Concepts for interventional MRI and computer assisted surgery in congenital heart diseases

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An integrated approach to assess ventricular pump function, diastolic compliance, myocontractility and vascular function would be of high clinical value. To date, MRI is considered the gold standard for quantifying ventricular volumes and blood flow and recent advances in fast imaging techniques made MRI catheterization a reality. The combination of invasive pressures with MRI derived volumes was demonstrated to provide accurate estimates of the endsystolic pressure-volume relationship, which is considered the optimal quantification of systolic ventricular function. In addition, MRI catheterization was shown to provide accurate vascular resistance measurements. We recently extended and validated this method for additional acquisition of diastolic compliance and demonstrate the clinical utility of MRI catheterization in the assessment in patients with complex hemodynamique conditions.

As an adjunctive to the acquisition of hemodynamique data we aim to improve the capabilities of post-processing of anatomic 3D MR images. In a recent study we could demonstarte the clinical utility of realistic cast models for surgical decision making in patients with complex congenital heart diseases. Our current work focusses on further improving 3D MR imaging modalities and to integrate concepts of compurter assisseted surgery into the obtained cast models.