

Paradoxical Interatrial Shunt During Cardiopulmonary Bypass - Transesophageal Echocardiography to the Rescue

To the Editor,

Left atrial (LA) vent may cause an unexpected paradoxical shunt during cardiopulmonary bypass (CPB) with serious hemodynamic consequences. Its timely detection is crucial which often requires comprehensive echocardiography and surgical evaluation. We report a case of transient hypoxemia due to LA vent where the intraoperative

transesophageal echocardiography (TEE) was instrumental in the identification of the problem and its successful management. The patient gave written informed consent for the publication of this case.

A 39-year-old male, weighing 58 kg (body surface area 1.71 m²) with severe rheumatic aortic stenosis and left

ventricular ejection fraction of 55% was scheduled for an autologous pericardial patch reconstruction of the aortic valve using the Ozaki technique. In the operating room, after anesthetizing the patient, an adult X7-2t, 3–8 MHz TEE probe (Phillips CVx, Koninklijke Phillips, N.V., USA) was inserted, which confirmed the diagnosis with no additional findings. Surgery proceeded with an institution of CPB using 20 Fr aortic and 34/36 Fr dual-stage venous cannula (Medtronic, USA) along with a 16 Fr vent into LA through the right pulmonary vein and cardioplegic arrest. After declamping of aorta, once the heart started beating while on CPB, the surgeon noticed deoxygenated blood in the LA vent and aortic root. A CPB full flow was maintained and the fraction of inspired oxygen (FiO₂) was increased to 100%. Repeat ACT showed 525 s while arterial blood gas (ABG) showed partial pressure of oxygen (PaO₂) of 380 mm Hg. The lungs were inflated using a recruitment maneuver; however, it did not improve the condition. TEE examination showed an atrial communication with a right to left shunt and a leftward bowing of the interatrial septum [Figure 1, Video 1]. Before termination of CPB, as the LA vent flow was decreased from 200 ml/min to minimal, the shunt decreased in size and completely ceased after stopped the vent. The patient was uneventfully weaned off from CPB. A relook of TEE after the termination of CPB showed an intact interatrial septum and no shunt. An agitated saline contrast echo with the Valsalva maneuver did not show any bubble appearing on the left side of the heart.

Intermittent right to left atrial shunt with hypoxemia has been demonstrated in patients with a synchronous

left ventricular or biventricular assist device.^[1,2] This may occur because of a relative increase in right heart pressures due to left heart unloading, pulmonary artery hypertension, or the use of high positive end-expiratory pressure (PEEP). A pro-active search for patent foramen ovale (PFO) is required in patients with migraine, cryptogenic embolus,^[3] or those undergoing left ventricular assist device (LVAD) implantation^[4] and heart transplantation. In our patient, a shunt could have appeared because of the negative pressure LA vent. Additionally, there could have been either an iatrogenic septal injury or a previously missed PFO; however, the agitated saline test with the Valsalva maneuver did not reveal right to left shunt across PFO. As the shunt appeared only in the presence of vent induced negative pressure and ceased after stopping it, we did not close PFO and avoided right atriotomy.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

Avneet Singh, Bhupesh Kumar, Subhashish G. Niyogi, Sheenam Walia, Shyam K. S. Thingnam¹

Department of Anesthesia and Intensive Care, ¹Cardiothoracic and Vascular Surgery, Postgraduate Institute of Medical Education and Research, Chandigarh, India

Address for correspondence: Dr. Bhupesh Kumar, Professor, Anesthesia and Intensive Care, Room No 4003, 4th Floor, Advanced Cardiac Centre, Postgraduate Institute of Medical Education and Research, Chandigarh - 160 012, India. E-mail: bhupeshkr@yahoo.com

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REFERENCES

- Kilger E, Strom C, Frey L, Felbinger TW, Pichler B, Tichy M, *et al*. Intermittent atrial level right-to-left shunt with temporary hypoxemia in a patient during support with a left ventricular assist device. *Acta Anaesthesiol Scand* 2000;44:125-7.
- Vélez-Martínez M, Albaugh MA, Amin AA, Thibodeau JT,

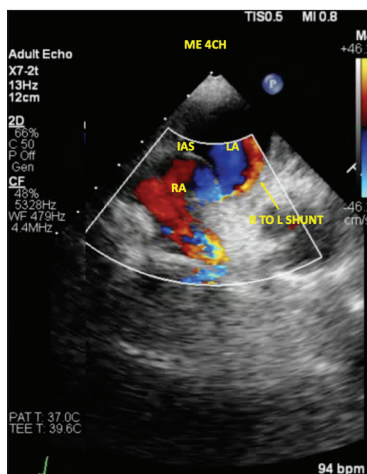


Figure 1: Transesophageal echocardiography mid-esophageal four-chamber view showing a leftward bulging interatrial septum and right to left shunt across the septum during initiation of bypass separation. (IAS: interatrial shunt; LA: left atrium; RA: right atrium; R to L shunt: right to left shunt; ME4CH: mid-esophageal four-chamber view)


Mammen PP, Markham DW, *et al.* Hypoxemia in a patient with biventricular HeartWare® ventricular assist devices. *Mechanical Circulatory Support* 2013;4:1. doi: 10.3402/mcs.v4i0.22638.

3. Argenziano M. PRO: The incidental finding of a patent foramen ovale during cardiac surgery: Should it always be repaired? *Anesth Analg* 2007;105:611-12.
4. Liao KK, Miller L, Toher C, Ormaza S, Herrington CS, Bittner HB, *et al.* Timing of transesophageal echocardiography in diagnosing patent foramen ovale in patients supported with left ventricular assist device. *Ann Thorac Surg* 2003;75:1624-6.

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