

CMR at 3 Tesla using a large flexible surface coil: initial experience

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Introduction:

The choice of receiver coils used in high-field CMR, such as at 3T, is critical. Because of reduced RF penetration, a broader surface area is required. Too large an area requires imaging with a large FOV, which increases scan-time. This can often be reduced with parallel reconstruction techniques, or k-t space techniques (if the additional FOV is relatively stationary). A simple solution is to use a single coil whose sensitivity profile barely covers the region of interest, minimizing the imaging FOV and therefore scan-time. We are in the process of testing a new 3T CMR-dedicated system, and are examining several approaches to optimize image quality. Promising initial results were obtained with a flexible receiver coil that generates LV function studies at 3T of diagnostic quality and coverage.

Purpose:

To evaluate the usefulness of our large, single channel, flexible surface coil that wraps around the left chest for CMR imaging of the heart at 3 Tesla.

Methods:

Experiments were performed on a GE Signa 3T scanner (Excite v.11) equipped with gradients supporting 40 mT/m amplitude and 150 T/m/s slew rate, and fast receiver. A general purpose 7 x 18in flexible rectangular RF coil (FLEXGP) was used in all studies.

Three healthy adult volunteers were scanned under a protocol approved by the Institutional Review Board of USC. Subjects were oriented supine with the flexible RF coil placed on the anterior and left lateral chest wall, and under the left axilla. Standard short axis, four chamber, and two chamber views were localized using the GE i-Drive real-time system. CINE loops of each view were acquired using a cine gradient echo sequence ("FastCARD") and a cine steady-state free precession sequence (2D-FIESTA), both with $TR < 4.8\text{ms}$. ECG gating was used in one subject, and plethysmographic gating was used in two subjects.

Results:

Using this unique surface coil approach, high quality images demonstrating the morphologic aspects of the LV and its function were excellent (see images below). Complete coverage of the LV was achieved using an imaging FOV from 18-20 cm. This

approach combined with higher field systems should provide close to optimal imaging of the left ventricle.

Conclusions:

The flexible surface coil provided sufficient RF penetration for CMR imaging at 3 Tesla. An unaliased FOV of 18-20 cm was easily acquired in three moderate sized subjects. Further studies are needed to establish FOV, penetration, and SNR tradeoffs compared with other available coils.



