

# MR manifestations of ovarian thecomas/fibrothecomas: Conventional and diffusion-weighted MR imaging

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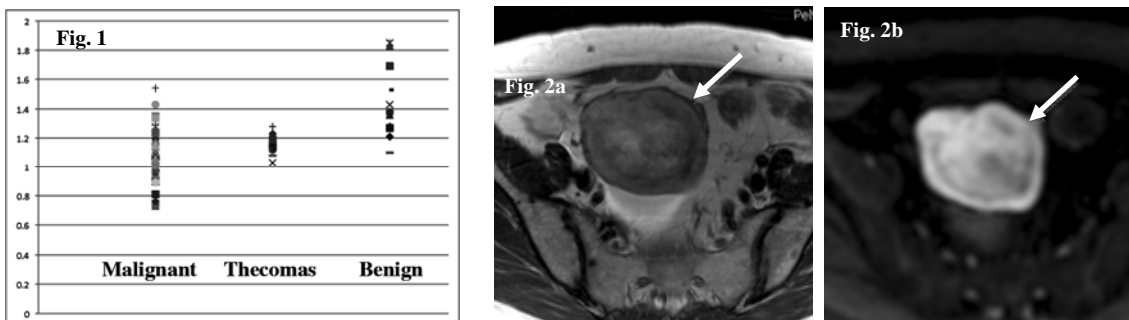
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**[Introduction]** Ovarian thecomas/fibrothecomas (T/FTs) are benign ovarian tumors, which belong to the sex cord-stromal tumor group affecting mainly postmenopausal women. T/FTs may secrete estrogen and cause endometrial thickening with genital bleeding. To distinguish ovarian T/FTs from other benign tumors is important because estrogenic effect of T/FTs may lead to endometrial hyperplasia and endometrial carcinoma. T/FTs may appear as fibroma-like hypointensity mass on T2-weighted images, however, may often show signal increase on T2-weighted images mimicking malignancy. To distinguish T/FTs from malignant tumors is also important to avoid excess surgical procedure. In this study we evaluated MR findings including diffusion-weighted imaging of T/FTs and compared with those of non-thecomatous benign ovarian tumors and primary malignant ovarian tumors.

**[Materials and Methods]** 11 surgically proven T/FTs were retrospectively evaluated. The ages of the patients ranged from 44 to 88 years (mean age: 65 years). MR images were obtained by using 1.5T (Signa Excite, General Electric), or 3T (Signa Excite HDx 3T, General Electric) superconducting units. Spin-echo T1-weighted images, fast spin-echo T2-weighted images and spin-echo, single-shot EPI diffusion-weighted images (DWI) ( $b=800$  sec/mm<sup>2</sup>) were obtained in all subjects. Signal intensity of solid portion of the lesions on DWI was visually evaluated (high; intermediate; low). The ADCs ( $\times 10^{-3}$  mm<sup>2</sup>/seconds) of the tumors were measured in a circular ROI from ADC maps on the workstation. ROI was placed on solid portion of the lesions so as not to contain cystic areas as much as possible by referring all MR images. Solid portions of 12 benign ovarian tumors (6 fibromas, 6 adenofibromas/cystadenofibromas) and 51 primary malignant ovarian tumors (48 carcinomas, 3 malignant germ cell tumors) were also evaluated. Mann-Whitney's U test was used to compare the ADCs among T/FTs, non-thecomatous benign tumors and malignant ovarian tumors. A value of  $p<0.05$  was considered statistically significant. The ADC cut off values ( $\times 10^{-3}$  mm<sup>2</sup>/seconds) to differentiate T/FTs from non-thecomatous benign tumors, and from malignant lesions were calculated, with their sensitivity, specificity, PPV and NPV.

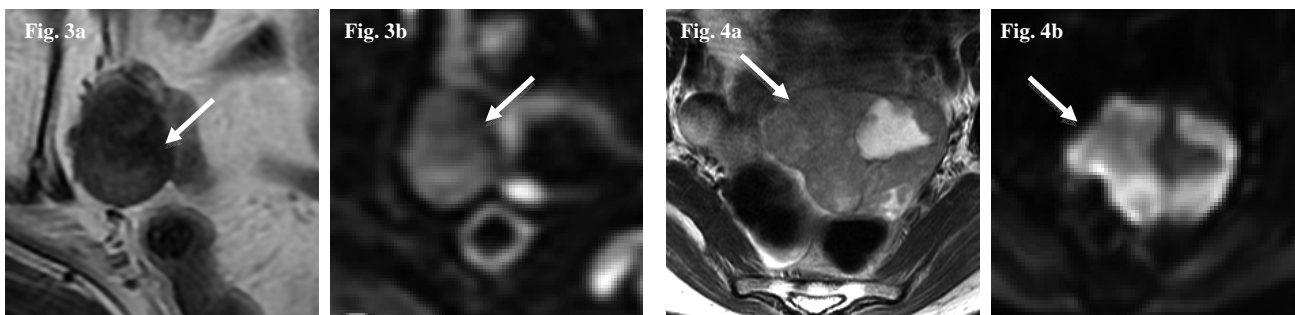
**[Results]** The tumor size ranged from 3.2 to 19.9 cm (mean; 9.6 cm) at their maximum diameter. In all 11 T/FTs totally or partially low signal intensity areas equal to that of skeletal muscles were observed, whereas only one malignant tumor (carcinoid) showed partially low signal intensity equal to that of skeletal muscles on T2-weighted images. All 11 T/FTs showed totally or partially high intensity on DWI. None of 12 non-thecomatous benign tumors showed high signal intensity on DWI, whereas all 51 primary malignant ovarian tumors showed totally or partially high signal intensity on DWI. The ADCs in 11 T/FTs, 12 benign tumors, and 51 malignant tumors were  $1.16 \pm 0.07$ ,  $1.44 \pm 0.24$ , and  $1.05 \pm 0.18$  respectively. The ADC of T/FTs is significantly higher than that of malignant tumors ( $p=0.01$ ) and lower than that of non-thecomatous benign tumors ( $p=0.001$ ). Using a cut off value of 1.25 for T/FTs from non-thecomatous benign tumors had a sensitivity of 91%, specificity of 83%, PPV of 83%, and NPV of 91%. Using a cut off value of 1.15 for T/FTs from malignant tumors had a sensitivity of 82%, specificity of 69%, PPV of 36%, and NPV of 95%.

**[Conclusion]** Ovarian T/FTs may show high signal intensity on DWI with relatively low ADC, possibly due to hypercellularity compared to other benign tumors, and may mimic malignancy. The existence of very low intensity area on T2-weighted images may suggest fibrous components of T/FTs, and unusual MR finding for primary malignant ovarian tumors except for carcinoid. Some non-thecomatous benign fibrous tumors may show relatively low ADC values, however, low signal intensity on DWI due to T2 blackout is suggestive for their benignity.



**Fig. 1:** Scatter plots of ADCs in malignant tumors, T/FTs, and non-thecomatous benign tumors.

**Fig. 2:** Thecoma appears as high intensity mass containing low intensity areas on T2WI, and high intensity on DWI with relatively low ADC (1.12).



**Fig. 3:** Fibroma shows inhomogeneous low to high intensity on T2WI, and low to intermediate intensity on DWI with relatively high ADC (1.38).

**Fig. 4:** Solid portion of clear cell carcinoma shows high intensity on T2WI, and high intensity on DWI with low ADC (0.90).