Physiology of the Pregnancy
Physiology of the Fetus

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Pregnancy

Pregnancy

Pregnancy or **gestation**, is the time during which one or more offspring develops inside a woman. A multiple pregnancy involves more than one offspring, such as with twins. Pregnancy can occur by sexual intercourse or assisted reproductive technology. It usually lasts around 40 weeks from the last menstrual period (LMP) and ends in childbirth. This is just over 9 lunar months, where each month is about 29½ days. When measured from conception it is about 38 weeks. An embryo is the developing offspring during the first 8 weeks following conception, after which, the term fetus is used until birth

Pregnancy

Pregnancy is typically divided into three trimesters. The first trimester is from week one through twelve and includes conception. Conception is followed by the fertilized egg traveling down the fallopian tube and attaching to the inside of the uterus, where it begins to form the fetus and placenta. The second trimester is from week 13 through 28. Around the middle of the second trimester, movement of the fetus may be felt. At 28 weeks, more than 90% of babies can survive outside of the uterus if provided high-quality medical care. The third trimester is from 29 weeks through 40 weeks

Fetus 8 weeks

Fetus 20 weeks

Fetus 31 weeks

Stages of Fetal development

Stage of the Fetal Development

Fertilization

Fertilization is the union of an ovum and a spermatozoon. This usually occurs in the outer third of a fallopian tube, the ampullar portion.

Usually only one ovum reaches maturity each month. Once it is released , fertilization must occur fairly quickly, because an ovum is capable of fertilization for only 24 hours (48 hours at the most). After that time, it s atrophies and becomes nonfunctional.

Fertilization

Because functional life of a spermatozooan is about 48 hours (max 72 hours), the total critical time span during which sexual relations must occur for fertilization to be successful is about 72 hours (48 hours before ovulation plus 24 hours after)

Fertilization

As the ovum is extruded from the Graafian follicle of an ovary with ovulation, it is surrounded by a ring of mucopolisaccharide fluid (the zona pellucida) and a circle of cells (the corona radiata). The ovum is propelled into a nearby fallopian tube

Fertilization

Normally, an ejaculation of semen averages 2.5 ml of fluid containing 50 to 200 million spermatozoa per ml or an average of 4 million sperm per ejaculation. Spermatozoa deposited in the vagina during intercourse generally reach the cervix in 80 seconds and the outer end of fallopian tube with 5 minutes

Fertilization

All the spermatozoa that achieve capacitation rich the ovum and cluster around the protective layer of corona cells. Hyaluronidase (a proteolytic enzyme) is apparently relisted by the spermatozoa and acts to dissolve the layer of cells protecting the ovum

Fertilization

Under ordinary circumstances only 1 spermatozoa is able to penetrate the cell membrane of the ovum. Once it s penetrate the cell, the cell membrane change composition to became impervious to other spermatouza

Fertilization

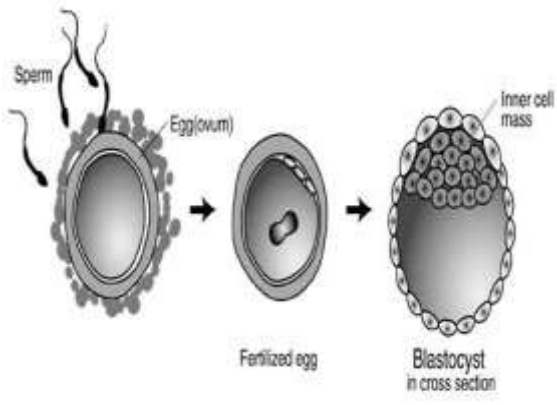
Immediately after penetration of the ovum the chromosomal material of the ovum and the spermatozoon fuse the resulting structure is called ZYGOTE. Because the spermatozoon and ovum each carried 23 chromosome (22 autosomes and 1 sex chromosome) the fertilized ovum has 46 chromosomes. If an X- carrying spermatozoon entered the ovum the resulting child will have two X chromosomes and will be female (XX). If Y carrying – the resulting will have YX chromosomes - male (YX)

Implantation

Once fertilization is complete the zygote migrates over the next tree to four days toward the body of uterus. The first cleavage occurs at about 24 hours cleavage divisions continue to occur at the rate of one every 22 hours . By the time the zygote reaches the body of uterus it consist of 16 – 50 cells. At this stage because of it s bumpy outward appearance, it s termed a MORULA

Implantation

Large cells tent to collect at the periphery of the ball, living a fluid space surrounding an inner cell mass. At the this stage, the structure is termed a BLASTOCYST. The cells in the outer ring are known trophoblast cells. They are the part of the structure that will late formed the placenta and membranes. The inner cell mass (embryoblast cells) is the portion of the structure that ll form the embryo

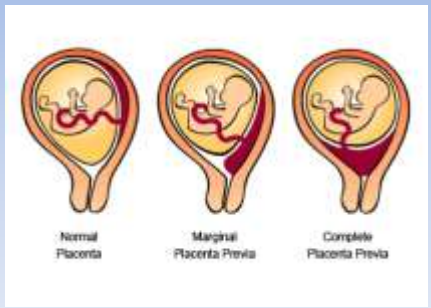


Implantation

The blastocyst is able to invade the endometrium because as the trophoblast cells on the outside of the structure touch the endometrium. They produce the proteolytic enzymes that dissolve the tissue they touch. If the point of implantation is low into in uterus, the growing placenta may occlude the cervix and make birth of the child difficult (placenta previa)

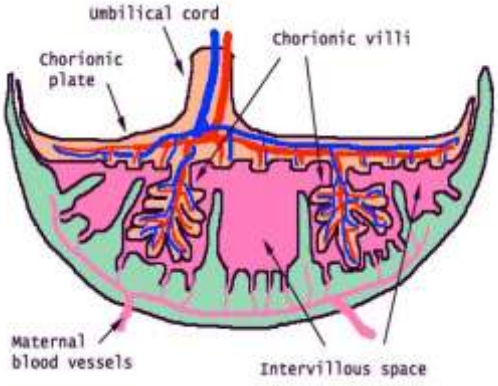
Once implanted the zygote, is an EMBRYO

Implantation



Chorionic Villi

Once implantation is achieved, the trophoblastic layer of cells of the blastocyst begins to mature rapidly. As early as the 11 th or 12 th day, miniature villi, or probing "fingers", termed chorionic villi, reach out from the single layer of cells into the uterine endometrium



The Placenta

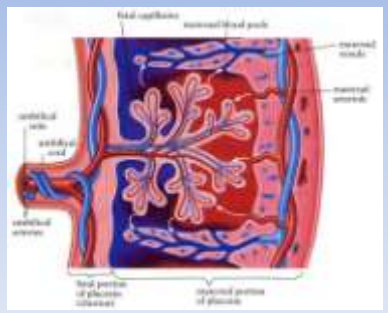
The Placenta

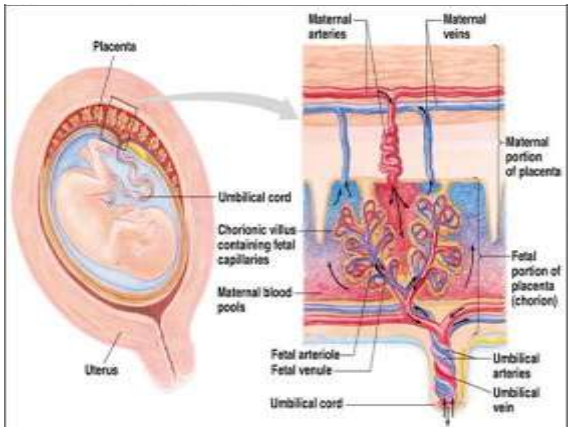
The Placenta arises out of trophoblast tissue. It serves as the fetal lungs, kidneys and gastrointestinal tract and a separate endocrine organ throughout pregnancy. Its grows parallels that of the fetus

The Placenta

As early as the 12 th day of pregnancy , maternal blood begins to collect in the intervillous space of the uterine endometrium surrounding the chorionic villi. By the 3rd week, oxygen and other nutrients and water diffuse from the maternal blood trough the cell layer of the chorionic villi to the villi capillaries

The circulation of placenta





The placenta

Placental osmosis is so effective that all but a few substance are able to cross from the mother into the fetus. Because almost all drugs are able to cross into the fetal circulation, it is important that a woman take no nonessential drugs during the pregnancy

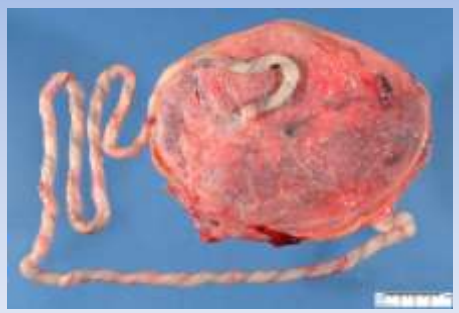
The placenta

About 100 maternal uterine arteries supply the mature placenta. To provide enough blood for exchange, the rate of uteroplacental blood flow in pregnancy increases from about 50 ml\min at 10 s week to 500-600 ml\min at term

The placenta

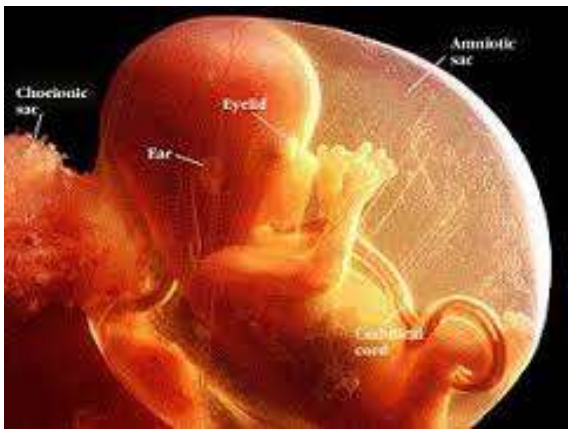
Uterine perfution and thus placental circulation is most efficient when the mother lies on her left side. This position lifts the uterus away from the inferior vena cava. If the mother lies on her back and the weight of the uterus compresses the vena cava , placental circulation can be so sharply reduced that supine hypotention occurs

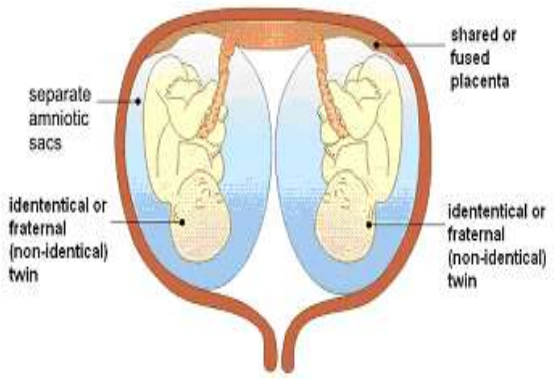
The Umbilical Cord

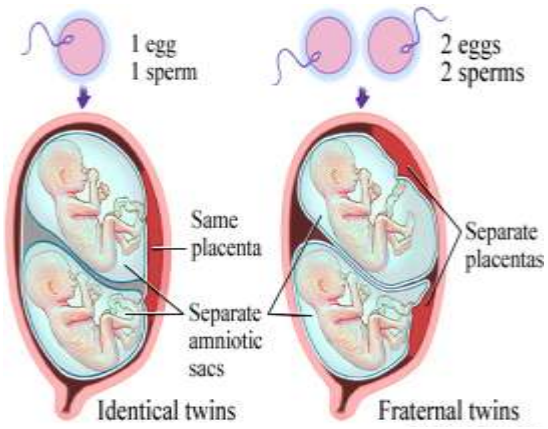


The Umbilical Cord

The Umbilical Cord is formed from the fetal membranes and provides a circulatory pathway that connects the embryo to the chorionic villi of the placenta. It s about 53 cm in length at term and about 2 cm thick. The bulk of the cord is a gelatinous mucopolysaccharide called Wharton s jelly, which gives the cord body and prevents pressure on the vein and arteries that pass through it







The Amniotic Fluid

Amnionic fluid is being newly formed by the amniotic membrane, so it never becomes stagnant. Some of it absorbed by direct contact with the fetal surface of the placenta. The amount of amniotic fluid has grown greatly and ranges from 800 to 1200 ml. If for any reason the fetus is unable to swallow , excessive amniotic fluid or hydramnios (more than 2.000 ml)

The Amniotic Fluid

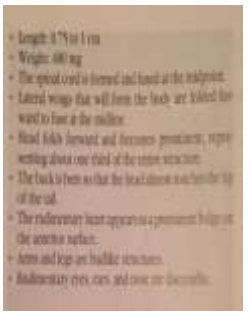
Hydramnios also can take a place in a woman with diabetes, because hyperglycemia causeve excessive fluid shift into the amniotic space. When the kidney became active fetal urine adds to the quantity of the amniotic fluid. A disturbance of kidney can occur oligohydramnios (fluid is less than 300 ml)

Fetus

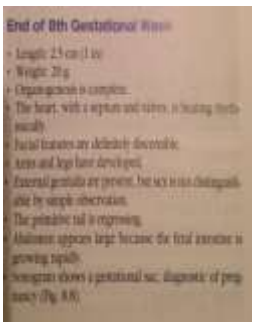
Fetus

The pregnancy as ussually measured in lunar months (4 weeks) or in trimesters (3 month period). A pregnancy is normal 10 lunar month (40 weeks – 280 days), a fetus grows in utero 9.5 month or tree full trimesters (38 weeks – 266 days)

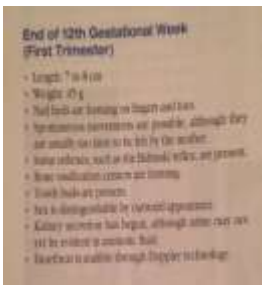
4 Weeks Fetus



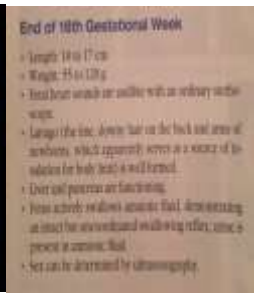
8 Weeks Fetus



12 Weeks Fetus

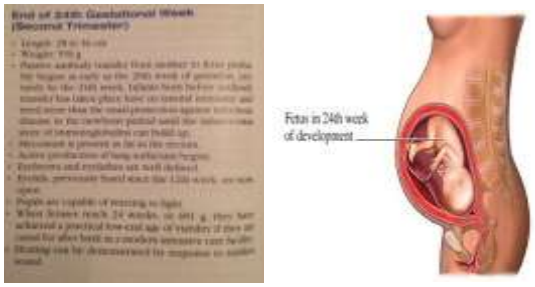


16 Weeks Fetus

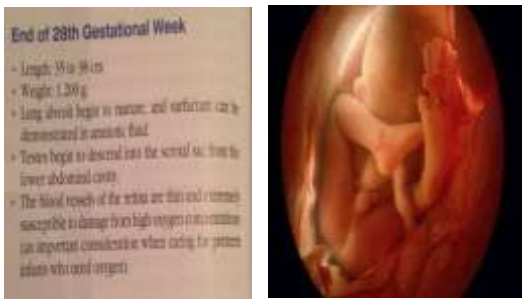


20 Weeks Fetus

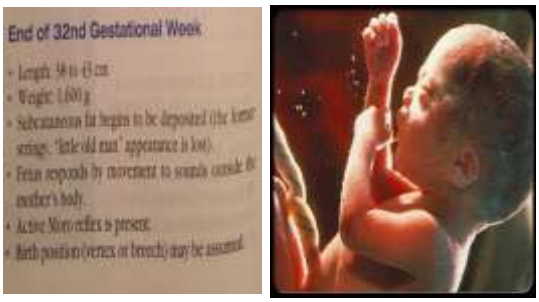
24 Week Fetus



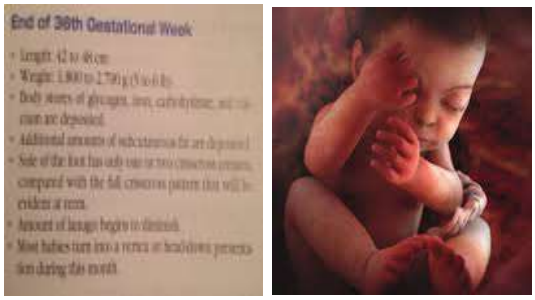
28 Weeks Fetus



32 Week Fetus



36 Weeks Fetus



40 Weeks Fetus

Thank you for your attention