Improving Quality of Embryos by Stem Cell Application

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ABSTRACT

Stem cell has the ability of self renewal or differentiation into more specialized cells. Embryo quality is detected by microscopic assessment of cell number, fragmentation & others. Aim of our study: detect effect of stem cell application on poor quality embryos, either improving or not. Methodology: 50 poor quality embryos divided into 2 equal groups (cases & controls). We added stem cell supernatant on each embryo of the cases After 3 days: improvement of most of the cases, but worsening of most of the controls. Conclusion: stem cells can improve poor quality embryos but genetic diagnosis is required.

Keywords: stem cell-poor quality embryos- Supernatant-improving

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LIST OF ABBREVIATIONS

ALCAM	Activated leukocyte cell adhesion molecule
ART	Assisted reproductive technology
AT	Adipose tissue
bFGF	Basic fibroblast growth factor
BM	Bone marrow
CES	Cumulative embryo score.
CFU-F	Colony-forming units of fibroblasts
C.M.	Conditioned medium
CRP	C-reactive protein
DMEM	Dulbecco's Modified Eagle's Medium
DNA	Deoxyribonucleic acid.
EGF	Epidermal growth factor
ESHRE	European Society of Human Reproduction and Embryology
Et	Embryo transfer
FBS	Fetal bovine serum
FDA	Food and Drug Administration
Fig.	Figure
FSH	Follicle stimulating hormone
G-CSF	Granulocyte colony-stimulating factors
GIFT	Gamete intrafallopian transfer
GM-CSF	Granulocyte-macrophage colony-stimulating factors
GnRH-a	Gonadotrophin-releasing hormone agonists
GnRH-ant	Gonadotrophin-releasing hormone antagonists
GnRH-R	Gonadotrophin-releasing hormone receptors
HCG	Human chorionic gonadotrophins
HESC	Human embryonic stem cell
H.S.	Highly significant

ICAM-1	Intercellular adhesion molecule one
ICSI	Intracytoplasmic sperm injection
IGF-I	Insulin like growth factor one
IGF-II	Insulin like growth factor two
IVF	In vitro fertilization
LH	Luteinising hormone
LIF	Leukemia inhibitory factor
MAPCs	Multipotent adult progenitor cells
MBTEU	Molecular Biology and Tissue Engineering Unit
M-CSF	Macrophage colony-stimulating factors
MHC	Major histocompatibility complex
MSCs	Mesenchymal stem cells
NPBs	Nucleolar precursor bodies
NRC	National research center
N.S.	Non significant
OHSS	Ovarian hyperstimulation syndrome
OI	Ovulation induction
OPU	Ovum pick-up
OR	Oocyte retrieval
OS	Ovarian stimulation
PAF	Platelet activating factor
PB	Polar body
PBS	Phosphate buffer saline
PCOS	Polycystic ovarian syndrome
PID	Pelvic inflammatory disease
PLA	Pelvic lipoaspirate
PR	Pregnancy rates
PN	Pronuclei
RCOG	Royal College of Obstetricians and Gynecologists

SCF	Stem cell factor
S.	Significant
SIG	Special Interest Group
Tab.	Table
TET	Tubal embryo transfer
TGF-a	Transforming growth factor a
TGF-b	Transforming growth factor b
TNF-αI	Tumor necrosis factors alpha one
TNF-αII	Tumor necrosis factors alpha two.
TGF-α	Transforming growth factor-alpha
TGF-β	Transforming growth factor-beta
UCB	Umbilical cord blood
UK	United Kingdom
VCAM-1	Vascular cell adhesion molecule one
VEGF	Vascular endothelial growth factor
ZIFT	Zygote intrafallopian transfer

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INTRODUCTION

INTRODUCTION

Stem cells are rare primitive cells which can be defined by their capacity to self renew as well as to differentiate into one or more mature cell types (Chan et al., 2006).

Mesenchymal stem cells (MSCs) represent a promising tool for new clinical concepts in supporting cellular therapy. Bone marrow (BM) was the first source reported to contain MSCs. However, for clinical use, BM may be detrimental due to highly invasive donation procedure and the decline in MSCs number and differentiation potential with increasing age (Kern et al., 2006).

Studies have demonstrated that the life span of mesenchymal stem cells invitro can be extended and thus allowing culture of large number of cells needed for therapy. In addition, it has been shown that it is possible to culture the cells without affecting their growth or differentiation potential. The mesenchymal stem cells seem to be hypoimmunogenic and thus allogeneic mesenchymal stem cell transplantation is possible (Kassem et al., 2004).

The quality of embryos from in vitro fertilization is assessed by determining three major components:

I) cell number,

II) cell regularity

III) degree of fragmentation.

There are also other things noted about the embryo appearance, such as multinucleation, presence of vacuoles, granularity, thickness of the shell

around the embryo, etc. Usually, determinations of quality are not made until about 48 hours (or later) after the egg retrieval (Sherban .2008).

The factors affecting embryo quality are combined in numerous ways, often complex, to produce embryo scoring systems to identify potential embryos that would result in pregnancy. As more is learnt about the different aspects of embryo morphology in relation to pregnancy outcome, more criteria can be included in the assessment of embryos, assessment of the oocyte, pronuclear as well as early cleavage status. The decision to use one system over another is often based on the individual laboratory's familiarity and training (Loi et al., 2008).

The true genetic potential of the embryo to continue development is really impossible to measure. However, embryo quality seen under the microscope gives us some reasonable ability to predict the chances for pregnancy after an embryo transfer. Embryos with higher cell numbers and regular appearing cells (blastomeres) and little or no fragmentation have a higher overall chance of implanting than do embryos with fewer cells, more irregularity and more fragmentation. However, because there are many other contributing factors involved that we can not measure, these generalizations do not always apply. Some cycles fail after transferring 3 perfect looking embryos and beautiful babies are born after transferring low grade embryos (Sherban, 2008).