



Contrast echocardiography assisted in the diagnosis of complications during minimally cardiac invasive surgery: case report

Natsumi Morisako¹ · Tsukasa Iwasaki¹ · Yasuyuki Kato² · Tadanobu Irie¹

Received: 10 July 2024 / Revised: 10 July 2024 / Accepted: 23 July 2024
© Japanese Society of Echocardiography 2024

Introduction

Standard color Doppler assessment during intraoperative transesophageal echocardiography may sometimes be insufficient due to blood flow velocities.

Case presentation

A 22-year-old male with right heart enlargement on transthoracic echocardiography was diagnosed with a secundum atrial septum defect (ASD) on transesophageal echocardiography (TEE). Cardiac catheterization revealed left to right shunt with a Qp/Qs ratio of 2.9. Due to the large size of the ASD (35 × 29 mm), the ASD closure by minimally invasive cardiac surgery (MICS) was performed instead of the transcatheter closure. After ASD closure, color Doppler imaging during intraoperative TEE revealed that the blood flow via the superior vena cava (SVC) was entering not only the left atrium but also the right atrium (Fig. 1, left panel).

Therefore, for intraoperative diagnosis, bubbles were injected into the peripheral vein of the right upper extremity as a contrast echocardiography. Subsequently, bubbles appearing simultaneously in the left and right atrium suggest that the patch suture of the superior side extended to the SVC (Fig. 1, right panel). Afterward, a median sternotomy was performed for the subsequent repair.

Discussion

Contrast echocardiography has been reported as a useful method for a diagnostic purpose [1]. Compared to median sternotomy, it is often challenging to secure a clear whole view in MICS. In our case, bifurcated blood flow from the SVC on color Doppler imaging would indeed suggest an inappropriate suture extending into the SVC which was confirmed by contrast echocardiography.

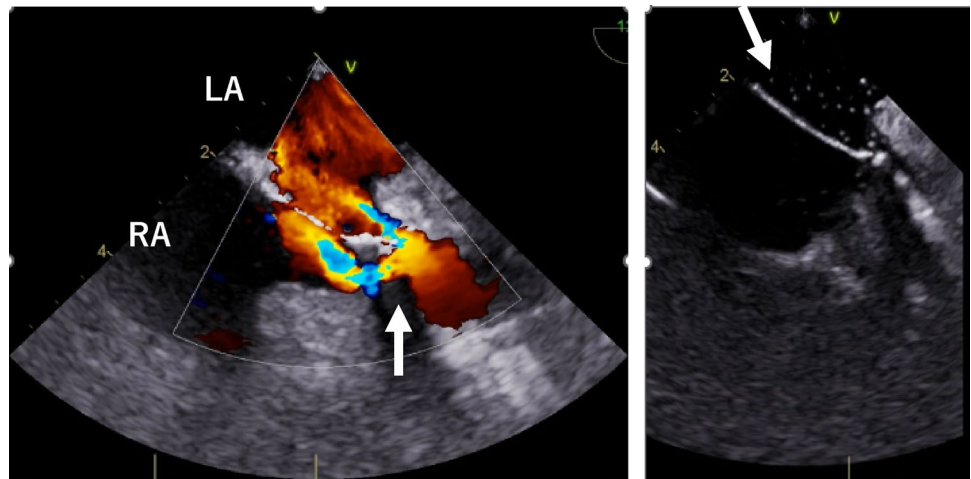
Some case reports demonstrated the usefulness of contrast echocardiography in intraoperative TEE. Maddali et al. [2] reported a case where residual ventricular septal defect (VSD), undetectable by color Doppler, was identified using contrast echocardiography. Similarly, Jeans et al. [3] reported a case where closure insufficiency in left atrial appendage closure surgery was revealed. Even after reducing the Nyquist limit, the assessment by color Doppler imaging remained insufficient in both cases. Bommer et al. [1] reported an incidence rate of air embolism with contrast echocardiography at 0.062%. Furthermore, another report indicated that only 2–3% of patients with grade 3 or higher shunts experience paresthesia and migraine, while those with grade 3 or lower shunts have no adverse events [4]. However, the safety of contrast echocardiography under using the cardiopulmonary bypass is unclear. For intraoperative diagnosis, it is important to consider the advantages and disadvantages of techniques such as contrast echocardiography and color Doppler imaging in an optimal manner.

✉ Natsumi Morisako
kuma.snowman7@gmail.com

¹ Department of Cardiology, Cardiovascular Center, Saitama Sekishinkai Hospital, 2-37-20, Sayama, Saitama, Japan

² Department of Cardiovascular Surgery, Cardiovascular Center, Saitama Sekishinkai Hospital, Sayama, Saitama, Japan

Fig. 1 Left panel: post-ASD patch closure. The arrow appeared to show bifurcated blood flow from SVC to the right and left atrium in color Doppler imaging. But under only color Doppler evaluation, we cannot confident that its flow is from SVC. Right panel: contrast echocardiography revealed bubbles (arrow) in the right and left atrium



Data availability This paper is a case report and is not applicable.

References

1. Bommer WJ, Shah PM, Allen H, et al. The safety of contrast echocardiography: report of the Committee on Contrast Echocardiography for the American Society of Echocardiography. *J Am Coll Cardiol.* 1984;3:6–13.
2. Maddali MM, Sanjeev GN, Al-Delamie TY, Al-Farqani A, et al. Arterial desaturation and left atrial contrast opacification after tetralogy of Fallot repair. *J Cardiothorac Vasc Anesth.* 2013;27:631–3.
3. Santana JM, Rosell FM, Dave B, El Manafi A, et al. Intraoperative echocardiographic contrast opacifies the left atrial appendage and assists in surgical exclusion. *Ann Card Anaesth.* 2022;25:77–80.
4. Jeon DS, Luo H, Iwami T, Miyamoto T, et al. The usefulness of a 10% air–10% blood–80% saline mixture for contrast echocardiography: Doppler measurement of pulmonary artery systolic pressure. *J Am Coll Cardiol.* 2002;39:124–9.

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

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.