

3 TESLA DIFFUSION TENSOR IMAGING (DTI) OF NORMAL UTERUS IN YOUNG AND MIDDLE-AGED WOMEN DURING THE MENSTRUAL CYCLE: AN INITIAL STUDY TO EVALUATE THE CYCLIC CHANGES OF FRACTIONAL ANISOTROPY (FA) AND APPARENT DIFFUSION COEFFICIENT (ADC) VALUES

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TARGET AUDIENCE: Radiologists engaged in female pelvis imaging and gynecologists.

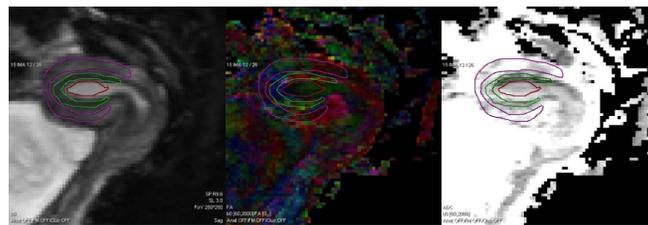
PURPOSE: To evaluate cyclic changes of fractional anisotropy (FA) and apparent diffusion coefficient (ADC) values of the normal uterus in different age groups during the menstrual cycle, and the correlation with basic hormone levels.

METHODS: 29 normal volunteers (22-40yrs, mean 28.7yrs) (20-30yrs, n=17; 31-40yrs, n=12) with regular menstrual cycle and biphasic basal body temperature accepted diffusion tensor imaging (DTI) of the uterus on a 3T MRI scanner (Skyra, Siemens Medical Solution, Erlangen, Germany) on the 2nd or 3rd days of menstrual phase (MP), follicular phase (FP), ovulatory phase (OP) and luteal-phase (LP) respectively. FA and ADC values of different layers of the uterus on midsagittal images were blinded measured by two radiologists on the post-processed workstation. Mixed liner models were used to evaluate the differences between two age groups and among four menstrual phases. One-way ANOVA analysis was used to evaluate the difference of FA and ADC values among three zonal structures of the uterus. Serum levels of oestradiol (E), progesterone (P), luteinizing hormone (LH), follicle stimulating hormone (FSH) were measured in MP, compared with the variation of FA and ADC values during the menstrual cycle using Pearson correlation analysis.

RESULTS: When age increased, FA and ADC values of the endometrium slightly elevated with on statistical difference ($p>0.05$). During the menstrual cycle, FA values of the endometrium declined whereas ADC values increased with significant difference ($p<0.05$). Serum E levels showed a moderate correlation with the difference of the FA values between MP and FP ($p=0.045$, $r=0.389$), MP and OP ($p=0.008$, $r=0.511$). FA values of the junctional zone showed an increasing tendency as age increased, while ADC values showed an opposite trend compare with FA, though without statistical difference ($p>0.05$). FA and ADC values of the junctional zone showed no significant difference during the menstrual cycle ($p>0.05$). FA values of the myometrium in 30-40 years group were lower than that in 20-30 years group without statistical difference ($p=0.0917$). FA values of the myometrium showed no significant difference during the menstrual cycle ($p=0.0961$). ADC values of the myometrium showed significant difference during the menstrual cycle (MP vs LP $p<0.0001$, FP vs LP $p=0.0002$, OP vs LP $p=0.0016$), but with no statistical difference between age groups ($p=0.7618$). FA and ADC values of three zonal structures of the uterus showed significant difference ($p<0.05$) at each time point during the menstrual cycle.

DISCUSSION: As age increasing, FA values of the endometrium and junctional zone showed an increasing tendency, while FA values of the myometrium showed an opposite trend, indicating the different variation of uterine microstructural organization such as the density and orientation of fibrous tissue as age increased (1). Description of the cyclic changes of FA and ADC values of the uterus during the menstrual cycle makes sense to the application of these MR parameters in the evaluation of gynaecological abnormalities (2,3). The correlation between E levels and variation of FA values of endometrium revealed the role of oestradiol on endometrial cell proliferation (4).

CONCLUSION: Dynamic changes of FA and ADC values of the uterus were observed during the menstrual cycle, which showed significant differences among three zonal structures on each phase. Variation of FA values of endometrium correlated moderately with basic E levels.



Measurements of FA and ADC values of the uterus

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