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An Improved System for Catheter Loading During Embryo Transfer

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INTRODUCTION

There are a number of different embryo transfer techniques currently in use. We report here an improvement in instrumentation in use since March 1986 which has resulted in improved Pregnancy rates.

MATERIALS AND METHODS

Embryos are transferred to the patient when the leading embryo is four cells or greater. This stage is usually reached about 46 hr after laparoscopy. Other embryos in the transfer clutch may be at earlier stages of development due to differences in fertilization time. Embryos destined for transfer are moved to the center well of a single Falcon 3037 culture dish filled with growth medium [modified Ham’s F10 (Gibco Laboratories, Grand Island, NY) + 15% maternal serum]. The dish is returned to the incubator for at least 10 min to allow the pH and temperature of the medium to stabilize.

The transfer catheter is of the standard design described Jones and his associates (1). We have modified this catheter by fitting it with a plastic tip inserted into the side port of the Jones. This has been christened the VJS tip.

VJS tips are prepared by cutting an 8- to 10-mm segment from the beveled end of the Craft catheter (Rocket of London, London). The nonbeveled end is cut at a slight angle for the ease of insertion into the Jones. The tips are packaged separately and autoclaved prior to use.

Transfers are done in specifically designed on-site rooms, all within 50 feet of the embryo lab. Once the patient is in position and the physician has measured the Jones catheter to correspond to the depth of the uterus, the embryologist takes the sterile catheter and returns to the lab for embryo loading.

A Sterile 1-cm³ tuberculin syringe is attached to the Luer end of the catheter. Using sterile technique, the angled end of the VJS tip is inserted into the side port of the Jones catheter to a depth of approximately 3 mm (Fig. 1). The tips fit snugly and we have had no difficulties with air leakage around the insertion point.

The catheter and tip are flushed three times with warm Ham’s F10. On the final rinse, the entire system is filled with Ham’s, since it is our experience that of the others (2) that embryo loading is facilitated by hydraulic continuity within the catheter. A small volume of air (5 µl) is aspirated into the catheter so that the original fluid column is separated from the distal medium containing embryos.

The dish containing the designated transfer embryos is removed from the incubator by an assistant and placed on the stage of the dissecting microscope. At this time, the 2-min clock is started. Embryos are loaded by placing the VJS tip into the medium and aspirating embryos and medium in the following order: 10 µl of medium, 10 µl of air, and 20–30 µl of medium containing embryos. Loading is completed by aspirating an additional 10 µl of air followed by a final 10 µl of medium. This removes embryos from the immediate vicinity of the side port. The total transfer fluid volume is 40–50 µl.

At the conclusion of loading, an assistant grasps...
the VJS tip with a sterile 4 × 4-in. gauze square and gently removes it from the catheter proper. If the end of the catheter is slightly bent, the assistant straightens it at this time.

The embryologist carries the loaded catheter to the transfer room and embryo transfer proceeds as previously described (3). The total elapsed time from the moment the embryos are removed from the incubator to the time they are deposited in the patient’s uterus is less than 2 min.

RESULTS

One hundred two transfers of embryos have occurred using the VJS tip, with 40 clinical pregnancies resulting (39.2% pregnancy rate). Four of these pregnancies aborted spontaneously (10.0%). This compares to a previously reported clinical pregnancy rate of 33.9% with a 17.2% spontaneous abortion rate (6). Statistical analysis of a binomial population using the difference between two means tests did not show a significant difference between the two treatments, based on the present number of cases (Uo = 1.372). However, we believe that this system provides sufficient technical advantages to justify its continued use.

The current methodology has facilitated the catheter loading procedure, allowing more precise control over aspiration of the embryos from the culture dish and reducing the final transfer fluid volume. Further, embryos can easily be “vacuumed” from the culture dish in single-file order, allowing the embryologist to count the embryos as they enter the catheter. This eliminates the necessity of examining the dish after loading to ensure that all embryos have been aspirated. Also, the current methodology reduces the total transfer time, since it eliminates the time-consuming process of positioning the side port over the embryo clutch of the bubble.

DISCUSSION

In the IVF procedure, the transfer process confers a degree of risk upon the embryo. Transfer is believed to account to a significant percentage of embryo loss and hence to a reduction in pregnancy rate (4,5). In an effort to minimize the stress on the embryo and to maximize the pregnancy rate, we sought an alternative method of catheter loading. There are end-loading catheters available; however, we wished to retain the Jones catheter, since it is our experience that it produces less cervical trauma during transfer.

Originally, we loaded directly through the side port of the Jones catheter. This loading method requires that the embryos be “bubbled” prior to catheter loading. Bubbling involves assembling the embryos in a drop (~800 µl) of growth medium centered on a flat tissue culture dish (Falcon 1007). The rationale for this is that the hydrostatic pressure forces the embryos to the center of the bubble. Once the embryos are congregated, the side port of the Jones catheter is placed squarely over them and they are aspirated as a clutch into the catheter along with medium. Utilization of the surface properties of the bubble is crucial to the quick transfer of multiple embryos in a small quantity of medium. This system has several disadvantages, however. Temperature and pH fluctuations in the bubble occur more rapidly because of the smaller volume present and the risk to trauma to the embryo is subsequently increased. Further, it is difficult to exert precise control over the total transfer fluid volume when loading directly through the side port. This is because the embryos are loaded as a clutch in one quick aspiration and the volume of fluid accompanying the embryos varies with the physical intensity of the aspirating movement. When using the bubble method, we frequently transferred volumes greater than 50 µl. Finally, we have observed that the hydrostatic pressure, while useful for congregating embryos in the center of the bubble, can exert distorting influences on the morphological integrity of the embryo. We have observed transitory physical deformation in embryos left in bubbles longer than 30 min. The deformations include irregularities in configuration of the individual blastomeres and their retraction from the zona pellucida. These distortions were not permanent and disappeared when the embryos were returned to the center-well culture dish (unpublished observations).

To avoid the adverse effects inherent in the bubble, we first attempted to convert temporarily the Jones catheter to an end-loading catheter by sharply bending back the nylon-plugged end and then loading directly out of the side well of the culture dish. However, we found it difficult to control precisely the transfer fluid volume with this adaptation. Also, inducing this degree of physical trauma on the catheter to its normal configuration.