

The vascular arrangement of the nasal septum of the Mongolian gerbil. A scanning electron microscopy study

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SUMMARY

This paper reports the results of a scanning electron microscopy (S.E.M.) study on the vascular arrangement of the nasal septum of the gerbil rat.

Using the microcorrosion cast technique we were able to visualize the overall picture of the capillary beds of the nasal septum.

With this technique we could demonstrate the different levels of the arterious and venous arrangements in the septal mucosa.

INTRODUCTION

A century ago Zuckerkandl (1885) published his classical studies on the nasal angioarchitecture. His work has been the foundation stone for all the subsequent studies on the morphology on the vessels of the nose. Most of these studies have been carried out in man (Dawes and Prichard, 1953). Swindle (1935, 1937) studied the vascular arrangements in the nose of different animals. He found that in some animals the arterial supply lies superficial to the vein while in other species the veins lie superficial to the arteries. He did not investigate the vascularization of the gerbil. In most of the studies on the distribution of the vessels in the nose the injection method with contrast media has been applied. Batson (1954) was the first to use methyl-methacrylate (a prepolymerized resin) for his corrosion preparation of the vasculature of the nose. Hodde et al. (1979) were the first to study the nasal vessels by means of corrosion casts and scanning electron microscopy. This paper reports on a study of microcorrosion casts of the vasculature of the nasal septum of the gerbil. This experimental model was designed to form a morphological basis for further investigation. The aim of this study is to describe the vascular arrangements in the nasal septum mucosa of the gerbil.

MATERIAL AND METHODS

Ten healthy Mongolian gerbils were used for the experiment. All animals were anaesthetized intraperitoneally with pentobarbital. The thorax was then opened and a plastic canula was placed and fixed into the ascending aorta. The right

heart auricle was cut away. The vascular system was then perfused with a heparinized buffered salt solution (40°), followed by a perfusion with prepolymerized resin (Mercox®).

The animals were then warmed up to 40°C for a period of 15 min to ensure the hardening of the plastic. The entire nasal septum was dissected out and with alternate application of macerating fluids and fresh water cast preparations of the nasal septum could be produced. These resulting casts were observed in a ISI - 40 S.E.M.

RESULTS

Using the microcorrosion technique we were able to study the vascular supply of the nasal septum in the gerbil.

All of the ten septae had a good filling of the vessels with the plastic material. In some specimen the lower anterior part of the septum "Kiesselbach's area" a diminished filling could be distinguished. On both sides of the nasal septum a submucosal vascular cast layer was seen. The morphology of the medial (septal) side of this layer differs completely with that of the lateral (cavum) side.

The medial side shows two or three straight running arteries coming from the

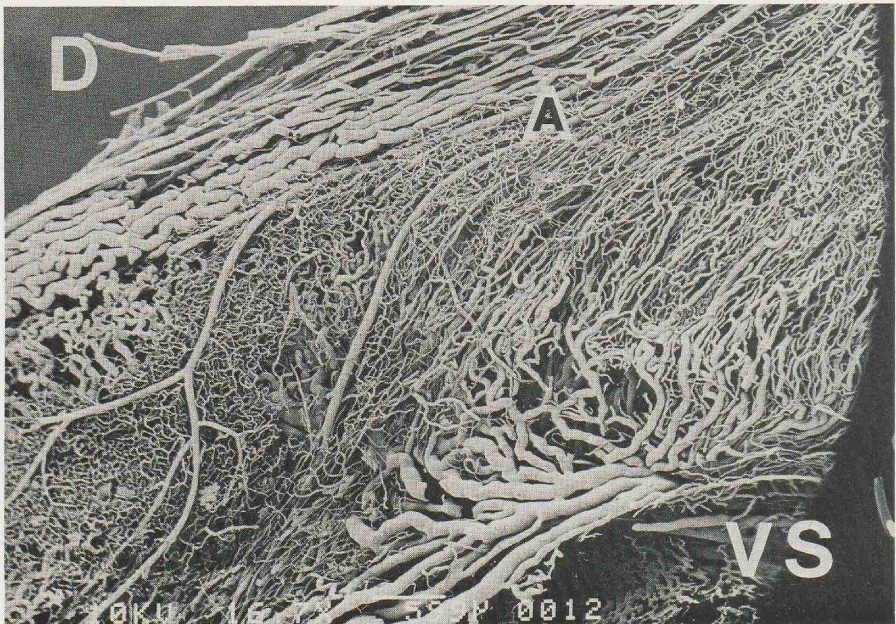


Figure 1. The medial side of the vascular cast layer of the nasal septum. Notice the arteriae (A) and the network of arterioles and capillaries.

D = Dorsal side of the septum

V.S. = Vena Sphenopalatinum

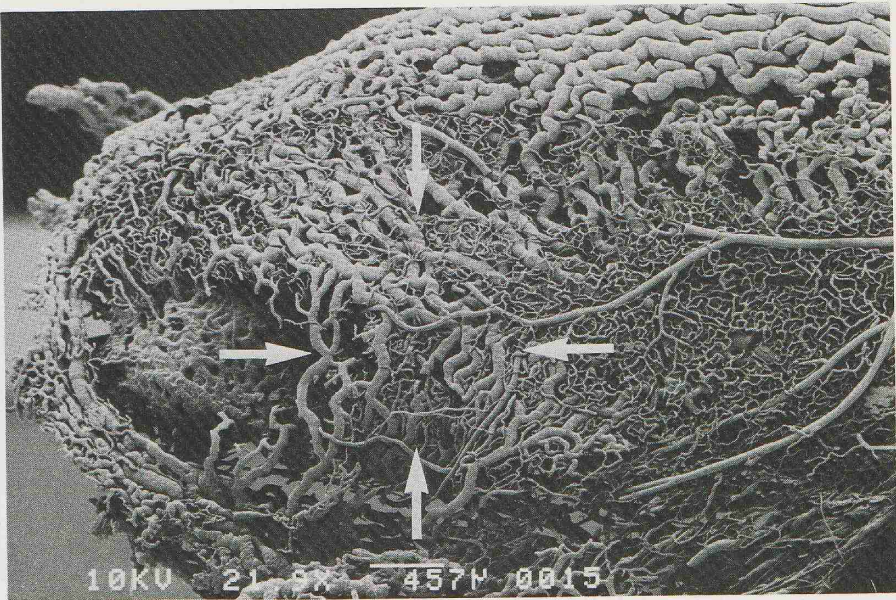


Figure 2. The "Kieselbach's area" where arterioles and venules lay in the same layer (arrows).

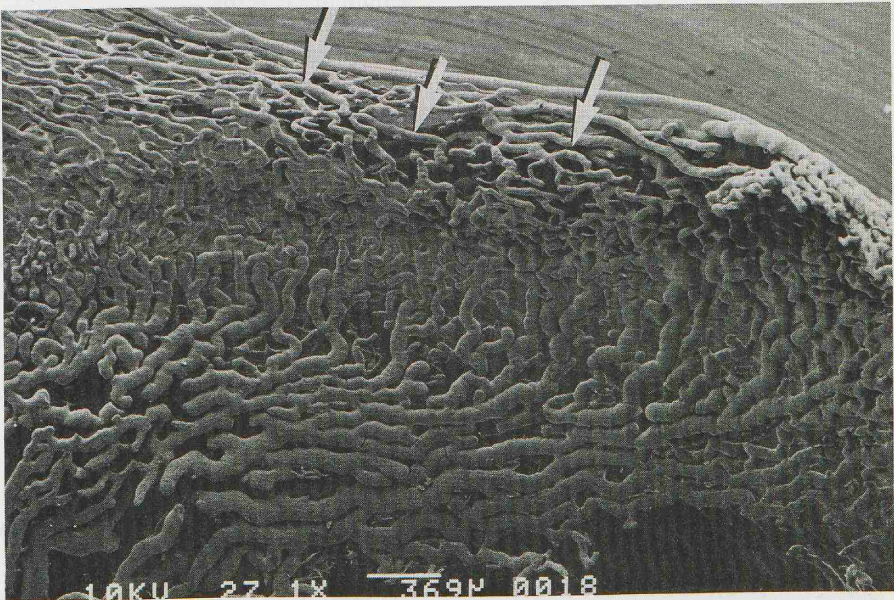


Figure 3. The lateral side of the vascular cast showing an enormous network of venules which cover the medial side (notice the different structures; compared with Figure 1 and Figure 2).
On the dorsal side many arteriovenous anastomoses (arrows) can be distinguished.

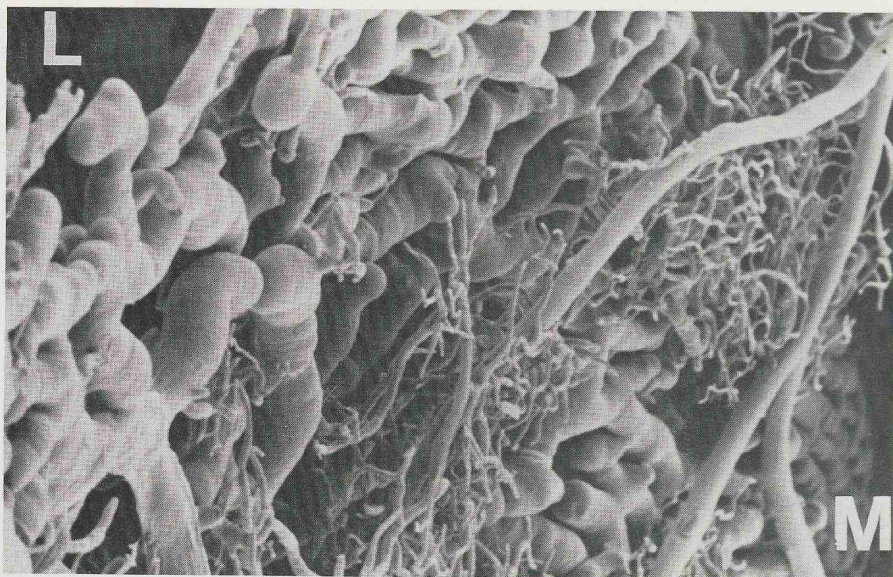
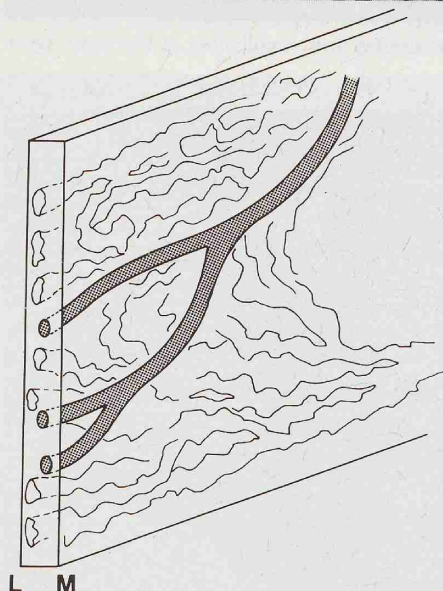


Figure 4. The vascular arrangement of the vessels in the nasal mucosa of the septum of the gerbil.

L = lateral side (cavum nasi)
M = medial side (septum)



arteria olfactoria running towards the lower anterior part of the septum. Around these arteriae a network of arterioles and capillaries can be seen (Figure 1). In the "Kiesselbach's area" the nasal septum arterioles mix with large venules (Figure 2).

The lateral side of the submucosal vascular cast shows a rich venous network (Figure 3) in which the drainage is from rostral towards the vena sphenopalatina

(Figure 1). On the dorsal border of the nasal septum an extensive zone of arterio-venous anastomoses could be distinguished (Figure 3).

Figure 4 shows in photo and diagram the vascular arrangement of the nasal septum of the gerbil.

DISCUSSION

For a good understanding of the vascular structures of the nose the corrosion technique is very important. Batson (1954) used methyl-methacrylate as corrosion medium for the nasal vessels which were studied by light microscopy. Hodde et al. (1979) used the same medium but studied the casts by scanning electron microscopy. He did not mention the particular arrangement of the vasculature of the nasal septum.

In our study we could clearly demonstrate the differences between the arterial supply and venous drainage of the nasal septum of the gerbil. The angioarchitecture shows in particular a great number and large capacity of the veins as compared with the arteries. The venous drainage layer is located more superficial than the arterial supply. This means that the gerbil belongs to the "V/A mammals" according to the description of Swindle (1935, 1937).

Using the microcorrosion technique we were able to demonstrate arteriovenous anastomoses on the dorsal border of the nasal septum. A region of interest is the "Kiesselbach's area". In this area the differences between the arterial and venous blood supply were not so prominent. Maybe this peculiar arrangement of blood vessels can be responsible for the vulnerability of the nasal septum in this area. Further research of the blood circulation in the nasal septum under various conditions seems to be important.

RÉSUMÉ

La vascularisation de la cloison septale du rat (Mongolian gerbil) a été étudiée au moyen d'un microscope électronique à balayage. Avec la "microcorrosion casting" technique il a été possible de visualiser l'ensemble des capillaires de la cloison et les différents niveaux d'arrangement de la circulation artérielle et veineuse de la muqueuse septale.

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