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CASE REPORT

Diagnosis of Ovarian Follicular Cyst in a Beetal Goat by Ultrasonography and Treatment with GnRH-PGF$_{2\alpha}$

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A B S T R A C T

A one year old healthy Beetal goat with nymphomaniac signs was diagnosed for ovarian follicular cyst via transrectal ultrasonography. Two ovarian scans at 10-days interval revealed an anechoic mass >10 mm in diameter with thin echogenic wall on the right ovary. The follicular cyst was treated with single dose of GnRH (50µg; i.m., Day 0), followed by a luteolytic dose of PGF$_{2\alpha}$ (0.075 mg, i.m.) on Day 11. The efficacy of the treatment was determined by monitoring ultrasonographic changes in follicular cyst on Days 0, 11 and 16, and by measuring plasma estradiol and progesterone concentrations on Days 0, 3, 6, 7, 11, 13 and 16. After GnRH treatment, Latinization of follicular cyst occurred and plasma progesterone concentration increased in tandem with the decrease in estradiol concentration. After PGF$_{2\alpha}$ treatment, luteinized cyst regressed and plasma progesterone concentration decreased while of estradiol increased. The goat expressed estrus 84 h after PGF$_{2\alpha}$. In conclusion, the combination of GnRH-PGF$_{2\alpha}$ is an effective therapy for a follicular cyst in Beetal goat.

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INTRODUCTION

In goats, follicular cysts contribute ~18% of the reproductive disorders resulting in infertility (Moreira *et al.*, 1991). A follicular cyst in goats is characterized as a fluid filled, thin walled ovarian structure >10 mm in diameter persisting for more than 10 days (Souza *et al.*, 2013). Limited information is available on the diagnosis and pathogenesis of follicular cyst in goats despite the fact that its incidence is as good as in cattle. Diagnosis of follicular cyst is difficult in goats due to the limitation in performing rectal palpation and unavailability of ultrasound equipment under field conditions. In goats, ultrasonography is considered as a gold standard for the reliable diagnosis of ovarian cyst (Medan *et al.*, 2004).

Goats affected with follicular cyst fail to catch breeding season if remain untreated. In cows, gonadotropin releasing hormone (GnRH) is often used to induce luteinization and ovulation of a follicular cyst (Šťastná and Šťastný, 2012). A similar approach has been documented in Egyptian Shiba goats with a high success rate of 80% (Medan *et al.*, 2004). In Pakistan, among various breeds of goats, Beetal is popular and constitutes ~10% of the goat population (Anonymous, 2006). However, there is limited information available on reproductive disorders of Beetal goats, especially the diagnosis and hormonal therapy of follicular cyst. This case describes the diagnosis of follicular cyst in a Beetal goat based on transrectal ultrasonography and provides an insight of endocrine milieu following treatment with the GnRH-PGF$_{2\alpha}$ protocol.

Case history, clinical examination, and diagnosis: A one year old healthy Beetal goat (weight~55Kg; BCS=3) at Small Ruminant Training and Research Center, Pattoki, Kasur was observed in intermittent estrus (nymphomania) for a week during the breeding season (September-November, 2015). The goat was mounting on other does, showing bucky behavior and serving as a teaser in the flock. The goat was scanned twice at an interval of 10 days with 7.5 MHz transrectal trasducer (Honda, HS1500, Tokyo, Japan) (Khan *et al.*, 2015). At both occasions, an

anechoic mass >10 mm in diameter with thin echogenic wall was detected in the right ovary (Fig. 1A), while there were small follicles on the left ovary. Based on the ultrasound examinations, persistent nature of the follicle and nymphomaniac signs, the goat was diagnosed as having a follicular cyst.

Treatment and blood sampling: The goat was subjected to GnRH-$PGF_{2\alpha}$ treatment. On Day 0, GnRH analog (50µg, Dalmarelin®, FATRO, Italy) was administered, followed by $PGF_{2\alpha}$ (0.075mg; Dalmazine®, FATRO, Italy) on Day11, intramuscularly. Plasma progesterone and estradiol concentrations were monitored on Days 0, 3, 6, 7, 11, 13 and 16. For this purpose, blood from the jugular vein was collected into heparinized vacutainers (18G, 3ml; Bolton Scientific Ltd. the United Kingdom) and plasma was separated by centrifugation at 1200 x g for 15 min. All samples were stored at -20°C until hormonal assays. Plasma concentrations of estradiol and progesterone were measured by solid phase radioimmunoassay through commercially available kits (ImmunoTech®, Prague, Czech Republic) using ^{125}I-labelled tracer. The intra-assay coefficients of variation for progesterone and estradiol were 2.2 and 0.2%, respectively. Additionally, the follicular cyst was scanned on Days 0, 11 and 16 of GnRH treatment, using transrectal ultrasonography with 7.5 MHz transducer (Khan *et al.*, 2015). The onset of the standing estrus was determined using a buck after administration of $PGF_{2\alpha}$.

Post-treatment hormonal profile: Prior to the administration of GnRH (Day 0), the diameter of follicular cyst was 11.5 mm (Fig. 1A), and plasma progesterone and estradiol concentrations were 1.0 ng/ml and 5.8 pg/ml, respectively (Fig. 2). By the Day 7 (post-GnRH), plasma concentration of progesterone increased to 11ng/ml, whereas of estradiol reached nadir at 0.42pg/ml; indicating the luteinization of the follicular cyst. Consequently, nymphomaniac signs disappeared within 2-3 days following GnRH treatment. By Day 13 (2 days after $PGF_{2\alpha}$ treatment), plasma concentration of progesterone decreased to 0.6ng/ml; indicating the luteolysis of the follicular cyst (Fig. 2). On Day 16, plasma concentration of estradiol reached 14pg/ml (Fig. 2). The goat was observed in estrus after 84 h of $PGF_{2\alpha}$ treatment; suggesting a successful response of follicular cyst to the GnRH-$PGF_{2\alpha}$ regimen. Analysis of the ultrasound images revealed that anechoic lumen of the follicular cyst regressed and its walls thickened after the administration of GnRH. Following $PGF_{2\alpha}$ treatment, previously luteinized cyst regressed, and a dominant follicle was detected on the right ovary on Day 16 (Fig. 1B).

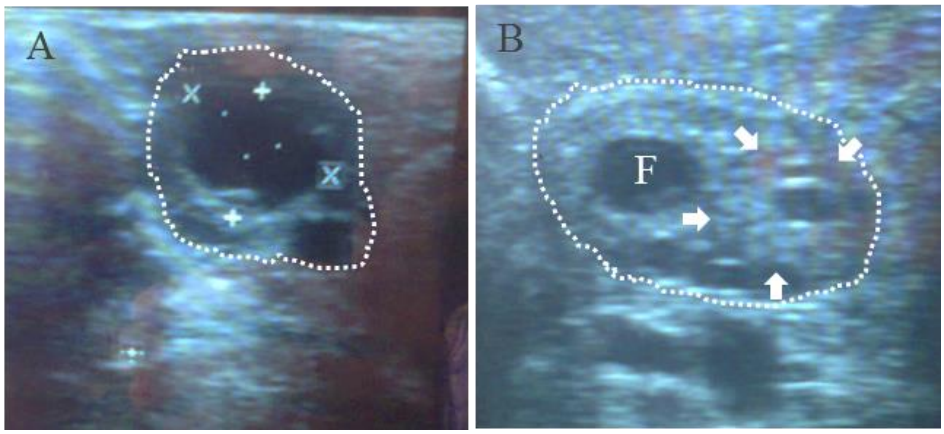

Fig. 1: A) An echogenic thin-walled follicular cyst with an anechoic lumen (cursors; diameter 11.5 mm) found in Beetal goat prior to GnRH administration. **B)** A regressing hypoehoic follicular cyst (arrows) beside a dominant follicle (F; 8 mm diameter) on Day 16. Dotted lines represent the boundary of the right ovary.

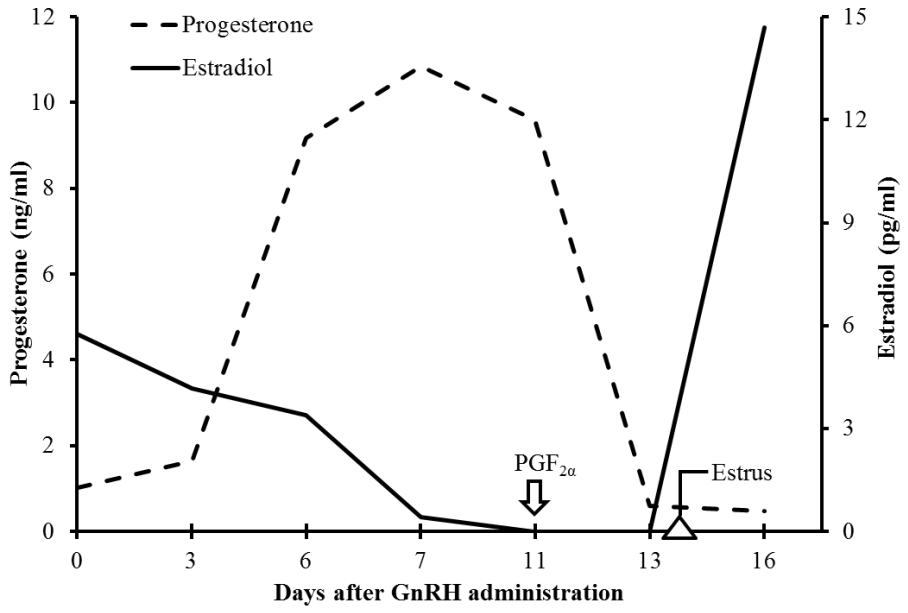

Fig. 2: Changes in plasma progesterone and estradiol concentrations following GnRH-$PGF_{2\alpha}$ treatment in a Beetal goat diagnosed with a follicular cyst. The onset of standing estrus (Δ) was observed after 84 h of $PGF_{2\alpha}$ treatment.

DISCUSSION

The ovarian follicular cysts are anovulatory structures reported in goat (Souza *et al.*, 2013) and sheep (Khodakaram-Tafti and Davari, 2013). This case report demonstrates that transrectal ultrasonography, along with nymphomaniac signs, is a reliable tool for the diagnosis of ovarian follicular cyst. Additionally, a combination of GnRH and $PGF_{2\alpha}$ can successfully resolve follicular cyst by inducing cyclicity in the Beetal goat. Similar findings in Egyptian Shiba goat with follicular cysts suggest that GnRH is an effective therapeutic agent (Medan *et al.*, 2004). On the other hand, findings in the goats having a follicular cyst with or without hydrometra suggest that human chorionic gonadotropin hormone (hCG; 500 IU) was not effective in luteinizing the follicular cyst (Souza *et al.*, 2013).

In goats, follicular cyst has been documented in the presence (Simões *et al.*, 2009) and absence (Medan *et al.*, 2004) of the corpus luteum; therefore, the plasma concentration of progesterone at the time of diagnosis varied from 1 to 5 ng/ml. Hence, clinical diagnosis on the basis of plasma progesterone alone may not depict the complete situation and is not as reliable as transrectal ultrasonography. The development of the follicular cyst in the Beetal goat may be attributed to 1) irregular secretion of hypothalamic GnRH, 2) lack of LH surge due to perturbation of estradiol feedback mechanism, and 3) altered expression of gonadotropin receptors in the follicular cyst as suggested in cows (Ortega *et al.*, 2015). However, the development of follicular cyst in goats may be different from cattle since experimental treatment with estradiol and progesterone did not induce follicular cyst in the goats (Tanaka *et al.*, 2007). Therefore, exact pathogenesis of follicular cyst remains unknown in goats.

In this case study, the efficacy of GnRH-$PGF_{2\alpha}$ treatment was monitored through plasma progesterone and estradiol concentrations. The cystic condition was resolved after GnRH injection as plasma progesterone concentration increased progressively due to luteinization of the follicular cyst rather than ovulation; hence no new corpus luteum was detected on subsequent ultrasound examination. Later, lysis of luteinized cyst through $PGF_{2\alpha}$ injection resulted in decreased plasma progesterone and increased estradiol concentration, and the goat was observed in estrus 84h later. Similar changes in plasma progesterone and estradiol have been reported in Egyptian goats after treatment with GnRH-$PGF_{2\alpha}$ for follicular cyst (Medan *et al.*, 2004).

The incidence of ovarian follicular cyst is not documented in the Beetal goat. Based on the information from other breeds of goats, incidence of follicular cyst varies from 0.6 to 18-21% (Moreira *et al.*, 1991; Khodakaram-Tafti and Davari, 2013). Under field conditions, ovarian cysts are not well investigated due to lack of diagnostic tools and understanding on the therapeutic use of the hormones. As a result, follicular cyst affects fertility of the goat in breeding and non-breeding season. This case report provides the basis for the clinical diagnosis of the follicular cyst in Beetal goat and highlights the endocrine changes associated with successful hormonal therapy.

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Author's contribution: MIRK investigated, planned and wrote the case study, MEH and AR performed transrectal ultrasonography and blood sampling. MH, NA and RK arranged and performed the hormonal analysis. IM supervised the feeding and management of the goat. All authors critically reviewed and edited the manuscript.

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