Embryo Quality

The Causes and Effects of Embryo Fragmentation

Through many years of experience with embryos formed and grown in vitro we are aware that there are two aspects of embryos which are related to the chances of their resulting in a pregnancy after transfer. These are:

• Their growth rate - they should be at the appropriate stage for their age. At 30 hours of age they should be at the 2-cell stage. By 45 hours of age they should have reached the 4-cell stage. We know that embryos developing too slowly have a lesser chance of resulting in a pregnancy.

• The degree of fragmentation in the embryos - We know that embryos with few fragments within them have the best chance of producing a pregnancy and that highly fragmented embryos have a poor chance of producing a pregnancy. Similarly, embryos with few fragments best survive freezing and thawing while highly fragmented embryos rarely do. Highly fragmented embryos rarely survive freezing and thawing.

For these reasons it is our practice to transfer the best available embryos in terms of both growth rate and degree of fragmentation and to only freeze embryos which are developing at a reasonable rate and do not have too high a degree of fragmentation.

What are embryo fragments?

It is thought that fragments are cast off pieces of the cytoplasm within the shell which have been shed because, for some unknown reason, they have degenerated. The fact that some patients seem, on repeated attempts at IVF, to get numerous highly fragmented embryos whereas others regularly get mostly good quality embryos seems to suggest that fragmentation represents defects within the eggs. There is video evidence that fragments come and go in embryos during the process of development and cleavage, further complicating their significance.

What causes embryo fragmentation?

The egg defect theory mentioned above is the most popular theory for embryo fragmentation however, as there is no definite proof of this, other theories must be considered. It has been postulated that the exposure of eggs to un-natural numbers of sperm could be the cause. In IVF up to 100,000 sperm may be put with the eggs compared with the probable contact with only a handful in natural conception. This theory has probably been discounted by the evidence that fragmentation occurs after egg fertilization by microinjection (ICSI) where each egg only contacts one sperm. The fact that the embryos are growing in an artificial environment could also provide an explanation. Our media are only a vague imitation of the composition of the fluids within the fallopian tubes where fertilization and early embryo development normally occurs. Much work is being done to research the needs of developing embryos to create better culture media but there is still a long way to go. Finally the unnatural conditions experienced first by the egg and then, once it is fertilised, the embryo could also provide an explanation. In handling them they experience minor temperature and pH shocks. Over the years however such handling procedures have been considerably improved and reduced the incidence of fragmentation.

What can be done about embryo fragmentation?

Apart from working towards better embryo culture conditions which may or may not help the problem there is little that we can do to prevent embryo fragmentation happening. With the advent of the micromanipulative procedures used in assisted fertilization by ICSI it has been suggested that the removal of fragments by aspirating them out of the egg through a very fine needle may improve the chances that the embryo will implant and result in a pregnancy. There is little evidence to support this at the present but we are monitoring the work of others in this field and should it prove to be a useful exercise we will seriously consider introducing it.