

*Reproductive Biology Section*

# Effect of poor motility on pregnancy outcome following intracytoplasmic sperm injection in couples whose male partners have subnormal hypo-osmotic swelling test scores

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## Summary

**Purpose:** To determine the confounding effect, if any, of poor motility of sperm that are already compromised by an abnormal hypo-osmotic swelling (HOS) test on pregnancy outcome following in vitro fertilization-embryo transfer (IVF-ET) and intracytoplasmic sperm injection (ICSI). **Materials and Methods:** Clinical and live-delivered pregnancy and implantation rates were retrospectively evaluated in first cycles of couples undergoing IVF-ET with ICSI where the HOS test was < 50% according to deciles of subnormal percentage motility (< 50%) and compared to those with normal motility  $\geq 50\%$ . **Results:** The combination of very poor motility and low HOS test scores did diminish pregnancy rates following IVF with ICSI. **Conclusions:** The only part of fertilization of the oocyte that ICSI does not overcome is phase 2 of oocyte activation. Based on these data, the combination of very low percentage motility and low HOS test scores do not adversely affect pregnancy outcome following IVF with ICSI.

**Key words:** Hypo-osmotic swelling test; Intracytoplasmic sperm injection; Motility; In vitro fertilization-embryo transfer.

## Introduction

Males with sperm with low hypo-osmotic swelling (HOS) test scores < 50% rarely achieve pregnancies with either intercourse or intrauterine insemination (IUI) [1]. Interestingly, sperm with low HOS test scores provide normal fertilization rates with conventional oocyte insemination during in vitro fertilization-embryo transfer (IVF-ET), but these embryos rarely implant [2].

There are ways to achieve pregnancies with low HOS test scores [3]. One method is to pre-treat the sperm before IUI or IVF with the protein digestive enzyme chymotrypsin and galactose [4, 5]. The most effective method is to bypass the contact of the sperm with a hypothesized associated toxic protein with the zona pellucida by performing intracytoplasmic sperm injection (ICSI) [6].

The present study evaluated whether poor motility reduces the effectiveness of ICSI in achieving pregnancies with sperm with low HOS test scores.

## Materials and Methods

A retrospective evaluation of IVF-ET cycles was performed requiring the male partner to have a semen concentration of  $\geq 20 \times 10^6/\text{ml}$  and the HOS test scores were < 50%. Pregnancy and implantation rates were compared according to the percentage of motile sperm. ICSI was performed in all cycles. Data were based on the couple's first IVF-ET cycle. Female partners were aged  $\leq 39$  years.

## Results

Fertilization and pregnancy rates according to the percentage of motility of the sperm in female partners aged  $\leq 39$  years whose male partner was also  $\leq 39$  years of age with a normal sperm concentration but low HOS test score (< 50%) ( $\geq 20 \times 10^6/\text{ml}$ ) are seen in Table 1. Table 1 shows no trend for lower pregnancy or implantation rates with poor motility vs. normal motility following IVF-ET using sperm with HOS scores < 50%.

Evaluating sperm with < 20% motility, the clinical and delivered pregnancy rates/transfer were 57.9% (11/19) and 52.6% (10/19), respectively vs 50.0% (18/36) and 41.7% (16/36) for those with motility  $\geq 50\%$ . The < 10% motility group was insufficiently powered to make conclusions as to whether very low motility percentage may show slightly lower fertilization rates, but the results did not show any trend to be lower than the other groups.

## Discussion

The added burden of low percentage motility does not adversely affect pregnancy rates following IVF with ICSI using sperm with low HOS test scores. Despite previous vivid demonstration of very poor (approaching zero) pregnancy rates following transfer of embryos formed from conventional oocyte insemination using sperm with low HOS test scores, the recorded pregnancy rates following ICSI are no lower than the normal pregnancy rates for this institution using sperm with normal HOS test scores.

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Table 1. — The confounding effect of low motility on pregnancy rates.

	Motility %					
	< 10%	10-19%	20-29%	30-39%	40-49%	≥ 50%
# transfers	7	12	10	22	27	36
Avg. HOS score (%)	19	29	37	42	43	42
% fertilized	55.4	64.6	71.0	71.2	76.7	66.3
Clinical PR/transfer	57.1%	58.3%	50.0%	45.5%	14.8%	50.0%
Delivered/ongoing PR	57.1%	50.0%	50.0%	36.4%	14.8%	41.7%
Implantation rate	56.3%	26.3%	29.0%	22.0%	13.4%	25.2%

In normal conception, oocyte activation occurs by a two-signal process. The acrosome reaction stimulation – the initial signal of  $Ca^{++}$  (signal 2) – occurs in an oscillatory fashion [7]. Though ICSI almost always stimulates signal 1, it does not always result in stimulating a signal 2. Achievement of oocyte fertilization despite failure with ICSI can be achieved by artificial oocyte activation of signal 2, e.g., with calcium ionophore [8].

These data not only confirm previous studies showing that ICSI corrects the embryo implantation defect that occurs with low HOS scores, but also show that very poor motility does not negate the beneficial effect of ICSI for the HOS defect [8]. Sperm morphology was not assessed in this study since a previous study found that poor morphology did not diminish the efficacy of ICSI for low HOS tests either [9].

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