Intraventricular dyssynchrony

Courtesy of Professor Jing Yao, Nanjing Drum Tower Hospital

Patient history

The patient is a 80-year-old male with chest tightness accompanied by mild lower limb edema for the past two years and a history of hypertension for over 20 years. ECG reveals sinus rhythm and complete left bundle branch block (CLBBB) with QRS duration 178 ms. Transthoracic echocardiography (TTE) indicates left ventricle dilation and dysfunction, asynchronous left ventricular contraction, moderate functional mitral and tricuspid regurgitation, and a small amount of pericardial effusion.

Challenges

The patient is presenting for the first time with left ventricle dilation and dysfunction, and concomitant CLBBB. The course of CLBBB is unclear. It is challenging to determine whether the patient has dilated cardiomyopathy with CLBBB or CLBBB-induced cardiomyopathy.

System, probe & device used

The system used is the Vivid E95 Ultra Edition and a M5sc-D probe.

Step-by-step procedure

Cardiac dyssynchrony analysis with TTE:

1. **Intraventricular dyssynchrony:** Septal flash on the colour M-mode, PSD = 220msms, myocardial work parameter: GWE = 55%.
2. **Interventricular dyssynchrony:** Interventricular mechanical delay (IVMD) = 110ms.
3. **Atrioventricular dyssynchrony:** E and A waves are merged. Termination of the A wave occurs after QRS onset.

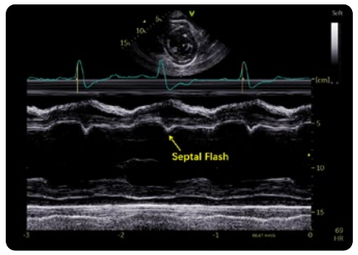
Conclusion

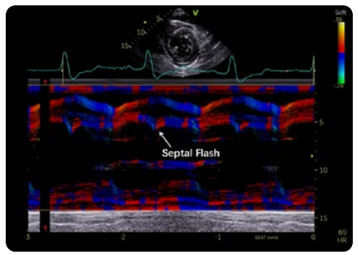
The analysis of conventional echocardiography and speckle tracking imaging techniques reveals significant intra-ventricular, inter-ventricular, and atrioventricular dyssynchrony in this patient. The myocardial work parameters, particularly, provide a more intuitive display of abnormalities in both segmental and global myocardial performance.

Imaging follow-up

One week post-implantation, the patient's symptoms improved, and the echo showed improvements in left ventricular dimension, function and myocardial work parameters. In the follow-up examination after four months, the patient remained asymptomatic, and various echocardiographic parameters continued to show further improvement.

Intraventricular dyssynchrony: Septal flash demonstrated on the M-mode (left) and colour M-mode (right).





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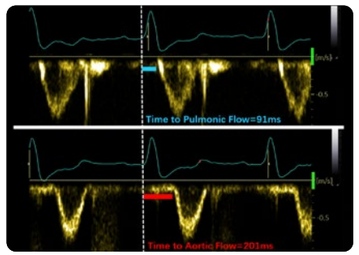
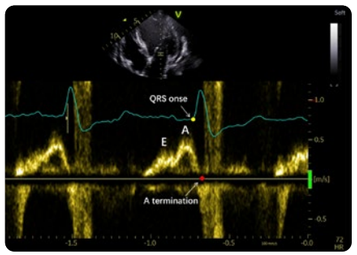
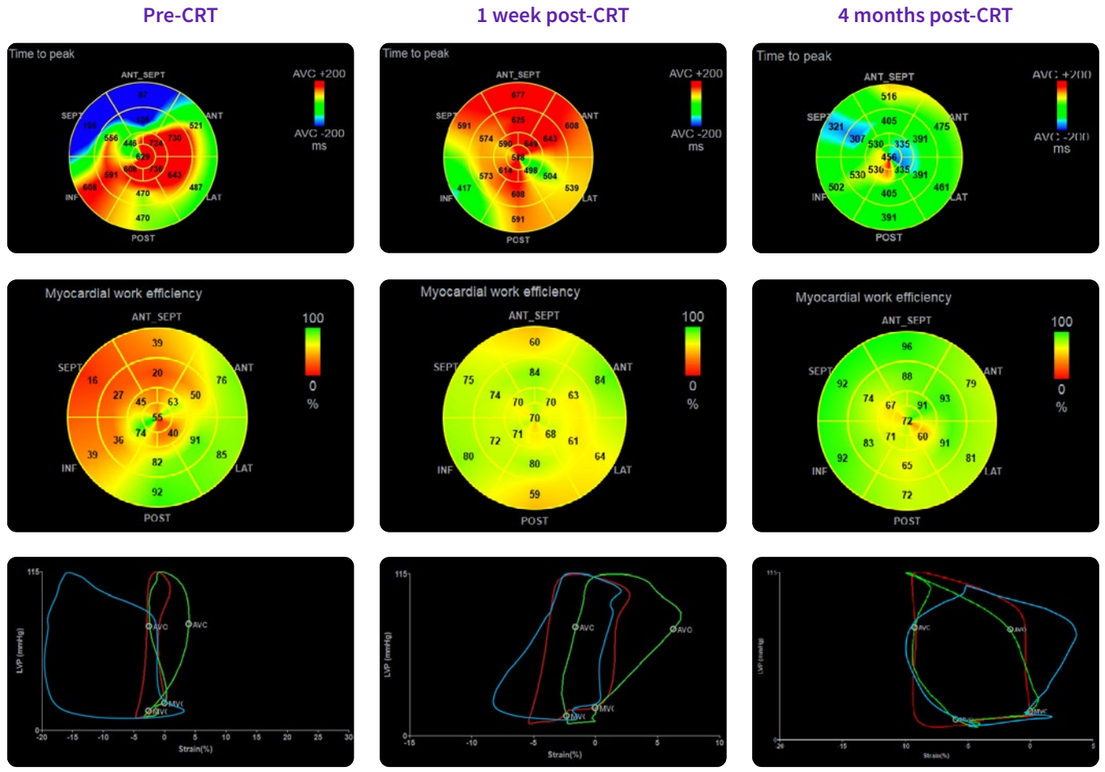


Atrioventricular dyssynchrony: Pulse Doppler mitral inflow (sample volume at mitral annular) revealed the fusion of E and A waves. The termination of the A wave occurs after QRS onset.





Bullseye plots of segmental strain peak timing (the first row), segmental myocardial work efficiency (the second row) and the pressure-strain loop for the left ventricle (red), basal septum (green) and basal lateral segment (blue) before (left column), one week after (middle column), and four months after (right column) CRT implantation.

Parameter	Pre-CRT	1 week post-CRT	4 months post-CRT
LVDd (mm)	67	62	44
LVEDV (ml)	230	211	120
LVEF (%)	25.4	34.5	52.3
GLS (%)	-5	-6	-10.2
PSD (ms)	220	-75	-18
Twist (°)	0.89	0.69	8.95
Torsion (°/cm)	0.10	0.08	1.10
GWI	403	671	898
GCW (mmHg)	920	1163	1198
GWW (mmHg)	679	502	283
GWE (%)	55	71	80

The changes in left ventricular structure and functional parameters before and after CRT implantation

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