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In vitro fertilization (IVF) is a type of assistive reproductive technology (ART). It involves retrieving eggs from a woman's ovaries and fertilizing them with sperm in a laboratory dish. This fertilized egg which is known as embryo, is then implanted in a woman's uterus or frozen for storage. IVF is used only when other treatment for pregnancy has not worked.

Normally, a sperm penetrates an egg and fertilizes it inside woman's body after ovulation of a mature egg. The embryo then attaches itself to the wall of the uterus, and begins developing into a baby. This process is known as natural conception. However, if natural conception is not possible, fertility treatment is opted.

On 25th July 1978, the first "test-tube baby," named **Louise Brown**, was born. **Robert Edwards** and **Patrick Steptoe** are considered to be the pioneers of IVF. **Robert Edwards** received the 2010 Nobel Prize in Physiology or Medicine "for the development of in-vitro fertilization."

Depending on the situation, IVF can use:

- Female's eggs and her partner's sperm
- Female's eggs and donor sperm
- donor eggs and the Female's partner's sperm
- donor eggs and donor sperm
- donated embryos
- Embryos can also be implanted in a surrogate, or gestational carrier.

Success rate

The success rate of IVF varies. According to the American Pregnancy Association, live birth rate for women under age 35 undergoing IVF is 41 to 43 percent. This rate falls to 13 to 18 percent for women over the age of 40.

Infertility issues for which IVF

It may involve:

- reduced fertility in women over the age of 40
- blocked or damaged fallopian tubes

- reduced ovarian function
- endometriosis
- uterine fibroids
- male infertility, such as low sperm count or abnormalities in sperm shape
- unexplained infertility

Ovarian reserve testing

First women undergo ovarian reserve testing. In this process, a blood sample is taken and tested for the level of follicle stimulating hormone for collecting information about the size and quality of the eggs.

Examination of uterus

This may be carried through an ultrasound. These tests can reveal the health of the uterus and help in determining the best way to implant the embryos. From the male a semen sample is collected, analyzed for the number, size, and shape of the sperm. If the sperms are weak or damaged, a procedure called **intracytoplasmic sperm injection (ICSI)** may be necessary.

Procedure of IVF:

There are 6 steps involved in IVF:

1. Suppressing the natural menstrual cycle:

The woman receives a drug, usually in the form of a daily injection for about 2 weeks, to suppress their natural menstrual cycle.

2. Super ovulation

Fertility drugs containing the fertility hormone follicle-stimulating hormone (FSH) are given to the woman. FSH makes the ovaries produce more eggs than usual.

3. Egg Retrieval

Egg retrieval is known as **follicular aspiration**. The eggs are collected through a minor surgical procedure known as "follicular aspiration." A very thin needle is inserted through the vagina and into an ovary. The needle is connected to a suction device. This sucks the eggs out. This process is repeated for each ovary.

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4. Insemination and fertilization

The collected eggs are placed together with male sperm and kept in an environmentally controlled chamber. After a few hours, the sperm should enter the egg. Sometimes the sperm is directly injected into the egg. This is known as an intracytoplasmic sperm injection (ICSI). The fertilized egg divides and becomes an embryo. One or two of the best embryos are selected for transfer. The woman is then given progesterone or human chorionic gonadotropin (hCG) to help the lining of the womb receive the embryo.

Insemination

A semen sample is collected. A technician mixes the sperm with the eggs in a petri dish. If that does not produce embryos, then ICSI is used. During ICSI, a technician injects sperm directly into the egg.

Embryo Culture

The embryo is monitored to ensure that they are dividing and developing. The embryos may undergo testing for genetic conditions at this time.

Embryo Transfer

When the embryos are big enough, they can be implanted. This normally occurs three to five days after fertilization. Implantation involves inserting a thin tube called a **catheter** inserted into the vagina, past the cervix, and into the uterus. Then the embryo is released into the uterus. Normally, more than one embryos are transferred if no ideal embryos are available. Pregnancy occurs when the embryo implants itself in the uterine wall. This can take 6 to 10 days.

Complications of in Vitro Fertilization

Followings are the risks associated with IVF.

- multiple pregnancies - increases the risk of low birth weight and premature birth
- miscarriage (pregnancy loss)
- ectopic pregnancy (implantation of eggs outside the uterus)

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- ovarian hyperstimulation syndrome (OHSS), a rare condition involving an excess of fluid in the abdomen and chest
- bleeding, infection, or damage to the bowels or bladder (rare)

Side effects of medication

The possible side effects of IVF drugs are:

- nausea and vomiting
- difficulty breathing
- irritability
- hot flashes
- enlargement of the ovaries
- difficulty sleeping
- abdominal pain
- Bruising can also result from repeated daily injections.

Health risks to the mother

Rarely, the drugs can cause ovarian hyperstimulation syndrome (OHSS). This happens when the ovaries over-respond to the gonadotropins to develop many eggs. Severe abdominal swelling and shortness of breath can result.

Pregnancy loss

The leading cause of pregnancy loss, whether in IVF or in natural conception, is an abnormal number of chromosomes, known as chromosomal aneuploidy.