

PROFILES IBSE Learning Materials

Teacher Notes



Suggestions

For those suggested lessons that constitute the whole Module, it is assumed that students have already known the bases of the human reproductive system. The presented lessons strengthen the knowledge and make the connection between those concepts and their application, in order to find the best solution for the sterile couples wishing to conceive a child. They illustrate the importance of browsing successive stages of the causes of male / female infertility, in order to provide a reasoned solution to a young couple who have infertility problems, but wants to conceive a child.

The Module covers topics such as: conception, fetal development, male and female infertility, in-vitro fertilization and comprehensive investigation of the problem, allowing students to give the couple the best answer.

Theoretical background

Anatomy and physiology of the human reproductive system

Male and female reproductive systems follow the same plan of organization, consisting of sex glands (gonads), genital ducts, external genital organs and annex glands.

The male reproductive system has the following structure:

- Two testicles located in the scrotum produce sperm and male sex hormones (testosterone) involved in the development of genital organs and the appearance of secondary sex characteristics (deepening of the voice, hair appearance, muscle growth);
- Genital ducts accumulate and lead sperm: - seminiferous tubes located in the testicles where spermatozoon are formed (male reproductive cells); - epididymis channel, vas deferens, ejaculatory canal, urethra (genital and urinary system);

- Penis;
- Annex glands: seminal vesicles (semen production) and prostate (its product participates in the formation of sperm).

The female reproductive system has the following structure:

- 2 ovaries which produce:
 - o every month a mature egg that will be expelled by ovulation;
 - o female hormones:
 - a. Estrogen: stimulates female genitals and the appearance of secondary sexual characteristics (development of mammary glands, characteristic arrangement of fat, female behavior);
 - b. Progesterone: prepare the uterine lining for the zygote attachment (implantation).
- 2 fallopian tubes - here fecundation may occur;
- uterus - lined with a mucous membrane that undergoes changes monthly in the embryo and fetus develops it.
- vagina;
- mammary glands - produce milk, the best food for the newborn.

Ovarian cycle lasts on average 28 days, so it is also called menstrual cycle. It has 2 periods:

- Pre-ovulatory period, which lasts from day 1 to day 14 of the cycle;
- Postovulatory period that lasts from day 15 until the first day of menstruation.

Female fertility – represents the fertile period of each ovarian cycle. The egg remains viable and able to be fertilized no more than 24 hours after ovulation. On the other hand, some spermatozoon may remain viable in the female genital tract up to 72 hours, although most of them do not last more than 24 hours.

Embryonic conception and development

Conception represents the union of the female reproductive cell (ovum) with male the reproductive cell (sperm). Conception can be about 14 days before menstrual period, immediately after ovulation.

Spermatozoa are attracted through chemo-taxis (vaginal environment is acidic, cervical mucus is alkaline), they enter the cervical canal prepared under hormonal influence from the ovulation time. Fecundation itself takes place in the fallopian tube. Following it results the zygote which makes the journey to the site of implantation (womb) and simultaneously divides, gaining aspect of the embryo.

Human pregnancy lasts about 280 days and is divided into three trimesters.

In the first trimester the offspring is growing rapidly, all organs are forming now. Since the third pregnancy month, the embryo becomes a fetus. He lives and breathes through the placenta. In the second trimester, further development, fetal movements can be felt. At the end of this trimester fetus has a length of 35 centimeters and 900 g. In the third trimester there are finalized all functions of the future child (it reaches about 3 kg and 51 cm).

To have a healthy child, parents should follow certain rules. Thus, before pregnancy, both parents must have a healthy lifestyle: avoid alcohol, tobacco, eat as healthy, do regular exercise, treat any health problems and give up as much as possible to stress. These rules will be followed by the mother throughout pregnancy, and they are added to regular health checks.

Infertility

Infertility is defined as the inability of a couple to conceive a child after a year of unprotected sex.

Causes of female infertility:

- Hormonal disturbances or deficiencies (progesterone);
- Tubal or uterus problems;
- Lack or occasional ovulation;
- Overweight and underweight, diet, inadequate nutrition, supported exercise (athletics);
- STDs;
- Age;
- Chronic diseases;
- Emotional stress.

Causes of male infertility:

- Malfunction of the endocrine system;
- Age;
- Sperm problems: lack of sperm, fewer spermatozoon, sperm abnormalities;
- Underdeveloped testicles;
- Problems of genital ducts;
- Mumps during post-puberty;
- Untreated / inadequately treated infections;
- STDs;
- Some medications;
- Unhealthy lifestyle;
- Chronic diseases;
- Stress.

In-vitro fertilization

In-vitro fertilization (*IVF*) is a component of the Medical Assisted Human Reproduction program and represents a process through which the spermatozoon fertilizes the ovum in a laboratory. There the embryo is formed, which is transferred to the womb, usually at 72 hours after conception. The fertilization does not interfere with the child's genetic complex, so between the "normal" fetus and the in vitro developed fetus there are no differences throughout their development. When all other designed methods cannot be applied, IVF is the ultimate solution for a sterile couple.

Therapy stages

A diagnose and an indication of IVF are made first. Usually a detailed discussion takes place, in which procedures, risks and chances of success of the proposed treatment are specified to the couple. Initially premises for the treatment are controlled and, if necessary, additional investigations are conducted.

The therapy includes a hormone inhibition step and an ovarian stimulation phase. The hormonal ovarian inhibition starts after an ultrasound is taken and the problem of a semen infection is taken care of. This phase lasts two weeks and is designed to prevent any early ovulations. Then, it come a stage of ovarian stimulation.

Ovarian hormonal stimulation therapy includes injections in the first week of stimulation, which are performed daily. Then, it follows a so-called monitoring cycle with ultrasound and hormonal controls done at certain intervals. The hormones dose is distinguished further considering these results. These checks are performed until hormone values (in blood) and an optimum number and follicles' size are obtained. When optimal conditions are achieved, a new hormone is administrated in preparation for the oocytes harvest. This hormone is called HCG and causes the follicles' rupture and oocytes' release.

After 36 hours of taking HCG, the oocyte harvesting is done, a procedure which is called follicular puncture. This technique is performed through the vagina under ultrasound and anesthesia. Harvesting oocytes takes 10-20 minutes. Then, the oocytes are highlighted with the microscope and placed in a special culture medium. On the day of follicular puncture the husband must obtain a sperm sample. After special training, the spermatozoa are placed in direct contact with the oocytes.

After approximately 18 hours the oocytes' fertilization is controlled. The fertilized oocyte has two pro-cores representing the genetic material coming from the eggs and sperm. This is the first stage in embryonic development.

Over 48-72 hours from the follicular puncture, the resulting embryos are placed in the uterus through a technique called embryo-transfer. This procedure does not require anesthesia because it is an extremely gentle maneuver.

After embryo-transfer treatment is needed in order to support the embryo development. At 2 weeks after the embryo-transfer, a blood pregnancy test is done.

References

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