The Ovarian Halo-A Valid Sign for Infertility Workup?

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Abstract
Female fertility period starts at the menarche which defined as age sexual puberty at which menstrual cycles begin to occur at 11-14 years of female age. Such period continues for about 40 years till reach the menopause occurring at the female age of 45-55 years. At the age of 35 years and before establishment of cessation of menses, there is a gradual decline in the ovarian reserve with subsequent decrease in the female fertility to totally stop at age of menopause. In the last stage of fertility period of females, many women are in need to become pregnant. Therefore, there an increasing necessity for establishment of a diagnostic method to assess the ability of female fertility at such age. A number of women was examined for diagnosis of ability for fertility. This was associated with blood hormonal assay. We observed a new parameter which was never described before. An Ovarian Black Halo, hypoechoic, with avascular appearance which surrounds one or both ovaries, partly or completely. We were surprised to find association between the existence of the halo with decreased AMH and Antral Follicular Count (AFC), while FSH a little higher in women who were consulted for infertility.

Keywords: Infertility, Ultrasound Scan, Follicles, Ovarian Reserve, Anti-Mullerian Hormone

Introduction

Female fertility period starts at the menarche which defined as age sexual puberty at which menstrual cycles begin to occur at 11-14 years of female age. Such period continues for about 40 years till reach the menopause occurring at the female age of 45-55 years [1]. At the age of 35 years and before establishment of cessation of menses, there is a gradual decline in the ovarian reserve with subsequent decrease in the female fertility to totally stop at age of menopause [2].

In the recent decades, more women decide to start childbearing in advanced age [3]. The fertility rate in these women is often decreased next to complications of pregnancies [4]. When pregnancy does not occur spontaneously, certain examinations have to be done, such as sperm examination of the partner, and blood tests for serum FSH, LH, Estradiol, Progesterone, and Anti-Müllerian Hormone Levels (AMH).

An ultrasound examination (US) enables counting of the antral follicles and compare it to the laboratory tests prior to decisions concerning suggested treatment, stimulation of ovulation, or IVF.

Therefore, in the current study we aimed correlate the US findings with the hormonal assay done for women referred to infertility unit.

Women and Methods

We investigated a total number of 132 women underwent a routine intravaginal ultrasound examination during infertility workup where the Black Halo was demonstrated.

In both groups the BMI, smoking, duration of infertility, and the number of nulligravida as well as the estimated etiology of infertility were registered.

In both groups serum FSH, LH, estradiol and AMH levels were measured on the third cycle day as well as the number of the Antral Follicles and the ovarian surface. Serum FSH, LH and estradiol levels were determined by an automated multi-analysis system using chemiluminescence detection technology (Cobas 6000, Roche, Meylan France).

The ultrasound were performed by two trained operators who were blinded to the results of the hormonal tests. The examinations were done with Voluson E8 system with a variable 5-9 MHz vaginal probe (General Electric). They were asked to determine the number and size of the small Antral follicles in order to assess the AFC All follicles with a mean diameter of 2 to 9 mm were considered for AFC. In order to optimize the reliability of the follicular assessment, the ultrasound scanner was equipped with a tissue harmonic imaging system [5].

The data were evaluated by student's t-test with Welch correction. Categorical variables were compared between the two groups

using a two-sided Pearson Chi-square test or Fisher's exact test, as appropriate. A p value < 0, 05 was considered significant.

Results

A Black Halo was demonstrated in a number of 69 women, aged 31-39, underwent a routine intravaginal US examination during infertility workup (Figures 1 and 2). The Black Halo which is characterized by hypoechoic, avascular appearance, 1-2 mm thick was completely or partly surrounding one or both ovaries.
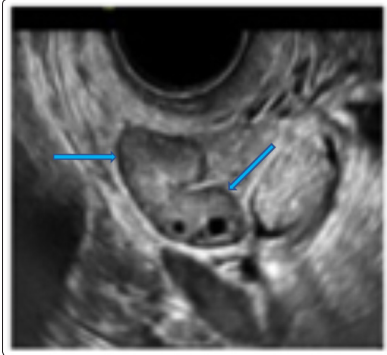

Figure 1: Photograph of US of female genitalia investigated by intravaginal examination showing a Black Halo (arrow) surrounding ovary
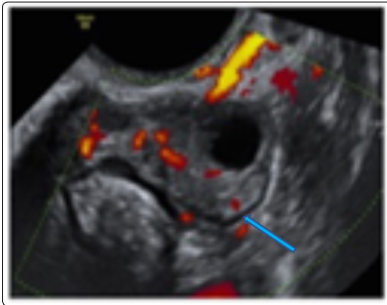

Figure 2: Another photograph of US of female genitalia investigated by intravaginal examination showing a Black Halo (arrow) partly surrounding the ovary

On the other hand, 63 women, aged 30-37, underwent a routine intravaginal ultrasound examination where no Black Halo was demonstrated. (Figure 3).
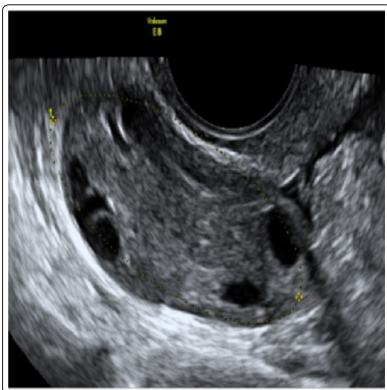

Figure 3: Photograph of US of female genitalia investigated by intravaginal examination showing no Black Halo surrounding the ovary

In both groups the BMI (Body Mass Index), smoking women, duration of infertility and other parameters showed no significant differences (Table 1).

However, there were significant differences between the AMH, number of Antral follicles, and ovarian surface in favor of the women without the Black Halo ovaries (Table 2).

Table 1: Patients Characteristics

	Black Halo (n=69)	No Black Halo (n=63)	*P*
Age (Year)	35.3 ± 3.7	34.3 ±3.9	0.13
BMI (kg/m²)	22.5 ± 3.7	22.8 ±3.8	0.6
Number of smokers (%)	30 (43.5)	27 (42.8)	0.9
Duration of infertility (Months)	32 ± 26	29 ± 28	0.13
Number of nulligravida (%)	30 (43.5)	28 (44.4)	1
Etiology of infertility (n)	21	17	
Not yet determined	26	23	
Idiopathic	15	13	
Male factor	6	5	
Tubal	1	0	
Endometriosis	0	5	

Table 2: Correlation of Hormonal and Ultrasound Results

	Black Halo (n=69)	No Black Halo (n=63)	*P*
Serum FSH levels (IU/L)	8.7 ± 4.2	6.8 ±2.4	0.002
Serum LH levels (IU/L)	5.1 ± 4.2	5.2 ± 2.1	0.8
Serum estradiol levels (pg/mL)	55.3 ± 35.2	48.1 ± 32	0.07
Serum AMH levels (ng/mL)	1.2 ±0.9	3.8 ±3.1	<0.0001
Number of antral follicles	10.4 ± 5.2	21.3 ± 8.5	<0.0001
Right ovarian surface (cm²)	3.5 ±1.4	4.5 ±1.9	0.002
Left ovarian surface (cm²)	3.2 ±1.1	4.4 ± 2.6	

Discussion

The Black Halo, which is described here for the first time, seems to be significantly associated with a reduction of AFC and serum AMH levels and increased FSH in the population of infertile women.

With advanced age the gradual decrease in the quantity and quality of the oocytes [6]. The serum AMH levels decline with aging and the AMH is predictive marker of the re-productivity [7,8]. But none of the available markers are predictive of the quality of the oocytes [9,10].

Any additional tool or marker could add value when infertility is assessed. It seems that the Black Halo might become an additional marker. Its existence indicates reduced ovarian reserve.

The reason for its existence is not clear. It might indicate impaired cortical vascularization and subsequent alteration of the folliculogenesis [11]. But also, other possibilities like toxic effect or reduced follicle density should be considered.

Conclusion

Our pilot study shows clearly that there is a close association between the appearances of the Black Halo with an alteration of the conventional markers of the ovarian follicle status, especially with low AMH serum levels.

We believe that more detailed studies should be done to confirm our observation (we included already another 100 patients), and also to find out if the existence or non-existence of the Black Halo might be predictive to the ovarian response to FSH and to assess its physiological significance.

The study was approved by the French College of Obstetricians and Gynecologists institutional review board; (Committee of Ethics of Research in Obstetrics and Gynecology) (CEROG 2014-GYN-0302). All participants signed a written informed consent form.

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