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Magnet Activated Cell Sorting Method in Sperm Selection and Their Benefit in Human Assisted Reproduction

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Opinion

Center of Assisted Reproduction in University Hospital Brno is the oldest one in Czech Republic and is linked to academic institution, Masaryk University Brno. We have long time experiences with the therapy of human infertility. During last years we are focused on evaluation of novel techniques in assisted reproduction. Sperm selection for assisted reproductive techniques (ART) is very important step for successful *in vitro* fertilization [1-6].Classical ICSI (introcytoplasmatic sperm injection) method is not optimal for subjective sperm selection based on only morphology and motility of spermatozoa. For this reason there is currently a trend to combine multiple methods to segregate inappropriate sperm based on multiple parameters to increase the likelihood of successful fertilization. Is it usually classical separation method like swim-up or density gradient and a group of additional techniques like PICSI (ICSI with preselected sperm). One of these additional methods is MACS (magnet activated cell sorting). How many methods are best combined, and whether a new MACS selection method really brings a better prognosis in terms of conception success, or from the point of view of the subsequent development of the foetus, has already been studied several times.

MACS method is based on using of paramagnetic Annexin V-conjugated microbeads. It has been proposed as a safe method to select non-apoptotic and viable sperm. The meta-analyse reported that MACS has positive effect on IVF outcomes in better pregnancy rate and lower miscarriage rate[2], but in IVF donation cycles MACS method does not improve reproductive outcome[2]. More relevant for adequate evaluation of MACS method are studies focused on proportion of spermatozoa with fragmented DNA after MACS. From this point of view, it was reported that using of MACS method can bring very good results (strong reduction of proportion of spermatozoa with fragmented DNA) in a part of patients, but in another part of patients it does not have any evident impact on spermatozoa [3]. Itcan be caused by a different degree of apoptosis impact on spermatozoa DNA integrity or different proportion of circular cell or imotile spermatozoa in sample. All these aspects can make inefficient MACS selection.

During last year we realized several experiments focused on MACS efficiency and practical using of this method in IVF laboratory[1]. On the basic of our results we strongly recommend touse a basic separation technique (dense gradient or swim-up) before the MACS method. This approach is more effective, because it increases proportion of motile spermatozoa in sample and reduces circular cells and imotile spermatozoa. The MACS has limitations regarding sperm concentration and volume for loading due to the small size and volume of the column. Therefore loading of raw semen into the MACS column may reduce the filtering function of MACS and impede its ability to isolate motile non-apoptotic sperm cells, because dead/apoptotic sperm cell bind to the MACS column in competition with motile/non-apoptotic sperm cells. For limited total amount of spermatozoa obtained after MACS this method is not suitable for intra uterine insemination (IUI). Preparation of spermatozoa for IUI can cause reduction of total number of spermatozoa suitable for IUI which can be especially limiting for this procedure.

Conclusion

Using of MACS method can be very beneficial, but it does not always have a positive effect. Especially in men normozoospermics, this method can have almost the same results as a carefully done swim-up method. Regarding using of the MACS before IUI, there is

no logical justification for this approach. In any case, it is always necessary to perform a basic separation method for segregation of live and dead spermatozoa (such as the swim up or density gradient method) as the first step prior to using the MACS method.

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