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"Assisted Reproductive Technology (ART) is a solution for Infertility."

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Abstract: - Reproduction is a process through which the living beings produce their off springs. But in several people due to various causes infertility occurs. Infertility is often thought of as a female concern, but in fact in a third of cases it is because of male problems, such as a low sperm count. In order to solve the infertility problems in human beings the solution up to some extent through modern medical technology is "Assisted reproductive technology". In this article we shall discuss various medical techniques and advances introduced which CREATE Fertility, Gynecologists and Andrologists perform a variety of treatments which are regarded as ART (Assisted reproductive technology) which includes IUI, IVF, IVM, ICSI and Vitrification. The article also throws light on treatment and several drugs of infertility.

Key words: *Reproduction, Infertility, In vitro fertilization, Vitrification, PCOS.*

I. INTRODUCTION:

Reproduction is a process through which the living beings produce their off springs and thus save their species from extinction .In human beings sexual reproduction takes place through specialized cells sperm and ovum. During sexual intercourse the male ejaculates sperms in to the uterus of female. The sperm enter in to the fallopian tube and unites with ovum. Thus fertilization takes place. The zygote thus formed proliferates through mitosis into different stages of embryology and ultimately transforms into a miniature human baby after nine months of gestation period in human beings. But in several people due to various causes infertility occurs. Infertility is often thought of as a female concern, but in fact in a third of cases it is because of male problems, such as a low sperm count.

What causes infertility?

Infertility in women

Conditions affecting a woman's fertility can include:

- damage to the fallopian tubes
- ovulatory problems
- endometriosis
- conditions affecting the uterus
- a combination of factors
- No identifiable reason.

Other factors that may play a part include:

- age – female fertility declines sharply after the age of 35
- Polycystic Ovary Syndrome (PCOS)
- gynecological problems such as previous ectopic pregnancy or having had more than one miscarriage
- medical conditions such as diabetes, epilepsy, and thyroid and bowel diseases
- Lifestyle factors such as stress, being overweight or underweight, and smoking.

Infertility in men

Conditions that may result in infertility include:

- low sperm count or quality
- problems with the tubes carrying sperm
- problems getting an erection
- Problems ejaculating.

Other factors that may play a part in infertility include:

- having had inflamed testes (orchitis)
- a past bacterial infection that caused scarring and blocked tubes within the epididymis as it joins the vas
- having received medical treatment such as drug treatment, radiotherapy or surgery – for example to correct a hernia, undescended testes or twisted testicles
- genetic problems
- diabetes

Lifestyle factors such as being overweight or having a job that involves contact with chemicals or radiation. Male fertility is also thought to decline with age, although to what extent is unclear.The above said factors contribute to in fertility in human beings .In order to solve the infertility problems the solution up to some extent through modern medical technology is **"Assisted reproductive technology"**. Assisted Reproductive technology (ART) is the umbrella term given to describe a number of different treatments that can be performed to help achieve pregnancy. There is no single definition of Assisted Reproductive Technology; it is usually illustrated in contrast to sexual intercourse as the method of reproduction. Hence, it covers a wide range of different fertility treatments.There is a long history of Doctors trying to provide **ART** to help couples start a family. **John Hunter**, the famous Scottish surgeon, carried out the first documented artificial insemination in the 1770s. Since then, there have been many new techniques introduced and new advances have brought better chances of success.CREATE Fertility, which perform a variety of treatments which are regarded as ART, including IUI, IVF, IVM, ICSI and Vitrification. Here we go through an outline of each of these fertility treatments:
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1. IUI – Intra-Uterine Insemination

IUI is one of the simplest forms of Assisted Reproductive Technology. It involves collection of the sperm, preparing the sperm in the lab and then inserting the prepared sperm into the uterus (womb) of the woman close to the time of ovulation. Before this takes place tests of tubal patency will have to be performed. A cycle of IUI can be undertaken with or without fertility drugs for the woman, depending on what is medically recommended. The success rate is generally lower compared with other forms of ART, and so it is usually only suitable for select couples and those without fertility problems, such as single women and same-sex couples.
Intrauterine insemination (IUI) is the placing of sperm into a woman's uterus when she is ovulating. This procedure is used for couples with unexplained infertility, minimal male factor infertility, and women with cervical mucus problems. IUI is often done in conjunction with ovulation-stimulating drugs. IUI can be performed using the husband's sperm or donor sperm. Before IUI, the woman should be evaluated for any hormonal imbalance, infection or any structural problems.

Insemination is performed at the time of ovulation, usually within 24-36 hours after the LH surge is detected, or after the "trigger" injection of hCG is administered. Ovulation is predicted by a urine test kit or blood test and ultrasound.In the case of husband inseminination, the male partner produces a specimen, at home or at the clinic or doctor's office. The sperm is then prepared for IUI. Sperm from the male partner or third-party donor are "washed" or separated. Separation selects out motile sperm from the man's ejaculate and concentrates them into a small volume. Sperm washing cleanses the sperm of potentially toxic chemicals which may cause adverse reactions in the uterus. The doctor uses a soft catheter that is passed through a speculum directly into the woman's uterus to deposit the semen at the time of ovulation.IUI may be used in conjunction with ovulatory medications, such as clomophine citrate, gonadotropins, or urofollitropins. If injectable ovulation stimulating drugs are used in an IUI cycle, careful monitoring is essential. Monitoring includes periodic blood tests and ultrasounds beginning around day 6 of the woman's cycle. Results of these tests will indicate when eggs are mature, prompting the hCG shot.IUI is also used with specially prepared donor sperm. The sperm bank sends the doctor's office sperm that is already prepared for IUI. IUI is a relatively quick procedure and is performed in the doctor's office without any anesthesia. It should not be painful, although some women report mild discomfort.

2. In vitro fertilization (IVF)

In vitro fertilization (IVF) is the joining of a woman's egg and a man's sperm in a laboratory dish. In vitro means outside the body. Fertilization means the sperm has attached to and entered the egg.**Description:**Normally, an egg and sperm are fertilized inside a woman's body. If the fertilized egg attaches to the lining of the womb and continues to grow, a baby is born about 9 months later. This process is called natural or unassisted conception.IVF is a form of assisted reproductive technology (ART). This means special medical techniques are used to help a woman become pregnant. It is most often tried when other, less expensive fertility techniques have failed.
There are five basic steps to IVF:

Step 1: Stimulation, also called super ovulation

- Medicines, called fertility drugs, are given to the woman to boost egg production.
- Normally, a woman produces one egg per month. Fertility drugs tell the ovaries to produce several eggs.
- During this step, the woman will have regular transvaginal ultrasounds to examine the ovaries and blood tests to check hormone levels.

Step 2: Egg retrieval

A minor surgery, called follicular aspiration, is done to remove the eggs from the woman's body.

- The surgery is done as an outpatient procedure in the doctor's office most of the time. The woman will be given medicines so she does not feel pain during the procedure. Using ultrasound images as a guide, the health care provider inserts a thin needle through the vagina and into the ovary and sacs (follicles) containing the eggs. The needle is connected to a suction device, which pulls the eggs and fluid out of each follicle, one at a time.
- The procedure is repeated for the other ovary. There may be some cramping after the procedure, but it will go away within a day.
- In rare cases, a pelvic laparoscopy may be needed to remove the eggs. If a woman does not or cannot produce any eggs, donated eggs may be used.

Step 3: Insemination and Fertilization

- The man's sperm is placed together with the best quality eggs. The mixing of the sperm and egg is called insemination.
- Eggs and sperm are then stored in an environmentally controlled chamber. The sperm most often enters (fertilizes) an egg a few hours after insemination.
- If the doctor thinks the chance of fertilization is low, the sperm may be directly injected into the egg. This is called intracytoplasmic sperm injection (ICSI).
- Many fertility programs routinely do ICSI on some of the eggs, even if things appear normal.

Step 4: Embryo culture

- When the fertilized egg divides, it becomes an embryo. Laboratory staff will regularly check the embryo to make sure it is growing properly. Within about 5 days, a normal embryo has several cells that are actively dividing.
- Couples who have a high risk of passing a genetic (hereditary) disorder to a child may consider pre-implantation genetic diagnosis (PGD). The procedure is done about 3 to 4 days after fertilization. Laboratory scientists remove a single cell from each embryo and screen the material for specific genetic disorders.
- According to the American Society for Reproductive Medicine, PGD can help parents decide which embryos to implant. This decreases the chance of passing a disorder onto a child. The technique is controversial and not offered at all centers.

.Step 5: Embryo transfer

- Embryos are placed into the woman's womb 3 to 5 days after egg retrieval and fertilization.
- The procedure is done in the doctor's office while the woman is awake. The doctor inserts a thin tube (catheter) containing the embryos into the woman's vagina, through the cervix, and up into the womb. If an embryo sticks to (implants) in the lining of the womb and grows, pregnancy results.
- More than one embryo may be placed into the womb at the same time, which can lead to twins, triplets, or more. The exact number of embryos transferred is a complex issue that depends on many factors, especially the woman's age.
- Unused embryos may be frozen and implanted or donated at a later date.

Why the Procedure is Performed

IVF is done to help a woman become pregnant. It is used to treat many causes of infertility, including:

- Advanced age of the woman (advanced maternal age)
- Damaged or blocked Fallopian tubes (can be caused by pelvic inflammatory disease or prior reproductive surgery)
- Endometriosis
- Male factor infertility, including decreased sperm count and blockage
- Unexplained infertility.

3. IVM – In Vitro Maturation

IVM is one of the most exciting forms of ART. The inventor of IVF, Sir Robert Edwards, used to describe IVM as the future of ART. CREATE Fertility are one of the few clinics in Europe to perform this Assisted Reproduction Technology. IVM is the process by which we collect immature eggs from a woman's ovaries during a natural (unstimulated) cycle. We then mature these eggs in the laboratory and when they have reached sufficient maturity, we perform ICSI to achieve fertilization. Hence, without giving any fertility drugs, we are able to create multiple embryos. Our Scientific Director, Professor Chian, was the worldwide pioneer of IVM and he introduced IVM to our services.

How does IVM work?

The procedure for IVM is as follows:

Step 1. As in conventional IVF, eggs are collected, but at an earlier stage, when they are immature. This means that you do not need to take as many ovary-stimulating hormones before your eggs are collected.**Step 2.** The eggs are matured in a dish placed in an incubator in the laboratory for one to two days.**Step 3.** When the eggs are mature, they are fertilized with your partner's, or donor's sperm. Embryos are cultured then transferred to your womb, just as they would be with conventional IVF treatment.

4. Intracytoplasmic sperm injection

Intracytoplasmic sperm injection, or ICSI, is a form of in vitro fertilization in which fertilization occurs outside of the body. First, egg cells are harvested and transferred to a special media in a laboratory dish. Within a few hours, a single sperm is injected through a fine needle into the center of an egg cell to aid in the process of fertilization. If successful, the cell will divide and form the beginning stages of an embryo. If necessary, the DNA of a single cell from an embryo may be checked to ensure that various genetic disorders are not present. Typically, several egg cells are harvested and fertilized at the same time then inserted back into the uterus to increase the chances that one will implant and develop into a successful pregnancy.

5. Vitrification – 'The Fast-freezing Method'

Vitrification is the method we use at CREATE to freeze eggs, sperm and embryos,. Previously, the freezing of gametes and embryos was a risky process with an uncertain thawing success rate. However, after the invention of Vitrification, all of that has changed and our thawing success rate at CREATE for embryos are over 95%. Essentially, in this ART, the cells are frozen much more quickly than they were in the old methods, and thereby avoid the creation of damaging ice-crystals. Our Scientific Director, Professor Chian, is one of the pioneers of Vitrification and introduced it to our services.

6. Treatments and drugs

How your infertility is treated depends on the cause, your age, how long you've been infertile and personal preferences. Because infertility is a complex disorder, treatment involves significant financial, physical, psychological and time commitments. Although some women need just one or two therapies to restore fertility, it's possible that several different types of treatment may be needed before you're able to conceive. Treatments can either attempt to restore fertility by means of medication or surgery or assist in reproduction with sophisticated techniques.

Fertility restoration: Stimulating ovulation with fertility drugs

Fertility drugs, which regulate or induce ovulation, are the main treatment for women who are infertile due to ovulation disorders. In general, they work like the natural hormones, follicle-stimulating hormone (FSH) and luteinizing hormone (LH) to trigger ovulation. They are also used in women who ovulate to try to stimulate a better egg or an extra egg or eggs. Fertility drugs may include:

- **Clomiphene citrate.** Clomiphene citrate (Clomid, Serophene)is taken by mouth and stimulates ovulation by causing the pituitary gland to release more FSH and LH, which stimulate the growth of an ovarian follicle containing an egg.
- **Gonadotropins.** Instead of stimulating the pituitary gland to release more hormones, these injected treatments stimulate the ovary directly. Gonadotropin medications include human menopausal gonadotropin or hMG (Repronex, Menopur) and FSH (Gonal-F, Follistim AQ, Bravelle). All act to stimulate production of multiple eggs. Another gonadotropin, human chorionic gonadotropin (Ovidrel, Pregnyl), is used to mature the eggs and trigger their release at the time of ovulation.
- **Metformin.** Metformin (Glucophage, others) is used when insulin resistance is a known or suspected cause of infertility, usually in women with a diagnosis of PCOS. Metformin helps improve insulin resistance, which can make ovulation more likely to occur.

- **Letrozole.** Letrozole (Femara) belongs to a class of drugs known as aromatase inhibitors and works in a similar fashion to clomiphene. Letrozole may induce ovulation. However, the effect this medication has on early pregnancy isn't yet known, so it isn't used for ovulation induction as frequently as others.
- **Bromocriptine.** Bromocriptine (Parlodel, Cycloset) may be used when ovulation problems are caused by excess production of prolactin (hyperprolactinemia) by the pituitary gland.

II. CONCLUSION:

The life is confined to planet earth exclusively. So for our knowledge goes no other planet in milky galaxy is possessing life. All the organisms in the world are possessing definite chromosome number in order to identify their species. There are lakhs of organism species existing in this world. Human beings are the most superior among them. For the survival and keeping their identity they have to produce their progeny through reproduction. But several deformities are existing in the morphology and physiology of human reproductive system .In order to correct those deformities assisted reproductive technology came in to picture and it is a boon to human beings to become parents for those who are childless. Thus the medical procedures like **Intra uterine insemination**, **In vitro fertilization, In vitro maturation**; **Intra cytoplasmic sperm injection** and **vitrification** (A fast freezing method) are very much helpful in conceiving children in human beings.

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