Research Article

A comparative study of Uterine Artery Blood Flow in Patients with Unexplained Infertility and Normal fertile Women using Doppler Sonography

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ABSTRACT

The uterine perfusion especially the uterine blood flow can play an important role in the uterine endometrial receptivity. Previous studies have shown possible effects of uterine artery blood flow on the etiopathogenesis of the unexplained infertility. Therefore, the present study aimed to comparatively investigate the color Doppler sonography parameters of transvaginal imaging during mid-luteal phase and compared with a group of normal fertile women. Thirty five unexplained infertile patients referred to Imam Hospital in Ahvaz were selected as subject after standardized diagnosis in the study and compared with a control group including normal fertile women without any special gynecology problems who had been referred for the periodic checkup. The transvaginal color Doppler sonography was performed for each patient by an obstetrician in a blind state for the studied groups with calculation of the PI and RI values. The obtained data were analyzed using the appropriate descriptive statistics and statistical tests. On average there was no significant relationship between the PI and RI in both groups in terms of age, BMI and number of infertility years in a women group with Unexplained infertility (p> 0.05). For the women control group with fertility, the values of RI and PI were calculated 0.82 ± 0.06 and 2.05 ± 0.36, respectively. For the infertile women subjects the values of RI and PI were calculated 0.86 ± 0.05 and 2.54 ± 0.48, respectfully. The difference between two groups was significant for RI (P= 0.003) and PI (P< 0.0001). In addition, there was a significant difference between the values of PI and RI among the patients of the primary and secondary infertility subgroups of the unexplained infertile women (P= 0.003, P= 0.04). In accordance with the Doppler parameters, the unexplained infertile patients were with high impedance in their uterine artery blood flow which it means that before implantation the blood flow is less in the patients

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than that of the control group of fertile women. The findings demonstrate that the endometrial perfusion can have an important role in the unexplained infertility etiopathogenesis.

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INTRODUCTION

Unexplained infertility is one of the most frequent diagnostic cases with a prevalence of 15 to 30% in the fertility and midwifery clinics (1, 2). The spiral artery perfusion in the luteal phase increases among women with normal infertility concurrent with the implantation window (3). The Uterine endometrial receptivity is regulated by different factors such as uterine perfusion (4). Various studies have shown that the (2, 5-9). The abnormal uterine perfusion may be an effective factor in the infertility etiopathology, especially among the women with unexplained infertility.

Transvaginal Doppler sonography is an important technology for examining the female reproductive system and a Suitable non-invasive method for investigating the uterine perfusion (10, 11). The study is aimed to investigate the uterine artery blood flow in midluteal phase in the women with unexplained infertility and to compare it with normal fertile women in order to identify the probable role of uterine perfusion in the unexplained infertility.

MATERIALS AND METHODS

The descriptive trial plan was used in the research. The methodology of the research was approved by department of obstetrics and gynecology of the Jundishapur, Ahvaz University of medical sciences and Ahvaz university research committee and Imam Khomeini hospital. The research was performed in fall and winter 2015-2016 in Ahvaz Infertility Research Center of Imam Hospital, Ahvaz, Iran. The study was designed as single blind and the obstetrician who has examined the patients through sonography was blind of the patients grouping.

SELECTION OF PATIENTS
This was a single blinded control trial conducted aiming to investigate the uterine artery blood flow in midluteal phase in the women with unexplained infertility. The infertility of under study women was diagnosed unexplained based on the normal semen analysis, investigation of the uterine cavity, openness of the tubules and approval of their normality by hystrosalpingography. The normal fertile women as the control group have the last parturition maximum two years before the start of the study. Therefore, 35 subjects were selected for each group randomly. All the women in both groups are at the fertility age and between 20 to 35 years old. The inclusion criteria were existence of regular and normal menstrual cycles, normal pelvis sonography, normal tests including, normal ranges of the tests Prolactin, TSH, and FSH within 4-23 ng/ml, 0.3-5 U/ml, and 4.7-21.5 mlU/ml, respectively. The exclusion criteria included the previous history of pelvis surgery, caesarean operation, history of pelvic inflammatory disease, endometriosis clinical evidences, smocking, pelvic pathology such as uterine fibroids and ovarian cysts, taking medicine and data medical diseases affecting on the pelvic blood flow. If any excluding factors exist, the subject will be excluded and replaced by another patient based on

random sampling. All of the experimental procedures of the study as well as its main goal were clearly explained to the participants. Then, the written consent form was obtained from all of the patients.

DATA COLLECTION

The research were collected during the midluteal or pre implantation phase in the women who are in the 20th to 22th day post menstruation. The subjects were under transvaginal color Doppler sonography by an obstetrician with measurement of Pulsatility Index (PI) and Resistance index (RI) of the right and left uterine arteries. The mean values of sonography were recorded for every subject. Other information including age & BMI and infertility duration were extracted and recorded for both studied subjects and women with unexplained infertility diagnosis respectively. The value of BMI was calculated in women using the weight in kilogram divided by square of height in meter. The duration of infertility in the group of women with the unexplained infertility diagnosis was determined based on the number of years in three parts under 3 years, 3 to 5 years and above.

STATISTICAL ANALYSES

The quantitative data has been demonstrated via a mean and standard deviation. The independent sample T test was used for statistical comparison of the data in both groups and the Pearson Correlation Test was used for statistical comparison of the quantitative data of each group of women. The significance level in statistical tests was considered 0.05 so that the P-values of less than 0.05 were considered as statistical significant. The statistical analyses were performed using the statistical package SPSS (version 22.0)

ETHICAL CONSIDERATIONS

The verbal consent for performing the research was obtained through the direct reference of professional assistant of Obstetrics and Gynecology to each patient. Every patient was informed that all tests are noninvasive and non- Risky. Total information of the patients have been encoded and preserved in the check list and they have not been available for real and legal persons. All of the experimental procedures of this study were approved by the ethical committee of Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

RESULTS

During the study, 35 infertile women and 35 normal fertile women were compared in terms of PI and RI sonography factors.

According to the Table 1, there is a significant difference in the value of PI in both groups of infertile women and women with normal fertility. This is the same for the RI value and the difference was significant difference.

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Table 1. The mean and relation of PI and RI in both studied groups

Variable	Group	Mean	Standard deviation	P-value
PI	Infertile	2.54	0.485	P< 0.0001
	Normal fertility	2.05	0.366	
RI	Infertile	0.86	0.054	P= 0.003
	Normal fertility	0.82	0.065	

There was no significant inter-group difference in the infertile or fertile groups in terms of the values of BMI and PI. Therefore, the BMI value does not affect the PI value in the infertile women. It is the same in the normal fertile women and there was no significant difference.

Statistical analyses showed that there was no significant relationship in the values of BMI and PI between the infertile and normal fertile women.

Table 2. The mean of BMI and its relationship with PI and RI in both studied groups

Variable	Group	-	Mean	Standard deviation	P-value
BMI*PI	Infertile	BMI	23.74	3.183	P= 0.1
		PI	2.54	0.485	
	Normal fertility	BMI	24.67	3.872	P= 0.5
		PI	2.05	0.366	
BMI*RI	Infertile	BMI	23.74	3.183	P= 0.9
		RI	0.86	0.054	
	Normal fertility	BMI	24.67	3.872	P= 0.7
		RI	0.82	0.065	

According to Table 3, there is no significant difference in age and PI value in infertile women with together. As a result, the age of women does not affect the PI value of infertile women. It is the same in the normal fertile women and there was no significant difference.
There was no significant relationship between the age and RI value in both infertile women and normal fertile women.

According to Table 4, there is no significant difference in value of PI in the infertility durations of infertile women. It was the same in the RI value and there was no significant difference between the two groups.

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Table 3. The mean of age and its relation with PI and RI values in both studied groups

Variable	Group	-	Mean	Standard deviation	P-value
Age*PI	Infertile	Age	29.63	5.462	P= 0.3
		PI	2.54	0.485	
	Normal fertility	Age	30.17	3.339	P= 0.5
		PI	2.05	0.366	
Age*RI	Infertile	Age	29.63	5.462	P= 0.3
		RI	0.86	0.054	
	Normal fertility	Age	30.17	3.339	P= 0.9
		RI	0.82	0.065	

Table 4. The mean of PI and RI values in infertility years of women with unexplained infertility

infertility years	PI		RI	
-	Mean	Standard deviation	Mean	Standard deviation
Under 3 years	2.56	0.596	0.87	0.058
3-5 years	2.57	0.391	0.87	0.054
Over 5 years	2.45	0.197	0.84	0.043
P-value	P= 0.8		P= 0.4	

Totally from among the women with unexplained infertility, 20 and 15 subjects had primary and secondary infertility, respectively. According to Table 5, there is a significant difference between the value of PI and RI in the primary and secondary infertilities in women with unexplained infertile.

Table 5. The mean of PI and RI values in the primary and secondary infertilities in women with unexplained infertilities

Type of infertility	No.	PI		RI	
-	-	Mean	Standard deviation	Mean	Standard deviation
primary infertility	20	2.68	0.533	0.89	0.048
secondary infertility	15	2.34	0.342	0.83	0.049
P-value		P= 0.04		P= 0.003	

DISCUSSION

It was previously evident that the spiral and uterine artery blood flow changes during the ovulation phase periodically (1, 2, 11). During the mid-luteal phase (when the Endometriosis moves from the proliferative phase to the secretory phase) the uterine is filled by blood and subject to implantation (11, 12). It has been reported that the impedance of the spiral artery blood flow is more significant in unexplained infertile women than normal fertile women (1, 10). Therefore, it is supposed that the uterine perfusion decline may be a reason for unexplained infertility (10).

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Accordingly, this study was aimed to demonstrate that whether or not the blood flow in the unexplained infertile women is different from the normal fertile women and whether or not the BMI, age of both subjects and the duration of infertility in unexplained infertile women affect this value.

According to the analysis of uterine blood flow through color Doppler, it has been evident that the lack of blood flow signal is accompanied with decrease or lack of pregnancy rate significantly (13, 14).

In this study, the values of PI and RI in the unexplained infertile women were higher than the normal fertile women and the difference was statistically significant.

In a research, the highest rate of pregnancy in a group with less resistance has been explained relative to the spiral and uterine blood flow (15). According to the results, the decrease in environmental impedance is reflected in the uterine vessels with decrease in uterine arteries PI as a result to increase the uterine blood flow and a sign of increased tissue perfusion.

According to the results of the research, the best receptivity of uterine and subsequently appropriate pregnancy obtained in women group with lower resistance and there was no pregnancy in PI value higher than 2.6 but infertility. The findings were consistent with the findings of the study conducted by Steer et al. (16).

Meanwhile, there was significant difference between the value of PI and RI in women with unexplained infertility and women with primary & secondary infertility. The result was evident in the similar researches (17). Therefore the women with secondary infertility had lower vascular resistance and better perfusion and uterine receptivity than the women with primary infertility.

The results of study showed that the BMI and age of patients had no significant effect on PI and RI value in women with unexplained infertility. The result was the same in the control fertile women. The result was the same with that of similar researches on lack of effectiveness and difference of BMI and age on the fertility and the value of uterine blood flow (18).

Doppler pulsed ultrasound is in a problem in technical terms especially in the small vessels like sub endometrial and spiral arteries and dependency to its being operated. This issue creates a restriction in extensive usage of this technique.

In this study, all sonography measurements were performed by a specialized technician who was not aware of the position and group of patient, so this method has made more credibility to the results given the limitations.

According to the results, Doppler mid-luteal measurement is recommended to the infertile women. Increasing the impedance of uterine vessels increases the luteal blood flow and the patient should be referred for the treatment.

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