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A HISTOLOGICAL STUDY OF THE RETE MIRABLE AT DOMESTIC MAMMALS

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Summary

The study of the histological aspects was made by using the rete mirables from two taurines and four ovines.

The space wich is circumscribed by the venous cavernous sinus and without possibility to distend it, which is offered to the rete mirable induces an important polymorphism to the blood sanguiferous vessels which struture the rete mirable.

The small artery's vascular wall from the rete has the median tunic flanked on both sides by endotelium, the adventitia being absent.

The arterial endotelium can structure small intravascular "pillows" with meaning to control the sanguin flow capacity at the level of encephalon.

The rete mirables play, for the beneficiary species, a fundamental role in controling the sanguin flow at the level of encephalon (1, 6, 9). Since in speciality literature we didn't come across dates about hystological particularities of the arterioles that structure the rete admirable, we considered the hystological study of these structures to be necessary (2, 3, 4, 5, 7, 8, 10, 11, 12).

Materials and methods

The study was achieved using the rete mirable from two taurines and four ovines. Thus, right after sacrifying the animals we washed the vasculary sublayer at the level of the rete admirable, injecting physiologic serum inside the carotid artery, until the respectively physiologic serum in the symmetric artery presents no blood traces. Afterwards, we proceed to extracting the rete mirable through the subsphenoidal region. After extracting, we dipped the rete in formaldehid solution 10%, in order to make further hystological mounts. The hystological study made within the hystological laboratory of the Veterianary Medcine Faculty of Bucharest. The images obtained were studied and photographed with the help of the Nikon optical microscope,equiped with a microphotography device. As a colouring method, we used hematoxilin – eozin , Giemsa , and orceine in order to highlight the elastic fibres in the vascular wall.

Results and discussions

The limited space, and without the dilation possibility at the level of the venous cavernous sinus, requires a great conformational variation of the vessels

that compose the rete mirable. This variation is also hystologically highlighted through the polymorphism of the vessels which struture the rete mirable.

The rete mirable is covered by nerve fibres with origins mainly in the suprasphenoidal sympathetic system, but also by ramifications from the 3rd,4th and 6th pairs of cranial nerves. Hystologically speaking, this nerve fibres appear separately from the vascular wall by conjunctive septums.

After studying the hystologic mounts performed, it was observed that large vessels such as the bazilar artery, it's collaterals, internal carotid artery reconstructed from the rete mirable, and also it's terminals etc. present the features of the musculary arteries.

In the wall's structure, the medium tunic prevails, composed mainly out of leyocites, ordered in several concentrical layers of cells. Among the muscular cells we encounter elastic fibres highlighted by the orcein colouring method and colagen fibres.

The adventitia includes many elastic and colagen fibres, fybroblastes , vasa vasorum, lymphocites and vasorum nerves. The muscular arteries receive abundent vegetative inervation, that allows them to unfold an intense and rapid vesselmotricity (vesselconstriction and vesseldilation).

However, most arteries that compose the rete mirable are arterioles with a much more reduced bore than the small muscular arteries that have a thicker wall comparatively with the bores. The limit between the tunics is less obvious and the bore is under 0.5mm. Most of the times, the differences between the small musculary arteries and arterioles is difficult to notice.

Generally speaking, the rete mirable includes large arterioles that have the following features: the intim tunic, very thin, composed by the endotelium, subendotelial layer with colagen and elastic fibres; the medium tunic composed by 2-6 concentrical layers of smooth muscular cells, fine elastic and collagen fibers. In the rete mirable's case, the medium layer is doubled at it's exterior by the venous cavernous sinus's endothelium that includes the rete. In these cases, adventitia is absent.

At the level of the previous arterioles, thickness of the intim layer was noticed, that outstands in the bore and closes it when the arteriole suffers vesselconstriction. The presence of the special vascular structures like artery "pillows" is dictated by the necessity of ensuring a variable sanguine flow, correlated with the sanguine necessary of the encephalon at a certain moment. The same structures are also present in organs with intense activity (kidneys, thyroid gland).

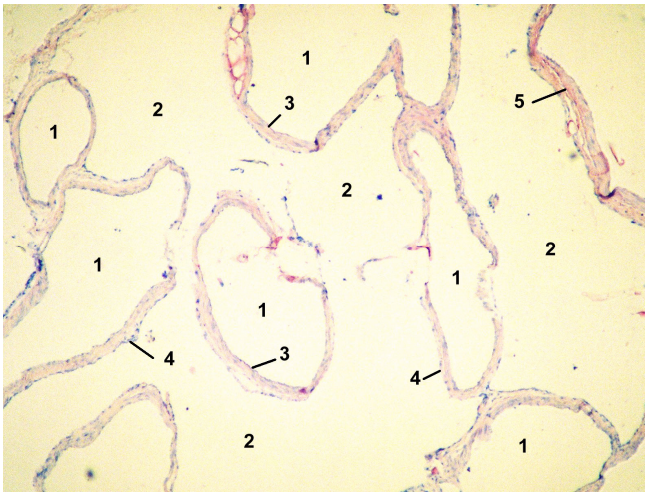

Fig. 1 General aspects of the rete mirable
Giemsa colouring method, ob. 4x
1. arterial ramifications; 2- venous cavernous sinus spaces; 3- arterial endotelium; 4- veinal endotelium; 5- leiocites.

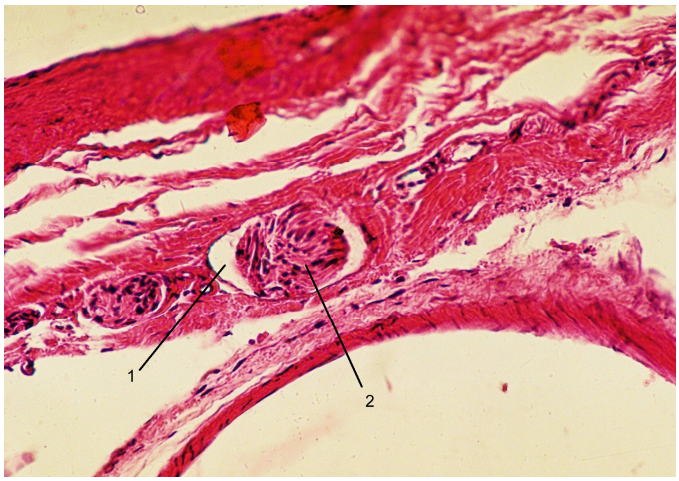

Fig.2 “Vascular pillows” at a level of some vessels from the rete mirable
Hematoxilin-eozin colourin, ob. 10x
1- vessel; 2- “vascular pillows”.

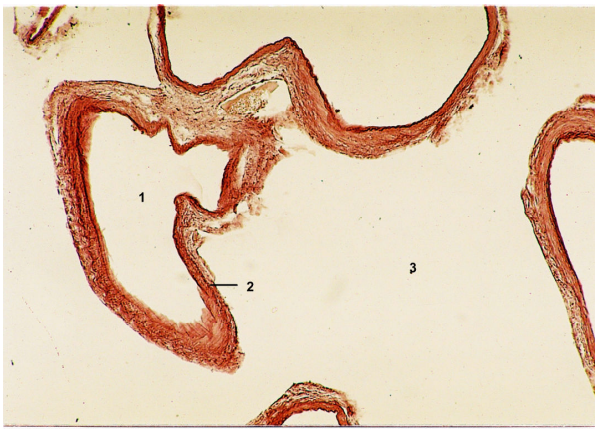

Fig.3 Elastic fibres from the vessel walls of the rete
Hematoxilin-eozin colouring, ob. 10x
1 - vessels; 2- nerve fibres; 3- conjuntive septum.

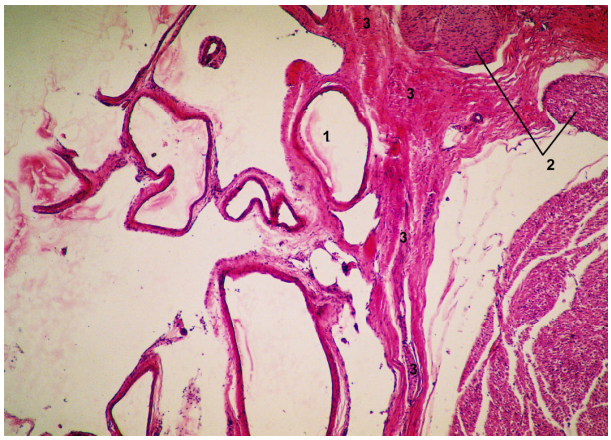

Fig.4 Nervous fibers separated by conjunctive septha of vasscular formation
1- vessel;2- nervous fibres; 3- conjunctive septha

Conclusions

a) The limited and without posibility of dilation space offerd to the rete mirable by the venous cavernous sinus, induces an important polymorphism to the blood sanguiferous vessels which struture the rete mirable.

b) The rete mirable is covered by nerve fibres with origins mainly in the oversphenoidal sympathetic system, but also by ramifications from the 3rd,4th and 6th pairs of cranial nerves. Histologically speaking, these nerve fibres appear separately from the vascular wall by conjunctive septums.

c) The medium tunic is composed by concentrical layers of smooth muscular cells; elastic fibres are abundent at this level, highlighted by the orceine colouring method.

d) The medium layer of the arterioles that structure the rete mirable is doubled at the interior by the arterial endotelium and at the exterior by the venous cavernous sinus's endotelium.

e) At the level of the rete's arterioles, we encounter thickness of the intim layer that close the bore when the arteriola suffers a vesselconstriction process. These endotelium structures called "vascular pillows" participate at the ensurance of a variable sanguin flow at the encephalon level.

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