Assisted Reproductive Technologies

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Guidelines for assessment of a case of infertility
To assess the fertility, the following elements are evaluated:
1. History and physical examination
2. Semen analysis
3. Sperm–cervical mucus interaction (postcoital testing)
4. Testing for ovulation
5. Testing for tubal patency
6. Investigations for detection of uterine condition e.g. abnormalities
7. Investigations for detection of peritoneal condition e.g. adhesions.

Basic concept for all techniques of assisted conception
The basic concept for all techniques depends on placing the egg and sperm in close proximity to facilitate fertilization. Assisted conception techniques have begun in the late 1970s, and helped millions of subfertile couples to achieve babies.

Types
The commonly used conception techniques are:
- Intrauterine insemination,
- In-vitro fertilization (IVF) (or fertilization in lab incubator),
- Intra-cytoplasmic sperm injection (ICSI).

N.B.: Abbreviations for techniques:
• IVF In-vitro fertilization
• DI Donor insemination
• GIFT Gamete intra-fallopian transfer
• ZIFT Zygote intra-fallopian transfer
• SUZI Sub-zonal insemination
• ICSI Intra-cytoplasmic sperm injection
• TESA Testicular sperm aspiration
• PESA Percutaneous sperm aspiration
• MESA Micro-epididymal sperm aspiration
**IVF method**

**Indications** include the followings:

1. Cases of **unexplained infertility** (when anatomy, function and ability of couples to perform fertilization appear to be normal and treatable causes of infertility are eliminated).
2. **Tubal disease**.
3. **Cervical** or **vaginal** causes such as evidence of hostility to sperms.
4. **Male** factors, such as low sperm count.

**Mechanism of IVF**

It includes the following steps:

1. **Consultation**
   This includes:
   - Taking complete history, & semen analysis for husband,
   - General examination,
   - Pelvic ultrasound assessment,
   - Treatment of any associated infection,
   - Baseline FSH level.
   **Consultation** aims to provide the most suitable technique.

2. **Medications** are given to enhance the egg ripening and to increase the chance of collecting multiple eggs during one of the woman's cycles.
   N.B.: Multiple eggs are required because some eggs do not develop or fertilize after retrieval.
   **Medication** includes the following:
   a. **Pituitary down-regulation**
      **Aim:** This regulation is essential to prevent a natural LH surge during follicular stimulation in order to prevent follicular rupture prior to egg retrieval.
      **Mechanism:** This done with either
      - GnRH analogues, given by daily injection, implant or nasal spray, prevents the natural LH surge and is continued throughout the treatment cycle.
- OR GnRH antagonists given during the mid- and late follicular phases of a superovulation cycle to lengthen the follicular phase so prevent the LH surge.

b. **Ovarian stimulation**
This is done by daily injections of gonadotrophins. The injections are continued for 11-14 days until the lead follicles are 18 mm in diameter shown by transvaginal ultrasound scan.

![Ultrasound showing stimulated ovary with multiple follicles](image)

- **c. Ovulation trigger with hCG**
The hCG is used instead of LH to trigger ovulation. The oocytes are retrieved 34-38 hours after the injection.

3. **Oocyte collection (follicular aspiration)**
The eggs are removed from the ovaries using a hollow needle, done under vaginal ultrasound guidance. Then, they are transferred to culture medium in an incubator. N.B.: It is an outpatient procedure, carried with the woman under intravenous sedation.

4. **Sperm preparation**
The sperm sample is taken by ejaculation. The sample is washed to remove seminal plasma, leukocytes and bacteria. Then it is processed for sperm maturation and capacitation. The motile sperm is selected for use in the insemination process.

5. **Fertilization:**
- **Fertilization in lab incubator** called: "**In-vitro fertilization (IVF)**": The sperms and egg are mixed in lab incubator. The incubators enable fertilization to occur.

- In other cases where there is a lower probability of fertilization, **intracytoplasmic sperm injection (ICSI)** may be used. Through this procedure, a single sperm is injected directly into the egg in an attempt to achieve fertilization. This procedure is indicated in case of husband with oligospermia in addition to wife with tubal occlusion.

On the 2nd day following egg retrieval, the eggs are examined microscopically to confirm occurrence of cell division. Once this occurs, the fertilized eggs are considered embryos.

### 6. Embryo transfer

The embryos are transferred into the uterus using a transcervical catheter on the second or third day of culture. Number of transferred embryos is usually two, however, the others are spared in cryopreservation (in liquid nitrogen) to be used if needed.

### 7. Follow up

- Urine pregnancy test or analysis of the serum B=–hCG, two weeks after embryo transfer is done to detect successful implantation and pregnancy.
- Complete rest physically and sexually is advised, if pregnancy occurs.
- Pregnancy support is provided by prescribing progesterone, orally or vaginally or parentally. Alternatively, low dose of hCG can be used to stimulate progesterone secretion.
**Assisted Techniques of conception**


**Intrauterine insemination**

It is used in case of mild male factor subfertility and in case of idiopathic infertility.

It is done through injection of purified sperm sample into the uterine cavity at the time of ovulation.

Incidence of success is about 10-15%.

Disadvantages include risk of multiple pregnancy that results from ovarian stimulation.
Gamete intrafallopian transfer (GIFT)

It is procedure in which the woman’s egg is mixed with sperm in special catheter outside the female body and immediately placing them into the fimbrial part of fallopian tube using laparoscopy.

**Advantage:** The fertilization process occurs inside the fallopian tube (the natural location) rather than in a laboratory. However, healthy tubes are necessary for GIFT.

**Disadvantage:** The procedure requires general anesthesia and laparoscopy. Egg retrieval may done by a laparoscopic technique or by the more usual ultrasound-assisted transvaginal method.

N.B.: This procedure is infrequently done nowadays, as the IVF has become more successful and straightforward.

**References**