دراسات تشريحية عن المدد الشريانى للخصية والبربخ فى الجمال

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الملخص العربى

أجريت هذه الدراسات على واحد وستين خصية أخذت من جمال يافعة • وقد حقنت هذه الخصيات بمادتى البلاستونيد ومحلول المطاط فى الشريان المنوى الداخلى وقد قام الباحثان بجمع ما أمكن العثور عليه من بحوث السابقين ممن تناولوا هذا الموضوع فى الحيوانات المختلفة • وقد ناقشت النتائج التى تم التوصل اليها مقارنة مع الحيوانات الأخرى • وقد تبين أن الشريان المنوى الداخلى فى الجمال هو المصدر الوحيد للمدد الشريانى للخصية والبربخ • وقد قسم الشريان الى ثلاثة أجزاء هى :

١ ـ الجزء البطنى الذى يمتد من مخرج الشريان من الابهر حتى الفوهة الغمدية •

٢ ـ الجزء الحبلى الذى يسير فيه الشريان داخل الحبل المنوى • وفى هذا الجزء يأخذ الشريان مسارا يتميز بشدة التعرج حيث يكون عديدا فى اللفات غير المنتظمة • ويخرج من هذا الجزء فروعا بربخية وخصوبة اضافية الى جانب فريعات تغذى الحبل المنوى •

٣ ـ الجزء الهامشى الذى يمر على الحافة البربخية للخصية خلال الرداء الأبيض • وينتهى الشريان عند القطب الخلفى للخصية حيث ينقسم الى الشريانين الخصويين الأنسى والوحشى اللذين يخرج منهما الفريعات التى تقوم بالدور الرئيسى فى امداد لحمة الخصية بالدم •

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ANATOMICAL STUDIES ON THE ARTERIAL SUPPLY OF THE TESTIS AND EPIDIDYMIS OF THE DROMEDARY CAMEL

(With 5 Figuers)

By

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SUMMARY

Mophological studies on the arterial supply of the testis and epididymis were carried out on 61 testes collected from adult camels and were injected with plastoid and gum milk. The available literatures on the internal spermatic artery were revised. The examined specimens revealed that the internal spermatic artery is the only source of blood supply to the testis and epididymis. For descriptive purposes the artery was divided into abdominal, funicular and marginal parts. The abdominal part extends from the aorta to the Ostium vaginalis, the funicular part is included in the spermatic cord and is characterized by highly packed convolutions. It gives epididymal, accessory testicular as well as a number of funicular branches. The marginal part passes over the epididymal border of the testis within the tunica albuginea about the caudal pole of the testis.

The course, distribution, and mode of termination of the before mentioned branches into the parenchyma of the tstis and epididymis are given in some details.

The epididymis is supplied mainly by two branches, one for the head and the other for the tail while the body is supplied by a contribution from both previous branches.

INTRODUCTIONS

In the last few decades, variable techniques were introduced in the methods of studying the angioarchitecture of different organs of the body. Moreover the study of the vascularization of the organs has proved to be extremely beneficial in the interpertation of certain physiological and pathological events that may happen. As it is well evident from previous studies in domestic animals that the scrotal tunics and the testicular vessels have an important effect on the regulation of temperature of the testis; yet the study of the course and distribution of the internal spermatic artery in the camel is necessary to define the part played by this vessel in the thermoregulatory mechanism of the testis.

The vascular supply of the testis was studied by a good number of workers, DE GRAAF (1677) in man, dog and darmouse, MIHALKOVICS (1873) in rat, boar and man, BIMAR (1888) in man and a variety of domestic animals, and CLARK (1900) and HILL (1906) in the pig.

CHAUVEAU, ARLOING and LESBRE (1905) stated that the spermatic or great testicular artery in horse, ram, pig and dog arises from the aorta about the origin of the posterior mesenteric artery. The artery is enclosed in a peritoneal fold with its satellite vein.

The same subject was studied by PIQUE and WARM (1909) in ram, bull and man, ANDRES (1927) in the mouse, guinea pig, rat and rabbit and by LASSERRE and ARMINGAUD (1934) in the horse,

HARRISON (1948) reviewed the publi ations on the vascular patterns of the testis of different vertebrates. He discussed the relation between the convolutions and distribution of the internal spermatic artery and the thermoregulat ory mechanism that occurs in the testis.

HOFMANN (1960) gave the most reliable description of the arterial and venous tracts in the bull testis and epididymis.

He gave several names to the artery along its course from the aorta till its distribution inside the testis. On leaving the inguinal canal he calls the artery, the pars convoluta which froms coils directed anticlockwise. Along the attached border of the testis, the artery is called the pars marginalis; it terminates at the tail pole into the lateral and caudal testicular arteries. The collateral branches of the internal spermatic artery are the epididymal and accessory testicular arteries; they arise from the pars convoluta. The accessory, lateral and caudal testicular arteries ramify within the tunica albuginea forming the tunica arteriosa testis from which branches invade the parenchyma as the Arteriae radiatee testes. The latter arteries proceed towards the mediastinum as the Arteriae centripetales which are again reflected outwards as the Arteriae centrifugales before breaking into capillaries.

SALISBURY and VANDEMARK (1951) stated that in the dorsal part of the bull testis immediately lateral to the Caput epididymidis, the blood vessels are amall and few and this is the region where the biopsy needle is directed to obtain tissue samples from the centre of the lateral half of the testis with least damage of the arterial system

GUSAL and HARUSZTI (1962) discussed the thermoregulatory mechanism in the testis as a result of the close contact between the highly convoluted arterial and the extensively branching venous routes.

MILER, CHRISTENSEN and EVANS (1964) and SISSON and GROSSMAN (1948) gave a brief description of the internal spermatic artery in the dog. KOCH and BERG (1970) described the basic anatomy of the internal artery in domestic anims.

The only aviable literatures on the blood supply of the camel testis are those offered by LESBRE (1903) and TAYEB (1945)

The latter author gave a brief description to the origin course and distrbution of the internal spermatic artery in the camel.

Materials and Methods

Sixty one testicles were collected from the public abattoirs at Cairo and Giza. The vascular bed was flushed by a warm normal saline solution. Latex coloured with Vulcanocarmine and carmine stains was injected through the internal spermatic artery in 50 specimens according to the technique adopted by NEUMYER (1932). Five corrosion specimens were prepared by using plastoid solution according to the procedure reported by SCHUMER (1951) The corrosion of latex injected specimens in a strong caustic soda solution gave useful results,

The origin and course of the intra-abdominal part of the artery were studied in 20 full term foetuses and 50 adult camels.

Observations

The internal spermatic artery is the only source of blood supply to the testis and epididymis. This vessel is long and slender, and arises from the ventral aspect of the abdominal aorta at the level of the 4th lumbar vertebra and a little behind the caudal mesenteric artery. The artery of the right side is usually more cranially situated. The artery measure from 270-290 cm in length.

Owing to the long course of the artery it has been found more convenient to divide it into three segments abdominal, fuinicular and marginal on a regional basis

Pars abdominalis

The abdominal part of the artery extends from the aorta to the Ostium vaginale internus. It measures about 53 cm in length.

It passes caudolaterally for about 12 cm retroperitioneally, then becomes enclosed-with the internal spermatic vein ina sickle shaped peritoneal fold, the Plica vasculosa. Along this course the artery gives 2-4 small twigs which arborise in the subserous fat. At the Ostium vaginale, the artery and vein meet the ductus deferens which is also invested in a special fold.

Pars funicularis (Figs 1,2 and 3)

The funicular part begins as the artery emerges from the anulus inguinalis externus of the inginal canal enclosed in the vaginal process. It ends close to the head extremity of the testis. It measures, when straightened, sbout 204 cm. in tength.

The artery performs a number of peculiar windings of an irregular pattern but with prevalence of the forward and backward directions.

These windings give the general mass of the artery a cone shaped appearance as the windings are greatly exaggerated when traced distally. The intervals between the arterial coils are occupied by the dense pampiniform plexus of the arterial mass as well as the accessory testicular arteries which are abundant at the base of the cone.

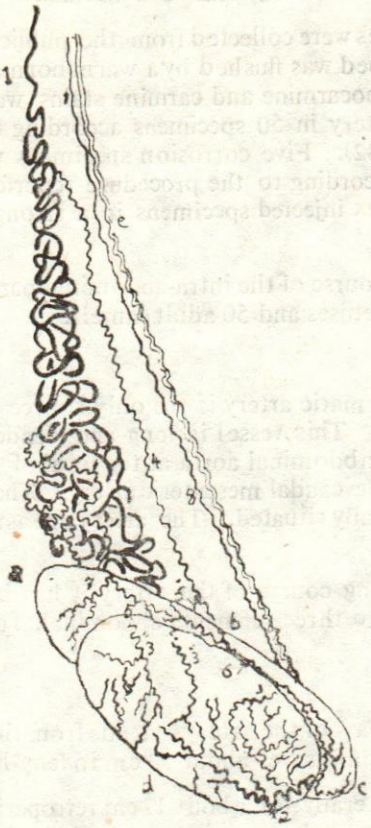

Fig. 1.—A diagram showing the distribution of A. spermatica interna of the right testis. (Lateral view)

1.— Pars funicularis.

2.— A. testicularis lateralis.

3.— 3 - Aa. accessoriae testes.

4.— A. cauda epididymides.

5.— 5- Rami corpores epididymides.

6.— Remus cauda epididymides.

7.— A. caput epididymides.

8.— A. deferentis.

a.— Caput epididymides.

b.— Corpus epididymides.

c.— Cauda epididymides.

d.— Margo liber.

e.— Ductus deferens.

Fig 2.—A diagram showing the distribution of the A. spermatica interna of the right testis (Medial view)

1.— Pars funicularis.
2.— Pars marginalis.
3.— A. testicularis medialis.
4.— 4.4 Aa. accessoriae testes.
5.— A. cauda epididymidis.
6.— Ramus corporis epididymidis.
7.— Ramus cauda epididymidis.
8.— A. deferentis.
a.— Caput epididymidis.
b.— Corpus epididymidis.
c.— Cauda epididymidis.
d.— Margo liber testis.
e.— Ductus deferens.

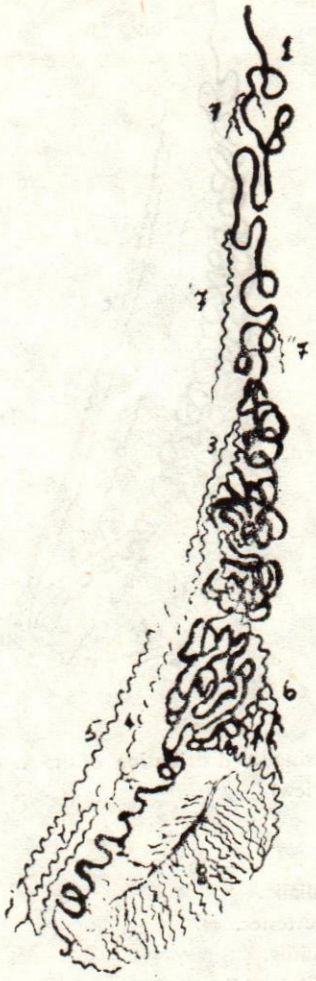

Fig. 3.—A diagram of the plastoid corrosion specimen of A. spermatica interna.

1.— Pars funicularis.
2.— Pars marginalis.
3.— A. cauda epididymides.
4.— Remus carporis epididymides.
5.— Ramus cauda epididymides.
6.— A. occessoria testis.
7.— 7- Rami funiculares.
8.— Aa. testicularis propriae.

Pars marginalis (Figs 2,3,4 and 5)

The marginal part begins at the head extremity of the testis, here it dips in the texture of the tunica albuginea and proceeds along the attached border under the epididymis. The convolutions of the artery are greatly reduced so that artery is more or less undulated. In most cases it shows a straight or a serpentine appearance. In- 2 specimens the artery forms dense and over lapping curns. Traced caudally the artery is reflected to the free border of the testis across its tail pole. In a few cases the artery pierces the tunica albuginea at variable distances from the tail pole, then returns to its course inside the tunica albuginea. The artery terminates a little before or beyond the tail extremity of the testis by giving 2 unequal medial and lateral testicular as well as a number of accessory testicular orteries.

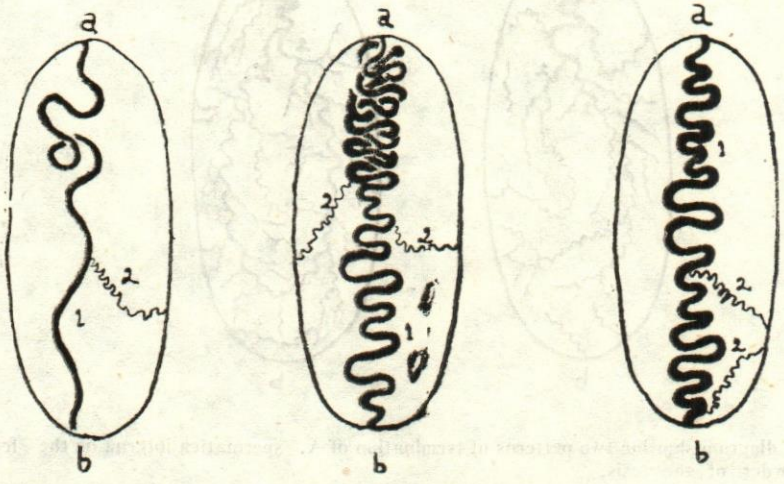

Fig 4.— A diagram showing the different courses of A. spermatica interna (Dorsal view)

1.— Pars marginalis.

2.— Aa. accessoria testis.

a.— Extremitas capitata testis.

b.— Extremitas caudata testis.

Arteriae epididymides (Figs 1,2 and 3)

The epididymal arteries are variable in number, origin and distribution They arise from the funicular part of the internal spermatic artery and in some cases from the accessory testicular arteries. In most cases there are two arteries namely, the artery of the tail and the artery of the head of the epiddiymis which supply the corresponding parts of the epididymis while the body supplies via the Rami corpores epididymides derived from both arteries. In a few cases these arteries arise independently from the internal spermatic artery.

A branch from the Arteria cauda epididymidis ascends along the ductus deferens and anastomoses with deferential artery

Arteriae accessoriae testes (Figs, 1,2 and 3)

The accessory testicular arteries are collateral branches of the funicular and marginal parts of the internal spermatic artery. They vary from 1 to 6 in number; they are small vessels that are distributed on the lateral surface of the testis, but a few of them are encountered in the medial surface.

Fig. 5.—A diagram showing two petterns of termination of A. spermatica interna on the free border of the tesis.

1.— Pars marginalis.

2.— A. testicularis laterelis.

3.— testicularis medialis.

a.— Extremites capitata testis.

b.— Extremitas caudate tesis.

The largest of these arteries forms massive tufts of convolutions which intermingle with those of the internal spermatic artery. In two cases, one of the accessory testicular arteries traverses the tunica albuginea obliquely towards the mediastinum where it persues a narrow spiral course; it is termed the Arteria centralis testis.

Pami funiculares (Fig. 3)

These branches arise from the funicular part of the artery; they vary from 3 to 5 in number and are distributed among the constituents of the vascular part of the spermatic cord.

Arteria testicularis medialis (Figs 1,2 and 5)

The medial testicular artery is one of the terminal branches of the internal spermatic artery. It emerges from the parent vessel at an acute angle with the lateral testicular artery at the tail pole of the testis. The two arteries run parallel to each other. The medial testicular artery presents 3 to 5 windings before terminating into two branches that ramify in an arbor-like fashion in the ventral surface of the testis. In addition the artery gives a large number of parallel undulating collateral branches which spread on the medial and lateral sufaces of the testis and usually anastomose with the terminals of the accessory testicular arteries.

Arteria testicularis lateralis (Fig 1 and 5)

This artery is usually smaller than the medial artery. It runs along the lateral face of the testis near its free border. It terminates close to the head pole of the testis. It gives a large number of collateral branches of variable sizes which arborise on the upper part of the lateral surface of the testis.

In two cases the medial and lateral testicular arteries diverge then converge and anastomose to form an arterial circle from which branches emerge and spread the suface of the testes.

In two other cases the marginal part of the internal spermatic artery continues along the free border of the testis without terminating into medial and lateral testicular arteries. Instead it gives a number of side branches which spread on the surfaces of the testis.

Arteriae testiculares propriae (Fig. 3).

The medial, lateral and accessory testicular arteries form a dense network of vessels within the tunica albuginea, these are termed the Tunica arteriosa testis. This network is well developed on the lateral and the greater part of the medial surface. It presetns two strata, superficial which is formed of large vessels and deep of smaller vessels which arise nearly perpendicular to the surface of the testis. These vessels which are termed the proper testicular arteries proceed internally in a winding course and are gradually reduced towards the Mediastinum testis. They give tree-like branches along the first part of their course. In the Mediastinum testis the vessels terminate in a network of larger thin-walled vessels longitudinal in direction. From this network larger vessels emerge and run peripherally to break, after a short course, into a large number of fine branches that are distributed in the parenchyma.

DISCUSSION

It is evident from the previous findings that the general morphological character of the internal spermatic artery of the camels simulates that of other domestic animals as reported by MIHALKOVICS (1973), CHAUVEAU et al. (1905), HARRISON (1948), GUSAL and HARASZTI, (1962) and SISSON and GROSSMAN (1968).

The abdominal part of the artery in the camel is straight as in the bull as desscribed by HOFMANN (1960).

The irregular arrangement of the convoluted part probably causes a slowere blood flow to the testis which allows either for preheating or precooling to be effectively performed. This function appears to be more needed for the camel which is subject to flactuating atmospheric circumstances causing the stabilization of the testicular temperature more difficult. The marginal part of the artery dose not show any significant feature except that it also gives a number of accessory testicular arteries.

In the majority of cases, the spididymis recieves its blood supply through two separate arteries instead of a single vessel as in other animals.

From the internal spermatic artery, one six to accessory testicular arteries are given in the camel. These vessels are represented by one artery in the ox (HOFMANN 1960) and play a role in supplying the parenchyma of the testis.

Some of the funicular branches that ramify among the components of the spermatic cord arise from the epididymal and accessory testicular arteries. Such branches which form communicating bridges between the different coils of the funicular part of the internal spermatic artery probably play a part in the regulation of blood flow to the testis.

The nomenclature given to the terminal branches of the internal spermatic artery as the medial and lateral testicular arteries corresponds to the lateral and caudal testicular arteries of HOFMANN (1960) in the ox. This difference in nomenclature is due to the differences in the directional position of the testis and the actual distribution of these vessels in relation to the testis in both animals. The Tunica albuginea, as in other domestic animals, is inelastic and contains a dense network of vessels, the Tunica arteriosa testis. The density of this tunic reaches its maximum extent at the caudal pole of the testis and is less pronounced along the free border and the lateral surface, as well as on the lateral part of the cranial pole. This arrangement is probably of value in the process of heat loss which affects thermoregulatory mechanism of the testis.

Since the medial surface shows the minimum amount of blood vessels in the tunica albuginea, its anteromedial part would be the best site for obtaining biopsy specimens.

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