Complete aortic valve fusion after HeartMate II left ventricular assist device support

Gallen T, Lau W, Mehta A
Cleveland Clinic, Cleveland, OH, USA

Introduction: End-stage heart failure patients have limited therapeutic options: hospice, Left Ventricular Assist Device (LVAD) as a bridge to transplant, a bridge to destination or as a bridge to recovery. They support the malfunctioning heart by redirecting blood flow from the left ventricle (LV) to the ascending aorta. This maintains systemic circulation and decompresses the LV(1). While device technology has improved, the consequences of non-pulsatile blood flow both on cardiac and end-organ function are unclear. We present a case of LVAD explantation with the finding of complete fusion of a bicuspid aortic valve on intraoperative transesophageal echocardiography (TEE).

Case Presentation: A 37 year old female developed heart failure symptoms during a pregnancy that worsened postpartum. She presented to our institution in acute decompensated heart failure and a LVAD was emergently placed as a bridge to transplantation. Initial TEE revealed a functionally unicuspid though patent aortic valve. Ten months later she presented for orthotopic heart transplantation and LVAD explantation. Intraoperative TEE demonstrated no aortic valve opening. On the midesophageal aortic valve short axis view, there was complete fusion of the two coronary cusps. Upon pathologic examination of the native aortic valve, gross examination revealed a calcified, bicuspid aortic valve with completely fused leaflets.

Discussion: When the LVAD is operating, continuous unloading of the LV can lead to prolonged closure of the aortic valve. Several studies have examined explanted heart tissue post-transplant. Letsou et al examined 33 consecutive patients receiving LVAD support, both implantable pneumatic and vented electric, examining the native valve upon death or transplantation. 17 of their 33 patients had some degree of native aortic valve fusion, 4 had a two commissure fusion while 13 had fusion at only one commissure(2). Partial fusion of aortic valve leaflets which were supported by LVADs has been reported by several other authors upon gross examination of explanted hearts(3) as well as by TEE(4).

This is the first description of complete fusion of a bicuspid aortic valve diagnosed by intraoperative TEE in a patient on LVAD support. In this case, TEE color flow Doppler, 2-D imaging and pathologic examination confirmed fusion of the leaflets. Certainly congenitally bicuspid valves have a propensity for premature fibrosis, stiffening and calcium deposition placing them at greater risk for aortic stenosis. In the event of prolonged leaflet coaptation due to reduced or absent LV ejection in conjunction with severely decreased systolic function and altered flow states local fibrosis and cusp fusion is predictable. In order to maintain leaflet mobility, brief periods of unassisted ventricular ejection may be helpful by allowing antegrade flow through the valve. Complete aortic valve fusion is of significant consequence, particularly in a bridge to recovery situation and maintenance of aortic valve leaflet mobility is preferable.

References:
4) J Am Soc Echocardiogr 2006;19:1401.e1-e3
5) Circulation 2002;106:900-904