Importance of Intravenous Contrast Administration to Improve the Diagnostic Accuracy of Preoperative MRI for Uterine Leiomyosarcoma

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TARGET AUDIENCE. Radiologist, Oncologist

PURPOSE. To evaluate the importance of intravenous contrast medium administration on preoperative magnetic resonance (MR) diagnosis of uterine leiomyosarcoma.

METHODS. Prospective investigation, including 35 female patients with rapidly growing uterine tumors, histopathologically diagnosed as LMS (n=9) or leiomyoma (n=26). Imaging criteria on a 3-T MR unit include unenhanced hyperintensity on T1-weighted imaging (T1WI), T2-weighted imaging (T2WI) or diffusion-weighted imaging (DWI, b=0, 1000 s/mm^2), and central non-enhancing area (CNE) on contrast-enhanced imaging at equilibrial phase. The diagnostic accuracy, sensitivity and specificity of each criterion were calculated, and receiver operating characteristic (ROC) analysis was applied to compare diagnostic performance. Apparent diffusion coefficient (ADC) values of LMS and leiomyoma were compared by Mann-Whitney U test.

RESULTS. CNE yielded a higher accuracy than that of T1WI, T2WI or DWI (0.97 vs 0.69, 0.49, 0.50, respectively). The sensitivity of CNE, T2WI or DWI was higher than that of T1WI (1.00, 1.00, 1.00 vs 0.67, respectively). The specificity of CNE was higher than that of T1WI, T2WI or DWI (0.96 vs 0.69, 0.31, 0.38, respectively). The area under the ROC curve (AUC) of CNE in diagnosis of LMS was 0.98, which was significantly greater than that of T1WI (AUC = 0.67, $p < 0.01$), T2WI (AUC = 0.65, $p < 0.001$) or DWI (AUC = 0.69, $p < 0.001$). ADC values of LMS and benign leiomyoma were not significantly different (1.00 vs 1.18×10^{-3} mm^2/s, $p = 0.41$).

DISCUSSION. The CNE was identified in this study as a MR characteristic for LMS. Indeed this feature could be found in the figures of previously reported series [1, 2] yet has not been highlighted. We found CNE is correlated with coagulative necrosis, a characteristic feature of leiomyosarcoma on histopathology, i.e., an abrupt transitional zone from viable cells to the ghost cells without an interposed zone of granulation or hyalinized tissue. Hence, areas of coagulative necrosis might be easily deviated by adjacent viable cells, to create a CNE as demonstrated on contrast-enhanced MRI [3].

CONCLUSION. CNE is an MR characteristic for LMS thus intravenous contrast medium administration is important for preoperative diagnosis of LMS.

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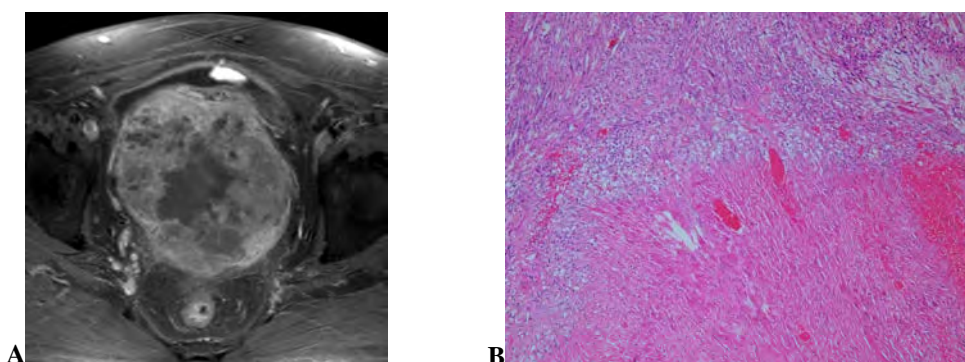
Figure 1 Leiomyosarcoma in a 65-year-old woman. (A) Transverse contrast-enhanced T1-weighted MR image (TR/TE, 567/10). This lesion exhibited vague hyperintensity on T1-weighted images and irregular mixed high and lower intensities on T2-weighted images but a broad central non-enhancing area after contrast administration (arrow). (B) Histopathologic examination demonstrated coagulative necrosis, an abrupt transition from viable cells to ghost cells without an interposed zone of granulation tissue or hyalinized tissue between viable and necrotic cells, characteristics of leiomyosarcoma (hematoxylin and eosin stain 100 x).