The time-course effect of anticholinergic agents on intestinal motion and uterine peristalsis: Evaluation on cine MRI

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Introduction:

It is known that anticholinergic agents contribute to improve quality of conventional uterine MR images with suppression of intestinal motion. Similar to intestine, uterine myometrium consists of smooth muscles and rhythmical motion is known as uterine peristalsis. However, the effect of the anticholinergic agents to suppress uterine contractility has been shown to be weaker compared to the effect on intestinal motion on a recent cine MRI study using T2-weighted half-Fourier rapid acquisition with relaxation enhancement (RARE)[1)]. Relaxation of smooth muscles in the intestines is reported to start in 45 seconds after intravenous injection of hyoscine butylbromide and to last 17 minutes[2)]., whereas effect of the drug to suppression of the uterine contractility regarding duration and degree has not yet been clarified. Purpose of this study was to compare time course of the effect of the anticholinergic agent between intestinal motion and uterine peristalsis by visual assessment of the cine MR images.

Materials and Methods:

MR imging was obtained with a 1.5T scanner(EXELART Vantage, Toshiba Medical Systems, Tokyo, Japan). A T2-weighted RARE sequence (repetition time/echo time = 3000/130msec, FOV of 300x300 mm, matrix of 512x512,slice thickness of 5mm) was employed. In a midsagittal plane of the uterus during quiet respiration, 60 serial RARE images were acquired to create cine MR images. Study population included19 healthy women of reproductive age (25.7±3.7 years) in periovulatory phase. Cine MR images were obtained at four occasions, each for three minutes: before (pre), and 2-5 (post 1), 5-8 (post 2) and 10-13 (post 3) minutes after intravenous injection of 20 mg of hyoscine butylbromide. For each session, AVI movie of 12 seconds was created by Osirix® and displayed at 15-30 times faster than real speed on computer monitors by using commercially available software package. Two experienced radiologists separately evaluated these movies in a random order. Intestinal motion was evaluated in degree. Uterine peristalsis was evaluated as frequency/3min and degrees of endometrial transformation, subendometrial conduction of low signal intensity, conduction of low signal intensity toward the outer myometrium. All degrees were graded by a five-point scale (0: not present, 1: weak, 2: mild, 3: moderate, and 4: marked). Frequency of uterine peristalsis during three minutes was each recorded. After the initial scorings, simultaneous re-evaluation was done when the scores showed discrepancy of 2 or more. Finally,scores of two radiologists were averaged. Scores of the qualitative evaluations were analyzed by Friedmann test. Wilcoxon signed rank test with Bonferroni correction was used as a post-hoc test. Frequency of the uterine peristalsis was analyzed by one-way repeated measures ANOVA. P-values less than .05 were regarded as statistically significant.

Results:

Results were summarized in Figure1 and Table 1. Intestinal motion were significantly reduced at post 1, 2 and 3 Compared with images before administration of the drug. In comparison of images at post 2 and 3, the intestinal motion showed significant, but incomplete recovery at post 3. No significant differences were shown regarding uterus peristalsis on all occasions.

Discussion and Conclusion:

In serial time course evaluation of cine MRI, suppressive effect of the anticholinergic agent on the intestinal motion was clearly proven. This result is in concordance with previous report of anticholinergic effect on intestine. We have further observed the strongest effect around 2min to8min.

In this study, however, effect of the drug to uteine peristaosis was not seen. It has been previously reported that uterine peristalsis in follicular through periovulatory phases is slightly suppressed by the administration of the anticholinergic agent. However it was also suggested that sporadic and contractions of the uterine myometrium disturb the conduction of uterine peristalsis and the relaxation effect of the drug adversely increase the uterine peristalsis in such situations. Further investigation with the evaluation of sustained contraction is necessary to clarify the anticholinergic effect in this group of women.

References:

1. Nakai A, Togashi K, Kosaka K, Kido A, Kataoka M, Koyama T, Fujii S, Do Anticholinergic Agents Suppress Uterine Peristalsis and Sporadic Myometrial Contractions at Cine MR imaging? Radiology. 2008 Feb;246(2):489-96.

2. Ayre-Smith G. Hyoscine-N-buthlbromide(Buscopan) as a duodenal relaxant in tubeless duodenography. Acta Radiol Diagn(Stockh) 1976;17:701-713.

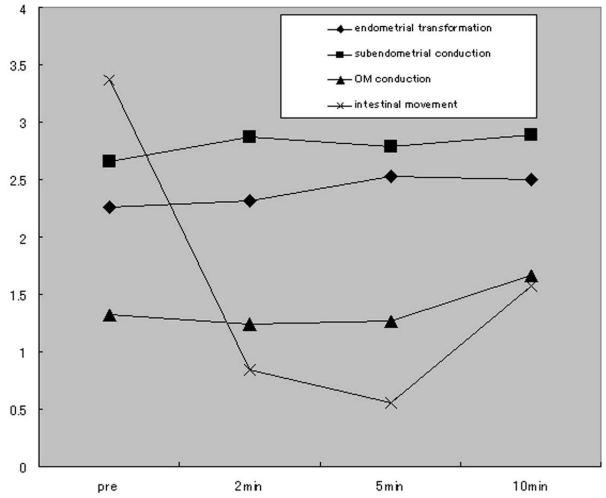

Figure 1. mean value of each qualitative evaluation.

measurements	analysis	p-value
frequency of peristalsis	ANOVA	0.89
endometrial transformation	Friedmann	0.87
subendometrial conduction		0.97
OM conduction		0.28
intestinal motion		< 0.001

Intestinal motion	2min	5min	10min
pre	<0.001	<0.001	<0.001
5min			0.001

Table 1. Results of the analyses. Regarding post-hoc test for intestinal motion, p<0.013 was regarded as significant.