Successful Day 5 Embryo Transfer and Pregnancies Resulting After Transport of Embryos by Air for Biopsy and Genetic Analysis

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Purpose: Case studies of four in vitro fertilization (IVF) cycles where embryo transport by commercial airline followed by biopsy and genetic analysis with subsequent culture to Day 5 and resulting ongoing pregnancy.

Method: Retrospective clinical case study of 4 patients requiring preimplantation genetic diagnosis (PGD) testing. Normally fertilized embryos were transported in a battery-powered portable incubator by commercial airline following evaluation for fertilization under controlled conditions from the Center for Assisted Reproduction, Bedford, Texas to the Reproductive Genetic Institute, Chicago, Illinois. Following Day 3 embryo biopsy and genetic analysis, embryos were transported back to the Center for Assisted Reproduction for Day 5 embryo transfer.

Results: Ongoing clinical pregnancy resulted for all patients receiving embryo transfer.

Conclusion: These results demonstrate the feasibility of embryo transport by air for centers that do not have the in-house capabilities to perform genetic analysis. With successful pregnancies obtained through extended culture to Day 5, embryos requiring genetic analysis can be successfully transported by air, tested, and returned to the initial facility for embryo transfer without time restriction.

KEY WORDS: Clinical pregnancy; embryo transport; extended culture; PGD.

INTRODUCTION

Clinical pregnancies have been reported for traditional in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI) cases when oocytes and/or embryos are transported by both ground and/or by air (1–3). Transport of gametes or embryos have become a popular means of achieving pregnancy in programs that provide infertility services but do not have an on-site IVF laboratory. In addition, many programs lacking the resources to establish an IVF laboratory utilize a central site where human assisted reproductive technologies (ART) can be performed. Advantages of this include a reduction of laboratory and personnel expenses associated with operating an ART laboratory. In addition to evading the cost associated with laboratory setup and maintenance, laboratory certification and labor intensive reporting is avoided. Other benefits of having a central ART laboratory site include consistent and strict quality control and concise laboratory protocols at a central location.

Just as some infertility programs are in need of an off-site IVF laboratory to perform assisted reproductive technologies, even more programs lack a genetic testing laboratory or the capability to perform preimplantation genetic diagnosis (PGD). Although the Center for Assisted Reproduction provides complete IVF services encompassing surrogacy and donor oocyte; however, it does not currently perform genetic testing.

Transport of embryos for the purpose of genetic testing with the intent to travel with embryos from one location, genetically test them at another, then return them to the original center for embryo transfer

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is a timely process. Blastomere biopsy from a 6–8-cell embryo on Day 3 leaves little time to biopsy, analyze, then transport back to original site for Day 3 embryo transfer. Recently, with the advent of sequential media embryos can be cultured successfully to Day 5 and Day 6 (4,5). This allows embryos requiring genetic analysis to be successfully transported by air, biopsied, analyzed, and returned to initial center for embryo transfer without time restriction.

In these case reports we will demonstrate the feasibility of embryo transport by air for centers that do not have the in-house capabilities to perform particular genetic analysis.

MATERIALS AND METHODS

This report demonstrates the ability to successfully transport embryos by air for genetic analysis and return the embryos for Day 5 transfer. Patients were advised to consider IVF with ICSI followed by PGD. All patients underwent controlled ovarian stimulation with GnRH analog and pure follicle stimulating hormone (FSH), using a conventional down regulation protocol. Upon confirmation of two dominant follicles (mean diameter ≥ 16 mm) and a peak estradiol level (E₂), human chorionic gonadotropin (hCG) was administered with oocyte retrieval occurring 36–37 h later. Following retrieval (Day 0) oocytes were placed into human tubal fluid (HTF; Irvine Scientific, Santa Ana, CA) +12% synthetic serum substitute (SSS; Irvine Scientific, Santa Ana, CA) and cultured for approximately 6 h. Upon oocyte examination sperm injection (Day 1). Intramuscular luteal support (Day 1). Following PGD on Day 3 and overnight culture at the Reproductive Genetics Institute each genetically normal embryo was evaluated for embryo progression and morphology and then resuspended in preequilibrated G1.2 (IVF Science, Gothenburg, Sweden) media for blastocyst biopsy and culture media as what is used at the Center for Assisted Reproduction. Zygotes were transported almost 1,000 miles by air from the Center for Assisted Reproduction, Bedford, Texas to the Reproductive Genetics Institute, Chicago, Illinois. Transport from the Center for Assisted Reproduction to Dallas/Fort Worth International Airport, nonstop flight interval, and transport from Chicago O’Hare International Airport to the Reproductive Genetics Institute took approximately 5 h. Upon arriving in Chicago, the zygotes/multicell embryos were removed from the culture tubes and placed in fresh media drops of preequilibrated G1.2 under oil. The control tube containing HTF was visually inspected after each trip for a change in media color and in all cases, the stable equilibrated color indicated no gas exchange during transport.

Following PGD on Day 3 and overnight culture at the Reproductive Genetics Institute each genetically normal embryo was evaluated for embryo progression and morphology and then resuspended in preequilibrated G2.2 (IVF Science, Gothenburg, Sweden) and individually placed in a snap-top culture tube. These tubes were wrapped with laboratory parafilm and loaded into the portable incubator along with a tube of HTF for quality control and transported to the Center for Assisted Reproduction. Once returned, each Day 4 embryo was recovered from the transport tubes and placed in fresh media drops of preequilibrated G2.2 under oil. The tube of HTF was evaluated, and again no color change was visually observed indicating no gas exchange. Each normal embryo was evaluated for embryo progression and morphology upon return to the Center for Assisted Reproduction. The next morning (Day 5), each embryo was again observed for progression and morphology. Subsequent embryo transfer occurred utilizing an abdominal ultrasound (5 MHz) to assist intrauterine placement.