A NOVEL 16-CHANNEL UPPER AIRWAY RECEIVE COIL ARRAY FOR THE INVESTIGATION OF ACCELERATED DYNAMIC SLEEP MRI

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Why sleep MRI

- Worldwide, almost 100 million people have sleep apnea.
  - Majority of the population is children
    - Therefore, surgical techniques are approached.
      - Careful patient-specific planning is required
        - Evaluation of the site of airway obstruction
  - 3D MRI is
    - Advantages
      - Non-invasive
      - Non-ionizing
      - High soft-tissue contrast
    - Challenges
      - Imaging speed
      - Image quality; SNR, Spatial & temporal resolution.
Our research design to improve MRI challenges

- Custom upper airway coil design (to be presented today!)
- 3D hybrid cartesian sampling trajectory
- Parallel Imaging and Compressed Sensing (PICS) reconstruction schemes
Our 16-channel airway coil

- more flexible to the subject size
- better sensitive to the regions of interests
Dataset & map generating-pipeline

Dataset (3D):
- Source: Head/neck coil array
  - Unique ID: Static efGRE 3D_P03584.7
  - #views(Kx,Ky*Kz)=(122,61000)
- Source: Our airway coil array
  - Unique ID: Static efGRE 3D_P99328.7
  - #views(Kx,Ky*Kz)=(122,61000)

Flow diagram of how the steps were followed to obtain the maps:
- Data undersampled at R=4
- Stack of white noise contaminated data
- Recon tool bart pipeline (no TV)
- Stack of 3D images
- Formulas from ISMRM code
- Pseudo SNR and g-map
- Reference image (3D) at R=1
- Eigen vector method
- Coil maps
Results

SNR improves with proximity to the ROIs

Unlike head/neck coil, spatial noise variation is low around the upper airway regions for our airway coil.

Figure: Our airway coil holds SNR better than the head/neck coil. (a) illustration of the upper airway regions of interest used in the evaluation of SNR; shown is a mid-sagittal slice from a static 3D data acquired with head/neck coil. (b) description of the regions numbered in (a). Bottom: direct SNR comparison for both the 16-channel coils at particular coordinates.
Thank you!