Brain MRI and MRS detection of falx ossification or lipomas in a majority of older adults

Peter B. Kingsley[1], and Marc L. Gordon[2,3]

[1]Radiology, North Shore University Hospital, Manhasset, New York, United States, [2]Litwin-Zucker Research Center, Manhasset, New York, United States, [3]Hofstra North Shore-LIJ School of Medicine, Hempstead, NY, United States

Introduction: Multi-voxel (MV) MRS studies of elderly adults (age 60-90 [1] or 50-90 [2]) reported lipid signals in 2-4% at TE=144 ms [1,2], often near the midline, and as many as 25% at TE=30 ms [2]. Two possible lipid sources are falx ossification [3,4] and lipomas [5]. Falx ossification has been reported in <1% of adults in this age range. Although large lipomas seem rare (<0.1% [4]), small lipomas have been reported by CT in up to 10% of older adults [5]. Since no lipomas were identified in [1], they concluded that the presence of lactate and lipids "strongly suggests the existence of asymptomatic focal pathology not shown on MRI." McIntyre et al mentioned falx ossification or lipomas as the probable source of their lipid signals despite not seeing them on their limited MRI scan [2]. Here, we present MRI and MRS evidence of small falx ossifications or lipomas in a majority of older adults.

Methods: MR images and midline spectra (TE=144 ms) were acquired on a GE 3T HDx MRI scanner after obtaining written informed consent. MRI included FLAIR (TR/TI/TE = 9500/2250/120 ms) and gradient echo images (GRE, TR/TE = 425/2.6 ms, flip angle = 20 degrees). Single-voxel (SV) spectra were from the precuneus and posterior cingulate region (Fig. 1). MV spectra were acquired with a 12x12 matrix over a field-of-view between 12 and 14 cm and a slice thickness of 1.5 cm. Over a 2-year period, 181 MR exams were performed on 165 subjects. SV spectra were acquired from all subjects, and MV spectra from 83 subjects. The probable or possible presence of lipoma or ossification was based on the imaging features of large lipomas (bright on FLAIR) and ossification (dark on GRE). Only large ossifications and lipomas were considered "definite".

Results and Discussion: An example of a large lipid signal is shown in Fig. 2a. The chemical shifts of 1.5 ppm (CH2) and 1.1 ppm (CH3), which are 0.2 ppm higher than lipid signals in most brain pathologies, are similar to those in [1]. The bright spot in the FLAIR image (Fig. 2b) suggests the presence of a lipoma. A broader lipid signal shown in Fig. 3a probably arises from falx ossification, as suggested by the dark spot in the GRE image (Fig. 3b). The source of the lipid signal in Fig 4a is unknown, as no clear abnormality was seen on either the FLAIR image (Fig. 4b) or the GRE image (Fig. 4c). An example of large lipid signals in MV spectra near the quadrigeminal cistern and the straight sinus is shown in Fig. 5. MRI indicated ossification and/or lipoma in 80 of 165 subjects (48%): ossification in 45 subjects (23 probable or definite, 22 possible) and lipomas in 48 subjects (24 probable or definite, 24 possible), with both ossification and lipoma observed in 13 subjects. Of the 83 subjects with MV spectra, 58 (70%) had probable or definite lipids (>20% of the tallest NAA peak), 10 (12%) had possible lipids (<20% of the tallest NAA peak, or 20-30% with a questionable baseline), and 15 (18%) had no clear lipid signal. Thus, MRS seems to be more sensitive than MRI for detecting falx ossifications or lipomas (70-82% vs 27-48% of subjects). Since MRS coverage was not complete, the true number of older adults with small falx ossifications or lipomas may be well over 80%. Little or no lactate was seen in our study, similar to [2] and in contrast to [1]. The failure to observe any lipomas with the lipid signals in [1,2] may have been due to their lack of FLAIR and GRE imaging, as lipomas may be obscured by CSF signal on conventional T1- and T2-weighted MRI [5]. Observation of lipid signals in brain MR spectra, especially near 1.5 ppm and in MV spectra including the midline, may not necessarily indicate brain damage, even if FLAIR and GRE imaging do not demonstrate the presence of falx ossifications or lipomas.

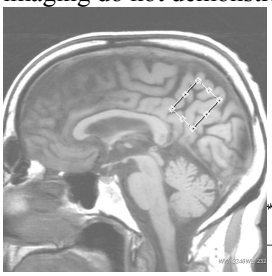

Fig. 1

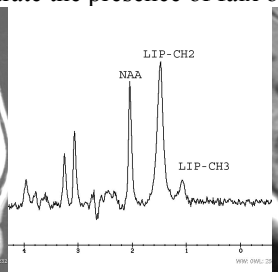

Fig. 2a

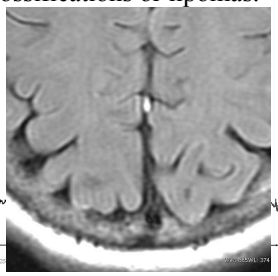

Fig. 2b

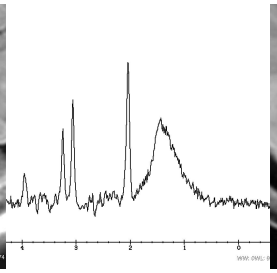

Fig. 3a

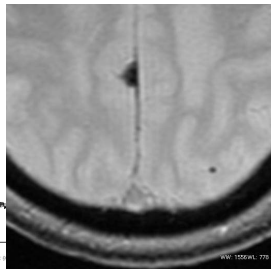

Fig. 3b

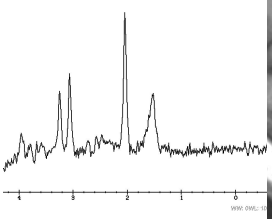

Fig. 4a

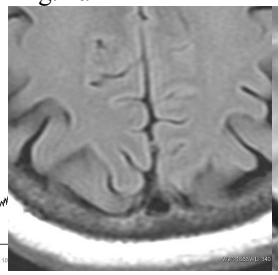

Fig. 4b

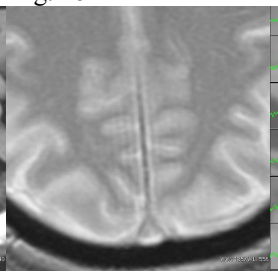

Fig. 4c

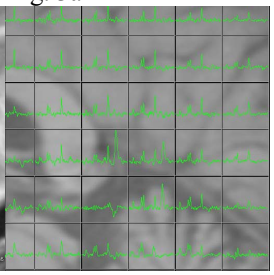

Fig. 5

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References: [1] PE Sijens et al, Eur Radiol 2001;11:1495-1501. [2] DJO McIntyre et al, JMRI 2007;26:1596-1606. [3] SF Sands et al, JCAT 1987;11:602-5. [4] DH Lee et al, J Can Assoc Radiol 1988;39:260-2. [5] SS Chen et al, Chin Med J (Taipei) 2000;63:804-8.