

Rabbit Fetuses Implanted and Developed in the Greater Omentum

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Abstract: The authors encountered rabbit fetuses that developed from fertilized eggs implanted in the peritoneal cavity. A laparotomy of a rabbit that showed no signs of parturition even in the late period of pregnancy 32 days after mating revealed two fetuses suspended from the greater curvature of the stomach. Both fetuses were dead, their body weights were 44 g and 37 g, and their body lengths were 8.0 cm and 7.8 cm. No placenta was present. Blood vessels that ran in the greater omentum communicated with the chorio-allantoic membranes of the two fetuses. Since no corpora lutea were observed in the ovaries, and since no injury was noted in the uterus, this case was judged to be primary ectopic pregnancy caused by migration of fertilized eggs in the peritoneal cavity and their implantation in the greater omentum.

Key words: Rabbit fetus, Implantation, Greater omentum.

In mammals, fertilization usually takes place in the ampulla of the oviduct [1–3], and fertilized eggs descend the isthmus of the oviduct as they repeat cleavage, and reach the uterus, where they are implanted.

However, ectopic pregnancy is observed occasionally in both humans and animals. Ectopic pregnancy is mostly tubal pregnancy [4, 5]. The endosalpinx has been shown to play a major role in prevention of implantation in the oviduct [4]. Ectopic pregnancy may take place on the ovarian surface or in the peritoneal cavity [6, 7] as well as in the uterine tube, but reports of such ectopic pregnancy are extremely rare.

We encountered rabbit fetuses developed from fertilized eggs that migrated in the peritoneal cavity and were implanted in the greater omentum. In this report, this rare case of ectopic pregnancy is presented.

Materials and Methods

The impregnated animal was a mature female Japanese white rabbit weighing 3.0 kg. It had no history of parturition or pregnancy. This female rabbit had been mated with mature male rabbits in a study for another purpose. No abnormality was noted in the clinical findings at mating. This rabbit gradually exhibited findings such as anorexia and emaciation after mating.

Although the gestation period of the rabbit is usually 30 or 31 days, this animal did not show signs of parturition even in the late gestation period. Therefore, a laparotomy was performed 32 days after mating, and two fetuses suspended from the greater curvature of the stomach were observed.

Results

Fig. 1 shows the findings in the left and right uterine horns and both sides of ovaries. The uterine horns showed the same shape as those of a non-pregnant rabbit, and no implanted fetus was observed in the uterus. Also, no injury of the uterus such as tear through which fetuses might have escaped from the uterus was noted.

There were several mature follicles about 1 mm in diameter and a large number of small follicles in the ovaries. No corpus luteum and/or corpus luteum of pregnancy was noted in the ovaries.

Fig. 2 shows the two fetuses. The chorio-allantoic membranes of both fetuses appeared to be attached directly to the fetuses. The two fetuses were suspended from the greater curvature of stomach by the greater omentum, and no structure corresponding to the placenta was observed. Many blood vessels ran in the greater omentum and were continuous with the chorio-

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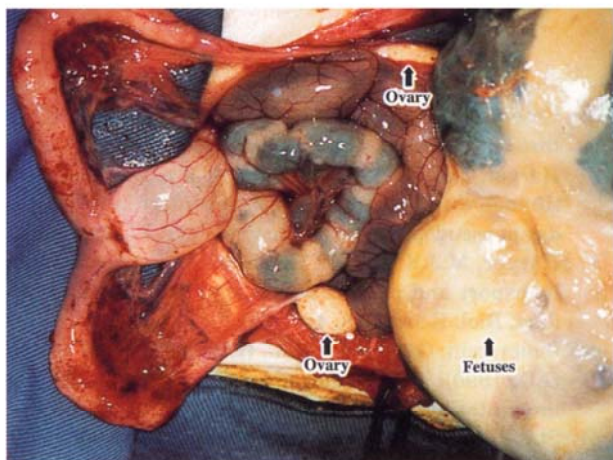


Fig. 1. *In situ* view of uterine horns and ovaries of both sides. Note that corpus luteum of pregnancy was not seen in the ovaries.



Fig. 2. *In situ* view of ectopic fetuses suspended from the greater curvature of stomach by the greater omentum. Placenta was not observed. Many blood vessels ran in the greater omentum and were continuous with the chorio-allantoic membranes of both fetuses. The chorio-allantoic membranes are closely adherent to the fetuses.

allantoic membranes in the posterior limbs of the two fetuses.

Fig. 3 shows the 2 fetuses excised by incision of the chorio-allantoic membranes. The chorio-allantoic membranes were directly in contact with the fetuses, and little allantoic fluid and amniotic fluid were present.

Both fetuses were dead, their body weights were 44 g and 37 g, and their body lengths were 8.0 cm and 7.8 cm. The mean body weight of neonates of the Japanese white rabbit is about 57 g, and the fetuses were



Fig. 3. The two ectopic fetuses with fetal membranes removed. Although marked dysplasia was noted in the femoral and crural regions of the fetuses with which the maternal vessels communicated, nails in the posterior limbs and whiskers were formed.

smaller than the average term fetus.

Marked dysplasia was seen in the femoral and crural regions of the two fetuses, with which the maternal vessels communicated. However, nails were formed in the posterior limbs of the two fetuses. The features and body weights of the fetuses suggested that they were alive and grew until relatively late in the pregnancy period.

The anorexia observed in the mother is considered to have been a result of compression of the stomach by the two fetuses.

Discussion

For eggs to be captured in the oviduct after ovulation, the tubal fimbria must be placed near the ovary and cover the ovarian surface at ovulation. In fact, an increase in motor activities of the tubal fimbria and covering of the ovarian surface by the tubal fimbria have been observed in rabbits at ovulation [8]. Furthermore, adhesiveness of granulosa cells, which surround the surface of ovulated eggs, is considered to be important for ovulated eggs to be taken up by the tubal fimbria [9].

Impairment of part of these physiological phenomena is considered to cause escape of ovulated eggs into the peritoneal cavity without being taken up by the

tubal fimbria. Experimentally, migration of ovulated eggs in the peritoneal cavity and their implantation on the opposite side of the uterus to establish pregnancy have been reported [10, 11].

In the rabbit, the site of fertilization is the ampulla of the oviduct near the ampullary-isthmic junction [1–3]. Since the direction of ciliary movement of ciliated cells on the luminal surface of the ampulla of the oviduct is toward the isthmus [12], the possibility that eggs are taken up into the oviduct once but are released into the peritoneal cavity through the tubal fimbria is small. In the present case, we speculate that ovulated eggs that had escaped into the peritoneal cavity were fertilized by capacitated sperms released into the peritoneal cavity through the tubal fimbria.

The following two cases are considered to be recognized as ectopic pregnancy. They are primary ectopic pregnancy [7], in which fertilized eggs are implanted in the peritoneal cavity, and secondary ectopic pregnancy [13], in which fetuses once implanted in the uterus escape out of the uterus due to accidents such as rupture of the uterus.

The present case was definitely primary ectopic pregnancy, because no injury was noted in the uterus, and because no corpus luteum was present in the ovaries.

Fetuses are supplied with oxygen and nutrients from the maternal blood flow and excrete CO₂ and waste materials by the function of the villous epithelial cells of the placenta. Therefore, physiologically, the maternal blood flow never directly mixes with the fetal blood flow. As shown in Fig. 2, no structure considered to be the placenta was observed in the present case. This study demonstrated that the fetuses were able to grow even without the placenta. In this case, why the fetuses were not rejected as foreign bodies or whether immunotolerance was induced in the mother or not is unknown.

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