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Research Article

A Comparison of Diagnosis of Early Pregnancy in Dairy Cows Via Transrectal and Transvaginal Ultrasound Scaning*

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Summary: The aim of this study was to compare the transrectal and transvaginal ultrasound (USGR, USGV) scanning in early pregnancy in cows to show that the later could be an alternative pregnancy examination technique. Pregnancy status and stage of gestation of 114 dairy cows aged 2-5 years and reared in three different dairy farms in Kayseri were determined by transrectal and transvaginal ultrasound techniques and data of gestation were compared. The diagnosis of the pregnancy was evaluated by the transrectal and transvaginal ultrasound techniques depending on their accuracy and facility. Transrectal ultrasound examinations were performed using an Acroscan L and Honda HS 1500 ultrasound and Esaote AU5 with a 5.0-7.5 MHz linear probe. Transvaginal examinations were carried out using the Esaote AU5 equipped with a 3.5-5 MHz sector probe with an exdending applicator. Considering the gestational age from 20 to 70 days, transrectal examination was superior to transvaginal ultrasonography (60.52%, 15.78%). The result of this study have shown that using transvaginal ultrasound alone cannot be recommended for early pregnancy diagnosis in dairy cows. However, if pregnancy testing is undertaken from 40 to 55 days of gestation, this technique could provide an accurate and rapid alternative to transrectal ultrasound or rectal palpation. Transvaginal ultrasound may be widely used in early pregnancy in dairy cattle if a probe and extending applicator is developed.

Key Words: Cow, pregnancy, transrectal, transvaginal, ultrasound

Sütçü İneklerde Gebeliğin Erken Tanısında, Transrektal ve Transvaginal Ultrason Muayenesinin Karşılaştırılması

Özet: Çalışmanın amacı, gebeliğin erken dönemlerinde transvaginal ve transrektal ultrasound (USGR, USGV) tekniklerini karşılaştırarak, transvaginal ultrasound tekniğinin ineklerde alternatif bir gebelik muayenesi olabileceğini göstermektir. Çalışma, Kayseri ilinde 3 farklı sütçü inek işletmesinde 2-5 yaşlı, 114 ineğin gebelik durumu transvaginal ve transrektal ultrasound teknikleriyle saptanarak, gebelik verileri karşılaştırıldı. İneklerin gebelik muayenesi, transvaginal ve transrektal ultrasound tekniklerini uygularken doğruluk ve kolaylık baz alınarak değerlendirilmiştir. Transrektal muayene Honda HS 1500 ultrasound cihazı ve Agroscan L model ultrasound cihazı 5.0-7.5 MHz problar kullanılmıştır. Esaote AU5 ultrasound cihazı ve uzatma aplikatörü takılmış 3.5-5.0 MHz'lik problar kullanılarak transvaginal muayene yapılmıştır. Gebeliğin 20-70. günler arası baz alındığında, transrektal muayenenin, transvaginal muayeneye göre rakamsal ve istatistiksel üstünlüğü görülmüştür (%60.52, %15.78). Sonuç olarak bu çalışmada, kullandığımız transvaginal ultrasound tekniğinin ineklerde erken gebelik tanısında tek başına kullanılamayacağı, bununla birlikte gebeliğin 40. ve 55. günleri arasında transrektal ultasound ve rektal palpasyonla gebelik muayenesine alternatif bir yöntem olabileceği sonucuna ulaşılmıştır. Prob ve uzatma aparatı geliştirilerek sütçü ineklerde erken gebelik muayenesinde daha yaygın ve uygun şekilde kullanılabileceği kanısına varılmıştır.

Anahtar Kelimeler: Gebelik, inek, transrektal, transvaginal, ultrasound

Introduction

One of the two most commonly used methods for diagnosing pregnancy in cows is rectal palpation and the other is transrectal ultrasonography. Depending on how experienced the veterinarian is, the earliest time that a pregnancy can be diagnosed with a rectal exam is 35 days (10). Some researchers have claimed that pregnancy determination with rectal palpation is risky even if implantation has been achieved (16, 17). In dairy cows, ultrasound is used for early diagnosis of pregnancy and identification of reproductive problems. Chavez et al. (3), have highlighted the importance of using ultrasonography as a reliable technique for quick and accurate determination of early embryonic development after natural mating.

Linear probes (7.5 and 5.0 MHz) have been used in imaging follicles during the process of gathering oocytes via follicle aspiration with transvaginal ultrasound guidance in cows, and it has been claimed that 7.5 MHz linear probes are superior to 5.0 MHz linear probes (6). Kot et al. (9), used the corpus luteum biopsy technique with transvaginal ultrasound guidance in cows and concluded that in terms of morphology and functionality, repeated ultrasound-guided transvaginal luteal biopsy

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samples were appropriate for laboratory studies, and observed that these biopsy procedures did not cause restrictions in subsequent timing or scheduling for in-vivo luteal function.

The study was designed for the purpose of comparing the criteria for success and the practicality of transrectal and transvaginal ultrasonography as used by physicians and researchers working under the requirements of veterinary reproductive field conditions in light of the literature.

Material and Methods

The study material consisted of 114 cows out of 122 cows aged 2-5 years which were inspected in different enterprises in the province of Kayseri and tested positive for pregnancy. The pregnancy test was conducted with different ultrasounds and different techniques between the 20^{th} and 70^{th} day. Ultrasound images were obtained from a Sony 890 C printer.

In transrectal examination, the rectum was emptied and then the organs were identified with a rectal exam, after which a probe applied with gel was used to examine the cornu uteri and the ovaries. A Honda HS 1500 ultrasound device and Agroscan L model ultrasound device with 5.0-7.5 MHz probes were used.

For the transvaginal exam, the vulva was washed with a non-irritating antiseptic. First, the vagina was examined with a sterile speculum and the location of the portio cervix was determined. Plastic extension applicators of various types and thicknesses were prepared in order to reach the vaginal fornix and to facilitate hygiene. With the assistance of an extension applicator, the cornu uteri and ovaries were examined along the vaginal fornix. An Esaote AU5 ultrasound device and 3.5-5 MHz probes were used. Care was taken not to damage the cervix uteri while the cornu uteri and ovaries were being examined by moving the probe around the cervix uteri.

Scale used to evaluate ultrasound findings:

Not observed:	0
Observed with difficulty:	1
Observed normally:	2
Observed with great ease:	3

The degree of difficulty was assessed based on the time it took, with the probe, to observe pregnancy and other criteria related to pregnancy and the ease with which this was accomplished.

The Wilcoxon signed-rank test was used to calculate the results of scoring in statistical differences between USGR and USGV.

Results

The transrectal ultrasound findings were graded from, 0-3 and are provided in Table 1. Pregnancy was observed although no pregnancy was diagnosed on day 20 with the transrectal exam. Pregnancy is difficult to observe between 25 and 30 days, normal on day 35 and easy on days 40, 45, 50, 55, 60. Heartbeats were observed after day 40 in the transrectal examination.

Table 1. Assessment of transrectal ultrasound findings in cows.

Pregnancy On Day	Diagnosis of Pregnancy	Diagnosis of Cl	Diagnosis of Embryo/Fetus	Diagnosis of Placentome	Diagnosis of Heart Beath
20-29 (n: 3)	1	2	1	0	0
30-39 (n: 9)	2	2	3	1	2
40-49 (n: 39)	2	2	3	2	3
50-59 (n: 45)	2	2	3	3	3
60-69 (n: 18)	3	2	3	3	3

The transvaginal ultrasound findings were graded from 0-3, and are provided in Table 2. Pregnancy could not be diagnosed transvaginally on day 20, pregnancy corpus luteum (Cl) was also not observed either. Pregnancy is difficult to observe between 25 and 30 days, it is easy to see on days 40 and 55. Non-echogenic areas such as the embryo were rarely seen in the transvaginal exam, and while the heartbeat could not be detected in any period, in one case a heartbeat was obtained on day 55. Success in identifying placentas was lower compared to transrectal ultrasonography.

Success was achieved in total pregnancy on 69 (60.52%) cows with only transrectal ultrasound exams while it was accomplished in 18 (15.78%) cows using solely transvaginal ultrasound exams and in 27 cows (23.68%) with both exams. There were no abortions related to trauma caused by the ultrasound in any cows with either technique throughout the study. In summary, the comparison of success rates with transrectal and transvaginal ultrasound findings in cows are (USGR, USGV; 60.52%, 15.78%) (Table 3). Statistical analysis of USGR, the median value and mode value 4.00 and 3.00 USGV statistical analysis is 3.00 and 1.00 respectively.

Discussion

Today, ultrasonography is widely used for both animal and human health. Ultrasonography is commonly used to explain physiological and pathological changes in the ovaries and uteri of animals whether pregnant or not (9, 12). Numerous articles have been written regarding the use of the transrectal method to diagnose early pregnancy in cows (13, 14) while transabdominal is only used in a limited way for cows whose pregnancies are advanced (2) and there are no studies regarding the use of a transvaginal method to establish the diagnosis of pregnancy. The transvaginal ultrasonography technique which is widely used to diagnose pregnancy in human health (15), is only used in the practice of veterinary medicine to determine pregnancy in sheep (1). In cows, transvaginal ultrasound is used to obtain amniotic fluid (5), collection of oocytes (6) and to obtain biopsies from Cl (9).

Table 2. Assessment of transvaginal ultrasound findings in cows.

Pregnancy on Day	Diagnosis of Pregnancy	Diagnosis of Cl	Diagnosis of Embryo/Fetus	Diagnosis of Placentome	Diagnosis of Heart Beath
20-29 (n: 3)	1	0	0	0	0
30-39 (n: 9)	1	1	1	0	0
40-49 (n:39)	2	0	3	2	0
50-59 (n: 45)	3	0	2	2	1
60-69 (n: 18)	2	0	1	1	0

Table 3. Comparison of success rates with transrectal and transvaginal ultrasound findings in cows.

USGR	USGV	USGR-USGV	Pregnancy
69 (60.52%)	18 (15.78%)	27 (23.68%)	n (114)

Large cattle operations follow the procedure of frequent application of synchronization protocols to obtain offspring, scheduled insemination and re-synchronization protocol following negative results on pregnancy tests conducted after insemination. Therefore, accurately diagnosing pregnancy in a short time becomes very important. An experienced veterinarian can only diagnose pregnancy on day 35 the earliest with rectal palpation (10). However, researchers have reported that rectal palpation can terminate pregnancy (16). Most studies have reported that, in practice, pregnancy can be determined with the assistance of ultrasound in cows starting on day 25 (4, 7, 11). In our study, which began on day 20, the fact that on day 20 (n:1) pregnancy was negative and that on day 25 (n:2) pregnancy was difficult to detect was attributed to the experience of the researcher, the quality of the ultrasound device and the fact that the number n was low.

The fact that in our study we observed the embryo only on day 30 both with the transrectal and transvaginal technique is consistent with a study (14) which reported that the embryo being clearly seen makes it possible to positively diagnose pregnancy between days 25 and 30.

In order to avoid abortion during the transvaginal procedure, the ultrasound probe was inserted into the vagina so that it was applied to the vaginal fornix wall, as reported by Kot et al. (9) and the probe was not moved around excessively during the pregnancy test. This also restricted detailed pregnancy exams. It was easier and there was a higher success rate with the transvaginal ultrasound exam in which indicates early pregnancy while only limited images related to pregnancy could be obtained after day 60 because the uterus hangs down thus limiting the probes ability to obtain an image. However, in the transrectal exam, pregnancy can be diagnosed easily, especially after day 60. In spite of the fact that pregnancy was easy to diagnose on days 40 and 55, especially with a transvaginal exam, inability to observe Cl and embryo/fetus was again attributed to the fact that the probe could not be comfortably manipulated inside the vagina and the increased angle between the uterus and the probe. Aria et al. (1) reported that it was very easy to obtain an image because the amniotic fluid in the uterus of pregnant sheep in the study they conducted for pregnancy diagnosis with the assistance of transvaginal echography stretched the vaginal fornix. The ease with which we obtained images on days 40 and 55 in our study with cows is attributed to this stretching.

The transvaginal ultrasound technique so widely used in human health has been reported by researchers (8) to provide better results than the transabdominal approach. This is attributed to the fact that the narrow vagina provides easy access to the uterus and ovaries. Even though the transvaginal ultrasound technique, which is not used in veterinarian pregnancy tests, poses less risk of contamination with feces when compared with the transrectal approach, and provides advantages, such as not harming the epithelium on the inner wall of the rectum and the fact that it costs less, a significant handicap is the low success rate in terms of accurate diagnosis.

In conclusion, this study found that although the transvaginal ultrasound exam was easier and more reliable between day 40 and day 55, it was less successful than the transrectal ultrasound exam in general because the number of exam days was limited. It was concluded that the transvaginal ultrasound technique in its current state of development could not be used alone to diagnose early pregnancy in cattle but could be an alternative between days 40 and 50 to pregnancy testing with the transrectal ultrasound exam and rectal palpation. However, we are of the opinion that better results could be obtained by changing the shape of the applicator or the transvaginal ultrasound device's probe design, and therefore new studies could be conducted.

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