Comparative Study between Ultrasound Linear Probe and Curved Probe in Pregnancy Diagnosis of Rabbits

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Abstract

This study aimed to evaluate the accuracy of using 7.5 and 5 MHz frequency probe for early pregnancy diagnosis in rabbits by ultrasonography technique. This study was conducted on sexually mature, and healthy twenty five rabbits (5 males and 20 non-pregnant female) were used. Mating was allowed between males and females where isolation of one male and four female was performed in separated cage. Results: early pregnancy diagnosis was easily performed with high accuracy by ultrasonographic scanning using probes of 7.5 MHz frequency on day 7 post-coitum in the pregnant does. Furthermore, using probe of 5 MHz frequency for pregnancy diagnosis was only feasible at 15th day of pregnancy. Conclusions: the use of the linear probe (7.5 MHz) was faster and more accurate in diagnosing pregnancy at an early age compared to the curved probe (5 MHz).

Keywords: Ultrasonography, Pregnancy diagnosis, Rabbits

Introduction

The using of rabbits in the reproductive studies of human has been growing particularly about reproduction in the last decades (1). They are considered as an ideal animal model due to similar maternal-fetal units between rabbits and human as well as suitable size of rabbits for using conventional veterinary scanners (2).

Ultrasound is safe and widely accepted imaging technique which has become a crucial procedure in obstetrics and gynecology setting. Ultrasound is particularly used for the assessment of gestational stages and diagnosis of many fetal abnormalities due to the non-usage of ionizing radiation (3) An early diagnosis of pregnancy is a key factor in reducing the interval between successive inseminations, supplying animals with appropriate diets and enable farmer to identify unwilling or non-receptive does where they can be treated and/or re-mated in due time (4). A determination of pregnancy in highly productive dairy animals became an indispensable and profitable supervision for the economic dairy farms. Following insemination, the accurate and early identification of the pregnant animals in a herd is enviable for the farmer, so that it is feasible to rebreed the non-pregnant animals with the minimum delay. On the other hand, the awareness of pregnancy in animals is helpful for farmers and veterinarians in treating the non-pregnant animals in case of reproductively disability or inappropriate insemination. Hence, early diagnosed pregnant animals could have short period of gestation interval which is utmost substantial in animal management for economic reasons (5).

Different probe frequencies have been used to early diagnose pregnancy by ultrasonographic technique in animals resulting in variable accuracy of pregnancy diagnosis. This study aimed

to evaluate the accuracy of using 7.5 and 5 MHz frequency probe for early pregnancy diagnosis in rabbits by ultrasonography scanning.

Materials and Methods

This study was conducted on sexually mature twenty five local rabbits (five males and twenty females). The animals were acclimatized for 7 days. The females were isolated from males to prevent fertilization. Pregnancy diagnosis was performed to confirm that the isolated females used in the study was non-pregnant. Mating was allowed by keeping one of both male and female in separate cage for sequential five days. Mating was monitored and proposed first day of pregnancy was considered following mating. Diagnosis and confirmation of pregnancy in does was performed on the days 7, 10, 15 and 20 post-coitum using ultrasonography technique.

Ultrasound imaging

A small transducers (linear and curved probes) of 7.5 and 5 MHz frequency were used following ultrasound gel placement directly on the skin to prevent extra air space between probe and the skin which is necessary for the creation of the clear image of the fetus. Animal was in the dorsal recumbency, hair was shaved, gel was placed and the probed was placed and moved alternatively between abdominal and pelvic cavities. During pregnancy period, females were followed up till parturition to confirm the results obtained by ultrasonography of the pregnant uterus. The uterus was imaged and pregnancy was asserted by the observation of the embryonic vesicles in the uterine horn which appeared as a small black sac containing grey-colored fetus as shown by figures in different stage of pregnancy.

Results

Results showed that pregnancy diagnosis by ultrasonography with frequency of 7.5 MHz were 100% accurate which were confirmed later by the results based on parturition. The best time to confirm pregnancy in does using probe of 7.5 MHz frequency was the 7th of pregnancy where clear image of fetus as well as detection of fetuses' number was easily performed. On the other hand, using probe of 5 MHz frequency for pregnancy diagnosis was feasible at 15th day of pregnancy. In addition to that, clearer image with possibility of more accurate diagnosis was obtained using probe of high frequency (more than 5 MHz).

Table 1 shows the number of non-pregnant versus pregnant does using ultrasonography of different frequencies at different time points.

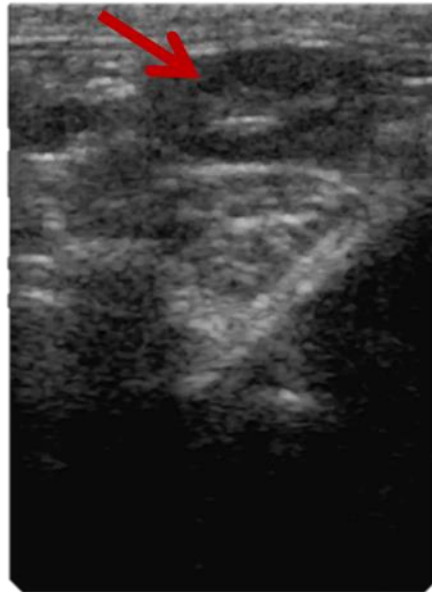| Post-coitum days	5 MHz frequency		7.5 MHz frequency	
	Non-pregnant	**Pregnant**	**Non-pregnant**	**Pregnant**
7	20	zero	5	15
10	15	5	3	17
15	2	18	2	18
20	2	18	2	18

**Figure 1: Transverse section of rabbit uterus (fetus) on 7 day of pregnancy by linear transducer 7.5
MHz. The arrows point to the embryonic vesicle.**
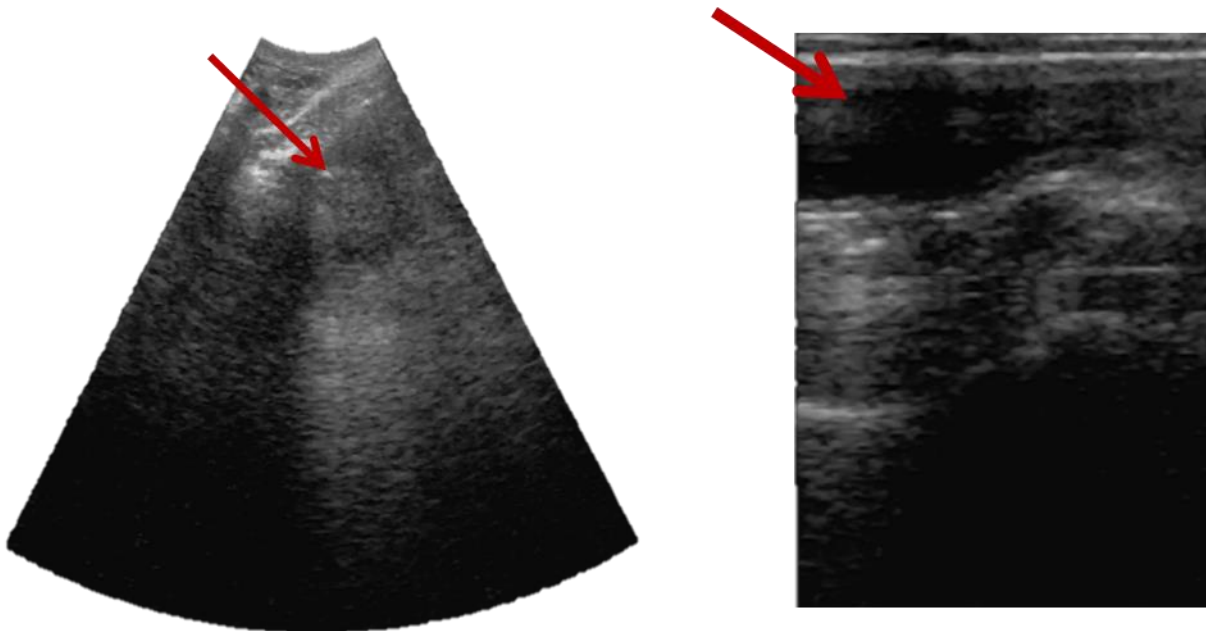

**Figure 2: Transverse section of rabbit uterus(fetus) on the 10th of pregnancy by sector transducer 5
MHz (left) and linear transducer 7.5 MHz (right). The arrows point to the embryonic vesicle.**
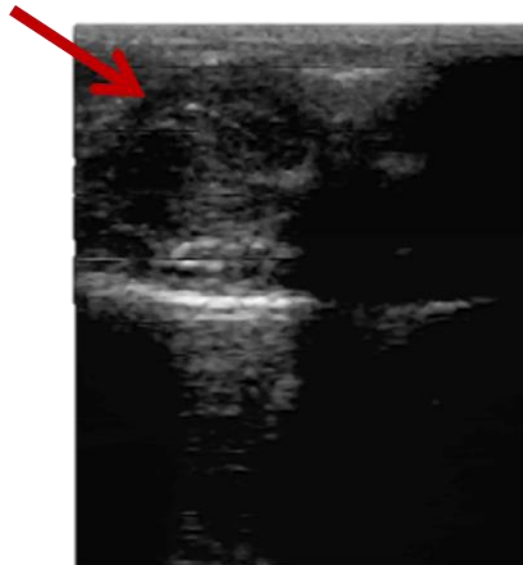
Figure 3: Transverse section of rabbit uterus(fetus) on the 15th of pregnancy by linear transducer 7.5 MHz. The arrows point to the embryonic vesicle.
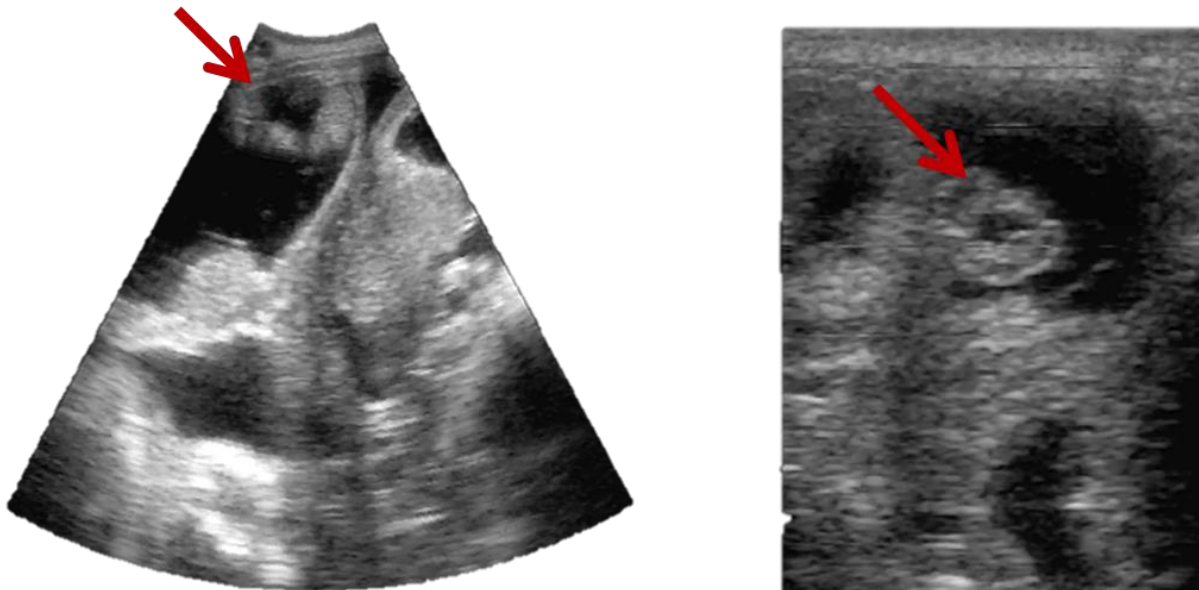

Figure 4: Transverse section of rabbit uterus on the 20th day of pregnancy show head of the fetus by sector transducer 5 MHz (left) and linear transducer 7.5 MHz (right). The arrows point to the embryonic vesicle.

Discussion

Pregnancy diagnosis and estimation isf the gestational age is thought to be important in rabbit practice in spite of short time between parturition. , transabdominal ultrasonographic examination is effective and practical method for pregnancy diagnosis in rabbits in clinics and

farms due to lack of reports of the mating date in clinics and farms (6). Based on the results obtained, the observation and identification of the embryonic vesicles were possible at 7th day following rabbits mating. This result was in agreement with earlier studies as reported by **(7)** that the earlier diagnosis of pregnancy in rabbits was feasible at the five days that followed rabbits mating.

The differentiation between the images of an embryonic vesicle from that of ball of feces would be important because of their similarity in shape and size particularly on 9-10 days post coitum. Usually the feces are echogenic due to their dense composition and their diameter is ranged from 13 to 20 mm (8). On the other hand, the embryonic vesicles are structures containing transparent fluid and have a diameter of 10.5 to 13 mm on day 9 and 10 to 20 mm on day 10 post coitum (9). The uterus of rabbit is ultrasonographically detectable only in pregnant does with a 100% accuracy of pregnancy diagnosis on the day 9 of pregnancy (10). Ultrasound scanning of the abdomen is safe and practical mean of pregnancy diagnosis at an early stage because of the relatively short time required to be performed including restraint, clipping and examination. Furthermore, ultrasound examination of the abdomen is helpful in the diagnosis of extra-uterine pregnancy, ovarian tumors, abscesses, cysts, pyometra and hydrometra in rabbits (11). Comparison of the two methods of pregnancy detection in rabbits confirms. The suitability of manual abdominal palpation is the most suitable commonly applied method which can be performed with less effort and without any equipment and require no equipment is required with less. This method is reliable from day 12 of pregnancy onward where rough handling should be avoided to prevent any considerable strain to the doe which may result in fetal loss (12) .

Conclusions

In conclusion, the use of ultrasound imaging technique is an alternative method to diagnose pregnancy in rabbits. Pregnancy in rabbits was early diagnosed at 7th day following mating by ultrasonography technique using probes of 7.5 MHz frequency. The use of the linear probe was faster and more accurate in diagnosing pregnancy at an early age compared to the curved probe. The accurate results of pregnancy diagnosis were confirmed later by the parturition.

References

1. Carter, A. M. (2007). Animal models of human placentation–a review. *Placenta*, (28), s41–s47.
2. Chavatte-Palmer, P., Laigre, P., Simonoff, E., Chesne, P., Challah-Jacques, M., & Renard, J. P. (2008). In utero characterisation of fetal growth by ultrasound scanning in the rabbit. *Heriogenology*, *69*(7), 859–869.
3. Dom, S., Rashmizal, H., Razak, A., Wahida, F., Zaiki, A., Saat, N. H., … Hashim, U. F. (2013). Ultrasound exposure during pregnancy affects rabbit foetal parathyroid hormone (PTH) level. *Quant Imaging Med Surg*, *3*(1), 49–53. https://doi.org/10.3978/j.issn.2223-4292.2013.02.06
4. Khalil, H., Hanafy, A., Yaseen, M., Hegaze, E., Marthold, D., Gauly, M., & Holtz, W. (2014). PREGNANCY DETECTION IN RABBITS BY ULTRASONOGRAPHY AS COMPARED TO MANUAL PALPATION, *51*, 196–199.
5. Patel, M. D., Parmar, S. C., Patel, A. S., Makwana, P. P., Rajput, M. B., Patel, J. H., & Patel,

A. G. (2016). EARLY PREGNANCY DIAGNOSIS IN DAIRY ANIMALS. *International Journal of Agriculture Sciences, 8*(11), 1134–1136.

6. Turna B. & Erdogan G. (2016). Assessment of fetal growth by B-mode and Doppler ultrasonography in rabbit during pregnancy. *F.Ü.Sağ.Bil.Vet.Derg*, *30*(2), 89–93.

7. Fraser, C. F., Tumbelaka, L. I., & Noviana, D. (2018). Poster Presentation (PF-31) Pregnancy Examination and Fetal Development of Indonesian Domestic Rabbits by Ultrasonography. Hemera Zoa, 576–577.

8. Ypsilantis, P. (1999). Early pregnancy diagnosis in the rabbit by real time ultrasonography. *World Rabbit Science*, *7*(2), 95–99. https://doi.org/10.4995/wrs.1999.385

9. Daniel Jr, J. C. (1964). Early growth of rabbit trophoblast. The American Naturalist, 98(899), 85–98.

10. Inaba. T, Mori .J, T. . . (1986). Use of echography in rabbits for pregnancy diagnosis. (The Japanese Journal of Veterinary Science), 48(5), 1003–1006.

11. Varga M. (2014). Urogenital Diseases. In *Textbook of Rabbit Medicine* (pp. 405–423).

12. Morrell JM. (1995). Artificial insemination in rabbits. Br Vet J, 151(5), 477–488.