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بعض الدراسات التشريحية على الشريان الفقارى فى البغل

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تم اجراء هذا البحث على عشرة رقاب بغال بعد اعدامها وحقنها بالفورمالين
ثم باللاتكس .

هذا وقد تبين من تشريح العينات السالف ذكرها أن :

- ا - ينشأ الشريان الفقارى من الشريان تحت الترقوى .
 - ب - يسير الشريان الفقارى فى الثقوب المستعرضة فى الست فقرات الاولى .
 - ج - يعطى هذا الشريان فروعاً ظهريّة وبطنية ووحشية واخرى شوكية .
 - د - تعطى الفروع الشوكية بدورها فروعاً للقناة الفقارية والفروع المكونة لكل من
الشريان الشوكى الظهرى الوحشى والشوكى البطنى .
- هذا وقد تم فى البحث مناقشة بعض المراجع والأبحاث التى تعرضت لنفس
الموضوع .

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SOME ANATOMICAL STUDIES ON A. VERTEBRALIS IN MULE
(Equus hinnus)
(With two Figures)

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SUMMARY

The vertebral artery originates in mule from the subclavian artery and detaches Rr. dorsales, ventrales, laterales and Rr. spinales. The segmental dorsal branches distribute in the dorsolateral muscles of the neck, while the ventral branches share in the formation of the plexus arteriosus vertebralis externus ventralis. Each spinal branch gives off R. canalis vertebralis and continues as A. nervomedullaris.

Each nervomedullary artery divides into A. radicularis dorsalis and A. radicularis ventralis. The dorsal radicular arteries share in the formation of A. spinalis dorsolateralis, while the A. spinalis ventralis originates from the right and left Rr. radicales ventrales I.

INTRODUCTION

The origin, course and distribution of the vertebral artery were studied by SIMOENS/DE VOS/LAUWERS (1979) and WILKENS/MUNSTER (1981) in different domestic animals; IBRAHIM (1980) in the same animal and ABD EL-MOATY (1980) and SELIM (1981) in donkey. The present study was carried out to obtain a clear picture about the course and distribution of the vertebral artery in mule and its role in vasculature of the spinal cord. The points of similarity and differences between the mule and other members of the family Equidae and other animals were described and discussed.

MATERIAL and METHODS

This study was carried out on 10 adult animals of the species *Equus hinnus*. The animals were anesthetized, bled and injected through the common carotid arteries with 10% formalin solution then with red coloured gum milk (Latex).

The nomenclature used in this work is that suggested by NOMINA ANATOMICA VETERINARIA (1973).

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RESULTS

The vertebral artery (1/6) originates from A. subclavia at a level with the 1st intercostal space. However, in only one dissected case, the artery arose from Truncus brachiocephalicus.

It passes in a craniodorsal direction and leaves the thoracic cavity between Mm. longus colli medially and scalenus medius laterally to reach the transverse foramen of the 6th cervical vertebra where it enters the transverse canal. It emerges from For. transversarium of the axis, crosses the atlantoaxial articulation and enters For. transversarium of the atlas to reach the atlantic fossa.

Within the latter, it gives off the R. anastomoticus cum a. occipitali and passes through the For. alare atlantis and detaches the R. descendens then continues through the lateral vertebral foramen of the atlas to enter the vertebral canal.

The vertebral artery then pierces the spinal dura mater and continues subdurally in a cranial direction where it curves ventromedially at the caudal margin of For. magnum to continue as A. basilaris.

In only two examined cases, the vertebral artery emerge from the For. transversarium of the axis and continued on the dorsal aspect of the wing of atlas to gain its lateral vertebral foramen without passing through the atlantic fossa.

The vertebral artery detaches the following branches during its course:

Rr. dorsales:

The segmental dorsal branches (1/7) are given off opposite to the cranial border of the pedicle of each corresponding cervical vertebra. The first branch is represented by the R. descendens (1/12), while the third one is double formed. The dorsal branches distribute in Mm. splenius, longissimus capitis et atlantis, longissimus cervicis, obliquus capitis cranialis and the interneural articulation. Moreover, several anastomoses are found between the dorsal branches and A. cervicalis profunda.

R. descendens:

The descending branch (1/12) originates from the vertebral artery just before it enters the lateral vertebral foramen of the atlas. It ascends between Mm. recti capitis dorsales major and minor medially and obliquus capitis caudalis laterally. It then continues caudally between the latter and M. semispinalis capitis to anastomose with A. cervicalis profunda. The descending branch supplies the before mentioned muscles and detaches a considerable branch for the occipital region to compensate the ill developed R. occipitalis.

Rr. laterales II-VIII:

The lateral branches (1/8) arise opposite to their corresponding intervertebral foramina, except the second one originates at the lateral vertebral foramen of the axis. However, the 4th and 6th lateral branches are given off the corresponding dorsal branches. They ramify in Mm. brachiocephalicus, splenius, longissimus cervicis and the skin covering.

Rr. ventrales:

The segmental ventral branches (1/9) are given off opposite to the origin of their corresponding dorsal branches. The first ventral branch is represented by the R. anastomoticus cum a. occipitali (1/11). Each ventral branch descends on the body of the corresponding cervical vertebra deep to M. intertransversarii cervicis to join its fellow of the other side forming an arch. The arterial arches anastomose with each other to form the plexus arteriosus vertebralis externus ventralis (1/10). This plexus is situated on the ventral aspect of the cervical vertebrae between the like

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named venous plexus dorsally and *M. longus colli* ventrally. It gives off muscular branches to *Mm. scalenus medius, longus colli* and *intertransversarii cervicis*. It also supplies nutrient vessels to the bodies of the cervical vertebrae and twigs for the intervertebral articulations. The plexus anastomoses cranially with a muscular branch from *A. condylica* and caudally with a branch from *A. cervicalis profunda*.

Rr. spinales

The spinal branches (1/13) are given off the dorsomedial aspect of *A. vertebralis* at the level of the intervertebral foramina. The first branch arises within the vertebral canal, while the second one is detached with its homonymous dorsal branch. Each spinal branch enters the vertebral canal through its corresponding intervertebral or lateral foramen where it detaches the *R. canalis vertebralis* and continues as *A. nervomedullaris*. However, the branches of the 2nd, 3rd and 4th spinal branches arise directly from *A. vertebralis*.

Rr. canales vertebrales

The branches of the vertebral canal (2/2) are detached from the corresponding *Rr. spinales* except the II, III et IV which arise directly from *A. vertebralis*. Each branch passes medially to lie deep to the plexus venosus *vertebralis internus ventralis* where it divides into a cranial and caudal branch. Each cranial branch courses in a cranial direction to join the caudal branch of the preceding *R. canalis vertebralis*. A transverse anastomosis also observed between each right and left caudal branches. These transverse anastomoses detach the *Aa. nutritiae* of the cervical *Corpus vertebrae*.

A. nervomedullaris

The nervomedullary artery (2/3) ascends in relation to the dorsal sensory root of its corresponding spinal nerve and divides into a *R. radicularis dorsalis* and *R. radicularis ventralis*. It also detaches 1 - 2 twigs for the epidural fat and a twig for the lamina of its corresponding vertebra.

A. radicularis dorsalis

The dorsal radicular artery (2/4) arises from the nervomedullary artery except the first which is detached directly from the vertebral artery. Each artery is related to the *Radix dorsalis* of its corresponding spinal nerve. As it reaches the *Sulcus lateralis dorsalis* of the spinal cord, it divides into a cranial and caudal branch. The cranial branch of each dorsal radicular artery joins the caudal branch of the preceding one to form the *A. spinalis dorsolateralis*.

A. spinalis dorsolateralis

The dorsolateral spinal artery (2/5) is situated in the *sulcus lateralis dorsalis* of each side of the spinal cord. Segmental dorsal anastomoses observed between the two arteries and with the ventral spinal artery (2/8).

A. radicularis ventralis

The ventral radicular artery (2/6) is the strongest terminal branch of *A. nervomedullaris*. The first branch originates directly from *A. vertebralis* and joins its fellow of the other side to continue caudally as *A. spinalis ventralis*.

Each ventral radicular artery passes in relation to the *Radix ventralis* of the corresponding spinal nerve to reach the *Fissura mediana ventralis* where it joins the *A. spinalis ventralis*.

A. spinalis ventralis

The ventral spinal artery (2/7) is formed mainly by the union of the right and left *Aa. radicales ventrales I* which originate directly from *A. vertebralis*. It passes along the *Fissura mediana ventralis* in a caudal direction. The artery is reinforced segmentally by the *Aa. radicales ventrales*. Along its course, it detaches fine meningeal branches and several twigs for the substance of the spinal cord.

DISCUSSION

The origin of A. vertebralis in mule is similar to that reported by IBRAHIM (1980) in the same animal, ABD EL-MOATY (1980) and SELIM (1981) in donkey. However, the same artery in horse arises from A. subclavia on the left side and the Truncus brachiocephalicus on the right as stated by SIMOENS/ DE VOS/ LAUWERS (1979) and WILKENS/ MUNSTER (1981).

The termination of A. vertebralis in mule simulates that reported by SIMOENS *et al.* (1979) in horse and ALY/ ANIS/ MOUSTAFA (1981) in donkey. However, KOCH/ BERG (1970) and WILKENS/ MUNSTER (1981) stated that the vertebral artery in cattle terminates as R. spinalis III.

The R. dorsalis I is represented by the R. descendens as reported by WILKENS/ MUNSTER (1981) in domestic animals, however, GHOSHAL (1975) considered the descending branch as the continuation of the vertebral artery.

A similar ventral external arterial vertebral plexus as that found in mule was not described in other domestic animals, however, diamond shaped anastomoses were observed by SMUTS (1977) along the ventral spines of the cervical vertebrae in ox.

The terminal branches of Rr. spinales in mule resemble that described by WISSDORF (1970) in pig and SEIFERLE (1975) in other domestic animals. The formation of A. spinalis dorsolateralis in mule simulates that recorded by the before mentioned authors. However, MILLER/ CHRISTENSEN/ EVANS (1964) stated that a continuous arterial dorsolateral trunk is not formed in dog.

The origin of A. spinalis ventralis in mule is similar to that described in pig by WISSDORF (1970) and SEIFERLE (1975) in other domestic animals. The artery is reinforced by the ventral branches of Rr. spinales in horse (GHOSHAL, 1975).

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LEGENDS

Fig. (1): A atlas, B For. alare, C axis, D 7th cervical vertebra, E 1st thoracic vertebra, F 1st rib. 1 Truncus brachiocephalicus, 2 A. subclavia sinistra, 3 Truncus costocervicalis, 4 A. cervicalis profunda, 5 A. intercostalis dorsalis I, 6 A. vertebralis, 7 R. dorsalis, 8 R. lateralis, 9 R. ventralis, 10 Plexus arteriosus vertebralis externus ventralis, 11 R. anastomoticus cum a. occipitali, 12 R. descendens, 13 R. spinalis, 14 Truncus bicaroticus, 15, 15' left and right common carotid arteries. 15'' A. occipitalis, 16 Rr. musculares.

Fig. (2): Arteries of the spinal cord a Radix dorsalis, b Radix ventralis 1 R. spinalis, 2 R. canalis vertebralis, 3 A. nervomedullaris, 4 A. radicularis dorsalis, 5 A. spinalis dorsolateralis, 6 A. radicularis ventralis, 7 A. spinalis ventralis, 8 R. anastomoticus.

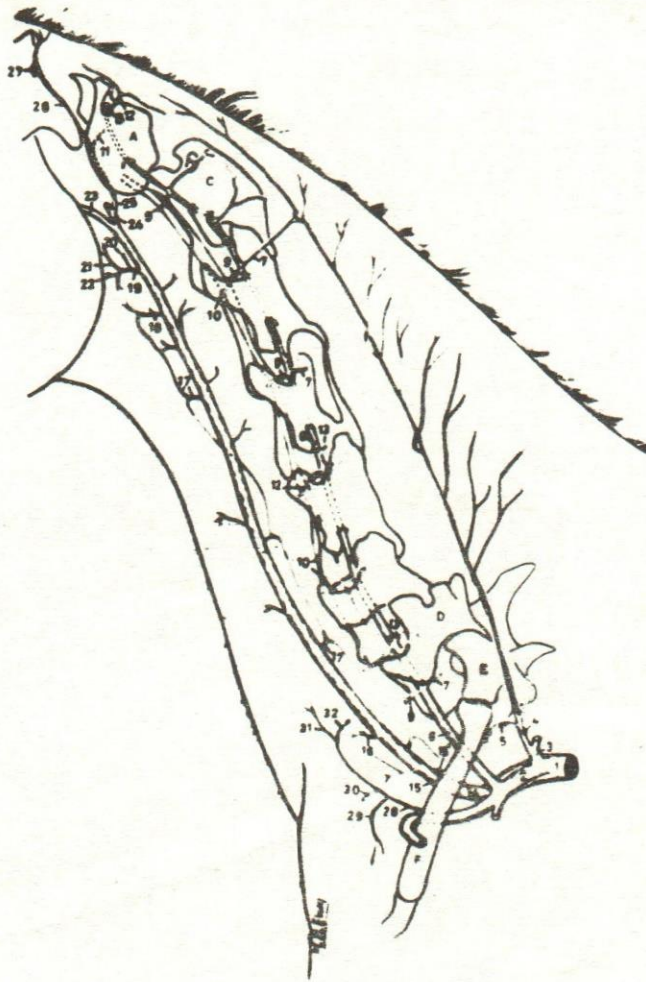


Fig. (1)

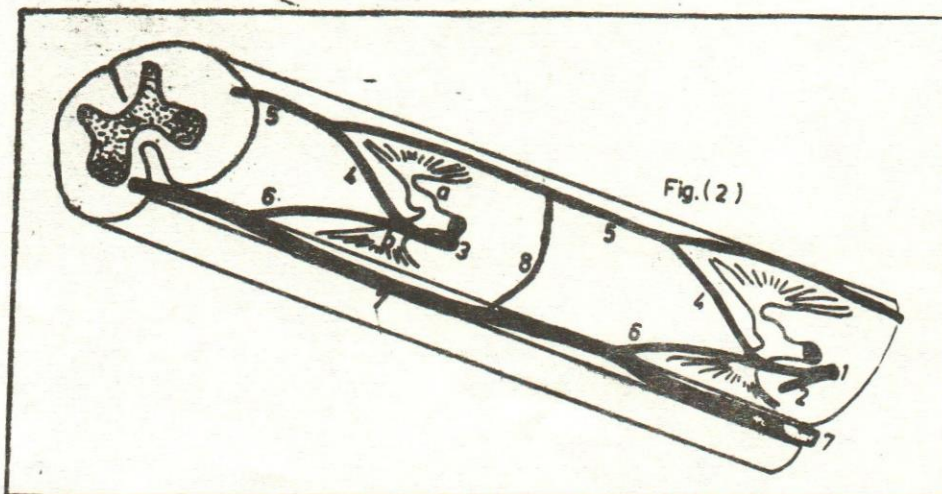


Fig. (2)

