Safety, feasibility, and diagnostic value of cardiac magnetic resonance imaging in patients with congenital heart disease and MRI-conditional pacemaker systems

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Introduction: In CHD patients, cardiac MRI (cMRI) is increasingly becoming the modality of choice for functional and anatomical imaging. With the recent introduction of MRI-conditional pacemaker systems (PMs), cMRI could also become accessible for CHD patients with PMs. Our aim was to analyse safety, feasibility and diagnostic value of cMRI in patients with CHD and MRI-conditional PMs.

Methods: CHD patients with MRI-conditional PMs and a clinical need for cMRI were examined with a 1.5 T MRI system (Philips Medical Systems, Best, the Netherlands). Specific absorption rate (SAR) was kept below 2 W/kg. Lead function was tested before and after cMRI. Image quality (IQ), relating to artefacts caused by device and PM leads, and diagnostic value (DV) were evaluated for each examination according to Naehle et al.¹ by 2 experienced investigators in consensus using a 4-point grading scale.

Results: Six patients (mean age 32.9 years, range 19.5 - 51.3 years) underwent a total of eight cMRI examinations. Diagnoses were dTGA after atrial redirection (n = 2), TOF (n = 1), DORV with PS (n = 1), ccTGA (n = 1) and TAPVC after anatomical repair (n = 1). Pacing indications were sinus node dysfunction (n = 4) and complete AV-block (n = 2). Patients did not note any PM-related sensations during cMRI, and there was no PM dysfunction. Device parameters did not change significantly compared to pre-cMRI. IQ was sufficient for evaluation of clinical questions in all cases (Figure 1, 4-chamber view, ccTGA). In patients with systemic RV, ventricular function could be calculated accurately. In the TOF patient, cMRI results led to consecutive RPA stenting due to peripheral branch stenosis. Comparing the results of two cMRI examinations in the DORV patient, planned percutaneous pulmonary valve implantation could be postponed due to stable RV volumes.

Conclusions: CMRI can be safely performed with relatively good IQ and DV in CHD patients with MRI-conditional PMs. In patients who need implantation or revision of transvenous PMs, switching to MRI-conditional systems allows for application of cMRI for non-invasive monitoring of CHD.