Post-treatment sequential ultrasound imaging of follicular cyst in a crossbred dairy cow

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Abstract Several studies in dairy cattle have investigated the final outcome of different treatment regimens in follicular cyst condition. However, sequential monitoring of the response of follicular cysts to these treatments is rather scanty. In this paper, we present the response of a large follicular cyst in a pluriparous crossbred dairy cow with prolonged conception failure to human chorionic gonadotropin, hCG (3,000 IU; day 0) and cloprostenol (500 µg; day 9) treatment. Using transrectal ultrasonography (USG), reproductive tract was imaged daily beginning day 0 until day 11. The follicular cyst showed a consistent regression to a very small anechoic area on day 7 and was undetectable thereafter. Concurrently, there was development of a new dominant follicle that was first detected on day 4 and showed progressive growth to preovulatory stage. The cow was inseminated and ovulation occurred, as diagnosed by the presence of a corpus luteum (CL) 7 days later, but conception did not occur. The animal was re-inseminated after estrus detection in the estrous cycle that immediately followed. Pregnancy diagnosis was performed on 30 and 60 days post-insemination (DPI) and the cow was confirmed to be pregnant. This paper underscores the importance of diagnostic ultrasound in veterinary medicine, especially in the management of reproductive problems.

Keywords Dairy cattle · Conception failure · Follicular cyst · Transrectal USG · hCG · Cloprostenol

Riassunto Molti studi sui bovini da latte hanno indagato l'esito dei diversi trattamenti in presenza di cisti follicolari, tuttavia, il monitoraggio della risposta a questi trattamenti è piuttosto scarso, nella letteratura. In questo articolo presentiamo la risposta di una voluminosa cisti follicolari in una mucca da latte pluripara, con prolungata incapacità alla procreazione, al trattamento con gonadotropina corionica umana, hCG (3000 UI; giorno 0) e cloprostenolo (500 mcg; giorno 9). Utilizzando l'ecografia transrettale (USG), è stato valutato l'apparato riproduttivo quotidianamente dall'inizio, giorno 0, fino all'11° giorno. La cisti follicolare ha mostrato una regressione costante fino ad apparire come una formazione molto piccola, anecogena, il giorno 7 e in seguito non era più rilevabile. Contemporaneamente c'è stato lo sviluppo di un nuovo follicolo dominante, che è stato rilevato la prima volta il giorno 4, ed ha mostrato una crescita progressiva fino alla fase preovulatoria. La mucca è stata inseminata e si è verificata l'ovulazione, come diagnosticato dalla presenza di un corpo luteo (CL), sette giorni più tardi, ma il non vi è stato concepimento. L'animale è stato ri-inseminato nel ciclo mestruale immediatamente successivo. La diagnosi di gravidanza è stata eseguita il 30° e il 60° giorni dopo l'inseminazione (DPI) e la mucca era realmente incinta. Questo articolo sottolinea l'importanza della diagnostica ecografica in medicina veterinaria, in particolare nella gestione dei problemi riproduttivi.

Introduction

Follicular cysts in dairy cattle are defined as follicles with a diameter greater than or equal to 2 cm that are present on one or both ovaries in the absence of any luteal tissue and that clearly interfere with normal ovarian cyclicity [1]. The

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condition has a huge negative impact on fertility and overall productivity, owing to its effects on reproductive parameters such as calving to conception interval, number of services per conception, and pregnancy rate [2, 3]. Incidence has been reported to vary from 5.6 to 18.8 % [4], although the actual figure may be higher because of the fact that 60 % of cows that develop cystic ovarian degeneration before the first postpartum ovulation recover spontaneously and may go undetected [5]. Diagnosis is generally made on the basis of behavioral abnormalities, transrectal

examination, ultrasonography (USG), and plasma or milk progesterone assays. On ultrasound examination, follicular cysts are seen to have a thin wall (≤ 3 mm) and the follicular fluid is uniformly anechogenic [6]. Different treatment regimens involving gonadotropin releasing hormone (GnRH), hCG, prostaglandin F $_{2\alpha}$ (PGF $_{2\alpha}$), and progesterone have been evaluated with respect to their efficacy in resolving the condition and reproductive performance post-treatment [7]. However, studies on sequential monitoring of follicular cysts after treatment are rather scanty. The aim

Fig. 1 Ultrasonograms depicting post-treatment response of follicular cyst in a dairy cow

of this paper is to present post-treatment sequential changes in a large follicular cyst imaged using transrectal USG in a dairy cow.

Case description

A pluriparous crossbred dairy cow (aged 10 years) at Instructional Dairy Farm, G.B. Pant University of Agriculture and Technology was reported with a problem of conception failure since last 12 months despite being repeatedly inseminated after detection of estrus by visual observation. During this period, the cow showed seven estrous cycles and different approaches such as double or multiple inseminations, intrauterine antibiotic infusions, and voluntary decision to not inseminate despite detecting the animal in estrus (sexual rest) were tried with no success.

All the restraint and handling procedures were performed in compliance with the institutional and national guidelines on animal care and handling. Transrectal USG of the reproductive tract performed using high standard ultrasound equipment (DIGI 600 M PRO VET with a 5 MHz linear array transducer; S.S. Medical Systems (I) Pvt. Ltd., India) revealed the presence of a large follicular cyst on the right ovary. The cow was administered 3,000 IU hCG (Chorulon®, Intervet Animal Health) by intravenous injection (day 0) and 500 µg cloprostenol (Vetmate®, Vetcare) intramuscularly on day 9. Daily USG monitoring of the reproductive tract was done beginning day 0 until day 11 (Fig. 1a–o). The cow was observed to be in estrus on day 11 (evening) and was artificially inseminated 12 h later (day 12). Estrus was again noticed 19 days later and the animal was re-inseminated. Pregnancy diagnosis by USG performed at 30 days post-insemination (DPI) revealed that the animal was pregnant, which was further confirmed later at 60 DPI (Fig. 1p).

Discussion

One of the important inferences that can be drawn from the case description presented above is the usefulness of diagnostic ultrasound in veterinary medicine, especially in the management of reproductive problems. Precise diagnosis of reproductive disorders makes it possible for the veterinarian to use specific treatments indicated for these disorders, which is both time and cost effective for the farmer. Since overall productivity of the dairy enterprise is highly dependent on the reproductive efficiency of the herd, early and accurate diagnosis and treatment of reproductive problems could reduce the number of days open and increase profitability of the enterprise. Moreover, specific treatments usually cost the farmer less than that

Fig. 2 Post-treatment diameters (mm) of follicular cyst and dominant follicle in a dairy cow

incurred on empirical diagnosis-based non-specific poly-pharmacy approaches that are very common in India.

Different responses of follicular cysts to the treatment have been reported including partial or complete luteinization, regression, and ovulation [4, 7]. In this case, after hCG treatment the follicular cyst showed a consistent regression to a very small anechoic area on day 7 (Figs. 1k, black arrow and Fig. 2) and was undetectable thereafter. Concurrently, there was development of a new dominant follicle that was first detected on day 4 (Fig. 1f) and showed progressive growth to preovulatory stage (Fig. 1f, h, j–o, white arrows and Fig. 2). Although the cow was inseminated and ovulation occurred, as diagnosed by the presence of a corpus luteum 7 days later, conception did not occur. However, the animal became pregnant in the estrous cycle that immediately followed. This could be attributed to the carry over effects of follicular cyst condition on the ovary and/or the uterus, which take some time to get neutralized.

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Conflict of interest F. A. Khan, Muqtaza Manzoor Khan, Shiv Prasad declare that they have no conflict of interest related to this paper.

Human and animal studies The study was conducted in accordance with all institutional and national guidelines for the care and use of laboratory animals.

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