PICSI

IVF - Picsi, Ha-Picsi, Physiological ICSI, Physiological Intracytoplasmic Sperm Injection

A sperm selection method prior ICSI based on hyaluronic acid binding.

About PICSI

Up to now, different methodologies to select sperm have been described in the hope of selecting a viable sperm without - or with a low level of - DNA damage. In 2005, it was the first group that reported the use of a hyaluronic acid (HA) assay as a method to select a sperm for use with ICSI (Pic.1). HA is a linear polysaccharide present in the extracellular matrix of cumulus oophorus around the oocyte that seems to play an important role in natural human fertilization. The use of this polysaccharide is based on the theory that hyaluronan is a major constituent of the cumulus oophorous matrix and may play a critical role in the selection of mature, functionally competent spermatozoa during in vivo fertilization. The head of a mature sperm holds a hyaluronan-specific ligand receptor that facilitates mature sperm to unite to hyaluronan. Comparatively, immature sperm do not unite. Competent, mature, biochemically active sperm unite to the hyaluronan where they can be selected by the embryologist and used for ICSI procedure.

The principles of this assay are:
1. expression of the protein HspA2, which indicates sperm maturation;
2. cytoplasmic membrane remodeling, which is responsible for the formation of sperm binding sites for the zona pellucida of oocytes and for HA binding sites.

It was suggested that immature spermatozoa present low HspA2 levels, fail to undergo cytoplasmic membrane remodeling and consequently are unable to bind to HA. This modus operandi mimics a focal step in the innate fertilization course of action, the binding of mature sperm to the oocyte complex. As a consequence, the opted spermatozoa are indispensable alike as one that would be successful and doing well in the natural reproductive progression. Nevertheless, this advancement does not imitate the genomic integrity of the spermatozoa and its aptitude to deliver the best paternal contribution to the zygote.

It was shown that binding to hyaluronic acid seems to be related to one or more conventional and one or more functional sperm tests, indicating that spermatozoa from patients with abnormal conventional semen parameters have a higher likelihood for multiple functional abnormalities. In addition, freezing and thawing seems not alter the HA-binding properties of the spermatozoa.

Some previous studies on sperm surface markers have demonstrated that HA-bound spermatozoa are mature and devoid of cytoplasmic retention, persistent histones, apoptotic markers and DNA fragmentation. In addition, a normal frequency of chromosomal aneuploides, normal and normal nucleus morphology criteria have been correlated positively with HA-bound spermatozoa. In contrast to this hypothesis, some researchers found no correlation between the HA-binding assay (PICSI) and a low degree of DNA damage. The HA-bound spermatozoa did not differ from HA-unbound ones as to DNA fragmentation (19.6% versus 21.4%, respectively). Also it was reported no difference in the sperm morphology between HA-bound and HA-unbound spermatozoa. Such controversy may be due to the different HA binding methods used, the PICSI dish, sperm slow medium and also the sperm morphology criteria: normal nucleus morphology and normal spermatozoa morphology. Other important point to emphasize is the possible influence of the sperm preparation on the outcome of HA binding. It is well defined in literature that semen sample preparations improve motility and morphology. Besides, the kind of semen preparation could impact the final sample quality.

Success or failure factors
Basically PICSI is a more filtered way of selecting the best competent sperm for fertilisation process. Despite the fact that conventionally sperm are selected for ICSI based on their morphology and motility quotient, PICSI consents to for this choice to be complete based on the sperm's capability to fertilise and perform the role job. Additionally the PICSI dishes are fairly easy to use. The technique of selecting sperm based on their facade and appearance is also flawed because chromosomal imperfections can still be found within healthy glance sperm. On the other hand, at present there are no specific drawbacks to PICSI be fully instituted. Except in TESA sample where sperms are immotile PICSI cannot be employed and patients with occasional spermia where sperm counts limits to ≤ 1 million/ml.

Complications

There is no possibility to use PICSI for selection of live but immotile sperm. Moreover, the findings suggest that HA-binding PICSI assay has very limited efficacy in selecting motile spermatozoa with normal morphology. It is possible that some spermatozoa can be mature and contain normal DNA but morphologically abnormal.

Prognosis

This selection method raises some questions. HA-bound is well characterized, however the HA-unbound sperm is a mixed population, as lack of binding may occur for several different reasons. In addition, it is not clear how sperm morphology is relevant in hyaluronic binding assay. It is possible that some spermatozoa can be mature and contain normal DNA but morphologically abnormal. In conclusion, the HA binding PICSI dish assay is not efficacious at improving the selection of motile spermatozoa with normal morphology at high magnification. However the same cannot be concluded for others HA assay methods.

Find more about related issues

Diagnoses

Hydrocele testis
An accumulation of clear fluid in the tunica vaginalis, the most internal of membranes containing a testicle. Learn more at: www.fertilitypedia.org/therapy/diag/hydrocele-testis

Risk factors

Hysterectomy
Surgical removal of the uterus. Learn more at: www.fertilitypedia.org/therapy/rd/hysterectomy

Gallery

PICSI dish
A is a graphical presentation of a PICSI dish. Each arrow is pointing to a dot containing hyaluronan. B and C are suggested arrangements for oocyte washing. PVP and ICSI drops (A, B and C are oocyte washing drops, P is PVP drop, a, b and c are hyaluronan.
Sources

“Efficacy of hyaluronic acid binding assay in selecting motile spermatozoa with normal morphology at high magnification [http://rbej.biomedcentral.com/articles/10.1186/1477-7827-8-149]” — by Petersen et al. licensed under CC BY 2.0


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