

# Chapter 43

## Artificial Reproductive Techniques (ART)



### What are the indications of artificial reproductive techniques (ART)?

- Tubal factor
- Severe male factor
- Severe endometriosis
- Unexplained infertility
- Age >35 years
- No pregnancy after 1 year of conventional ovulation induction treatment

### What are the aims of the ART?

- Achievement of oocyte from ovary with an artificial method.

### What are the methods of the ART?

- In vitro fertilization: Oocytes achieved from ovary and these oocytes and sperm put same media. After fertilization, embryo transfer is achieved.
- Gamet intrafallopian transfer (GIFT): Oocyte and sperm are placed in the fallopian tube.
- Zygote intrafallopian transfer (ZIFT): Zygote is placed in the fallopian tube.
- Tubal embryo transfer.
- Peritoneal oocyte and sperm transfer.

### Which artificial reproductive techniques are used in male infertility?

- Techniques of sperm achievement
  - Injection of one sperm to oocyte—Intracytoplasmic sperm injection (ICSI)
  - Testicular sperm extraction (TESE)
  - Microsurgical epididymal sperm aspiration (MESA)
  - Sperm aspiration from testis

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**Which screening tests are made before ART?**

- Hormone profile
- HSG
- Sperm test
- Ultrasonography
- HIV1 and HIV2
- Hepatitis B and hepatitis C
- Chlamydia, syphilis, gonorrhea, CMV, and rubella

**What are the treatment alternatives of artificial reproductive techniques?**

- Spontaneous cycles (6% success)
- GnRH analogues
- GnRH antagonists
- Human menopausal gonadotropin (HMG)
- FSH
- Clomiphene citrate
- Metformin
- Aromatase inhibitors—letrozole, anastrozole

**How to determine treatment options of patients requiring ART?**

- Treatment is determined according to women age, and ovarian reserve.
- GnRH analogues + FSH are preferred in young women.
- Low-dose GnRH analogues + high-dose FSH ± combined oral contraceptives are preferred in advanced ages.
- GnRH analogues + FSH (or HMG) + letrozole preferred in patients with poor ovarian reserve.
- GnRH antagonist + low-dose FSH are used in PCOS.
- GnRH analogues + FSH (Luteal long protocols) are preferred in endometriosis.

**How would you follow up a patient when ART is applied?**

- Aim is controlled hyperstimulation.
- For each follicle (>14 mm), estradiol level of at least 200 pg/mL is preferred.
- Endometrial thickness in ultrasonography should be 7–12 mm; endometrial lining in ultrasonography should be triple line.
- Oocyte pick-up (OPU) is made 34–39 h after hCG injection.
- Embryo transfer is made 3–5 days later.
- Generally progesterone is given after embryo transfer.

**What is the basic technique of oocyte pick-up (OPU)?**

- Mild anesthesia and sedation is preferred.
- Optimal monitoring is made.
- Generally pick-up needle is inserted into an ovary once and oocytes are aspirated.

**Describe the process of oocyte culture.**

- Oocytes are examined under a microscope.
- Separated from the sheath (cumulus) around the oocyte after the egg collection.
- After 4–6 h, the sperm is injected into the egg or leave to fertilization.

- Sperm is separated by swim-up method (If IVF is done, 50,000–100,000 sperms are left per oocyte).

**Describe the fertilization process.**

- Matured oocytes are fertilized at 65–80%.
- Roughly 6% polyspermia-type 3 pronucleus cells are consisted.
- If fertilization problem is present or if sperm count is too low, ICSI should be referred.
- Surplus embryos are frozen.

**Describe the embryo transfer process:**

- Generally 8-cell embryos after 72–80 h are transferred.
- Or, if the quality embryo is high, embryo is transferred to the blastocyst stage after 5 days.
- Depending on the age of the woman, the number of embryos may increase. Normally good quality 1–2 embryos are given.
- Luteal phase support is needed.
- After the transfer, hCG is measured on day 10–11.
- Five weeks after last menstrual period, fetal heart activity is expected.

**What are the pregnancy associated results of ART?**

- Abortion rate 20%.
- It is stated that there may be minimal increase in congenital malformation because of increased multiple pregnancy.
- Ectopic pregnancy is seen 3%.
- Risk of multiple pregnancy 35%.
- After three unsuccessful cycles, success rate is significantly decreased.

**Describe male factor in fertility in artificial reproductive techniques.**

- Fertilization rate is low.
  - ICSI is recommended treatment.
  - All kinds of immature, immobile sperm can be used.
  - Morphological selection of sperm is recommended.

**Describe genetic problems in male factor infertility**

- Infertile men have chromosomal anomaly in 5–7%.
- There are high deletions in the Y chromosome in the presence of azoospermia.
- 7–10% Y deletion in oligospermia.
- 10% of sperms carry extra chromosomes.
- There is 0.84% sex chromosomal anomaly in ICSI pregnancies due to male infertility.
- Genetic screening should be made to azoospermic men.
- Klinefelter syndrome
  - LH  $\beta$  subunit mutation
- There may be congenital absence of vas deferens. It is seen 1–2% in infertile men.
- There may be cystic fibrosis mutation.

**Describe oocyte donation.**

- Forbidden in some countries. Oocyte donation is the process in which a fertile woman's several oocytes are aspirated, usually following ovarian stimulation, in order to be used in another patient (mostly infertile due to ovarian failure; Premature ovarian failure, Turner syndrome, Ovarian failure following chemotherapy or radiotherapy, IVF failure, genetic disorders).
- It may be used in patients with premature ovarian failure.
- Donor age 22–24 is preferred.
- Success rate is approximately 50%.

**In which patients, preimplantation genetic diagnosis (PGD) is preferred?**

- Cystic fibrosis
- Duchenne muscular dystrophy
- Sickle cell anemia
- Hemophilia
- Tay–Sachs disease
- Lesch–Nyhan syndrome
- Trisomy

**Suggested Reading**

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