Hippocampal sclerosis: Evaluation with high-spatial-resolution T2-weighted images at 3T

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PURPOSE

The most reliable MR findings in detection of hippocampal sclerosis (HS) include atrophy of the hippocampus and changes in signal intensity on fast fluid-attenuated inversion recovery (FLAIR) images. With the improved signal-to-noise ratio at 3T, it is possible to reduce slice thickness with preservation of image quality. Thus, it is expected that high-spatial-resolution T2WI with thin slice thickness would provide additional information in the investigation of HS. Our purpose is to assess prospectively the usefulness of high-spatial-resolution T2WI at 3T for HS.

MATERIALS AND METHODS

Fourteen consecutive patients (15 abnormal hippocampi; 13 patients were unilateral and one was bilateral) with a clinical diagnosis of HS were examined with a 3T MR system (Signa EXCITE 3T; GE Medical Systems) using a dedicated eight-channel phased-array coil. The following imaging parameters were used: 4000/85/20/512x320/2.5mm/4.56min (TR/TE/FOV/matrix/slice thickness/imaging time) for T2-weighted fast spin-echo (FSE) imaging, and 12000/140/2600/22/256x224/4mm/3.12min (TR/TE/TI/FOV/matrix/slice thickness/imaging time) for FLAIR imaging. Both sequences were performed in the orthogonal coronal plane. With regard to four anatomic sections in the hippocampus (dentate gyrus; DG, cornu ammonis; CA, subiculum; Sb, and entorhinal area; ERA), two radiologists were asked to identify which hippocampus had an atrophy and increase in signal intensity on T2WI (Fig.1).

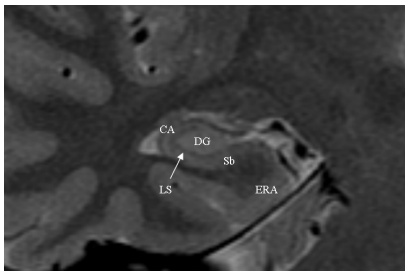


Fig. 1.

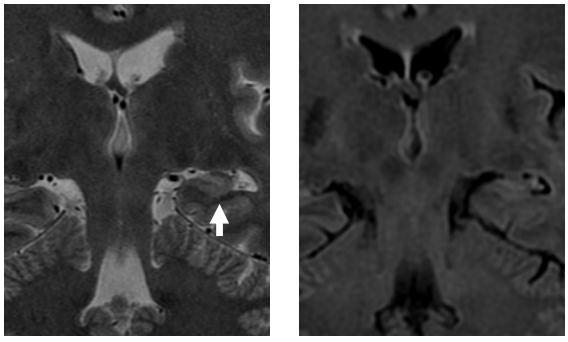
These radiologists also evaluated the visualization of the layered structures including (LS) the white matter fibers and molecular layer. For FLAIR images, the radiologists visually evaluated the signal intensity of the hippocampus. In 13 patients with unilateral HS, for quantitative assessments, a manual segmentation of hippocampus was performed to determine hippocampal volumes, and an intraindividual comparison was performed between normal and sclerotic hippocampi.

RESULTS

Results of visual assessment regarding the atrophy and signal intensity of hippocampi on T2WI according to signal intensity on FLAIR are summarized in Table 1. For evaluation of atrophy of four segmentations on T2WI, the atrophy were observed 87% (13/15) at DG, 93% (14/15) at CA, 60% (9/15) at Sb, and 53% (8/15) at ERA. For the intraindividual comparison, the mean volume of the hippocampal body was significantly smaller for the sclerotic side than for normal side ($P<0.01$). In 2 of 6 sclerotic hippocampi which showed normal signal intensity on FLAIR, the high-spatial-resolution T2WI demonstrated partial disappearance of the layered structures (Fig.2).

Table 1 Results of visual assessment

SI on FLAIR (n=15)	Atrophy (n=15)				Partial disappearance of LS (n=13)
	DG	CA	Sb	ERA	
Abnormal (n=9)	9/9 (100%)	9/9 (100%)	9/9 (100%)	8/9 (89%)	6/7 (86%)
Normal (n=6)	4/6 (67%)	5/6 (83%)	0/6 (0%)	0/6 (0%)	2/6 (33%)



(a) (b)

Fig. 2. 57-year old woman with left hippocampal sclerosis. T2WI (a) shows partial disappearance of LS (arrow), while FLAIR (b) is normal.

CONCLUSION

The high-spatial-resolution T2WI clearly visualized the anatomic sections of hippocampus and demonstrated the abnormality of the layered structures, even when FLAIR showed the normal appearance of the hippocampus. The high-spatial-resolution T2WI at 3T may provide additional imaging information in the investigation of HS.