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Dharani P
Department of Veterinary Pathology, Rajiv Gandhi Institute of Veterinary Education and Research, Kurumbapet, Puducherry, India

Kumar R
Department of Veterinary Pathology, Rajiv Gandhi Institute of Veterinary Education and Research, Kurumbapet, Puducherry, India

Nair MG
Department of Veterinary Pathology, Rajiv Gandhi Institute of Veterinary Education and Research, Kurumbapet, Puducherry, India

Lakkawar AW
Department of Veterinary Pathology, Rajiv Gandhi Institute of Veterinary Education and Research, Kurumbapet, Puducherry, India

Murugavel K
Department of Veterinary Gynaecology and Obstetrics Rajiv Gandhi Institute of Veterinary Education and Research, Kurumbapet, Puducherry, India

Varshney KC
Department of Veterinary Pathology, Rajiv Gandhi Institute of Veterinary Education and Research, Kurumbapet, Puducherry, India

Correspondence
Kumar R
Department of Veterinary Pathology, Rajiv Gandhi Institute of Veterinary Education and Research, Kurumbapet, Puducherry, India

Pathomorphological studies of the ovaries in goats

Dharani P, Kumar R, Nair MG, Lakkawar AW, Murugavel K and Varshney KC

Abstract
In the present study, the biometry, gross and histopathology of the right and left ovaries of 100 non-descript female goats (97 slaughter house and 3 necropsy cases) were carried out. Biometry of ovary revealed no significant difference between right and left ovaries. Ovarian lesions were recorded in 21 cases (21%), either singly or in combination. The unilateral affections were more than the bilateral. Cystic corpus luteum were recorded in 9 ovaries (4.5%) and was grossly characterised by enlarged ovaries with cystic fluid, and microscopically by intermediate to large luteal cells surrounded by connective tissue. Follicular cysts were recorded in 4 ovaries (2%), characterised by cyst of 1.2 to 1.5 cm in diameter filled with clear fluid. Luteal cyst (3, 1.5 %) was characterised by enlarged ovaries with vacuolated luteal cells and cystic fluid. The sclerosed or inactive ovaries were characterised by absence of follicles and accounted for 2.5%. Parovarian cysts were recorded in 3 ovaries (1.5%). Embedded corpus luteum recorded in 5 ovaries (2.5%), was characterised by yellowish corpus luteum surrounded by thick fibrous stroma. Rete ovarii, oophoritis and follicular atresia were recorded, each in 5 ovaries (2.5%).

Keywords: goats; morphometry; pathological condition; ovary

Introduction
Goats are very vital for the livelihood security of the small and marginal farmers and landless labourers, especially in arid, semi-arid and mountainous regions of the country. Goat rearing is preferred over other livestock for the reasons that it is less risky, prolific breeders, attain sexual maturity at an early age, high fecundity and in addition, Indian breeds exhibit oestrus throughout the year. The goat sector contributes Rs. 1,44,530 million to the agricultural economy of the country [8]. Among the various diseases that can affect goats, those causing abortion and reproductive failure are always important from economic point of view. Reports on the occurrence of various pathological conditions affecting the reproductive tract in general and ovaries in specific of goats are scanty [2].

Ovarian lesions can be either unilateral or bilateral and are associated with varying degree of infertility. Ovarian malformations are rare among goats and usually occur in association with those of other organs of the reproductive system [10]. In an abattoir based survey, Shringi *et al* [14] have recorded 39.4% of ovarian lesions among goats in Rajasthan, India.

Pathological changes of the reproductive system undoubtedly have a direct relationship to infertility problems in domestic animals. Many of the ailments cannot be easily detected by routine clinical examination. Abattoir surveys provide useful information on the various types of reproductive abnormalities and also allow for examination of a large number of animals in a short period of time with low cost involvement. Hence the present study was undertaken to investigate the occurrence and types of ovarian abnormalities in goats.

Materials and Methods
During the study period, right and left ovaries from 100 goats were collected (97 from local and organized slaughter houses in Puducherry, India, and 3 from necropsied cases at Department of Veterinary Pathology, RIVER, Puducherry, India. All the goats were of non-descript type. Both nulliparous and pluriparous goats were included in the study. The samples were collected after slaughter and transferred immediately to the Department of Pathology, RIVER for morphological studies. A detailed gross examination of the collected ovaries with respect to size, shape, color and texture/consistency were carried out. In addition, biometrical measurements with respect to the length and circumference were also carried out on all the samples.

Ovarian tissue samples fixed in 10% NBF were processed by routine paraffin embedding technique and 4-5 µm thick sections were obtained and stained by Haematoxylin and Eosin (H&E) for detailed histopathological studies as per standard procedure [13]. Pathological conditions were categories based on histopathological features. The data obtained were analyzed by standard statistical procedures described by Fowler and Cohen [6].

Results and Discussion

The biometrical measurements were carried out on 200 ovaries (100 right and 100 left sides). The mean (± S.D.) length and circumference of the right and the left ovaries are presented in table 1. In the present study, though the biometry (length and circumference) of ovaries did not reveal a significant difference between the right and left, a numerically higher measurement was noticed for the right ovaries. Earlier workers have reported a statistically significant difference between the right and the left ovaries in Red Sokoto goats [1], Black Bengal goats [9] and in different age groups of Bakerwali goat [16]. In all these studies, the biometric values for the right ovary were significantly higher than those of the left ovary.

Table 1: Biometry on ovaries (n=100)

Age	Length (Mean ± S.D)			Circumference (Mean ± S.D)		
	Right ovary	Left ovary	P value	Right ovary	Left ovary	P value
< 1 year	1.58±0.77	1.58±1.01	0.52	1.68±1.29	1.72±1.17	0.92
1 - <2 years	1.81±0.77	1.703±1.11	0.672	2.32±1.17	1.82±1.16	0.108
2 - <3 years	1.75±0.84	1.729±0.66	0.473	2.15±1.06	2.20±0.91	0.85
3 years and above	1.97±0.83	1.909±0.83	0.8	2.5±1.0	2.34±0.79	0.562

*Data analyzed by independent t- test.

Out of 100 goat carcasses, the ovarian affections were noticed in 22 (22%) cases. These affections occurred either singly or in combination. The unilateral affections were more than the bilateral affections in the ovaries. This is similar to the observation made by Francis [7] who recorded ovarian lesions leading to infertility in 22.5% cases. A higher incidence (39.4%) of ovarian affections was reported by Shringi *et al.* [14] in 1024 slaughtered goats. Among the ovarian lesions, the most commonly observed lesion was cystic corpus luteum in 4.5% (9/200) cases. However, a lower incidence of 0.8% and 2.2% was recorded by Timurkaan and Karadas [19] and Francis [7] respectively.

In some of the ovaries examined, microscopic changes were noticed even in the organs which failed to reveal gross lesions. Hence, the lesions observed were classified based on the histological findings. The occurrence of ovarian lesions is presented in Table. 2.

Table 2: Lesions in Ovaries

Sl. No.	Condition	Unilateral		Bilateral	Total
		Right side	Left side		
1	Follicular cyst	2(1%)	2(1%)	-	4(2%)
2	Luteal cyst	2(1%)	1(0.5%)	-	3(1.5%)
3	Cystic corpus luteum	4(2%)	5(2.5%)	-	9(4.5%)
4	Rete ovarii	2(1%)	3(1.5%)	-	5(2.5%)
5	Parovarian cysts	2(1%)	1(0.5%)	-	3(1.5%)
6	Oophoritis	3(1.5%)	2(1%)	-	5(2.5%)
7	Embedded corpus luteum	2(1%)	2(1%)	1 (0.5%)	5(2.5%)
8	Sclerosed and inactive ovary	3(1.5%)	2(1%)	-	5(2.5%)
9	Follicular Atresia	2(1%)	3(1.5%)	-	5(2.5%)

In this study, follicular cysts (1.2 to 1.5 cm) were noticed in 2% cases (4/200). Grossly, the affected ovaries were large, round to oval and the cysts ranging from 1.2-1.5 cm (Fig.1). Microscopically, the cysts were lined by multiple layers of granulosa cells with lumen containing eosinophilic material (Fig. 2).

Fig 1: Ovary showing large follicular cyst (arrow) filled with clear fluid

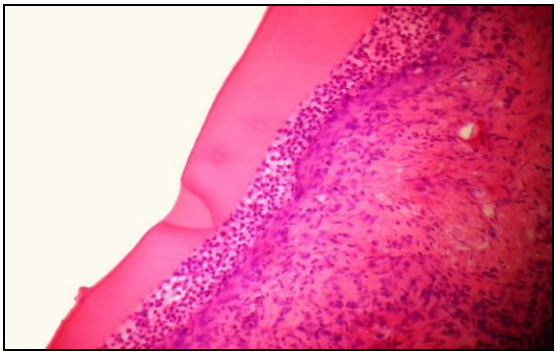

Fig 2: Photomicrograph of ovary showing follicular cyst with five layers of granulosa cells with lumen containing eosinophilic material. H & E x 200.

Luteal cyst was noticed in 1.5% (3/200) cases and microscopically showed large luteal cells with vacuolated cytoplasm (Fig. 3). In comparison to the present study, a lower incidence of luteal cyst was recorded by Timurkaan and

Karadas [19] in 0.37% cases. The cause of cystic ovarian disease is idiopathic. It has been described mainly among dairy goats especially those grazing estrogenic pastures [3, 12]. Heredity and phosphorous deficiency have also been associated with this condition among goats [15]. Tanaka *et al.* [18] have ruled out follicular cysts development in association with progesterone and oestradiol treatment among goats.

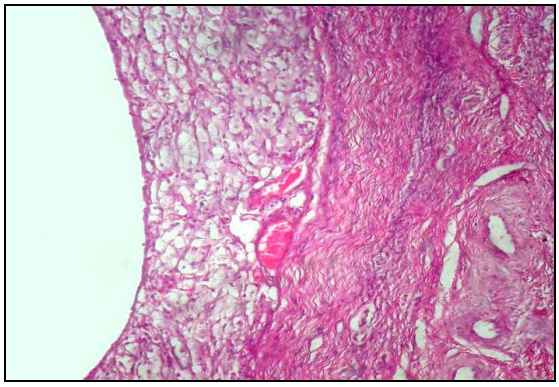

Fig 3: Ovary showing luteal cyst with large vacuolated luteal cells. H & E x 200.

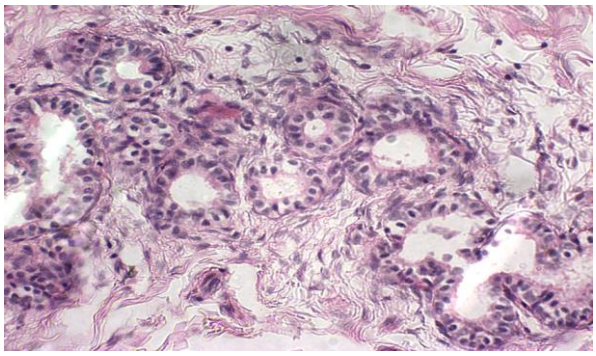

Fig 4: Rete ovarii showing anastomosing canals separated by connective tissue. H & E x 200.

Rete ovarii were noticed in 2.5% cases (5/200) and characterised by tubular network of anastomosis canals separated by thick band of connective tissue (Fig. 4). These structures are more conspicuous and dilated when associated with the presence of corpus luteum in ovaries indicative of their functional status induced by hormones in buffaloes [11]. Embedded corpus luteum/persistent corpus luteum was noticed in 3% cases (6/200). Grossly, the ovaries showed mild enlargement, firm in consistency and were embedded within the fibrous stroma (Fig. 5). Microscopically, such corpus luteum showed normal luteal cells arranged in groups separated by irregular stands of connective tissue stroma (Fig. 6). The exact reason for embedded corpus luteum is not described in goats. However, Damodaran [4] and Kumar [11] suggested that the persistent corpus luteum was associated with pyometra and was considered secondary to the inflammatory lesions in the uterus in buffaloes. In addition, the authors have also reported that the embedded or persistent corpus luteum might be due to lack or diminished secretion of luteolytic substances released by the severely inflammed uterus. In the present study, sclerosed/ovarian inactivity had an occurrence of 2.5% (5/200). On the contrary, a lower and higher incidence of 1.9% and 3.84% cases were observed by Francis [7] and Shringi *et al.* [14] respectively.

Fig 5: Cut surface of ovary showing embedded CL.

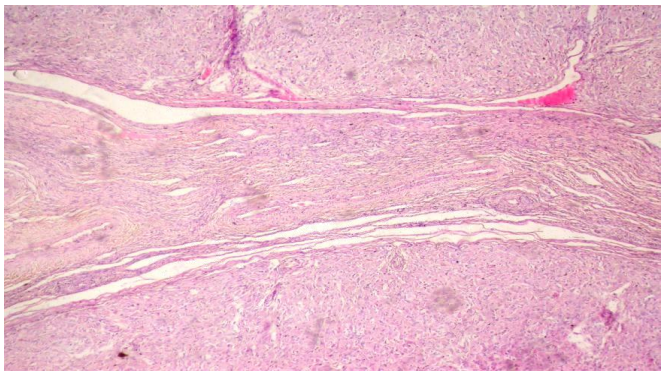

Fig 6: Embedded CL showing normal luteal cells separated by thick connective tissue septa. H & E x 200.

Parovarian/paraovarian cyst was observed in 1.5% (3/200) cases. Though paraovarian cysts do not have significant effect on the reproductive potential of the animals, if sufficiently enlarged in size, it can create problem in clinical diagnosis of ovarian lesions and thus is important from differential diagnosis point of view. Follicular atresia was recorded in 2.5% (5/200) cases. The most important cause for the marked and progressive follicular atresia might be lack of proper amount of gonadotrophins or imperfect balance of hormones viz. luteinizing and follicular stimulating hormones in buffaloes [5, 11].

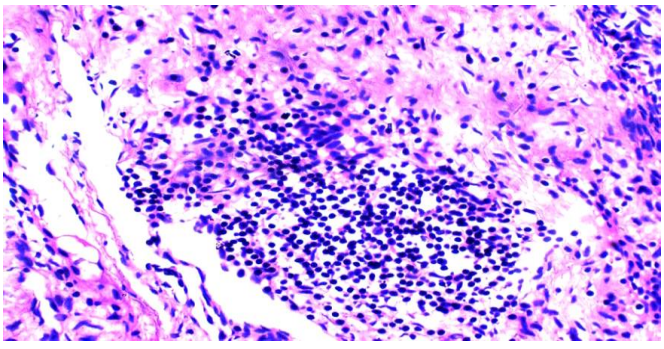

Fig 7: Oophoritis with mononuclear cellular infiltration in the ovarian stroma. H & E x 200.

Oophoritis is a rare condition in domestic animals [10]. In the present study, it was recorded in 5 cases. Although no significant gross changes were noticed, microscopically such ovaries were characterised by cellular infiltrates predominantly with mononuclear cells (Fig. 7). Though in the present study no specific etiological agent could be identified, oophritis was associated with non-suppurative endometritis

and cervicitis. According to Tafti and Davari [17], oophritis in ewes results from either a direct extension or haematogenous spread of uterine infections to the ovary.

Conclusion

The biometry on ovaries revealed no significant difference between right and left ovaries with respect to length and circumference. Ovarian lesions were mostly unilateral in distribution and cystic CL was the most common lesion. Since majority of the lesions recorded in the present study were microscopical, the clinical correlation in the field cases and the abattoir based studies can be of significant importance for the detection and categorization of the ovarian lesions.

Conflict of Interest: All authors declare no conflicts of interest. All authors participated and approved the manuscript for publication.

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