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Review

Intracytoplasmic morphologically selected sperm injection results in improved clinical outcomes in couples with previous ICSI failures or male factor infertility: a meta-analysis

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ABSTRACT

The objective of this study was to perform the first meta-analysis to compare conventional intracytoplasmic sperm injection (ICSI) outcomes and intracytoplasmic morphologically selected sperm injection (IMSI) outcomes in couples with previous ICSI failures (IF) or male factor infertility (MF). A systematic review was performed by searching Medline database to identify articles reporting on the comparison between ICSI and IMSI outcomes in couples with IF or MF. The main outcome measures were the implantation, pregnancy and miscarriage rates. Thirteen studies fulfilled our predetermined criteria. The overall results of meta-analysis for implantation (OR: 2.88; CI: 2.13–3.89), pregnancy (OR: 2.07; CI: 1.22–3.50) and miscarriage rates (OR: 0.31; CI: 0.14–0.67) were in favor of IMSI in couples with IF. Additionally, the overall result of meta-analysis for implantation (OR: 1.56; CI: 1.11–2.18) and pregnancy rate (OR: 1.61; CI: 1.17–2.23) were in favor of IMSI in couples with MF. IMSI increases the odds of implantation by 50% and pregnancy by 60% in couples with MF. In light of improved clinical outcomes, we recommend promoting the IMSI method in couples with MF. Moreover, IMSI results in a 3-fold increase in implantation rate, a 2-fold increase in pregnancy rate and a 70% decrease in miscarriage rate as compared to ICSI in couples with IF, however, as no randomized evidence exists, randomized studies are needed to confirm the IMSI benefits in couples with IF.

Contents

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Introduction

In the last decade a new approach involving real-time, high-magnification observation of unstained spermatozoa, named 'motile sperm organelle morphology examination' (MSOME), has been introduced [1]. The incorporation of this technique together with a micromanipulation system has allowed the introduction of a modified intracytoplasmic sperm injection (ICSI) procedure, known as intracytoplasmic morphologically selected sperm injection (IMSI). This system of real-time detailed morphological sperm examination at high magnification, ranging from ×6600 to ×13,000 with Nomarski optics, enables the selection of the best available motile spermatozoa before oocyte injection [2–5].

Several studies have investigated the benefits of IMSI by comparing the results obtained using this technique with those obtained via ICSI; however, the results are controversial [2–18]. Nevertheless, numerous publications have reported that IMSI is positively associated with implantation and/or pregnancy rates [2–5,7–12,16–18] in couples with previous and repeated implantation failures and in patients with male factor infertility.

Meta-analysis provides an overall consensus from studies, resulting in a more precise estimate than any of the individual articles. A meta-analysis, published in 2010, comparing ICSI vs. IMSI outcomes concluded that IMSI not only significantly improves the percentage of top-quality embryos, implantation and pregnancy rates, but also significantly reduces miscarriage rates as compared with ICSI [19]. However, this previous meta-analysis included a single randomized controlled trial and two non-randomized studies. Similarly, a more recent meta-analysis showed a very-low-quality evidence that IMSI improves clinical pregnancy [20]. These two meta-analyses did not take into account the indications for ICSI; therefore, their results cannot be generalized for all the couples undergoing ICSI. Therefore, the aim of this study was to perform the first meta-analysis to compare conventional intracytoplasmic sperm injection (ICSI) outcomes and intracytoplasmic morphologically selected sperm injection (IMSI) outcomes in couples with previous ICSI failures (IF) or male factor infertility (MF).

Materials and methods

Literature search

A computerized search in MEDLINE (from January 2001 until April 2013) was performed to identify articles reporting on the comparison between ICSI and IMSI outcomes. Keywords used were: "Intracytoplasmic morphologically selected sperm injection", "motile sperm organelle morphology examination" "IMSI", "MSOME" and "high magnification ICSI". The search was not restricted for articles written in English. References detected with the related articles function in Pubmed were also checked to identify cited articles not captured by electronic searches. The reference lists of eligible primary studies were examined for identification of additional articles.

Study selection and data extraction

Grey literature (abstracts, unpublished studies, conference proceedings, graduate theses, book chapters, company reports, and applications) was not included in this meta-analysis. Studies dealing with azoospermia and sperm DNA fragmentation and studies in which patients acted as their own controls were excluded from the subsequent analysis. No strict selection according to the experimental designs or language was applied. The main outcome measures were implantation, pregnancy and miscarriage rates. Studies were selected in a two-stage process (illustrated in Fig. 1). At the first screening, the titles and abstracts from the electronic searches were scrutinized by two reviewers independently (A.S. and D.B.). Studies with lack of any relevance were excluded and full manuscripts of all citations that were likely to meet the predefined selection criteria were obtained. Second, final inclusion or exclusion decisions were made on examination of full manuscripts by both reviewers.

Two independent investigators (A.S. and D.B.) extracted the data from all eligible trials. Discrepancies were resolved by the involvement of another investigator (R.F.). From each eligible trial we recorded for both arms the following data: demographic

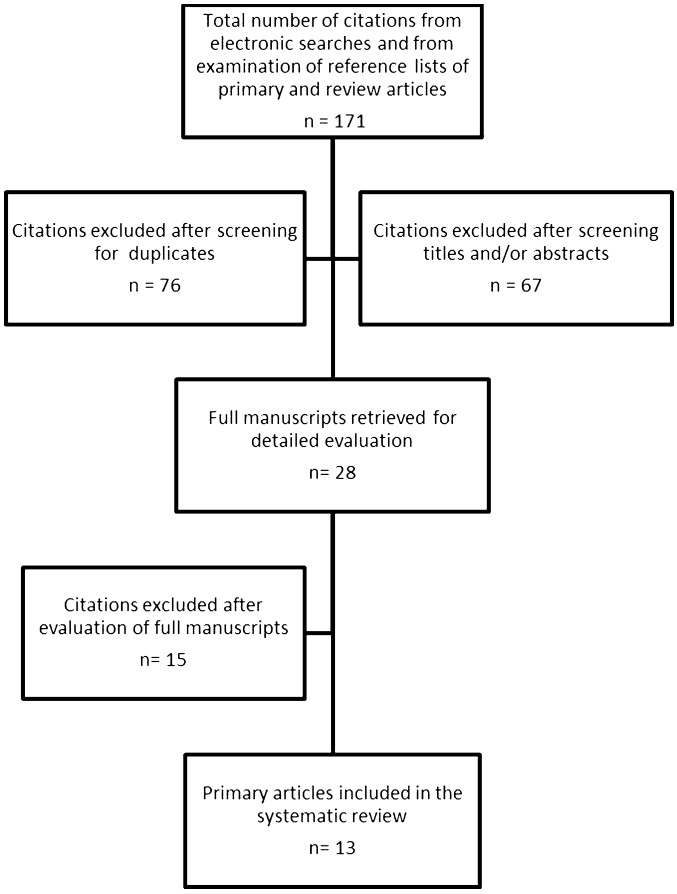

Fig. 1. Study selection process for systematic review.