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CASE STUDY

Fetus in feto: a case study with explanation

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A 13-year-old boy was operated (exploratory laparotomy) for unexplained pain in the abdomen, and a live fetus was found attached to the left kidney. It was explained to be a case of identical twins. In twins, the placental capillaries anastomose very intricately so that one fetus may draw more blood resulting in deprivation of blood supply to the other fetus who may end up with no supply later. It did not kill the deprived fetus, but made it remain arrested in the erstwhile embryonic stage. While remaining in extraperitoneal space, the deprived fetus is joined by herniated intestines of the healthy fetus in the physiological hernia. Later, when the intestines return to the abdominal cavity (by creating extra space in the abdomen) of the healthy fetus, the stunted fetus accompanies the intestines and manages to reach the abdominal cavity of the healthy baby.

Keywords: fetus in feto, identical twins, gametogenesis, zona pellucida, monochorionic monoamniotic twins, twin to twin transfusion syndrome, physiological hernia

Introduction

It a case history of a 13-year-old boy suffering from intermittent pain in the abdomen who came to a surgeon in Kalna Hospital, Burdwan district, West Bengal, India. After much investigation, the surgeon was unsure about the cause of the pain and decided to do exploratory laparotomy to find out the source of the abdomen pain. To his amazement, he discovered a live fetus attached to the left kidney of the boy and that was moving intermittently. The surgeon severed the fetus and made an announcement that a fetus was found within a male child. The people of that area flocked to see the patient and the fetus. It is a biological wonder not only to the general public but also to the reporters who reached by observing public response and started to investigate. Burdwan Medical College is nearby, and a reporter of a popular daily reached out to me to try to find out the explanation for this wonderful developmental anomaly.

I said, it is a case of identical twins. The fetus found within the boy was nothing but his own brother unfortunately arrested in that development stage due to disconnection of blood supply to its placenta. Since it is a case of identical twins, by simple body attachment it drew its nutrients to manage survival these 13°years (Identical twins can exchange body tissues with a high rate of acceptance). However, it remained stunted in growth due to being devoid of direct blood supply at an early stage when it was detached by the placental supply and lost its growth factors to reach him. By keeping himself floating within embryonic fluids, he managed to survive as it did not pose any problem in blood/tissue typing.

Mechanism of doing identical twins

Till now, I discussed the event by which it came to my notice. Now, it's time to go into the embryological steps that gave origin to this wonderful incidence of the case. The general body cells (somatic) contain 46 chromosomes, and of them, 44 are autosomes and 2 are sex chromosomes (XX for female or XY for male). If the chromosome number is more than 46, the baby is either diseased or not viable. For that, nature has arranged a reduction of cell division (meiosis) in the testes or ovaries. In this way, we get mature male or female cells (22X or 22Y) to fuse each other to establish the 46 number. These 22X or 22Y numbered chromosome cells are called gametes.

Male gametogenesis

In the testis, there are multiple partitioned compartments (300–600) called lobules that contain 2–3 seminiferous tubules having multiple sperm stem cells that undergo a series of mitotic divisions until they reach a large cell (16 m in diameter) known as primary spermatocyte. The meiosis starts in this stage. In the first meiotic division, homologous (looking same) chromosome pairs separate and so is the case of sex chromosomes. In the male, sex chromosomes are XY, while in the female, they are XX. So at this stage, one separated cell contains 22X and the other cell contains 22Y. Immediately after the second meiosis division starts, these 22X and 22Y become double and are known as spermatids. These spermatids are normal-looking cells containing cell membrane with intracytoplasmic organelles like the nucleus, Golgi apparatus, mitochondria, and centrosome with first and second centrioles. The seminiferous tubules contain stem cells of another type of cells called sustentacular cells of Sertoli. These cells do a miracle. They actively engulf these spermatids and nurse them to become a motile cell. The Sertoli cells first pick up the nucleus and make it head, then take Golgi apparatus to change it into a cap called the acrosomic cap, and take the first centriole to make neck; cytoplasm and mitochondria are packed into a membranous bag called midpiece; and the second centriole generated nine pairs of elongated fibrils called tails. The whole structure is called spermatozoon (plural: spermatozoa or sperms). With the contractility of the tail and mitochondrial powerhouse, the sperms move forward and reach uterine tubes from the vagina where ejaculations are made.

Female gametogenesis

Gametogenesis in the female is much different than that in the male. Oogenesis in females is restricted till the age of 45°years. A female baby is born with a number of oocytes, and they get exhausted at the age of 45°years. Female sex stem cells undergo mitosis during the embryonic period, and by the age of the fifth fetal month, all turn into primary oocytes and get arrested until the age of 13°years (puberty). The arrested meiosis 1 will be completed by extruding homologous chromosomes in the form of expelling the first polar body where only chromosomes are expelled with no cytoplasm. The resultant secondary oocytes again at meiosis 2 get arrested and expelled out normally during menstruation. The secondary oocytes turn to mature oocytes only once or twice in the mother's life when she becomes pregnant. There is a unique feature of the mature oocyte's outer covering, known as zona pellucida. The moment a sperm touches the zona pellucida and tries to penetrate, immediately a signal reaches the arrested chromosomes which then completes the job of second meiosis division and allows the incoming sperm to pierce zona pellucida so that both sided haploid (half) chromosomes can meet each other to establish 46 numbers. This event is called fertilization.

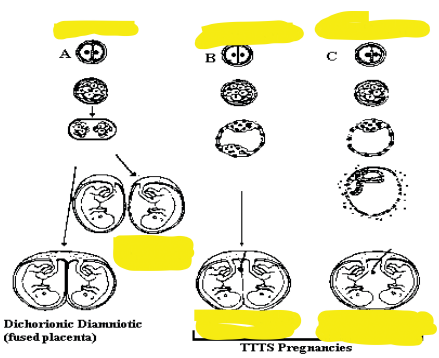
Zona pellucida

It is a thick membrane of the mature oocyte. It has a sensor so that when an incoming sperm touches it to penetrate, it sends a signal inside. After sperm penetration occurs, a chemical change takes place within its substance so that it becomes impermeable to further entry of sperms. This is called zonal reaction. The acrosomic cap of the sperm contains many enzymes. Hyaluronidase dissolves the corona radiata cells that still remained attached outside the mature oocyte and gives passage to sperm. The acrosomic cap contains neuraminidase, another enzyme that helps the sperm head to penetrate corona radiata. Other parts of the structure of the spermatozoon remain outside, and only the head, i.e., the nucleus, is allowed to pass in.

The chemical change that hardened the zona is a unique phenomenon. It did the second sperm onward impermeable. This is a protective character of zona. However, the degree of hardening that occurs on the substance of the zona differs from case to case. This hardening prevents multiple sperm entry, but sometimes it becomes so hard that zonal dissolution is not at the same time in every case. As a result, blastomeres (dividing cells from the fertilized egg) are not released in time. The blastomeres that have time-bound genetic code to unfold their development may be arrested or abnormality sets in.

Sometimes, a small crack appears in the zona, and hungry blastomeric cells in the form of a cavity try to herniate out through that small crack pore on the zona. When it wholly comes out, the process causes a jerk by compression to suddenly widen cavity formation, which makes the ICM (inner cell mass) splits. The splitting may be 2–8. This results in the formation of 2–8 monozygotic babies. This is the mechanism of twinning. So far in the world, octuplets is the highest number of twins reported.

Twins

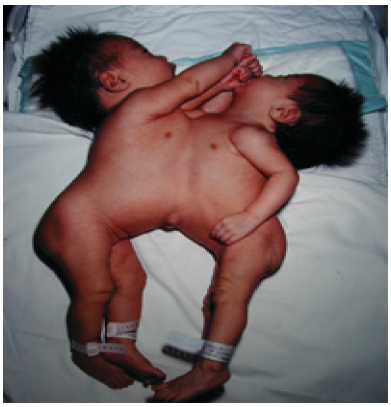


A: 0–4°days. If the release of the blastomeric cavity is delayed by 4°days, the picture shows two fetuses

with their own separate placenta completely separated by amniotic cavities.

B: 5–8°days. If the release of the blastomeric cavity is delayed by 8°days, then there will be a single placenta serving both feti but feti are separated by amniotic cavities.

C: 9–12°days. If the release of the blastomeric cavity is delayed by 12°days, then there will be a single placenta serving both feti and a single amniotic cavity lodging both feti with no membrane interposed in between.



D: If the release of the blastocyst cavity is delayed by more than 12°days, then there is a high chance of conjoint twins as they stay within a hard-pressed small cavity, and body parts of one baby accept other babies' parts to fuse easily. This feature has been reported in the cranium, thorax, abdomen, and buttocks. The picture is taken from Langman's Medical Embryology, Kluwer, (1).

Mechanism of fetus in feto (How a baby enters inside the other baby)

Twin to twin transfusion syndrome

When there are monochorionic (single placenta) twins, this syndrome may occur. In this case, because of highly developing fetal tissues, blood capillaries have a tendency to communicate with each other placenta. This results in a network of capillaries that may channelize more blood to one fetus than the other or in more rare cases completely deprive blood flow to the other fetus. If blood never reaches the fetus, no nourishment reaches the fetus, and there is no conduction of developmental factors which is crucial for the unfolding of the body's different systemic growth. However, the stunted baby will not die. The two babies are made up of the same tissue, and hence, simple attachment in any body part can derive some nutrients by percolation sufficient to live a life but development will be arrested at that stage of embryological milestone.

So, it may be deduced that twin-to-twin transfusion syndrome can completely deprive blood supply and results in one full-blown baby, while the other baby is arrested in a miniscule shape attached anywhere with his/her brother/sister body parts. Another determinant is that it should be a case of monochorionic and monoamniotic twins.

In the case of conjoint twins, the two babies are well developed but may be fused in the buttocks, abdomen, chest, or head. So, it may be deduced that it is not a case of monochorionic meaning they have their own separate placentas but a case of monoamniotic so no barrier existed in-between them and two babies were in contact with body parts which got fused by staying longer in the same position within a tight amniotic cavity.

How the second fetus managed to enter the first?

At the outset, I described a small baby was found within the abdomen of a grown-up male boy and was attached to the left kidney.

To understand this problem, we note that in the case of monochorionic and monoamniotic twins, there is no barrier existing in between, and one baby was fully grown up, while the other was arrested in growth due to twin-to-twin transfusion syndrome.

Physiological hernia

The sudden and rapid growth of the liver in a small abdominal cavity makes the contents very much pressurized, and movable organs are the intestines that move out of the abdomen *via* the umbilicus. So at this stage, in the same amniotic cavity, not only the herniated intestines lodge but also the stunted fetus exists. However, after the 10th week, the liver growth ceased and the size of the abdominal cavity increased. Intra-abdominal pressure drops and intestines started returning. The liver occupied the right and upper part of the abdomen. So, the returning intestines cannot stay in the occupied area by the liver, and they occupy the left and lower part of the abdomen, along with the returning intestines accompanied by the small fetus in the lower left side of the abdomen.

Ascent of kidneys

Kidneys are developed in the pelvic cavity and later ascend in the abdominal cavity along the posterior wall until stopped by suprarenal glands. Since the left kidney came directly in contact by pushup, the fetus got attached to it and remained there for 13°years.

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