The continuum of biofilm-like structures in different types of otitis media

Dai Shibata1,2, Patricia A. Schachern1, Vladimir Tsuprun1, Tamotsu Harada2, Michael M. Paparella3, Sebahattin Cureoglu1

1. Introduction

A biofilm is an aggregate of microorganisms, in which cells adhere to each other on a surface. The matrix provides protection from environmental threats including antibiotics, surfactants, and host immune responses. Biofilms are known to evade host defenses and antibiotic medication. The recent elucidation of biofilms discloses that biofilms play an important role in otorhinolaryngological diseases. Immune responses are believed to play a role in chronic diseases and biofilms have been associated with chronic otitis media (COM).

Biofilm-like structures in different types of otitis media were studied using surgical temporal bone samples. The hypothesis was that biofilm-like structures in different anatomical locations are present in different types of otitis media and have been associated with chronic otitis media (COM).

In this study, we examined the occurrence, frequency, and location of biofilm-like structures in different types of otitis media. Biofilm-like structures were defined as bacteria and their aggregates bound to fibrous material in "web-like structures" that contain inflammatory cells. We examined the frequency and anatomical locations of biofilm-like structures.

Results: Biofilm-like structures were observed in 23.7% of cases of SOM, 43.5% of cases of MOM, 43.5% of cases of POM, and 43.5% of cases of COM. There was no significant difference in the frequency of biofilm-like structures between SOM and POM (p = 0.0055), and SOM and COM (p < 0.001), was observed by chi-square test.

Discussion: Biofilm-like structures were not seen in any of our cases of pure SOM, while their highest incidence occurred in COM. Paparella et al. (1990) described OM as a continuum, where the more acute serous phase can progress over time into the more chronic stages. We suggest that the growth and development of biofilms may play an important role in the progression of the chronicity of OM.

Table 1: Properties of fluid and pathological changes in each OM type

Table 2: Number of TBs with different types of OM in each anatomical location

Table 3: Number of anatomical locations with biofilm-like structures in each TB

Given the similar incidence in the clinical studies and in our histopathological findings, it is reasonable to believe that biofilm-like structures may be important in the progression of the chronicity of OM.

Acknowledgements

This study was supported by the NIDCD 3R03DC008393-05S18, R01 DC004542, and the Starkey Foundation.

References