MRI Protocol for Repaired Tetralogy of Fallot

W. James Parks, MSc., MD

Pediatric Cardiologist
Assistant Professor of Pediatrics and Radiology

Children’s Healthcare of Atlanta
Sibley Heart Center Cardiology

Emory University School of Medicine
MRI Protocol for Repaired Tetralogy of Fallot

I. Introduction:

Tetralogy of Fallot is one of the most common forms of cyanotic heart disease affecting the newborn with reports approaching 5-6% of all patients with congenital heart disease (1). The defect results primarily from anterior displacement of the outflow septum resulting in a ventricular septal defect with overriding of the aorta, right ventricular (RVOT) outflow tract obstruction and leading to right ventricular hypertrophy.

Surgical correction is directed toward relief of RV outflow with removal of infundibular muscular obstruction, performance of a pulmonary valvotomy and closure of the ventricular septal defect (VSD). Surgical repair may be complicated by anatomic variation which complicates the desired repair and may leave or result in undesired residual lesions, volume loading issues and functional embarrassment (2).

II. Clinical Concerns:

Survival rates and surgical outcomes are excellent however, long term assessment of RV function, volumes and residual lesions in addition to interval developments such as tricuspid regurgitation, RV dysfunction, RV dilatation, residual outflow obstruction or pulmonary artery stenosis, flows and hypoplasia is clinically necessary (3,4,5,6) to improve long term outcome and reduce morbidity.

III. Magnetic Resonance Imaging (MRI):
The imaging and flow assessment techniques available through MRI are abundantly and ideally suited for the assessment and understanding of the complexities surrounding repair of tetralogy of Fallot.

1. Anatomy / Residual Vascular Lesions:

Black blood (spin echo) and Steady State Free Precession (SSFP) Imaging

   a. RV anatomy
   b. RVOT (aneurysm) – transannular patch / conduit
   c. Main and branch pulmonary arteries
   d. Left ventricle and outflow tract
   e. Aorta

2. Ventricular Volume, Mass and Function:

   a. Biventricular short-axis acquisition, multislice multiphase gradient echo
   b. Four-chamber view acquisition wall motion and dyssynchrony

3. Pulmonary Flow and Regurgitation:

   Phase Contrast Imaging and Direct Gradient and Flow Quantification

   a. Branch pulmonary arteries
   b. Right ventricular out flow tract
   c. Left ventricular outflow tract
   d. Atrioventricular valves
4. **Contrast Enhanced Angiography and 3-D Imaging:**
   a. Three-dimensional volume rendering
   b. Peripheral vascular angiographic assessment
   c. Delayed enhancement imaging (four-chamber and short-axis)

5. **Summary**

**Literature:**


