Use of left ventricular flow mapping in echocardiographic optimization of atrioventricular delay†

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Optimal atrioventricular delay (AVD) in a patient with cardiac resynchronization therapy (CRT) showed discrepant values between the ‘iterative method’ (80 ms), left ventricular outflow tract (LVOT) velocity-time integral (VTI) (120–140 ms), and flow mapping based, defined as the shortest interval at which the ejection and transmitral filling curves did not overlap (140 ms).

At an AVD of 140 ms, a vortex redirecting flow from the inflow to the outflow tract was visualized (Panel A) and energy dissipation due to flow collision was low (Panel B). Time-flow graphic representation shows complete LV filling prior to ejection (Panel C). An AVD of 80 ms showed incomplete vortex development, and the absence of flow redirection towards LVOT leading to ‘filling-ejection’ flow collision in the submtral region (Panel D) and increased kinetic energy dissipation (Panel E). Despite a non-truncated A-wave, the final phase of the inflow was compromised due to collision with simultaneous ejection flow directed towards the LVOT (Panel F). Finally, AVD was programmed at 140 ms. One month later, the patient referred improvement in his functional status and no symptoms of heart failure.

Vector flow mapping (VFM) is an echocardiographic technique that allows simultaneous definition of flow behaviour in the whole left ventricle. Intraventricular flow analysis provides additional insight into diastolic–systolic coupling through vortex formation, smooth flow redirection, and energy preservation. This additional data may be relevant to define optimal cardiac resynchronization, especially when the interpretation of spectral Doppler signals is challenging. In the case here presented, the most commonly used ‘iterative method’ provided misleading information.