

Ultrasonic estimation of gestation age in goats via placentomes diameter

Yaseen Mahmood Rasheed

Department of Surgery and Veterinary Obstetrics, College of Veterinary Medicine, Diyala University, Iraq.

E-mail: dr.yaseen73@gmail.com

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Summary

The aim of the present study is to establish the relationship between gestational age and placentome measurement via real-time ultrasound. This study is conducted in the college of Veterinary Medicine at Diyala University. Seventeen multiparous does were synchronized for estrus and naturally served to obtain pregnancy and subsequently scanned using both transducers. Ultrasonic (U.S) examination was performed transabdominally (TA) with sector-probe (5MHz) and transrectally (TR) with linear-probe (7.5MHz), in 10 day interval done started from day 35-135 post mating. The placentome was observed for the first time on day 35 by using TR ultrasonic examination (7.5MHz) linear transducer, as echogenic densities on the surface of endometrium. The results showed a significant increased ($P \leq 0.05$) in placentomes growth with gestation age. The placentome diameter (PD) reached maximized size around days 126 (39.6 ± 2.37 mm). Also, the results indicated significant difference between placentome diameter (PD) size in single and twin-pregnant does at ($P \leq 0.05$). The average of PD size in the single and twin-pregnant does was, respectively, 7.5 ± 0.41 mm and 9.2 ± 0.74 mm at the day 35 and 45 of gestation. The maximal size of PD was 39.2 ± 2.50 mm in singleton-bearing does during 116-125 day and 41.0 ± 2.19 mm in twin-bearing does during 126-135 day of gestation. In conclusion, the determination of gestation age according to placentome measurement was not reliable after day 90. Also, the use of 7.5 MHz linear array transducer for TR examination was found to be efficient, for early recognition of placentomes starting point from 35 days of gestation, as well as, the larger placentomes are expected in twins-bearing does.

Keywords: Ultrasound, Gestation age, Placentomes, Goat.

Introduction

In most flocks of goats, natural breeding dates are generally unobserved or unrecorded, making fertile breeding impossible to determine. Furthermore, accurate information on the stage of gestation would be useful to monitor does near term (1). The early and precise detection of pregnancy in goat is especially important from economic point of view, the separation of the flock into pregnant and non-pregnant permits scheduling of the technology of breeding (2). Ultrasonography is a reliable technique for early pregnancy diagnosis would allow early culling or rebreeding of barren does (1 and 3). B-mode ultrasonography is an accurate, rapid and safe method for diagnosing pregnancy in small ruminants. Transrectal or transabdominal approaches could be used with nearly 100% accuracy rate (4-7). The size of fetal head (Biparietal diameter) and development fetal heart size between 40 and 100 day of gestation are reliable measures of gestation age (8). The other possible measurable objective variable

included the size of placentomes, placentomes could be detected by trans-rectal ultrasonography and 5MHz linear transducer at days 28-30 of gestation (9). The placentomes appear small echogenic areas on the surface of endometrium (10), later, they are readily imaged in cross section as cup-shaped hyperechogenic structures with the concave surface directed toward uterine lumen (4 and 5). The ultrasonography measurement of placentome during gestation offers an objective means of determining gestational age. Therefore, this study aimed to the relationship between gestational age and placentome measurement via trans-abdominal and trans-rectal ultrasonography in goats throughout pregnancy.

Materials and Methods

Seventeen multiparous does were employed in this study; their average age was 2-4 years. The study was conducted in the College of Veterinary Medicine-University of Diyala.

The does had been synchronized for estrus by using the intra-vaginal sponges containing 20mg Cronolone (chronogest CR, Intervet, International B.V., Boxmeer, The Netherland) for 12 days. Applicator for insertion of chronogest CR vaginal sponge, at the moment of sponge removal, each doe received 400 IU eCG (Folligon, Intervet, International B.V., Boxmeer, The Netherland), Intramuscularly. Estrus was carefully observed and every doe was naturally mated twice at the 1st and 2nd day of estrus, thus the first day of estrus was designated as day 0 of gestation. Ultrasonographic (U.S) examination was performed either trans-rectal or trans-abdominal using a real-time B-mode scanner (Welld ultrasound, Shenzhen well. D. Medical Electronics Co. LTD. China). Light wave record and play video, USB 2.0 TV BOX, ultrasound transmission gel. The transrectal examination was conducted with 5-7.5 MHz linear array transducer, the transducer was fastened to a plastic rod (30cm) length and (20mm) in diameter and the examination done according to (11 and 12). Transabdominal examination was conducted with 3.5-5 MHz convex array transducer and with 5-7.5MHz linear array transducer, the examination according to (4). U.S examination in 10 day interval start from day 35-135 post mating and the time spent on each animal to reach a diagnosis was always more than 2 min. estimates of gestational age (GA) in days depending in placentome diameter (PD) in millimeters was made according to the fallowing formula which clarified in (1) $GA=28.74+1.80(PD)$, after 35 days of gestation. Also in current study, at three big sizes of placentomes was measured and then mean diameter of those placentomes were calculated. All measurements were in millimeters (mm). Least significant difference-LSD test was used to significant compare differences between different observations of each measurement in this study (13).

Results and Discussion

A total of 165 ultrasonographic examinations were obtained from seventeen does during 30-135 day of pregnancy. The data of (Table, 1) showed a significant effect ($P \leq 0.05$) in placentomes growth with gestation age. These results are in agreement with

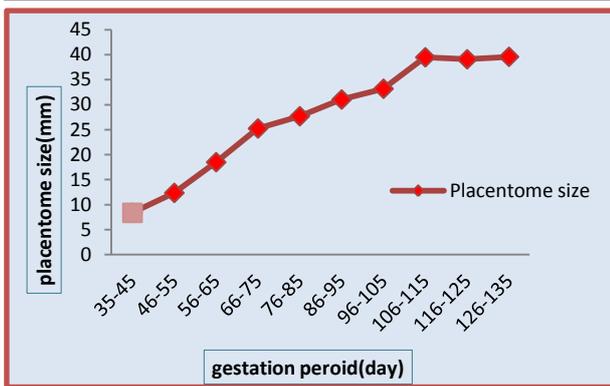
several previous researchers (1, 14 and 15) who revealed high correlation between PD and gestational period in small ruminants, moreover, in cattle (16). From (Table, 1) the placentome size was attained to overestimate gestation length around day 126 was 39.6 ± 2.37 mm. This observation was confirmed by (17 and 18) who found the placentome size was 4.08cm, 2.58 ± 0.33 cm, respectively, in the identified period. From day 125 onwards it was cease growing of placentome in does (Fig. 1). These result close to (19). While in others studies (1, 20 and 21), which was carried out in ewes, the placentome diameter (PD) reached maximized size around days 90, 82 and 74, respectively. Whereas, in sheep the placentomes cease growing around day 70 of gestation (1). The disparity between present study and previous due to differences in species of animal. The most restrictive factors of ultrasound are that its efficiency is always dependent on the expertise of the operator (22).

Table, 1: Ultrasonic measurement of placentome diameter at different Gestational age in goats.

Gestation Period (days)	Placentome size (mm)
35-45	8.35 ± 0.64
46-55	12.35 ± 0.71
56-65	18.5 ± 1.48
66-75	25.25 ± 2.09
76-85	27.7 ± 2.41
86-95	31.1 ± 2.57
96-105	33.2 ± 1.98
106-115	39.5 ± 2.82
116-125	39.1 ± 2.69
126-135	39.6 ± 2.37
LSD value	8.924 *

* ($P \leq 0.05$).

From the current study, the placentome was the most available structure of the pregnant uterus for ultrasonic examination and the placentome was easily observed for the first time on day 35 by using TR ultrasonic examination with 7.5MHz linear transducer, as an echogenic densities on the surface of endometrium (1, 2, 20, 21 and 23), (Fig. 2).



Figure, 1: Relationship between placentomes development and Gestation age in does.

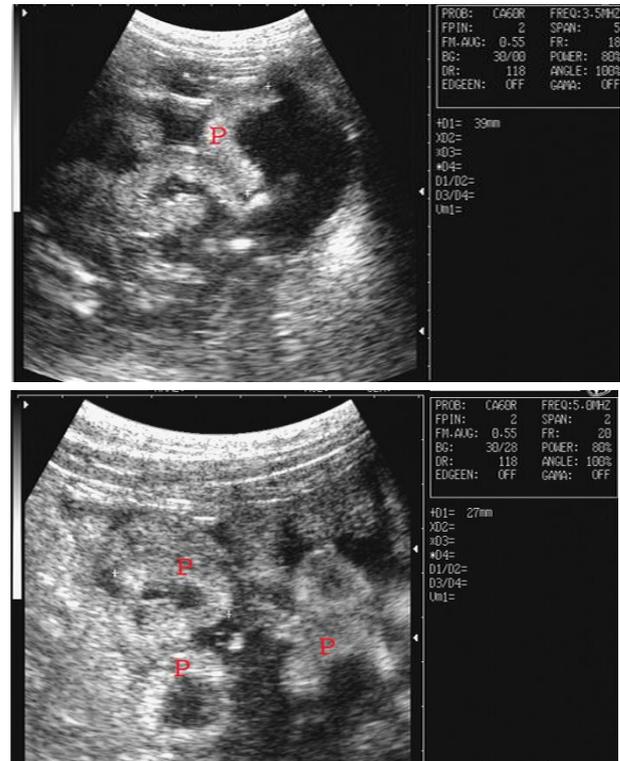
At gestational age (35 day), the mean PD was 8.35 ± 0.64 mm these result convergent with (11 and 18) who reported PD was 7 ± 2 mm; 9.875 ± 4.14 mm, respectively. While (14 and 24) reported placentomes detected was on day 50 of gestation. The divergence between the results of present study and previous, might be attributed to use a TR ultrasonographic examination with 7.5 MHz probe combined with improvement in resolution of the B-mode ultrasonic technology in this study, whereas, used TA ultrasonic scan with 5MHz transducer in previous study. Researchers (25 and 26) were reported the first time for placentome observed were around 25 day of gestation in ewes. Since the placentomes lies very close to the uterine wall, it might be prove difficult to find it especially for the first month of gestation, meanwhile, it projects from endometrium into the anechoic uterine lumen and could be identified it (12).



Figure, 2: Trans-rectal Ultrasonic images of 35day of pregnancy, Placentome: Arrowhead; u.b; urinary bladder; a.f: allantois fluid.

As pregnancy progressed, the placentome increase in size and appear as distinct O-shaped and C-shaped echo densities surrounded by anechoic fluid when imaged in

the longitudinal and cross-sectional planes, respectively (Fig. 3). This is almost similar to the registered by (1, 20 and 27).



Figure, 3: Trans-abdominal Ultrasonic images of placentomes (P) at gestational age 84 day in multiple-bearing (left image) and single-bearing doe (right image), using Sector probe.

Furthermore, the placentomes were measuring up to day 135 of pregnancy. These result was close to (24 and 28) whom reported that possible observed and measuring placentome in the last third trimester of pregnancy with TA approach and 5MHz sector probe. Meanwhile, these result disagreement with (1) who reported that it was difficult to visualized of placentome after about 100 day of gestation as well as not reliable for measuring by using TR ultrasonic examination with 5 MHz transducer. This variation was explained by method of ultrasonographic scanning and probe frequency used in both studies. The results (Table, 2) shown there was significant effect ($P \leq 0.05$) in placentomes diameter between single and multiple pregnancy with progression of gestation in does, (Fig. 4 and 5). These observed coincided with result of (17) who explains that placentome size was variation according to number of fetuses during gestation period until twelve week of pregnancy (19).



Figure 4: Trans-abdominal ultrasonic images of PD in single pregnancy. P: placentomes, a,f: Allantoic fluid. (Linear probe).

The mean values of PD are given in (Fig. 6), there was significant differences ($P \leq 0.05$) in a rapid increase of PD were during 35-75 day and 35-105 day in singleton and multiple-bearing does, respectively. These observed disagree with (26) was carry out on ewes, the

differences between the studies might be attributed to the different of animal species. Moreover, there is no doubt that accuracy of the method in recognizing placentome is very high if the operator is adequately experienced (12).

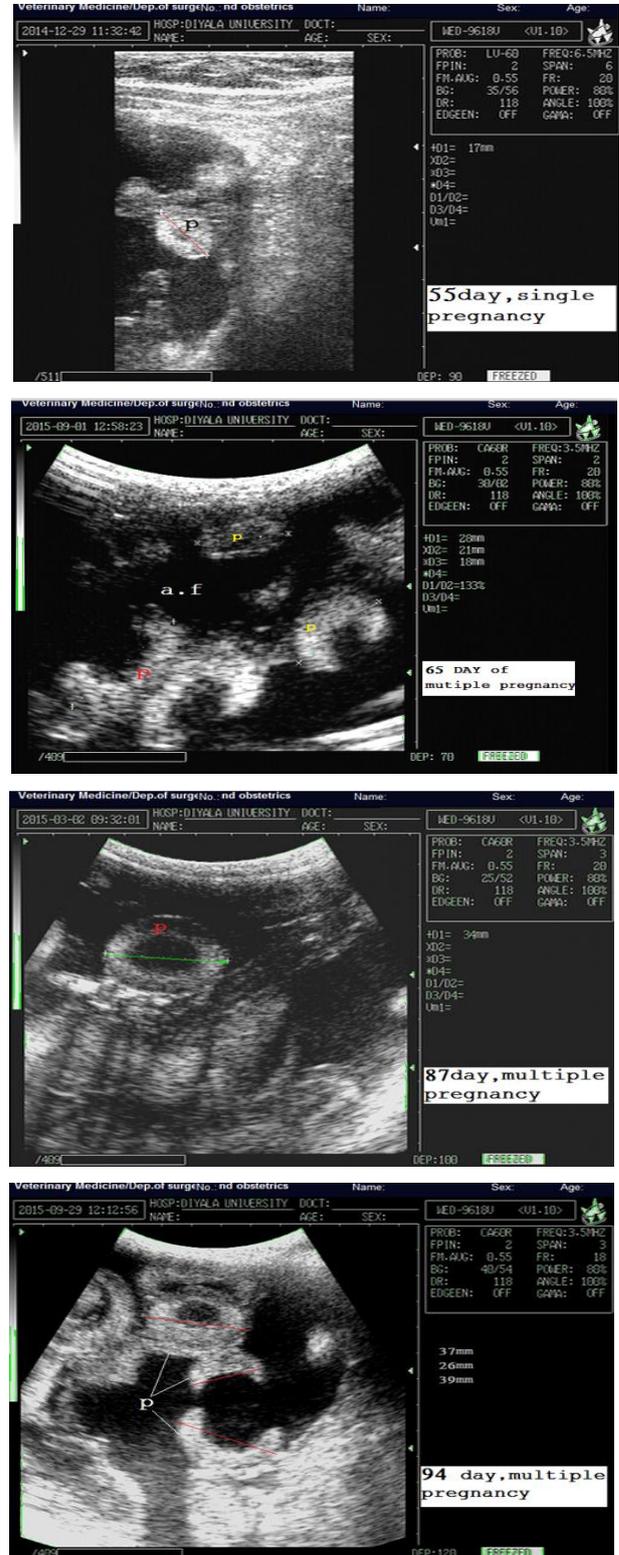
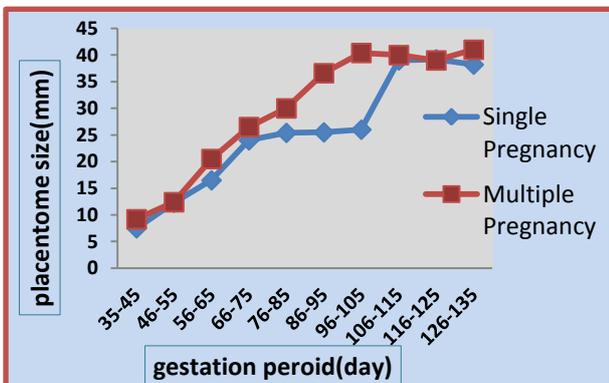


Figure 5: Trans-abdominal ultrasonic images of PD in multiple pregnancy. P: placentomes, a,f: Allantoic fluid. (Sector probe).

Table, 2: Comparison of placentomes diameter and gestational in single and Multiple-bearing goats.

Gestation Period (days)	Placentome size(mm)	
	Single Pregnancy	Multiple Pregnancy
35-45	7.5 ± 0.41	9.2 ± 0.74
46-55	12.3 ± 0.85	12.4 ± 0.91
56-65	16.5 ± 0.94	20.5 ± 0.76
66-75	24.0 ± 1.26	26.5 ± 1.04
76-85	25.4 ± 0.84	30 ± 2.57
86-95	25.5 ± 0.91	36.6 ± 1.38
96-105	26.0 ± 0.69	40.4 ± 1.25
106-115	39.0 ± 2.39	40.0 ± 2.33
116-125	39.2 ± 2.50	39.0 ± 2.64
126-135	38.2 ± 2.44	41.0 ± 2.19
LSD value	7.939 *	8.027 *

* (P<0.05).



Figure, 6: Comparison of placentome size and gestational age in singleton and twin-bearing does.

The average of PD size in singleton and twin pregnant does was, respectively, 7.5±0.41 mm and 9.2±0.74 mm at the day 35-45 of gestation. Thus, larger placentomes are expected in twin's pregnancies (18). The maximal size of placentome was 39.2±2.50 mm in singleton-bearing does in 116-125day and 41.0±2.19 mm in twin-bearing does during 126-135 day of pregnancy. These results are consistent with (26 and 29), but different from data of (1 and 30) were carry on sheep, the difference among the studies could be referring to animals species differences, equipment quality, transducer frequency, examination environment in addition to operator experience (12). In previous study, (23 and 31) whom concluded that PD increase more in twin pregnancy than in the singleton during the third month of gestation. This is in agreement with reported in present study. In conclusion, the determination of gestation age

according to placentome measurement was not reliable after day 90, these observed was coincided to (1, 21 and 32) the authors reported that these PD is not helpful in prediction after third month (16).

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استعمال الموجات فوت الصوتية في تقدير الحمل في المعز عن طريق قياس قطر الفلقات الرحمية

ياسين محمود رشيد

فرع الجراحة والتوليد، كلية الطب البيطري، جامعة ديالى، لعراق.

E-mail: dr.yaseen73@gmail.com

الخلاصة

هدفت الدراسة الحالية إلى تقدير مدة الحمل بقياس قطر الفلقة الرحمية عند مراحل الحمل المختلفة في المعز باستعمال الموجات فوت الصوتية مع مجس منحني ذو تردد 5 ميغاهرتز ومجس خطي (مستقيمي) ذو تردد 7.5 ميغاهرتز. أجريت الدراسة في كلية الطب البيطري-جامعة ديالى، استعملت 17 معزة محلية متعددة الولادات. إحداث توحيد للشبق لحيوانات التجربة لتثبيت بدء الحمل واعتبر يوم الشبق هو يوم الصفر. أجري الفحص في مدة 30-140 يوم من الحمل وبفاصل عشرة أيام بين فحصين متتابعين. أظهرت النتائج إمكانية رؤية الفلقات الرحمية عند المدة 35 يوم من الحمل باستعمال المجس المستقيمي (7.5 ميغاهرتز) عبر المستقيم. ولوحظ من الدراسة الحالية أن هناك فرقاً احصائياً عند ($P \leq 0.05$) بين نمو الفلقات وتطورها ومدة الحمل، حيث بلغ قطر الفلقات الرحمية خلال الفترة 126 يوم 2.37 ± 39 ملم وهي تعد الزيادة القصوى لتطور الفلقة في الحجم. كما بينت النتائج وجود فارق احصائي في حجم الفلقات الرحمية عند ($P \leq 0.05$) بين الحمل المفرد والحمل المتعدد، وكان قطر الفلقة عند المدة 35-45 يوم في الحمل المفرد والمتعدد 0.41 ± 7.5 ملم و 0.74 ± 9.2 ملم، على التوالي. وبلغ الحد الأقصى لنمو الفلقات في الحمل المفرد في المدة 116-125 يوماً وكان 2.50 ± 39.2 ملم، وفي الحمل المتعدد في المدة 126-135 يوم وكان 2.19 ± 41.0 ملم. يستنتج من الدراسة، إمكانية تحديد مدة الحمل اعتماداً على قياس قطر الفلقة الرحمية لغاية نهاية الشهر الثالث للحمل بدءاً من اليوم 35 من الحمل باستعمال مجس خطي (7.5 ميغاهرتز)، فضلاً عن أنه بعد المدة 90 يوم من الحمل لا يمكن الاعتماد على قياس قطر الفلقات الرحمية في تحديد مدة الحمل، كما أنه من الممكن تمييز الفلقات في المدة المبكرة للحمل، فضلاً عن أن الفلقات الرحمية الأكبر حجماً تكون مصاحبه للحمل المتعدد في المعز.

الكلمات المفتاحية: الموجات فوت الصوتية، مدة الحمل، الفلقات الرحمية، المعز.