

*Short Communication***The relation between endometrial thickness and pattern with pregnancy rate in infertile patients***Ziba Zahiri Soroori*, Seideh Hajar Sharami**, Zahra Atrkar Roshan******Abstract**

BACKGROUND: The usefulness of determination of endometrial thickness and pattern by ultrasound for pregnancy prediction has been confirmed as well as questioned in the literature. In an effort to help clarify this controversial issue and to find the relation between endometrial thickness and pattern and pregnancy rates, this study was undertaken.

METHODS: This was a cross-sectional study. One thousand and thirty infertile couples with ovulatory factor infertility that underwent 1,030 cycles of induction of ovulation were included in this study. All patients charts were reviewed for endometrial thickness (<7, 7-14 and >14 mm) and pattern (triline versus homogenous) on the time of HCG administration. Age, duration of infertility and number of follicles were evaluated in all patients. Treatment outcome was clinical pregnancy rate. The SPSS 10 software and chi-square t-test and ANOVA were applied for statistical analysis. P<0.05 was determined as statistical significant.

RESULTS: The overall pregnancy rate was 25.8% (266 from 1030). There was no statistically significant difference in pregnancy rates in three groups of endometrial thickness (<7, 7-14, >14 mm) and two groups of endometrial patterns (triline and homogenous).

CONCLUSIONS: This study showed that there is no significant relation between endometrial thickness and pattern and pregnancy rate. Further studies are recommended.

KEY WORDS: Endometrial thickness, endometrial pattern, pregnancy, ultrasound.

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The thickness and appearance of pre-ovulatory endometrium, as judged by ultrasound examination, have been shown in some studies to be important factors for predicting the outcome of ovarian stimulated cycles¹⁻⁹, while other studies have shown no such relationship¹⁰⁻¹⁷. In one study, the authors reported no difference in the clinical pregnancy rate when the endometrial thickness was ≥ 14 mm¹⁸. In another study, the

authors reported a success of less than 3% when the endometrial lining was greater than 14 mm on the day of HCG administration⁸. Several studies demonstrated that a thin endometrium is associated with failure of implantation and that pregnancy rarely occurs in the presence of an endometrial thickness of <6-7 mm⁶. Individual case reports described a successful pregnancy with low extreme of endometrial thickness of 4 mm¹⁹. In an effort to

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help clarify this controversial issue, this study was undertaken. Our objective was to determine whether pregnancy rates are related to endometrial thickness and pattern in ovarian stimulated cycles.

Methods

In this cross-sectional study, the records of all patients who underwent ovarian stimulation at the family IVF center during the years 2002-2004 were evaluated. Women aged, 20-40 years with a total sample of 1,030 cycles were included in this study. All patients had a normal uterine cavity and fallopian tubes, as evidenced by a normal hysterosalpingography or laparoscopy, performed before treatment. All couples had normal semen analysis, based on WHO criteria, and only the patients with ovulatory dysfunction were included. The local ethics committee approved the study protocol, and written informed consent was obtained from all patients. All patients underwent controlled ovarian hyperstimulation, using clomiphene citrate and HMG, or HMG alone. HCG (5000 IU) was administered intramuscularly when at least one follicle was ≥ 18 mm in diameter and the patient was advised to have intercourse on the same day and on two subsequent days. On the morning of the HCG administration, endometrial thickness and pattern were measured by transvaginal ultrasound (Honda HS 2000). All of the measurements were performed by the same physician. Age, duration of infertility and the number of follicles of each patient were recorded. Endometrial thickness was measured in the central longitudinal axis from the echogenic interphase of the junction of the endometrium and myometrium (stratum basalis of endometrium and inner myometrium) on the anterior side of the endometrium to the same plane on the posterior side of the endometrium. The largest wall-to-wall endometrial diameter was measured. Treatment cycles were further subdivided into three groups according to endometrial thickness¹⁴. Group A consisted of cycles with an endometrial thickness of <7 mm. Group B involved cycles with an endometrial

thickness of 7-14 mm. Finally, Group C consisted of cycles with an endometrial thickness of >14 mm. According to the endometrial pattern, the treatment cycles were subdivided into two groups¹⁴: group 1 with triple line endometrium and group 2 with homogenous endometrium. Treatment outcome was a clinical pregnancy rate that was diagnosed by increasing serum concentrations of β HCG 2-3 weeks after HCG administration and the subsequent demonstration of fetal heart 3 weeks after missed period. The treatment outcome was evaluated for each group in terms of age, duration of infertility and number of follicles. Chi-Square analysis and ANOVA were performed and $P < 0.05$ was considered statistically significant.

Results

The three groups of endometrial thickness were similar in terms of age of female, duration of infertility and the number of follicles (table I). Also, between the two endometrial pattern groups, there was no statistically significant difference in terms of age of female, duration of infertility, and the number of follicles (table II).

Endometrial thickness data is shown in table III. Women were divided into 3 groups. Between these groups, no difference in age, duration of infertility, or number of follicles was detected, as mentioned earlier. The overall pregnancy rate was 25.8% (266 from 1030). From 316 patients that were included in the group with endometrial thickness of <7 mm, 22.2% (75) became pregnant. From 706 patients that were included in the group with endometrial thickness of 7-14 mms, 27.5% (194) became pregnant. From 8 patients that were included in the group with endometrial thickness of >14 mm, 25% (2) became pregnant. The difference between these groups was not statistically significant. Endometrial pattern data is shown in table IV. Women were divided into two groups. Of the 988 patients that were included in the group of triple line endometrium, 25.9% (256) became pregnant. Of the 42 patients that were included in the groups of

homogenous endometrial pattern, 23.8% (10) became pregnant. There was no statistically significant difference between them.

Table 1. Age, Duration of infertility and the number of follicles in three groups of endometrial thickness.

Variable	<7 mm n = 316	7-14 mm n = 706	>14 mm n = 8	P value
Age	33 ± 3.3	33.8 ± 3.2	33.9 ± 3.2	NS
Duration of infertility	4 ± 1.9	7.1 ± 2.1	6.7 ± 2.0	NS
No. of follicles	3.1 ± 0.5	3.1 ± 0.7	3.2 ± 0.6	NS

Values are mean ± SD.

Table 2. Age duration of infertility and the number of follicles in two groups of endometrial pattern.

Variable	Trilene N = 988	Homogenous N = 42	P value
Age	33.5 ± 3.7	33.1 ± 3	NS
Duration of infertility	6.7 ± 2	6.9 ± 2.1	NS
No. of follicles	3.2 ± 0.5	3 ± 0.7	NS

Values are mean ± SD.

Table 3. The relation between endometrial thickness and pregnancy rate.

Endom.thickness	Pregnancy		Total	X ²
	YES	NO		
<7 mm	75 (22.2)	246 (77.8)	316	NS
7-14 mm	194 (27.5)	512 (72.5)	706	
>14 mm	2 (25)	6 (75)	8	
Total	266 (25.8)	764 (74.2)	1030	

Values in parentheses are percentages.

Table 4. The relation between endometrial pattern and pregnancy rate.

Endometrial pattern	Pregnancy		Total	X ²
	YES	NO		
Trilene	256 (25.9)	732 (74.1)	988	NS
Homogenous	10 (23.8)	32 (76.2)	42	
Total	266 (25.8)	764 (74.2)	1030	

Values in parentheses are percentages.

Discussion

Uterine receptivity is an important factor that may affect embryo implantation. Two measures of uterine receptivity that are commonly used are the thickness and pattern of the endometrium, as measured by ultrasound during the periovulatory period. Endometrial thickness and pattern, as a predictor of outcome, have been investigated by numerous studies with variable results. While some study groups

found a significant correlation between thickness and pattern of the endometrium and pregnancy rate, others reported no such relationship. Several studies have suggested a poor outcome when the endometrium exceeded a certain thickness. One study showed that there were no pregnancies with an endometrial thickness over 15 mm on the day of ET²⁰. The literature, however, does offer some reassurance (see introduction). Other investiga-

tors found that an endometrial thickness of ≥ 14 mm was present in 9.6% of IVF-ET cycles and was associated with a normal pregnancy rate in 42.8% but a high rate (66%) of biochemical pregnancies⁹. In the other study investigators noted that an endometrial thickness of ≥ 15 mm was found in 11.6% of IVF-ET cycles and resulted in high implantation rates and clinical pregnancy rates of 24.8% and 48.3%, respectively⁷. In one study, there were two cases of successful pregnancy in the setting of exaggerated endometrial thickness. One case involved an endometrial thickness of 16 mm and the other was 20 mm¹⁵. Several studies demonstrated that a thin endometrium is associated with failure of implantation and that pregnancy rarely occurs in the presence of an endometrial thickness of $< 6-7$ mm^{4,6}. Individual case reports describing a successful pregnancy with low extremes of endometrial thickness (4 mm) have been published¹⁹. In this study, we found no significant relation between endometrial measurements (thickness and pattern) and pregnancy rate. Several explanations can be made for the differences that exist between various studies, including ours. Most of the studies that showed decreased pregnancy rate with increased endometrial thickness were undertaken in IVF-ET cycles. The mechanism leading to this poor outcome may be related to an increased risk of endometrial trauma due to the transfer catheter at the time of ET. On the other hand, the opposing conclusions drawn by different authors may be due, in part, to different techniques used; i.e. vaginal versus abdominal sonography and different ovarian stimulation protocols²¹. Furthermore, measurement of the maximum endometrial height is fraught with several problems. There are

several reasons for this. First, the uterus may be scanned in an oblique plane, thus over- or underestimating the true endometrial thickness. Second, a single measurement, usually obtained at the fundus of the uterus is used to represent the entire cross-section of the endometrium. Third, marked ovarian enlargement may distort the endometrial outline. All of these can lead to incorrect measurements²². In this study, no difference was seen in pregnancy rates according to whether the endometrium was "thin" or "thick", "homogenous" or "trilene". However, it is obvious that an intrauterine pregnancy can be established even in a cycle where the ovulatory endometrium is much thinner (e.g., 4 mm). In conclusion, this study adds further evidence supporting the idea that ultrasonographic parameters, as predictors of implantation, have a limited value in a clinical setting. Thus, neither can be clinically employed to cancel a cycle because of insufficient or excessive endometrial thickness or abnormal endometrial pattern. We confirm that there seems to be no definite relation between the pre-ovulatory endometrial thickness and pattern and outcome. Further confirmation of our preliminary data is needed before a change in the therapeutic approach can be suggested. It seems that factors other than endometrial thickness and pattern may affect the pregnancy rate. We recommend further studies, such as the evaluation of histological characteristics of endometrium in different thicknesses and patterns, or a three-dimensional volumetric study of endometrium that may offer a more reliable method to assess the endometrial cavity from the fundal region to the internal cervical os.

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