ORIGINAL ARTCLE

Rate of Success of Pregnancy on the Basis of Endometrial Thickness and Endometrial Pattern at the Time of Ultrasound Guided Embryo Transfer

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ABSTRACT

Aim: To determine the rate of success of pregnancy based on endometrial thickness and endometrial pattern at the time of ultrasound guided embryo transfer, in FET (Frozen-thawed embryo transfer) cycles.
Methods: The study was carried out by studying FET cycles in which at least one morphologically good quality blastocyst was used, it was conducted retrospectively between 2017 till 2020 at a state of the art infertility Centre. Ultrasonographic characteristics of the endometrium were noted on the progesterone supplementation, trigger, day as well as on the day of embryo transfer in each FET cycle. On the basis of endometrial thickness two groups were observed, patients having endometrial thickness <0.85 cm and those having an endometrial thickness of >0.85cm, on the trigger day. Similarly on the day of embryo transfer two groups were observed, first group had an endometrial thickness of <1.0 cm and the other group >1.0cm. All cycles selected for our study had an endometrial pattern A (Triple line pattern). Clinical pregnancy rates in different groups divided on the basis of endometrial thickness were analyzed.
Results: A total of 97 FET cycles were studied. The result shows that no significant differences in endometrial thickness were observed between the positive pregnancy group (n=14) and not pregnant group (n=14) at the time of trigger when the endometrium measured <0.85cm and no significant difference between the positive pregnancy group (n= 30) and not pregnant group (n=39) when the endometrium measured >0.85 cm, (P <0.05). Similarly no significant differences were observed in endometrial thickness between the positive pregnancy (n=17) and not pregnant group (n= 24) when the endometrium measured <1.0 cm and none in positive pregnancy group (n= 27) and not pregnant group (n=29) when the endometrium measured > 1.0 cm at the time of embryo transfer, (P <0.05).
Conclusion: According to the results of this study the analysis of endometrial thickness at the time of trigger and at embryo transfer both, showed no predicting effects on the outcome of pregnancy rate.
Keywords: clinical pregnancy rate, endometrial thickness, endometrial pattern, Frozen-thawed embryo transfer.

INTRODUCTION

There is a range of emotions that people experience when their expectations and beliefs are challenged by problems in achieving reproduction.[1] Great development has occurred in the assisted reproductive technology (ART) during last several decades that contributes to improving the pregnancy rates (PRs) with in vitro fertilization (IVF) development and intracytoplasmic sperm injection (ICSI) as well as Frozen-thawed embryo transfer (FET). Simultaneously, the recognition of most favorable conditions regarding in vitro fertilization & intracytoplasmic sperm injection has long been the topic of extreme exploration. The in vitro fertilization cycles success is mostly dependent upon female age, embryo quality as well as endometrial receptivity[2]. Regarding uterine receptivity, endometrial receptivity assessment remains an important challenge in ART[3]. The capability to discover a receptive uterus through a noninvasive technique will have a significant effect on the efficiency of treatment as well as success rates after ART[4]. At present, ultrasonography is utilized to assess the endometrium during the IVF cycles. Ultrasound (US) indices, for example, EnT (endometrial thickness), endometrial volume, EnP (endometrial pattern), and endometrial & sub-endometrial blood flow are utilized to detect the endometrial receptivity[5]. Endometrium is uterus inner lining and has the receptors for ovarian hormones and gonadotrophins.[6] In reaction to the estradiol from ovaries the lining of endometrium develops in a classic pattern that is identifiable through transvaginal ultrasonography. All through the menstruation, changes occur that arrange endometrium for implantation[6]. As fresh in vitro fertilization cycles mostly cause embryos that are surplus for single in vitro fertilization cycle, embryos cryopreservation and frozen-thawed embryo transfer (FET) have become an important part of in vitro fertilization method.[7] Nevertheless, while majority of examinations have focused upon probable association between EnT during the fresh cycles & pregnancy results after sequent frozen-thawed embryo transfer cycles, some studies investigated the best environment of frozen-thawed embryo

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transfer, however, suggesting a contradictory relationship between EnT and pregnancy results after frozen-thawed embryo transfer cycles.[8,9]

Various studies have demonstrated an association between EnT or definite kind of an echogenic pattern as well as uterine receptivity.[7,10-15] Several researches have reported minimum thickness regarding successful pregnancy to take place, however other studies have demonstrated unfavorable effects of enhanced EnT above that pregnancy is doubtful to happen.[14,16,17] On the contrary, others remained unsuccessful to show an association between the endometrial thickness, its pattern, implantation rate and pregnancy.[18-20]

Sonographic evaluation of EnP is one more indicator utilized to describe endometrial receptivity.[21] During similar study, EnP was assessed demonstrating unfavorable outcomes at triggering day with mid excretory pattern.[11] Though, EnP assessment continues to offer contradictory outcomes either it is studied like a sole determinant or along with the endometrial thickness.[26]

To confirm the beneficial diagnostic role of endometrial thickness and pattern on ultrasonography, this study was conducted.

MATERIALS AND METHODS

The data for this study was collected retrospectively, the assessment of endometrium was done routinely using vaginal and abdominal sonography during FET cycles, at Australian Concept Infertility Medical center. This FET cycles data was collected between August 2017 to August 2020. Females with chronic hypertension (BP ≥140/90mmHg), anemia (Hb <10g/dl), cardiac disease (on medical record), diabetes (BSR >186mg/dl), liver disease (ALT & AST >40IU), renal disease (creatinine>1.2mg/dl), were excluded. All other FET cycles with transfer of at least one good quality embryo (blastocyst-stage) were included irrespective of reproductive history, diagnosis, stimulation protocol, insemination method or FET protocol.

Protocols for ovarian stimulation were chosen according to the cause of infertility, maternal age, Anti-Mullerian Hormone and Luteinizing hormone level, ovarian response and co existing medical condition. On folliculometry when two or more leading follicles reached a mean diameter of 18mm or above, recombinant human chorionic gonadotropin injection was given to trigger ovulation, after 36 hours oocyte retrieval is performed transvaginally under ultrasound guidance. Using Intracytoplasmic Sperm Injection (ICSI) technique the fertilization of oocytes is performed. Once good quality embryos are formed they are cryopreserved using vitrification method. FET protocol includes hormonal replacement treatment cycles. This protocol was started on Day 2 of menses and includes oral administration of estradiol (Progynova), it was initiated with 2-4mg/day from cycle day 2 to day 5, then 6mg/day from day 6 to day 9, a transvaginal ultrasound was performed on day 10 to measure the endometrial thickness, in accordance with which the estradiol dosage is adjusted. Once the endometrial thickness reaches 0.85cm or more, a trigger dose of 5000IU or 10,000IU of human chorionic gonadotropin is administered. The embryos are then thawed and transferred on either day 3 or day 5 of HCG administration depending on at which day were the embryos cryopreserved during the initial ICSI cycle.

Patients are followed up for ultrasound after 4 to 5 weeks of embryo transfer where a clinical pregnancy is defined on identification of a gestational sac along with a fetal cardiac activity. The features of endometrium assessed during FET cycle includes endometrial thickness and endometrial pattern at the time of trigger injection. Endometrial thickness was measured in the mid sagittal plane of the uterus, as the maximum distance between the two interfaces of endometrial and myometrial junction. All FET cycles were divided into two groups at trigger <0.85cm and other group >0.85cm. Similarly the endometrial thickness was again measured abdominally during embryo transfer, and was divided into two groups, first group included those with an endometrial thickness of <1.0cm and the second group >1.0cm. All cycles with an endometrial pattern A (triple-line type characterized by a hypoechoic endometrium with well- defined hyperechoic outer walls and a central echogenic line) were included.

RESULTS

Table 1: Frequency Distribution of Females According to Outcome

	Frequency	Percentage (%)
Positive	44	45.3
Negative	53	54.6
Total	97	100.0

Table 2: Frequency Distribution of Females According to Endometrial Thickness at Trigger

	Frequency	%age	Mean	Std Deviation
<0.85 cm	28	28.9	0.8150	0.03459
>0.85 cm	69	71.1	0.9557	0.07628
Total	97	100.0	0.9151	0.09254

Table 3: Frequency Distribution of Females According to Endometrial Thickness at Embryo Transfer

	Frequency	%age	Mean	Std Deviation
<1.0 cm	41	42.3	0.9822	0.03343
>1.0 cm	56	57.7	1.1459	0.08011
Total	97	100.0	1.0767	0.10368

Table 4: Success of Pregnancy Rate on the Basis of Endometrial Thickness at Trigger Cross tabulation between at Trigger and Outcome

Endometrial Thickness at Trigger	Outcome		Total
	Positive	Negative	
<0.85 cm	14(14.1%)	14(14.1%)	28(28.8%)
>0.85 cm	30(30.9%)	39(40.2%)	69(71.1%)
Total	44(45.3%)	53(54.6%)	97(100%)

Table 5: Success of Pregnancy Rate on The Basis of Endometrial Thickness at Embryo Transfer Crosstabulation between at Embryo transfer and Outcome

Endometrial Thickness at Embryo Transfer	Outcome		Total
	Positive	Negative	
<1.0 cm	17(17.5%)	24(24.7%)	41(42.2%)
>1.0 cm	27(27.8%)	29(29.8%)	56(57.7%)
Total	44(45.3%)	53(54.6%)	97(100%)

Duration of infertility, body max index (BMI), maternal age, endometrial thickness at trigger and at embryo transfer were compared with the clinical pregnancy group

and the no clinical pregnancy group. The endometrial pattern at the time of trigger and embryo transfer were compared by Chi- square test. All collected data was entered and analyzed by using SPSS version 25.0. Quantitative variables like age, BMI, duration of infertility and endometrial thickness were described as mean and SD. Qualitative variable like success was described as frequency and percentage. Chi-Square test was applied to compare success of pregnancy rates in groups sorted according to the endometrial thickness. P-value < α =0.05 was taken as significant.

DISCUSSION

During embryo transfer, endometrial thickness plays an imperative role in predicting the success of the procedure. Ultrasound can help in estimating endometrial thickness which helps in deciding whether at which endometrial thickness embryo transfer will be more successful. In our study 97 FET cycles at Australian Concept Infertility Medical Center, Lahore were studied to evaluate the effect of endometrial thickness and pattern on the outcome of pregnancy.

The inclusion of FET cycles omitted the probable effects of ovarian stimulation protocols on endometrium in fresh cycles. Our results suggested no association between endometrial thickness and pattern with pregnancy outcomes. When the outcome among females was assessed, study disclosed that 45.3% of the females had positive pregnancy tests. The results of our study exhibited better scenario than the study carried out by Kovacs and researchers (2003) who reported that 32.8% women had positive tests.[7] The findings of a study done by Hamdi et al. (2018) showed that only 26.7% females were found with positive pregnancy tests.[23] But the results of a study conducted by Yang and coworkers (2018) are better than our study results who confirmed that 55.7% females had positive pregnancy report.[22] The endometrial thickness measurement mostly at the time of embryo transfer helps in assessing the minimum thickness that allow fertilized ovum implantation.[1] Several studies demonstrated an important association between EnT and clinical pregnancy rate while some other studies asserted that EnT is not an interpreter for clinical pregnancy outcome.[24] Our study provided an additional confirmation that EnT is only a helpful indicator for positive pregnancy outcome, however statistically no positive association was found. Study showed very encouraging results that among 44 females who had positive pregnancy tests, 17 females had endometrial thickness <1.0 cm at embryo transfer while 27 had an endometrial thickness of >1.0 cm at embryo transfer and the pregnancy positive outcome was 61.3% which shows that an endometrial thickness of >1.0 cm was related to positive pregnancy outcome. The results of a study performed by Rehman and teammates (2015) showed that among 282 females, 41.0% had endometrial thickness <8 mm and 59.0% had endometrial thickness above 8 mm.[1] Zhao and colleagues (2012) elucidated that EnT and pattern autonomously affect the pregnancy outcomes. Combined EnT and pattern may not forecast the IVF-ET outcome when the endometrial thickness was less than 7mm or more than 14 mm, while one triple-line pattern together with moderate EnT was found related to a better positive pregnancy outcome. Kovacs and researchers (2003) demonstrated in their study that enhanced pregnancy rates were observed when EnT reached at least 10mm. Increased EnT was found associated with elevated pregnancy rates.[7]

CONCLUSION

During embryo transfer, endometrial thickness plays a significant part in predicting the success of the procedure. Study concluded that endometrial thickness >1.0 cm is associated with a positive pregnancy outcome. However the results also conclude that endometrial thickness is not the only factor that affects pregnancy positive rates. There are other factors that play a role, embryo quality might be the most important one, since the genetic composition of embryos is unknown.

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