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التصرف الوريدي للأدমে والتركيبات الأخرى بللقدم الأمامي في الجمل وحيد السنام

فؤاد عثمان ، ابراهيم أرناؤوطوفتش ، جمال الخليجي

أجريت هذه الدراسة لاعطاء بعض المعلومات عن الصفائر الوريدية في الأدمة وعلاقة هذه الأوردة بالتركيبات الأخرى وارتباطها بالوظائف الطبيعية والتدخل الجراحي للقدم في الجمل وحيد السنام •

حقنت الأوردة في أربعة وأربعين من الأقدام الأمامية لهذا الحيوان اما بمادة الفينيليت أو بمادة اللاتكس •

أوضحت الدراسة أنه تتواجد تشابكات عديدة بين الأوردة المشط قدمية (الوحشي والانسي والظهري) علاوة على الأقواس الوريدية الخاصة بالسلاميات الثلاث في كل أصبع •
أوضحت الدراسة أن الضفيرة الأخمصية تتمثل في طبقة واحدة وتتكون من أوردة مختلفة الأطوال والتخانات والتي تتشابه فيما بينها تاركة مساحات مختلفة الأشكال منها المربع والمستطيل والسداسي والمستدير والمثبت • أما الضفيرة الخاصة بالجزء الجداري من الأدمة فهي تنقسم الى قسمين جزء صفيحي وآخر غير صفيحي •

آخذين هذه الحقائق في الاعتبار يجدر بنا القول بأنه يمكن ربط أحد هذه الأوردة بدون خطر ضмор الجزء الخاص به ولكن على النقيض فان أي تلوث يصيب القدم يمكنه الانتشار بسرعة • كما أن هذه الدراسة ذات أهمية خاصة لاجراء أي تدخل جراحي في القدم •

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**VENOUS DRAINAGE OF THE CORIUM AND OTHER STRUCTURES
OF THE FORE FOOT OF ONE-HUMPED CAMEL**
(*Camelus dromedarius*)
(With 3 Figures)

By
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SUMMARY

The study was undertaken to provide some informations about the plexuses of the corium and the relations of the veins to other structures in connection with functions and surgical interference of the fore foot in the one-humped camel. Forty four feet of thoracic limbs were studied after injection by vinylite or latex.

The venous blood from the solar corium (the largest in the camel) is drained mainly by the branches of the abaxial and axial proper digital veins. The solar corium has very rich plexuses, which are represented by a single layer formed by veins of different sizes, leaving the spaces of various geometrical outlines e.g. quadrilateral hexagonal, quadrate, round and triangular. The venous plexuses of the parietal corium form single layer and can be divided into laminar and non-laminar parts. The venous plexuses of periopic corium are ill-developed. Three dorsal and three palmar arches for each digit are described in the text. The results presented in this paper might help in surgical interference.

INTRODUCTION

Description of the blood supply of the foot of the one-humped camel has been confined to the reports of ALY (1974) and SABER (1979). The present study was undertaken to define the distribution of the veins of the foot, so as to provide some informations about the plexuses of the corium and the course of the veins to other structures of the foot in relation to its function and surgical interference. Similar studies have been conducted on the foot of the pig by BICKHARDT (1961); in the goat by BADAWY and SCHWARZ (1963); in sheep by FREYTAG (1962) and in ox by IPPENSEN (1969); HEINZE and KANTOR (1972); HABERMEHL (1976) and WILKENS and MUNSTER (1976).

MATERIAL and METHODS

Forty four feet of thoracic limbs of adult clinically normal one-humped camels were used in this study. Twelve distal ends of the limbs were dissected after the injection of the veins with vinylite or latex. Venous casts of ten feet were prepared by vinylite injection and twelve with latex. Again, ten of the specimens injected with latex were used for transverse and longitudinal sections of the foot to define the topographical relationships of the large and medium-sized veins to the neighbouring structures. Injection of the vinylite and latex

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have followed the venous flow to avoid the effect of the large number of valves in large, medium-sized and small veins. The nomenclature adopted according to the *Nomina Anatomica Veterinaria* (1975) and ALY (1974).

RESULTS

The solar corium, largest in camel, presents very rich plexuses (Fig. 2/1) represented by a single layer of veins of different sizes crossing each other to leave spaces with different geometrical outlines e.g. quadrilateral, hexagonal, quadrate, round and triangular. The peripheral part of the solar corium is drained by the palmar branches of the abaxial proper digital veins (Figs. 1/7, 2/2). They, 5-6 in number, found around the circumferent border. The central part of the corium of each digit has the richest plexuses which form relatively small spaces. Most of the blood of this part is drained by the palmar branches of the axial proper digital veins (Fig. 2/3). These veins, 2-5 in number, which are formed by the plexuses 1-1.5 cm far from the median plane enter the interdigital septum and run vertically away from the solar surface to join alternatively the axial proper digital veins. Both central and peripheral parts of solar plexuses anastomose with each other forming a continuous venous network. The rostral part of the solar plexus is continuous with the veins of the plexuses of the parietal corium. The veins of this part of the solar corium are the smallest. The caudal part of the solar venous plexuses is drained usually by one large and one or two small veins (*Rami toricae digitales*) which run towards the median plane joining the axial proper digital vein.

The plexuses of the parietal corium (Fig. 1/18) follow the shape of the latter. They form a single rich layer and can be subdivided into laminar and non-laminar parts. The former (Fig. 3/6) is formed by relatively large anastomotic branches forming spaces of different shapes and sizes. These plexuses are continuous with those of the solar corium distally and medially, where they take part, together with the corresponding plexuses of the solar corium, in the formation of the *Vena marginis solearis* (Fig. 1/16, 3/4). Dorsally, the plexuses of the laminar corium are continuous with the plexuses of the non-laminar part of parietal corium. The latter forms dense network of small veins with scarcely noticeable spaces between them. They are continuous upward with the plexuses of perioplic corium (Fig. 3/5). The plexuses join on either side with the continuation of the *Vena marginis solearis* by which the dorsal proper digital vein is formed.

The venous plexuses of perioplic corium are not so rich and they are partly the upward continuation of the parietal plexuses. The veins of these plexuses join the termination of the *Vena marginis solearis*, as well as, the dorsal arch of the distal phalanx.

The *vena digitalis palmaris propria III axialis* (Fig. 1/11) and *Vena digitalis palmaris propria IV axialis* (Fig. 1/11') receive the branches from the axial part of the solar corium and drain also indirectly the plexuses of the parietal corium via the *Vena marginis solearis*. The veins run horizontally and parallel to the axial borders of the middle and proximal phalanges. They join each other about 1 cm distal to the fetlock forming the *Vena digitalis palmaris communis III* (Fig. 1/10).

Each of the *Vena digitalis dorsalis propria III* (Fig. 1/9) and *Vena digitalis dorsalis propria IV* (Fig. 1/9'), continuation of the *Vena marginis solearis*, ascends proximally on the dorsal surface of middle phalanx. It curves towards the interdigital septum and at the level of or a little above the fetlock joint, joins its fellow of the other digit forming the *Vena digitalis dorsalis communis III* (1/8). Here, they receive the inter-digital vein which anastomoses with the *Vena digitalis palmaris communis III*. This confluence lies between the proximal parts of the proximal phalanges.

VENOUS DRAINAGE OF THE CORIUM

Each of the vena digitalis palmaris propria III abaxialis (Fig. 1/5) and Vena digitalis palmaris propria IV abaxialis (Fig. 1/13) as mentioned before, is formed by 5-6 branches which drain the peripheral part of the solar corium and (indirectly) part of the parietal corium via the Vena marginis solearis. It runs firstly caudally on the abaxial side of the soft structures about 1-1.5 cm distal to the abaxial border of the middle and distal half of proximal phalanges. On reaching the abaxial border of proximal half of first phalanx, each abaxial vein crosses the palmar aspect of the first phalanx towards the median plane. From here, it takes proximal direction and runs along the lateral border of the deep digital flexor, lateral aspect of proximal sesamoid bone towards the cleft between the third and fourth metacarpal bones. At the commencement of the cleft, the Vena digitalis palmaris propria IV abaxialis joins the Vena digitalis palmaris communis IV. However, the Vena digitalis palmaris propria III abaxialis joins the Vena cephalica accessoria (Fig. 1/4), halfway between the distal and middle thirds of metacarpal bone.

The dorsal arch of the proximal phalanx situated at the boundary between the distal and middle thirds of the proximal phalanx. It is formed by one branch joining the abaxial and dorsal proper digital veins and then in turn it joins the axial proper digital vein (Fig. 1/14). The dorsal arch of the middle phalanx located at the proximal end of the phalanx, joining again the veins in the same way like that of the proximal phalanx (Fig. 1/15). The dorsal arch of distal phalanx formed by the termination of the Vena marginis solearis, is located at the proximal border of the distal phalanx (Fig. 1/17).

The palmar arches in general are stronger than the dorsal arches of the phalanges. They are formed between the axial and abaxial proper digital veins and found at the same level like that of the corresponding phalanx.

DISCUSSION

The only available literature on the blood supply of the foot of camel has been done by ALY (1974) and SABER (1979). However, they described only the large vessels of the foot and their findings are generally in agreement with the present work.

The veins of camels foot bear great resemblance to those of ox described by HEINZE and KANTOR (1972), HABERMEHL (1976) and WILKENS and MUNSTER (1976) as well as those of goat by BADAWI and SCHWARZ (1963). They have pointed out that the venous terminal arch in ox is located within the semilunar canal of distal phalanx that was not observed in camel.

It is to be mentioned, however that the corium of the foot of the camel is peculiar due to the fact that the foot of this animal has its specific configuration. The foot of the camel has two developed digits connected by interdigital septum, the only small cleft being rostrally, showing the divisions between the digits. The large ground surface is completely covered by horny structures. Consequently, the largest corium is that of the sole, which present very rich venous plexuses. The formation of this plexuses is in accordance with that described by SABER (1979) in the pelvic limb of camel, however; its arrangement in the hypodermis, dermis and subdermis as he said could not be confirmed by the present work. The plexuses are distributed intensively within the corium and connected with those of the parietal corium.

Bearing in mind the anastomoses between different plexuses, and the arches between the proper digital veins, almost any vein can be ligated without risk of necrosis. On the other hand any infection entering the corium could spread very rapidly. Finally, any surgical interference on the foot of the camel is suppose to be familiar with the course and distribution of the veins inside the foot of this animal.

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LEGENDS OF FIGURES

Fig. 1: Diagram showing the veins of the right fore-foot, dorsal view.

1 : Ossa metacarpalia IV, 2- Phalanx proximalis, 3- Phalanx media, 4- Vena cephalica accessoria, 5- Vena digitalis palmaris propria III abaxialis, 6- Vena digitalis palmaris communis II, 7- Rami palmares, 8- Vena digitalis dorsalis communis III, 9- Vena digitalis dorsalis propria III, 9'- Vena digitalis dorsalis propria IV, 10- Vena digitalis palmaris communis III, 11- Vena digitalis palmaris propria III axialis, 11'- Vena digitalis palmaris propria IV axialis, 12- Vena digitalis palmaris communis IV, 13- Vena digitalis palmaris propria IV abaxialis, 14, Ramus dorsalis phalangis proximalis, 15- Ramus dorsalis phalangis mediae, 16- Vena marginis solearis, 17- Ramus dorsalis phalangis distalis, 18- Plexus parietis.

Fig. 2: Vinilyte cast for the solar venous plexuses of the left fore foot showing the anatomoses and spaces with different geometrical outlines.

1- Plexus soleae, 2- Rami palmares venae digitales palmares propriae abaxiales, 3- Rami palmares Venae digitales palmares propriae axiales.

Fig. 3: Vinilyte cast for the parietal plexus of the fourth digit of the right fore-limb.

1- Vena digitalis palmaris propria IV abaxialis, 2- Vena digitalis dorsalis propria IV, 3- Vena digitalis palmaris propria IV axialis, 4- Vena marginis solearis, 5- plexus parietis (non-laminar part), 6- Plexus parietis (laminar part).

