Histology of the mucous membranes of the lateral nasal wall

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SUMMARY

The preliminary results of investigating the lateral nasal wall are presented. In this study only three strips of mucosa are analysed from histological point of view using serial sections. One strip corresponded to the plane of lateral osteotomy, the second crossed the middle of turbinates and the third corresponded to the vestibular area.

The accurate number and distribution of vascular and glandular elements were determined by help of Visopan and micro-photographs.

INTRODUCTION

THE principal aim of the functional surgery of the nose is the least possible mutilation of functionally important mucous elements. This fact incited us to investigate the mucous membrane of the lateral nasal wall with special regard to the very part where lateral osteotomy is performed.

Our supposition based on clinical experience was that this part of the mucous membranes in front of the turbinates was functionally very important. We decided thus to study comparatively the distribution of the glandular and vascular elements in the determined sectors of the mucous membranes.

MATERIAL AND METHODS

The mucous membrane of the lateral nasal wall was taken in the Institute for Forensic Medicine. We reached the lateral nasal wall from above through the cribrose plate. Using this way we were able to remove the mucous membrane of the whole lateral wall including the turbinates, the part of the mucosa covering the nasal bones, the frontal process of the maxilla and the vestibular region. From 15 removed specimens 9 belonged to males and 6 to females in the life period of 25 till 60 years. All bodies belonged to people who had met an accident, so that no special disease was found at the postmortal examination. We believe thus that the sample taken for examination represent the larger population

Paper presented at the 6th Congress of the European Rhinologic Society, Erlangen, September 1975.



Fig. 1: Schematic presentation of the strips taken from lateral nasal wall mucosa.

with all anatomical and histological variations in spite of the relatively small number of specimens.

The material was fixed in 10% formalin and then embedded in paraffin. The sections were dyed hemalaun-eosin as well as by azan and after Mallory to demonstrate better the different elements of the mucosa.

From the mucous membrane of the lateral nasal wall we took 3 strips of mucosa (figure 1). The strip (1) corresponded to the plane of lateral osteotomy and crossed the mucosa just in front of the turbinates, the second strip crossed the middle of the turbinates and the third corresponded to the vestibular area. Every strip was devided in 3 thirds so that we could determine the distribution of mucosal elements in craniocaudal direction. In the plane of lateral osteotomy which was of our main interest we performed not only one section but we cut here the mucous membrane in serial sections of 10 μ in an anterior direction. We obtained thus 120 sections of this region.

We studied on the sections under the microscope and Visopan the elements of the mucous membrane: the epithelium, the glands, the vascular and the nervous elements as well as their relation to the cartilage and bone. To be able to count the glandular and vascular elements more accurately we made microphotographs of the sections and by aid of the magnifying glass determined the mentioned elements also quantitatively.

RESULTS

In the region of lateral osteotomy the glandular and vascular elements are very rich in all serial sections. The distribution of the glandular and vascular elements



Fig. 2: Histological picture showing the distribution of vascular and glandular elements in the middle third of strip 1.

changes in cranio-caudal direction. In the same direction the thickness of the muosa is changed as well. The mucosa of the strip 1 is the thickest in the caudal part. The thickness of the mucosa varies here from 160-300 μ being 235 μ in average. In the middle part the average thickness of the mucosa is 157 μ (ranging from 100-200 μ). The thickness of the mucosa of the upper third varies from 70-190 μ (118 in average).

The most caudal part of strip 1 is very rich in glandular elements, they are accumulated in groups being scattered all over lamina propria. The vascular pattern shows numerous cavernous spaces and such areas of predominantly

DISTRIBUTION OF GLANDULAR AND VASCULAR ELEMENTS IN SECTION 1 AND 2

		GLANDS/1mm ²	VASCULAR SPACES/1mm
	CAUDAL THIRD	53.1	11,2
SECTION 1	MIDDLE THIRD	52,5	10,6
	CEPHALIC THIRD	41,07	13,5
inder forder in der	TURBINATES	28,0	19,8
SECTION 2	MUCOSA BETWEEN TURBINATES	42,8	10,9

Fig. 3: Distribution of glandular and vascular elements in strip 1 and 2.



Fig. 4: Histological picture of vestibular area: dense subepithelial fibrous tissue without glands.

vascular elements are often found in this part of mucosa. In the middle third of strip 1 the glands are numerous and situated subepithelially. The vascular elements with many cavernous spaces are situated more deeply in lamina propria reaching the bony and cartilagineius structure (Figure 2). In the uppermost third of this strip the disposition of the elements is the same, the glandular layer is smaller and the vascular one being relatively larger and richer in cavernous elements.

By counting the number of vascular and glandular elements in every third of the strip 1 separately, we have come to the following results. The average number of glandular elements in caudal third is 53,1/mm² being in this way the richest area in glandular elements. The number of vascular elements is here 11,2. In the middle third the number of glandular elements decreases slightly to 52,5, in average, as well as the number of vascular spaces (10,6). The upper third is highly vascularized (13,5) being the best vascularized area of the strip 1. Here the number of glands decreases slightly to an average value of 41,07/mm² (Figure 3).

Observing mentioned elements in strip 1 on serial sections (in an anterior direction towards vestibular region) we could determine that the number of vascular and glandular elements gradually decreased.

In the strip 3 itself the cavernous spaces are absent in all sections. The number of glandular elements varies and one narrow zone of 500 μ to few mm on the very margin to the vestibular area exists. Here is the stroma very dense, containing very scarce vascular and glandular elements (Figure 4).



Fig. 5: Typical histological picture of the middle turbinate with numerous cavernous spaces.

We compared these findings with the pattern of strip 2 which was situated vertically across the turbinates. In the strip 2 we have found large cavernous spaces only (Figure 5), as well as their combination with diffuse glandular elements — similar to those in the caudal third of strip 1. The parts of strip 2 corresponding to the mucosa between turbinates containes dense subepithelial layer of glandular elements and vascular elements in the deeper layers of lamina propria. This structure resembles highly to those structures of the middle third of strip 1.

Comparing quantitatively turbinates with the middle third of section 2 — representing mucosa between turbinates the following data have been obtained. Turbinates are very highly vascularized with an average number of vascular spaces

NUMBER OF GLANDULAR AND VASCULAR ELEMENTS IN LATERAL NASAL WALL

	GLANDS/1mm ²	VASCULAR SPACES / 1 mm
SECTION 1	47,2	12,4
SECTION 2	35,4	15,8
SECTION 3	39,2	10,1

Fig. 6: Number of glandular and vascular elements in lateral nasal wall (strips: 1, 2, 3).

of 19,8 and with an average number of glands of 28,0. On the contrary mucosa between turbinates is rich in glands (42,8) and is not highly vascularized with an average number of vascular elements of 10,9 (Figure 3).

Although we have counted the number of glandular and vascular elements separately in every third of each strip it seems to us that it is more accurate to give the number of mentioned elements on mm² in relation to the whole strip (Figure 6). The average number of glandular elements in the strip 1 is 47,2/mm² and the number of vascular elements 12,4/mm². In strip 2 the number of glandular elements is reduced to 35,4 while the number of vascular elements is increased to 15,8/mm². The strip 3 has the poorest vascularization of 10,1/mm² while is rather rich in glandular elements (39,2). Comparing these results it becomes evident that the strip 1 is the richest in glandular elements and very good vascularized. The strip 2 is the richest in vascular spaces, while the strip 3 is the poorest in vascularization. The strip 2 contains smaller number of glands and the bigger absolute number of it is due to the relatively thicker mucosa. The strip 3 is significantly richer in glandular elements than the strip 2.

The nerves in the examined strip 1 are rather rich and situated below the glandular layer. We did not differentiate them either by caliber or by histochemistry. The nerve fibers between the glandular elements and around vessels are probably autonomic fibers.

CONCLUSIONS

- 1. The distribution of glandular and vascular elements is different in the various regions of lateral nasal wall mucosa.
- 2. All regions investigated except one narrow zone in borderline to vestibulum are highly vascularized and very rich in glandular elements.
- 3. The area of the lateral osteotomy is of utmost functional importance because of the great number of vascular and glandular elements.
- 4. In evaluating the functional importance of different regions of lateral nasal wall mucosa, the method of comparative quantitative morphology proved to be efficient.

ZUSAMMENFASSUNG

Präliminäre Resultate der Untersuchung lateraler Nasenwand werden dargestellt. In dieser Studie wurden nur drei Schleimhautteile serienweise geschnitten und histologisch analysiert. Ein Ausschnitt entspricht der Fläche der lateraler Osteotomie, der zweite verläuft durch die Mitte der Nasenmuscheln und der dritte führt durch dem Nasenvorhof.

Die genaue Zahl und Verteilung der Vaskulären- und Drüsenelemente wurde mittels Visopan und Mikrophotographien festgestellt.

RÉSUMÉ

Les auteurs présentent les résultats préliminaires d'une étude histologique de la muqueuse tapissant la paroi latérale des fosses nasales. Trois bandelettes verticales

de muqueuse sont utilisées: l'une correspond au plan de l'ostéotomie latérale; la deuxième traverse la partie médiane des cornets; la troisième se situe au niveau de la région vestibulaire.

La répartition et le nombre approximatif des éléments vasculaires et glandulaires sont déterminés au niveau de coupes sériées à l'aide d'un microscope Visopan et de microphotographies.

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