



Morphological Studies on the Male Copulatory Organ of Balady Duck (*Anas boscas domestica*) with Special Reference to Its blood Supply

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Abstract

The present study was applied on ten adult mature male balady ducks to demonstrate the anatomical features of the phallus and its vascularisation. Four healthy birds were slaughtered then dissected to study the external and internal structures of phallus; other six birds were injected with red colored latex through descending aorta for showing its blood supply. The phallus of duck was of intromittent type (phallus protrudens); at rest state, it was a coiled structure kept within a phallic pouch lateral to the cloaca. However at erected state, it protruded through the vent opening in a cranial direction. It composed of base, shaft and apex, its length about 6-8 cm while during fully erection, it reached 13-14cm. The phallus was supplied by phallic branches which aroused from internal pudendal artery

Key words: Morphology - Male copulatory organ – phallus – Balady duck.

Introduction

The domestic ducks considered the main source of food and income for people in many parts of the world. Ducks belong to family Anatidae, genus *Anas*. Almost all varieties of domesticated duck (*Anas boscas domestica*) were descended from the mallard (*Anas platyrhynchos*). Native breeds of duck as Domiati duck and Balady (Sudan) duck were neglected in research for long time as most of scientists worked on foreign breeds.

Waterfowl was among the few birds that have a penis, in that birds' semen was transported along the penis in an external groove instead of an enclosed urethra as in mammals where it flowed from the base of the penis to its apex at the end of the sulcus. The waterfowl penis considered a means of sex and age identification.

Our studies were on some parameters on phallus of duck to help other scientists to focus up the functional morphology of the penis and the mechanics of copulation in domestic ducks and help in the surgical operation of wild ducks.

Materials and methods

The present study was carried out on ten adult duck weighing (2-4) kg. The birds were anesthetized by intramuscular injection of ketamine HCl 60 mg/kg and xylazine 6 mg/kg, and then slaughtered; macroscopically dissection was carried on four males to study the morphology of phallus, it was seen in situ at its sac and everted outside the vent to demonstrate its shape, parts and length. Six males were

used to demonstrate the blood supply through injecting the descending aorta by latex coloured by red ink using Nelaton catheter of size 6F (MA MEDICAL company) after that all the specimens were fixed in a suitable container with 10%

formalin solution for 3-5 days. The anatomical nomenclature used was that recommended by the (Nomina Anatomica Avium, 1993.)

Results

A- Morphological study:

The phallus of duck was an intromittent type (phallus protrudens), at rest state, it was a spiral coiled structure invested within a double peritoneal membrane called phallic pouch (Fig. 1A, 1B/2), it was placed slightly left to the median plane and lateral to the cloaca. That coiled structure was about 3 and half coils had a clock wise direction and covered by thin layer of connective tissue (suspensorium phalli) (Fig. 1B/6), these coils when dissected it seen as U- shaped tube, attached to the cloaca at both ends, this tube formed of thick and thin parts in between phallic flexure (flexura phalli) (Fig. 2/5), the thick part called cutaneous sac (saccicutanei phalli) (Fig. 2, 5A/3) while the thin one called glandular sac (sacciglandularis phalli) (Fig. 2, 5A/4).

The cutaneous sac contained erectile tissue and everted in tumescence or erected state. The glandular sac devoid of erectile lymphatic tissue, non everted in tumescence and end blindly attached ventrally to the fibro-cartilage body. The two parts of the tube were equal in length about 13-15cm each.

Elastic ligament of the phallus (ligamentum elasticum phalli) (Fig. 1/7) was an elastic ligament attached at one end to the fibro-cartilage body and the other to phallic flexure.

The internal structure of cutaneous sac carried phallic ridges and longitudinal groove called phallic sulcus (Fig. 5B/13). The erected phallus composed of base, shaft and apex, its length about 6-8 cm while during fully erection it reached 13-14cm.

The base of the phallus (Fig.3, 4A/8) measured about 1.5-3cm; it supported by fibro-cartilage body (corpus fibrocartilagineum) (Fig.6/11) and contained a narrow ejaculatory sulcus (sulcus ejaculatorius) (Fig.3, 4A/15).

The shaft of the phallus (Fig.3, 4b/9) measured about 5-6 cm; it had linear part and coiled one that formed of two coils directed anticlockwise. its internal wall carried phallic ridges (Rugae phalli)(Fig.5B/12) and phallic sulcus(sulcus phalli) (Fig.5B/13). This sulcus was a spiral longitudinal groove around the whole length of phallus, it extended from the ejaculatory fossa to the apex of phallus. The sulcus had right and left labia formed the boundaries of the groove, the left one was larger than the right.

The apex of the erect phallus (Apex phalli erecti) (Fig.3, 4C/10) was the terminal part of it with average length 1-1.5cm, it shifted to the left side

and had the opening of glandular sac (ostium sacciglandularis phalli) (Fig.4C/16).

The ejaculatory fossa (Fossa ejaculatorius) (Fig.6/14) was a depression in the proctodeal floor, which the papillae ductus deferre directed, it lead to the ejaculatory sulcus and continued into phallic sulcus.

B- Arterial blood supply:

Two main phallic branches (Fig. 7/20) arose from internal pudendal artery gave which run caudo-ventrally towards the thick and thin tube of phallus. The branch that supplied the thick part of phallus was further divided into 2-3 smaller branches. Each phallic branch passed along the whole length where they anastomosed at phallic flexure.

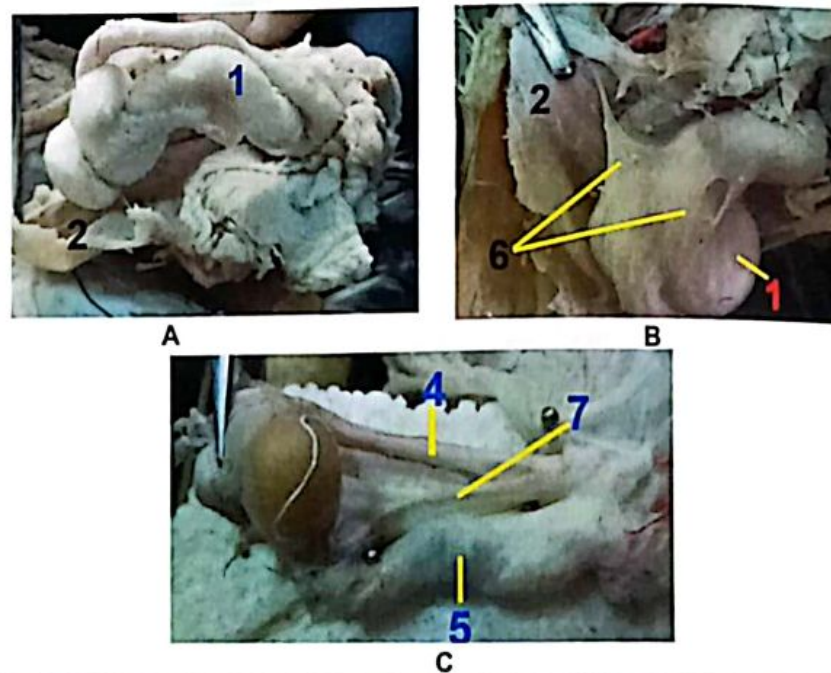


Fig : (1) A

photograph showing the phallus insitu and elastic ligament

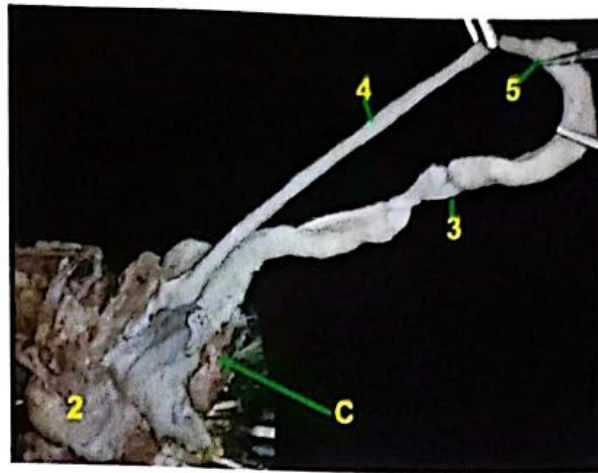


Fig :(2) A photograph showing the inverted phallus

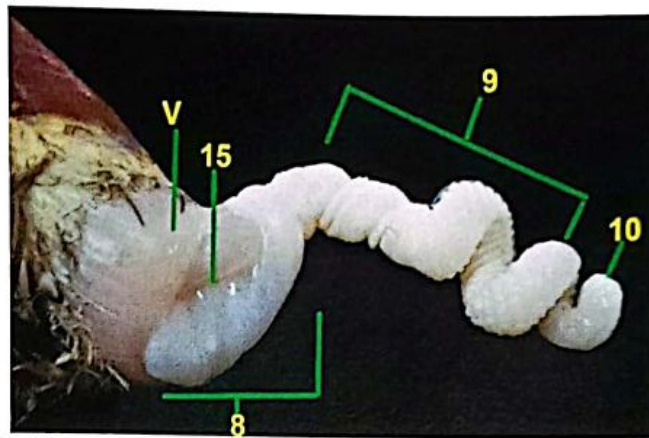


Fig :(3) A photograph showing the erected phallus and its different parts

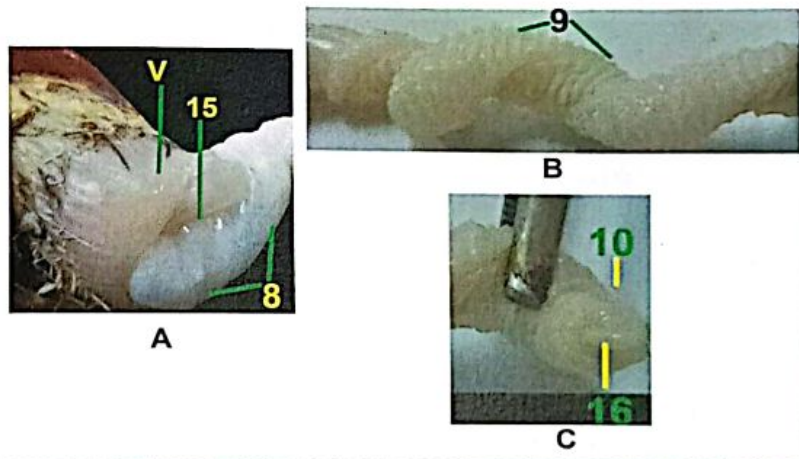


Fig :(4) A photograph showing different parts of phallus
A-Base of phallus B- Shaft of phallus C- Apex of phallus

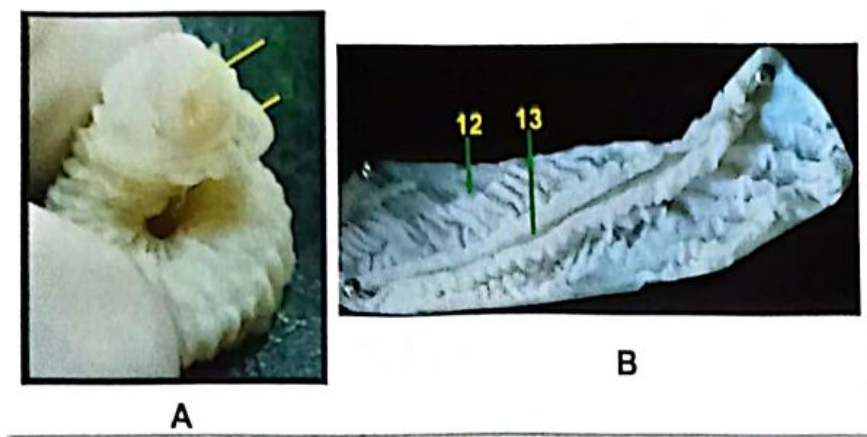


Fig :(5) A photograph showing
 A- Cross section in erected phallus B- Longitudinal section in cutaneous sac

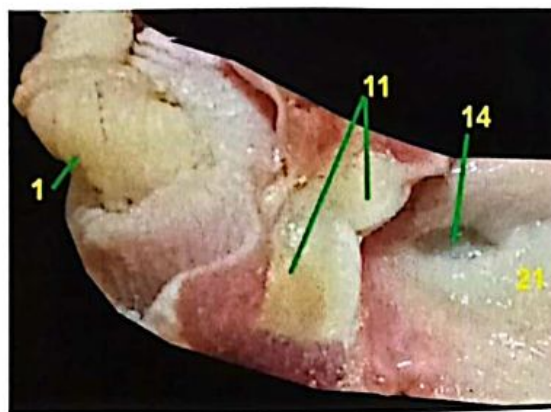


Fig :(6) A photograph showing the fibro-cartilaginous body of the phallus

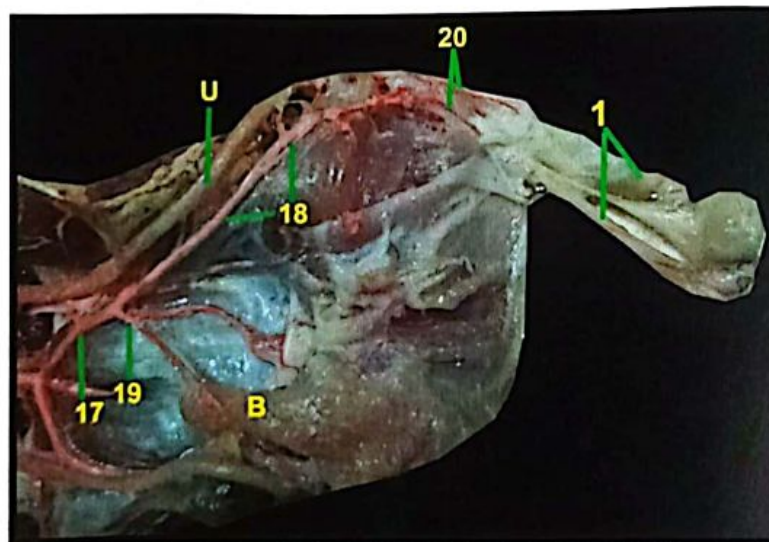


Fig :(7) A photograph showing the blood supply of phallus

Legend from the figures Fig: (1) To Fig: (7)

1- Phallus	13- Phallic sulcus
2- Phallic pouch	14- Ejaculatory fossa
3- Cutaneous sac of phallus	15- Ejaculatory sulcus
4- Glandular sac of phallus	16- Opening of the glandular sac
5- Phallic flexure	17- Internaliliac A.
6- Suspensorium phalli	18- Internal pudendal A.
7- Elastic ligament of the phallus	19- cloaco-bursal A.
8- Base of the phallus	20- Phallic branches
9- Shaft of the phallus	C: Cloaca
10- Apex of the phallus	V: Vent
11- Fibro-cartilaginous base	B: Bursa
12- Phallic ridge	U: Ureter

Discussion

Our result revealed that the phallus was of intromittent type, at rest state it was a spiral coiled structure invested within a double peritoneal membrane called phallic pouch and covered internally by thin layer of connective tissue (suspensorium phalli), it was placed slightly left to the median plane and lateral to the cloaca and at tumescence, it everted and protruded through the vent opening in a cranial direction that confirmed by Getty (1975), King (1981), McLelland (1990), Kevin (2000) and Brennan et al. (2009) in duck, King and McLelland (1984), Baumel et al. (1993), Brennan and Prum (2011) in ostrich and kiwis, Rajendranath et al. (2013) in emu, but the same authors detected in domestic fowl that, phallus was of non intromittent type and presented on the crest of the ventral lip of vent.

Concerning to Kevin (2000) in Argentine Duck, the phallus was coiled structure when dissected it seen as U- shaped tube, attached to the cloaca at both ends. Its total length when measured from the base of the cloaca to the bend of the loop was 13-15 cm while the author added that, its length was 22cm.

According to our result, this tube was formed of thick and thin parts in between phallic flexure, the thick part called cutaneous sac while the thin one called glandular sac. That statement agreed with King and McLelland (1984) and Baumel et al. (1993) in duck, goose and rhea.

Elastic ligament of the phallus was an elastic ligament attached at one end to the fibro-cartilage body and the other to phallic flexure. That agreed with Baumel et al. (1993) in duck.

The internal structure of cutaneous sac of invaginated phallus carried phallic ridges and phallic sulcus. This sulcus was a spiral longitudinal groove around the whole length of phallus, extended from the ejaculatory fossa to the apex of phallus, it had right and left labia formed its boundaries; the left one was larger than the

right. That statement agreed with Baumel et al. (1993) in duck.

Our result revealed that erect phallus composed of base, shaft and apex, while Brennan et al. (2009) in Muscovy drake studied that, the penis divided into basal and apical region. Unlike Getty (1975), King and McLelland (1984) and McLelland (1990) in duck who mentioned that, the phallus composed of large left and small right basal fibro-lymphatic bodies twisted around each other which form the bulbous root of the phallus. (Baumel et al., 1993) in duck it was composed of four components: the base, body of phallus, phallic sacs and the phallic pouch.

Regarding the length of phallus was about 6-8 cm while during fully erection it reached 13-14cm as in domestic duck (King and McLelland, 1984, McLelland, 1990). Elias et al. (2007) and Brennan and Prum (2011) in ostrich revealed that, length of phallus changed from 20 cm when flaccid to 40cm when erect during tumescent state.. Brennan et al (2009) in Muscovy drake it had average length 20 cm, Góes et al (2010) in Rhea showed that average length of phallus was 3cm.

Our result in line with Getty (1975), McLelland (1990) and Brennan et al. (2009) in duck that, the penis was spiral with anticlockwise coils, while Brennan and Prum (2011) in ostrich revealed that, it was a conical structure bent towards the left because of the asymmetry in size of the fibrous bodies, but it was corkscrew shape in Rhea (Góes et al., 2010).

Our observation revealed that, the surface of the penis was covered with ridges spines, those ridges ran around the circumference of the penis that simulated. Brennan et al. (2009) in mallard duck but it referred to the presence of spines, its tips were oriented backward towards the base of the penis. While Kevin (2000) in Argentine Lake Duck noted a well-developed, sharp black-tipped, white spines especially at the base of phallus and diminished in number distally.

The base of the phallus was supported by fibrocartilage body and contained a narrow ejaculatory sulcus. That result in line with Getty (1975), King and Mclelland (1984) and Baumel et al. (1993) in duck.

Concerning the body of phallus, it was measured about 5-6 cm, had linear part and coiled one that formed of two coils directed anticlockwise, while Brennan et al. (2009) in Muscovy drake revealed that the basal region measured about 7-8 cm length, its coils was tight and everted on a linear path.

Our observation agreed with Baumel et al. (1993) in duck that, the apex of the erect phallus was the terminal part of it that shifted to the left side and had the opening of glandular sac. While Getty (1975) revealed that, the free part of phallus contained trabecular spaces, blind end mucus producing glandular tube which ran the whole

length of the free part with an opening at the tip of phallus.

Concerning the ejaculatory fossa was a depression in the proctodeal floor, which the papillae of ductus deference directed, it lead to the ejaculatory sulcus and continued into phallic sulcus. That simulated Baumel et al. (1993) in duck, Rajendranath et al. (2013) in emu. The later author added that, ejaculatory region was pinkish triangular area.

Regarding to our result, the internal pudendal artery gave two main phallic branches which run caudo-ventrally towards the phallus; the branch that supplied the thick part of phallus was further dived into 2-3 smaller branches. Each phallic branch passed along the whole length where they anastomosed at phallic flexure, while Elias et al. (2007) in ostrich reported that, phallus vascularized through an arterial plexus or network came from the pudendal artery.

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الملخص العربي

دراسة مورفولوجية على عضو الجماع الذكري في البط البلدي مع إشارة خاصة إلى المدد النموي
عصام محمد الجندي- أسماء محمد إبراهيم- سماح حسين البابلي- نورا عبدالعزيز شاكر
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أجري البحث على عشرة ذكور كاملة النضوج من البط البلدي وقد تم ذبح الطيور وحفظها بمحلول ملحي طبيعي 0.9% لتنظيفها من بقايا الدم من خلال الشريان الأبهري الهابط، تلي ذلك حفظها بكتله المطاط السائل الملون بحبر الروترينج الأحمر وقت بينت الدراسة أن القضيب يوجد داخل كيس قضيبي مجاور للمجمع وفي وقت الجماع يخرج من الفتحة الشرجية في اتجاه أمامي، حيث يتكون من قاعدة القضيب، جسم القضيب وطرف القضيب، يصل طوله إلى حوالي 6-8 سم وحين الانتصاب الكامل يصل إلى 13-14 سم.

يتنذى القضيب بفروع قضيبيه صغيرة تخرج من الشريان الأستحياني الداخلي
الكلمات الدالة: مورفولوجي- عضو الجماع الذكري- القضيب- البط البلدي