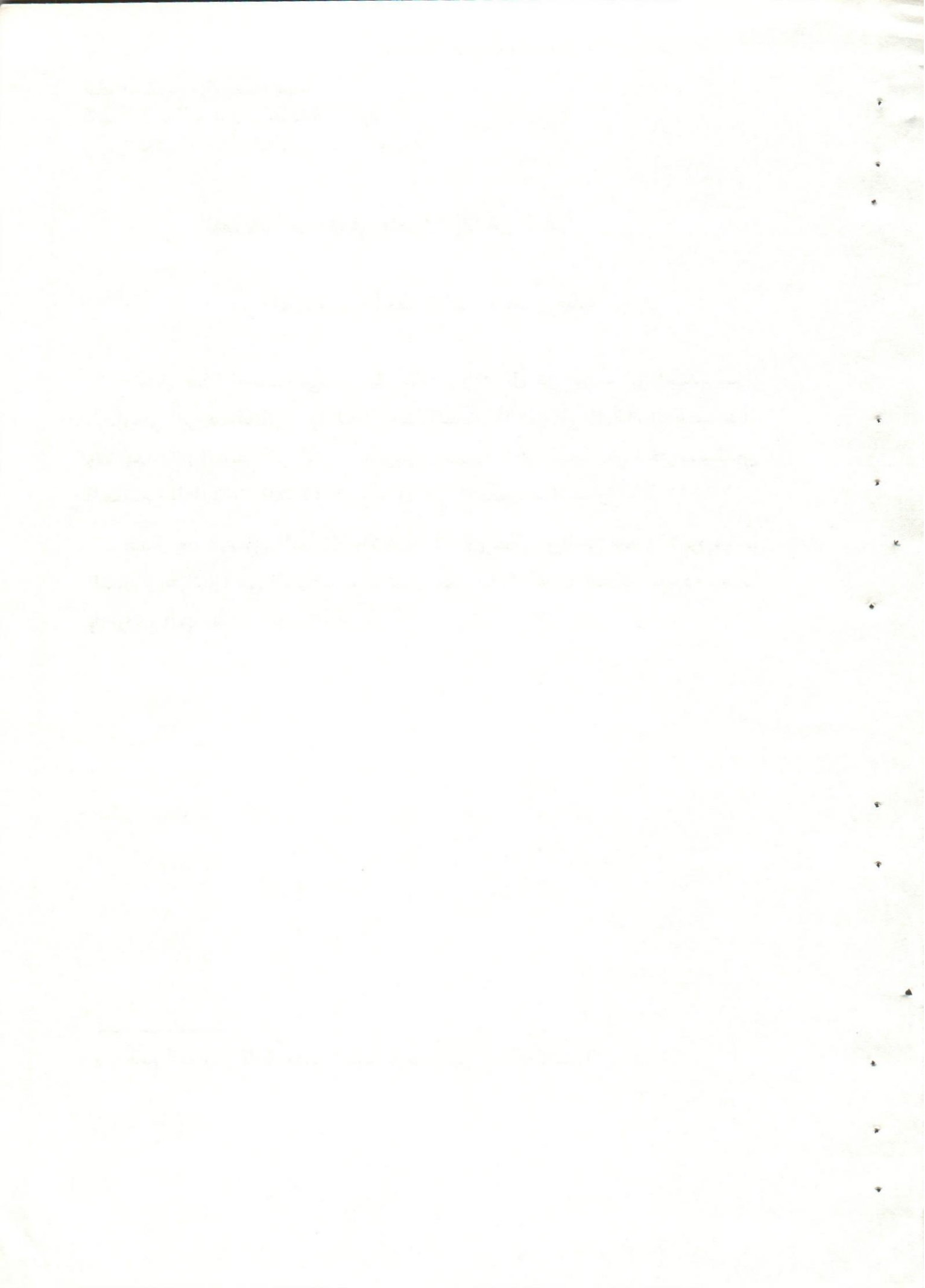


التصريف الوريدى فى منطقة الرقبة فى البغل

عبد الله حفى ، أحمد قناوى ، محمد عطية*

اشتمل هذا البحث على دراسة مسار وروافد كل من الوريد الوداجى الخارجى الوريد الفقارى وكذلك الوريد العنقى الغائر فى البغل . هذا وقد وجد أن الوريد الوداجى الخارجى ينتهى مقابل الثقب بين الفقرتين العنفتين الثانية والثالثة كما هو الحال فى الحيوانات المجترة . هذا وقد تم بيان التماثل والاختلاف بين مسار وروافد هذه الاوردة فى البغل ومثيلتها فى الحيوانات الاخرى وتمت مناقشة هذه النتائج مع الابحاث والمراجع التى عالجت نفس الموضوع .



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VENOUS DRAINAGE OF THE NECK REGION OF THE MULE
(*Equus hinnus*)
(With One Fig.)

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SUMMARY

The venous blood of the neck region in mule is returned to the heart through the V. jugularis externa, V. vertebralis and V. cervicalis profunda. An internal jugular vein was not demonstrated in any specimen as the case in horse.

The V. vertebralis emerges from the transverse foramen of the 3rd cervical vertebra, crosses the joint capsule between the 3rd and 2nd cervical vertebrae. It reaches the atlantic fossa where it joins the R. anastomoticus cum. V. occipitalis. It detaches a stem vessel for R. descendens and V. emissaria foraminis occipitalis and enters the lateral vertebral foramen of the atlas to join the ventral internal vertebral vertebral venous plexus.

INTRODUCTION

The venous system in horse was studied by many authors. However, no informations could be traced in the available literature concerning the venous system in mule (*Equus hinnus*). This study was, therefore, carried out on the venous drainage of the neck region in mule with the aim of describing the differences between it and other domestic animals, specially equines.

MATERIAL and METHODS

The present work was carried out on ten heads of adult mules (*Equus hinnus*). The animals were firstly bled, the vertebral and transverse canals were occluded and the heads were injected by blue gum milk Latex through the mandibular labial veins to recognize the tributaries of the veins.

The nomenclature used is that adopted by Nomina Anatomica Vetrinaria (1973).

RESULTS

The venous blood of the neck region in mule is drained mainly through V. jugularis externa, V. vertebralis and V. cervicalis profunda.

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V. jugularis externa:

The external jugular vein (1/15) originates from the cranial vena cava medial to the cranial border of the 1st rib. It passes between the caudal deep cervical lymph node dorsally and M. sternomandibularis ventrally to continue its course within the jugular groove. The external jugular vein divides at the cervical angle of the parotid salivary gland into the V. lingualis and V. maxillaris after detaching the V. cervicalis superficialis, Rr. esophagei et tracheales and Rr. musculares.

V. cervicalis superficialis:

The superficial cervical vein (1/17) joins the V. jugularis externa just cranial to the thoracic inlet. It runs craniad along the ventral border of M. scalenus medius to reach the deep aspect of M. cleidocephalicus where it continues its course as R. ascendens. It detaches a branch for the deep cervical lymph node and 2-3 muscular twigs for Mm. subclavius and scalenus medius.

The ascending branch (1/18) passes on the deep aspect of M. cleidocephalicus where it terminates after detaching 2-3 twigs to the superficial cervical lymph nodes and 4-5 branches for Mm. cleidocephalicus and splenius.

Rr. esophagei et tracheales:

Five esophageal and tracheal branches (1/19) are detached from the left external jugular vein, while the right one gives off tracheal branches only. Each esophageal and tracheal branch divides into a cranial and caudal twig which anastomose with the twigs of the corresponding branches to form a continuous vessel. This vessel lies on the lateral aspect of the trachea and joins cranially with the esophageal branch of V. thyroidea caudalis and detaches several twigs to the cervical part of the esophagus and trachea. The esophageal twigs reach the submucosa where they ramify to form an esophageal plexus which is well developed around the aditus esophagi and communicates with the pharyngeal venous plexus.

Rr. musculares:

The muscular branches (1/20) comprise a dorsal and ventral group. The dorsal one consists of 3-4 branches which ramify in Mm. brachiocephalicus, cutaneous colli and the covering skin. While the ventral group comprises 5-6 branches which drain Mm. sternothyrohyoideus, sternomandibularis, omohyoideus, cutaneous colli and the skin covering the ventral aspect of the neck.

V. vertebralis:

The vertebral vein (1/3) joins the cranial vena cava on the right side and the costocervical vein on the left at a level with the caudal border of the 1st rib.

It leaves the thoracic cavity and passes through the For. transversarium of the 6th cervical vertebra where it continues its course within the Canalis transversarius. The vertebral vein then emerges from the transverse foramen of the 3rd cervical vertebra and crosses the joint capsule between the 3rd and 2nd cervical vertebrae and detaches a branch which enters the vertebral canal through the second intervertebral foramen where it joins the ventral internal vertebral venous plexus. The vertebral vein then reaches the atlantic fossa where it joins the R. anastomoticus cum v. occipitalis. It then detaches a stem vessel for R. descendens and V. emissaria foraminis occipitalis and enters the lateral vertebral foramen of the atlas to join the ventral internal vertebral venous plexus.

During its course the vertebral vein detaches the following branches:

Rr. dorsales I - VIII:

The Rr. dorsales I and II originate from the plexus venosus vertebralis internus ventralis and are represented by the common stem for the V. emissaria foraminis occipitalis and the R.

VENOUS DRAINAGE OF THE NECK

descendens. The emissary vein passes through the occipital foramen to join the caudal communicating sinus, while the descending branch joins the V. vertebralis externus dorsalis.

The Rr. dorsales III - VI are detached opposite the cranial margins of their corresponding vertebrae, while the Rr. dorsales VII - VIII are ill developed and are compensated by 3-4 strong branches from V. cervicalis profunda. The dorsal branches ascend under cover of Mm. intertransversii cervicis to ramify in the lateral muscles of the neck and anastomose with branches from V. cervicalis profunda, while the R. dorsalis III joins the deep cervical vein itself.

Rr. ventrales I - VIII:

The R. ventralis I originates from the internal vertebral venous plexus and is represented by the R. anastomoticus cum v. occipitalis (1/9). The rest of the ventral branches are detached from the vertebral vein opposite to their corresponding dorsal branches. The ventral branches join with each other and with those of the other side to form the plexus venosus vertebralis externus ventralis (1/6). This plexus drains the cervical intervertebral articulations, Mm. intertransversii cervicis and longus colli and receives two nutrient vessels from each cervical corpus vertebrae.

Vv. intervertebrales III - VIII:

The intervertebral veins (1/7) are six in number as the first two are absent in all dissected specimens. Each vein arises opposite to its intervertebral foramen where it enters to continue within the vertebral canal to join the plexus venosus vertebralis internus ventralis.

Plexus venosus vertebralis internus ventralis:

The plexus consists two large parallel vessels which lie in grooves situated on the dorsal surface of the bodies of the cervical vertebrae. They join each other by transverse regular anastomoses, in addition to another connection with the vertebral vein through openings in the pedicles between the transverse and vertebral canals. The plexus detaches the R. spinalis I, the radicles of Vv. interarcuales and 1-2 basivertebral veins which enter each vertebral body through the basivertebral foramina. In addition, it gives off a vessel which represents the terminal part of V. vertebralis.

Vv. interarcuales II - VIII:

Each interarcuate vein (1/8) originates by 2-3 radicles from either both Plexus venosus vertebralis internus ventralis and V. intervertebralis or from the former plexus only. These vessels reach the caudal border of the arch of the preceding vertebra to join the V. vertebralis externus dorsalis, however the last two vessels join the V. cervicalis profunda. Each interarcuate vein detaches a R. spinalis except R. spinalis I which arises from the internal venous plexus.

Each spinal branch divides within the vertebral canal into a dorsal and ventral branch, both pierce the spinal dura mater to join the corresponding dorsal and ventral spinal veins.

V. cervicalis profunda:

The deep cervical vein (1/12) originates from the costocervical vein medial to the 2nd rib. It leaves the thoracic cavity through the proximal part of the 1st intercostal space to ascend between the lamellar part of Lig. nuchae and M. semispinalis capitis. At the level of the atlantoaxial articulation it anastomoses with R. descendens and R. dorsalis II. The deep cervical vein drains the muscles and skin of the lateral aspect of the neck and detaches the V. vertebralis externus dorsalis. It also receives the Vv. interarcuales VII et VIII and the R. dorsalis III.

V. vertebralis externus dorsalis:

The dorsal external vertebral vein (1/14) arises at the level of the 6th cervical vertebra. It passes along the dorsal aspect of the arches of the cervical vertebrae between the lamellar part of the nuchal ligament and M. spinalis et semispinalis cervicis till the atlantoaxial articulation

where it terminates by joining the R. descendens. The dorsal external vertebral vein drains the deep muscles of the neck and receives the Vv. interarcuales II - VI.

DISCUSSION

An internal jugular vein is absent in mule as the case in small ruminants and horse (WILKENS/ MUNSTER, 1981).

The emergence of the vertebral vein in mule from the transverse foramen of the third cervical vertebra resembles that described by RAUCHUT (1962) in sheep and goat and SMUTS (1977) in ox. Moreover, RAUCHUT (1962) stated that the termination and course of V. vertebralis in sheep and goat resembles that of the vertebral artery described in cattle by SCHMIDT (1910), who reported its termination also between the axis and the third cervical vertebra.

The ventral external vertebral venous plexus which is found in mule was described only in dog by REINHARD/ MILLER/ EVANS (1962).

The plexus venosus vertebralis internus ventralis of the mule was described in all domestic animals by WILKENS/ MUNSTER (1981) and in ox by SMUTS (1977). However, the same plexus was considered by BRADLEY/ GRAHAME (1947) and SISSON/ GROSSMAN (1969) in horse; REINHARD *et al.* (1962) in dog as the ventral longitudinal sinus.

The interarcual veins found in mule are present only in dog as stated by WILKENS/ MUNSTER (1981), SMUTS (1977) observed these veins also in ox. These veins join either the Plexus venosus vertebralis externus dorsalis as in dog (REINHARD *et al.* 1962) and ox (SMUTS, 1977) or the dorsal external vertebral vein as the case in mule.

The V. vertebralis externus dorsalis found in mule corresponds in position to the dorsal external vertebral venous plexus described in dog (MILLER/ CHRISTENSEN/ EVANS, 1964), ox (SMUTS, 1977) and camel (HASHEM, 1980).

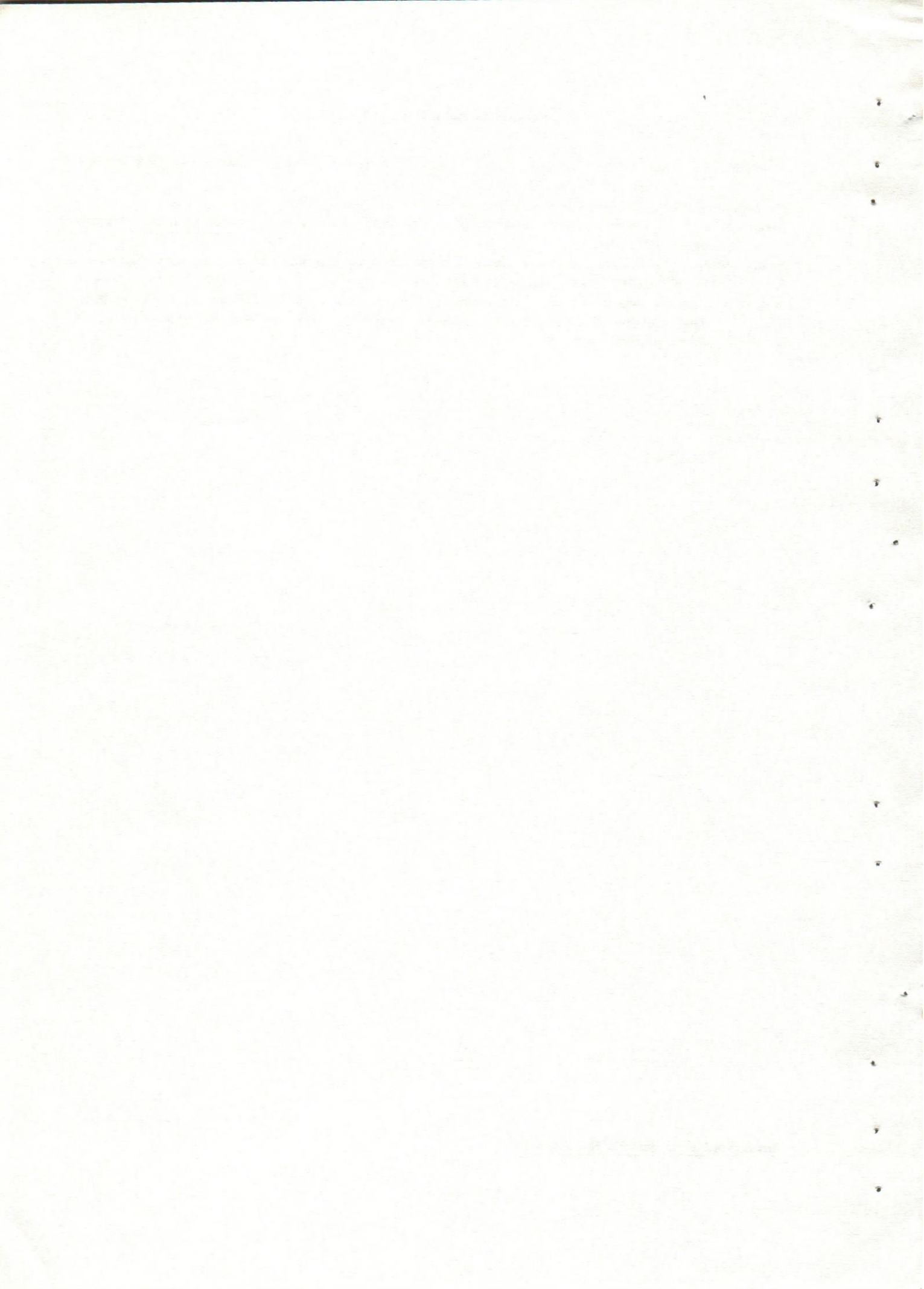
The comparison between the results of the present study and those described by BRADLEY/ GRAHAME (1947) and SISSON/ GROSSMAN (1969) in horse, REINHARD *et al.* (1962) in dog, RAUCHUT (1962) in sheep and goat, SMUTS (1977) in ox and WILKENS/ MUNSTER (1981) revealed that the drainage of the venous blood of the neck region of the mule is similar to that of dog and ruminants.

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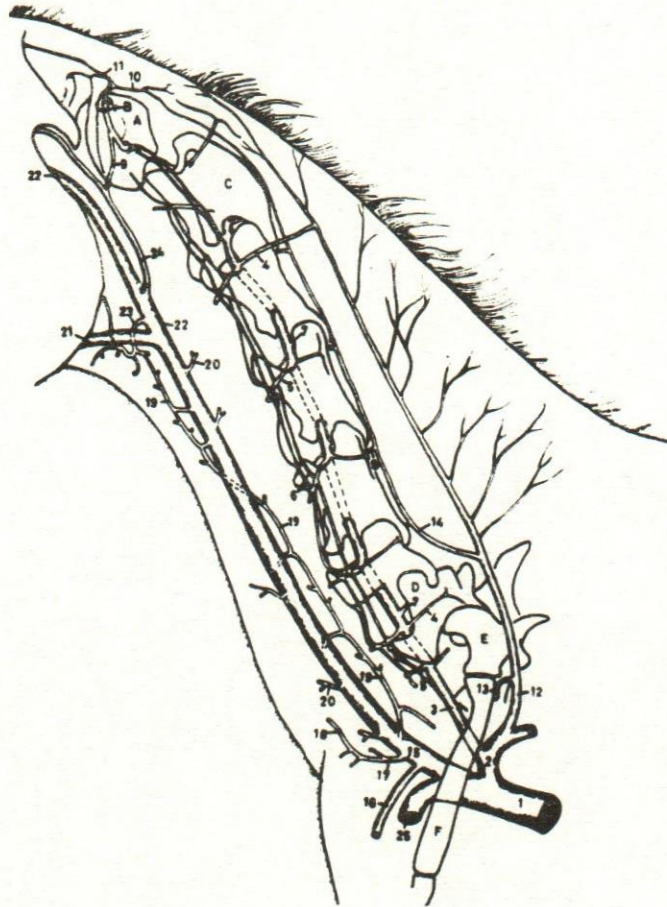


Fig. (1): The veins of the neck region in mule

A Atlas,
 C Axis,
 E Vertebra thoracica I.

B For. alare,
 D Vertebra cervicalis VII,
 F Costa I

- | | |
|--|--|
| 1 V. cava cranialis, | 2 V. costocervicalis, |
| 3 V. vertebralis, | 4 R. dorsalis III, |
| 5 R. ventralis III, | 6 Plexus venosus vertebralis externus ventralis, |
| 7 V. intervertebralis, | 8 V. interarcualid, |
| 9 R. anastomoticus cum v. occipitalis, | 10 R. descendens, |
| 11 V. emissaria for. occipitalis, | 12 V. cervicalis profunda, |
| 13 V. intercostalis dorsalis I, | 14 V. vertebralis externus dorsalis, |
| 15 V. jugularis externa, | 16 V. cephalica, |
| 17 V. cervicalis superficialis, | 18 R. ascendens of 17, |
| 19 Rr. esophagei et tracheales, | 20 Rr. musculares, |
| 21 V. linguofacialis, | 22 V. maxillaris, |
| 23 V. thyroidea cranialis, | 24 V. occipitalis, |
| 25 V. axillaris. | |



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