Ultrasonographic Appearance and the Pattern of Uterine Edema to Time Ovulation in Mares

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Using this scoring system for endometrial edema detected by ultrasonography per rectum, an equine practitioner will be able to improve the prediction of time of ovulation in normal mares and be able to detect postbreeding therapies. Author’s address: JCS Veterinary Reproductive Services, 2236 Gladwin Rd., Abbotsford, BC V2S 2Y6, Canada. © 1997 AAEP.

1. Introduction

The mare, on the average, has an estrous period that lasts around 6.5 days. Most mares will ovulate follicles ranging between 40 and 45 mm, 24–48 h before the end of their standing heat. Therefore, mares can show strong signs of heat up to 48 h after ovulation. Although these parameters are well established for the average mare, follicle size at ovulation and the duration of estrus in mares vary widely. Some mares might consistently ovulate 35-mm follicles, whereas others will not ovulate until the follicle has reached more than 50 mm in size.

For pregnancy rates to be maximized at breeding farms, normal mares must be bred within 24–48 h prior to ovulation. However, mares bred artificially will have higher conception rates if bred within 24 h before ovulation. Furthermore, mares bred with subfertile stallions or with frozen semen will have higher fertility if bred within 12 h of ovulation. Therefore, determining the time of ovulation becomes a critical factor in achieving maximum pregnancy rates at breeding farms.

Current systems to determine the time of ovulation in mares rely mostly on (a) teasing, and (b) the softening of a preovulatory size follicle detected by rectal palpation and in some instances the ultrasonographic appearance of the follicle. In addition, human chorionic gonadotropin (hCG) or deslorelin (Ovuplant) implants are routinely used for induction of ovulation in mares in an effort to minimize the variation in the time of ovulation. Although it has been shown that most mares that are in standing heat and have at least a 35-mm follicle will ovulate between 36 and 48 h after treatment with these products, there is still a wide variation in the response of individual mares. Perhaps this is due to the wide variation in the size of the follicles that individual mares ovulate.

The mare under the influence of estrogen will have an increase of edema of the reproductive tract. This includes mild hyperemia of the vulvar lips and vagina with a concomitant relaxation of the vaginal vault and cervix. In addition the uterus under the influence of estrogen will display a characteristic pattern of edema that could be described as a cart wheel pattern. Once the mare has ovulated and a reproductive tract begins to be under the influence of progesterone the endometrial edema is no longer present under normal circumstances. The appearance and disappearance of endometrial edema are
related with the onset of estrus and ovulation in mares. The present paper describes a scoring system for endometrial edema (SEE) detected by transrectal ultrasonography, and the use of the pattern of endometrial edema as a tool to help veterinarians (a) improve the prediction of the time of ovulation in normal mares, and (b) detect mares that need post-breeding therapies such as uterine lavage.

2. Materials
The information presented here has been gathered from the examination of mares in my practice over the past three years. All mares (n = 452) were examined by rectal palpation and ultrasonography at least daily if they were bred by artificial insemination and some by natural cover, or every other day for normal mares at Thoroughbred breeding farms.

A subjective scoring system (0–5) for the degree of endometrial edema (score of endometrial edema SEE) was established. A grade of 0 was given to mares that were in diestrus and had no uterine edema and a grade of 5 was assigned to mares with maximal uterine edema. In order to use this scoring system the mares were examined on a regular basis throughout their estrous cycle and the pattern of endometrial edema determined. Teasing was done on a daily basis and behavioral signs correlated with the appearance of uterine edema. In addition SEE, follicle size and time of ovulation were recorded after injection of 2500 IU of hCG.

3. Results
There is a very typical pattern in the normal mare regarding the ultrasonic pattern of endometrial edema. Mares will start displaying signs of behavioral heat when the ultrasound score reaches around 2. (X = 1.83, range 1–4) From there on, the score will increase gradually until it reaches its maximal degree (X = 4.3, range 3–5). It is at this point when mares will respond most consistently to hCG with follicular size very often larger than 35 mm. Of the mares that I have treated with hCG (n = 414) 98% have ovulated within 48 h. Follicle size at the time of treatment in these mares had an average of 39.8 mm (range 33–52 mm). From the time that a mare reaches her peak SEE or is treated with hCG, endometrial edema starts to gradually decrease as the mare approaches ovulation. The normal mare will ovulate within a few hours after the SEE has decreased to an average of 1.3; range between 1 and 4. In most mares impending ovulation will coincide with a history of behavioral estrus for 4 or 5 days and a preovulatory size follicle 40–55 mm in size. The ultrasonographic appearance of the follicle that is approaching ovulation is quite distinct with irregular borders, and hyperechogenic walls. This follicle in general is painful and will be soft at palpation, depending on its location within the ovary.

Frequently veterinarians working at breeding farms do not have the opportunity to follow a mare during the entire estrous cycle and often the mares are already in standing heat when they are presented.

A. Mares in Estrus
Frequently a mare is presented for breeding when she is in standing heat. Veterinarians often are puzzled on when to breed these mares, particularly when they should be bred to a heavily booked stallion. The degree of uterine edema combined with follicular size is an important marker to decide when these mares should be bred. Low SEE (1–2) and the presence of a large follicle often >40 mm is a good indication of imminent ovulation. In contrast, low SEE with follicles <38 mm would be suggestive of a mare in early estrus. Furthermore, the presence of uterine edema is the most reliable indicator of heat in the normal mare, even when she does not respond to teasing or a teaser is not available.

B. Transitional Mares
Mares early in the breeding season might display behavioral signs of heat. These heats in general can be quite erratic and unpredictable and very often are anovulatory heats. The presence of uterine edema in these mares, unlike that in the cycling mare, does not follow the pattern described above. However, the detection of an edema is a good sign of the estrogenic competence of the follicles. Mares with a uterine edema and follicles <35 mm could be started on progesterone therapy. Mares with uterine edema and a follicle <35 mm can be treated with an ovulation-inducing agent.

C. Mares in Diestrus
Mares presented to a breeding farm are often in diestrus. These mares are often given prostaglandin to induce their heat. The appearance of endometrial edema in these mares will depend on the size of the follicle present at the time of treatment. Mares with follicles over 30 mm will display uterine edema sooner than those mares having smaller follicles.

D. Abnormalities of the Uterine Pattern
As stated above, a normal mare will have a marked decrease in endometrial edema (SEE) as she approaches ovulation. However, there are some instances when mares ovulate with a SEE of 4 and 5. In my experience these mares very often have either poor perineal conformation, predisposing them to aspirate air, or they have clinical or subclinical endometritis. Very often these mares benefit from postbreeding therapies such as uterine lavage or antibiotic infusions. Mares that are bred and ovulate with no marked decrease in SEE often will have marked accumulations of uterine fluid.

Mares with endometrial edema prior to their expected return to a normal heat should be considered as having a short luteal phase that would suggest the possibility of a uterine infection. Furthermore, mares that are pregnant with a high
degree of wide-spread uterine edema often undergo early embryonic death in the first 30 days of gestation. The presence of ultrasonographically detectable uterine edema 15 or 16 days after their last ovulation should alert the veterinarian of a potential problem.

4. Discussion

The timing of ovulation of mares at breeding farms is imperative to maximizing pregnancy rates. This becomes even more important with heavily booked stallions or when artificial insemination with transported or frozen semen is used. Detection of the pattern of uterine edema with ultrasonography, combined with rectal palpation of the follicles and the use of ovulation-inducing agents, helps veterinarians determine the optimal time for breeding of a normal mare. In addition, the routine examination of mares will help veterinarians (a) determine the optimal time for the administration of ovulatory agents such as hCG or deslorelin; (b) determine mares that are in true standing estrus when a teasing stallion is not available; (c) determine when there is estrogenic competence of follicles in transitional mares; (d) diagnose uterine inflammation that might indicate uterine infection, urine pooling, or pneumouterus and implement appropriate therapy; and (e) make a prognosis of the possibility of early embryonic death.

There is a great deal of controversy regarding the timing of injection of ovulatory agents. Treatment with hCG has been demonstrated to induce ovulation 36–48 h after treatment when administered to mares that have a >35 mm follicle. However, there are a certain percentage of mares that will not respond, probably because of immature follicles or because these mares are not in estrus even though a large follicle has been detected.

In my experience, using the SEE has proven to be the most helpful aid to determine the appropriate time for giving hCG and determining ovulation in mares. However, the routine examination of the mares at regular intervals is imperative for this system to be implemented. I treat mares with hCG when the SEE has reached a score of 4 or 5. This means some mares will have a 35 mm follicle, whereas in others the follicle might be 40 mm or larger. With the use of this system, the response to this agent is over 95% in the first two cycles. The decrease in the pattern of uterine edema is accelerated by the use of ovulatory-inducing agents as the mare approaches ovulation. Although the pattern of appearance and disappearance on uterine edema is fairly consistent in the barren and young maiden mare, I have found its usefulness quite limited in postpartum mares with less than 20 days postfoaling.

In conclusion, this system has worked for me and I have been able to significantly reduce the number of breedings per mare. Furthermore, I have been able to predict with more accuracy which mares should have a uterine culture, treated postbreeding, or are more likely to undergo early embryonic death. Abnormalities in the appearance and disappearance of uterine edema will help veterinarians predict which mares should have a uterine culture in addition to those that might need postbreeding therapies.

This study was supported by Products Group International, Lyons, CO. All images were generated with the use of a Dynamic Imaging Ultrasound with a dual-frequency (5–7.5 MHz) transducer.

Further Reading and Footnotes


*Ultrasound equipment provided by Products Group International, Inc., 447 Main St., Lyons, CO 80540; phone 1-800-336-5299.