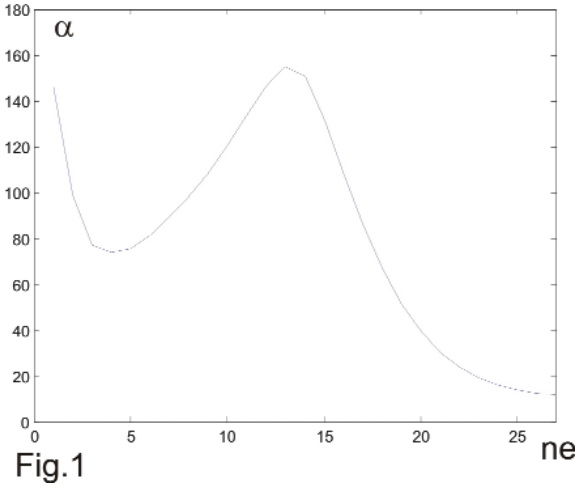

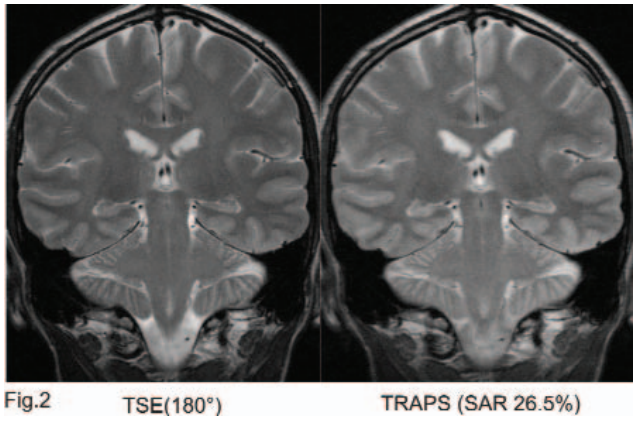

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Multiregion Noquist: non-contiguous dynamic regions within the field-of-view

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Introduction: Important dynamic MR imaging applications involve repeated acquisition of image planes in which only part of the field of view (FOV) changes over time. Conventional image acquisition techniques acquire all data for each image of such sequences. This represents a redundancy of the data.

Several applications of cine MRI, importantly including cardiac MRI and quantitative flow (QF) methods, may likely benefit from faster acquisition.

Two years ago we introduced a reduced-field of view (rFOV) technique "Noquist" for acceleration of ciné-imaging sequences. Here we report an important modification to this technique, demonstrating the technique's capability of allowing multiple, non-contiguous dynamic regions within the FOV.

Subjects and Methods: MRI data were acquired on a Philips Gyroscan Intera scanner using a balanced FFE sequence and a five element phased-array receiver coil. Typical parameters are: 192-256 phase encodings, TR:3.5ms, TE:1.7ms, flip angle:60 degrees, FOV:250-350mm.

Results: Figure 1 shows a short-axis slice through the heart of a normal volunteer. The multi-region approach allows classification of the heart and the great vessels as dynamic regions, reconstructing the rest of the FOV, including structures in-between dynamic regions (indicated by arrows), as static.

Multi-region NoQuist reconstruction used roughly 53 percent as much data showing faithful preservation of relevant image detail, with an adequate SNR for evaluation of myocardial functional parameters such as ejection fraction and radial thickening.

Discussion/Conclusion: The Noquist method reduces acquisition time in dynamic MRI scans by eliminating the data redundancy associated with static regions. Our initial experience using Noquist with non-contiguous dynamic regions appears to yield stable and promising results. Non-contiguous dynamic regions in rFOV methods offer substantial further improvements in imaging efficiency, in particular in scenes with small and disjoint moving objects such as QF imaging of abdomen or neck.

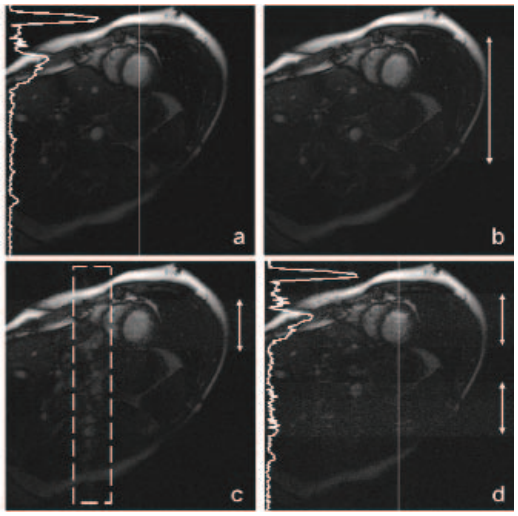

Figure 1. Full matrix(a), single-region "Noquist" reduced-matrix(b and c) and multi-region "Noquist" reduced-matrix(d) reconstructions from a short-axis study. In(a) and(d), an intensity profile along the white line in phase-encoding direction has been drawn. The arrows (b, c and d) point out the dynamic region considered within the FOV for "Noquist" reconstructions. In(c), the single dynamic region chosen for "Noquist" has been reduced in order to save more scan time than in(b), but the aorta, not the heart, causes a column of ghost artifacts(white box). In multi-region "Noquist"(d) this does not occur, because both, the heart and the aorta, are considered as dynamic regions within the FOV, saving more scan time than in (b).

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Accelerating cardiac cine 3D SSFP imaging using *k-t* BLAST

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Introduction: Cine 3D acquisitions of the whole heart within a single breath-hold have required compromises between image quality, spatial and temporal resolution. Using an elliptical k-space shutter, 3D data sets may be obtained at relatively high spatial resolution in a single breathhold (1). Still, temporal sampling does not satisfy the requirements for accurate volume determination (2). By exploiting spatio-temporal correlations in cardiac imaging, the acquisition efficiency can be considerably increased. The underlying method, called *k-t* BLAST, was introduced recently (3,4).

The aim of the current work was to extend the *k-t* BLAST scheme to three spatial dimensions for cardiac-gated cine acquisition. To