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ORIGINAL ARTICLE

The influence of the depth of embryo transfer into the uterine cavity on implantation rate

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KEYWORDS

Embryo transfer;
Depth of replacement;
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Abstract *Objective:* To assess the effect of the depth of embryo transfer replacement on implantation and clinical pregnancy rates in intracytoplasmic sperm injection cycles.
Materials and methods: This study was conducted on 90 consecutive patients. All patients underwent a standard down regulation protocol for ovarian stimulation. Oocytes retrieval was performed at 36 h after HCG administration. Embryo transfer took place 2–4 days after oocyte retrieval. The patients were grouped according to the distance between the tip of the catheter and the uterine fundus at transfer (group I <0.75 cm, group II 0.75–<1.5 cm, group III 1.5–2 cm).
Results: Implantation and clinical pregnancy rates varied significantly between group I and other groups: 10.3% and 13.3%, respectively, in group I; 26.7% and 53.3%, respectively, in group II; 27.8% and 53.3%, respectively, in group III.
Conclusion: The depth of embryo replacement inside the uterine cavity may influence implantation rates and should be considered as an important factor to improve the success of implantation and pregnancy rates.

1. Introduction

Since the birth of Louise Brown (the world's first IVF baby) in 1978, numerous and significant advances have taken place in the science and practice of IVF, resulting in increased success rates. For example, in the UK, the live-birth rate per cycle statistics has increased from 14.0% in 1991 to 23.7% in 2007 (1). Despite numerous developments in assisted reproduction, the clinical pregnancy rate in intracytoplasmic sperm injection (ICSI) remains low. It has been estimated that up to 85% of the embryos placed into the uterine cavity fail to implant (2). Embryo transfer is the last and probably least successful step in the ICSI treatment procedure, however, much less effort has been placed on assessing or maximizing embryo transfer procedures and the technique of embryo transfer has remained largely unchanged since it was first described (3).

Embryo transfer can be performed in two ways: blind (clinical touch), based on information on the length of the uterus (obtained by previous ultrasonographic measurement or mock

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transfer) or guided by abdominal ultrasonography. It is advantageous to place the embryo into the uterus in as atraumatic manner as possible (4). The embryos should be placed in an area within the uterus most likely to afford implantation. Some (5–7) have suggested that ultrasound guidance of the embryo transfer procedure may be of benefit because the tip of the embryo transfer catheter can be visualized to ensure that the embryo is placed in the proper location. Ultrasound-guided embryo transfer significantly increases the chance of live birth and ongoing and clinical pregnancy rates compared with the clinical touch method (8). It showed that pregnancy and implantation rates can be dramatically affected by the physician performing the embryo transfer (9).

Most IVF teams consider not touching the endometrial fundus during the replacement of the embryos in the lumen of the endometrial cavity the most important factor for successful embryo transfer (10). It has been traditionally accepted that the embryo should be placed 10 mm below the fundal endometrial surface (11). Some authors have suggested that placing embryos rather lower in the uterine cavity may improve pregnancy rate (12). On the other hand, some investigators showed a significant increase in pregnancy rate and implantation rate where there was a distance > 10 < 15 mm between the tip of the catheter and uterine fundus (13).

The aim of this study was to assess the importance of the depth of embryo replacement into the uterine cavity measured by ultrasound and its influence on implantation rate after ICSI.

2. Materials and methods

2.1. Patients

This prospective clinical cohort study was carried out in assisted reproductive technology (ART) unit, Department of Obstetrics and Gynecology, Benha University Hospital during the period from September 2006 to September 2008 on 90 consecutive patients complaining of infertility and undergoing ICSI procedure, after obtaining their written consent and approval of the ethics committee. Patients were selected on the basis of the following inclusion criteria: (1) main causes of infertility attributable to tubal, ovarian, idiopathic or male factors, (2) serum level of FSH and LH on day 3 of the ovarian cycle is less than 12 IU/L, (3) normal uterine cavity which was examined by ultrasound or hysterography. A total of 90 patients who met the above mentioned criteria were enrolled in this study. These patients were randomly assigned to three study groups according to the distance between the tip of the catheter and the uterine fundus at the time of embryo deposition in the cavity; group I (< 0.75 cm); group II: (0.75–< 1.5 cm); group III (1.5–2 cm).

2.2. Ovarian stimulation

Patients were down regulated with gonadotropin releasing analog SC daily (Decapeptyl 0.1, Ferring) from day 21 of the pretreatment cycle. Ovarian stimulation was started when serum estradiol declined to < 50 pg/ml and a vaginal ultrasonographic scan showed an absence of follicles > 10 mm in diameter. Human menopausal gonadotropin (HMG) (Marional, IBSA) was started usually on day 3 of the menstrual cycle till HCG day.

HCG 10,000 IU (Choriofactor, Biofactor Egypt) was given intramuscular when > 50% of follicles reached 20 mm of diameter.

Trans-vaginal ultrasound-guided oocytes retrieval was done 36 h after HCG administration using follicle aspiration set 17-gauge/1.5 mm × 300 mm echo marking (Labotect, Germany).

2.3. Micro-injection

It was done by using inverted microscope fitted in micromanipulator (Axiovert S100, Ependorf) connected to monitor. All selected metaphase II oocytes were injected by the same procedure, then transferred to the final dish and put in the incubator (Heraeus, BB6220, Germany).

2.4. Luteal phase support

The luteal phase was supported by progesterone vaginal suppository from the day of retrieval until confirmation of pregnancy (14).

2.5. Embryo transfer

Embryo replacement was carried out 2–4 days after oocyte retrieval. Embryos were selected for transfer according to morphology and cleavage criteria, only grade 1 and 2 were transferred. All embryo transfers were performed by the same attending physician. Two hundred milliliters of liquid were given to the patient 30 min before embryo transfer to partially fill the bladder. The transfer was performed with the patient placed in the lithotomy position, without any anesthesia.

Cleaning the external genitalia was done with a moist swab before insertion of a sterile speculum into the vagina. Then the external cervical os was cleaned with a moist cotton piece and a small amount of culture medium. The mucus in the cervical canal was sucked. Concurrently, in the adjacent embryo culture laboratory, the embryo transfer catheter (Labotect, Trans-vaginal ET catheter set 4, Germany) was loaded.

After being inserted into the cervical canal, the tip of the guide catheter was gently advanced through the internal os under trans- abdominal ultrasound control. Once the guide was positioned after the internal os, the inner ET catheter was advanced through the canal to the uterine cavity until it was approximately < 0.75, 0.75–< 1.5 or 1.5–2 cm from the fundus according to the studied groups. At that point, the embryos were slowly released and the transfer and guide catheters were withdrawn 30 s later. The catheter was examined under stereo dissecting microscope after the procedure to confirm that all embryos had been replaced.

The patient was kept in this position after freeing of her legs for at least half an hour and then transferred to her bed to remain in supine position for 2 h.

The increase in serum concentration of beta HCG and the presence of the intrauterine gestational sac demonstrated pregnancy.

2.6. Statistical design

Records of the studied cases and the results obtained after the proposed procedure were statistically analyzed using SPSS 10.0 under Microsoft windows XP.