قسمى : التشريح ، علم الحيوان - كليتى الطب والعلوم - جامعة أسيوط .
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التصريف الوريدى للجدار الظهرى للصدر
فى بعض الثدييات

محمد نبيل صالح ، رفعت محمد ، محمد وهبه

أجريت هذه الدراسة على ٧ ثعالب رمادية ، ٣٠ فأر أبيض ، ١٥ أرنب ، ١٣ خفاش صغير. وقد استخدم المجهر التشريحى (× ١٣٫٥) فى دراسة الأوردة الخاصة بجمع الدم من الجدار الظهرى للصدر . وجد أن الوريد المفرد (Azygos - vein) يوجد فى جميع الثدييات التى استخدمت وأنه يقوم بجمع الدم من معظم الأوردة الظهرية البينضلعية .

وقد قورنت نتائج هذه الدراسة بنتائج الدراسات الأخرى التى أجريت على الفقاريات المختلفة .

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THE VENOUS DRAINGE OF THE DORSAL THORAGIC WALL IN SOME MAMMALS

(With 5 Figures)

By

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SUMMARY

The present work is done on seven greyl foxes, thirty albino rats, fifteen rabbits and thriteen microbats (rhinopomadidae). The venous drainage of their dorsal thoracic wall is described completely. It was found that, most of the dorsal intercostal veins are received by the azygos vein. Neither hemiazygos nor accessory hemiazygos veins present in these mammals.

INTRODUCTION

Compared to higher mammals, little attention is paid to the venous drainage of the dorsal throacic wall in lower mammals. McCLURE (1906), in didelphys, TYLOR and WEBER (1956) and HARRISON (1970) in cat, WELLS (1968) in rat and COOK (1965) in alboratory mouse gave little informations about this subject. The present work is done to give a complete identification for the veins draining the dorsal throacic wall in lower mammals. In addition to this, the present results are compared with those obtained in lower and higher vertebrates and to throw some light on the evolution of the azygos venous system.

MATERIALS AND METHODS

Seven grey foxes, fifteen rabbits, thirty albino rats, and thirteen microbats (rhinopomadiac) are used in the present study.All animals are adults.Grey foxes were shotted and collected from the fields in the vicinity of Assiut University While other animals are anaesthetised with ether. All animals are injected with coloured latex (DRURY et al., 1967) and kept in 10 per cent formaldehyde solution for seven days to hasten the settling of the cast.

The viscera, lungs and heart are carefully removed. The first thoracic vertebra is identified and used as a landmark from which other thoracic vertebrae are counted.

By means of a dissecting binccular micrescope, the dorsal intercostal veins and the veins draining them are identified and studied.

An outline of the ventral aspect of the dorsal thoracic wall, showing different vertebrae and ribs, of the different mammals is drawn. Mimeographed copies of these outlines are made and used to record the result (SEIB, 1932). The veins are drawn with regard to their relative size and their bony relations.

RESULTS

GREY FOX

Dorsal Intercostal Veins:

Each intercostal space has a dorsal intercostal vein. The dorsal intercostal vein arises about the middle of its own intercostal space. It passes medially unitl it reaches the azygos vein or the precava, according to its position, where it terminates. The most rostral veins terminate in pairs, but the remaining ones terminate separately (Fig. 1).

Each dorsal intercostal vein situated along the caudal border of the corresponding rib rostral to the accompanying artery and nerve.

Each dorsal intercostal vein receives several innominate muscular veins from the adjacent muscles.In addition it receives the lateral cutaneous and the collateral veins from the skin and muscles of the lateral thoracic wall. It also receives, the dorsal vein, (Fig. 2), which drains skin and muscles of the dorsum, the spinal cord and the vertebral column.

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The dorsal intercostal vein and its collateral tributary anastomose laterally with the ventral intercostal veins.

The first two dorsal intecostaly veins, one each side, terminate by a common stem into the precava (Fig. 1). The thrid and fourth veins on the left side behave also as the preceding veins. The remaining dorsal intercostal veins and the dorsal costo-abdominal veins are received by the azygos vein (Fig. 1).

The dorsal costo-abdominal vein arises by the confluence of two veins; a dorsal abdominal vein from the dorsal muscules of the abdomen and a costal vein extending along the caudal borders of the last rib. It runs medially in series with the dorsal intercostal veins, and terminates into the azygos vein (Fig. 1).

Azgos Vein:

The azygos vein is formed as the direct rostral continuation of the median lumbar vein (Fig. 1).

It enters the thorax through the aortic hiatus of the diaphragm where it lies dorsal to the aorta. It continues rostrally along the mid line of the vertebral column near its termination, it deviates slightly to the right (Fig. 1). Finally, it swerves ventrally around the root of the right lung to open into the precava, just fore piercing the pericardium, opposite the body of the third thoracic vertebra.

During its course, the azygos vein is present ventral to the vertebral column, ventral longitudinal ligament, right dorsal intercostal arteries, dorsal to the oesophagus, thoracic aorta and medial to the sympathetic trunks. As it swerves ventrally to reach the precava, it crosses the right side of both the oesophagus and trachea.

The azygos vein receives oesophageal veins in addition to the before mentioned tributaries.

It anastomoses with the first two or three pairs of lumbar veins through the small median lumbar vein. (Fig. 1). It is present venral to the first two or three lumbar vertebrae.

RABBIT

Dorsal Intercostal Veins:

The dorsal intercostal veins are similar to those described in grey fox except in their mode of termination. The first four left dorsal intercostal veins terminate into the left rostral intercostal vein. The first two right dorsal intercostal veins terminate into the right rostral intercostal vein. The remaining dorsal intercostal veins and the dorsal costo-abdominal veins open into the azygos vein (Fig. 3).

Each rostral intercostal vein passes rostro-ventral to the necks of the corresponding ribs. Finally opens into the corresponding precava (Fig. 3).

Azygos Vein:

It is similar to that described in grey fox except that it opens into the right precava opposite the rostral border of the thrid thoracic vertebra (Fig. 3).

ALBINO RAT

Dorsal Intercostal Veins:

The dorsal intercostal veins are similar to those described in grey fox and rabbit except for their termination. The first two dorsal intercostal veins, of each side, form the rostral intercostal vein. The latter passes rostro-ventral to the neck of the first rib to open into its corresponding precava. The thrid and fourth, on the right side, open in common into the right precava. The remaining dorsal intercostal and the dorsal costo-abdominal veins open into the azygos vein. The last two dorsal intercostal and dorsal costo-abdominal veins, on each side, form a common vein which joins the azygos vein opposite the body of the tenth thoracic vertebra (Fig. 4).

Azygos Vein:

It is similar to that of grey fox and rabbit except for its relations and termination. It lies to the left of the middle of the vertebral column (Fig. 4). Unlike that in grey fox and rabbit, it lies ventral to the left dorsal intercostal arteries. As it swerves ventrally to reach its termination into the left precava, it crosses the left sides of the trachea and oesophagus.

MICROBAT (RHINOPOMADIDAE)

Dorsal Intercostal Veins:

The dorsal intercostal veins are similar to those described in the previous mammals except for the mode of termination. The first two dorsal intercostal veins, on each side, draine into the corresponding rostral intercostal vein which opens into the corresponding precava. The remaining dorsal intercostal and the dorsal costoabdominal veins open separately into the azygos (Fig. 5).

Azygos Vein:

The azygos vein is nearly similar to that described in grey fox except it termination. It terminates into the right precava at the level of the body of the second thoracic vertebra (Fig. 5).

DISCUSSION

In most vertebrates, the venous drainage of the posterior wall of the thorax, passes chiefly through the azygos system.

In birds, the azygos system was not developed (McCLURE, 1906). This was explained by the disappearance of the anterior portions of the corresponding postcardinal vein and the complete absence of the supracardinal veins which were essential in the formation of the vena azygos, (LILLIE, 1930); PATTEN, 1958 and ROMANOFF, 1960). The same opinion was considered by WEICHERT, (1958),in reptiles, HUETTNER, 1949, in the frog.

In reptiles (WEICHERT,1958) and in birds (BAUMEL, 1975) the venous drainage of the posterior thoracic wall passes mainly through the internal vertebral sinus which corresponds to the azygos system.

In the present study, the venous drainage of the posterior thoracic wall, passes mainly through the azygos vein. There is neither accessory hemiazygos nor hemiazygos vein. This is similar to didelphys (McCLURE, 1906) and to cat (TYLOR and WEBER, 1956 and HARRISON, 1970). The abscence of the accessory hemiazygos veins was explained by HUNTTNGTON and McCLURE, (1920),who attributed it to atrophy of the cranial part of the left supracardinal vein.

Position of the vena azygos: In gray fox, rabbit and bat, the vena azygos lies on the right side of the front of the vertebral column.

This is similar to the cat (TYLOR and WEBER, 1956 and HARRISON, 1970), dog (MILLER, et al., 1964) pithecus rhesus (SEIB, 1932) and to man (SEIB, 1934; DAVIES and DAVIES 1926).

In rat, the vena azygos lies on the front of the left side of the vertebral column. This is similar to didelphys (McCLURE, 1906) and laboratory mouse (COOK, 1965).

Origin Of Vena Azygos:

In grey fox, rabbit, albino rat and bat, the vena azygos is found to be the direct continuation of the median lumbar vein.

The same observation was detected by McCLURE (1906) in didelphys; MILLER et al.(1964), in dog; SEIB,(1932),in pithecus rhesus and SEIB, (1934) and DAVIES and DAVIES (1962) in man. SEIB, (1934) termed the lumbar vein, the ascending lumbar, while DAVIES and DAVIES (1962) termed it, the lumber azygos. Both of them correspond to the median lumbar vein of the present study. SEIB, (1934) found that in 6% of cases the vena azygos was the direct continuation of the right subcostal vein. In cat, the vena azygos arises from the junction of several samll veins which originate in the musculature of the rostral part of the dorsal wall of abdomen (TYLOR and WEBER, 1956).

Intersegmental Veins: In the present study the intersegmental veins of the first and second right spaces, form a common trunk, the right rostral intercostal vein which opens into the right precava. It corresponds to the intercostalis prima dextra in pithecus rhesus (SEIB, 1932). In man, only the first intersegmental vein which joined the brachiocephalic vein, while those of the second and third spaces form the superior intercostal vein which joins the vena azygos (SEIB, 1934; DAVIES and DAVIES, 1962). The present study also shows that the intersegmental veins of the first and second left spaces form the left rostral intercostal vein which joins the left precava. But in the rabbit, the left rostral intercostal vein extends to the fourth space. It corresponds to the intercostalis prima sinistra in pithecus rhesus (SEIB,1932). In man the first interesgmental vein joins the left brachiocephalic vein, while the second and third form the left superior intercostal vein which also joins the left brachiocephalie vein (SEIB, 1934; DAVIES and DAVIES, 1962).

As regards to the rest of the intersegmental veins of the right side, the present study shows that most of them open into the vena azygos. The same observation was also detected in most mammals (MILLER et al., 1964), in dog (SEIB, 1932) in pithecus rhesus, and (DAVIES and DAVIES, 1962 in man). As regards to the rest of the intersegmental veins of the left side, the present study shows also that most of them open directly into the vena azygos. This is similar to didelphys (McCLURE, 1906) and to cat (TYLOR and WEBER, 1956).

In pithecus rhesus (SEIB, 1932) and in man (SEIB, 1934 and DAVIES and DAVIES, 1962) the intersegmental veins from the fourth to the eithth spaces join the hemiazygos while those of the lower spaces join the accessory hemiazygos vein.

CONCLUSION

1) In higher mammals(man) the azygos system is composed of a vena azygos, hemiazygos and an accessory hemiazygos veins. The vena azygos is developed from the proximal part of the right postcardinal and the cranial part of the right supracardinal veins. While the hemiazygos and accessory hemiazygos veins are developed from the cranial part of the left supracardinal vein (AREY, 1965).

2) In lower mammals (fox, rabbit, cat, rat) there is neither hemiazygos nor accessory hemiazygos vein. This is due to the disappearance of the cranial part of the left supracardinal vein. So most of the intersegmental veins on the side open directly into the vena azygos.

3) In reptiles and birds there is no azygos system at all. This is due to the disappearance of the cranial part of the postcardinal and complete abscence of the supracardinal veins. The intersegmental veins open into the internal vertebral veins.

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ABBREVIATIONS

T.V.: Thoracic vertebra.
Ic. V.: Dorsal intercostal vein.
Ant. Ic. v. : Rostral intercostal vein.
Int.J.V.: Internal jugular vein.
S.V.: Spinal vein.
L.V.: Lumbar.
D.C.A.V.: Dorsal costo-abdominal vein.
B.C.V.: Braciocephalic vein.
Ext.J.V.: External jugular vein.
D.V.: Dorsal vein.
L.Cu.V.: Lateral cutaneous vein.
Az. V.: Azygos vein.
Pre.: Precava.
Med.L.V.: Median lumbar vein.
S.V.: Spinal vein.
Col. V.: Collateral vein.
Sc. V.: Subclavian vein.

EXPLANATION OF FIGURES

Fig. 1: A diagram of the venous drainge of the dorsal thoracic wall of grey fox.
Fig. 2: A diagram of the fifth right dorsal intercostal vein and its tributaries, in grey fox.
Fig. 3: A diagram of the venous drainge of the dorsal throacic wall of rabbit.
Fig. 4: A diagram of the venous drainge of the dorsal thoracic wall of the albino rat. Note that the azygos vein was present to the left of the midline of the vertebral column.
Fig. 5: A diagram of the venous drainge of the dorsal thoracic wall of microbat.

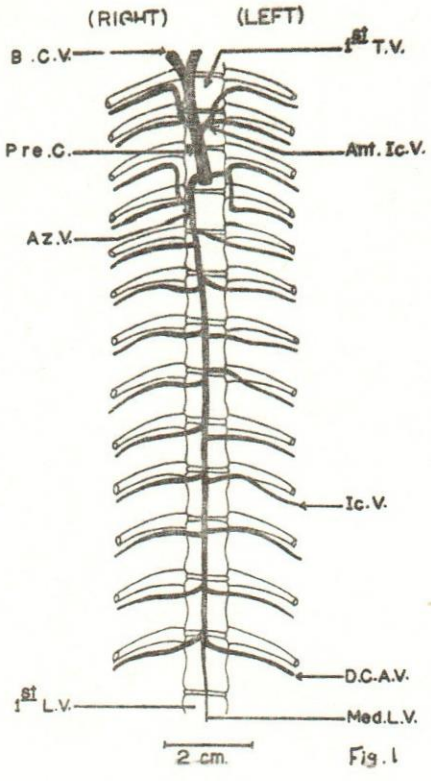

Fig. 1

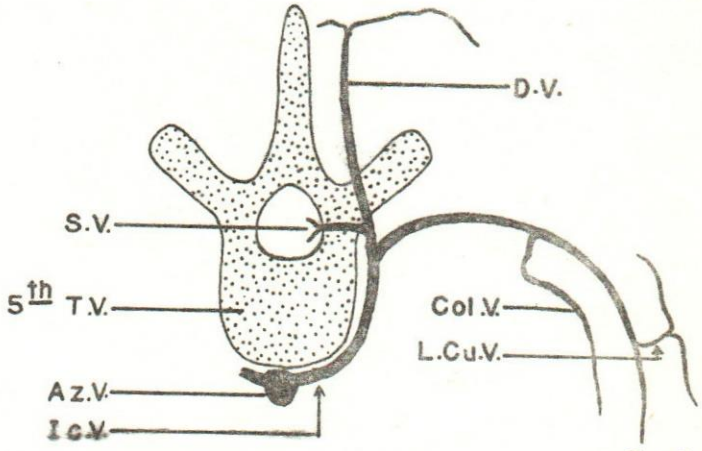

Fig. 2

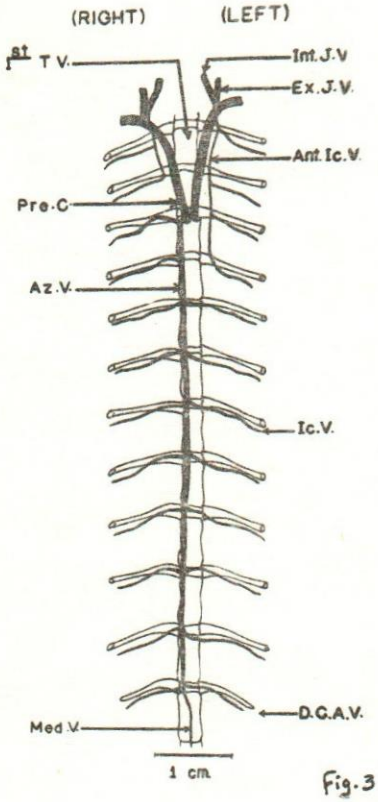

Fig. 3

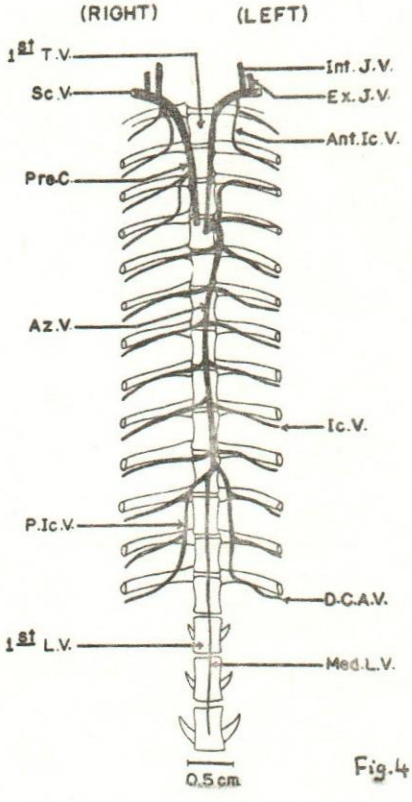

Fig. 4

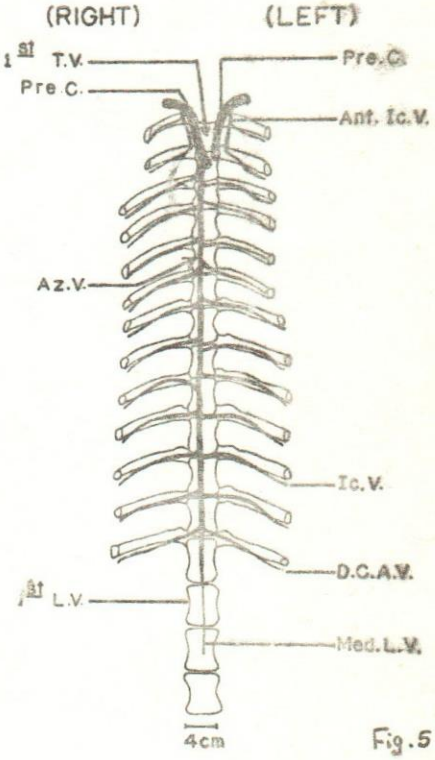

Fig. 5