Intracytoplasmic Sperm Injection [1]

By: Zhu, Tian  Keywords: Reproductive assistance [2] Fertilization [3]

Intracytoplasmic Sperm Injection (ICSI) is an assisted reproductive technique (ART) initially developed by Dr. Gianpiero D. Palermo [5] in 1993 to treat male infertility [6]. It is most commonly used in conjunction with in vitro fertilization (IVF) or a less commonly used technique called zygote intrafallopian transfer (ZIFT). In natural fertilization [8], the sperm [10] must penetrate the surface of the female egg [11], or oocyte [12]. When the male has a fertility problem such as low sperm [10] count, malformed sperm [10] shape, or sperm [10] immobility, there is a significant decrease in the chance a healthy sperm [10] will penetrate the outer surface of the oocyte [12]. Other fertility problems ICSI can be used to overcome include the sperm [10] having trouble attaching to the egg [11] or the male having a blockage in his reproductive tract preventing normal ejaculation. In this procedure, the physician first obtains the sperm [10] and oocytes from the male and female and then manually injects the sperm [10] through a needle into the oocyte [12] to fertilize it in an injection plate. The physician then places the fertilized egg [13] into the female?s uterus [14] for implantation [15], following IVF or ZIFT procedures.

Physicians obtain sperm [10] by the same methods as with IVF: either through masturbation, by using a collection condom, or by surgically removing sperm [10] from a testicle through a small incision. The females are treated with fertility medications for approximately two weeks prior to oocyte [12] retrieval to stimulate superovulation [16], where the ovaries produce multiple oocytes rather than the normal one oocyte [12]. The oocytes are retrieved by either laparoscopy, or more commonly, transvaginal oocyte retrieval [17]. In the latter procedure, the physician inserts a thin needle through the cervix [18], guided by a sonogram and pierces the vaginal wall and then the ovaries to extract several mature ova.

Before the physician can inject the sperm [10] into the oocyte [12], the physician must prepare the sperm [10] by washing and exposing it to various chemicals to slow the sperm [10] movement and prevent it from sticking to the injection plate. Physicians treat the oocytes with hyaluronidase to single out the oocyte [12] ready for fertilization [8] by the presence of the first polar body. The physician then injects one prepared sperm [10] into an oocyte [12] with a thin needle. Often, physicians will fertilize several eggs so they can implant more than one into the uterus [14] and increase the chance of at least one successful pregnancy [19]. This also allows them to save extra embryos, using cryopreservation [20], in case later IVF rounds are needed. After the physician manually fertilizes the oocytes, they incubate for sixteen to eighteen hours and develop into a pronucleate egg [11] (a successfully fertilized egg [13] about to divide into an embryo). The egg [11] then grows for one to five days in the laboratory before the physician places it in the female?s uterus [14] for implantation [15].

Some problems may occur after injecting the oocyte [12] with a sperm [10]. The needle can possibly damage the oocyte [12] upon penetration; the oocyte [12] may stop dividing into an embryo at some point; or once the fertilized oocyte [12] has reached the embryo stage, the embryo may stop growing. Despite these possible problems, the chance of fertilization [8]
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Subject

Sperm Injections, Intracytoplasmic [26]
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[3] https://embryo.asu.edu/keywords/fertilization
[16] https://embryo.asu.edu/search?text=superovulation
[17] https://embryo.asu.edu/search?text=transvaginal%20oocyte%20retrieval
[18] https://embryo.asu.edu/search?text=cervix
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