

THE PROPERTIES OF THE REPARATIVE TISSUE WHICH OCCUR AFTER
REMOVAL OF MUCOUS MEMBRANE OF MAXILLARY SINUS
(An Experimental Study)

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ÖZET: Yazarlar paranasal sinüs mukozasındaki reparasyon sonuçlarını deneysel olarak araştırmıştır. Deneysel hayvanı olarak koyun kullanılmışlardır. Maksiller sinüs cerrahi olarak açılıp mukozanın küretajı yapılmıştır. Alınan materyal histopatolojik olarak araştırılmıştır. Cerrahi girişimden bir ay sonra hayvanlar dekapite edilerek, aynı maksiller sinüs reparatif örtüsü histopatolojik incelemeye alınmıştır. Böylece daha önce kürete edilen sinüsteki reparatif mukozanın özelliklerini belirtmişlerdir. Yazarlara göre, reparatif mukozadaki özellikler, insanda sinüs hastalıkları cerrahi tedavisinde ortaya çıkan bazı durumların yorumunda faydalı olabilecektir.

ABSTRACT: Mustafa Zafer UGUZ, Saffet SOLAK, A, BIROL, Semih ÖNCEL, The Properties of the Reparative Tissue Which Occur After Removal of Mucous Membrane of Maxillary Sinus. Ear, Nose, Throat Department of State Hospital of Izmir and Department of Dermatology, Faculty of Medicine, Ege University, Izmir.

The results of reparative sinus mucosa have been studied by authors with experiments. Sheep have been used as experimental animal. Maxillary sinus has been opened and sinus curettage has been done. The material has been explored histopathologically. One month after the operation, the animals have been decapitated, and the same sinus reparative tissue has been studied histopathologically. Thus, the properties of reparative mucosa of the curetted sinus have been reported. According to the authors, exploring the properties of reparative mucosa in sinus surgery of human being will be useful.

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One of the disease concerning the branch of ear-nose and throat is paranasal sinus inflammation(1). Filtration and moistening of inspired air, and regulation of temperature are among the important functions of paranasal sinuses.

Paranasal sinus inflammations often follow upper respiratory tract infections. Acute forms of these do benefit from medical treatment. In chronic cases, however, surgical intervention is usually necessary (2). Paranasal sinus infection occurs in intranasal tumoral processes, nasal allergy and deviations of nasal septum. Maxillary sinusitis often results from ostiomeatal inflammation or insufficient drainage (3). The basic principle of the surgical intervention is to remove the disease mucousa or the obstacle that impairs drainage (4). In the literature you can scarcely encounter information about the regenerative tissue after these are not satisfactory. Furthermore, the complaints of the patient who were operated upon, still remain and sinusitis recurs. Therefore the question still remains about the changes in the mucosa of the sinus. This study on animals was planned to enlighten this subject.

To be able to indicate the pathological changes that take place after removal of paranasal sinus mucosa of sheep, it is convenient to mention about the normal sinus mucosal characteristics in these animals. In sheep, structure of sinus mucosa is identical to that of nasal cavity histologically just as it is in terrestrial mammals, and human beings. But, although there is an olfactory area in nasal mucosa, there is no report of such a structure in paranasal sinus mucosa (5,6,7). Mucosa is covered with stratified, ciliated, cylindrical epithelium. Goblet cells are encountered among these cells. Tunica propria is rich in especially elastic fibers and contains serous and mucous glands. Patchy lymphoplasmocytic infiltration is also seen. There may be lymphoid follicles here, too. Still deeper, submucosa, bony lamellae and periosteum are found (5).

The most important function is that of cells of covering epithelium. Cytoplasm of some of these cells are full of mucus. Sometimes aggregations are seen. Mucus, here, is different from that of tubuloalveolar glands because it contains sulfate salts. The cells of the bottom layer of covering epithelium are called basal cells and are tightly fastened to basal epithelium. These cells both accompany normal activities of epithelium and function in a way that will keep epithelium integrity (7).

MATERIALS AND METHODS: Maxillary mucosa of sheep was examined in this experimental study. Six sheep were used as animals of the experiment. Two sheep were taken from the slaughterhouse of Izmir, and four were obtained from Izmir Veterineriy Vaccination Research Institute of Ministry of Agriculture.

Sheep 1 and 2 (prot.no: 974/988: 976/988) that were obtained from slaughterhouse were males of about 1,5 years of age, and they weighed 43 and 45 kg respectively, during the time of slaughter. They were healthy from the veterinarian point of view and had no medical intervention before. Other sheep that were obtained from Vaccination Research Institute, had been used in vaccination controls and were healthy. All were 1 year old. Two are "Ak Karaman", the other two are "Merinos".

3rd sheep: Ak Karaman, (ear number yellow 94), male, weighing 38.5kg before the experiment, and 42 kg one month after the experiment.

4th sheep: Ak Karaman, (ear number black 14), male, weighing 50.5 kg before the experiment, and 50 kg one month after the experiment.

5th sheep: Merinos, (ear number black 8) male, weighing 38.5 kg before the experiment and 38 kg one month after the experiment.

6th sheep: Merinos, (ear number black 37), male, weighing 34 kg before the experiment, and 35 kg one month after the experiment.

Experiments were done in two steps.

First step: The skin over maxillary sinus was cleaned with water containing soap and antiseptic solution (diluted 1 % benzalchonium chloride). Hair on the skin was shaved, and the skin to be operated on was disinfected with alcohol-iodine. Operation field was infiltrated with local anesthetic containing 2% Lignocaine HCl + 0.00125 % Epinephrine solution (Jetokain). Then, cutaneous and subcutaneous tissues were passed using a four cm. long oblique incision extending from a point one cm. lateral and two cm. inferior to medial canthus to nostril. Bony plane was reached. Anterior wall of maxillary sinus was removed using a gouge and a hammer. The mucosa in maxillary sinus cavity was totally elevated and put into 78% alcohol solution for microscopic examination. In order to fully remove the mucosa in sinus cavity, the cavity was scraped with a gas sponge. bony cover of which attachment had been kept with a periosteal hinge was put back into its place. Layers were sutured in accordance with their anatomic structure and the operation ended.

800.000 I.U. of procaine penicilline was injected to the animals intramuscularly, once a day, for five days postoperatively. In the postoperative period moderate endurance was observed in operation field. Rectal temperature was followed daily. Clinical course was normal from veterinarian point of view. Sutures were removed one week after.

During this period, no special diet was applied to the animals.

Second step: The animals which had been operated on, were decapitate. Operated maxillary sinus was reopened, and following macroscopic examination, regenerating mucosa lining the cavity was removed total and sent for microscopic examination.

FINDINGS:

Findings of the first step: Maxillary sinus was found to be clear macroscopically. Mucosa was light yellow, bright and moist, appearing like normal sinus mucosa. Microscopically, there was stratified ciliated, cylindrical epithelium on mucosal surface, beneath this there was lymphoplasmocytic structures specific to normal mucosa, and still deeper there was severely loose connective tissue, beneath this mucous glands that sometimes formed groups and sometimes were solitary, were seen. In submucosa, lumens of capillary vessels were seen, at the very bottom periosteal layer and bony lamellae were identified (prot. nos. 974-976-1019-1020/1988; 86-89/1989), (Fig. 1).

Findings of second step: Upon entering sinus cavity, it was seen macroscopically that the cavity was totally lined by a clean reparative tissue that was partly atrophic and matt.

Newly formed mucosal lining was removed for microscopic examination. In none of these sections, normal sinus mucosa was encountered. Reduction in the number of cells of the covering epithelium was seen, in fact, sometimes it was composed only one layer of cells. Stratified cylindrical epithelium wasn't seen. Usually, a layer of cells contained flattened nuclei (Fig. 2). In the mucosal sections of the four animals, however, hydropic degeneration was found besides the other findings.

In the examinations of the other three animals (prot. nos. 167-171, 198/1989), cilia of ciliated cells weren't clearly identified. However, in some parts, elements resembling cilia were seen. In all hyalinized connective tissue was found under this covering epithelium. Beneath this, partly sclerotized young connective tissue was identified (Fig. 3). In the microscopical examination of the mucosa of the 3rd animal (prot. no. 169/1989), macrophages loaded with hemosiderin pigment were found under this connective tissue (Fig. 4). There was ectasia of capillaries in mucosal examination of the 3rd and 4th animals (Prot. nos. 169-171/1989). It was noted that capillary vessels were reduced in the mucosa of the third animal, and lymphoid vessels were widened in the fifth (prot. no. 198/1989). Glandular structure of mucosa was seen in none of the sections. In the sections of the sixth animal (prot. no. 213/1989), covering epithelium composed of one layer

sparse, irregular, squamous cells were seen on the surface, right beneath this was hyalinised connective tissue, then there was bony lamellae and in some parts, hyalinised young connective tissue. Glandular structures and lymphoplasmacyte cells were not encountered.

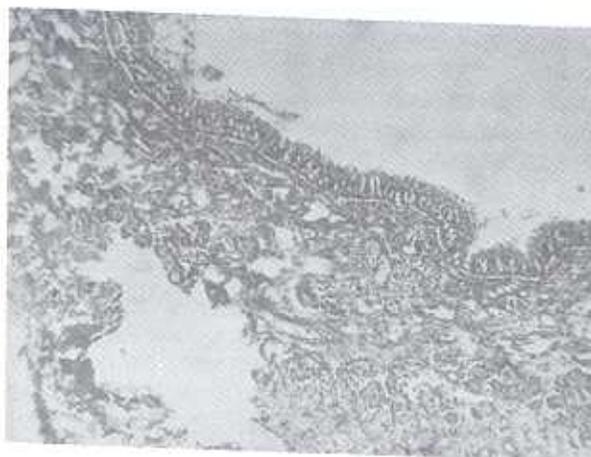


Fig 1: The microscopic appearance of normal sinus mucosa that was from maxillary sinus cavity with first operation (prot.no:88/1989).X 20.

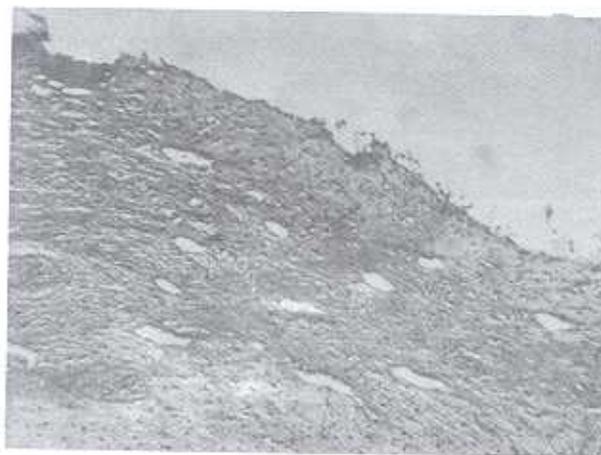


Fig 2: The microscopic appearance of reparative tissue which have covered maxillary sinus cavity after one month from the first operation (port. no: 171/1989). X20.



Fig 3: The appearance of young connective tissue and scarrification of reparative tissue which covered maxillary sinus cavity (prot. no: 198/1989). X20.



Fig 4: The appearance of macrophages loaded with hemosiderin pigment which have been found under the connective tissue of reparative tissue that cover maxillary sinus cavity (prot. no: 165/1989). X20.

DISCUSSION : In the course of paranasal sinus inflammatory processes, pathologic changes occur in mucous membrane. Inflammatory processes of sinus occur in four different types: acute congestive, acute purulent, chronic purulent and chronic hyperplastic (8).

The initiation and course of bacterial infections of sinuses depend on virulence of pathologic microorganism, patient's immunity, gas composition in sinuses, and patient's nutrition (9).

Microscopically, chronic suppurative sinus disease can be classified as: a)edematous; b)granular or infiltrative; c)fibrous; d)a combination of any of these (8).

Acute forms benefit from medical treatment.

In the following conditions, however, surgical intervention of the maxillary sinus is indicated in : 1) intranasal antrostomy insufficiency in chronic infections; 2) the formation of polypoid tissue in antrum; 3)cystic diseases of antrum; 4)osteonecrosis; 5)suspected maxillary sinus tumors; 6)oroantral fistulas; 7)complicated fractures of maxilla (10). The aim of sinus surgery is to maintain a patent and easy drainage between sinus and nose and to eradicate all diseased mucosa (10). As seen in the course of the inflammatory processes, the characteristics of this new tissue are: a)reconstruction ; b)formation of new tissue different from normal; c)the absence of metaplasia (11). According to us, removed mucosa is replaced by new reparative tissue appropriate to tissue reparation principles.

In fact, the replaced tissue which come after total curettage of sinus mucosa, is not reconstructive tissue. This replaced tissue is only the reparative tissue. Special structured basal membrane and stroma are totally removed when curettage has been done. The replaced reparative tissue, can't organise as reconstruction. Also, a lot of deficiency have seen about vascularisation and innervation of this reparative tissue. For this reason, mucous glands are totally absent, and covering epithelium on the surface are insufficient because of their properties. The covering epithelium is reduced to single layer although it has to have multiple layers. Besides these, ciliated epithelium cells are not produced perfectly.

These properties are morphologic explanation of mucousa that can't protect itself perfectly.

Therefore, in clinical practice after the curratage of the sinusal mucosa for many causes, the problems of the sinus is not resolved. This experimental study, explains clearly evidence of the clinical

observations. The cells have lost their cilia, so it has become impossible to excrete materials that must be removed. Also since mucous glands are lost, the secretion layer is not found to protect from harmful materials. The absence of mucous gland secretions to irrigate and to remove harmful materials, make the tissue unprotected.

The atrophy of the epithelium layer of mucosa is due to absence of vessels because of the underneath connective tissue being in charge of scarified tissue.

RESULTS: The fact that the complaints of the patients with maxillary sinusitis do not recover and that the disease often recurs has led us to this study in which we tried to examine the reparative tissue covering the operated area.

After the surgical intervention we applied in order to determine the nature of reparative tissue, we saw that the new formed reparative tissue was not the same as preoperative (normal) mucosa. The changes were: 1) in ciliated, cylindrical structure, the ciliated elements were significantly reduced; 2) stratified cylindrical epithelium was reduced to only a few layers and the nuclei became squamous; 3) scarification hyaline degeneration occurred in connective tissue; 4) mucous glands were significantly diminished and inactivated; 5) capillary vessels were ectatic.

The fact that the disease recurs, and some of the complaints continue to go on after the operation for maxillary sinusitis, could be due to formation of a new, differently functioning reparative tissue instead of normal mucosa.

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