Marked improvement in clinical pregnancy rates following in vitro fertilization-embryo transfer seen when transfer technique and catheter were changed

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Summary

Purpose: To compare in vitro fertilization (IVF) outcome with two different embryo transfer (ET) catheters: the Frydman and Wallace catheters.

Methods: Retrospective review of outcome of IVF cycles where there was at least one embryo that had assisted hatching prior to transfer at 72 hours according to which catheter was used.

Results: Pregnancy rate 17.6% per transfer with Frydman (FET-SET) vs 44.2% for fresh ETs and 15.4% and 43.2% for frozen ETs. The implantation rates for fresh ETs were 7.6% vs 20.0% for fresh and 5.7 vs 2 l.1% for frozen ETs.

Conclusion: The soft Wallace catheter is superior to the stiffer Frydman catheter when transferring embryos subjected to assisted embryo hatching.

Key words: Transfer catheter; Soft; Firm; Assisted embryo hatching.

Introduction

Two popular embryo transfer (ET) catheters, the Frydman catheter and the Wallace catheter, have recently been compared for efficacy. Two retrospective studies came to opposite conclusions; Wood *et al.* found a significantly higher pregnancy rate (PR) following ET with the Wallace catheter [1] and the study by Urman *et al.* [2] found no difference. Interestingly, the Frydman catheter used by Wood *et al.* was the new soft one and the one used by Urman was more rigid, i.e., the one used for more difficult transfers.

Neither study mentioned whether they performed assisted embryo hatching at all, or in a minority or majority of cases. The hatched embryo may be one that especially requires a soft catheter, e.g., the Wallace catheter. The study presented here evaluated pregnancy outcome according to the use of the Frydman catheter vs Wallace catheter on embryos subjected to assisted embryo hatching.

Material and Methods

The results of two series of ETs were compared. The first series consisted of 108 oocyte retrieval and transfer cycles and 130 frozen ET cycles performed at the Cooper Center for IVF between July 1, 1996 and November 30, 1996. The second series consisted of 156 oocyte retrieval and transfer cycles and 111 frozen ETs performed at the Cooper Center for IVF between December 1, 1996 and June 30, 1997.

Revised manuscript accepted for publication July 19, 2001

In all the cycles, the embryos were transferred on day 3 by the same two experienced physicians and assisted embryo hatching was performed on all embryos with a thickened zona pellucida [3, 4]. In both series, the protocols used for ovarian stimulation and preparation for frozen ET were the same. All personnel and laboratory conditions were the same during these time periods. However, in the first series embryos were loaded into the Frydman short catheter (FET-SET) for transfer. In the second series the embryos were loaded into a Wallace catheter.

The FET-SET is a stiff catheter and cannula. The cannula is extended into the uterine cavity and the loaded catheter pushed through. When using the FET-SET, the cannula was handed to the physician for insertion into the cervix. A 1 cc TB syringe was attached to the catheter, the catheter was rinsed with media and loaded sequentially with .05 mL of air, 1 cm of media, $^1/_2$ cm of air, 1 cm of medium containing the embryos, $^1/_2$ cm of air and a medium plug at the end to prevent evaporation. The loaded catheter was handed to the physician for insertion into the cannula.

The Wallace catheter is a softer catheter/cannula. The cannula has "memory" when bent and the objective is to try not to pass the internal os. The catheter is very floppy with a small internal diameter and a rounded tip. The Wallace catheter was not removed from the cannula before loading. A 1 cc TB syringe filled with transfer media was attached to the catheter. The catheter was rinsed and completely filled with medium so no air spaces were present. The embryos were drawn into the tip of the catheter in 20 to 25 µl of medium. The loaded catheter/cannula was handed to the physician for insertion into the cervix.

In the first series, ultrasonography was not used during ET. In the second series, transvaginal ultrasound was used to help guide the catheter into the uterus. Patients were required to have a full bladder for ET. All transfers were done in the dorsal lithotomy position. The cervical mucus was removed with a TB syringe prior to cannulating to avoid having the mucus plug the catheter or having embryos stuck in or near the cervix.

Table 1. — *Comparison of IVF Outcome by Transfer Method*

	Series 1 - Transfer Catheter: FET-SET	Series 2 - Transfer Catheter: Wallace
Clinical PR/Transfer		
IVF-ET*	17.6% (19/108)	44.2% (69/156)
Frozen ET*	15.4% (20/130)	43.2% (48/111)
Implantation Rates		
IVF-ET*	7.6% (49/383)	20.0% (108/541)
Frozen ET*	5.7% (27/477)	21.1% (89/421)

*$p < .05$

The outcome measures compared were clinical PRs per transfer and implantation rates. A clinical pregnancy was defined to be sonographic confirmation of a gestational sac in the uterus. Pregnancy rates were compared by transfer technique by chi-square analysis. A p value of 0.5 was used.

Results

The average age of the women undergoing IVF-ET was the same in both series: 35.8 years in series 1 and 36.1 years in series 2. The average age of the women undergoing frozen ET was the same in both series: 34.8 years in series 1 and 34.9 years in series 2. There was no difference in the mean number of embryos transferred per cycle by series: 3.5 vs 3.5 for IVF-ET cycles; 3.7 vs 3.8 for frozen ET cycles.

The outcome of the transfers is summarized in Table 1. The clinical PR per transfer following the transfer of fresh embryos was increased significantly when the Wallace/ultrasound technique was used; from 17.6% for the FET-SET to 44.2% ($p < .001$). The corresponding implantation rates were 7.6% (FET-SET) and 20.0% (Wallace) ($p < .05$).

A similar increase in PR following frozen ET was also found: from 15.4% for the FET-SET to 43.2% for the Wallace/ultrasound technique ($p < .001$). The corresponding implantation rates were 5.7% (FET-SET) and 21.1% (Wallace) ($p < .05$).

Discussion

A recent randomized study compared the Wallace catheter to the Erlangen metal catheter [5]. The PRs were higher for both 48 and 72 hour transfers with the Erlangen catheter (26 vs 17.5% and 33.7% vs 21%) but these differences were not significant. The metal sleeve allow, easier insertion but it is not clear how the softness of the silicon insertion catheter compares to the Wallace catheter. There was no mention again in this study about the frequency (if at all) of use of assisted embryo hatching.

Our study, similar to the previous two aforementioned studies comparing the Frydman vs Wallace catheter, was also retrospective and therefore subject to the problems of such studies; nevertheless it clearly demonstrates that the use of the Wallace catheter will improve pregnancy rates when assisted embryo hatching is used. Nevertheless, the study with the Erlangen catheter reminds us never to be complacent with our present methodology and to look for continued improvement. Certainly more studies, especially prospective ones, should be conducted with the Erlangen catheter vs the Wallace to determine if the trend noted for improved PRs is significant or not. However, it is important to evaluate PRs also according to whether assisted embryo hatching was performed or not. Any IVF center thinking of using a new catheter based on economics or theoretical advantages should perform their own randomized studies before making the switch.

The one thing that the present study makes clear is that if one is striving to provide the patient with the greatest chance of success, the Wallace catheter should be used rather than the FET-SET in IVF centers using assisted embryo hatching in the majority of cases. However, there still may be uses for the Frydman catheter especially for difficult transfers. In fact, when comparing catheters it may be important to separately compare PRs with easy transfers and PRs following more difficult transfers.

The hypothesis that we have formed from our comparison study is that hatched embryos will fare better in a soft catheter. Hopefully these data will stimulate some centers with a high percentage of ETs having hatched embryos to set up a randomized prospective study to see if the use of a soft catheter will improve PRs and implantation rates. Based on the superior PRs found in this study, the ethics committee for the Cooper Center for IVF would not approve the suggested prospective study.

Finally, the possibility exists that a catheter that shows superior results with fresh ETs will not be found superior for frozen ETs. The present study is the only one to date to separately compare fresh and frozen ETs. The Wallace catheter was clearly superior to the FET-SET for fresh and frozen ETs.

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