Haryana Vet. (December, 2021) **60(2),** 285-288

Short Communication

POSTNATAL MORPHOLOGICAL DEVELOPMENT OF MALE REPRODUCTIVE ORGANS IN GUINEA PIGS

S. RAJATHI*, GEETHA RAMESH, T.A. KANNAN and K. RAJA
Department of Veterinary Anatomy
Veterinary College and Research Institute, Tirunelveli-627 358, India
Tamilnadu Veterinary and Animal Sciences University, Chennai, India

Received: 30.03.2021; Accepted: 17.04.2021

SUMMARY

The gross anatomy of the male reproductive organs of the 24 guinea pigs of four different postnatal age groups with six male animals each was conducted. The animals were collected from the Department of Laboratory Animal Medicine, Madhavaram Milk Colony, Chennai as per the Ethical committee approval. After collection, animals were euthanized and male reproductive organs were dissected out and gross anatomical observations and morphometrical data were recorded. Testes were extra-abdominal in all the age groups and more prominent with abundant fat covering in the adult animal when compared to preweaning animals. The epididymis was located dorsolaterally. The coiled epididymis continued by the straight ductus deferens. Ductus deferens at its entrance into the urethra showed a slight ampullary enlargement. The morphometrical observations increased as age advanced. Accessory sex glands observed were seminal vesicles, coagulating glands, prostate glands and bulbourethral glands in all the age groups. The dorsal part of the glans penis had os penis bone and a pouch ventrally.

Keywords: Accessory sex glands, Epididymis, Gross anatomy, Morphology, Penis, Postnatal development, Testis

How to cite: Rajathi, S., Ramesh, G., Kannan, T.A. and Raja, K. (2021). Postnatal morphological development of male reproductive organs in guinea pigs. *Haryana Vet.* **60(2)**: 285-288.

Guinea pigs are large rodents and the best experimental animals for physiological, pharmacological, clinical and anatomical research (Rowlands and Weir, 1974). Guinea pig (*Cavia porcellus*) is also known as cavy and is rodent species belonging to the order Rodentia, family Cavidae and the genus Cavia. (Wagner and Manning, 1976).The male reproductive system consists of testes, epididymis, ductus deferens, accessory sex glands and penis. The function of the testes is to produce sperm and male sex hormone testosterone. The epididymis, ductus deferens and accessory sex gland produce secretions for semen (Androma and Khasanah, 2017). The knowledge of the growth of the morphology of male reproductive organs is necessary to understand the normal physiology, surgical anatomy and breeding aspects (Hassan *et al*., 2018). Literature available on the postnatal development of gross anatomy of male reproductive organs in guinea pigs is scanty. So the present investigation is undertaken to study the postnatal morphological development of guinea pigs.

The gross anatomy of the male reproductive organs of a guinea pig from postnatal age groups (Table 1) was conducted at the Department of Veterinary Anatomy, Madras Veterinary College, Chennai-7. Guinea pigs were procured from the Department of Laboratory Animal Medicine, Madhavaram Milk Colony, TANUVAS, Chennai-51 as per the Ethical Committee approval.After collection of the guinea pigs, they were euthanized as per the standard operating procedure by using the Carbon dioxide asphyxiations as per CPCSEA norms and they were subjected to dissection.

After careful dissection of the animals, male reproductive organs namely testis, epididymis, ductus deferens, accessory sex glands and penis were dissected out and gross anatomical observations and morphometrical data like weight, volume, length, width and thickness of testis measured. Gonadosomatic index (GSI) of testis was calculated (GSI = (Gonad weight/total body weight) X 100). Length, width and thickness were recorded by using the scale and thread method. The weight of the organs was determined by an electronic weighing balance. The volume of the organs was recorded by using the water displacement method (Ali *et al*., 2015). One way Anova with Arithmetic Mean and the Standard Error for the data were calculated as per Snedecor and Cochran (1994).

In the present study, the male reproductive organs consisted of a pair of testis, epididymis, ductus deferens, accessory sex glands and penis in all age groups. Similar observation was recorded by Onyango (1992) in naked mole rats, Stan (2015) and Androma and Khasanah (2017) in guinea pigs.

Testis:

In all age groups, the testes were located in the perineal region, on both sides of the urethral opening (Fig. 1). Testes were extra-abdominal in a location with fat covering and so it was visible during dissection in all the

*Corresponding author: rajathis9936@gmail.com

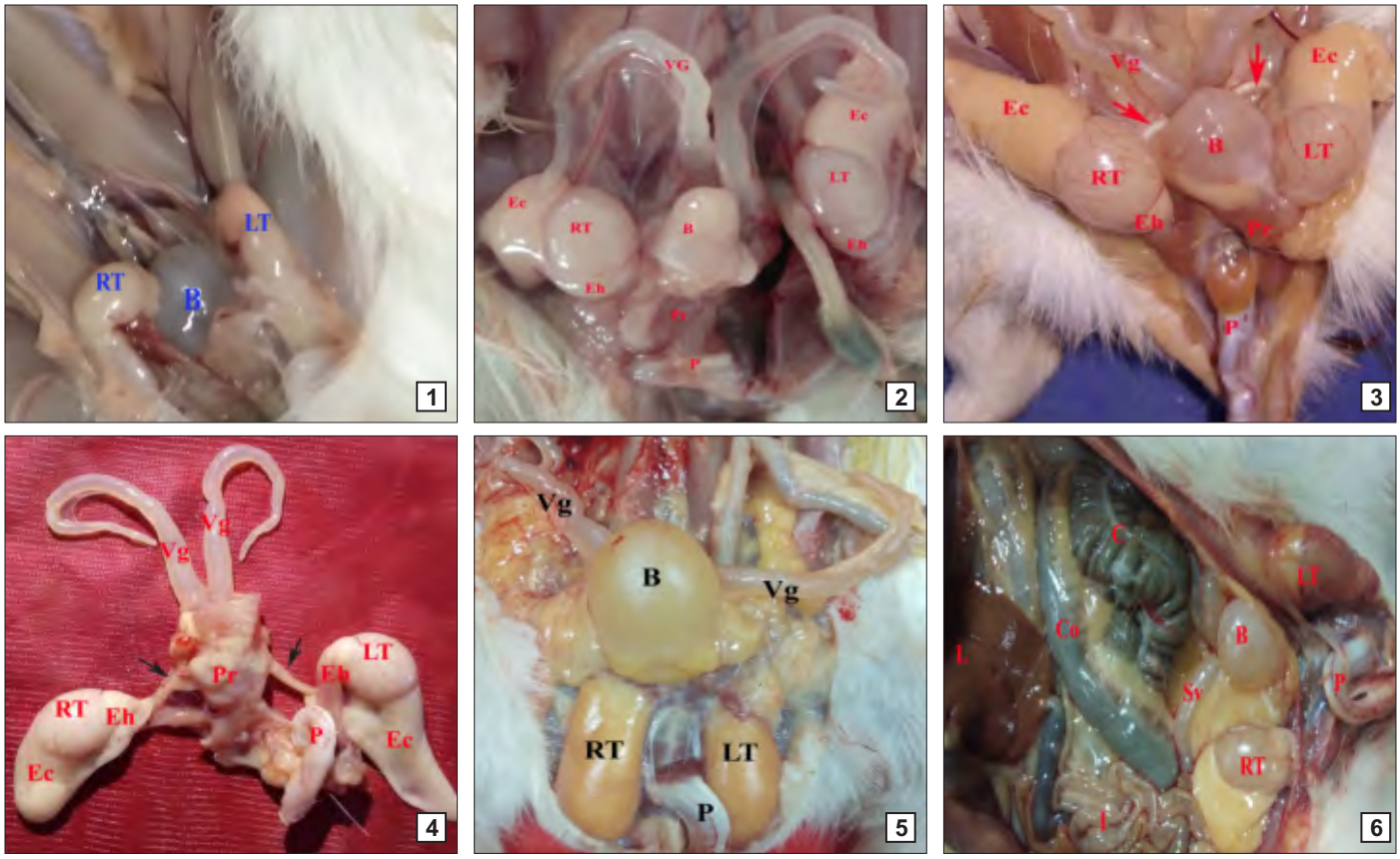

Fig. 1-6. (1) Photograph showing topography of the right testis (RT) and left testis (LT) in 10 day-old guinea pig B - Bladder; **(2)** Photograph showing insitu views of the right testis (RT) and Left testis (LT) with Bladder (B), Cauda epididymis (Ec), Caput Epididymis (Eh), Vesicular gland (VG), Prostate gland (Pr) and Penis (P) in four weeks old guinea pig.; **(3)** Photograph showing insitu view of the right testis (RT) and left testis (LT) with Bladder (B), Cauda Epididymis (Ec), Caput Epididymis (Eh), Vesicular gland (Vg), Prostate gland (Pr) and Penis (P) in 10 weeks old guinea pig. Arrow showing ductus deferens; **(4)** Photograph showing right testis (RT) and left testis (LT) with Cauda Epididymis (Ec), Caput Epididymis (Eh), Vesicular gland (Vg), Prostate gland (Pr) and Penis (P) in 12 weeks old guinea pig. Arrow showing ductus deferens; **(5)** Photograph showing insitu view of right testis (RT) and left testis (LT) with Bladder (B), Vesicular gland (Vg), and Penis (P) in 24 weeks old guinea pig.; **(6)** Photograph showing relations of right testis (RT) and left testis (LT) with Bladder (B), Vesicular gland (Sv), Penis (P) with L – Liver, C – Caecum, Co – Colon and I - Intestine in 28 weeks old guinea pig.

Table1

Details of postnatal age groups of guinea pigs used for research work

Age groups	Preweaning	Weaning	Young	Adult	Total
		0-2 weeks	2-8weeks	one 8-16 weeks	16-32 weeks
No. of animals	6	6	6	6	30

Table 2

Postnatal morphometry of testis in guinea pigs (Mean ±SE)

Age groups (Weeks)	Length (cm)		Width (cm)		Height (cm)		Weight (g)		Volume (ml)		GSI (%)	
	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right	Left
0-2	0.5±0.20	0.7±0.10	0.7±0.30	0.8±0.20	0.3±0.10	0.3±0.01	0.8±0.020	0.91±0.20	0.6±0.10	0.6±0.01	0.46	0.52
2-8	1.6±0.30	1.7±0.01	1.1±0.30	1.2±0.10	0.7±0.20	0.8±0.02	1.8±0.010	1.95±0.30	1.2±0.10	1.4±0.01	0.67	0.73
8-16	2.2±0.01	2.3±0.30	1.5±0.01	1.7±0.20	0.9±0.10	1.0±0.01	3.8±0.20	3.75±0.30	3.0±0.01	3.1±0.01	0.92	0.91
16-32	3.6±0.20	3.8±0.01	2.6±0.10	2.6±0.20	1.4±0.01	1.5±0.01	4.56±0.30	4.59±0.10	4.1±0.20	4.2±0.01	0.49	0.50

age groups (Fig. 2) and more prominent with abundant fat covering in the adult animal when compared to preweaning animals. It was in contact with a ventral abdominal wall between the abdominal muscles and skin. It was oriented dorsolaterally with a slight ventromedial tilt.

The shape of the testis was ovoid in all the age

groups of the present study (Fig. 3) whereas, in male rodent mole, it was slightly oval or round in shape (Horst, 1972). Testis was creamy yellow in colour and soft in all age groups of the present study (Fig. 4) but was red coloured in the dog (Sharma *et al*., 2011), pink colour in guinea pigs (Stan, 2015) and reddish-yellow coloured in guinea pigs (Andromа and Khasanah, 2017) which may be due to individual and species variation.

Each testis had two extremities namely dorsal and ventral, two borders and two surfaces (Fig. 1). The two surfaces are medial and lateral in which the lateral surface was convex and the medial flattened. The two borders were cranial and caudal. Similar observations were also recorded by Hanumant (2016) in goats. Obvious blood vessels were seen on the external surface of testis in young and adult age groups (Fig. 4) when compared to preweaning and weaning age groups (Fig. 1). Similar observations were also recorded by Andromа and Khasanah (2017) in guinea pigs. This showed that the functional activity of the gland in the young and adult age groups.

Epididymis:

The epididymis was located dorsolaterally in all the age groups (Fig. 3). But in goats, the epididymis was attached to the caudomedial border of the testis (Hanumant, 2016) and in the male rodent mole (Horst, 1972) which may be due to species differences. The three parts of epididymis namely head, body and tail were identified in all the age groups (Fig. 5). Horst (1972) in male rodent mole, Onyango (1992) in naked mole-rat and Andromа and Khasanah (2017) in guinea pigs also observed comparable results. The head of the epididymis was coiled and covered with fat tissue (Fig. 3). The proportion of fat tissue was found increasing with preweaning, weaning, young and adult animals as age advanced. Fat covering was also observed in the epididymis body in young and adult animals (Fig. 6) but not found in the preweaning and weaning group of animals. More fat accumulation was found in the tail of the epididymis as a projected mass at the dorsal extremity of the testis (Fig. 4). Similar observations were noticed by Stan (2015) in adult guinea pigs.

Ductus deferens:

The coiled epididymis continued by the straight ductus deferens in all the age groups (Fig. 3) as reported by Stan (2015) in guinea pigs. The diameter of the ductus deferens was1-1.5mm diameter at the proximal end and was 1.5-2 mm diameter at the distal end and was less coiled. But Stan (2015) observed different diameters of ductus deferens which may be due to individual or feed variation. Ductus deferens at its entrance into the urethra showed a slight ampullary enlargement. Similar observations were also recorded by Horst (1972) in male rodent mole and Stan (2015) in guinea pigs.

MORPHOMETRY

Testis:

The testis in the present study showed that as age advanced, the morphometrical observations like length, width, height, weight, the volume of the testis increased (Table 2). Gonadosomatic index was less at preweaning age groups and showed increased values from weaning to young age groups and decreased in adult age groups. This showed that the organ growth was pronounced upto the young age group and reached its normal value concerning body weight in the adult age group. Stan (2015) recorded that the length and width of testis in adult guinea pigs as 2-3 cm and 1.2-1.8 cm which was comparable with the values of the young age group in the present study. Hanumant (2016) in goats noted that the weight of the left testis was more than the right testis and was similar to our present study in all age groups. The width, height, weight and volume of left testis were found more than the right testis in all the age groups of the present study.

Accessory sex glands

Accessory sex glands observed in the present study were seminal vesicles, coagulating glands, prostate glands and bulbourethral glands in all the age groups (Fig. 3). Similar results were also observed by Stan (2015) in adult guinea pigs. In contrast to our present observation, Horst (1972) in male rodent mole found two multilobed seminal vesicles, prostate with four lobes and pair of bulbourethral glands. Onyango (1992) in naked mole-rat found only prostate gland and Andromа and Khasanah (2017) in guinea pigs found ampullary glands, seminal vesicles, prostate glands, bulbourethral glands and preputial glands. The largest accessory sex gland found in all the age groups of the present study was the seminal vesicle or vesicular gland. It was paired, well developed, tubular with blind-ended extremity (Fig. 4). Its length and width were 10-15 cms and 0.5-1 cm, respectively in adult age groups. The vesicular gland started from the neck of the bladder and showed an upward direction and entered the abdominal cavity. The blind distal ends were located on either side of the descending colon (Fig. 6). There found a ligament attaching the vesicular gland with the adjacent structures. The vesicular glands opened medially into the urethra in the cleft called colliculus seminalis while ductus deferens opened laterally.

Coagulating gland was found in pair's posterior to the bladder in all the age groups studied. The coagulating gland was triangular, lobulated and found dorsolateral to

the vesicular gland. The coagulating gland was also close to the dorsal lobe of the prostate gland. Prostate gland was with two lobes namely the dorsal and ventral lobe and located below the neck of the bladder (Fig. 3). Prostate gland was located medial to the coagulating gland and lateral to the vesicular gland. The prostate gland opened into the urethra. Similar observation related to the prostate gland was also observed in adult guinea pigs (Andromaand Khasanah, 2017).

Bulbourethral or Cowper's gland was small paired and located on either side of the urethra at the level of the ischial arch. Dorsal to the Cowper's gland, the rectum was found and ventrally pubic symphysis was observed.

Penis:

In the present study, in all the groups, penis was located between the testes. Two parts of the penis were identified namely the body and glans penis (Fig. 5). Both body and glans penis were approximate of the same diameter and 4-6 cm long in the adult group. The dorsal part of the glans penis had os penis bone. Similar results were also observed by Horst (1972) in male rodent mole and Andromaand Khasanah (2017) in guinea pigs. The tip of the glans penis contained many small spurs in a continuous and discontinuous fashion. Ventral to the urethral opening, a small pouch with a slit-like opening was identified and in which two hair-like particles were found. A similar observation was recorded in adult guinea pigs by Stan (2015). But in the preweaning and weaning group of animals, the spur in the glans penis and hair-particles in the pouch were not found which may due to the process of sexual growth.

REFERENCES

Ali, M.Z., Qureshi, A.S., Rehan, S., Akbar, S.Z. and Manzoor, A. (2015). Seasonal variations in histomorphology of testes and bursa, immune parameters and serum testosterone concentration in male guinea fowl (*Numida meleagris*). *Pak. Vet. J.* **35(1)**: 88-92.

Andromaa, E.M. and Khasanah, L.U. (2017). Anatomy and histology of reproductive organ of male guinea pig as a source of learning. Proc. *Int. Conf. Sci. Eng.* **1**: 9-18.

Hanumant, B.P. (2016). Gross anatomical and histomrophological studies of testis in goat (*Capra hircus*). M.V.Sc. thesis submitted to the Maharastra Animal and Fisheries Sciences University, Nagpur, India.

Hassan, N.F., Soliman, G.M., Okasha, E.F. and Shalaby, A.M. (2018). Histological, immunohistochemical and biochemical study of experimentally induced fatty liver in adult male albino rat and the possible protective role of pomegranate. *J. Microsc. Ultrastruct*. **6**: 44-55.

Horst, G.V. (1972). Seasonal effects on the anatomy and histology of the reproductive tract of the male rodent mole (*Bathyergus suillus suillus*). *Zoologica Africana.* **7(2)**: 491-520.

Onyango, D.S. (1992). Histological and ultrastructural study of the male reproductive system of non breeding naked mole rats (*Heterocephalus glabes*) and *in vitro* interstitial (Leydig) cell response to luteinizing hormone (LH). M.V.Sc. thesis submitted to the University of Nigeria, Nigeria.

Rowlands, I.W. and Weir, B.J. (1974). The biology of hystricomorph rodents. *The Quarterly Rev. Biol*. **51(1)**: 156.

Sharma, K.K., Mathur, R. Joshi,A. and Singh, Y.P. (2011). Anatomy and histology of the testes of the dog. *XXVI annual convention of IAVA Technical Bulletin*: **8**.

Snedecor, G.W. and Cochran, W.G. (1994). Statistical methods. (8th Edn.), Iowa State Univ. Press, Ames, Iowa.

Stan, F. (2015). Anatomical particularities of male reproductive system of guinea pigs (*Cavia porcellus*). *Bull. IASVM Vet. Med.* **72(2)**: 288-295.

Wagner, J.E. and Manning, P.J. (1976). The Biology of the guinea pig, Academic Press, New York.