The impact of diastolic flow kinetic energy loss of the left ventricle on cardiac output (Q) in patients with tetralogy of Fallot

Saikawa Y., Yasukochi S., Nakano Y., Takigiku K., Tazawa S., Ebina S., Shibata A., Hidaka E. Nagano Children's Hospital Azumino-Shi Nagano Japan

Introduction (or Basis or Objectives): The impact of diastolic flow energetics on cardiac output remains unknown. We investigated the impact of intra-cardiac blood flow kinetic energy loss (EL) on cardiac output in patients after the definitive surgical repair of tetralogy of Fallot (TOF), by using a novel echocardiographic imaging modality of Vector Flow Mapping (VFM).

Methods: The subjects were 24 pts with TOF (age; 13.9 +/- 7.4 y, interval from surgical repair; 143 +/- 64 months) and 16 normal healthy children (8.9 +/- 4.6 y).
The three chamber view of the left ventricle (LV) with color Doppler was recorded by Prosound F75 (Hitachi-ALOKA, ltd) with VFM mode. Then we calculated EL (mW) from the reconstructed velocity vector components transformed into Cartesian coordinate system as previously reported by Itatani K. (Jpn J Appl. Phys 2013;52:07HF16). The EL data were indexed by measuring a ratio of EL to the inflow kinetic energy (KEin) through mitral valve in diastole. Cardiac output (Q) was calculated from velocity-time integral and cross-sectional area of LVOT.

Results: EL/KEin was significantly higher in TOF (0.21 +/- 0.16) than in N (0.06 +/- 0.03). In TOF, EL/KEin had a negative correlation with Q (R²=0.54, p=0.000231).

Conclusions: The diastolic blood flow energy loss contributes to cardiac output (Q) in TOF.