Uterine Position Change Between Mock and Real Embryo Transfers

Wen-Jui Yang[1], Robert Kuo-Kuang Lee[1,2,3]*, Jin-Tsung Su[1], Ming-Huei Lin[1], Yuh-Ming Hwu[1]

[1]Division of Reproductive Endocrinology and Infertility, Department of Obstetrics and Gynecology, Mackay Memorial Hospital, Taipei, [2]Division of Reproduction and Endocrinology, Department of Medical Research, Mackay Memorial Hospital, Tamshui, and [3]Department of Obstetrics and Gynecology, Taipei Medical University, Taipei, Taiwan.

SUMMARY

Objective: This study was designed to assess the change in uterine position between mock and real embryo transfers.

Materials and Methods: A total of 386 embryo transfer cycles were reviewed, and the uterine position was recorded at the time of mock embryo transfer and then again at the time of real embryo transfer.

Results: Of 254 patients with an anteverted uterus at mock transfer, only 3 (1.2%) were found to have a retroverted uterus at actual embryo transfer. Of 132 patients with a retroverted uterus at mock transfer, 24 (18%) had an anteverted uterus at actual embryo transfer ($p < 0.0001$).

Conclusion: Routine ultrasound-guided embryo transfer is suggested when a retroverted uterus is found at mock embryo transfer, as there is a significant chance that the uterine position will change. [*Taiwan J Obstet Gynecol* 2007;46(2):162–165]

Key Words: mock embryo transfer, retroverted uterus, uterine position

Introduction

Embryo transfer is the final, critical step in *in vitro* fertilization (IVF). It is generally not a difficult task to insert the embryo transfer catheter and eject the embryos. If the procedure can be performed smoothly and easily, it is likely to result in a significantly better pregnancy outcome [1–3]. Performing a mock embryo transfer before the start of the stimulated cycle offers many potential advantages: one can choose the most suitable catheter for the individual patient, assess the direction of the passage through the cervical canal into the uterine cavity and measure the length of the uterine cavity. However, since the uterus is mobile, it is possible that its position may change between the mock and real embryo transfers. The aim of this study was to assess the frequency of such a change.

Materials and Methods

We reviewed the records of 386 embryo transfer cycles in 381 patients seen for IVF from March 2003 to May 2006. Cycles involving frozen and then thawed embryos were excluded from this study. The clinical characteristics of the cycles are listed in Table 1. Before the initiation of treatment, all patients underwent screening by pelvic transvaginal ultrasonography on day 3 of the menstrual cycle, in order to exclude the presence of ovarian cysts. All patients underwent mock embryo transfer on day 2 of menstruation in the stimulated cycle. The procedure was performed blindly by clinical touch alone, without ultrasound guidance. The uterine position and

**Correspondence to:* Dr Robert Kuo-Kuang Lee, Department of Obstetrics and Gynecology, Mackay Memorial Hospital, 92, Section 2, Chung-Shan North Road, Taipei 10449, Taiwan.
E-mail: yu@ms1.mmh.org.tw
Accepted: March 8, 2007

endometrial cavity depth were documented. All real embryo transfers were performed on day 3 after oocytes retrieval, and under ultrasound guidance with a full bladder, the uterine position was recorded again. Embryos were placed 1–1.5 cm below the uterine fundus. Anteverted uterus was defined when the catheter curves towards the anterior in the supine position during mock embryo transfer or during ultrasound-guided real embryo transfer. Retroverted uterus was defined when the catheter curves towards the posterior in the supine position during mock embryo transfer or during ultrasound-guided real embryo transfer. We counted the numbers of patients whose uterine position did not change (i.e. anteverted or retroverted at both mock and real embryo transfers) and whose uterine position did change (i.e. either from retroverted to anteverted or vice versa). We also measured the estradiol level on the day of human chorionic gonadotropin (hCG) administration and counted the number of oocytes retrieved, comparing the data among the women based on their uterine position and whether or not it had changed.

Statistical analysis was performed using SPSS version 10.1 (SPSS Inc., Chicago, IL, USA) for Windows. The differences among group means were calculated using the Kruskall–Wallis test, as appropriate. The differences in ratios among the groups were calculated using the McNemar test, as appropriate. A p value of less than 0.05 was considered statistically significant.

Results

Embryo transfer was performed in 386 cycles in 381 women. At mock embryo transfer, anteverted and retroverted uteri were identified in 254 (66%) and 132 (34%) cycles, respectively. At the real embryo transfer, an anteverted uterus that became retroverted was identified in 3 cycles, and a retroverted uterus that became anteverted was identified in 24 cycles. Women with initial uterine retroversion were significantly more likely to have anteversion by the time of embryo transfer, as compared with those with initial anteversion that changed to retroversion (24/132, 18% *vs.* 3/254, 1.2%; $p < 0.001$; Table 2).

The estradiol level on the day of hCG administration and the number of retrieved oocytes did not differ significantly with uterine position, whether or not it had changed (Table 3).

Discussion

In this study, we assessed the frequency of a change in uterine position and found that the change was significantly more likely to occur with a retroverted uterus becoming anteverted than vice versa; 18% of retroverted uteri became anteverted in the interval between mock and real embryo transfer day. Henne et al had similar findings, though with a much higher frequency, with over 50% of initially retroverted uteri found to be

Table 1. Characteristics of the cycles*

Cycle number, *n*	386
Mean age (yr)	34.4 ± 4.1
Unexplained infertility (%)	7 (1.8)
Tubal factor (%)	95 (24.6)
Ovulation dysfunction (%)	122 (31.6)
Male factor (%)	124 (32.1)
Endometriosis (%)	35 (9.1)
Uterine factor (%)	3 (0.8)
Previous pelvic surgery	13 (3.4)

**Data are expressed as mean ± standard deviation or n (%).*

Table 2. Uterine position at real compared with mock embryo transfer

Uterine position	At real embryo transfer	
At mock transfer (*n*)	Anteverted, *n* (%)	Retroverted, *n* (%)
Anteverted (254)	251 (98.8)	3 (1.2)*
Retroverted (132)	24 (18)*	108 (82)

$*p < 0.0001$.

Table 3. Comparison of peak estradiol level and the number of oocyte retrieved among 4 groups

	AV/AV	RV/RV	AV/RV	RV/AV	*p* value
Number	251	108	3	24	
Estradiol level (mean ± SD)*	2286.0 ± 1292.8	2426.2 ± 1312.9	2049.0 ± 1221.5	2005.7 ± 1569.9	NS
Number of oocytes retrieved (mean ± SD)	9.7 ± 2.8	9.5 ± 2.7	10.0 ± 0.0	10.4 ± 2.0	NS

**Estradiol level on the day of hCG administration. Data are expressed as mean ± standard deviation. AV/AV = anteverted at mock transfer and anteverted at real ET; RV/RV = retroverted at mock transfer and retroverted at real ET; AV/RV = anteverted at mock transfer and retroverted at real ET; RV/AV = retroverted at mock transfer and anteverted at real ET; NS = not significant.*

anteverted at real embryo transfer in fresh cycles [4]. A reasonable explanation for this change is that the hyperstimulated and, therefore, enlarged ovaries lying in the posterior cul-de sac push a retroverted uterus to the anteverted position. Interestingly, Henne et al retrieved a significantly higher number of oocytes from women whose initial retroversion changed to anteversion than from those whose uterus remained retroverted. This might be a clue supporting the role of enlarged ovaries in stimulated cycles affecting the position. However, in our study, we did not find a similar difference either in the number of oocytes retrieved or the estradiol levels. Henne et al also compared the uterine position in frozen–thawed embryo transfer cycles and found that in one-third of these cycles, the conversion of the uterus from retroverted to anteverted was still seen. He, therefore, concluded that ovarian volume could not be the only factor involved in the change in uterine position, since the ovaries were not hyperstimulated in frozen–thawed embryo transfer cycles. The mechanisms involved in the position change, thus, remain uncertain.

The use of ultrasound guidance during embryo transfer is a possible solution to this problem of a change in uterine position, since it allows visualization of the catheter, thereby confirming its passage beyond the internal os and allowing the operator to avoid touching the uterine fundus [5–8]. Buckett et al published a meta-analysis that compared ultrasound-guided embryo transfer with the clinical touch method and concluded that the former significantly increases the chance of clinical pregnancy [9]. The use of ultrasound guidance likely decreases the incidence of endometrial trauma which is more likely to occur with a traditional blind transfer. Such trauma can cause bleeding with blood in the catheter tip blocking the release of embryos from the catheter [10]. Furthermore, catheter contact with the fundus and endometrial trauma have been shown to cause a strong fundo–cervical contraction which may conceivably lead to extrusion of the embryos from the uterine cavity [11]. Shamonki et al have reported discrepancies in cavity length, even in highly experienced hands; 19.4% of their patients had a discrepancy of ≥ 1.5 cm and 29.9% had a discrepancy of ≥ 1 cm between the length measured at mock transfer and that at ultrasound-guided trial embryo transfer [12]. Tang et al have also shown that mock transfer performed prior to IVF-stimulated cycles had an inaccuracy of ≥ 1 cm in about 30% of patients [7]. Ultrasound-guided embryo transfer may, therefore, be preferable to traditional blind transfer because it allows for more accurate placement of embryos in patients where there is a significant discrepancy between actual and blindly perceived uterine cavity length.

In our study, we performed real embryo transfer under transabdominal ultrasound guidance in patients with a full bladder to allow for adequate ultrasound visualization. A full bladder also helps straighten the utero–cervical angle, thus increasing the ease of embryo transfer [5,13,14]. One possible objection to the full bladder technique is that the patient will need to get up and empty her bladder immediately after embryo transfer. However, several studies have shown that bed rest following embryo transfer is not necessary and does not seem to affect the outcome of pregnancy [15,16].

The limitation of our study was that the definition of uterus position could differ with different clinicians performing the mock embryo transfer, since uterus position was checked blindly. Though patients were all in supine position, their bladders were not checked during mock embryo transfer, and the results of uterus position could have been interfered by full or empty bladders.

In conclusion, our study suggests that routine ultrasound-guided embryo transfer is necessary when a retroverted uterus is found at mock embryo transfer, since there is a significant chance that the uterus will be anteverted at the time of real embryo transfer.

References

1. Ghazzawi IM, Al-Hasani S, Karaki R, Souso S. Transfer technique and catheter choice influence the incidence of transcervical embryo expulsion and the outcome of IVF. *Hum Reprod* 1999;14:677–82.
2. Hearns-Stokes RM, Miller BT, Scott L, Creuss D, Chakraborty PK, Segars JH. Pregnancy rates after embryo transfer depend on the provider at embryo transfer. *Fertil Steril* 2000;74:80–6.
3. Mansour RT, Aboulghar MA. Optimizing the embryo transfer technique. *Hum Reprod* 2002;17:1149–53.
4. Henne MB, Milki AA. Uterine position at real embryo transfer compared with mock embryo transfer. *Hum Reprod* 2004;19:570–2.
5. Sallam HN, Agameya AF, Rahman AF, Ezzeldin F, Sallam AN. Ultrasound measurement of the uterocervical angle before embryo transfer: a prospective controlled study. *Hum Reprod* 2002;17:1767–72.
6. Coroleu B, Carreras O, Veiga A, et al. Embryo transfer under ultrasound guidance improves pregnancy rates after *in vitro* fertilization. *Hum Reprod* 2000;15:616–20.
7. Tang OS, Ng EHY, So WWK, Ho PC. Ultrasound-guided embryo transfer: a prospective randomized controlled trial. *Hum Reprod* 2001;16:2310–5.
8. Matorras R, Urquijo E, Mendoza R, Corcostegui B, Exposito A, Rodriguez-Excudero FJ. Ultrasound-guided embryo transfer improves pregnancy rates and increases the frequency of easy transfers. *Hum Reprod* 2002;17: 1762–6.

9. Buckett WM. A meta-analysis of ultrasound-guided versus clinical touch embryo transfer. *Fertil Steril* 2003;80: 1037–41.
10. Nabi A, Awonuga A, Birch H, Barlow S, Stewart B. Multiple attempts at embryo transfer: does this affect *in vitro* fertilization treatment outcome? *Hum Reprod* 1997;12: 1188–90.
11. Lesny P, Killick SR, Tetlow RL, Robinson J, Maguiness SD. Embryo transfer and uterine junctional zone contractions. *Hum Reprod Update* 1999;5:87–8.
12. Shamonki MI, Spandorfer SD, Rosenwaks Z. Ultrasound-guided embryo transfer and the accuracy of trial embryo transfer. *Hum Reprod* 2005;20:709–16.
13. Sharif K, Afnan M, Lenton W. Mock embryo transfer with a full bladder immediately before the real transfer for *in vitro* fertilization treatment: the Birmingham experience of 113 cases. *Hum Reprod* 1995;10:1715–8.
14. Lewin A, Schenker JG, Avrech O, Shapria S, Safran A, Friedler S. The role of uterine straightening by passive bladder distention before embryo transfer in IVF cycles. *J Assist Reprod Genet* 1997;14:32–4.
15. Botta G, Grudzinskas G. Is a prolonged bed rest following embryo transfer useful? *Hum Reprod* 1997;12:2489–92.
16. Sharif K, Afnan M, Lashen H, Elgendy M, Morgan C, Sinclair L. Is bed rest following embryo transfer necessary? *Fertil Steril* 1998;69:478–81.