stem cell therapy for male and female infertility

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Abstract: (Review Article)

Fertility is the ability to achieve clinical pregnancy. According to the international glossary, infertility is defined as "A disease characterized by the failure to establish a clinical pregnancy after 12 months of regular, unprotected sexual intercourse or due to an impairment of a person's capacity to reproduce either as an individual or with his/her partner." Fertility interventions may be initiated in less than 1 year based on medical, sexual, and reproductive history, age, physical evaluation, and diagnostic testing. Infertility is a disease, which generates disability as an "impairment of function". The main causes of male infertility include impaired spermatogenesis and abnormal sperm quality in males. In females, pelvic or inguinal surgery, impairment of follicle development, ovu□lation disorders, ovarian dysfunction, damaged fallopian tube or fallopian tube obstruction, and so on, could give rise to female infertility.Assisted reproductive technologies (ART) have shown promise in increasing the pregnancy rate; however, these methods have issues related to gametes regeneration and immune system intervention.1 There are consistent reports that the application of ART for infertility treatment carries the risk of adverse perinatal outcomes and an increase in birth defects. After a cycle of intracytoplas□mic sperm injection (ICSI), the risk of major birth defects associated with the cardiovascular, genitourinary, and mus□culoskeletal systems has been reported to have doubled. This is very concerning as ICSI accounts for 70% of all treatment cycles worldwide.

Stem cells can proliferate extensively, produce similar copies of cells, and also differentiate into specific cells of a variety of tissues. They are commonly categorized as adult stem cells, early embryonic stem cells, and induced pluripotent stem cells (iPSCs) according to their derivations.

The proposed mechanism of stem cells in the repair of reproductive dysfunction includes the following steps: stem cells migrate to the injured reproductive tissues caused by chemokines, and then differentiate and integrate somatic cells with non-tumorigenic properties. These cells, especially in the GCs, participate in follicle development and regulate ovarian physiology, including ovulation and luteal regression. They may reside in the reproductive tissue and help ameliorate the damaged microenvironment by producing paracrine factors. Subsequent stem cell transplantations can restore the endocrine function by secreting anti-inflammatory factors or increasing the number of Treg cell population, leading to immune suppression. Adult stem cells are isolated from a variety of tissues, including bone marrow, adipose tissue, Wharton's jelly, umbilical cord blood, human amniotic fluid, and peripheral blood. Current reports have

proposed that these stem cells could rescue unexplained infertility. MSCs, the most common adult stem cells, have the highest multi-lineage differentiation potential among human stem cells to date. Stem cells derived from the bone marrow, amniotic fluid, embryos, iPSCs, spermatogonia, and oocytes can all be reprogrammed to generate germ cells. Tissue-specific resident stem cells are sources of regenerative gametes, which could assist future research in reproductive medicine. In this section, we discuss the various features of stem cells, including migration, anti-apoptosis, anti-fibrosis, angiogenesis, anti-inflammation, immunoregulation, and oxidative stress, which provide the theoretical basis for further reproductive medicine research and clinical infertility treatment.