Apparent diffusion coefficient values in endometrial cancer: comparison with the normal endometrium and correlation with histologic grades

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Introduction

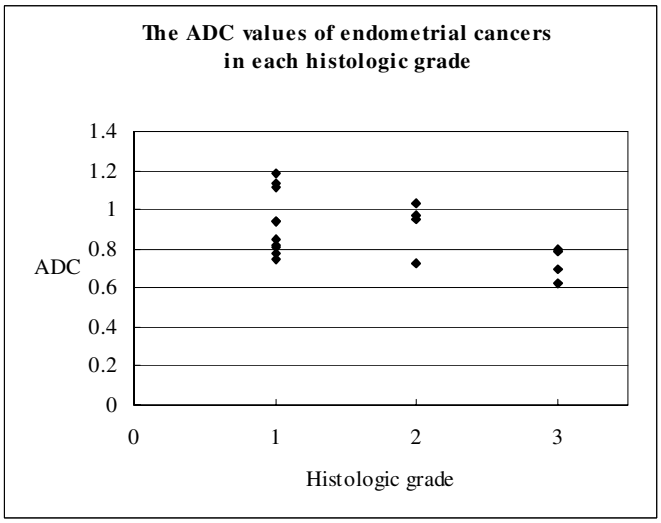
In management of patients with endometrial cancers, histologic subtypes and grade can be one of the prognostic factors as well as tumor staging. Although MR imaging is known as a useful modality for local staging in endometrial cancers, conventional MR sequence has not provided information regarding histologic natures. Recently prevailing diffusion weighted images (DWI) can exhibit tissue characteristics based on diffusion motion of water molecules. The apparent diffusion coefficient (ADC) value can be quantitatively obtained by measuring signal intensity in a series of DWI and is considered to represent the microstructures of tissues of solid tumors. The purpose of this preliminary study was to investigate whether the ADC values of the endometrial cancers on DWI differ according to the histologic grade of the tumor, and whether they differ from those of the normal endometrium

Materials and Methods

Our study population included 18 patients with surgically proven endometrial cancer (age; 35-76 y.o., mean; 58) and 12 patients with cervical cancer, who were pathologically confirmed to have normal endometrium (age; 34-66 y.o., mean; 49). The histologic subtype was found to be endometrioid adenocarcinoma in all endometrial cancer patients. MR imaging was performed with a 1.5T unit (Symphony; Siemens) with a phased-array coil. Following sagittal T1WI and T2WI obtained for the clinical purpose of tumor staging, DWIs were obtained in the same sagittal plane using single-shot echo-planar sequence (TR/TE=2500/80ms) with a matrix of 128x64, SENSE factor of 2, three excitation, and b-factors of 0, 500, and 1000 sec/mm^2. All MR images were uniformed with 5mm thickness, 1.5mm intersection gap, and a FOV of 260mm. T2WI and fusion images with DWI (b=1000 sec/mm^2) onto T2WI were evaluated by two radiologists unaware of histologic results, regarding the presence and size of the tumor. The ADC measurement of endometrial cancer and normal endometrium was performed on ADC maps. The ADC values of the endometrial cancers were statistically compared with those of normal endometrium. The ADC values of the tumors were also compared with histologic grade.

Results

The size of endometrial cancers ranged from 13 to 72 mm (mean; 34). Their histologic grade included G1 (n=10), G2 (n=4), and G3 (n=4). Both endometrial cancers and normal endometrium were depicted as hyperintense area on both T2WI and DWI (b=1000 sec/mm^2) in all cases. On ADC maps, 15 endometrial cancers (83%) and all normal endometrium were demonstrated as decreased signal intensity. Since tumors could not be identified on ADC maps in the remaining 3 tumors, ADC measurement of these tumors was performed by referring fusion images with ADC maps onto T2WI. The mean ADC value (10^{-3} mm^2/s) of endometrial cancer was 0.88 ± 0.16, which was significantly lower ($P<0.01$) than that of normal endometrium (1.53 ± 0.10). The mean ADC value for each grade was 0.93 ± 0.16 (G1), 0.92 ± 0.13 (G2), and 0.73 ± 0.09 (G3), respectively. The ADC value of G3 tumors was significantly lower than that of G1 tumors ($P<0.05$).



Discussion

The present study shows that the ADC values of endometrial cancers were significantly lower than those of the endometrium, although both normal endometrium and endometrial cancers were depicted as an area of high intensity on DWI (b=1000 sec/mm^2). Higher ADC values in normal endometrium may be attributed to abundant water molecules within intracellular space of endometrial stromal cells. Meanwhile, our study also shows that endometrial cancers of higher grade exhibit decreased ADC values compared with cancers of lower grade. Decreased ADC values in high-grade tumors are considered to represent more restricted motion of water molecules in tumors with increased cellularity. However, preoperative estimation of exact histologic grade of endometrial cancers based on ADC value may be difficult, since there is a considerable overlap in the ADC values among each histologic grade.

Conclusion

The ADC values of endometrial cancers are significantly lower than those of normal endometrium. The ADC values of endometrial cancer of higher grade tend to exhibit decreased titer compared with those of lower grade, although estimation of histologic grade based on ADC values seems difficult because of considerable overlap among each histologic grade.