A Novel Echocardiographic Window for the Evaluation of the Outflow Graft in HeartMate 3 Left Ventricular Assist Devices

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Background: Echocardiographic assessment of the outflow graft is challenging and generally limited to the level of the anastomosis with the ascending aorta.

Method: At LVAD implant, the outflow graft courses along the inferior margin of the RV, up along the RV and RA before anastomosing with the ascending aorta. On this basis, we hypothesized that the outflow graft may be visualised using a shallow subcostal window with the probe tilted almost parallel to the abdominal wall. We evaluated 40 consecutive patients with HeartMate 3 LVAD using this shallow subcostal echocardiographic window at the routine 6-month assessment. The pump parameters were recorded at the same time.

Results: Of the 40 patients, 5 patients died before the study and the outflow graft was not seen in 7 patients (1 descending aorta anastomosis). Hence, the outflow graft could be visualised in 28 of 35 patients (80%). The colour Doppler and velocity time integral (VTI) of the outflow graft are shown in FIGURE, with the systolic 's' and diastolic 'd' waves marked (note electrocardiogram for timing). The latter also demonstrates the characteristic flow pattern generated by the 'artificial pulse' that is asynchronous to the intrinsic LV contraction (the horizontal double arrow indicates the 2 second cycle length of the artificial pulse).

The calculated pump flow correlated with the displayed pump flow (R^2=0.69, p<0.001). Despite the strong correlation, there is poor agreement on the Bland-Altman test. The 'pulsatility' could also be assessed based on the ratio of s and d flow on Doppler [FIGURE 2]. There is a strong correlation between the displayed pulse index and the s/d ratio (R^2=0.52, p<0.001).

Conclusion: we have described a shallow subcostal echocardiographic window to interrogate the LVAD outflow graft. This echocardiographic technique offers an alternative imaging modality for the assessment of the outflow graft in patients with HeartMate 3 LVAD.