Poster presentation

# Combined parallel and K-T approach improves dynamic imaging

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This abstract is available from: http://jcmr-online.com/content/12/S1/P82

## Introduction

Previously we introduced the k-space-time (KT) acceleration approach MACH (Multiple Acceleration Hierarchy) and the parallel imaging variant SCIPI (Single Coil Implementation of Parallel Imaging). While KT approaches retain signal to noise, high acceleration values result in temporal blur, and conversely parallel approaches result in loss of SNR and introduce non-cancellation artifacts. It is not known for MACH and SCIPI what combination results in lower artifacts.

## Purpose

We hypothesize that for progressively higher resolution scans, higher accelerations can be achieved with low artifact by the combination of MACH and SCIPI (Combo).

## Methods

Fully resolved cine images (SSFP, TR/TE 4.1/2.1) with a matrices of 224, 336 and 384 were used to simulate MACH and SCIPI with acceleration factors ranging from 2-15. A uniform cardiac region was compared between the original images and accelerated scans to assess the net error term. For each resolution series (224, 336 and 384), a line was fitted for error term vs. acceleration separately for MACH alone and the Combo.

## Results

For each series, the fitted lines describing the error term vs. acceleration for MACH alone and Combo intersected to reveal a point where Combo quality exceeded MACH alone. For all series, above this point, the Combo quality was higher than that of MACH. The acceleration values at the transition point for each series were 2, 5 and 8 for resolutions 224, 336 and 384, respectively. These intersection points were in turn fitted to a straight line with the formula: Resolution = 26.7 × acceleration + 181. For example, it indicates that at a resolution of 512, MACH would be beneficial up to an acceleration of 12, and Combo would be better after that. In figure 1, the results for 336 resolution comparing the original (A), MACH (B) vs. Combo (C), both with acceleration 8 are shown, indicating the superiority of the Combo series.

## Conclusion

When using accelerated scans relying on KT and parallel approaches, higher accelerations generally benefit from a combination of the two. Here we showed that the acceleration transition point linearly increases with spatial resolution. In general, when high accelerations are required for cine imaging, the combination of a moderate acceleration for each of the two approaches is superior to applying the KT or parallel approaches singly.
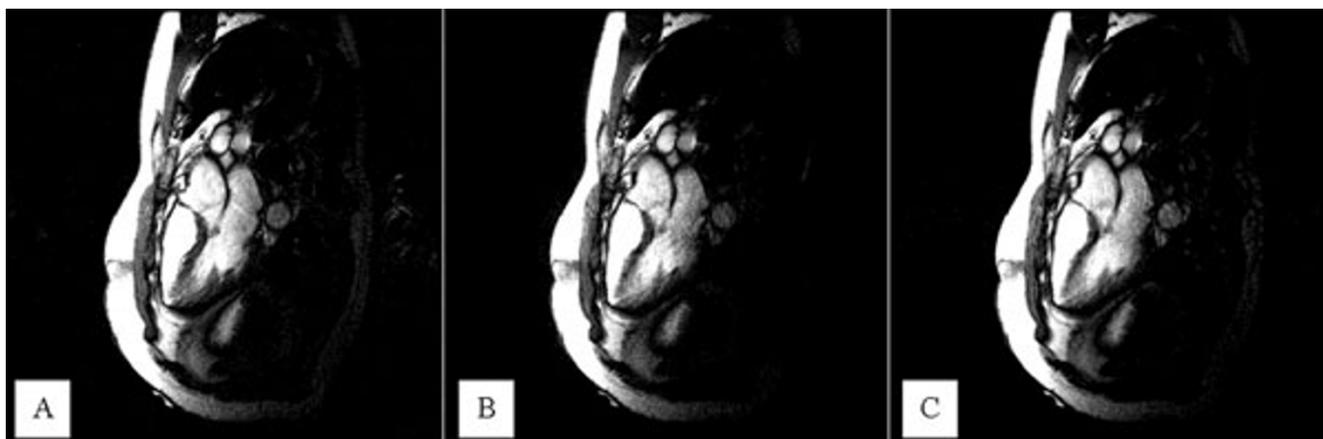
**Figure 1**