ULTRASONOGRAPHIC EVALUATION OF LUTEAL GROWTH AND REGRESSION CHARACTERISTICS IN CROSSBRED CATTLE

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Abstract:

With view to study the luteal growth and regression pattern, ultrasonographic studies were carried out in 10 apparently healthy crossbred dairy cattle at 24 hour interval from the day of ovulation to next oestrus. In all the animals the span of corpus luteum (CL) was completed in three phases like growth, stationary and regression phase. First appearance of CL by transrectal ultrasonography (TRUS) was detected on third day of ovulation and was imaged as poorly defined, uneven, greyish-black structure with echogenic spots within the ovary. An increased growth rate of CL was noticed up to day 8 post ovulation, formed the growth phase. Mean maximum diameter of CL was observed on day11.From day 8 to day 16 of ovulation the luteal growth rate is in a stationary phase and the luteal regression observed from day 16 or 17 post ovulation.

Key words: Corpus luteum, Transrectal ultrasonography

Correct identification of the bovine CL is a real challenge to the veterinarian as this structure can present diverse morphological manifestations depending on the stage of development. Ultrasonography offered a much better break in the bovine reproductive studies as it permitted the absolute appraisal of the functional and structural condition of the CL (Ribadu *et al*. 1994). The predictive value for the detection of corpus luteum by rectal palpation during mid-cycle was 73.2 per cent but it was 85.3 per cent by ultrasonographic method. The detection of CL regression was difficult by rectal palpation and a positive predictive value of only 64 per cent was observed (Pieterse *et al*. 1990).

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The mature CL is hypoechoic (darker) compared to the ovarian stroma due to extensive vascularization. In bovine reproduction, to identify the presence of corpus luteum (CL) at different stages of oestrous cycle is very important as it is helpful in deciding to initiate a synchronized ovulation protocol (Ovsynch) or to propose treatment with prostaglandin. Detection CL in heifers confirms that it has attained puberty. Recognition of presence of CL on the left or right ovary can give indication to the veterinarian, in which uterine horn the presence of an embryo or fetus needs to be examined for pregnancy diagnosis. It is also possible in these cases to verify the presence of a large follicle (≥8 mm) for better prediction of the response and success of the proposed synchronization reproduction protocol (Luc Descoteaux, 2010).

Materials and Methods

The study was performed at University Livestock Farm and Fodder Research and Development Scheme (ULF &FRDS), Veterinary and Animal Sciences University, Mannuthy. Ten apparently healthy postpartum crossbred dairy cows with a history of normal calving, maintained under identical conditions of feeding and management were selected for the study. The body condition score (BCS) of all the selected animals were calculated based on a five scoring point system as described by Edmonson *et al*. (1989). An absolute body condition score was derived for each cow and the animals with a body condition score of 3 or more were selected for the study. Detailed clinico-gynaecological examination was carried out to rule out any anatomical defects and pathological conditions and all the animals were screened for subclinical endometritis by performing white side test. The study started on the day of oestrus and the luteal characteristics were sonographically monitored from the day of ovulation. Trans-rectal scanning of uterus was performed using a real time colour Doppler ultrasound scanner (Mylab ™ Gamma, Esoate SPA, Italy) equipped with linear array transducer, 5-10 MHz frequency. The gain, brightness and contrast were set optimally for each examination. Ovulation was sonographically deemed either by the disappearance of Graafian follicle

Table 1. Growth and regression pattern of corpus luteum in crossbred cattle (n=10)

Days post ovulation	Volume (Mean± SE) (ml)	Area (Mean± SE) (cm^2)	Diameter (Mean± SE) (mm)
3D	1.92± 0.19	1.65± 0.11	13.81± 0.65
4D	3.10± 0.24	2.32± 0.16	16.11± 0.51
5D	4.14± 0.31	2.84± 0.14	18.71± 0.39
6D	4.82± 0.30	3.07± 0.09	20.30± 0.36
7D	5.33± 0.25	3.40± 0.10	21.26± 0.29
8D	5.84± 0.41	3.61± 0.15	21.72± 0.41
9D	7.27± 0.55	3.96± 0.15	22.51± 0.34
10D	7.87± 0.69	4.08± 0.19	22.66± 0.57
11D	7.68± 0.56	4.09± 0.18	22.88± 0.45
12D	7.39± 0.56	3.94± 0.15	22.57± 0.46
13D	7.49± 0.57	3.93± 0.12	21.97± 0.36
14D	7.28± 0.48	3.67± 0.14	21.93± 0.51
15D	6.87± 0.41	3.66± 0.11	21.49± 0.57
16D	6.13± 0.45	3.57± 0.13	21.12± 0.45
17D	4.32± 0.54	2.74± 0.15	19.00± 0.61
18D	3.48± 0.48	2.41± 0.13	16.75± 0.53
19D	2.32± 0.20	1.88± 0.07	14.89± 0.35
20D	1.85± 0.17	1.60± 0.11	13.65± 0.20

J. Vet. Anim. Sci. 2018. 49 (2) :74 - 77

or appearance of corpus hemorrhagicum. Following ovulation, trans-rectal sonographic assessment of the luteal growth and regression was performed at 24h interval up to the next oestrus.

Results and Discussion

Luteal growth and regression patterns were studied in 10 animals at 24 h interval from the day of ovulation to next oestrus. During the

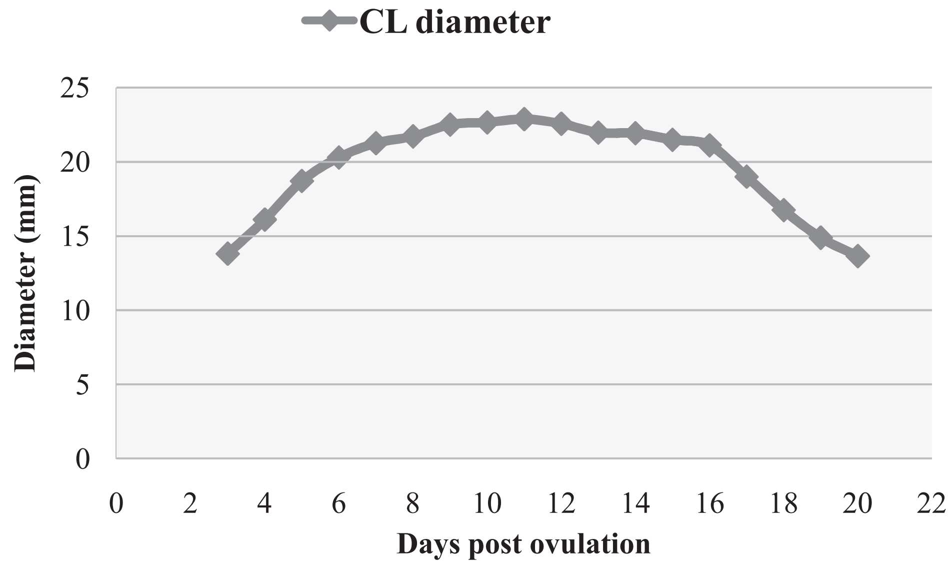

Fig 1. Growth and regression pattern of corpus luteum in crossbred cattle

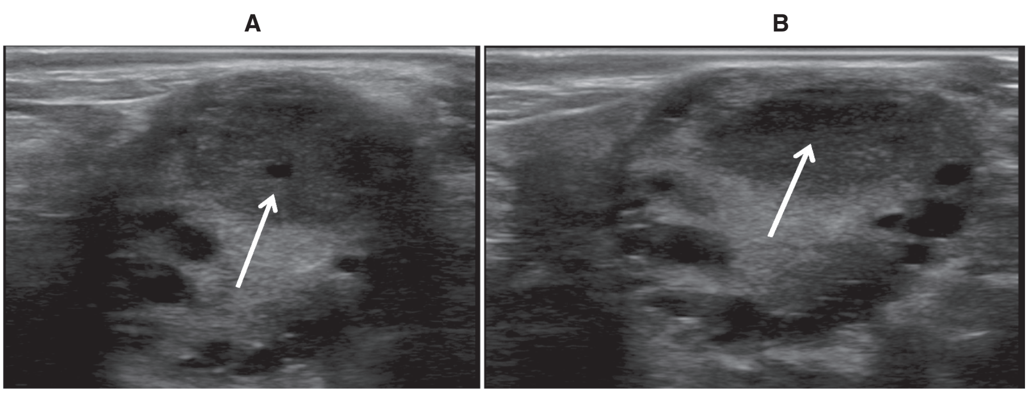

Fig 2. Developing Corpus Luteum (CL): CL on day 3 (A) CL on day 5 (B)

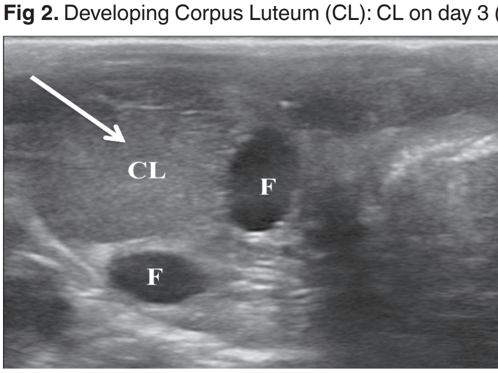

Fig 3. Developed CL on day 10

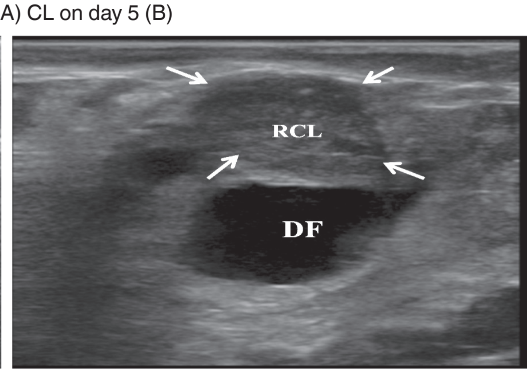

Fig 4. Regressed Corpus Luteum on the day of oestrus

J. Vet. Anim. Sci. 2018. 49 (2) :74 - 77

period of study luteal size, area and volume were recorded. Ovulation could be detected either by the disappearance of graafian follicle or by the detection of corpus hemorrhagicum on the day of ovulation. Corpus hemorrhagicum appeared as a more hypo-echoic, darker area as against the ovarian stroma. Clear appearance of CL by TRUS was recognized on third day of ovulation and sonographically imaged as poorly defined, uneven, greyish-black structure with echogenic spots within the ovary. This finding is in accordance with the findings Pierson and Ginther (1984) who found that the corpus luteum was identifiable throughout the inter-ovulatory interval except from day 0-2 post ovulation when CL was indistinct. First appearance of CL by transrectal ultrasonography was detected on third day of ovulation (Fig 2). An increased growth rate of CL was noticed up to day 8 post ovulation. Mean maximum diameter (22.88± 0.45 mm) of CL was observed on day10 or 11 (Fig3). From day 8 to day 16 of ovulation, the luteal growth rate was in a stationary phase. Further, luteal regression was identified from day 16 or 17 post ovulation and the rate of luteal regression observed was 1.77± 0.24 mm/day (Fig. 1 and Table 1). Complete regression of CL was observed on the day of oestrus (Fig 4). These findings are in harmony with the report of Kito *et al.* (1986), Herzog *et al.* (2010) and Ghuman *et al.* (2014) who studied the luteal growth and regression pattern using B-mode and color Doppler ultrasonography and observed a two fold increase in the size of CL during growth phase (day 7-8 post ovulation) and persisted as such during the static phase (day 8-16) which then underwent a decrease in size rather slowly during the phase of luteal regression (1-5 days prior to oestrus).

Though TRUS requires skill of performing, it possess various advantages like early identification, growth and regression characteristics of CL, identification of follicular characteristics concurrently with luteal studies which is limiting with rectal palpation. These merits facilitate effective use of ovulation synchronization protocols, improving its efficiency in dairy cattle.

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