Multivariant Analytical Statistical Study of Factors Affecting Success of ICSI

BY

Marwa Galal El-Din Abdel Hady Farrag
M.B,B.Ch of Medicine, Cairo University.
Research fellow, National Research Center, Cairo, Egypt

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Under Supervision of

Prof. Dr. Diaa El-Din Sarhan
Professor of Obstetrics and Gynecology.
Faculty of Medicine, Cairo University.

Dr. Ahmed Zakaria EL-Shaikha
Assistant Professor of Obstetrics and Gynecology.
Faculty of Medicine, Cairo University.

Dr. OSAMA MAHMOUD AZMY
Assistant Professor of Obstetrics and Gynecology.
National Research Center, Cairo, Egypt.

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List of appreviation

1-PN ---------- one pronuclear.

2-PN ---------- two pronuclear.

AMH ---------- antimullerian hormone .

ART ---------- assisted reproduction technology.

COH ---------- controlled ovarian hyperstimulation.

CT-ET ---------- clinical touch embryo transfer.

DET ---------- double embryo transfer.

EP ---------- ectopic pregnancy.

ET ---------- embryo transfer.

FET ---------- frozen embryo transfer.

FSH ---------- follicle stimulating hormone.

GnRH ---------- gonadotropin releasing hormone.

GnRHa ---------- gonadotropin releasing hormone agonist.

HCG ---------- human chorionic gonadotopin.

HMG ---------- human menopausal gonadotropins.

ICM ---------- inner cell mass.

ICSI ---------- intracytoplasmic sperm injection.

IVF ---------- invitrofertilization.

LH ---------- luteinizing hormone.

LHRH -------- luteinizing hormone releasing hormone.

M II ---------- metaphase two.

MESA ------- microsurgical epididymal sperm aspiration

NOA --------- non obstructive azospermia.

OA ---------- obstructive azospermia.

OAT --------- oligo-atheno-teratospermia.

OHSS -------ovarian hyperstimulation syndrome.

OPU --------- ovum pickup.

PCO --------- polycystic ovary.

PCOS ------- polycystic ovary syndrome.

PZD --------- partial zona dissection.

SET --------- single embryo transfer.

SUZI ------- subzonal insemination.

TE ---------- trophoectoderm.

TESA ------ Testicular sperm aspiration.

U/S -------- ultrasound.

US-GET ------- ultrasound guided embryo transfer.

Abstract

The aim of the study was to assess the factors that affect the success rate of ICSI procedure and to build up a multivariant analysis scheme to predict ICSI success rate. The sample of the study was 521 infertile couple. After ICSI procedure were done and, factors affecting ICSI success were statistically analyzed, the following factors were of statistical significance; female and male age, induction protocol, number of retrieved oocytes, number of grade A embryos, number of transferred embryos, cytoplasmic fragmentation, and azospermia as a sole factor of infertility.

Key words: ICSI, success, factors, analysis, statistics.

Introduction

Infertility as a worldwide problem may be due to male factors, female factors, unexplained infertility, or combined factors in male and fenale.

Intracytoplasmic sperm injection (ICSI) is one of assisted reproduction techniques. ICSI is a relatively new but well-established procedure first performed in 1992(**Palermo et al., 1993**).

Fertilization rates are in the region of 60-70% of the injected eggs and cleavage rates of about 80% are expected after ICSI. The risk of complete failure of fertilization is less than 5%. The overall live birth rate per embryo transfer is about 28.7% **.** There is wide variability in results between centers **(Loutradis et al., 1999)**.

Multiple factors affect ICSI cycles such as woman's age **(Wang et al., 2007)**, sperm quality **(Strassburger et al., 2000),** hormonal state, day of embryo transfer and cause of infertility. Duration of infertility, the number and quality of retrieved oocytes **(Serhal et al., 2000)**, number of injected oocytes **(Shehua et al., 2003)**, embryo morphology, quality of transferred embryos **(Hsu., 1999),** and the number of embryos transferred also affect ICSI success rate. Furthermore the success rates of ICSI treatment are dependent on the skill and experience of the practitioners **(Joris et al., 1998).**

This study is a prospective study and will include 521 couple who will be treated by ICSI in National Research Center (NRC) assisted conception clinic and two private centers.

Factors affecting success of ICSI: cause of infertility, duration of infertility, woman's age, male age, sperm sample type, hormonal state of female, type of induction protocol number of retrieved oocytes , number of 2 PN, embryo quality , day of embryo transfer, number of embryos transferred, rate of cytoplasmic fragmentation, will be tabulated and analyzed to detect its effect on success rate of ICSI. These factors will be compared all to detect which one affect success of ICSI more than the others.

Aim of work:

- To assess factors that affect success rate of ICSI.
- To build up a multivariant analysis scheme to predict success rate of ICSI.

Introduction to ICSI

In 1978 a fruitful collaboration between **Stepote**, a gynecologist, and **Edwards**, a physiologist, resulted in the birth of the first human baby after in vitro fertilization (IVF) and subsequent embryo transfer (ET). This represented a major breakthrough in human infertility treatment and, since then, IVF has become a well-established treatment procedure in certain types of infertility, as infertility due to male factor, tubal factor or unexplained infertility (**Clarke ., 2006)**.

It soon became obvious that certain couples with male factor infertility could not be helped by conventional IVF. In order to solve this problem, several procedures of assisted fertilization based on micromanipulation of oocytes and spermatozoa have been established. The evolution of these techniques started with partial zonal dissection (PZD), followed by subzonal insemination (SUZI), and finally to the procedure of intra cytoplasmic sperm injection (ICSI) **(Lanzendrof et al.,1988)**. The two former techniques were developed to circumvent the barrier to fertilization represented by the zona pellucida. PZD involves mechanical disruption of the zona pellucida so that inseminated sperm cells obtain direct access to the perivitelline space of the oocytes, (**Tucker et al., 1991** and **Palermo J et al 1992).**

In SUZI, several motile sperm cells are immediately delivered into the perivitelline space by means of an injection pipette. ICSI is even more invasive, because a single spermatozoon is directly injected into the ooplasm, thereby crossing not only the zona pellucida but also the oolemma
(Van Sterirteghem et al., 1996).

In 1992 the 1st live birth baby delivery after ICSI had been reported. Fertilization rates after ICSI had been reported to be significantly better than after SUZI. Moreover ICSI resulted in the production of more embryos with higher implantation rates **.** As a result, ICSI has been used worldwide successfully to treat infertility due to impaired testicular function or obstruction of the excretory ducts resulting into severe oligo-, astheno-, or teratozoospermia or even azosprermia in the ejaculate **(Palermo et al., 1993).**

Since the publications describing ICSI procedures minor modification have contributed to reduced rates of oocyte activation. Hyaluronidase may be responsible for oocytes activation; therefore the concentration used during oocytes denudation and the exposure time of oocytes to the enzymes has been reduced **(Van De Veld et al., 1998)**.

The moment of denudation relative to the oocytes pick up (immediately or 4 hours later) does not influence the ICSI results. The orientation of the polar body during injection has an influence on embryo quality. Motile sperm cells are selected and immobilized prior to injection (**Nagy et al., 1995**).

Cytoplasm aspiration to ensure oolemma rupture is critical for the ICSI procedure, and the method of rupture has been correlated with oocyte degeneration. Furthermore, the morphology of the injected spermatozoon is related to the fertilization outcome of the procedure as well as to the pregnancy outcome (**De vos et al., 2003**).

Indications for ICSI:

May include the following...

1-Where a previous IVF cycle has resulted in failed fertilization.

2-If the number of sperms in the ejaculate is very low, (Oligospermia).

3-If the motility of sperms is poor, (Asthenospermia).

4-If the morphology (shape) of sperms is poor. (Teratospermia).

5-If there are no sperm in the ejaculate (Azoospermia), and sperms therefore have to be surgically retrieved from the epidydimis (MESA – microsurgical epididymal sperm aspiration) or testis (TESA – Testicular sperm aspiration).

6-If there are antisperm antibodies present.

7-If there are frozen sperms only available, with limited counts and motility. Sperm may be banked and frozen in cases where the sperm counts are very low, in men who need the sperm to be surgically retrieved (TESA, MESA) or in men who have banked sperm before chemotherapy for cancer**(Linda et al 2006)**.

Patient Selection:

Successful IVF depends on the presence of spermatozoa with good motility and morphology. **Riedel and colleagues**, (**1989**) reported minimal andrological requirements for conventional IVF: total concentrations of spermatozoa must be greater than 5 million spermatozoa/micro liters with progressive motilities of at least 30% and also a normal morphology of at least 30%.. Today, however, the most efficient procedure to treat this type of male infertility is ICSI: only one motile (live) spermatozoon is required per mature metaphase II oocyte to be injected. A summary of several years of ICSI practice indicated that