

Computed diffusion-weighted imaging for differentiating decidualized endometrioma from ovarian cancer

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[Target audience] The target audience of this article includes gynecologic radiologists, general radiologists with an interest in gynecologic MR imaging, residents, fellows, and other health professionals interested in the science and practice of gynecologic MR imaging.

[Purpose] Malignant transformation of endometrioma is a rare but often fatal complication. The most important MR imaging finding for a diagnosis of malignant transformation is the presence of mural nodules within endometrioma. Ovarian cancer arising from endometrioma may affect younger women, and may occur during pregnancy. Decidual changes of endometrial tissue in endometrioma during pregnancy may manifest as mural nodules and mimic malignant transformation. Takeuchi et al. reported that both decidualized endometrial tissues in endometrioma and malignant mural nodules in ovarian cancer showed high signal intensity on DWI ($b=800\text{ sec/mm}^2$), and the ADC of decidualized endometrial tissues was significantly higher than that of ovarian cancers¹⁾. Because the vascularized, edematous decidualized endometrial tissue may cause T2 prolongation and relative high ADC values compared with those of ovarian cancers, signal increase of mural nodules in decidualized endometrium on DWI may be caused by T2 shine-through effect. Computed DWI (cDWI) is a mathematical computation technique, which calculates DWIs from at least two acquired DWIs using different b-values, and allows higher b-value images without T2 shine-through effect with maintaining a good SNR²⁾. The purpose of this study was to evaluate the clinical diagnostic ability of cDWI for differentiating decidualized endometrioma from ovarian cancer.

[Methods] Nine women with decidualized endometrioma during pregnancy were retrospectively evaluated. MR images were obtained by using 1.5-T superconducting units (Signa Excite /Excite HD, GE) with 8ch body-array torso coils. Fast spin-echo T2WI and DWI ($b=800\text{ sec/mm}^2$) were obtained in all 9 patients. The mean ADC values ($\times 10^{-3}\text{ mm}^2/\text{sec}$) of 20 mural nodules in 9 decidualized endometriomas were measured in a circular ROI from ADC maps on the workstation (AW 4.2). The mean ADC values of 20 pathologically proven ovarian cancers in 18 women (10 clear cell adenocarcinomas, 7 endometrioid adenocarcinomas, 2 serous adenocarcinomas, and 1 mucinous adenocarcinoma) were also measured for comparison. The Mann-Whitney U test was used to compare ADC values among decidualized endometriomas and ovarian cancers. A value of $p < 0.05$ was considered statistically significant. cDWIs of 9 decidualized endometriomas and 20 ovarian cancers with b values of 900, 1000, 1100, 1200, 1300, 1400, 1500 sec/mm^2 were generated from real measured DWIs with b values of 0 and 800 sec/mm^2 by using Osirix (32-bit) with computed DWI plugin (medITools) on a personal computer (MacBookPro, Apple, OSX). Signal intensity of the mural nodules in decidualized endometriomas and that of solid portion in ovarian cancers on DWI was visually evaluated and classified as high, slight high, or low by 2 radiologists. Agreement between the 2 reviewers was reached in consensus after careful individual evaluation.

[Results and discussion] All 9 decidualized endometriomas contained one or more high signal intensity mural nodules on T2WI. These mural nodules exhibited high to slight high signal intensity on DWI, whereas all 20 ovarian cancers contained high intensity solid components on DWI. The ADC value of 20 mural nodules in 9 decidualized endometriomas was 2.01 ± 0.26 , which was significantly higher than that of 20 ovarian cancers (1.08 ± 0.20) ($p < 0.001$). The signal intensity of mural nodules in decidualized endometriomas decreased on cDWI with higher b values, and all mural nodules were classified as low on cDWI₁₅₀₀. On the other hand, all 20 ovarian cancers still contained high signal intensity solid components on cDWI₁₅₀₀. These results may suggest that high signal intensity of mural nodules in decidualized endometriomas on DWI was caused by T2 shine-through effect due to vascularized, edematous decidualized endometrial tissue with high ADC, whereas high signal intensity of solid components in ovarian cancers was caused by restricted water diffusion reflecting hypercellularity in cancer tissue with low ADC.

[Conclusion] Mural nodules in decidualized endometriomas may show high signal intensity on DWI due to T2 shine-through effect, and DWIs with computed $b=1500\text{ sec/mm}^2$ can distinguish decidualized endometriomas from ovarian cancers by visual evaluation.

[References] 1) Takeuchi M, et al. Magnetic resonance manifestations of decidualized endometriomas during pregnancy. J Comput Assist Tomogr. 32:353-5, 2008. 2) Blackledge MD, et al. Computed diffusion-weighted MR imaging may improve tumor detection. Radiology. 261:573-81, 2011.

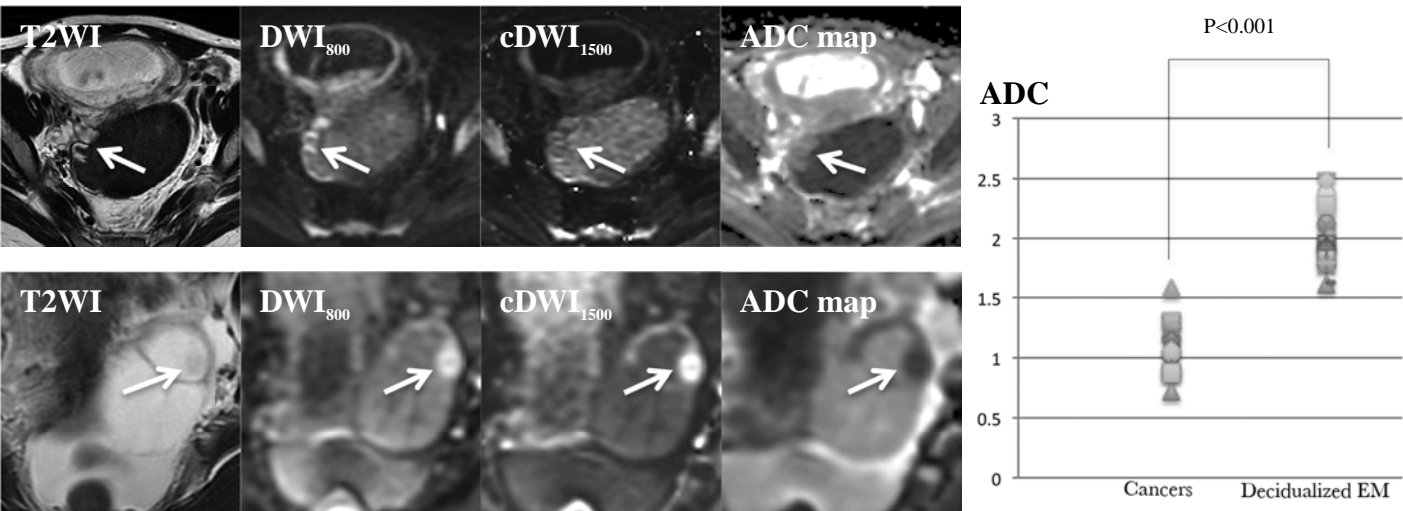


Fig. 1: 29-year-old pregnant woman with decidualized endometrioma. Small high intensity mural nodules on T2WI and DWI with relatively high ADC decrease the signal intensity on cDWI₁₅₀₀. **Fig. 2:** 40-year-old woman with ovarian cancer. High intensity mural nodule on T2WI and DWI with low ADC shows no signal decrease on cDWI₁₅₀₀. **Fig. 3:** The ADC values of decidualized endometriomas and ovarian cancers.