



Structural features of tympanostomy tube biofilm formation in ciprofloxacin-resistant *Pseudomonas* otorrhea

Chul-Ho Jang^{a,b,*}, Yong-Bum Cho^a, Cheol-Hee Choi^b

^a Department of Otolaryngology, Chonnam National University Medical School, Gwangju, South Korea

^b Research Center for Resistant Cells, Chosun Medical School, Gwangju, South Korea

Received 6 June 2006; received in revised form 6 December 2006; accepted 8 December 2006

KEYWORDS

Tympanostomy tube;
Biofilm;
Pseudomonas;
Otorrhea

Summary

Objective: Bacterial biofilm formation has been implicated in the high rate of persistent otorrhea after tympanostomy tube insertion. In this study, we evaluated *Pseudomonas* biofilm formation from intractable post tympanostomy tube otorrhea in children.

Materials and methods: Twelve patients (seven males, five females) with unilateral post tympanostomy tube *P. aeruginosa* otorrhea were evaluated prospectively. All patients were treated with ciprofloxacin otic drops but the otorrhea failed to resolve. Ear discharge for culture was collected from the external auditory canal using a swab. The tympanostomy tubes were removed and collected for evaluation of biofilm formation using a scanning electron microscopy.

Results: In all cases, ciprofloxacin-resistant *P. aeruginosa* was the only organism grown. The surface of the silicone tube contained undulations or microfissures throughout. The thick biofilms present on most tube surfaces were densities with no intervening spaces, consistent with biofilms.

Conclusion: Biofilms can be directly observed by scanning electron microscopy. Therefore, our results demonstrate that bacterial aggregates called biofilms, that are resistant to treatment by antibiotics, can be detected by standard culture techniques, and may play a major etiologic role in posttympanostomy otorrhea.

© 2007 Elsevier Ireland Ltd. All rights reserved.

1. Introduction

Acute tympanostomy tube otorrhea is a common problem [1–3] that mainly occurs with upper respiratory infection [4]. In children with tympanostomy

* Corresponding author at: Department of Otolaryngology, Chonnam National University Hospital, Hak-dong 8, Dongku, Gwangju, South Korea.

E-mail address: chulsavio@hanmail.net (C.-H. Jang).

tubes, acute otitis media can be diagnosed in the presence of acute otorrhea and acute symptoms. The causative pathogens in young children with acute otorrhea are the same as those found in acute otitis media with an intact tympanic membrane [5]. Recently the most frequently isolated organism is *Pseudomonas aeruginosa* [6].

The lack of consensus concerning the best treatment is due to the lack of randomized controlled studies in well-defined populations [7,8]. Nonetheless, recommendations suggest systemic antibiotic treatment in children with concomitant respiratory infection [9]. On the other hand, topical otic solutions, especially fluoroquinolones, are often recommended for the treatment of tympanostomy tube otorrhea. Goldblatt et al. [10] compared the safety and efficacy of ofloxacin otic solution, 0.3% with that of Augmentin oral suspension in pediatric subjects 1–12 years of age with tympanostomy tubes and acute purulent otorrhea. Overall eradication rates for ofloxacin otic solution and Augmentin oral suspension were similar for *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Moraxella catarrhalis* and were superior with ofloxacin otic solution for *Staphylococcus aureus* and *P. aeruginosa*.

As the clinical application of the topical ciprofloxacin solution has increased, newly evolved bacterial fluoroquinolone resistance has become an increasing problem. Due to the resistance of *P. aeruginosa* and the development of resistance during therapy, the selection of optimal treatment for this pathogen is often complicated.

Bacterial biofilm is a polysaccharide formation believed to be an important mediator of infection at the site of implanted materials. [11,12] The organisms within this polysaccharide matrix, or glycocalyx slime layer, are relatively resistant to antibiotics and can become a source of persistent and relapsing

infection, often necessitating the removal of the implanted material. [13] Bacterial biofilm formation has been implicated in the high rate of persistent otorrhea after tympanostomy tube insertion. [14,15,16] In this study, we evaluated the formation of *Pseudomonas* biofilm in the presence of intractable posttympanostomy tube otorrhea in children.

2. Materials and methods

Twelve patients (seven males, five females) with unilateral posttympanostomy tube with *P. aeruginosa* otorrhea were evaluated prospectively. The average duration of drainage for the current ear infection studied was 21 days (range 7–36 days). All patients were treated with ciprofloxacin-hydrocortisone otic drops (CiproBay[®]HC, Alcon Co., USA) but the otorrhea failed to resolve. Ear discharge for culture was collected from the external auditory canal using a swab. The MIC for each strain was determined in triplicate using Isosensitest agar medium (Oxoid, Basingstoke, Hants, UK) containing ciprofloxacin in final concentrations of 32, 16, 8, 4, 2, 1, 0.5, 0.25, 0.12, 0.06, and 0 µg/ml [17]. The inoculum was about 100 000 colony forming units transferred to the agar surface with a 96 pin applicator from a microtitration plate containing suspensions of the individual strains. The MIC was defined as the lowest concentration inhibiting visible bacterial growth as evaluated after 18 h incubation at 37 °C. Using the reference value for resistance in systemic therapy, strains were regarded resistant to ciprofloxacin if MIC ≥2 mg/l.

The tympanostomy tubes were removed and evaluated. All tympanostomy tubes were immersed in fresh 2% glutaraldehyde overnight. They were cut longitudinally into two segments for scanning

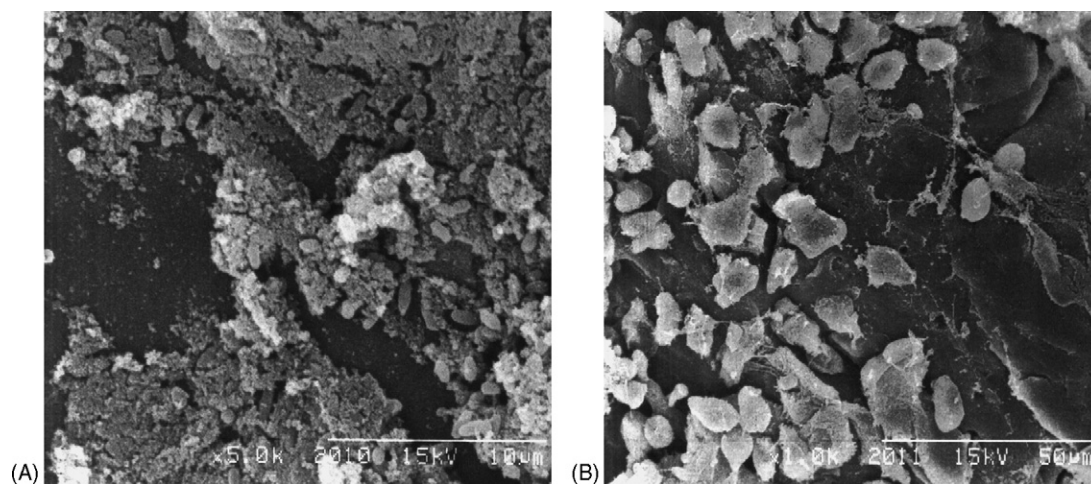


Fig. 1 The biofilm formation at the outer surface of tympanostomy tube. (B) Magnified view.

Download English Version:

<https://daneshyari.com/en/article/4114870>

Download Persian Version:

<https://daneshyari.com/article/4114870>

[Daneshyari.com](https://daneshyari.com)