Transrectal Ultrasonography of the Placenta in Normal Mares and Mares with Pending Abortion: A Field Study

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Transrectal ultrasonography of the equine placenta is a valuable diagnostic tool in mares with placental failure. An abnormal combined thickness of the uterus and the placenta may serve as an early indicator of placental failure and impending abortion. Authors' addresses: Dept. of Clinical and Population Sciences, College of Veterinary Medicine, University of Minnesota, St. Paul, MN 55108 (Troedsson); Veterinary Medical Teaching Hospital, University of California at Davis, Davis, CA 95616 (Renaudin); and Hagyard-Davidson-McGee Associates, Lexington, KY 40511 (Zent and Steiner). © 1997 AAEP.

1. Introduction

Pregnancy losses during late gestation (>5 months) represent a great problem for the equine breeding industry. Affected mares will not only fail to produce a foal but often have a lower conception rate during the next breeding season. The most common cause of late-term pregnancy loss is placentitis. Placentitis in the mare is usually caused by an ascending infection that enters the uterus via the cervix. Clinical signs of placental failure include udder development, premature lactation, cervical softening, and vaginal discharge; however, abortions can also occur without prodromal signs. The caudal area of the chorion adjacent to the cervical star shows gross pathology in aborting mares. This area of the allantochorion is thicker than normal, and the surface of the chorion is discolored and covered with fibronecrotic exudate. A definitive diagnosis of placentitis is made from culture and histopathological examination of the allantochorion and the aborted fetus. Ultrasonographic examinations of mares that are considered to be at risk for abortion during late gestation are routinely performed by a transabdominal approach. However, with this technique the caudal portion of the allantochorion cannot be imaged, resulting in an inability to diagnose an ascending placentitis in its early stages. In contrast, transrectal ultrasonography of the caudal allantochorion provides an excellent image of the placenta close to the cervical star. Using transrectal ultrasonography, we have recently established the normal range for the combined thickness of the uterus and the placenta (CTUP) at an area immediately cranial to the cervix during midgestation and late gestation in normal pregnant mares. Here we report on a
field study that compares these measurements with those of pregnant mares at commercial stud farms during a subsequent breeding season.

2. Materials and Methods

A. Mares
A total of 33 pregnant mares were examined during middle and late gestation at a commercial stud farm in Lexington, KY. Ultrasonographic recordings from nine healthy reproductively normal mares were used as control mares. All control mares had a history of at least one successful pregnancy. They were examined as previously described at the Equine Research Laboratory at the University of California, Davis.

B. Transrectal Ultrasonographic Examinations
All mares were examined repeatedly on a monthly basis during middle and late pregnancy (from 150 days of gestation to term). A 5-MHz linear transducer was positioned at the cervical–placental junction. When an optimal image was visualized, measurements of the CTUP were recorded from the ventral aspect of the uterine body. This site was considered to give more accurate information than the dorsal aspect of the uterus. Placental attachment was evaluated in an area adjacent to the cervical star. Both the dorsal and ventral aspects of the uterine body were examined.

C. Statistics
The effect of month of gestation on the CTUP was analyzed by using a one-way repeated measures analysis of variance. Mean comparisons between months were done by using Fisher’s protected least-significant-difference test. The CTUP of individual mares was compared with the mean CTUP from the control group. Significance was set at \( p < 0.05 \).

3. Results
Thirty-one of the 33 mares carried their foals to term. Two mares aborted without clinical signs between 150 and 210 days. Both aborting mares had an abnormal thickness of the CTUP (11 mm; >10 SD from the controls; Fig. 1). None of the mares with a CTUP within 2 SD for any month of gestation aborted. One mare was diagnosed with an 8-mm CTUP at 226 days of gestation (>7 SD from controls). Upon examination 2 weeks later, the CTUP had increased to 10 mm (>10 SD from controls). This mare was treated (systemic antibiotics, anti-inflammatory drugs, and tocolytic drugs) for the rest of her pregnancy, and she delivered a normal foal at 346 days of gestation. The measurements of the CTUP for this mare did not change until >330 days of gestation. At this time the CTUP was found to be 12 mm. An area of the placenta adjacent to the cervical star was thickened upon examination postfoaling, and placentitis was diagnosed upon histopathological examination.

At all examinations for all horses, the allantochorion and the uterus were indistinguishable from each other on the ultrasound image. No marked detachment was observed at any time. The CTUP in the control group did not change between 150 and 270 days of gestation when measured by transrectal ultrasonography, but it increased 1.5–2 mm for each month between 270 days of gestation to term (\( p < 0.001 \); Fig. 1). Similar to that of the control group, the CTUP in mares that carried their pregnancies to term did not change before 270 days of gestation. However, only 42% had a CTUP within 2 SD of control mares prior to day 270 of gestation. The pooled mean \( \pm \) SEM for the CTUP between 150 and 270 days of gestation was 5.4 \( \pm \) 0.17 mm in mares with normal pregnancies compared with 4.2 \( \pm \) 0.11 mm in control mares. The mares that aborted prior to 270 days of gestation had a CTUP >4 SD above the mares that carried their foals to term (Fig. 1). All recordings of mares with normal pregnancies with a gestational length of >270 days were within 2 SD of the control mares.

4. Discussion
Results from this study suggest that an increased CTUP during middle and late gestation indicates placentation failure and pending abortion. None of the mares with normal thickness of the placenta lost their pregnancies, and all mares that aborted had a marked increase of the CTUP. All mares with normal pregnancies after 271 days of gestation had a CTUP within 2 SD of the control. However, more than half of these mares had a CTUP above 2 SD of the controls between 150 and 270 days. The conditions of examination may explain the differences between the CTUP in control mares and mares examined at farms. The hospital conditions, under which the normal range was established in control

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**Fig. 1.** Comparisons of monthly recordings (mean \( \pm \) SD) of the CTUP in 33 mares at stud farms (■) and previously established normal controls (●) from 150 days of gestation to term. Two mares lost their pregnancies between 181 and 240 days (▲). One mare with a CTUP ranging over time from >7 to >10 SD from controls was treated and delivered normally (●).
mares, differ from field conditions in time spent per examination, restraining arrangements, and lighting conditions. Measurement of the CTUP below 5 mm may be difficult to measure accurately at farms, and the present study suggests that a CTUP of up to 7 mm prior to day 300 of gestation may be considered normal under field conditions. A CTUP above 2 SD of the established normal range after 271 days of gestation suggests placental failure and pending abortion (8 mm between days 271 and 300; 10 mm between days 301 and 330; and 12 mm after day 330). A CTUP above 10 SD of the normal range prior to 270 days of gestation also indicates pending abortion. A CTUP slightly above normal but below that for placentitis should be monitored closely until placental disease can be ruled out, based on return to a normal CTUP or absence of any clinical evidence of disease.

It was concluded from this study that transrectal ultrasonographic examinations of the CTUP can be used under field conditions to monitor early signs of placental failure and pending abortion. Mares with an abnormal combined thickness of the CTUP should be considered to be at risk of abortion. The importance of early diagnosis to prevent abortion in mares with placental failure and the efficacy of different treatment regimes require further investigations.

This study was supported by AGRIA Insurance Company, Sweden.

References