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Research Article

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Monitoring of Uterine Involution in Indigenous Ewes Using Ultrasonography

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Abstract

Real-time ultrasonography is a non-invasive diagnostic tool used for the diagnosis of pregnancy, fetus quantification and sex determination in animals. Its use in small ruminant's reproduction is very scanty in Bangladesh. Therefore, we conducted the study to monitor uterine involution in indigenous ewes at the Research Animal Farm, Department of Surgery and Obstetrics, Bangladesh Agricultural University, Bangladesh. After parturition uterine involution was monitored with transabdominal ultrasonography in indigenous ewes. Ultrasonography was performed in nine post-partum indigenous ewes. Daily involution progress was 0.97 $\pm$ 0.25 mm from 3rd to sixth day and 0.13 $\pm$ 0.04 mm from 15th to 18th day of post-partum. At Day 18, we found iso-echogenic image during ultrasonography of uterine lumen, which indicated that uterus returned to its normal texture. The findings of the study could help the veterinarians to determine superior time for uterus to return into its regular structure during selective breed up-gradation program using giant sheep breed.

Keywords: Real-time ultrasonography; Post-partum; Involution of the uterus.

INTRODUCTION

Sheep donating meat, milk and fibre (Shelton, 1995) is drawing the attention of different stakeholders to be used as one of the economically important livestock species in Bangladesh. Recently, government is giving special attention to improving sheep farming in Bangladesh. Crossbreeding is considered as an efficient, thrifty and cost-effective procedure for genetic improvement, utilizes genetic variation across breeds to promote the efficiency of commercial livestock production. Rapid reproductive rate is one of the most important advantages of sheep production. Lambing twice yearly or thrice in two years is the ideal goal of sheep production (Gordon, 1997). For lambing more frequently than once a year, the post-partum interval to the resumption of sexual activity must be reasonably short so that the ewes could become pregnant again with a minimum of delay. To maintain this reproduction rate, actual observation of uterine involution is very much essential in a sheep flock. Uterine involution is completed within 17-40 days post-partum in the sheep (Rubianes und Ungerfeld, 1993). Unlike cattle, the time of uterine involution cannot be predicted by palpating uterus per-rectally in the sheep due to difficulty in rectal or abdominal palpation.

The use of ultrasound (US) in animal reproduction has lead animal scientists to perform modern researches in clinical practice (Jannat *et al.*, 2018). The ultrasound produces echoes visible on the screen as varying shades of gray (black to white) (Rantanen und Ewing III, 1981). B-mode ultrasonography is most accurate, rapid, safe, economical and practical method (Scott, 2012; Ginther, 2014). Uterus is one of the first clinical organs to be examined with US and ultrasonography can differentiate the normal or abnormal post-partum uterus (Krajnicakova *et al.*, 1996). To plan an effective lambing protocol, the time of complete post-partum uterine involution and the onset of ovarian activity must be known. There is no report on ultrasonographic monitoring of post-partum uterus of ewes in Bangladesh. Therefore, considering the above facts, this study was conducted to monitor uterine involution in indigenous ewes using real-time ultrasonography.

MATERIALS AND METHODS

The research was conducted by following the UK Animals (Scientific Procedures) Act, 1986 and associated guidelines, EU Directive 2010/63/EU for animal experiments at the Research Animal Farm (RAF), Department of Surgery and Obstetrics (DSO), Faculty of Veterinary Science, Bangladesh Agricultural University (BAU), Mymensingh, Bangladesh from March 2018 to May 2018.

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Selection and management of ewes as the dam

Total nine ewes of indigenous breed from 1.5 to 2 years old were selected. They were housed in a covered shelter with an open-air run in RAF, DSO, BAU and allowed 6 to 8 hours natural grazing. Routine vaccination and deworming programs were conducted. Each ewe fed approximately 0.5 to 1.0 kg concentrate daily. Teaser male was used for detecting heat.

Examination of the post-partum uterus

Uterine involution was checked using B-mode ultrasound machine (My Lab ®, Esaote) equipped with 7.5 MHz linier and 2.5 MHz convex probes started from 3rd day postpartum to day 18 at three days interval until complete uterine involution. Uterine involution was considered to be complete when there was no further reduction in the uterine diameter for two successive examinations as reported by Zdunczyk *et al.* (2004). All measurements were taken after freezing the images with built-in electronic calipers.

Maximal transversal cross-sectional diameter and the lumen diameters of the right and left uterine horn were recorded on Day3, Day 6, Day 9, Day 12, Day 15 and Day 18. Echogenicity due to the presence of contents in the uterine cavity were also included in this investigation. The ewe was restrained in standing position with the help of an assistant. After evacuation of the rectum the lubricated transducer (fixed to an extension rod) was introduced into the rectum. The transducer was moved medially and laterally along its longitudinal axis to get the best view of the uterine horn and to record maximum diameter. Transabdominal scanning was bilaterally carried out in the inguinal area after shaving a section of the ventral abdominal wall cranial to the udder in order to obtain echo of the extended uterus.

Statistical analysis

Data were analyzed and presented as mean ± SEM. One-way Analysis of Variation (ANOVA) was performed to find out the significant differences of uterine involution progress using IBM SPSS 20.0. P<0.01 was considered as the level of significance.

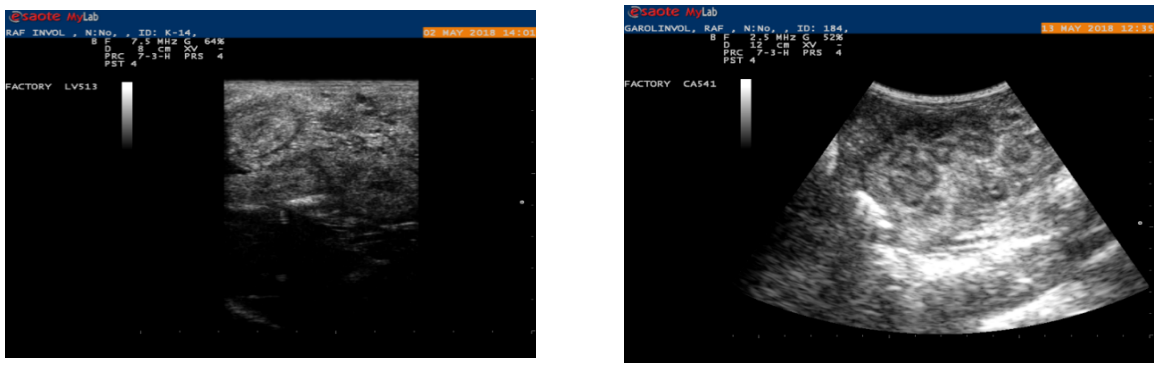


Figure 1: (a) Transrectal view of uterus involution with linier probe; (b) Transabdominal view of uterus involution with convex probe.

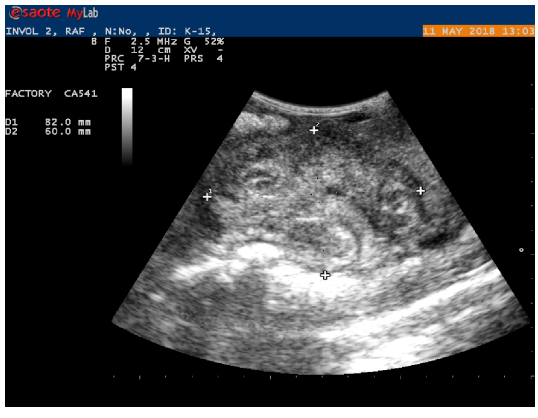
Table 1: Involution of the uterus at different observation time.

Days	Horn lumen size			Daily involution progress		
	Mean ± SEM	Min.	Max.	Mean ± SEM	Min.	Max.
3rd	14.17 ± 0.64[a]	12.10	18.40	-	-	-
6th	11.27 ± 0.46[b]	9.40	13.20	0.97 ± 0.25[a]	0.27	2.87
9th	8.86 ± 0.42[c]	6.60	10.30	0.80 ± 0.11[b]	0.30	1.27
12th	6.42 ± 0.43[d]	4.50	8.50	0.81 ± 0.16[b]	0.20	1.73
15th	6.42 ± 0.43[d]	4.50	6.70	0.27 ± 0.10[c]	0.00	1.00
18th	6.42 ± 0.43[d]	4.40	5.90	0.13 ± 0.04[c]	0.00	0.37

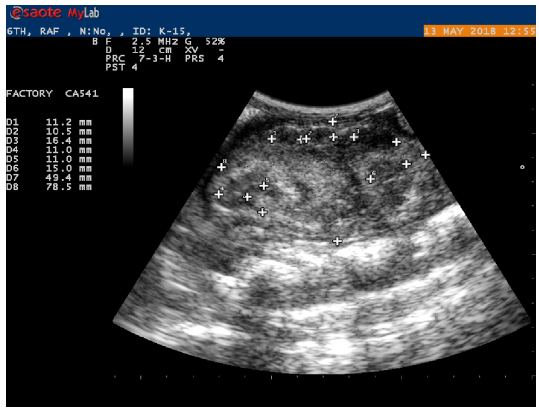
a, b, c & d indicate significant (P<0.05) variation within column.

RESULTS

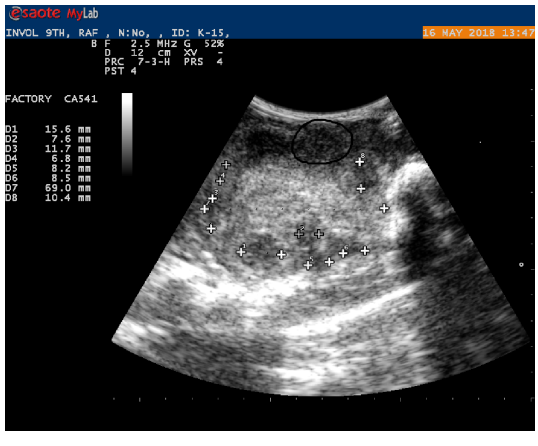
Real-time ultrasonography was performed to study uterine involution in indigenous ewes and luminal size and involution progress are presented in Table 1. Results revealed 14.17 $\pm$ 0.64 mm uterine horn lumen sizes at day 3 after parturition, which gradually decreased. Daily involution progress was 0.97 $\pm$ 0.25 mm from 3rd to sixth days, and this was very markedly decreased from 15th to 18th day of post-partum. Figure 2 (a, b, c, d, e and f) shows involution status of uterus observed at a different time of post-partum. At day 18, we found iso-echogenic image of uterine lumen, when uterus returned to its normal function and position (Figure 2f). Besides, none of the ewes was in heat when checked with teaser male.



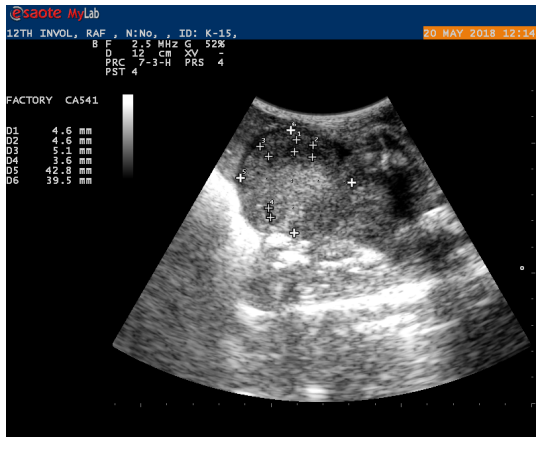
(a) 3rd-day involution



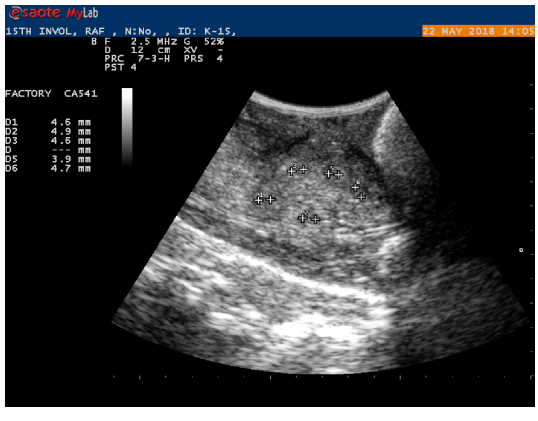
(b) 6th-day involution



(c) 9th-day involution



(d) 12th-day involution



(e) 15th-day involution

(f) 18th-day involution

Figure 2: Uterine involution progress at three days interval (a, b, c, d, e, f)

DISCUSSION

The post-partum fertility is based on the involution of the uterus and the resumption of ovarian activity. The post-partum period in the sheep is very crucial from a reproductive perspective. Ultrasonography is routinely used to observe post-partum uterus. We monitored uterine involution in indigenous ewes using 2.5 MHz convex transabdominal transducer. Results revealed 14.17 $\pm$ 0.64 mm uterine horn lumen sizes, which gradually decreased (Table 1). Daily involution progress was 0.97 $\pm$ 0.25 mm from 3rd to sixth days and this was very markedly decreased from 15th to 18th day of post-partum. Baru *et al.* (1983) found that the post-partum uterine lumen's diameter decreased rapidly until day 11 post-partum, in ewes. We observed complete involution between 15-18 days post-partum. Whereas, Rubianes und Ungerfeld (1993) reported that uterine involution varied between day 17 and day 40 in the sheep. Hauser und Bostedt (2002) and Zdunczyk *et al.* (2004) reported transrectal ultrasonography as a useful and reliable method to observe the uterine involution in sheep. However, several factors like breed, management, season, dystocia and suckling can influence the process of uterine involution (Hauser und Bostedt, 2002).

The results of the study lead to the duration of complete uterine involution in indigenous ewes and their daily involution progress. Uterine involution is remarkable highest at 3-6 days post-partum. In our country, there is no controlled breeding system in practice. Both ewes and rams are always maintained together in a group and are allowed them grazing together. This study will help the veterinarians to determine an optimum time for uterine involution and monitor estrus for ewe's rapid post-partum reproduction, which will help in the commercialization of sheep farming using large sheep breed in Bangladesh.

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