

Morphometry and Histology of Ovaries in Malabari Goats

Bijna .M¹, Karthiayini K.², Lucy, K. M.³

¹MVSc Scholar Department of Veterinary Physiology, KVASU, Mannuthy

²Professor, Department of Veterinary Physiology, KVASU, Mannuthy

³Professor and Head, Department of Veterinary Anatomy and Histology, KVASU, Mannuthy

Abstract: *The almond-shaped pale colored ovaries in Malabari goats were seen situated in the edge of the mesovarium. The mean (\pm S.E) value of weight, thickness and breadth of right (1.69 ± 0.26 g, 4.66 ± 0.29 mm, 10.40 ± 0.31 mm) and left (1.65 ± 0.22 g, 4.49 ± 0.22 mm and 10.33 ± 0.40 mm) ovaries were not significantly different in Malabari breed. The length of right ovary (17.87 ± 0.79 mm) was significantly higher than that of the left (15.31 ± 0.57 mm). There was no significant difference in the number of medium sized follicles (3-5 mm) and large follicles (>5 mm) between left and right ovaries. The primordial follicles had a mean diameter of $68.04\pm 0.33\mu$ m. The average diameter of primary follicle, secondary and Graafian follicle was $115.13\pm 0.64\mu$ m, $227.85\pm 0.43\mu$ m and $970\pm 33.78\mu$ m, respectively.*

Keywords: Ovary, primary, secondary, Graafian, oocyte

1. Introduction

The goat (*Capra hircus*) being a good source of meat, milk, fibre and skin supports small and marginal farmers of developing countries like India. Malabari breed (Tellicherry goats) an indigenous breed of Kerala is known for its low fat meat, medicinal properties of the milk, high prolificacy with 50% twinning, 25% triplets and 5% quadruplets [5]. Ovary has paramount importance in fertility and hence reproduction. The reproductive physiology of goat is least understood compared to sheep and cattle. Understanding the follicular dynamics helps in better exploitation of the beneficial aspects of goat reproduction.

In this background the present study was undertaken to evaluate the histomorphological changes of ovary in Malabari goats during various stages of folliculogenesis.

2. Materials and Methods

The experiment was conducted in six adult Malabari goats. The ovaries of cyclic culled animals from All India Co-ordinated Research Project (AICRP) Goat Farm, Kerala Veterinary and Animal Sciences University, Mannuthy, were used for the study. Does of two to five years weighing 15.6-35 kg were used for the study. Immediately after collection, the ovary was washed with the chilled normal saline (NS). Ovaries were transported to the laboratory within 90 min after slaughter in thermoflask containing chilled phosphate buffered saline (PBS) solution. The ovaries were washed with normal saline and the adipose tissues surrounding the ovaries were removed by dissection.

The right and left ovaries were weighed with the help of an electronic balance. The length and width were measured with help of Vernier callipers. Ovaries were fixed in 10 percent formalin and standard procedures were adopted for processing and sectioning and the sections were stained using haematoxylin and eosin (H&E).

The sections were observed under bright field microscope. The follicles were classified into four categories according to the number and morphology of granulosa cell layers as: i) Primordial follicles with one layer of flattened granulosa cells surrounding the oocyte; ii) Primary follicles with a single layer of cuboidal granulosa cells; iii) Secondary follicles with two or more layers of granulosa cells but no antrum and iv) Antral follicles having an antral cavity with multiple layers of granulosa cells. The diameter of the follicles, thickness of follicular layers (granulosa and theca cells), and diameter of the oocytes were measured using micrometric methods.

3. Results and Discussion

The age of the Malabari breed under the study ranged from 2 to 5 years with a mean (\pm S.E) age of 4.42 ± 0.90 years. The body weight of the does ranged from 15.6 to 35 kg, with a mean (\pm S.E) weight of 25.45 ± 2.75 kg.

The almond-shaped pale colored ovaries were seen situated in the edge of the mesovarium. The mean (\pm S.E) value of weight, thickness and breadth of the right (1.69 ± 0.26 g, 4.66 ± 0.29 mm, 10.40 ± 0.31 mm) and left (1.65 ± 0.22 g, 4.49 ± 0.22 mm and 10.33 ± 0.40 mm) ovaries were not significantly different in Malabari breed. But the length of right ovary (17.87 ± 0.79 g) was significantly higher than that of the left (15.31 ± 0.57 g) and this might be due to the more physiological activity of right ovary than left [3,4]. Similar results are reported in goat (Asadet al., 2016).

The number of follicles on the surface of the ovary was recorded separately in right and left ovaries (Fig. 1) and classified in to medium follicles (3-5 mm) and large follicles (>5 mm). Ariyaratna and Gunawardhana (1997) observed that the average number of antral follicles of 1mm or more was 31 [1]. In the present study in Malabari goats, a total of 38 visible follicles were recorded on the surface of the ovary. Average number of follicles was 3.83 ± 0.401 (medium) and

1.50±0.224 (large) in the left ovary and 5.00±0.365 (medium) and 1.50±0.224 (large) in the right ovary but there was no significant difference between the two ovaries as far as the number of follicles was concerned. The ovary was covered by a germinal epithelium made of simple cuboidal cells. Underlying the surface epithelium was a capsule of dense irregular connective tissue called tunica albuginea. Parenchyma of the ovary consisted of two distinct zones, peripheral cortex and central medulla.

The primordial and primary follicles were present in the peripheral cortex while secondary and tertiary follicles occupied the deeper cortex. The primordial follicles were seen immediately beneath the tunica albuginea. Primordial follicles comprised of an oocyte surrounded by a single layer of epithelial, flattened cells (Fig. 2). The primordial follicles had a mean diameter of 68.04±0.33µm. Follicles were called primary when single layer of squamous granulosa cells (GC) surrounding oocyte become cuboidal (Fig. 3) and the average size of primary follicle was 115.13±0.64µm. Oocyte surrounded by two or more layers of granulosa cells and theca cells formed secondary follicle (Fig. 4). When they developed antrum, surrounded by two layers of thecal cells and granulosa cells, Graafian follicle or vesicular follicles were formed (Fig. 5). The mean diameter of secondary follicles was 227.85± 0.43µm with a mean thickness of 55.64± 0.91µm in membrana granulosa and 56.45± 0.67µm in theca layer. The mean diameter of oocyte of secondary follicle was 81.02±1.06µm. The mean follicular diameter of antral follicle was 970±33.78µm. The mean diameter of antrum was 491.91± 4.03µm and that of membrana granulosa, theca layer and oocyte was 88.52± 2.83µm, 81.31±4.11µm and 86.77±5.75µm, respectively in the antral follicle. The mean diameter of oocyte of Graafian follicle was 86.77±5.75µm. The tunica albuginea consisted of thick coarse collagen bundles (Fig. 6). The medulla of the ovary was made up of dense irregular connective tissue with extensive network of blood vessels and nerves.

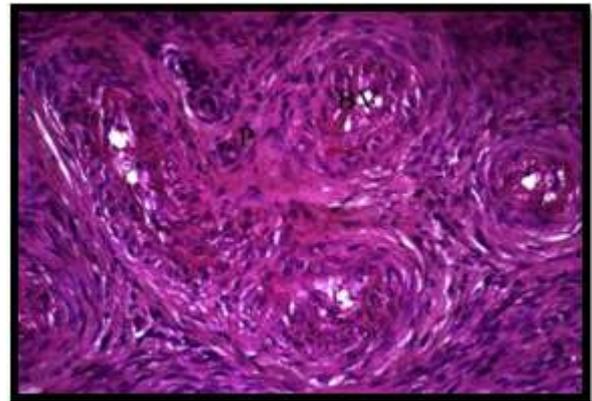


Figure 2: Primordial follicle (P), blood vessel (BV).H&E x 400

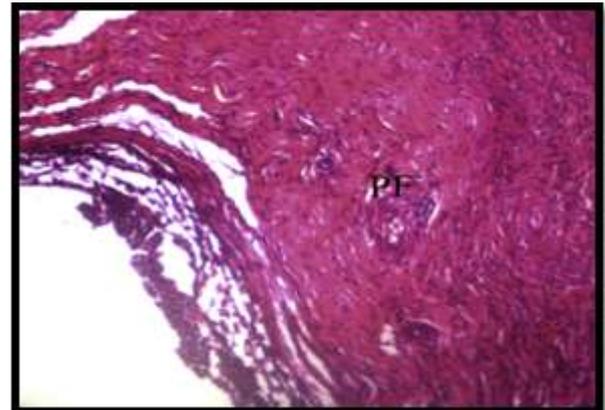


Figure 3: Primary follicle (PF).H&E x 400

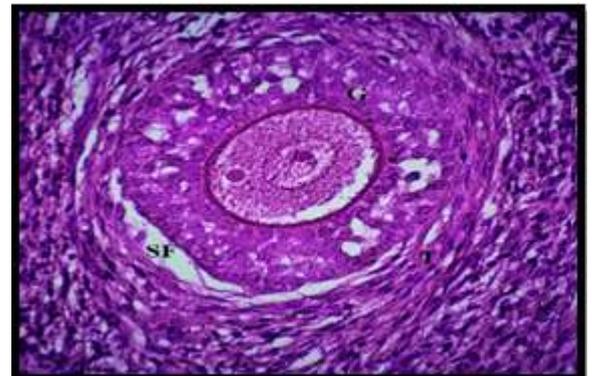


Figure 4: Secondary follicle (SF)-Granulosa layer (G), Theca Layer(T). H&E x 400

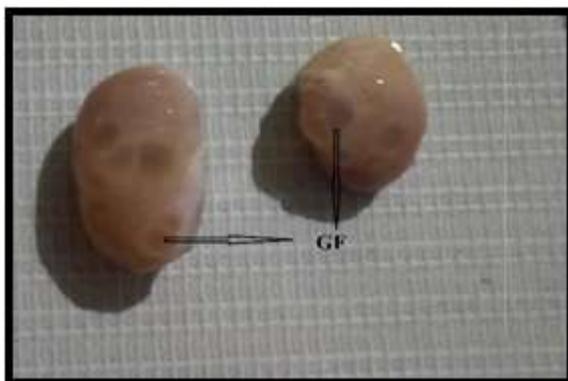


Figure 1: Ovaries of Malabari goat showing Graafian follicles

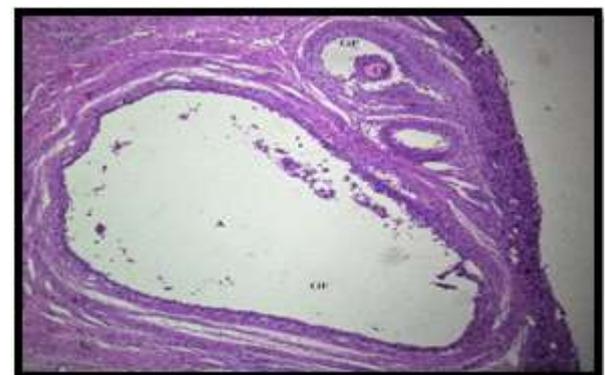


Figure 5: Graafian follicle (GF)-Antrum(A),Granulosa(G), Theca(T), Oocyte(O).H&E x 100

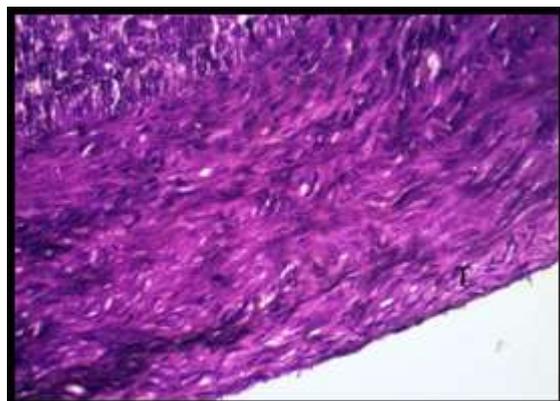


Figure 6: Tunica albuginea (T). H&E x 400

4. Conclusion

The dimensions of ovary like breadth, weight and thickness of right and left ovaries of Malabari breed of goats were not significantly different while the length of right ovary was significantly more than that of the left. In the present study a total of 38 visible follicles were recorded on the surface of the ovary. There was no significant difference in the number of medium sized follicles (3-5 mm) and large follicles (>5 mm) between left and right ovaries.

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