Practical Aspects of Ultrasound Examination in Establishing the Diagnosis of Pregnancy at Mares

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REVIEW, RESEARCH ARTICLE

Abstract

A correctly established diagnosis at an early stage of gestation provides optimum management of the entire reproductive process. Without going into the actual selection procedure for the type of horse to be bred, the main thing to consider (without referring to breed, peculiarities, genetics, diseases), is the age of the mare. Age group considered optimal for a problem-free pregnancy is between 4 and 12 years.

Keywords: equine reproduction, diagnosis of pregnancy, ultrasound

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INTRODUCTION

The present research presents some aspects of the ultrasound examination both in the preparation of mares for insemination as well as for establishing the pregnancy diagnosis and monitoring the whole process. Ultrasound is useful for monitoring changes follicular and luteal dynamics of equine ovaries.

The procedure allows quick, visual access, non-invasive in the reproductive tract. Through the ultrasound examination it is possible to evaluate the stage of the estrogen cycle, pre-ovulatory follicles, ovulation can be determined or corpus luteum can be examined.

A variety of images will provide information regarding abnormalities and pathology of the ovary or the uterus.

MATERIAL AND METHOD

Rulanda II and Alice are two breeding mares that we will study in the first part of the research. The two animals are owned by a breeding center in Bihor county. The center has been included in several international breeding programs in the Netherlands and Germany.

The third specimen chosen from the same center, Quookie, is included in a breeding program in the Netherlands, too. This specimen was inseminated with semen from the stallion Untouchable 27 of the KWPN breed (Dutch sport horse). The pregnancy of the Quookie mare was followed from day 10, precisely to see the evolution of the embryo to the stage of fetus or foetus. All three mares studied in the research belong to sports breeds: Hanoverian and Holsteiner.

The procedure for ultrasound examination of the mare in advanced gestation is similar to that used for the management of the reproduction. The equipment required is a portable ultrasound machine with a linear (5-7 MHz) probe, commonly used by trained specialist personnel.

RESULTS AND DISCUSSIONS

Rulanda II is the mare prepared for examination before performing artificial insemination. Using the Universal S8 Color Doppler ultrasound device, ovarian follicles were measured by the ETR (trans rectal examination) method. In the upper part of Figure 1, the left ovary is ultrasounded, and the image shows the measurement of the ovarian follicle, the one that stands out on the surface of the ovary and which will later release the egg. In the lower part of Figure 6, the right ovary was examined by the same method, measuring the ovarian follicle.

Figure 1. **Shows ovarian follicles in mare Rulanda II**

Until the 20th day of gestation, the formula "possible" gestation is used. Figure 2 represents the possible gestational diagnosis for the mare Alice. The image represents the measurement of the yolk sac, on the 13th day of gestation. A white line can be found in the dorsal part of the yolk sac, which can indicate an embryo and confirm pregnancy.

Figure 2**. Possible diagnosis GESTATION with embryo measured at 13 days**

To better understand the evolution of the embryo, Figure 3. shows the development process during the first two weeks of gestation. The evolution of the embryo in diameter is shown on the left side of the image, and the period between days 10-17 post-ovulation is shown on the bottom. Embryo growth between days 10-17 is usually linear, averaging about 3.4 mm/day.

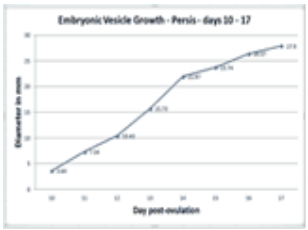

Figure 3**. Shows the stages of embryo growth on days 10-17 (www.equine-reproduction.com))**

The following images show the stages of gestation in the mare Quookie (7 years old, Hanoverian breed). The images below show, in a first stage, embryonic development between days 10-18, up to day 53 of gestation.

In Figure 4., we have a diagnosis of possible pregnancy, on day 10. The black dot in the upper part indicates the presence of the vitelline or gestational village with amniotic fluid.

Figure 4. **Shows pregnancy diagnosis in mare Quookie, day 10**

Figure 5. shows diagnosis of possible pregnancy in mare Quookie. In the image we have the representation of the gestational sac (spherical shape) with amniotic fluid (black) and the embryo (the white color line located in the dorsal part of the yolk sac).

Figure 5. **Presents diagnosis of possible pregnancy on day 12**

In the second week of gestation, more precisely on day 14, there is a slight "irregularity" in the linear evolution. Figure 6. is a representation of the yolk sac and embryo on day 14 of gestation

Figure 6. **Shows gestation on day 14**

In each of the day 10-15 images, a small white area appears on both the upper (dorsal) and lower (ventral) sides of the embryo. Some practitioners insist that this is a definite indicator that the ultrasound shows a pregnancy and not a cyst or other fluid-filled area. The statement is incorrect.

The small white area does not physically exist! In technical language it is a spectral reflection. On the dorsal, sometimes ventral side, the embryo is shown in ultrasound as having a white line, like a specular reflection, which is a change produced in the natural structure of cells and tissues when the ultrasound wave hits the more extensive and smooth part of the embryo, in an angle of 90 ◦ . Embryonic movement, specular reflection, and linear growth rate can help differentiate a 16-day embryo from a uterine cyst.

In Figure 7. the embryo which has now reached 18 days is visible. Around this date, a loss of regularity in the shape of the embryo is noticeable. The period also coincides with the cessation of movement in the uterus. This cessation of movement is often mistakenly referred to as "implantation/insemination", but at this stage there is no advancement into the endometrium (uterine lining). Basically, on days 17 and 18, the embryo is "fixed".

Figure 7. **Shows gestation at 18 days**

In the image you can see the actual embryo at the age of 19 days, as a small white grain on the ventral region. Normally, around days 20-21, when using standard ultrasound equipment, the "embryo itself" is visible as a small irregularity at the edge of the vesicle - most commonly towards the ventral region. The spherical shape is the representation of the gestational sac (yolk sac) with amniotic fluid.

Figure 8**. Shows the embryo on day 19 (yolk sac and ventral embryo)**

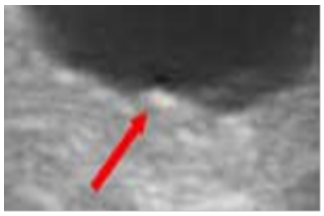

Figure 9**. The arrow points to the embryo**

At 40 days, the term used for the developing foal will change from "embryo" to "fetus". The image shows the fetus on the 40th day after conception.

Figure 10**. Shows gestation on day 40 with the outline of the conceptual product, "fetus**

In the image taken on the 53rd day of gestation, we observe a lateral image of the fetus. The sonographer now points to the fetal head, at the top of Figure 11.

Figure 11**. Shows the fetus (anterior body area)**

Figure 12**. Shows the fetus (anterior body area)**

Figure 13**. Image of the fetus with the posterior area of the body**

CONCLUSIONS

The earliest recognition of pregnancy in mares is possible 48 hours after ovulation. The diagnosis of pregnancy can also be made between days 12 and 16 post-ovulation. Noting that during this time, the concept is extremely mobile.

The spherical shape of the equine embryo and the manner of development of the fetal membranes allow the estimation of the gestational stage accurately by the ultrasound method 45 days after ovulation. The embryo can be detected in the uterus 9-10 days after fertilization.

On days 17-18, the embryo changes its shape, and looks like a "guitar pick". On day 21, the embryo can be visualized on the ventral side of the yolk sac, and on day 24 a first heartbeat can be recorded. As it develops, the allantois will occupy all of the extra embryonic space between the amnion and the chorion and the yolk sac.

The allantois takes on a sac form appearance and in the interval of 24 - 45 days the stage of gestation can be indicated with certainty. At 45 days, the only fluid part visible in the ultrasound is the allantois cavity, and the fetus appears in the image as suspended from the ventral part of the uterus by the umbilical cord and is dorsally inclined.

Trans rectal ultrasound examination is a commonly used procedure in mares for reproductive management and pregnancy detection. Trans rectal ultrasound examinations of the genital tract are routinely performed throughout the estrous cycle and during the first 60 days of gestation.

Testing in late gestation is done in special circumstances. However, regular monitoring provides important information about the feto-placental unit and fetal well-being, elements that can help in the early diagnosis of some conditions.

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