Blastocyst culture and transfer

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Human blastocyst culture without co-culture and subsequent embryo transfer is a tool now available to in-vitro fertilization (IVF) centres around the world. With the advent of new commercially available sequential culture media systems (P1 and blastocyst and S1 and S2), viable blastocysts may now be attained at a relatively high rate (on average $\geq 50\%$) yielding high implantation rates (50%) when transferred into the uterus on day 5 or 6 of culture (Gardner et al., 1998; Behr et al., 1999). One issue that must be recognized is that we cannot compare old technology with new. There was a significant development in IVF media technology in the mid-1990s (Gardner et al., 1994; T.B.Pool, personal communication) and Gardner and Lane (1997) recently demonstrated in a mouse model that the previous assumption of simply forming a blastocyst does not equal viable blastocyst and proposed this for the human system. These developments were the first culture systems designed specifically for human embryo extended culture using the specific energy sources and amino acids with the specific intent of developing viable embryos since the introduction of human tubal fluid (HTF) in the 1980s (Quinn et al., 1985). Blastocyst development potential in vitro without co-culture is different now since these developments.
The sequential media approach has not necessarily resulted in higher numbers of blastocysts but more importantly, blastocysts that are more viable as evidenced by the high implantation rates achieved (Behr et al., 1998).

Clearly, as with any tool used in assisted reproductive technology (ART), blastocyst culture and transfer may not maximally benefit all patients. With our current knowledge, the patients who stand to benefit most from this technology are those patients who are at greatest risk for high order multiple gestations. The benefit to patients of advanced maternal age or those patients who simply do not produce many eggs despite aggressive controlled ovarian hyperstimulation (COH), is not yet clear. Even though we do know the natural time-course of events with respect to blastocyst arrival into the uterus (Buster et al., 1985) and that the timing of embryo transfer more closely matches the natural physiological window, one has to weigh the risk of no embryo development against the potential advantage of embryo–endometrial synchrony. The major question that still remains to be answered is: ‘Is no blastocyst development in vitro equivalent to a negative pregnancy test several days early?’ I believe the answer is yes. Any approach in ART which uses a tool that decreases the amount of guesswork, will decrease the variability in outcomes and increase the efficiency of the process. Blastocyst culture and transfer is no exception.

It is likely that a woman has a finite number of eggs each ovulation cycle that are viable to the extent of generating a term pregnancy. In the future, it may be possible to identify the ‘viable eggs’ earlier in development than the blastocyst stage. Using polarity of the egg and pronuclei and new information about cleavage symmetry, we may be able to gain the same information about viability without extended culture (Edwards and Beard, 1997). Blastocyst culture and transfer is a tool we have at our fingertips today which gives us this information. This is accomplished by allowing the embryos that result from these ‘viable’ eggs to make themselves known to the embryologists so they may be the ones selected for transfer. Prior to embryos reaching this developmental landmark, their morphological characteristics are difficult to use as criteria for potential viability. It is certain that there will be improvements in the current formulations of the new media used for blastocyst culture, but is doubtful that the percent blastocyst formation will change significantly. This is largely due to the fact that the number of blastocysts that develop in culture may reflect the quality of the gametes from which they were derived. Therefore, optimization of blastocyst transfer and successful integration into clinical IVF may begin by using appropriate selection criteria for which patients stand to benefit most from this tool. Tailoring COH regimens such that only the most viable eggs are stimulated for retrieval combined with blastocyst culture and transfer, may be the optimized IVF system of the future.

References