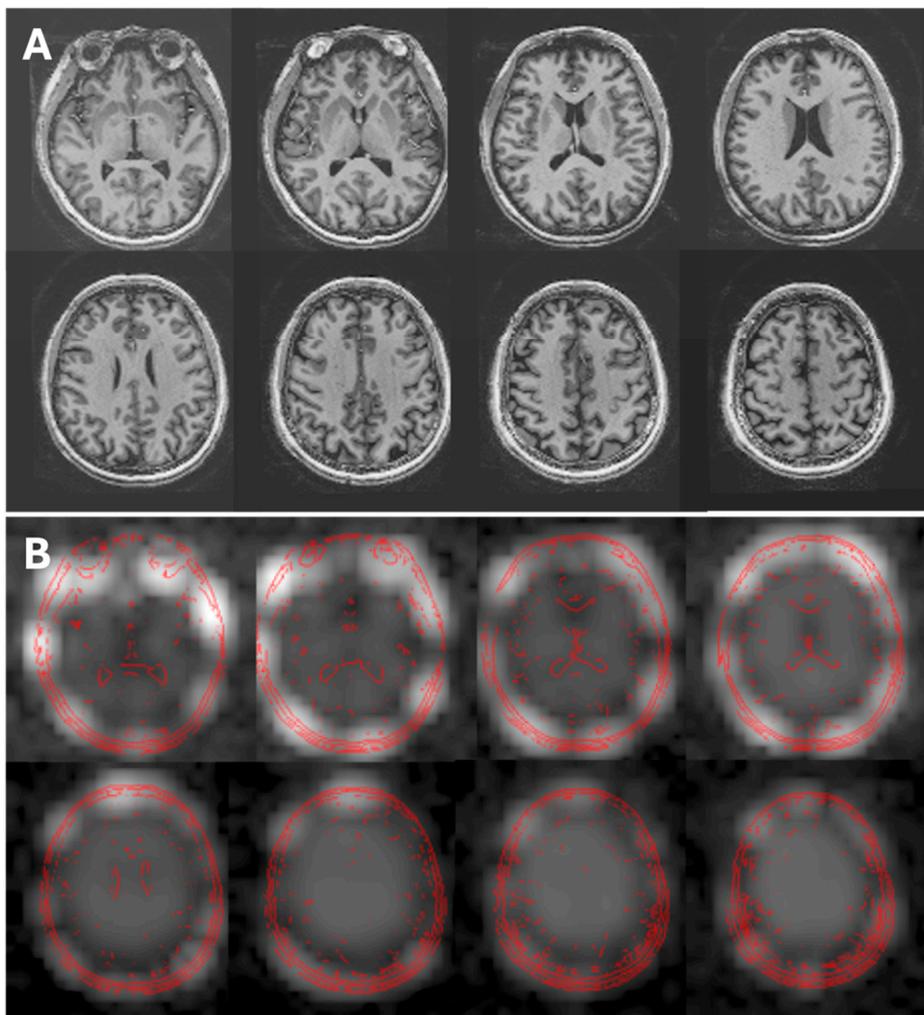


Supplementary Material

Eight-slice Hadamard encoded single spin echo rosette spectroscopic imaging (RSI) acquisition:

To demonstrate the multi-slice capability of the cascaded RF pulse encoded by Hadamard in slice direction, Figure S1 shows the magnitude images of NAA acquired with the eight-slice Hadamard RSI with 16 min scan duration using  $N_{sh} = 40$ ; the slices are 4mm thick with a 1mm slice gap slice to span a 40 mm slab. TEs for the respective eight slices are 35, 42, 49, 56, 62, 70, 77 and 83 ms. More detail image acquisitions and reconstruction are described at Methods section of 2.1. *Multi-slice Hadamard-encoded sequence: cascaded and simultaneous excitation.*



**Figure S1.** Scouts T1 anatomy (A) and magnitude NAA images (B) from an eight-slice Hadamard RSI scan, acquired with total scan duration of 17.6 min. The red contours are the edges of the T1 brain images, (A) are overlaid on the NAA magnitude images in (B).