Effectiveness of “swim-up technique” to recover functionally intact spermatozoa from cryopreserved specimens for assisted reproduction

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Objectives: The freeze-thaw process extensively damages human spermatozoa by decreasing motility and the percentage of intact acrosomes, and by elevating reactive oxygen species levels. Removal of defective and dead sperm, debris, leukocytes and seminal plasma is essential to optimize the fertilizing potential of cryopreserved spermatozoa. We studied if the “swim-up technique” can select the most functional sperm population from cryopreserved specimens as effectively as it does from fresh ones.

Design: Percentage sperm recovery (%REC), motion characteristics and acrosome integrity were assessed after sperm selection by “swim-up” in fresh and cryo-thawed specimens.

Materials and Methods: IRB approval was obtained for this study. Semen specimens from 15 proven fertile donors were divided into two equal aliquots: the first aliquot was treated by “swim-up” (fresh) and the second one was cryopreserved using the liquid nitrogen vapor method, and then treated by “swim-up” after thawing (frozen). Percentage recovery of motile spermatozoa (%REC), percentage sperm motility and motion characteristics using a computer-assisted semen analyzer (CASA), and acrosome integrity assessed by fluorescein iso-thiocyanate conjugated peanut lectin in conjunction with a viability staining Hoescht-33258 were evaluated in fresh and frozen specimens. The Wilcoxon rank sum test was used to detect differences in %REC, sperm motion characteristics and acrosome scores.

Results: The %REC after swim-up in fresh and frozen specimens were 13.9 (25%-75% interquartile range: 9.7-29.4) and 22.0 (25%-75% interquartile range: 11.0-43.0), respectively (P = 0.51). Swim-up treatment selected a sperm population with better motion characteristics, percent motility and viability in fresh than in frozen specimens (P <0.01). The frequency of acrosome intact spermatozoa after swim-up treatment was higher in fresh than in frozen specimens (P <0.001).

Conclusions: 1) Swim-up provides similar yields of spermatozoa from cryopreserved specimens of normozoospermic individuals compared to fresh ones. This finding may help in the prediction of the number of spermatozoa to be recovered from cryopreserved specimens after swim-up, thus allowing a better decision regarding the type of ART to be used; 2) The overall sperm quality after swim-up preparation is lower in frozen than in fresh semen, and it seems to be related to the osmotic effects and sublethal damage during the freeze-thaw process rather than the inability of the washing technique to select functional spermatozoa.

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