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Gross morphometric analysis of the testis of tom cats (*Felis catus*)

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Abstract

The present work was undertaken to study the gross details of the testis and its duct system in cats during pre-pubertal and post pubertal stages. For this, testes were obtained from 20 healthy tom cats showing no signs of illness. Various gross morphological parameters were recorded. The testes of cats were located within the scrotum, oval in shape and reddish white in colour. The long axis of testis was running dorso-caudal to the long axis of the body. The epididymis was attached to the dorso-lateral surface of the testis. Significant difference was noticed in the weight, length, circumference and the volume of the testes in prepubertal and post pubertal groups.

Keywords: Dog, testis, epididymis

Introduction

A wide range of animals were brought into domestic partnership as working animals, household pets and livestock and this is a journey of more than 11,000 year. The opportunities and various biologicals constraints of the animals and the cultural contexts of the human partner has shaped the pathway of the domestication. (Zeder, 2012) [13].

In mammals, reproduction involves internal fertilization within the body of the female animal. The function of the male tract is to produce spermatozoa to fertilize ova, secrete seminal fluids to aid the survival of the sperm and transport them into the female reproductive tract and also to secrete hormones to bring about secondary sexual characteristics and influence male reproduction.

The maturation of reproductive system depends on the capacity of the production quantity of androgens from the interstitial cells and the production of optimal number viable sperms from the testis (Hafez and Hafez 2000) [4].

The testis is an endocrine as well as an exocrine gland. Tubules within the epididymis secrete important substance that help the sperm survive and mature. While in the body of the epididymis, sperm are nurtured by epididymal secretions and undergo further stages of their maturation (Jones and Lopez, 2014) [14]

The epididymis is a dynamic organ in which substantial maturational changes of spermatozoa occur. The absorptive and secretory functions of epididymal epithelial cells affect the luminal environment and cell membrane of the maturing spermatozoa. During epididymal transit, spermatozoa acquire the capability to be motile. In the cauda epididymis, the specific luminal environment allows spermatozoa to survive for several weeks (Eva Axner 2006) [1].

Though considerable literature available on the gross and histological features of the testis in mature animals, the studies on the duct system are very scanty in Indian breeds of cats. A thorough knowledge on this is essential to gain a comprehensive knowledge on the reproductive physiology and to form a base line for the interpretation of various pathological conditions of the testis and duct system.

Materials and Methods

The present study was conducted on six pairs of testes along with epididymis. The samples of testes were procured from teaching Veterinary Hospital, Madras Veterinary College, TANUVAS from the healthy cats brought for the elective castration after getting proper concern from the pet owners. For the gross anatomical studies, the whole testis along with the epididymis was carefully dissected out and the measurements for various physical parameters like weight, length, width, thickness, circumference, volume and density of both the left and

right testis were recorded. Weight in gms was measured using an electrical digital balance, length and width were measured at three different regions *viz.*, the cranial extremity, middle and caudal extremity while the thickness was measured by digital vernier calipers. The volume was measured by water displacement method with the help of a measuring cylinder, and circumference was measured at the middle portion of testis by a cotton thread.

Statistical analysis

All the biometrical observations for different parameters of testes from six each freshly castrated healthy cats was depicted in (Table -1) in the form of mean \pm standard error (SE). Student 't' test was used to compare difference between two groups. Differences were considered significant at $p < 0.05$.

Results and Discussion

The results recorded in the present study were based on the testes and epididymis collected from six each freshly castrated healthy cats.

In dogs, the testes were lodged within the scrotum which was located approximately two thirds of the distance from the preputial opening to the anus. It was situated between the thighs and had a spherical shape, indented in an oblique cranio-caudal direction by an indistinct raphe scroti. The left testis was usually farther caudad than the right, allowed the surfaces of the testes to glide on each other more easily and with less pressure.

The long axis of testis was running dorso-caudal to the long axis of the body. The epididymis was attached to the dorso-lateral surface of the testis (Figure 1). This was similar to the findings of Smuts and Bezuidenhout (1987) [9], Miller *et al.* (1965) [5] in dogs, Naggar and Rath (1990) [6], Singh and Bharadwaj (1978a) [12] and Pasha *et al.* (2013) [7] in camel where the testes were located in the scrotum obliquely, in high perineal region with their long axis running cranio-ventrally.

The testes were roughly oval in outline, compressed laterally and comparatively smaller in size compared to its body weight and were reddish white in colour covered by a thick connective tissue capsule, the tunica albuginea (Figure 2). Our findings were similar to the testes in camel (Smuts and Bezuidenhout 1987) [9]; tom cat (Dawood *et al.* 2019) [3] and Bhagyalakshmi *et al.* (2020) [2].

Each testis in cats presented two surfaces, two borders and two extremities. Both medial and lateral surfaces were convex and compressed laterally which was similar to different animals studied by Sisson and Grossman (1953) [8].

The dorsal boarder gave attachment to the epididymis and ventral broader found to be free. The extremities were cranial and caudal, to which head and tail of the epididymis were attached respectively. Each testis was covered by a thick connective tissue capsule, the tunica albuginea. Covering the tunica albuginea was a serous membrane, the visceral layer of tunica vaginalis (Figure 1)

Gross morphometry

The average weight of the right and left testicles of cats was 1.07 ± 0.11 gm and 1.09 ± 0.10 gm respectively in post-pubertal

groups (Table- 1) which slightly varied from the findings of Miller *et al.* (1965) [5] where the fresh organs weighed 7.8 to 8.2gm in a 25 pounds dog.

The average length of the right and left testicles of cats was 1.40 ± 0.12 cm and 1.36 ± 0.10 cm (Table- 1). Miller *et al.* (1965) [5] reported that the length of testes in a 25 pounds dog averages 2.8 to 3.1 cm in dog while Bhagyalakshmi *et al.* (2020) [2] stated that the average length of left testis was $3.73 + 0.07$ cm and right was $3.47 + 0.13$ cm respectively in dog (Table – 1).

The average circumference of the right and left testicles of adult cat was found to be 3.2 ± 0.12 cm and 3.18 ± 0.11 cm, respectively (Table- 1). The difference observed in the values noted for testicular weight, length and circumference of dog might be due to age and breed variation.

The volume of the right and left testis in adult cats respectively was and 06.85 ± 0.47 and 06.33 ± 0.25 cc (Table-1). The volume of the testicles was significantly increased as age advanced. The volume of the right testicle was slightly more as compared with the left testicle (Fig.2). It was observed that the weight of the testicles in grams was almost equivalent with its volume in millimeters (Fig. 2). This finding is in accordance with report of the Leal and Francal (2006) [11] in black tufted ear marmoset.

To conclude there was no significant difference in the adult cats. This indicates that as age advances morphological changes in the testes occurs. Also, differences in the left and right testes in an animal was also recorded indicating the growth of the pair of testes independent of each other.



Fig 1: Photograph showing the location of the scrotum in the adult cats



Fig 2: Photograph showing the gross appearance of the testis of cats

Table 1: Gross morphometrical observations of the Testis of Tom Cats

Sr. No.	Parameter	Mean \pm SE		Result
		Right	Left	
1	Weight of testis (gm)	1.07 \pm 0.11	1.09 \pm 0.10	Significant
2	Length of Testis (cm)	1.40 \pm 0.12	1.36 \pm 0.10	Significant
3	Width of testis (cm)	1.1 \pm 0.08	1.1 \pm 0.09	Significant
4	Circumference of testis (cm)	3.2 \pm 0.12	3.18 \pm 0.11	Significant
7	Volume (cc)	06.85 \pm 0.47	06.33 \pm 0.25	Significant

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