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ARTICLE

IVF Development and Analysis of Neonatal Conditions

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ABSTRACT

This paper first discusses the developmental origin of IVF (In vitro fertilization) and analyzes the four generations of IVF technology in detail. Then, combined with its own work experience, it discusses the neonatal situation of IVF, in order to improve reference for other medical staff.

1. The Development Origin of IVF

The research and development of IVF technology can be traced back to the middle of the 20th century. The original purpose of this kind of assisted reproductive technology research is to better contraception. In this process, people have studied the ovulation cycle and inheritance of mammals. The content of learning, embryology, etc., finally got the key content of the female egg cell development cycle. At first, the scientists at that time speculated that the female egg cell development cycle only required a false conclusion of 12h, which led to serious obstacles and blows to the in vitro fertilization experiment. It was not until 1965 that scholars pointed out that human and some mammalian egg cells have a fixed developmental time (37h). Subsequently, the application and research of gonadotropins in other countries further promoted the progress of IVF. Superovulation is induced by ovulation drugs, and the control of egg cell maturation time is achieved by using drugs such as clomiphene citrate and stimulating hormone, which makes it easier to grasp the timing of egg retrieval. This method is called controlled superovulation.[1] In addition, advances in egg retrieval technology have also played an important role in promoting the development of IVF. The use of laparoscopic technologys to achieve egg retrieval can reduce the trauma caused to women. The appearance of pyruvate has effectively improved the effect of in vitro embryo culture and greatly promoted the development of IVF technology.

2. The Development History of IVF

In 1978, the world's first IVF baby was born in the UK, bringing the gospel to infertility patients. IVF is not really a growing baby in a test tube, but is artificially in vitro fertilized in the laboratory by taking a large amount of ovum from the female ovary. And bred it into an early embryo, and then transplanted back to the mother uterus at the appropriate time to further develop and grow the

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baby. Research on IVF has continued for several decades, during which time the development of IVF technology has gone through four generations, where the four generations of IVF technology are explained in detail.

2.1 First Generation IVF (IVF-ET)

The first generation of IVF includes in vitro fertilization and embryo transfer, which is the most basic assisted reproductive technology for IVF. This technology covers a wide range of subjects such as embryology, micromanipulation, and endocrinology, through human intervention. The form solves the infertility caused by the problem of female uterus endometriosis and tubal occlusion, and realizes the reproduction of human beings. At the same time, the first pregnancy rate of the first generation of IVF technology was less than 3%. With the maturity of biotechnology and the improvement of cell nutrient solution, coupled with the continuous enrichment of medical staff, the success rate of IVF in recent years. Increase to 20% to 30% or even higher than the success rate of natural conception. The first generation of IVF is commonly used in infertility caused by female reasons. It has no good solution to male problems such as weak, abnormal, and azoless, which is also its shortcoming. The first IVF baby in mainland China was born in 1988 at Peking University Third Hospital.

The IVF technology requires several steps. First, biological means is required to promote superovulation in women, followed by removal of ovum and sperm, in vitro fertilization, and embryo transfer after a period of culture. In order to improve the success rate of this technology, it is necessary to obtain as many healthy and mature ovum and a large number of sperm as possible, and after in vitro fertilization, a plurality of embryos are cultured, and 2 to 3 excellent embryos are implanted from the mother. At a time when embryo freezing and thawing technology has been widely developed, women can choose this technology to preserve mature ovum or embryos, so that the re-transplantation will not be successful due to the fact that the fertilized eggs are not implanted. The success rate of the first generation of IVF will be affected by maternal health status, age and history of abortion and the increase in age is inversely proportional to the success rate of IVF

2.2 Second Generation IVF (ICSI)

The academic name of the second generation of IVF is intracytoplasmic sperm injection. Many people think that the second generation of IVF is the evolution of the first generation of IVF, which is better than the first generation of IVF technology. In fact, the second generation of IVF is mainly developed for the problem of male sperm fertilization ability. The second generation of IVF technology is to extract sperm from the epididymis, or to obtain sperm through testicular tissue sectioning method, and then inject single male sperm into the cytoplasm of egg cells by single sperm microinjection technology, thereby achieving egg cell fertilization and breeding into embryos. The subsequent steps are the same as the first generation, so the success rate of ICSI technology and IVF technology is not much different. Under normal circumstances, the fertilization process of the natural physiological state is competitive. Only the sperm that undergoes the acrosome reaction can fuse with the egg, and the egg membrane is induced to harden to prevent other sperm from entering. ICSI technology does not have a competitive process of sperm, which leads people to worry about sperm quality. In 2006, the emergence of PICSI technology improved this situation. Hyaluronic acid is the main component of egg cells, which can screen sperm quality and improve the quality of sperm entering the egg cell. The PICSI technology refers to the combination of hyaluronic acid in a culture dish, the addition of sperm obtained by puncture, and subsequent selection of sperm bound to the droplets to achieve screening of high-quality sperm. Studies have shown that hyaluronic acid can exclude sperm with abnormal chromosomes or genes, and DNA strand breaks and other conditions appear less, which is conducive to promoting sperm maturation. ICSI technology can solve the infertility of male weak sperm, abnormality, azoospermia, abnormal sperm acrosome, etc., and promote the application of IVF more widely.[2] The second generation of IVF was successfully conceived in Belgium in 1992. The first second-generation IVF in China was born in 1996 at Zhongshan Medical University.[3]

2.3 Third Generation IVF (PGD/PGS)

The third generation of IVF is a preimplantation genetic diagnosis technology that enables genetic diagnosis and screening of in vitro fertilized embryos, selecting the highest quality embryos, and preventing the birth of a fetus with a genetic defect. The PGD technology mainly consists of two steps. One is a biopsy, which refers to the aspiration of cells during a part of the embryonic development (the cleavage phase and the vesicle phase) to be examined; the other is genetic diagnosis, which is a genetic problem such as single-gene genetic disease or chromosomal abnormality by technologys such as polymerase chain reaction (PCR) to achieve embryo screening.[4] PGD technology can not only solve the problem of infertility, but also bring about a major change in improving the quality of birth. At the same time, the third generation of IVF technology can also analyze the sex of the embryo, but in general, Chinese doctors will not inform the sex of the fetus, and will only be obliged to inform couples in-

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volved in sexual chromosome diseases. Therefore, China has a higher screening requirement for couples applying for the third generation of IVF. At present, diseases that can be circumvented by PGD technology include cystic fibrosis, hemophilia A, and myotonic dystrophy. The technology is still developing, and it is believed that in the near future, it will be able to judge more genes and chromosomal diseases and contribute to the improvement of China's reproductive quality.[5]

2.4 Fourth Generation IVF

The fourth generation of IVF is a domestic name for the technology of cytoplasmic replacement, and it has also become a three-tube IVF technology. Since the chromosome in the nucleus is the genetic material of the human gene, it plays an important role in determining the genetic characteristics of the offspring and maintaining the life activities of the cell. The cytoplasmic replacement technology refers to the realization of the nucleus replacement between aging ovum and vigor ovum, forming a new ovum, which still expresses the genetic characteristics of aging ovum. This technology is mainly applied to older women. Because of their older age, if they use their own egg cells, they may affect the quality of the embryo. By borrowing the follicle cytoplasm of young women, the quality of the embryos carrying both husband and wife can be greatly improved. The success rate of IVF is increased. However, although most of the genetic information of ovum is located in the nucleus, there is also human genetic information in the cytoplasm of the follicle, and it is also possible to write into the genetic sequence of the embryo. Therefore, although this technology has been gradually implemented in countries such as Japan and the United Kingdom, since China is a traditional socialist country, it is very important to ethics. This technology is likely to cause serious ethical and legal problems, and may also have a serious impact on the social atmosphere, so the technology has not been promoted and applied in China.

3. The Analysis of IVF Neonatal Conditions

With the development of IVF technology, because IVFs usually need to transplant 2~3 embryos during embryo transfer to increase the success rate of test tubes as much as possible, the IVF rate is higher. At the same time, since the embryo needs to be cultured in vitro for a period of time after transplantation, the quality of the culture medium in vitro and related environmental factors may affect the development of the embryo, which may lead to a lower birth weight, perinatal complications, and birth defects in IVF neonates than in naturally conceived infants.[6] Relevant scholars at home and abroad pay more attention to the birth quality of IVF, and their research conclusions are different. Combining my many years of work experience, the author summarizes the conditions of newborn birth and analyzes the reasons, in order to provide reference for other medical staff.

3.1 The Observation Method of Neonatal Conditions

Randomly select 100 newborns of IVF babies who were born in our hospital in 2018 and stay in our hospital, as well as 100 newborns with natural pregnancy and delivery that were born in our hospital and stay in our hospital. Record in detail the birth status and information, and observe and count the indicators such as Apgar score, birth defects, and neonatal complications, and draw conclusions.

3.2 Neonatal Asphyxia

There was no significant difference in neonatal Apgar scores, mean weight, hospitalization, neonatal malformations, and mortality between the single-fetal infants and the natural twins. Neonatal asphyxia occurred in only 3 of 100 single-child single-birth babies, and 10 cases of spontaneous births in single-child babies. It can be seen that the neonatal asphyxia is mainly due to the hypoxia of the mother uterus, hypoxia during labor, or the imperfect lung development and insufficient surfactant.

Because of the hard-won achievements of IVF newborns, it is also called precious baby. Pregnant women have been strictly pregnant during pregnancy and prenatal examination since pregnancy, to prevent all kinds of accidents, so as to effectively prevent uterus hypoxia during pregnancy. The situation happened. During the delivery of precious baby, the mother is usually hospitalized in advance and highly valued by the obstetrician. Once the production process is hypoxic, it can be discovered in time and properly treated and treated by the doctor. It can also effectively prevent neonatal asphyxia. Some pregnant women who give birth naturally may not receive systematic pregnancy care and prenatal examination, thus losing the best time to deal with fetal suffocation. This is also the main reason why the neonatal asphyxia rate of IVF babies in this hospital is lower than that of natural delivery babies.

3.3 Neonatal Preterm Birth Rate, Hospitalization and Birth Weight

Since assisted reproductive technology usually transplants multiple embryos to ensure the success rate of IVF, the twin pregnancy rate of IVF is 20 times higher than that of natural childbirth. Twins will cause greater intrauterine pressure on the mother uterus. At the same time, nutritional needs have also increased, resulting in premature

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birth rate of IVF higher than that of natural delivery babies. Twins are an important cause of preterm birth, and preterm birth is the main cause of neonatal hyperbilirubinemia and low birth weight.

3.4 Neonatal Birth Defects

Neonatal birth defects refer to the embryos being affected by adverse factors during the process of gestation, resulting in congenital physiological structural malformations or disorders and systemic disorders in the development of normal embryos.[7] Congenital birth defects are not only indicative of birth babies, but also natural abortions and stillbirths. Relevant surveys have shown that pregnant women who use IVF technology have a 20% to 30% higher risk of spontaneous abortion than women with natural pregnancy, which is related to the relatively large age of IVF women. According to the analysis of the follow-up data of the IVF infants born in our hospital, the total birth defect rate of IVF was 0.88%, and the incidence of congenital heart disease was 0.23%. In recent years, the incidence of birth defects in infants born with natural pregnancy has increased from 0.86% in 1995 to 2.08% in 2004. The incidence of congenital heart disease in natural gestational infants is 0.8% to 1.3%, indicating that the application of IVF technology does not increase the incidence of neonatal birth defects.[8]

3.5 Neonatal Complications

According to the comparative analysis of IVF and natural delivery babies in our hospital, it is concluded that the complications of venous respiratory system, sepsis, neonatal anemia and jaundice and the mortality rate are higher than those of natural delivery babies. However, after the twins were excluded, the perinatal complications of IVF were similar to those of natural delivery babies. At the same time, during the investigation, it was found that neonatal complications were closely related to the age of the pregnant woman, the gestational age and whether the pregnant woman had pregnancy-induced hypertension. At present, many scholars blame the neonatal complications on neonatal premature birth, twins, and pregnancy-induced hypertension. Both premature birth and pregnancy-induced hypertension are associated with twins, and it can be considered that reducing twin pregnancies significantly reduces the incidence of neonatal complications. In addition, if the twin-pregnant women can get adequate nutrition guarantee during pregnancy, and receive the system of pregnancy care and prenatal examination, timely give the lung-promoting medicine before the premature delivery, which can effectively avoid respiratory diseases caused by neonatal lung hypoplasia, thus effectively reducing the incidence of death and asphyxia caused by complications.[9] Therefore, improving the perinatal nutrition supply and obstetric care of pregnant women and women is an important prerequisite for reducing the complication rate and mortality of newborns.

4. Conclusion

IVF technology has gone through four generations of technology since its inception, and it has been repeatedly questioned by various circles in the development process. Only strengthen the research and development of IVF technology, strictly control the indications of IVF, improve the quality of embryo culture in vitro, and reduce the rate of multiple pregnancies as much as possible, so as to effectively improve the fertility quality of IVF, promote family happiness, social stability and national prosperity.

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