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Low Birth Defect by Sperm Selection: Follow Up Prospective Study Children Born

Cassuto NG[1*]

Abstract

The final goal for the gynecologist, the biologist, and all the team members of an IVF unit is to get a healthy baby home at the end of the process. The prevalence of birth defects after assisted reproductive technologies (ART) remains controversial.

Keywords

Sperm selection; Low birth defect; Intracytoplasmic sperm injection; Intracytoplasmic morphologically selected sperm injection

To date, the rate of major malformations (MM) after natural conception according to the registry of birth defects of Paris over 27 years, from 1981 to 2007 is 2.40% [1]. Most publications examining the incidence of MM for children born after Intracytoplasmic sperm injection (ICSI) or in vitro fertilization (IVF) compared to spontaneously conceived infants showed an increased risk, where birth defects were twice as likely than in naturally conceived infants [2] and these risks effect boys more often than girls [3].

More recently in a meta-analysis taking into account the analysis of 46 studies, Wen confirmed a higher rate of birth defect for children after IVF or ICSI compared to spontaneously conceived children (OR = 1.37). In the same report these authors did not found any difference on birth defects for the children conceived by IVF or by ICSI [4]. Within this scenario, under a good clinical practice, we must inform the couple about the existence of a certain level of risk. In order to decrease such a risk of MM, we decided to compare the incidence of MM between two techniques in the choice of the spermatozoa before injection, at high and at low magnification.

The aim of this study was to compare the cohort of children born after two different ART: Intracytoplasmic sperm injection (ICSI) or intracytoplasmic morphologically selected sperm injection (IMSI)

In this long prospective follow up study, we decided to include all the couples recruited and programmed for ICSI and IMSI during 5 years. All patients have signed and agreed to the protocol. Medical data from babies born alive were collected based on 6 questionnaires sent to the parents or attending physicians from birth to 2 years-old. In total, 1028 children were followed during 2 years: 578 (56%) conceived after ICSI and 450 (44%) after IMSI. The lost follow up is 1.09%. The mean age of women at conception was 32.4 ± 4.0 years for ICSI and 32.8 ± 3.5 for IMSI and for men was 36.3 ± 6.3 and 36.4 ± 5.9 years, respectively.

In all the attempts, fresh ejaculated semen was considered.

The two groups were similar according to the number of oocyte retrieval, fertilization rate, embryos rate, and drugs treatment used. No significant difference in completed pregnancies due to foetal malformations or genetic disorders was observed between the two groups.

More than 96% percent of the children were normal and healthy but we found an important impact for the MM which were identified, compared and classified in the ICSI and IMSI groups, respectively. Major malformations were significantly lower with IMSI (6/450, 1.33%) versus ICSI (22/578, 3.80%) (Adjusted OR 0.35, 95% confidence interval 0.14–0.87, $P = 0.014$), and for the 2 groups mainly affecting the uro-genital system.

As previously described, we also reported that birth defect concerned more often boys than girls (Adjusted OR 2.84, 95% CI 1.24–6.53, $P = 0.009$) [5].

Our main hypothesis is therefore that the selection of the best spermatozoon decreases the incidence of major birth defects.

The definition of the best spermatozoon is not clear; there are a series of confounding factors to delineate this concept and the subject still conflicting. Detailed sperm examination, especially sperm head, at high magnification in real time allows the selection of the best morphological spermatozoa before oocyte injection. We previously reported a clear positive correlation between the head morphology of the spermatozoon, the fertilization rate as well as rate of embryo blastulation [6]. Ultra morphological criteria with a scoring scale have been established according to the head, vacuole and base of the spermatozoon, which appear to be unrelated to chromosomal abnormalities [7] but related to DNA damage, particularly to chromatin decondensation which may affect embryo development [8]. It is well known that chromatin condensation is a crucial step in protecting the paternal genome during the transit from the male to the oocyte prior to fertilization. The chromatin of the spermatozoon is normally packaged tightly during spermatogenesis.

By deselecting the worst morphology spermatozoon (S0), undetectable at low magnification, high magnification seems to provide less MM for the newborn.

In conclusion, this follow-up study emphasizes the importance of spermatozoon selection before ICSI and using high magnification before injection in the oocytes, minimizing the risk of MM in offspring.

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***Corresponding author:** Nino Guy Cassuto, Art Unit, Drouot Laboratory, Drouot Street 21, 75009 Paris, France, Tel: 0145231045; Fax: 0147707779; E-mail: guycassuto@labodrouot.com

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Author Affiliation

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[1]*Art Unit, Drouot Laboratory, Drouot Street 21, 75009 Paris, France*