25 Years of Cardiac Magnetic Resonance: Moving Beyond the Gate in 2006

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There have been dramatic improvements since Goldman and associates reported the first cardiac MR images 25 years ago in 1980:

1. Multiphase black blood and white blood cine motion displays
2. Motion sensitive phase contrast flow quantitation
3. Time-of-flight MR angiography
4. Presaturation grid myocardial tissue tagging
5. Reliable volumetric measurements
6. Dedicated cardiac multi-channel RF coils
7. Navigator pulse controlled respiratory triggering
8. Contrast enhanced MR angiography
9. Robust steady-state free precession imaging
10. Double and triple inversion recovery black blood imaging
11. Contrast enhanced myocardial perfusion imaging
12. Delayed contrast enhanced viability imaging
13. MR coronary artery imaging
14. Improved cardiac triggering
15. Cardiac MR at 3T
16. Real-time cardiac MR

Two major applications for CMR have emerged:

1. Left ventricular volumetric measurements-for longitudinal clinical trials
2. Delayed contrast myocardial enhancement- for the demonstration of non-viable myocardium.

The single most important limiting factor to CMR is physiologic motion. The application of robust gradients and novel acquisition protocols allow for real-time interactive scanning. Much of a functional cardiac study may be performed in minutes with these new techniques.

It has indeed been a wonderful 25 years of CMR!

References: 1.Goldman MR, Pohost GM, Ingwall JS, Fossel ET. Nuclear magnetic resonance imaging: potential cardiac applications. *Am. J. Cardiol.* 1980; 46: 12781283 , 2. KS Nayak, BS Hu, and DG Nishimura. Rapid Quantitation of High-Speed Flow Jets. *Magnetic Resonance in Medicine.* 2003:50:366-372. August 2003, 3. KS Nayak, JM Pauly, PC Yang, BS Hu, CH Meyer, and DG Nishimura. Real-time Interactive Coronary MRA. *Magnetic Resonance in Medicine* . 2001:46:430-435. September 2001.