Supplementary material:
Accelerating free breathing myocardial perfusion MRI using multi coil radial k-t SLR

1. Prospectively undersampled radial data acquisition

An experiment with multi slice acquisition using prospectively undersampled radial data was performed. Data was acquired with the same FLASH sequence as described in the paper, although 5 slices were imaged after each saturation pulse (Adluru et al., 2009). Seven slices per beat, and 30 rays/frame with a golden angle spacing between successive rays were acquired using a 32 coil cardiac array. Here, golden ratio sampling was employed based on our k-t sampling experiments. A healthy subject was scanned during rest conditions as described above. The subject was not able to maintain a steady breath hold during the entire scan, and the data contained motion. Prior to reconstruction, a PCA based coil compression strategy (Buehrer et al., 2007) was used to compress the 32 coil data set to four principal component data set. The PCA coil compression was used to facilitate reconstruction without incurring a high computation cost and memory requirements associated with the 32 coils. As reported in (Adluru et al., 2012), and also from our observation, about 4-5 principal components were enough to capture most of the variance in the data, which motivated us to use 4 coils for processing this data.

2. $k - t$ SLR reconstructed multi-slice images

In the below figure, we show the k-t SLR reconstructed images from the above acquisition experiment with multiple (seven) slices coverage using 30 rays/frame. We observe that the k-t SLR reconstructions provided improved heart coverage with good spatio-temporal resolution.

3. Discussion

Acquiring multiple slices during a single saturation pulse has shown to be more efficient as it minimizes the time spent for saturation (Adluru et al., 2009; Plein et al., 2005). However, this comes at an expense of different slices having different saturation recovery times, and hence different intensities as seen in the figure below. As recommended in (Adluru et al., 2009), the slices could be analyzed separately and be scaled to have similar intensities.

References

Adluru G, DiBella E et al. 2012 *Journal of Cardiovascular Magnetic Resonance* **14**(Suppl 1), P242.

Adluru G, McGann C, Speier P, Kholmovski E, Shaaban A and DiBella E 2009 *Journal of Magnetic Resonance Imaging* **29**(2), 466–473.

few spatial frames
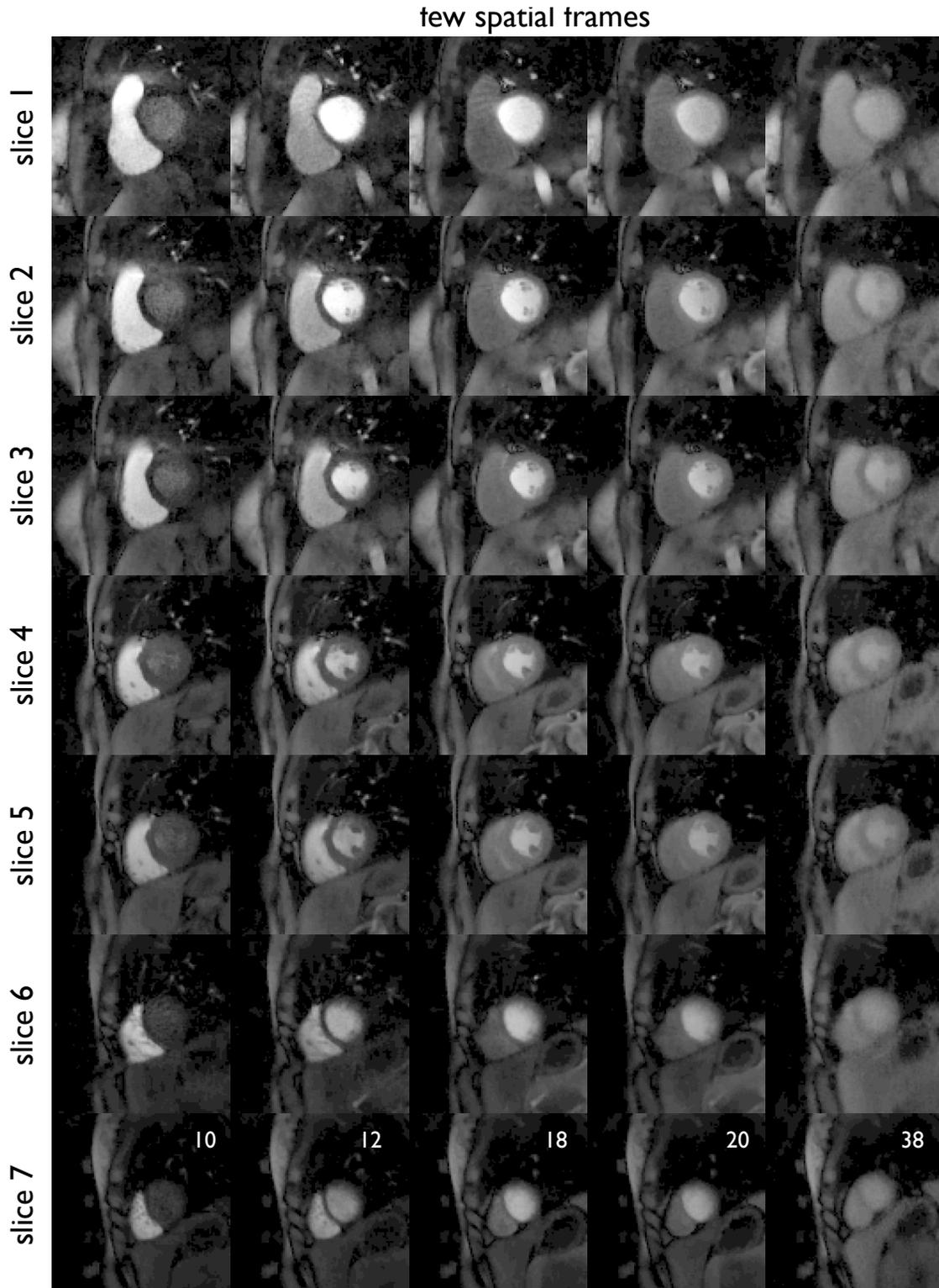
Figure 1. Example k-t SLR reconstructed multi slice 2D first-pass myocardial perfusion images on a healthy subject. The numbers on the images indicate the time instants of the dynamic perfusion acquisition. The subject could not maintain a steady breathhold during the entire scan, due to which the data contained motion content. These reconstructions demonstrate good spatial and temporal resolution with extended volume coverage of the heart.

Buehrer M, Pruessmann K, Boesiger P and Kozerke S 2007 *Magnetic Resonance in Medicine* **57**(6), 1131–1139.

Plein S, Radjenovic A, Ridgway J P, Barmby D, Greenwood J P, Ball S G and Sivananthan M U 2005 *Radiology* **235**(2), 423–430.