

Abstract: Visualization and quantification of alterations in flow is particularly challenging in congenital heart disease (CHD). Four-dimensional (4D) flow-sensitive magnetic resonance imaging offers unique opportunities to investigate complex flow patterns in patients with CHD. This presentation will review the use of 4D flow MRI in CHD, including

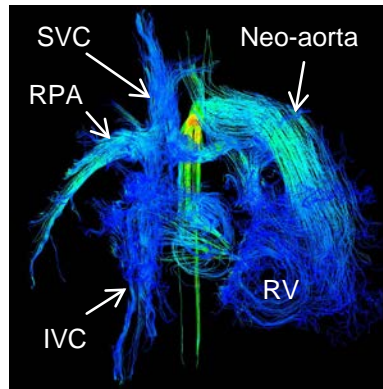
1. MR angiography
2. Flow visualization
3. Flow quantification.

Following this presentation, attendees should be able to

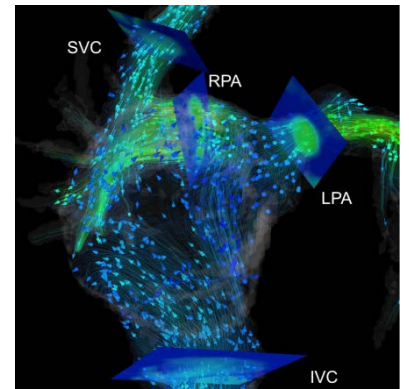
1. Describe how 4D flow MRI is different from 2D flow MRI for flow visualization and quantification
2. Differentiate between various flow visualization methods, such as streamlines, particle traces, and velocity vectors
3. Evaluate the evidence on the use of 4D flow MRI in congenital heart disease.



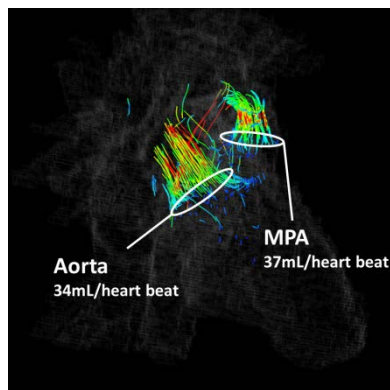
**Figure 1** – Volume rendered MRA from 4D flow MRI in 6 month-old with congenital pulmonary vein stenosis.



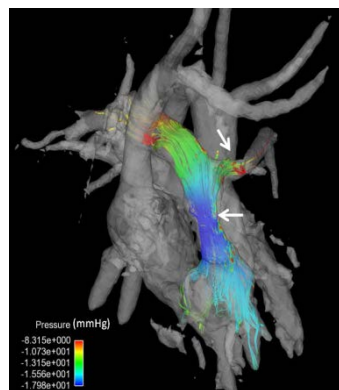
**Figure 2** – Velocity streamlines from 4D flow MRI in patient with hypoplastic left heart syndrome status post Norwood.



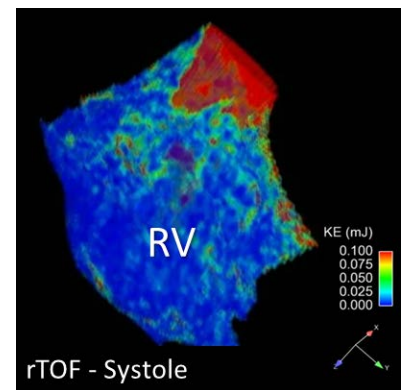
**Figure 3** – Velocity vector fields from 4D flow MRI in patient with extra-cardiac Fontan.



**Figure 4** – Flow quantification with 4D flow MRI is simplified with retrospective quantification in all vessels within imaging volume.



**Figure 5** – Pressure gradient mapping from 4D flow MRI in patient with pulmonary artery stenosis.



**Figure 6** – Kinetic energy map of right ventricle in patient with repaired tetralogy of Fallot.