

## Evidence of Bacterial Biofilms in Human Chronic Sinusitis

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### ABSTRACT

**Objective:** The reason of this study design is to analyze the presence of bacterial biofilm on the sinus mucosal surface of humans with the presence of stubborn chronic sinusitis.

**Place and duration of study:** The study is conducted in Khyber Teaching Hospital ENT Peshawar and the duration of study is March 2022 to August 2022.

**Material and Method:** We have evaluated small Sinonasal samples from 20 numbers of patients having previous history of sinus surgery or surgical intervention. No courses of antibiotic and endoscopic sinus surgery work best for all the number of samples. By the use of cutting instrument we have seen the ethmoid sinus mucosal specimens and maxillary specimens. Scanning and microscopic evaluation techniques are used to detect patients with continuous manifestations of chronic sinusitis even with prior medical and surgical intervention.

**Results:** Physical presence of microbial cluster of pseudomonas aeruginosa, a gram negative bacteria validate the existence of microbes in the sinus mucosa of patients. The existence of this microbial cluster may provide the evaluation of stubborn nature of some appearance of chronic sinusitis.

**Conclusion:** Spire shaped cluster of microbes are the structural indication of the presence of microbial biofilms in a patient with chronic sinusitis. Not only antibiotics but the combination of peroperative antibiotics and surgical intervention treatment therapy is recommended in such kind of chronic infections.

**Keywords:** Gram negative bacteria, sinonasal epithelium, electron microscopy

### INTRODUCTION

Chronic sinusitis is one of the emerging disease state in united state which affects approximately 13% of people in an year. This disease badly hits the society and affects the number of patients as per the reaserchers. Patients with recurring or chronic sinusitis experience worse sense of general health and liveliness than other inhabitants<sup>1</sup>. the estimated medical and surgical interventions of this chronic state is shocking nowadays. There is a clarifying treatment processing of chronic sinusitis in a medical and surgical intervention although some patients get stubborn sinus infections. These kinds of patients are difficult to treat whether through surgical intervention of sinus cavities or by induction of culture-directed antibiotic therapy. According to researchers gram negative bacteria are responsible for such chronic representation of this disease state. These observation providing the evidence that some other factors also involving to sustain this disease state.

Recent authentications have suggesting the part of bacterial microbes in the cause of many device related and chronic infections including otitis media, osteomyelitis, endocarditis, and pneumonia in cystic fibrosis patients<sup>2, 3</sup>. Bacterial biofilms are structurally composite, three dimensional colony of bacteria. Every discrete biofilms has matrix consisted of negatively charged polysaccharide. Once group together, these biofilms are able to leave behind both the effects of antibiotics and host immunological system<sup>4</sup>.

This contrary nature of many chronic cases of sinusitis providing the hypothetical evidence that some patients are suffering from biofilm-mediated chronic disease state. Researchers use electron microscopic evaluation as a gold standard for analyzing the presence of microbial clusters<sup>5</sup>. This medical report highlighting the biopsy specimens of 20 numbers of patients treating with chronic sinusitis.

### MATERIAL AND METHODS

This Study is conducted in the department of ENT of Khyber Teaching Hospital Peshawar and The duration of study is from March 2022 to August 2022.

We have noticed small Sinonasal samples from 20 numbers of patients having previous history of sinus surgery or surgical intervention. No courses of antibiotic and endoscopic sinus

surgery work best for all the number of samples. By the use of cutting instrument we have seen the ethmoid sinus mucosal specimens and maxillary specimens<sup>7</sup>. All the specimens are then settle into 4% formaldehyde solution to approx. 24 hours at minimum to allow fixation process. The entire specimen is then dehydrated using incubation with increasing concentration of ethanol of about absolute concentration of 100%. Specimens are then supercritical drying with CO<sub>2</sub> and sprayed with gold of a thickness of about 12nm. At the last these specimens are examined with electron microscope and classic image is considered at magnification points.

### RESULTS

In an overall 20 number of patients examined in this study showing the presence of inflammatory cells stains and loss of pithy cilia. In fig 1 you can observe, ciliary surface has much thicker coating than mucociliary surface<sup>6</sup>. All of these areas associated with the presence of rod-shaped bacterias, fig2-3, in an intraoperative culture of sinus secretions of patients, growth of gram-negative pseudomonas aeruginosa has been observed.

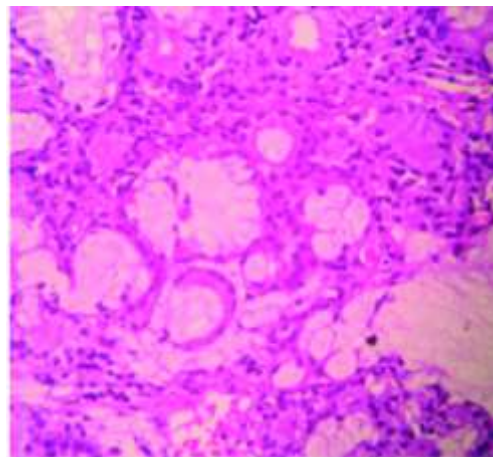


Fig 1: Cilia matted thick sinusitis histology

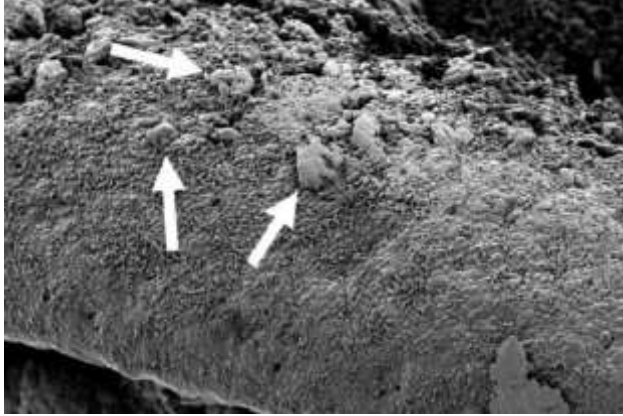


Fig 2: Spire shaped sinonasal epithelium (in white arrows)

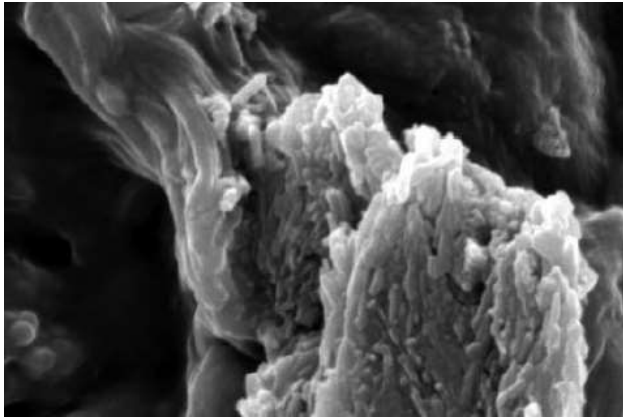


Fig 3: Dense mass of rod-shaped bacterium visible within spire shaped sinonasal epithelium.

## DISCUSSION

Our findings in this experiment provide captivating physical proof of the presence of bacterial biofilms in number of patients examined with chronic sinusitis. Spire shaped cluster composition of matrix-shaped microbes are the structural indication of biofilms<sup>8</sup>. This structural report of classic biofilms appear on the surface of human epithelial Sinonasal area giving the understanding of the nature of intractable gram-negative sinusitis<sup>9</sup>.

Variable morphological appearance of microbes alters the idea of getting device related or certain types of chronic infections<sup>10,11</sup>. Instead of relying on the use of antibiotics for the treatment of chronic infections, use of perioperative antibiotics with the addition of surgical intervention is recommended to use.

The molecular pathways which are involved in the morphological appearance of microbes are also researching

nowadays so as to given the targeted class of antibiotics to resist the microbial differentiation to some extent.

Microbial role in the cause of chronic sinus disease gives us frame of reference to understand the frustrating clinical course of some stubborn disease. The alliance is positively increasing important as targeted therapies may prevent or upsetting the treatment of microbial growth.

## CONCLUSION

Spire shaped cluster of microbes are the structural indication of the presence of microbial biofilms in a patient with chronic sinusitis<sup>12,13,14</sup>. Surface of human epithelial sinonasal area containing a gram-negative pseudomonas aeruginosa, not only antibiotics but the combination of peroperative antibiotics and surgical intervention treatment therapy is recommended in such kind of chronic infections.

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