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Anatomical study of male accessory genital glands in hare *Lepus americanus*

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Abstract
Objective: The study is investigate the anatomical description of the male accessory genital glands in hare in addition to blood supply and nerves which nourish these glands.
Methods: the study included 20 hares aged between 8 –12 months and average of weights ranged between 1.5–2 kgs. These animals were euthanatized by giving 5 ml/kg b.w. of ketamine and giving (3) ml/kg b.w of zylazine intramuscular injection. Hares were dissected by using sharp scalpel in order to make incision in lina alba of the location so that the male accessory.
Results: The anatomical study revealed ampulla of duct deferens, paired seminal vesicle gland, paired prostate gland and paired bulbourethral glands, that well developed in hare. It explained that the prostate gland has only body, which located on external part of the pelvic urethra. On opposite with another animals, found without the disseminate portion, it is diffused within the pelvic urethra. Disseminated. The study included the anatomical parameters of ampullae gland ranged between (1.97±0.06–1.73±0.05) cm. in length, (0.22±0.02– 0.28±0.02) cm. in width, (0.152±0.004–0.167±0.005) gms. in weight and (0.25±0.01–0.22±0.005) cm³. in volume. The seminal vesicle glands have (0.63±0.04–0.73±0.02) cm. in length, (0.41±0.02–0.52±0.03) cm. in width, (0.089±0.002–0.080±0.003) gms. in weight and (0.20±0.003– 0.28±0.007) cm³. in volume. The body of prostate in hare ranged between (0.47±0.02– 0.58±0.04) cm. in length, (0.28±0.02–0.62±0.03) cm. in width, (0.142±0.004–0.157±0.005) gms. in weight and (0.20±0.01–0.177±0.003) cm³. in volume. The measurement of bulbourethral glands are ranging between (2.28±0.03–1.99±0.05) cm. in length, (0.58±0.04–0.55±0.04) cm. in width, (0.56±0.01–0.54±0.01) gms in weight and (0.86±0.02–0.86±0.008) cm³. in volume.
Conclusions: the main signal of the study was observed the prostate glands in hare body corpuscles and this different on rest animals.

Keywords: Anatomy, ampulla, seminal vesicles, prostate, bulbourethral glands, hare

Introduction

The hare is one of the wild animals the distinctive features of hare are small mammals, long front teeth, fluffy short tail, long hind legs use for hopping and jumping with long ears [1]. The hare belongs into kingdom *Animalia* to genus *Lepus* [2]. The young hares are born in the wild areas (not nest) with open eyes, hair covered the all body
whereas the rabbits are born in the nest, blind eyes, naked hair and helpless. A hare is larger than a rabbit topically, but not always [3]. In mammals, male reproductive system is very important because it is responsible to produce the spermatozoa to enhance the capability of the fertilization, movement and contribute to color and motility of the spermatozoa [4, 5, 6]. The male accessory genital glands consist of four types of the glands in the most domestic animals. These glands include ampullae (terminal portion of duct deferens), seminal vesicle, prostate gland and bulbourethral gland. Type of secretion of these glands were gave mucous secretion sometimes seromucous, nutritive secretion and buffer. These fluids increase which volume and act as lubricants to the urethra during ejaculation. These secretions are to neutralize the slight acidity of the vaginal contents [7]. The ampullae is a terminal portion of duct deferens and glandular enlargement nearly from the pelvic urethra. Ampullae found in stallion, bull, boar, ram, buck and absent in dog [8, 9]. The seminal vesicle is hollow tubular organ and does not store the sperm and locate at the seminal vesicle is dorsolateral aspect of the neck of the urinary bladder. This gland is found in all domestic animals except dog and cat. The excretory duct of seminal vesicle is connected with terminal portion of the duct deferens (ampullae) to form the apparatus duct [10]. The prostate gland is generally included from two portions of the glands. The first portion called the disseminate part and the second portion called the body of the prostate gland which it has two lateral lobes covered by a capsule of the connective tissue. The body of prostate is lobulated and lie outside of the urethra while the disseminate part of prostate gland is a scattered glandular tissue surround around the pelvic urethra [10]. The bulbourethral gland is located at the caudal aspect of the prostate complex and it is like the prostate. It has pair of lobes which are separated by a connective tissue. This gland is absent in
dogs and very small in cats [11].

Materials and methods

The study was used 20 healthy male hares, they were collected from Ghazile market of Baghdad aged between 8–12 months and their average of weight between 1.5–2 kgs. These animals were euthanatized by giving 5 ml/kg b.w. of ketamine and giving 3 ml/kg b.w of zylazine intramuscular injection [12]. Hares were dissected by using sharp scalpel in order to make incision in lina alba of the location so that the male accessory. It's includes anatomical and topographic location of hare's glands and anatomical shape. This study revealed that the measurements of the glands (parameters) length, width, and weight. The dissected glands were done after short time after anesthesia. For blood supply study, it used 3 animals of hares were anesthesized by giving (5) ml/kg b.w. from ketamine** and giving 3 ml/kg b.w. from

zylazine* intramuscular injection then the neck region was cleaned from hair by using a sharp blade and worked incision of the neck region and after that common carotid artery was cut transversely by using sharp surgical scalpel then the neck of region was washed by tap water in order to remove the blood. So, the study included 3 hares. These animals were euthanized

Results of the study

Generally, this study explained that hare's glands have four glands. These glands revealed terminal portion of duct deferens (ampullae), paired seminal vesicle, body(corpus) of the prostate, paired bulbourethral glands. All these glands are opened in the pelvic urethra as in (Fig. 1, 2 and 7).

a. Ampulla gland

Ampullae of hare included end part of vas deferens which elongated and spindle-like (Fig. 2 and 3). Location of the ampullae was near at neck of the urinary bladder forward the seminal vesicle (Fig. 1). Our research included the anatomical measurements of ampullae, the length of ampullae in hare ranged between (1.73–1.97) cm., width ranged between (0.22–0.28) cm., the weight of ampullae ranged between (0.152–0.167) gms. and volume of ampullae ranged between $c.m^3$(0.22–0.25)

b. Seminal vesicle gland

found that a pair of seminal vesicle glands were observed and identified grape like (Fig. 4). The study presented that the seminal vesicle in hare situated adjacent to the ampullae and dorsolateral to neck of the urinary bladder which is opened in the pelvic urethra after joining of excretory ducts to the ampullae to form the ejaculatory apparatus (Fig. 1). The study revealed that length of the seminal vesicle was between (0.63–0.73) cm., width ranged between (0.41–0.52) cm., weight was between (0.080–0.089) gms. and volume ranged between (0.20–0.28) cm^3. The seminal vesicle is shorter than ampullae and bulbourethral, but longer than prostate gland.

c. Prostate gland

The study revealed that in hare only body of the prostate gland located as an external part of the pelvic urethra and which has two lateral lobes of the prostate glands. It was seen covering cranially the caudal part of the seminal vesicle gland (Fig. 1). The lobes of the prostate gland separated by connective tissue septum. (Fig. 2 and 5). Anatomical measurements of prostate gland according to length was about (0.47–0.58) cm., width ranged between (0.28–0.62) cm., weight ranged between (0.142 – 0.157) gms. and volume ranged between (0.177–0.20) cm^3. in hare and these results are not fixed by other research workers, especially in hare. the prostate gland is shorter than all the male accessory genital glands in hare.

d. Bulbourethral glands

Anatomical study showed that the bulbourethral glands in hare is pair of the glands located on two side of the pelvic urethra. The gland is related with root of the penis (Fig. 1). However, this study showed the bulbourethral gland is longer than the other glands.

e. Blood supply

It included the blood vessels which nourish hare's glands, coming from branches of arteries internal iliac arteries, and the small branches called cranial vesicular artery to the prostate gland (Fig. 9). This study showed that the seminal vesicle, the prostate and bulbourethral glands receive blood supply from urogenital artery which is branching from pudendal artery.

f. Innervation

This study revealed that the nerves innervate the male accessory genital glands which included hypogastric nerve in origin that is the first 4 lumber splanchnic nerves, give rise 2 hypogasteric nerves (left and right), gentofemeral nerve branch and ilioinquinal nerve (Fig. 8). These nerves pass towards caudoventrally along the dorsal border of the muscle.

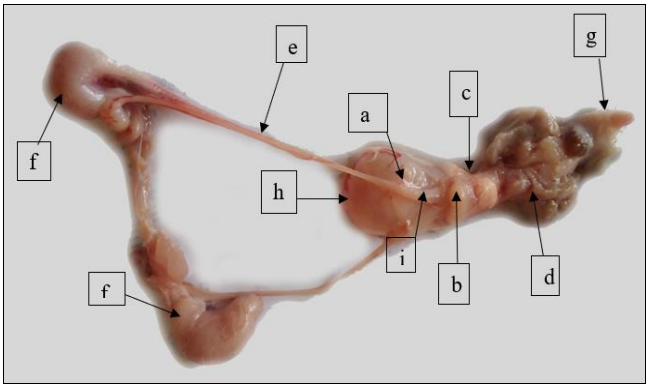

Fig 1: The male reproductive system of showing ampullae (a), seminal vesicle (b), prostate (c), bulbourethral gland (d), vas deferens (e), testes (left&right), (f), penis (g), urinary bladder (h), & ejaculatory apparatus (i)

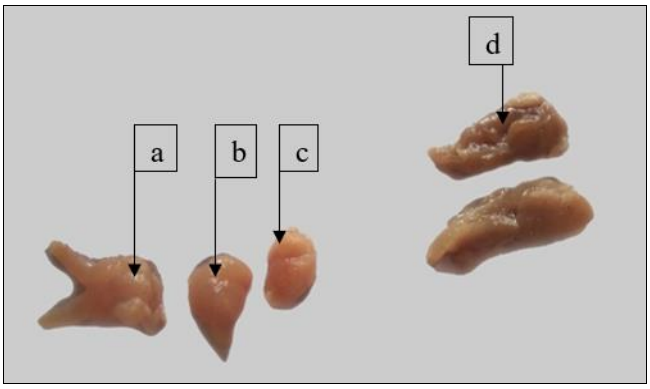

Fig 2: The male accessory genital glands of showing ampullae (a), seminal vesicle (b), prostate (c), & bulbourethral gland (d)

Fig 3: Ampullae of the duct deferens

Fig 4: seminal vesicle gland

Fig 5: prostate gland

Fig 6: Bulbourethral (left and right) glands

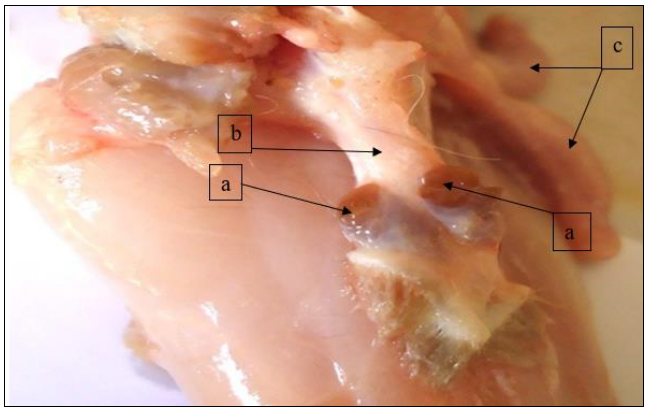

Fig 7: bulbourethral gland (left & right), (a) & pelvic urethra (b), testes (left & right), (c)

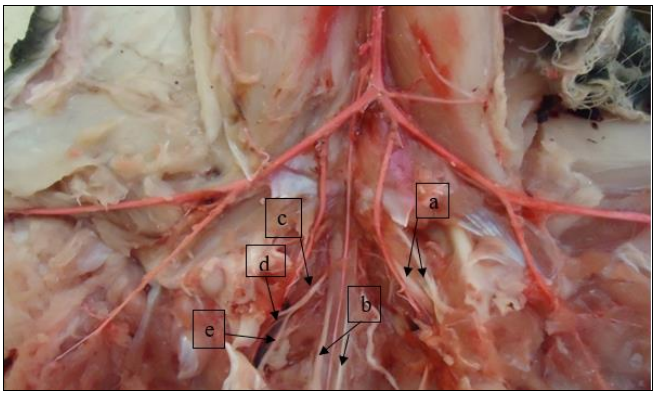

Fig 8: Innervation of the male accessory genital glands showing ilioinquinal nerve (a), hypogastric nerve (left & right) (b), gentofemeral branch nerves (c), genital nerve (d), & femeral nerve (e)

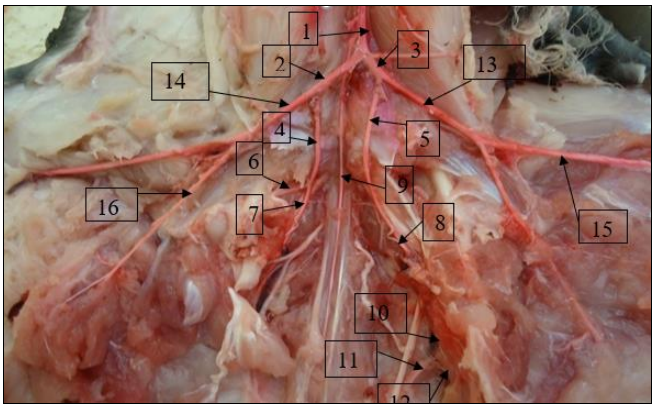

Fig 9: The blood supply of male accessory genital glands (Termination of abdominal aorta)

Abdominal aorta 2. Right external iliac artery 3. Left external iliac artery 4. Right internal iliac artery 5. Left internal iliac artery 6. Internal pudendal artery 7. Umbilical artery 8. Crainal gluteal artery 9. Median sacral artery 10. Urogenital artery (prostatic artery) 11. Branches vesicular gland 12. Branches bulbourethral gland 13. Left femeral artery 14. Right femeral artery 15. Sural artery 16. Saphenous artery

Discusion

Ampulla: This study presented that ampullae of hare included end part vas deferens characteristics elongated and spindle in like. Location of the ampullae was closed from neck of the urinary bladder cranially to the seminal vesicle (Fig. 1). This study coincides with the results found by [5, 12]. This research included the anatomical measurements of ampullae, the length, width, the weight of ampullae and volume while the results obtained by [13, 14, 15] in small ruminant discovered that length of ampullae is (6–8) cm. and (4–8) cm. in diameter and this does not correspond with the present study, present study appeared that the ejaculatory apparatus is composed connected the excretory portion of seminal vesicle and duct of ampulla. Previous studies found that ampullae may be pass dorsal, entirely ventral or intermediate in position to the seminal vesicle and this results coincides with the research of [16]. However, the ampullae is longer than the seminal vesicle and the prostate glands, but it is shorter than the bulbourethral gland.

Seminal vesicle gland: found that a pair of seminal vesicle glands were observed and identified grape like. The study presented that the seminal vesicle in hare situated adjacent to the ampullae and dorsolateral to neck of the urinary bladder which is opened in the pelvic urethra after joining of excretory ducts to the ampulla to form the ejaculatory apparatus. These results are similar to the anatomical description of the seminal vesicle in bull reported that have S–shape, irregular elongated form, often bent on itself and this result does not agree with the present study. The study revealed that length of the seminal vesicle, width, weight and volume. This result does not correspond with the result of [12, 17] in the small ruminant which found as that length of the gland. The seminal vesicle in horse found two elongated hollow, pear shape sac by [18] while the gland in boar consists of two pyramidal masses via [6] described that the seminal vesicle in rabbit is bilobed which located caudally to ampullae. The seminal vesicle is shorter than ampullae and bulbourethral, but longer than prostate gland.

The prostate gland: The study revealed that in hare only body of the prostate gland located as an external part of the pelvic urethra and which has two lateral lobes of the prostate glands. It was seen covering cranially the caudal part of the seminal vesicle gland. (The lobes of the prostate gland separated by connective tissue septum, this result was confirmed with study. It's in agreement with the results of [7]. who reported that the two lateral lobes of prostate gland in sheep are well closely to the pelvic urethra. On the other hand, the prostate gland in bull and boar are composed from two parts, body and disseminate parts [19] This result does not correspond with the present study [20]. Found the prostate gland in camel alpaca (one species of llama) has an H–shape. The prostate gland in dog described as two lateral lobes surrounded neck of the urinary bladder [21]. On the

other hand, prostate in rabbit described as prostate and the paraprostate. According to [22] described the prostate gland in human that consists of 3 main lobes, one median lobe and two lateral lobes. On ultrasound it is measured 35 mm. in length, about (45) mm. in height and 35 mm. in width. These results are not agreed with those found in hare. However, the prostate gland is shorter than all glands.

Bulbourethral gland: It showed that gland in hare is two parts located on two sides of the pelvic portion. The gland is closely related to the root of the penis. It has enlarged, elongated to form cylindrical shape. This results are not compatible with [23]. This result coincides with this study. In addition to this fact [24] registered that this gland in bull and equine are embedded in bulbospongisum muscle and had spherical and ovoid shape. The present study observed that the excretory duct of the hare's gland (left and right) has several ducts joined to urethra. This result not compatible [23].

Conclusion

Our study concluded that sex glands in hare four glands (ampulla, seminal vesicle, prostate and bulbourethral). And showed that the study the main signal consider during the prostate glands were body corpus and don't disseminated in pelvic urethra same rest animals, so anatomical parameters were shown a non-significant general increase in level of sex glands.

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