

## THE IMPORTANCE OF ULTRASOUND EXAMINATION IN ESTABLISHING THE DIAGNOSIS OF PREGNANCY AT MARES - review -

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### **Abstract**

*This paper is a bibliographic study on the usefulness of the diagnosis of pregnancy in mares at an early stage through ultrasonography. Perpetually improved diagnostic methods lead to a better understanding of the process of reproduction of horses, so that the resulting products follow the purpose for which financial and human resources were used, namely, obstacle jumping competitions, training, aerobatics, carts, trekking, endurance, horseback riding (in a more widely accepted sense) or improvement, and the whole process of gestation to parturition can be followed by minimally invasive methods on mares.*

**Key words:** equine reproduction, diagnosis of pregnancy, ultrasound.

### **INTRODUCTION**

Few people have predicted the impact that ultrasonography has had on the equine breeding industry. The ability to examine non-invasively the mare's genital tract using ultrasonography-based technology provides the ability to diagnose gestation earlier than by the method of transrectal examination to effectively manage twin gestation and to detect early embryonic death (EED) imminent. However, ultrasonography should not be limited to these areas. Ultrasonography can be used to diagnose the pathology of the uterus, such as the presence of intrauterine fluid, air, residues of organic substances and cysts. In addition, ultrasound examination of the ovaries can help determine the stage of the estrogen cycle, the status of preovulatory follicles, the development and morphological evaluation of the luteal body (CL), but also to interpret the malfunction of the ovaries.

Ultrasonography, synonymous with the ultrasound or sonography, is an imagistic method that helps to visualize different organs of the body. It has many advantages, namely, it is not harmful, it is fast, simple, safe and easy to perform. It is informative, non-invasive, painless, has no side effects, as it uses ultrasound.

The modern ultrasound technology used to examine the genital tract of mares is the B-mode, which scans in real time. B-mode refers to brightness, in which the ultrasound image is a two-dimensional display of dots. The brightness of the dots is directly proportional to the amplitude of the returning echoes. When repeated signals are transmitted, received and processed, a continuous visual image of the tissues is produced, which allows the observation of the structure and movement in real time (B-mode, real time).

The procedure and precautions taken for intrarectal ultrasound examinations are similar to those for rectal palpation. The transducer should be covered by the examiner's hand to prevent trauma of the rectal wall. At the same time, it must be well lubricated. It must be handled with care to avoid attaching feces to the transducer. After evacuating the fecal material from the rectum, the probe is inserted and moved on the genital tract as follows: uterine body, right uterine horn, right ovary, right uterine horn, uterine body, left uterine horn, left ovary, left uterine horn, uterine body, then cervix uterine or cervix. There must be good contact between the probe and the rectal wall. Rectal air, fluid or gas in the intestines will result in a distorted image. To minimize scanning errors, mainly omissions, practitioners recommend performing the same scanning procedure during each examination.

The two types of ultrasonographic transducers used to examine gestation in mares are linear and sectoral. A linear transducer is oriented longitudinally relative to the mare's body. Therefore, the images of the cervix and uterine body are oriented longitudinally, and those of the uterine horn are transverse. The images of the tissues closest to the probe are at the top of the screen. Sector scanners produce a triangular beam so that the sound beam generally moves transversely to the mare's body and therefore the images of the cervix and uterine body are transverse, while the images of the horns are longitudinal or oblique.

At the breeding process of mares, one of the risks that may occur is multiple gestation. Statistics indicate that only about 60% of mares with twin embryos give birth to a single alive product, 31% lose both fetuses and only 9% of mares diagnosed with multiple gestations manage to give birth in time. Literature notes that of this last category, more than half (64.5%) give birth to dead foals. Another 21 percent complete the pregnancy, but only one of the fetuses is born alive. The success rate in twin pregnancy (both fetuses are born alive) shows an unsatisfactory percentage of 14.5%. After endometritis, twin pregnancy is the second leading cause of abortions in mares. Specimens diagnosed with multiple gestations should be assisted in calving, and often the surviving foal is usually weaker, susceptible to infection, and develops more slowly. When both fetuses are born alive, most

often, one is less developed and has an increased mortality rate. Most of the time, the foal dies in 3 to 4 days. Aborted mares have an increased incidence of fetal membrane retention, do not enter the estrus, and the attempts of insemination during the same or later breeding season are doomed to failure, and this translates into low reproductive efficiency.

The method in removing one of the blisters, causing an abortion with prostaglandins or saline are some of the methods in managing twin pregnancies. Gemini in most species can occur through one of two mechanisms: a) the division of a fertilized egg or b) multiple ovulations that result in multiple eggs. The possibility of twins occurring from the release of a single fertilized egg can be eliminated in mares, because in this species, the twins are almost always dizygotic, i.e. derived from different eggs. It has been found that the mare develops a natural biological mechanism for the elimination of twins.

In a study carried out for 2 years, on a total number of 496 mares, without lactation, the fertilization rate, twin pregnancies, etc. were followed. The mares were examined on days 15, 20, 25, 30, 35, 40 and 50 after ovulation with an ultrasound device, which operated in real time at a frequency of 3 MHz. The mares belonged to the light breeds, mostly Quarter Horse. 307 of the specimens received the diagnosis of gestation, and in 15 of them, the imagistic indicated the twin gestation. One of the mares treated with prostaglandin was removed from the study. The other 14 mares diagnosed with twin gestation did not receive treatment before the 50th day of gestation. 12 of the mares (i.e. a percentage of 85.7%) eliminated one of the fetuses before the 50th day. One of the mares lost both embryos between days 15 and 20. It was found that the non-intervention led to the following result: 85.7% naturally eliminated one of the fetuses before the 50th day of gestation. This natural biological mechanism of embryo reduction appears to be just as effective and, in some cases, more effective than the treatments suggested for removing one of the fetuses. Most embryonic reductions occurred between 25-30 and 30-35 days of gestation (four in each time period). In the gestation intervals between days 15 - 20, 20 - 25, 35 - 40 or 40 - 50 there was an embryonic reduction. Unfortunately, the number of mares under study was too small to provide conclusive data in twin pregnancy statistics. In most cases, pregnancy loss can be predicted by measuring the size of the vesicle and / or embryo over time. In general, it was found that one embryo continued to grow, while the other bladder and / or embryo did not increase or decrease in size between measurement periods. The exact mechanism of elimination of one of the embryonic vesicles has not been fully elucidated, but it seems that success lies in the way the twin vesicles attach to the uterus.

Manual removal of a twin vesicle during 12 to 30 months of pregnancy led to an extremely high rate (96%) of single embryonic reduction. The frequency of the ultrasound examination is therefore necessary to identify a good separation of the vesicles. The less developed bladder should be led and removed at the tip of one of the uterine horns. After day 16, embryo removal is more difficult. During the breeding seasons of 1987 and 1988, the elimination was successful with the help of the transducer. The ability to carefully separate embryos and lead them to the end of a uterine horn is facilitated by ultrasonographic monitoring. The uterine horn is pressed towards the side edge of the pelvis, and the pressure increases by driving the transducer down to the bladder until it is destroyed. Another method accepted by practitioners for the elimination of twin pregnancy is ultrasound monitoring and non-intervention until the 30th day of pregnancy. If the mare's biological mechanism has not eliminated one of the fetuses by that time, doctors and veterinary technicians believe that prostaglandin intervention will eliminate unwanted pregnancy. If the reintroduction of the mare is not chosen or the specialist does not consider it appropriate, the induction of abortion can be postponed until the pregnancy reaches the interval of 70-80 days, so it must be done within 40 days.

To evaluate the effectiveness of the ultrasound examination in detecting gestation at mares, practitioners in the United States made 18 studies. The subjects were 496 mares that did not show lactation. All were examined on days 15, 20, 25, 30, 35, 40 and 50 post-ovulation, unless they were not pregnant at subsequent examinations and / or returned to the estrus phase before the next examination. By the method of transrectal examination (ETR), veterinary technicians performed 1 of 3 determinations: open, pregnant or too early for diagnosis. The transducer (3 MHz) was then used and inserted into the genital tract. If a bladder was located, the image was frozen, and electronic stirrups were used on the screen to determine the largest diameter of the bladder and embryo. The diagnosis of non-gestation was made when the technicians could not locate a blister. False negative diagnoses were also recorded, when at a single scan, the mare received an unfavorable diagnosis, but a subsequent examination established a gestational diagnosis. Mares that have been misdiagnosed as pregnant due to confusion between an embryo and a uterine cyst, follicle or other circular structure have been recorded and classified as false positives. A group of 20 unmounted mares was included for examination, without the veterinary technician knowing the condition of the animals. Two technicians with experience in both transrectal examination and ultrasound diagnosis were used. Subsequently, during the studies, two other technicians, experts in establishing the diagnosis by the method of rectal palpation, collected information from the target group. The results show that, in all stages of

gestation (15 to 50 days), the ultrasound method indicated accuracy in detecting gestation from 97.4 to 100%. On the other hand, the rectal palpation method indicated accuracy in only 30% of cases (for a 15-day gestation). On day 20, the accuracy of the ultrasound examination and rectal palpation for gestation was similar (99.3% and 95%, respectively). Consequently, for the correct diagnosis it was found that knowledge of ultrasound technology and ETR skills were required. The accuracy of 15-day gestation detection reported in this study using a 3.0 MHz real-time scanner was extremely high.

To determine whether the frequent manipulation of the transducer at the mare's rectum or sound waves at 3 MHz were harmful to the fetus, a study was performed on 90 subjects. The mares were assigned to one of the following three groups in which one of the three methods was used: a) ETR; b) ETR and ultrasound scanning, in off mode; c) ETR and ultrasound scanning, in on mode. All inseminated mares were examined on days 15, 20, 25, 30, 35, 40 and 50 post-ovulation, unless they returned to the estrus phase or received a negative diagnosis after three consecutive examinations. Manipulation with the transducer or waves produced by the equipment did not change the gestation rate compared to mares for which only the ETR method was used. None of the subjects suffered side effects from the application of the ultrasound method.

## CONCLUSIONS

Ultrasound transrectal examination is a useful procedure at mares in reproductive management and gestation detection. Ultrasound transrectal examinations of the genital tract are usually performed throughout the estrous cycle and during the first 60 days of gestation. Testing at late pregnancies is done in special circumstances.

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