The significance of antral follicle count in controlled ovarian stimulation and intrauterine insemination

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Purpose: This retrospective study evaluated the role of antral follicle count (AFC) in predicting ovarian response and successful outcome of stimulated insemination cycles.

Methods: One-hundred and fifty infertile women with bilateral patent tubes receiving a standard regime of human menopausal gonadotrophin (HMG) in their first cycle were evaluated. Multiple regression analysis was used to evaluate the effects of different parameters on ovarian responses and multiple logistic regression analysis was applied to determine which parameters gave the maximum discrimination to predict clinical pregnancy.

Results: Body mass index was the only significant parameter to predict the number of follicles ≥14 mm whereas AFC was the only significant parameter to predict the HMG duration. Only the number of follicles ≥14 mm significantly improved the chance of clinical pregnancy with an odds ratio of 1.8.

Conclusion: AFC was related to the HMG duration but was not predictive of number of follicles and clinical pregnancy of stimulated insemination cycles.

KEY WORDS: Antral follicle count; intrauterine insemination; ovarian stimulation.

INTRODUCTION

Intrauterine insemination (IUI) in conjunction with controlled ovarian stimulation (COS) is usually the first line treatment offered to infertile couples having patent fallopian tubes as it is less expensive, less stressful and less invasive when compared to other assisted reproduction techniques. COS may correct subtle problems of ovulation, increase the number of oocytes available for fertilization and enhance the accuracy of timing of insemination. During IUI, a higher number of motile spermatozoa with normal morphology are inseminated around the time of ovulation to the uterine cavity, which is closer to the site of fertilization. The effects of COS and IUI are independent and Hughes (1) has shown in a meta-analysis that the odds ratio for pregnancy associated with gonadotrophin stimulation and IUI was 2.35 (95% confidence interval [CI], 1.87, 2.94) and 2.82 (95% CI, 2.18, 3.66) respectively.

A number of parameters known as ovarian reserve markers have been examined to predict ovarian responses to gonadotrophin during in vitro fertilization/embryo transfer treatment (IVF/ET). Early follicular FSH concentration (2,3) prior to the treatment cycle is widely used and is a better predictor of ovarian response than the age of women (4,5). Recently, ultrasound assessment of the antral follicle count (AFC) (6–14) has been considered to be the best clinical predictor of ovarian responses or successful outcome.

Despite the importance of COS during IUI cycles, little information exists in the literature regarding the role of AFC in COS/IUI treatment. Chang et al. (15) reported that the pregnant group had a significantly higher AFC than the nonpregnant group.
during COS/IUI treatment. The aim of this retrospective analysis was to evaluate the role of AFC in predicting ovarian response and successful outcome of COS/IUI.

MATERIALS AND METHODS

Infertile women undergoing the first cycle of COS/IUI from 1999 to 2002 at Department of Obstetrics and Gynecology, Queen Mary Hospital, were retrospectively analyzed. They had to fulfill the following inclusion criteria before they were recruited: (a) duration of infertility >2 years; (b) regular ovulatory cycles as shown by midluteal progesterone concentrations \( \geq 30 \text{ nmol/L} \); (c) bilateral tubal patency and absence of peritubal adhesion confirmed by diagnostic laparoscopy with chromotubation and (d) the total number of motile spermatozoa in the ejaculate during work-up \( \geq 10 \text{ million} \). Exclusion criteria were (a) smokers; (b) previous artificial insemination cycles; (c) history of ovarian surgery; (d) multiple causes of infertility and (e) presence of polycystic ovaries (16) on scanning. Ethical approval was not required for this retrospective study. The details of COS, sperm preparation and IUI were as previously described (17).

On the second day of the treatment cycle, transvaginal scanning was performed using a 6.5 MHz vaginal probe (Aloka, Model SSD-5500, Aloka Co. Ltd., Tokyo, Japan) to count the number of antral follicles (Ng et al., 2000). AFC was the sum of antral follicles on both sides and the intraobserver coefficient of variation for AFC was 7%. Blood was then taken for basal serum estradiol (E2) and FSH concentrations. Neither AFC nor serum FSH concentration affected the subsequent clinical management of patients. When E2 was less than 220 pmol/L and there was no ovarian cyst on the scan, all patients received a daily intramuscular injection of 150 IU of human menopausal gonadotrophin (HMG, Pergonal, Serono, Aubonne, Switzerland) from day 3 onwards. Ovarian response in terms of the size and number of follicles was assessed by transvaginal scanning on a regular basis from day 6 of the HMG injection. HMG dosage was reduced in women with excessive responses but was not increased in those having a single dominant follicle. Human chorionic gonadotrophin (HCG, Profasi, Serono, Aubonne, Switzerland) 10,000 IU was administered when the leading follicle was \( \geq 18 \text{ mm} \) in diameter and there were no more than three follicles \( \geq 16 \text{ mm} \) in diameter. Serum E2 concentration was measured on the day of the HCG injection. Four cycles with excessive responses during the study period were cancelled because of the risk of multiple pregnancies.

IUI was performed once 38 h after HCG using a Tomcat catheter (Monoject, St. Louis, MO). The patient was asked to rest in supine position for 15 min after the procedure and thereafter to resume her routine activities. Luteal phase was supported by two further doses of 1500 IU HCG on day 5 and day 10 after the ovulatory HCG injection. Serum E2 and progesterone concentrations were also checked on day 10 after the ovulatory HCG injection. Pregnancy test was performed on day 20 after the ovulatory HCG injection and if positive a pelvic ultrasound was arranged to confirm the presence of intrauterine pregnancy and to determine the number of gestational sacs.

Statistical Analysis

The primary outcome measure was the number of developing follicles. Secondary outcome measures include serum E2 concentration on the day of HCG, duration/dosage of HMG and number of clinical pregnancies. A clinical pregnancy was defined as the presence of intrauterine gestational sac(s) on scanning or products of conception on histological examination in case of a miscarriage. On-going pregnancies were those pregnancies beyond 10–12 weeks of gestation, at which stage the patients were referred out for antenatal care. Data on age of women, primary/secondary infertility, duration of infertility, body mass index (BMI), FSH concentration, AFC and the number of motile sperm in the inseminate were retrieved. The number of motile spermatozoa was obtained by multiplying semen volume, concentration and percentage of progressive motile spermatozoa.

Data were expressed in median (2.5th–97.5th centiles), unless indicated. Comparison of various characteristics between pregnant and nonpregnant cycles was done by Mann–Whitney U test and chi-square tests, where appropriate. Correlation was assessed by the Pearson method. Multiple regression analysis with the least-squares regression was also applied to evaluate the effects of different parameters on ovarian responses in terms of number of follicles, serum E2 concentration on the day of HCG and duration/dosage of HMG. Multiple logistic regression analysis was applied to determine which parameters gave