

'Pseudo'-D-shaped septum post-left ventricular assist device implantation

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Patients implanted with left ventricular assist devices (LVADs) are subject to altered cardiac physiology. Differences in pump speed setting may affect biventricular chamber size and function and can induce changes to the geometry and position of the interventricular septum (IVS).¹ In this article, we present an unusual and underreported case of a 'pseudo'-D-shaped IVS in an LVAD patient.

A 63-year-old man with a HeartMate II LVAD (pump speed 9000 RPM) presented to the outpatient clinic with frequent low pulsatility index (PI) events. Mean blood pressure was 83 mmHg and the patient's fluid intake was 2 L per day. A cardiac computed tomography scan excluded mechanical obstruction in the inflow or outflow cannulas but indicated significant right ventricular (RV) dilatation. Transthoracic echocardiography confirmed a severely dilated RV, small left ventricular (LV) chamber, non-opening aortic valve and an

early diastolic leftward shift of the IVS, creating a 'D-shaped' septum as seen in a volume overloaded RV (Figure 1; Supplementary material online, Videos S1 and S2). There was no clinical or echocardiographic explanation for RV volume or pressure overload, which led to the possibility that the 'pseudo' D-shaped septum was related to suction of the LV due to relatively high LVAD speed settings. After stepwise lowering of the LVAD speed to 8400 RPM, the D-shaping of the LV and the frequent PI events diminished (Figure 2; Supplementary material online, Video S3).

In this case, an overly high degree of LV unloading resulted in a volume overloaded RV and subsequent under filling of the LV, causing low flow events. This combined with reduced pulmonary capillary

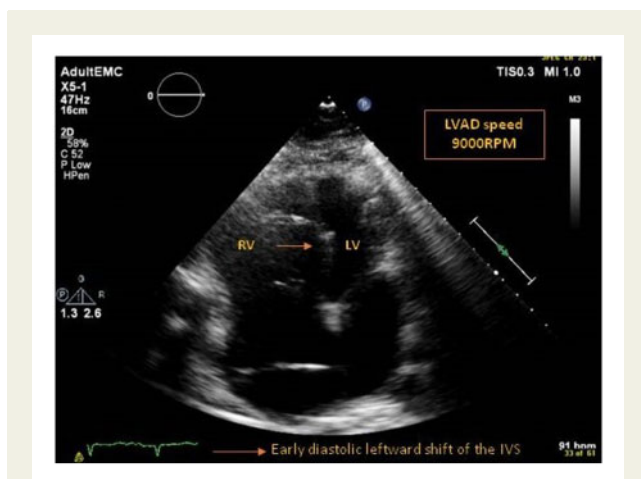


Figure 1 Apical four-chamber view demonstrating a leftward diastolic shift of the interventricular septum, a markedly small left ventricular cavity and severely dilated right heart. Left ventricular assist device pump speed is 9000 RPM.

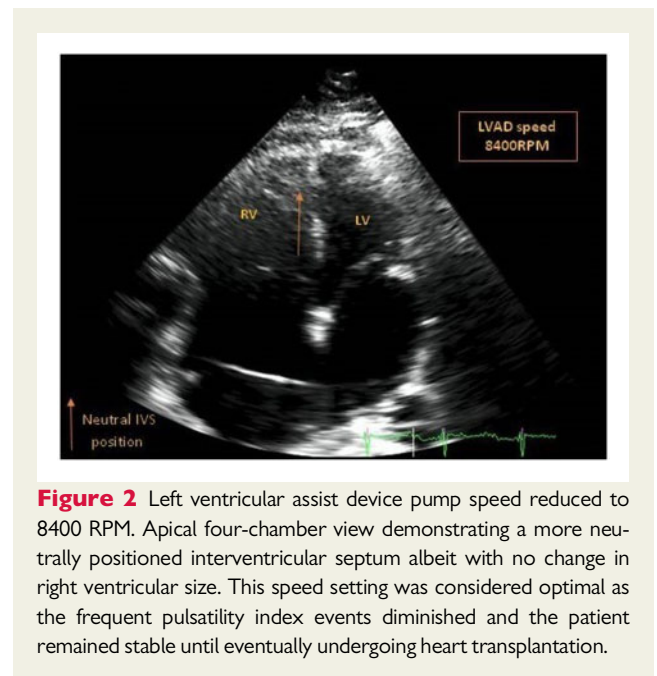


Figure 2 Left ventricular assist device pump speed reduced to 8400 RPM. Apical four-chamber view demonstrating a more neutrally positioned interventricular septum albeit with no change in right ventricular size. This speed setting was considered optimal as the frequent pulsatility index events diminished and the patient remained stable until eventually undergoing heart transplantation.

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wedge pressure led to a marked diastolic leftward septal shift.^{2,3} Low flow events may also be due to RV failure, ventricular arrhythmias, hypovolaemia or hypertension¹ leading to a difficult diagnosis for the cardiologist.

In patients with no obvious cause of RV pressure or volume overload, the 'pseudo'-D-shaped septum may be seen secondary to a high LVAD pump speed and subsequent distortion of interventricular dependence.

Supplementary material

Supplementary material is available at *European Heart Journal - Case Reports* online.

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and

associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: none declared.

References

1. Stainback RF, Estep JD, Agler DA, Birks EJ, Bremer M, Hung J, Kirkpatrick JN, Rogers JG, Shah NR. Echocardiography in the management of patients with left ventricular assist devices: recommendations from the American Society of Echocardiography. *J Am Soc Echocardiogr* 2015;**28**:853–909.
2. Addetia K, Uriel N, Maffessanti F, Sayer G, Adatya S, Kim GH, Sarswat N, Fedson S, Medvedofsky D, Kruse E, Collins K, Rodgers D, Ota T, Jeevanandam V, Mor-Avi V, Burkhoff D, Lang RM. 3D morphological changes in LV and RV during LVAD ramp studies. *JACC Cardiovasc Imaging* 2018;**11**:159–169.
3. Sack KL, Dabiri Y, Franz T, Solomon SD, Burkhoff D, Guccione JM. Investigating the role of interventricular interdependence in development of right heart dysfunction during LVAD support: a patient-specific methods-based approach. *Front Physiol* 2018;**9**: 520.