# EFFECTS OF SPERM SELECTION USING MICROFLUIDS ON THE IMPROVEMENT OF EMBRYO QUALITY

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## INTRODUCTION

There are several sperm selection techniques, but the most commonly used are Swim-up and density gradients. Both techniques require centrifugation of the sample, exposing the sperm to a high level of reactive oxygen species that lead to increased DNA fragmentation. Also, both techniques require many steps, consuming a lot of time and increasing the risk of error. Therefore, microfluidics emerges as an attractive alternative for sperm selection.

## GOAL

To compare the sperm quality as well as fertilization rate, useful blastocyst, euploidy and embryo quality of two sperm selection techniques: SwimCount™ Harvester (microfluidic-based system) and Swim-up, through an intermediate analysis on a prospective study.

## MATERIALS AND METHODS

The interim analysis of a prospective study in which 50 patients were recruited, with a mean age of 38±4,3 years. Fresh and processed sperm samples from each patient were analyzed according to WHO 2021 criteria. The semen sample was divided into two volumes, one volume was processed using Swim-up and the other using SwimCount™ Harvester . Subsequently, half of the mature oocytes were microinjected with the semen selected by SwimCount™ Harvester and the other half with the semen processed by Swim-up in a randomized, double-blind manner. The remaining semen sample from both groups was analyzed for morphology, vitality, chromatin structure stability and DNA fragmentation. Once the oocytes were microinjected, embryo development data were collected.

## RESULTS

The total number of progressive motile spermatozoa was statistically higher for the SwimCount™ Harvester group compared to the Swim-up group: 7.1±7.7x$10^6$ and 3.4±3.5 x$10^6$ respectively ($p<0.05$). The vitality, morphology and stability of chromatin structure was higher for the microfluidic processed group, obtaining no significant differences. On the contrary, sperm DNA fragmentation was significantly lower for SwimCount™ Harvester (5.2±4.8%) compared to Swim-up (7.6±6.7%) ($p<0.05$).

The fertilization rate for the group of oocytes microinjected with the semen processed by SwimCount™ Harvester was 77.9% and similar in the Swim-up group (78.1%). In reference to embryo development, for the useful blastocyst rate, a non-significant increase was observed for the SwimCount™ Harvester group (49.0%) compared to the Swim-up group (43.9%). Similarly, the euploidy rate was higher for the SwimCount™ Harvester group (51%) compared to the Swim-up group (36.0%) (p=N.S). Finally, the rate of good quality blastocysts (ASEBIR A+B quality) was higher for the SwimCount™ Harvester group (61.4%) compared to the Swim-up group (50.0%), with no significant differences.

| Lab Indicators | Used Techniques | Number of oocytes | Rate |
|---|---|---|---|
| **Fertilization** | SwimCount™ Harvester | 208 | 77.90% |
| | Swim up | 207 | 78.11% |
| **Useful Blastocyst** | SwimCount™ Harvester | 102 | 49.04% |
| | Swim up | 91 | 43.96% |
| **Euploidy** | SwimCount™ Harvester | 25 | 51.02% |
| | Swim up | 18 | 36.00% |

*FIGURE 1: Table showing how the sperm selection technique used affects the laboratory indicators.*

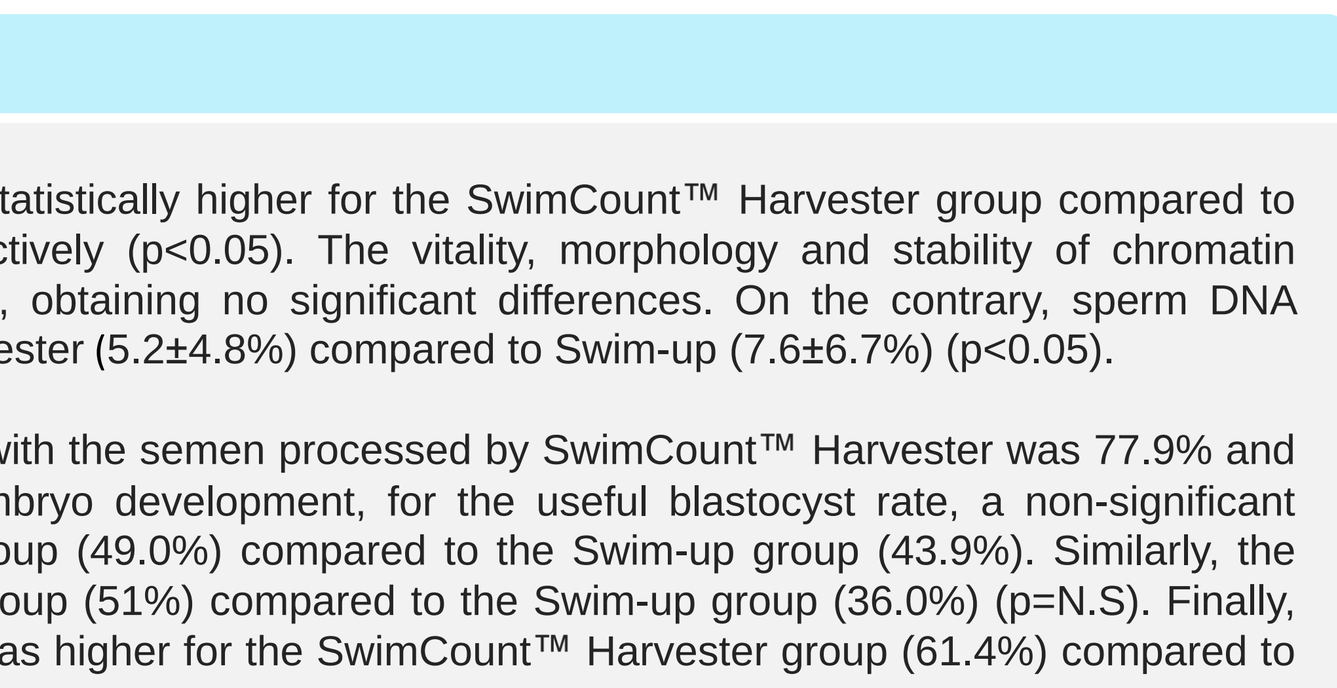


*FIGURE 2: Graph showing how embryo quality varies according to the sperm selection technique used. For the SwimCount™ Harvester group N = 126 blastocysts. For the Swim Up group N = 116 blastocysts.*

## CONCLUSION

The SwimCount™ Harvester is presented as a novel sperm selection methodology to be taken into account in the coming years. The observations provided in the interim analysis show trends of increase in the rates of useful blastocyst and euploidy as well as improvement of embryo quality, that will be confirmed or refuted at the end of the blinded study, being the continuity of the same. Preliminarily, the significant improvement in sperm quality stands out. Likewise, the number of steps necessary to perform the selection technique are reduced to the lowest level possible, decreasing the risk of human error, saving time and amount of cultivation media needed.

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