



PICSI: A Boon for Quality Sperm Selection?

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Fertilization is possible in cases in which the sperm motility and ability to penetrate the zona pellucid are impaired. PICSI has now a day's become method of choice to achieve fertilization. Hyaluronan (HA), a significant ingredient of the cumulus matrix plays a crucial role in the selection of functionally competent sperm for in vitro fertilization. Here HA-bound sperm carry increased levels of developmental maturity and sperm integrity.

The PICSI dish can be used for standard ICSI procedure and is a sterile plastic dish containing 3 microdots of Hyaluronic acid, where only mature DNA intact spermatozoa will bind for easy picking.

Keywords: Fertilization; Hyaluronan (HA); DNA**Introduction**

There are many reasons for male infertility like age, profession, geographical location associated pathologies, smoking, consumption of alcohol and drugs, body and environmental temperatures etc. These factors can give rise to conditions like asthenozoospermia (low sperm motility), oligozoospermia (low sperm concentration), teratozoospermia (abnormal sperm) and even DNA damage. we have developed several different methods for sperm separation to get an excellent yield of sperm. In case of male factor being the reason for infertility, the sperm obtained from these techniques are used for ICSI (Intra Cytoplasmic Sperm Injection). Although, sperm selected for injection is subjective, as embryologist chooses the sperm by observing different parameters and not naturally as it occurs in IVF (In- vitro Fertilization).

Sperm selection *in-vivo* is an efficient procedure as sperm is subjected to different barriers, the (i) cervix, (ii) uterus, (iii) uterine tubal junction (UTJ), (iv) oviduct, (v) cumulus oophorus and (vi)

zona pellucida. The selection of functional spermatozoa at these different sites is achieved by a variety of mechanical, biochemical and biophysical mechanisms (Figure 1) [4].

The DNA damage cannot be observed under microscope during ICSI and thus the chances of miscarriages and congenital defects are greater. Damaged DNA is incapable of fertilizing the oocyte and forming cleavage stage embryos. As a solution to eliminate damaged sperm, the method of PICSI (Physiological Sperm Injection) was arose.

PICSI contains a sterile, gamete-safe plate with 3 microdots of HA. It works on the principle of naturally selecting the sperm. The HA dots on the plate mimic the oocyte cumulus complex (OCC) as HA is the major component of oocyte.

It is known that only sperm who are successful in hyperactivation by stripping off the glycoproteins on the sperm head and exposing HA-binding sites, they also have completed the spermatogenic

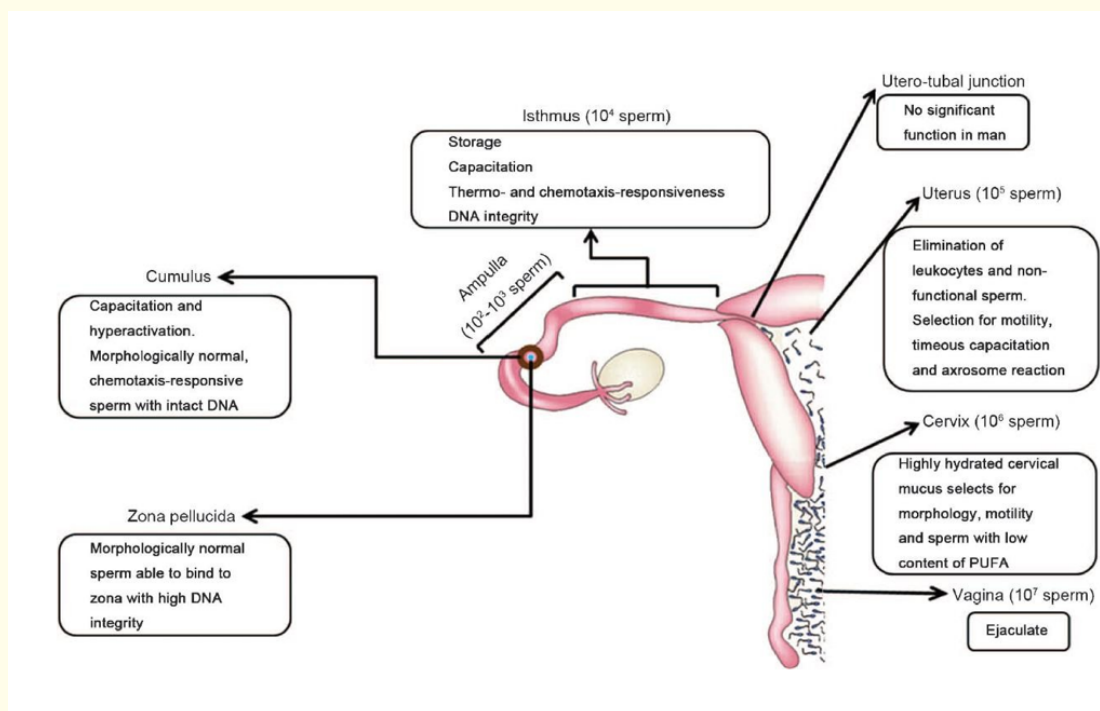


Figure 1: Natural selection sites for ejaculated sperm in female reproductive tract.

process of remodelling the plasmatic membrane, cytoplasmic extrusion and nuclear maturity. Thus, it can easily be assumed that the DNA of these sperm is completely intact with no damages and can result in a full-term gestation. While there is usually no difference in the total number of eggs that are fertilized, there is generally better embryo development, and ongoing pregnancy rates, compared with standard ICSI [2,6].

Material and Method

- It is a retrospective study which was conducted at Dr L.H Hiranandani Hospital and Genesis fertility Centre, Mumbai, Maharashtra, India.
- A total of 30 patients with a history of severe oligospermia and one previous failed ICSI cycle were enrolled in this study.
- Detailed information was given to the couple on this procedure and written and informed consent was taken from them.
- Control group consisted of 30 patients with oligoasthenozoospermia where normal ICSI was done.

Inclusion criteria

- At least one failed ICSI cycle in the past.
- Males with oligoasthenozoospermia with count between 1 million and 10 million/ml with low motility.
- Normal female partner with no other indication for IVF/ICSI.

Exclusion criteria

- Males with totally non motile sperms
- TESA sperms
- Very severe oligoasthenozoospermia with count less than 1 million/ml
- Associated female factor infertility

Males were informed to maintain abstinence of 2 to 3 days to expel overly aged and less motile sperm. Fresh semen sample was collected by masturbation in a wide-mouthed, sterile container after OPU. Semen was kept at 37°C and allowed to liquefy. Liquefaction occurred after 15-60 minutes of collection. If not, vigorous pipetting or trypsin is used. Manual semen analysis was performed on the homogenized semen sample. Volume for every semen sample was 1 to 2 ml.

Results

In the current study we have studied each and every couple and kept track until they got conceived. The objective was comparing results of PICSI with ICSI.

Male age groups for PICSI as well as control group (ICSI) were ≤ 38 years and that for females were ≤ 35 years with infertility history of 6 years or more. Out of all the OCCs aspirated, only 8 MII oocytes were injected with sperm selected by embryologist fir ICSI method and sperm attached to HA dot for PICSI method. Day 3 cleavage stage embryo transfer was performed for the couples. The minimum endometrial thickness on the day of Embryo Transfer measured between 7 to 11mm. 3 day 3, Grade I embryos were transferred.

	ICSI Group (30)	PICSI Group (30)
Male age	34.5 \pm 3.2 yrs	35.1 \pm 3 yrs
Female age	31.2 \pm 2.5 yrs	33 \pm 1.5 yrs
Duration of infertility	5.8 \pm 2.7 yrs	6.2 \pm 2.1 yrs
ET on the day of hCG	10.2 \pm 1.2 mm	9.6 \pm 1.4 mm
No. of oocytes retrieved	10 \pm 2	9 \pm 2
No. Of MII oocytes	8 \pm 1	8 \pm 1
No of embryos transferred	3	3

Table 1

The pregnancy was detected by β hCG blood test, 12 to 15 days post Embryo Transfer. The results do not show a huge difference in embryo development, but it can clearly be seen that clinical pregnancy rate of PICSI is much higher than that if ICSI. While it can also be observed that miscarriages occurred comparatively less with patients treated with PICSI technique.

Discussion

More randomized control multicentric trials with larger study population are required to assess the role of PICSI successful pregnancy outcomes. Oligozoospermic men requiring ICSI often carry seminal populations demonstrating increased levels of chromosomal aberrations and compromised DNA integrity. The current study suggests that the use of PICSI may allow isolation of sperms with potentially enhanced level of functional competence thereby exerting positive paternal influence on preimplantation embryogenesis. If the patients have come so far in their journey of having a baby, we must give them an option of best available technique of PICSI.

Parameters	ICSI Group (%)	PICSI Group (%)
Fertilization rate	56.2 \pm 3.8	68.5 \pm 4.1
No of top quality embryos	42.4 \pm 3.2	56.2 \pm 2.4
Fragmentation rate	18.2 \pm 1.8	9.5 \pm 1.5
Positive beta HCG	16.66% (5/30)	46.66% (14/30)
No. of abortions	3	2
Clinical pregnancy rates	6.66%	40%
Pregnancy loss rate	10%	6.66%

Table 2

Conclusion

To conclude, PICSI seems to offer a more physiological and appropriate approach in selection of the best mature and viable sperm. Also, this technique mimics the natural approach of selection of sperms. It gives higher fertilization rates, higher number of good quality embryos, higher pregnancy rates and lower miscarriage rates.

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