Sonographic Evaluation of Ovarian Reserve in Management of Infertility

Thesis

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Gynecology and obstetrics

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{قَالُواْ سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا عَلَّمْتَنَا
إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ }

(البقرة ٣٢)

ABSTRACT

THE AIM is to assess the application of ultrasonography and Doppler in the evaluation of ovarian reserve in management of infertility. **METHODS:** Transvaginal ultrasound and Doppler examination were performed to the selected 30 patients **RESULTS:** An increase of ovarian volume in PCOS patients and decreased after induction of ovulation, a decrease of AFC and increased after induction, PI and RI of uterine artery increased in PCO and decreased after induction , PI and RI of ovarian artery decreased in PCO and increased after induction ,Ovarian stromal blood flow indices were insignificant.**CONCLUSION:** ultrasonography and Doppler were proved to be important tools for prediction of ovarian reserve

Key words:

(Polycystic ovary disease PCOD/ovarian blood flow/stromal blood flow/uterine blood flow/pulsatility index PI/ resistance index RI ultrasonography, Doppler and ovarian reserve)

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Abberviations

Abberviation	Details
IVF	In vitro fertilization
FSH	Follicle stimulating hormone
LH	Lutenizing hormone
CCCT	Clomiphene citrate challenge test
GnRHa	Gonadotopin releasing hormone agonist
GAST	Gonadotopin releasing hormone agonist stimulating test
EFFORT	Exogenous follicle stimulating hormone ovarian reserve test
IGF-1	Insulin growth factor 1
IGFBPs	Insulin growth factor binding protein
HMG	Human menopausal gonadotropins
m RNA	Messenger RNA
VEGF	Vascular endothelial growth factor
cAMP	Cyclyc adenosine monophosphate
ATP	Adenosine triphosphate
HCG	Human chorionic gonadotropin
OHSS	Ovarian hyperstimulation syndrome
CC	Clomiphene citrate
E_2	Estradiole
IUI	Intra uterine insemination
3D	Three dimensions
U/S	Ultrasonography
TVS	Transvaginal sonography
PI	Pulsatility index
RI	Resistance index
PCO	Polycystic ovary
AF	Antral follicle
AFC	Antral follicle count

INTRODUCTION

Delaying the period of life to have children considerably contributes to the proportion of couples with involuntary childlessness ***(Mosher and Partt, 1991).*** Demographic **(**wood **1989)** and clinical **(*Noord-Zaadstra et al., 1991*)** studies have shown that a woman experiences her optimal fertility before the age of' 30-31 years. Thereafter, fertility gradually decreases with acceleration towards the age of 40 years.

Already at an age of 40-41 years half of the women will have completely lost their capacity for reproduction. It is generally accepted that reproductive ageing is in fact ovarian ageing and is related to the decreasing quantity and quality of the pool of` follicles preserved in the ovary **(*Tevelde and Pearson, 2002*)**

Ovarian reserve is the term that refers to a woman current supply of ova and is associated with the reproductive potential. In general, the greater the number ova, the better the chance for conception and vice versa. The decline in fecundity with female age, long before menopause occurs, is a well-known phenomenon .Ovarian ageing, more than uterine ageing seems to play an important role. The cohort of primordial follicles undergoes steady depletion with age, starting already before birth **(*Navot et al., 1994*).**

Determination of ovarian reserve is important before any expensive IVF treatment is undertaken. Identification of both low and high responders prior to treatment may decrease cycle cancellation rate

as well as side effects, such as ovarian hyper stimulation syndrome. Determination of the probability of pregnancy beforehand is important because of its prognostic value which allows physicians to evaluate and counsel patients before IVF stimulation and to optimize stimulation protocols or consider other treatment options such as gamete donation or adoption **(*Eldar-Geva et al., 2005*).**

Several methods were used to evaluate the ovarian reserve in women during childbearing period, these tests are:

(A) Static tests:

Generally agreed to be undertaken on day 3 of a natural cycle and commonly are termed "basal tests" and includes:

- Age
- Basal day 3 FSH
- Basal day 3 inhibin –B
- Basal day 3 estradiol
- Anti-mullerian hormone.
- LH and FSH/LH ratio

(B) Ultrasonographic assessment:

- Ovarian volume
- Antral follicle count
- Stromal blood flow

(C) Dynamic tests

They have been performed to assess ovarian reserve after challenge with:

- Clomiphene citrate ⇒ The clomiphene citrate challenge test (CCCT).
- GnRHa ⇒ The GnRH agonist stimulation test(GAST)
- Gonadotropins ⇒ The exogenous FSH ovarian reserve test(EFORT)

Induction of super ovulation for conventional fertility treatment or for assisted reproductive techniques also could be considered a dynamic test of ovarian reserve.

(D) serum progesterone and premature luteinization:

Either in natural or stimulated cycles.

(E) Ovarian biopsy:

However, many authors found no place for this procedure in clinical evaluation of reproductive ageing

AIM OF WORK

The aim of this thesis is to study the combined role of sonographyic assessment and dynamic assessment of ovarian reserve in management of infertility, as we use clomiphene citrate to induce ovulation starting from the 2nd day of the cycle for 5 days and to evaluate its effect by using sonography at the 14th day by measuring

- uterine dimensions
- Ovarian volume
- Antral follicle count
- Volume of leading antral follicle
- Ovarian stromal blood flow indices
- Ovarian vessel blood flow indices
- Uterine vessel blood flow indices

FOLLICULOGENESIS AND COMPOSITION OF OVARIAN RESERVE

Anatomy of the human ovary:

The human ovary is a paired intra-abdominal organ, amygdaloid in shape, whose primary roles are to release, during each menstrual cycle, an egg that is fully competent for fertilization and embryonic development (gametogenic function) and to prepare the accessory reproductive organs for the pregnancy and birth of a healthy baby by producing steroid hormones (endocrine function).

When the mature human ovary is observed in midsagittal section, it consists of an outer zone, the cortex, and an inner zone, the medulla. The cortex is covered by a specialized mesothelium called the surface epithelium; it contains an outer strip of connective tissue, the tunica albuginea, and inner zone that contains the follicles. The resting follicles are located in a relatively a vascular layer in the ovarian cortex beneath the tunica albuginea. In contrast, growing and atretic follicles and involuting corpora lutea are found in the cortical medullary border, which is richly vascularized. Follicles are closely surrounded by a complex and dynamic milieu of ovarian stromal cells and branches of the vasculature and autonomic nervous system. The medulla contains a variable dense- connective tissue that enmeshes stromal cells, blood