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**SURGICAL ANA ANATOMICAL STUDIES ON THE PERINEAL
 REGION OF THE DOG WITH SPECIAL REFERENCE TO
 EXTIRPATION OF THE ANAL GLANDS**
 (With 9 figures)

By

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دراسات جراحية وتشريحية على منطقة العجان فى الكلب بالاشارة الى استئصال الغدد التشريحية
 احمد قناوى ، أشرف قرقوره ، أنور قاسم

تم تشريح الحجاب الحاجز الحوضى فى الكلاب ووجد أنها تتكون من ثلاثة عضلات اثنين منهم عضلات هيكلية وهما العضلة الراقعة الشرجية والعضلة العصصية التى تقع أمام الدهن العجانى الموجود بداخل التجويف الشرجى الوركى والعضلة الثالثة هى من النوع الاماى حيث أنها تعتبر الاستمرار المناشر لعضلات جدار المستقيم وهى العضلة المستقيمية عصصية. أما بالنسبة للغدد الشرجية فهى أكياس صغيرة مستديرة فى حجم حبه البسله تقع على جانبى القناة الشرجية ويمكن الاحساس بها باليد فوق النتوء الوركى وهى تتسع لجوالى ١-٢ مل محلول وهى محاطة بالكامل بالعضله العاصرة الشرجية الظاهرة. وقد تم دراسة الامداد الدموى والعصبى لمنطقة العجان ووضعها من الناحية التشريحية التطبيقية لخدمة الجراحة خاصة عند استئصال الغدد الشرجية - التدخل الجراحى لاستئصال الغدد الشرجية تم بحشو الجيوب الشرجية بواسطة الديوراكليل/ عجينة باريس/ لاتكس/ برافين/ شاش وقطن/ ماء مقطر وأخيرا الحبر الشينى. وتم إجراء العمليات الجراحية باستخدام الادوات العادية وجهاز الجراحة الكهربائى. وقد وجد أنه عجينة باريس أعطت نتائج جيدة يليها الديوراكليل والتكنوفيت من حيث أفضل المواد التى استخدمت فى حشو الجيوب الشرجية.

SUMMARY

The paranal sinuses were rounded small pear shape sacs on both sides of the anal and can be palpated just above the ischiatic tuberosities and have a capacity of about 1-2 ml. It was surrounded by the M. sphincter ani externus. The pelvic diaphragm has three muscles two of them were skeletal; type M.levator ani and M.coccygeus which were present cranial to perineal fat located in the ischiorectal fossa; while the third one was smooth as it was the direct continuation of the rectal wall muscles, M.rectococcygeus. The internal pudendal artery branch from the internal iliac artery, was the main blood supply of the perineal region. The pudendal nerve also supplied this region, together with the caudal rectal nerve. The surgical approach for the infected anal sacs was carried out by filling materials of different types inside the anal sacs as duracryl, technovit, plaster of paris, latex, liquid paraffin, gauze,cotton,

distilled water and indian ink. The operative procedure was described in details using ordinary instruments or the diathermy apparatus. The obtained results revealed that the plaster of paris was excellent, Duracryl and technovit were also very good material for the filling of anal sac.

Keywords: Surgical, anatomical, studies, perineal region, dog, extirpation, anal glands.

INTRODUCTION

The surgical anatomy of the perineal region and the anal sacs of dogs still has a great importance in the field of veterinary medicine.

The anal sacs are usually subjected to injury and or infection. The peri-anal region of dogs was also subjected to several affections as peri-anal tumours, peri-anal scabies and peri-anal trichophytosis. The infection of the anal sacs is a persistent problem in dogs, manual expression of excessive secretion provides only a temporary symptomatic relief. In spite of the clinical importance of the perineum of the dog, no comprehensive study has been published since MILLER *et al.* (1964) in dog, brief description of this region was given in cow by HABEL (1949), (1964) and (1966), by GEIGER (1954) and BASSETT (1961) on the cow perineal muscles, by VOLLMERHAUS (1964) on the cow perineal blood vessels and by LARSON and KITCHELL (1958) on bull perineal nerve supply, YADAM (1988) (1989) on nerve supply of goat and donkey perineum, HABEL (1953) on mare perineal nerves and also in case of camel by MOBARAK *et al.* (1980).

HICKMAN and WALKER (1980) preferred to outline the sac with a variety of packing materials before complete removal of the anal sacs. These vary from cotton wool, wax to

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plaster of paris, but modern dental impression plastics are probably the most suitable for the purpose.

ZANINOVIC, SININC and Cestrik (1978) treated successfully sacculitis by irrigation of the anal sacs with 2-3 ml. 20% cetavlon solution.

LANE (1975) described the operation for ablation of the anal sacs by means of the cryosurgery in german shephard dogs.

VASSEUR (1984) stated that the inflammation of the anal glands is more prevalent in male dogs than female ones, and the german shephard dog was the predominant breed.

HALT (1985) stated that the anal sac disorders include impaction, infection, abscesses and tumors, usually originating in the gland of the sac wall.

MAKADY, YOUSSEF and ALI (1987) reported that the acrylic mixture (Duracryl) was the best material used for preoperative packing of the canine anal sac.

THEOBALD (1942) reported that after removal of anal sac no sutures are required, healing is rapid, defecation is normal and no stricture will result.

MATERIAL and METHODS

Ten stray dogs of different ages (1-10 years) and weighing about (12-30 kg) from both sexes were used for the dissection of perineal region and anal sacs. They were injected with formalin

0% after being bled. Then injected again with gum milk latex coloured with carmine stain for the dissection of arterial and the nerve supply of the perineal region, the muscles of the pelvic diaphragm as well as the anal sacs (position and relation).

The surgical intervention was done on forty five stray dogs ranging in weight from 8-22 kilograms and their age was between 2-8 years. The dogs were divided into 9 groups each of five dogs.

Before the operation all animals were premedicated with com-belen in dose of 0.05 mg/kg. Body weight given by the intramuscular route. One milliliter lidocaine 1% for every 20 cm body length was injected extradurally in the lumbosacral space.

The animal was then placed in sternal recumbency, the root of the tail and the perineal region were clipped, shaved and disinfected. An elliptical incision was made on each side of the anus directly over the anal sacs. The incision sites are approximately 1.2-2.0 cm lateral to the anus between the 4 and 8 O'clock position. Dissection by separation of the sphincter ani muscle fibers from the filled anal sac is simply achieved either by ordinary scalpel and toothed forceps or by diathermy. After that the anal sac duct is ligated with fine catgut. The residual gap is closed with a continuous subcutaneous suture and the skin is closed with simple interrupted silk suture.

RESULTS

I- The perineum and the muscles of the pelvic diaphragm:

The perineum is a part of the body wall which closes the pelvic outlet. It is

complicated by the terminal parts of the digestive and urogenital tract organs.

The pelvic diaphragm is the principle component of the perineum, it has muscular and fascial structures which is closing the pelvic outlet and has also a main role in preventing the prolapse of pelvic viscera, perineal hernias and all affections of the paranal sinuses occur inside its wall externally or superficially. This diaphragm also has an important role in defecation especially in case of constipation in dogs which has paranal sinuses swellings due to obstruction of its opening.

The pelvic diaphragm has three muscles two of them are skeletal muscles, M. levator ani and M. coccygeus which are present cranial to the perineal fat at the ischioanal fossa, and the third one is a smooth muscle because it is the direct continuation of the rectal wall which is called M. rectococcygeus.

1- M. Levator ani (1, 2, 3,4/1):

This is a fan shape triangular muscle divided in both male and female into two parts. It originates by the base of the triangle from the floor and to some extent at the lateral wall of the pelvic cavity covering the muscle obturator internus and inserted in the ventrolateral part of the root of the tail at about the fourth till the six coccygeal vertebrae. This muscle is divided into two parts a caudal wide, triangular band called ischiococcygeus its width is 3 cm in male (2/1) and 2 cm in female (4/1) and cranial long (strip) band called iliopubococcygeus (its width is 1.5 cm in male and 1cm in female). These two parts are clearly separated and are only

attached together by a fine sheet of fascia. The latter band originates from the ischial bone while the former is originating from the iliopubic region. It is observed that this muscle is well developed in case of male than in female where the caudal border of this muscle in the male is related completely to the paraanal sinuse. It closes the pelvic diaphragm so the perineal herniasis in male are very rare (2/1). In case of female (4/1) its caudal border is separated from the paraanal sinuses by a space of about 2.5 cm filled with perineal fat, so the perineal hairiness can easily occur. This affection is prevalent in male dogs and very rare occurs in females because the muscles of pelvic diaphragm generally were very weak in male than females.

This muscle is longer in male (5.5 cm) than female (4.5 cm), and also thicker (0.5 cm) in male than female (0.3 cm).

2- M. Coccygeus (1, 2, 3, 4/2):

It is short and thick muscle if it is compared with the previous muscle. It is well developed in male (2/2) than in female (4/2), its length is about 3.5 cm in male and 3 cm in female, its width is 2 cm in male and 1.5 cm in female and has 0.7 cm thickness in male 0.5 cm female, the coccygeus muscle is somewhat rectangular in shape present craniodorsal to the m. levator ani muscle. The origin of this muscle is from the ischiatic spine and is inserted lateral and somewhat dorsal to the caudal vertebrae from third to fifth ones.

3- M. rectococcygeus (1,3/3):

It is the continuation of the smooth muscles of the rectum and it is

somewhat similar in case of male and female, it has 0.5 thickness and 1.5 cm length. It originates from the dorsal surface of the rectum at the level of the third to fourth caudal vertebrae directed caudodorsally and is inserted at the ventral surface of the caudal vertebrae of the sixth and seventh.

Generally all the muscles of the pelvic diaphragm depress the tail, when tail raised they compress the rectum. These muscles are supplied by the ventral branches of the last sacral spinal nerve while the smooth muscle are supplied by autonomic nerves.

II. Nerve and blood supply of the perineum:

The pudendal nerve (2,4/4) receives fibers from the ventral branches of the second and third sacral nerves, it courses caudally accompanying the internal pudendal artery (2,4/10) and lateral to coccygeus muscle toward the pelvic outlet. The pudendal nerve divides into superficial perineal nerve (1,2,3,4/5) which supplies the skin of perineum, the deep perineal branch innervates the muscles of the perineum and the last nerve which is the caudal rectal nerve (1,2,3,4/7) which supplies the external anal sphincter. The distal continuation of the pudendal nerve is the dorsal nerve of penis in male (1,2/8) and nerve of clitoris in female (3, 4/9).

The internal pudendal artery (2,4/10) is a branch from the internal iliac artery which is responsible mainly for supplying the perineal region, it passes caudally in the ischiorectal fossa along the lateral surface of the rectum, levator ani and coccygeus muscles, then passes

under the para-anial sacs (1-5/a) to continue as artery of the penis or clitoris. It divides into its two main terminal branches the ventral perineal artery (1,2,3,4/12) which supplies the anal sacs, fat, fascia and skin of the pelvic outlet as well as scrotum and vulva in male and female. The second terminal branch is the artery of penis or clitoris (1,2,3,4/14,15) which is the continuation of deep perineal artery (2,4/16). and must be avosded by the exterpation of the anal sacs these two terminal branches of the internal pudenal artery which is present above and below both anal sacs (caudal haemorrstidal artery).

III. Para-anal sinuses: (anal sacs) (1,2,3,4,5/a):

The dog has two para-anal sinuses which are rounded small sacs, pea shaped situated on both sides of the anal canal and can be palpated just above the ischiatic tuberosities (1,3/n). Its lumen capacity reach 1-2 cm. It has a small opening on both sides of the cutaneous zone of the anal canal, each anal sac is resting on large amount of perineal fat separating it from the ischiatic tuber this fat has a thickness about 1 cm. The para-anal sinuses are surrounded by the m.sphinctor ani externus (1,3/k) together with the anal canal completely. The type of this muscle is a skeletal while the m. sphincter ani internus is a smooth muscle continuous with the smooth muscle of the rectum.

For the surgical interference the dogs were classified into nine groups.

The first group six where duracryl was used fill the anal pockets where the solidification takes place after 10 minutes. The anal sacs were removed

easily specially with diathermy and electro-coagulation (Fig. 7/a,b,c).

In the second group where technovit was used as a filling material and liberation of heat was noticed during polimerization. Extripartion of the anal sacs was easy specially with the diathermy (Fig. 6/a,b).

In second group the anal sacs were delineated when packed with distilled water. Reflux or returning back of some water took place where the diathermy is difficult to work. (Fig. 6/c).

In the third group where the anal pockets were filled with liquid paraffin. The wall of the anal sac may by punctured during operation, the contents are evacuated and the area of the operation was obscured and became slippery (Fig. 6/D).

In dogs of fourth group, filling the anal pockets with cotton was performed with more difficulty than gauze (Fig. 6/E).

The anal pockets of dogs of the fifth group were also delineated when packed with indian ink, where the ink made the sac darker and the surgical field not clear (Fig. 7/A). The six group anal pockets were packed with the anal pocketes of the seventh group were sticky after being filled with latex, hence the operation for extirpation was easy (Fig. 8/A).

Results of filling the anal pockets in eighth group with plaster of paris were encouraging very slight heat being liberated during setting up of the gypsona, and the pockets were easily removed. (Fig. 8/B) duracryl Fig. (7B,C).

In group nine the gauze outlined clearly the anal pockets and the sac was successfully removed.

DISCUSSION

The anatomy of the perineal region of the dog in the present work proved that its pelvic diaphragm has three muscles, *M. levator ani*, *M. coccygeus* and *M. rectococcygeus* as recorded by MILLER *et al.* (1964), NICKEL *et al.* (1986) ADAMS (1986) in dog and GROUCH (1969) in cat while HABEL (1966) in bovine mentioned that the pelvic diaphragm is composed only of the levator ani and coccygeus muscles and the fascia investing them however. The urogenital diaphragm in man is composed of the transversus peronei profundus which does not occur in quadrupeds, the sphincter urethrae and the fasciae on the inner and outer surfaces of these muscles according to GRAY (1959) and GARDNER *et al.* (1963) in human.

The perineum is part of the body wall that covers the pelvic outlet and surrounds the anal and urogenital canals, its deep boundaries those of the pelvic outlet, and its superficial boundaries those of the perineal region which is considered by GARDNER *et al.* (1963) a part of the trunk. The term perineum is sometimes restricted in obstetrics to the fibromuscular mass between the anus and vulva in female but we can call it perineal body.

The origin and insertion of the *Mm. levator ani* and *coccygeus* of dogs of this work are nearly similar to that mentioned by MILLER (1964), NICKEL *et al.* (1986) and ADAMS (1986) in dogs also. These two muscles cannot be considered as single muscle because

they are well distinct in this animal where the coccygeus is lateral to the levator and its fiber has different direction and are separated from each other by a septum as observed by many authors HABEL (1966) in bovine GEIGER'S (1956) in sheep while BASSETT (1965) in ewe considered these two muscles a single muscle, the ischiococcygeus, but this not accepted by the present work, BASSETT (1961) and (1965) explained that the two parts of the levator ani of the human are iliococcygene and pubococcygeus which are not present in ungulates with small origin and insertion as in man. The human pubococcygeus originates from the pubis while the ungulates pubic origin is loosed. According to GEIFER (1956) the pubic origin is represented in sheep by the arcus tendines which extends from the origin of the levator to the pelvic symphysis.

The fossa ischiorectalis as what observed this work, by MILLER (1964), ADAMS (1988) in dog, HABEL (1966) and GODINA (1939) in bovine, lies lateral to the anus (where it formed by clear depression and filled with fat) medial to the ischiatic tuberosity, the internal pudendal artery as well as pudendal nerve pass in the ventral part of the fossa.

The nerve supply of the perineal muscles; levator ani and coccygeus muscle occurs through deep perineal branch of the pudendal nerve as observed by the present work whereas in man GRAY (1959) and dog, MILLER *et al.* (1964) recorded that the branches to these two muscles are extended directly

from the sacral plexus to the muscles. In the horse *HABEL (1953)* and *PIG REIMERS (1913)* mentioned that the muscular branches are combined with the caudal rectal nerve, *HABEL (1966)* in cow showed that the branches were usually combined in a single nerve which originated from the fourth sacral nerve with a smaller contribution from third sacral via the *N.pudendalis*, this combination was formerly called the middle haemorrhoidal nerve in ox by *REIMERS (1913)*.

The branches to the perineal region are the superficial perineal nerve for the skin of this area and the caudal rectal nerve to supply the external anal-sphincter as observed by this work, it is emerged from ischioanal fossa as in man and dog. In the horse *HABEL (1953)* the caudal rectal nerve supplies the superficial perianal nerves through the ischioanal fossa. In cow the caudal rectal nerve also reaches the labium but independently by passing medial to the levator ani *HABEL (1966)*, this termination was called the perineal nerve by *REIMERS (1913)*. It is best left unnamed (*LARSON and KITCHELL (1958)*), the latter added that in bull the superficial perineal nerve joined to form the caudal scrotal nerve.

The term deep perineal nerve was introduced into the veterinary anatomy by *LARSON and KITCHELL (1958)* who found that it innervated the homologous muscle in the male. In man it is called the deep branch of the perineal nerve *GRAY (1959)* it was called perineal branch of pudendal in mare by *HABEL (1953)*. In dog it arises as series of small branches from the pu-

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dendal (*MILLER et al. (1964)* and *PRAKASH et al. (1980)*) buffalo.

The combination of caudal rectal nerve with muscular branch of coccygeus and levator ani muscles formerly was called in ox middle hemorrhoidal nerve the caudal hemorrhoidal (rectal) nerve was said to be often absent *REIMERS (1913)*, *HABEL (1989)*, *LARSON and KITCHELL (1958)* this was contrary to the nomenclature of the same nervous elements in man, dog and horse.

The internal pudendal artery supplies the perineal region. Its ventral perineal branch vasculoreyes the anal sacs as observed in this work of dog also similar results were observed by *Miller (1964)*, *ADAMS (198)* *NICKEL et al. (1983)* in dog.

Inflammation and impaction of the anal sacs is common in dogs and is likely to recur and become a chronic condition.

Anal sac disease may be the result of poor management and feeding.

Ablation of the anal sac is required when blockage of the anal sac recur more frequently in young dogs (*LANE 1975*).

THEOBALD (1942) was against the use of suture following extirpation of anal sac, while in the present study the skin wound was sutured after extirpation of the anal sacs with either interrupted or mattress silk sutures.

The results of the present study showed that the capacity of the anal sac did not exceed 3-cc and this result agrees with that mentioned by *MAKADY et al. (1987)*.

Our observation in the present study ensured that distilled water as a packing material was more better than india ink

because the latter stained the operative area from its reflux. In addition distilled water is more cheap than india ink.

VASSEUR (1987) stated that the inflammation of the anal glands is more prevalent in male dogs than female ones, and the German shaphered dog was the predo-minant breed.

HOLT (1985) stated that the anal sac disorders include impaction, infection, abscesses and tumors, usually originating in the gland of the sac wall.

MAKADY, YOUSSEF and ALI (1987) reported that the acrylic mixture

(Duracryl) was the best material used for preoperative packing of the canine anal sac.

THEOBALD (1942) reported that after removal of anal sac no sutures are required, healing is rapid, defecation is normal and no stricture will result.

It is adivsable to give the affected animal the proper antibiotic and the tonsils are cured and then performed only extirpation of the anal sac. This is in agreement with VASSAR (1984) and HOLT (1985).

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LEGENDS

- Fig. 1:** Diagram of dissected male perineal region of the dog showing its muscles, nerves and blood supply, caudal view.
- Fig. 2:** Diagram of dissected male perineal region of the dog showing its muscles, nerves and blood supply, Sagittal view.
- Fig. 3:** Diagram of dissected female paronychia region of the dog showing muscles, nerves and blood supply, caudal view.
- Fig. 4:** Diagram of dissected female perineal region of the dog showing its muscles, nerves and blood supply, sagittal view.

Fig. 5: X-ray picture showing the anal sac position after filling with barium sulphate dog.

Fig. 6: Photograph for isolated anal sacs after filling with certain materials.

A. Technovit material after curing.

B. Opened anal sac after emptying from technovit (having reaction from curing).

C. Anal sac filled with distilled water.

D. Anal sac filled with liquid paraffin.

E. Anal sac filled with cotton wool.

Fig. 7: Photograph showing anal sac other filling materials.

A. Filled with indian ink.

B. Opened anal sac after emptying from duracryl.

C. Duracryl material after curing.

Fig. 8: Photograph showing anal sacs with certain filling materials.

A. Filled with latex.

B. Filled with plaster of paris.

Fig. 9: Photograph showing the anal region after extirpation of the anal sacs.

1 . M. Levator ani.

2 . M. coccygeus.

3 . M. rectococcygeus.

4 . Pudendal nerve.

5 . Superficial perineal nerve.

6 . Deep perineal nerve .

7 . Caudal rectal nerve.

8 . Dorsal nerve of penis.

9 . Nerve of clitoris.

10. Internal pudendal artery.

11. Caudal rectal artery.

12. Ventral perineal artery.

13. Artery of bulb of penis.

14. Dorsal artery of penis.

15. Artery of the clitoris.

16. Deep perineal artery.

17. M. Gracilis.

18. M. semimembranosus.

19. M. semitendinosus.

20. M. biceps femoris.

21. Bulbs spongiosus muscle.

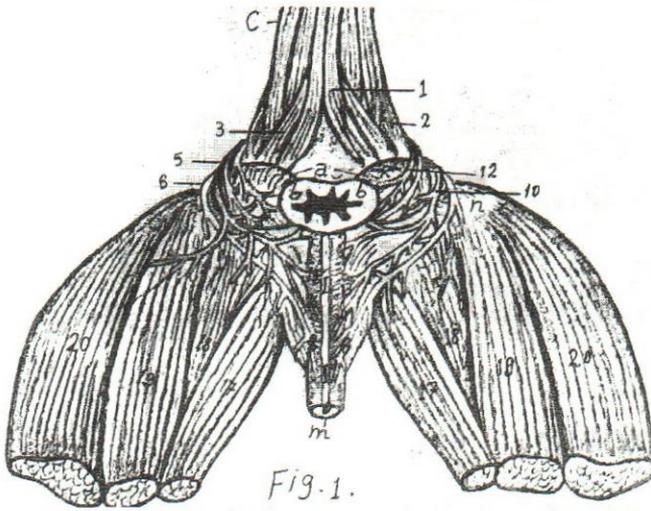


Fig. 1.

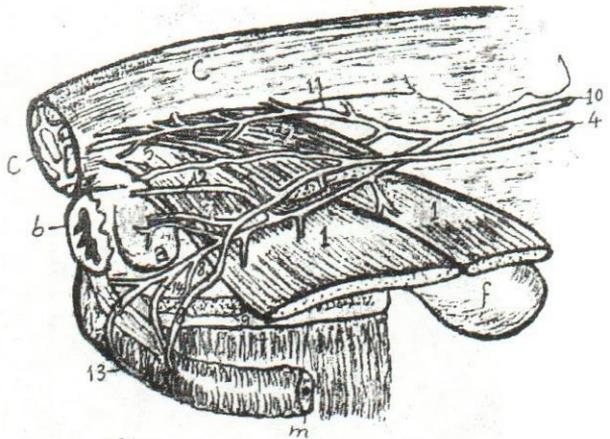


Fig. 2.

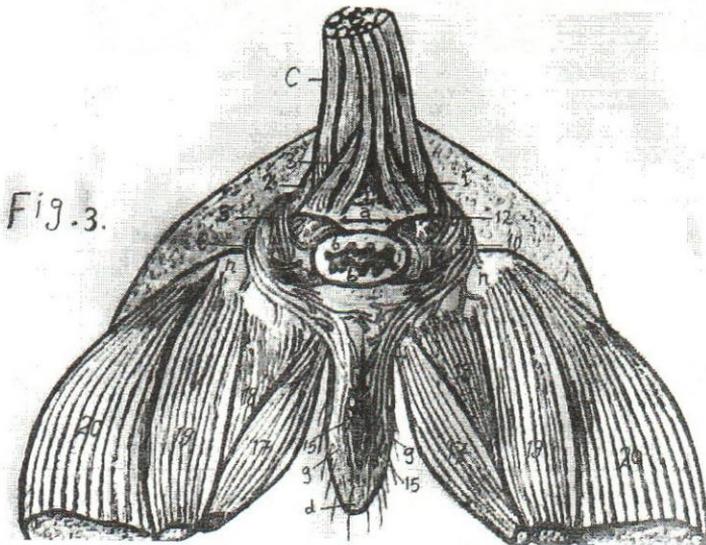


Fig. 3.

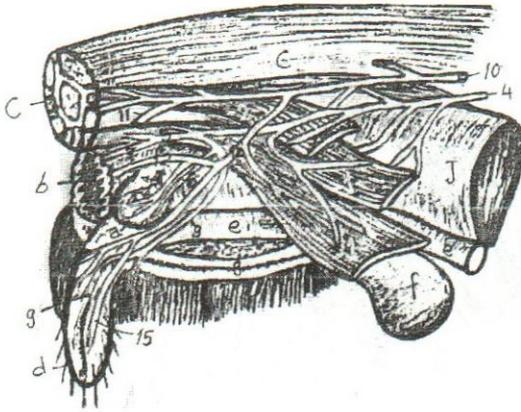


Fig. 4.

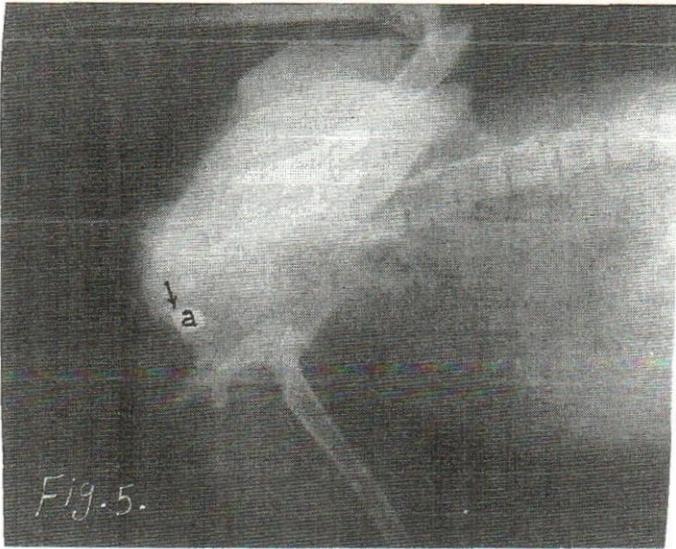


Fig. 5.

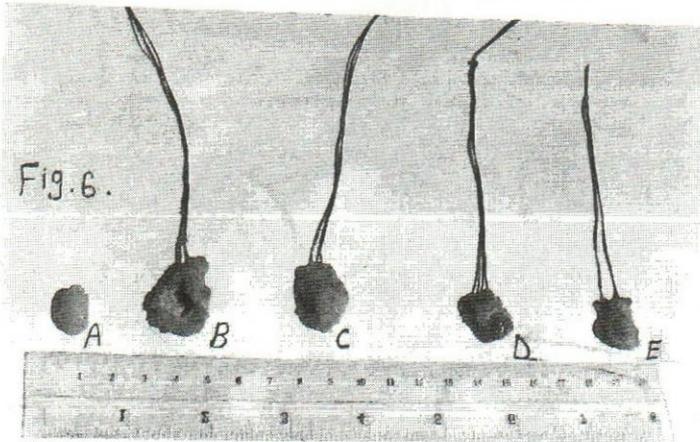


Fig. 6.

