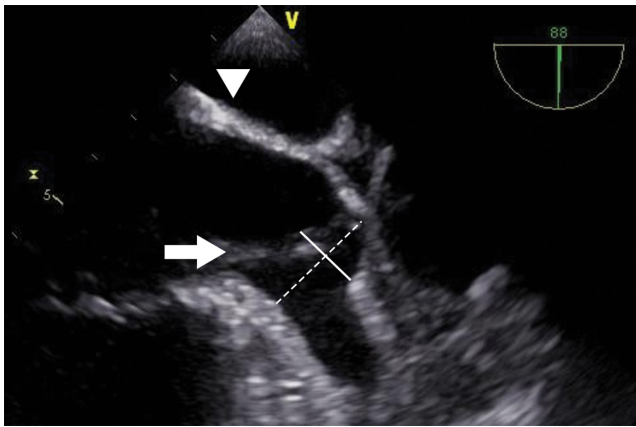


FIGURE 1 Transesophageal ultrasound imaging of the left atrial appendage (LAA) (88° probe rotation). This image illustrates a reverberation artifact (arrow) arising from the ridge between the LAA and the left upper pulmonary vein (arrowhead) and mimicking a thrombus.

from real atrial thrombosis. In particular, reverberation artifacts are typically seen when highly reflective surfaces are imaged in the same acoustic window.¹ Spontaneous echo contrast and prominent pectinate muscles may also interfere with the diagnosis or exclusion of LAA thrombi.² In these situations, use of ultrasonic contrast agents may help to optimize image acquisition by enhancement of endocardial border delineation and opacification of the left-sided cardiac cavities.³ In addition, this procedure may facilitate the diagnosis or exclusion of LAA thrombus in patients awaiting conversion of atrial fibrillation to sinus rhythm.

Finally, assessing the LAA morphology with the 2D xPlane mode may provide some insights into the differentiation between artifact and thrombus. In particular, the unusual body location of the suspected thrombus without evidence of appendage wall adhesion should reinforce the diagnostic hypothesis of a mimicker (Figure 3). Furthermore, in experienced hands, considering the absence of spontaneous echo contrast, normal pulsed wave Doppler measurements, preserved left ventricular systolic function, and normal left atrial volume should facilitate the diagnosis of artifact.

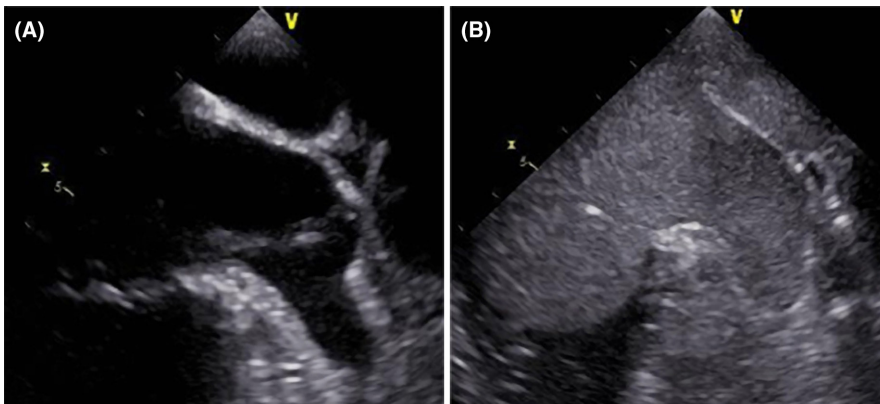


FIGURE 2 Pre- and post-contrast-enhanced transesophageal echocardiography evaluation of the left atrial appendage (LAA). The previously detected hyperechogenic material (A) has been suppressed by contrast echocardiography after complete opacification of the LAA cavity (B).

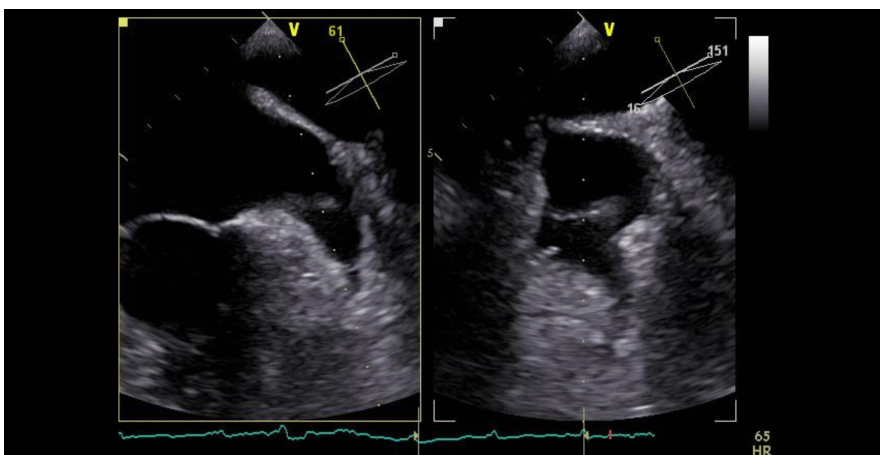


FIGURE 3 Transesophageal segmental sweep analysis of the left atrial appendage (LAA) with 2D xPlane imaging. These two perpendicular anatomic planes demonstrate a floating hyperechogenic structure in the middle part of the LAA without evidence of appendage wall adhesion.

4 | CONCLUSION

This report reminds us that the adjunctive use of UEAs may help to differentiate artifacts from thrombus by improving cardiac structural definition. Furthermore, contrast-enhanced analysis of the LAA may help to increase the level of confidence for thrombus exclusion before electrical cardioversion.

AUTHOR CONTRIBUTIONS

Colin Hanneke: Data curation; writing – original draft.

Martin Benoit: Investigation. **Julien Higny:** Writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to declare.

DATA AVAILABILITY STATEMENT

The data sets generated during the current report are available from the corresponding author on reasonable request.

CONSENT

Written informed consent was obtained from the patient to publish this report for educational/research

purposes in accordance with the journal's patient consent policy.

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REFERENCES

1. Bertrand PB, Levine RA, Isselbacher EM, Vandervoort PM. Fact or artifact in two-dimensional echocardiography: avoiding misdiagnosis and missed diagnosis. *J Am Soc Echocardiogr.* 2016;29(5):381-391. doi:10.1016/j.echo.2016.01.009
2. Lozier MR, Sanchez AM, Mihos CG. A systematic review on the use of ultrasound enhancing agents with transesophageal echocardiography to assess the left atrial appendage prior to cardioversion. *Echocardiography.* 2021;38(8):1414-1421. doi:10.1111/echo.15150
3. Porter TR, Mulvagh SL, Abdelmoneim SS, et al. Clinical applications of ultrasonic enhancing agents in echocardiography: 2018 American Society of Echocardiography guidelines update. *J Am Soc Echocardiogr.* 2018;31(3):241-274. doi:10.1016/j.echo.2017.11.013

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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