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DOPPLER ULTRASOUND ASSESSMENT OF UTERINE AND OVARIAN ARTERY BLOOD FLOW IN UNEXPLAINED INFERTILITY IN A TERTIARY CARE HOSPITAL IN KASHMIR

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ABSTRACT
Background: Unexplained infertility is the failure to conceive in a couple for whom no definitive cause for infertility can be found. It is suggested that women with unexplained infertility may have an impaired uterine and ovarian blood flow. Color Doppler USG is used to assess the utero-ovarian blood flow during the mid-luteal phase and to evaluate the receptivity of the endometrium and revealing unexplained infertility problems. **Methods:** Trans-vaginal color Doppler ultrasonography was performed in 34 infertile patients as well as age matched controls in the mid-luteal phase. The blood flow resistant and pulsation indices (RI and PI) of both the uterine and ovarian arteries were visualized displayed on the monitor and the mean calculated. **Results:** Statistical significance (p value <0.05) was found between the RI and PI values of Right and Left Uterine artery in patients (N=34) versus the controls (N=34). Similarly, Statistical significance (p value <0.05) was found between the RI and PI values of Right and Left ovarian artery in patients (N=34) versus the controls (N=34). **Conclusion:** In our study we found that the Color Doppler blood flow studies provide significant information about the association of unexplained infertility with decreased uterine and ovarian arteries blood flow during the luteal phase.

INTRODUCTION

The inability to conceive after one year of unprotected intercourse of reasonable frequency is termed infertility. It can be subdivided into primary infertility and secondary infertility [1]. Primary infertility refers to the condition of a woman who has never conceived, and secondary infertility to one who has had a previous pregnancy [2,3,4].

It is estimated that 60-80 million couples all over the world can be labelled as suffering from infertility [5]. The female factors contribute the most (40- 55%) in the aetiologies of infertility followed by male factors (30-40%), both partners (10%) and unexplained (10%) [6].

Infertility in many couples has multiple aetiologies; however, in approximately 15-17% of couples, no reason for infertility is found and the infertility is defined as unexplained [7]. Aetiology of the unexplained infertility includes the following factors:
1. Pituitary and follicular dysfunction
2. Gamete dysfunction
3. Alterations in endometrial function
4. Immunological factors [8].

A luteal phase defect has been implicated as a cause of infertility in 32.6% of infertile women [9].Studies have shown that the uterine receptivity is decreased if the uterine artery impedance during the mid-luteal phase is increased [10,11]. It has therefore been suggested that abnormal uterine perfusion may be a contributing factor to infertility among different subgroups of women especially among women with unexplained infertility [12,13,14,15].

Trans-vaginal color Doppler ultrasonography is used to assess utero-ovarian blood flow and to evaluate the functional capacity and receptivity of the endometrium [16].

Fertility is usually affected when the uterine artery resistance during midluteal phase is increased and when normal haemodynamic changes in uterine artery impedance do not occur. The uterine artery resistance in the luteal phase is also shown to be elevated in different infertile subgroups [11].

Materials and Methods:

The present observational study that was performed for over a period of one and a half year from June 2015 to December 2016 on women with unexplained infertility who were attending to our Hospital,Govt Lalla Ded hospital GMC Srinagar. An age-matched control group of fertile women who got pregnant within 1 year of marriage and a study group of women with unexplained infertility were included according to the following Inclusion criteria:

- Unprotected regular intercourse.
- Normal semen analysis.
- Serum progesterone at the mid luteal phase >P10 ng/ml.
- Patent fallopian tubes and normal pelvic cavity diagnosed by hysterosalpingography and laparoscopy.

Exclusion criteria included:
- Patients treated with vasodilator drugs.
- Women who received hormonal therapy or ovarian stimulation during the cycle of the study.

After taking a written informed consent from the patients, Trans-vaginal color Doppler ultrasonography was done at 21–23 days of the cycle between 10 am and 12 pm to avoid circadian changes in blood flow. The uterus was scanned to identify the ascending branch of the uterine artery. The probe was then moved and the color flow explored until the typical low-amplitude ovarian artery signals were obtained. The blood flow resistant and pulsation indices of both the uterine and ovarian arteries were visualized displayed on the monitor and the mean calculated.

Statistical Analysis

Categorical variables were summarized as frequency and percentage. Continuous variables were summarized as mean and standard deviation. Data has been analysed using EpiInfo 7.0 statistical software.

RESULTS:

In this study, the majority of the patients were in the age group of 26- 30 years constituting 61.8% (N= 21) of the cases and 82.4% (N= 28) of the control groups respectively. The majority of the patients were having primary infertility constituting 76.47% (N=26) and the other patients were having secondary infertility constituting 23.53% (N= 08).

Table 1: Types of infertility versus number of enrolled patients.

Infertility	Patients	
	N	%
Primary	26	76.47
Secondary	08	23.53

In our study most of the patients were from rural areas including 88.2% (N=30) patients and 11.8% (N=4) patients were residing in urban areas.

In this study, the mean value of Right Uterine artery RI of patients (N=34) versus the controls (N=34) was 1.1838 and 0.8024 respectively. While the mean value of Right Uterine artery PI of

patients (N=34) versus the controls (N=34) was 3.4968 and 2.4879 respectively (p value <0.05).However, the mean value of Left Uterine artery RI of patients (N=34) versus the controls (N=34) was 1.0594 and 0.7988 respectively (p value <0.05). While the mean value of Left Uterine artery PI of patients (N=34) versus the controls (N=34) was 3.3356 and 2.5118 respectively (p value <0.05).

Table 2: Comparison of Uterine Artery RI and PI values of infertility patients versus the controls.

Group		N	Mean	Std. Deviation	Std. Error Mean	P-Value
RUA_RI	Case	34	1.1838	0.25164	0.04316	<0.001
	Control	34	0.8024	0.10183	0.01746	
RUA_PI	Case	34	3.4968	1.06855	0.18326	<0.001
	Control	34	2.4879	0.45029	0.07722	
LUA_RI	Case	34	1.0594	0.27116	0.04650	<0.001
	Control	34	0.7988	0.11302	0.01938	
LUA_PI	Case	34	3.3356	0.78863	0.13525	<0.001
	Control	34	2.5118	0.42765	0.07334	

In this study, the mean value of Right Ovarian artery RI of patients (N=34) versus the controls (N=34) was 0.9644 and 0.7912 respectively (p value <0.05). While the mean value of Right Ovarian artery PI of patients (N=34) versus the controls (N=34) was 3.2468 and 2.4000 respectively (p value <0.05).

Table 3: Comparison of Ovarian Artery RI and PI values of infertility patients versus the controls.

ROA_RI	Case	34	0.9644	0.25228	0.04327	0.001
	Control	34	0.7912	0.12399	0.02126	
ROA_PI	Case	34	3.2468	1.26006	0.21610	0.001
	Control	34	2.4000	0.49175	0.08433	
LOA_RI	Case	34	0.8941	0.19142	0.03283	0.055
	Control	34	0.8212	0.10330	0.01772	
LOA_PI	Case	34	2.9515	0.87590	0.15022	0.001
	Control	34	2.3647	0.40593	0.06962	

DISCUSSION

In our study, majority of the patients were in the age group of 26- 30 years constituting 61.8% of the cases (infertile woman) and 82.4% of the control groups (fertile woman). Our study more or less finds congruence with the study of Selda Uysal et al in 2012 [17] and the study done by Razik M.A. et al in 2014 [18].

In our study, the majority of the patients were having primary infertility constituting 76.47% (N=26) and the other patients were having secondary infertility constituting 23.53% (N= 08). Similar results were shown by Qurat-ul-ain et al in 2014 [19] and R. Isaksson et al in 2003 [20].

Trans-vaginal color Doppler ultrasonography is a non invasive and efficient method for visualizing small vessels and study of blood flow changes. Changes in flow velocity waveforms of the uterine and ovarian arteries during the normal ovulatory cycle are related to ovulation (Razik M.A. et al 2014) [18].

In our study, the Uterine and Ovarian Artery RI and PI were significantly higher during the luteal phase in unexplained infertility women compared to the fertile women (P <0.001). The mean value of Uterine Artery PI of infertile woman was found to be >3.4 as against the controls (fertile woman) where the mean value of Uterine Artery PI was found to be 2.4.

For Resistivity indices, the mean value of Uterine Artery RI of infertile woman was found to be 1.1 as against the controls (fertile woman) where the mean value of Uterine Artery RI was found to be 0.8. However, the mean value of Ovarian Artery RI of infertile woman was found to be 0.9 as against the controls (fertile woman) where the mean value of Ovarian Artery RI was found to be 0.8.

These results are in agreement with the previous studies done by Razik M.A. et al (2014) [18] that demonstrated significantly high PI on the day of ovulation in non conception cycles compared to conception cycles . Owing to the similar interests, the study performed by Selda U. et al 2012 [17] borrowed similar results.

CONCLUSION

In our study we found that the Color Doppler blood flow studies provide significant information about possible causes of unexplained infertility and planning the treatment for the same. It is pertinent to mention that the unexplained infertility is associated with decreased uterine and ovarian arteries blood flow during the luteal phase. Thus, in our study the endometrial perfusion may have an important contribution to etiopathogenesis of unexplained infertility.

REFERENCES:
1. Schorge J.O, Schaffer J.I, Halvorson L.M, Hoffman B.L, Bradshaw K.D, Cunningham F.G. Willaims Gynecology; 2008, Chapter 19:, 426-444, Mc Graw Hill.
2. Guzic DS, Sullivan MW, Adamson GD, Cedars MI, Falk RJ, Peterson EP, Steinkampf P. Efficacy of treatment for unexplained infertility. Fertil Steril 1998; 70: 207–213.
3. Crosignani PG, Collins J, Cooke ID, Diczfalusy E, Rubin B. Unexplained infertility. Hum Reprod 1993; 8: 977–980.
4. Aboulghar M, Mansour R, Serour G, Abdrazek A, Amin Y, Rhodes C. Controlled ovarian hyperstimulation and intrauterine insemination for treatment of unexplained infertility should be limited to a maximum of three trials. Fertil Steril 2001; 75: 88–91.
5. Fathalla MF. Reproductive health: A global overview. Early Human Develop. 1992; 29:35-42.
6. Speroff L, Marc A. F. Female infertility: Clinical Gynecologic Endocrinology and Infertility, 7th Ed, Jaypee Brothers Medical Publishers, India. 2005; 1013-1068.
7. Cui W: Mother or nothing: the agony of infertility. Bull World Health Organ. 2010;88:881-882.
8. Rita Isaksson. Unexplained infertility: Studies on aetiology, treatment options and obstetric outcome. Page 15; Helsinki 2002.
9. Jain M, Sinha M, Shukla RC. Transvaginal Doppler ultrasound with color flow imaging in luteal phase defect. Int J Gynecol Obstet 2004;84:266 –7.
10. Steer CV, Tan SL, Mason BA, Campbell S. Midluteal-phase vaginal color Doppler assessment of uterine artery impedance in a subfertile population. Fertil Steril 1994; 61: 53–58.
11. Coulam CB, Bustillo M, Soenksen DM, Britten S. Ultrasonographic predictors of implantation after assisted reproduction. Fertil Steril 1994; 62: 1004–1010.
12. Zaidi J, Jacobs H, Campbell S, Tan SL. Blood flow changes in the ovarian and uterine arteries in women with polycystic ovary syndrome who respond to clomiphene citrate: correlation with serum hormone concentrations. Ultrasound Obstet Gynecol 1998; 12: 188–196.
13. Goswamy RK, Williams G, Steptoe PC. Decreased uterine perfusion – a cause of infertility. Hum Reprod 1988; 3: 955–959.
14. Kurjak A, Kupesic-Urek S, Schulman H, Zalud I. Transvaginal color flow Doppler in the assessment of ovarian and uterine blood flow in infertile women. Fertil Steril 1991; 56: 870–873.
15. Tinkanen H, Kujansuu E, Laippala P. Vascular resistance in uterine and ovarian arteries: its association with infertility and the prognosis of infertility. Eur J Obstet Gynecol 1994; 57: 111–115.
16. Ziegler WF, Bernstein I, Badger G, Leavitt T, Cerrero ML. Regional hemodynamic adaptation during the menstrual cycle. Obstet Gynecol 1999; 94: 695–699.
17. Selda Uysal, Elif Pelin Özün Özbay, Tekin Ekinci, Hayri Aksüt, Şebnem Karasu, Ahmet Zeki Işık, Ferit Soylu. Endometrial spiral artery Doppler parameters in unexplained infertility patients: is endometrial perfusion an important factor in the etiopathogenesis? J Turkish-German Gynecol Assoc, 2012; 13: 169-71.
18. Mohamed Abdel Razik, Mohamed Abdel Hady Farag, Mohamed Sheta. Uterine and ovarian arteries blood flow during the mid luteal phase in women with unexplained infertility. Middle East Fertility Society Journal, (2014) 20, 209–212.
19. Qurat-ul-Ain Wani, Rifat Ara, Sajad Ahmad Dangroo, Mehbooba Beig. Diagnostic Laparoscopy in the Evaluation of Female Factors in Infertility in Kashmir Valley. Int J Women's Health Reproduction Sci Vol. 2, No. 2, Winter 2014 Supplement.
20. R. Isaksson, A. Tiitinen, L. M. Reinikainen, B. Cacciatore. Comparison of uterine and spiral artery blood flow in women with unexplained and tubal infertility. Ultrasound Obstet Gynecol 2003; 21: 174-180.