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Antipseudomonal Activity of Soft Contact Lens Solution: A Comparative Study

Dr. Kalpana Suresh
Professor & Head of the Department of Ophthalmology
Sri Ramachandra Medical College & Research Institute
Sri Ramachandra University, Porur, Chennai, Tamil Nadu, India
Dr. Manipriya
Resident, Sri Ramachandra Medical College, India
Dr. Anandhalakshmi
Resident, Sri Ramachandra Medical College, India

Abstract:
Since contact lens disinfection solutions come into contact with the ocular surface, they may adversely affect ocular physiology if they are inappropriately formulated. Various conditions resulting from contact lens contamination and colonization by foreign organisms are causing serious problems to contact lens users. The introduction of multipurpose solutions has helped to alleviate some of the problems associated with contact lens. These infections are often associated with contaminated contact lens solutions and improper hygienic care of contact lenses. This experience has motivated us to study these disinfection systems because of the need to keep the lenses in a perfectly hygienic condition in order to avoid infection. The purpose of this study was to evaluate the disinfection capacity of a few popularly used soft contact lens solution in our country especially against pseudomonas aeruginosa. The antibacterial effects of five soft contact lens solutions are studied.

1. Introduction

Problems associated with contact lens wear may affect the eyelid, the conjunctiva, the various layers of the cornea, and even the tear film that covers the outer surface of the eye[1]. Since contact lens disinfection solutions come into contact with the ocular surface, they may adversely affect ocular physiology if they are inappropriately formulated [2].Various conditions resulting from contact lens contamination and colonization by foreign organisms are causing serious problems to contact lens users. The introduction of multipurpose solutions has helped to alleviate some of the problems associated with contact lens [3].These infections are often associated with contaminated contact lens solutions and improper hygienic care of contact lenses.[4, 5]There is a need to keep the lenses in a perfectly hygienic condition in order to avoid infection. The purpose of this study was to evaluate the disinfection capacity of a few popularly used soft contact lens solution in our country especially against pseudomonas Aeruginosa.

2. Aim

Popularly used soft contact lens solutions which are used in our country are taken and a comparative study of their efficacy to inhibit pseudomonas Aeruginosa is done.

3. Materials and Methods

The bacterium to be studied is Pseudomonas Aeruginosa. The antimicrobial activity of six commercially available disinfecting solutions was assessed and compared. It included the following solutions: Revita, Renu, Crystal, Complete, Aqua Soft and Biotrue. Their efficacy to disinfect saline solution experimentally contaminated with American Type Culture Collection (ATCC): Pseudomonas Aeruginosa (ATCC27853) was tested. The bacterium was grown on nutrient agar plate. Using physiological saline, the microbial suspensions were adjusted to contain 1.0×10^8 colony-forming units per milliliter (CFU/ml) bacteria. The appropriate volume of the disinfection solution (10mL) and 2mL of physiological saline were inoculated with appropriate volume of the microbial suspension to achieve a final concentration of 1.0×10^6 CFU/ml bacteria. The mixtures of the disinfection solution and the microbial suspension were stored at ambient temperature, which was 25 ±1° C. After 3-hour incubation (overnight disinfection period), appropriate disinfectant neutralizer was applied and the plates were inoculated. The nutrient agar is used for identification of bacterial

growth. The plates were cultured at 35±2° C for 24 hours. In addition sterility control of disinfection solutions (100 micro liter of each solution were seeded in the nutrient agar plate) and microbial growth control (100 micro liter of each microbial suspension in a series of dilutions 1.0×10^8 or 1.0×10^6 to 1.0×10^1 CFU/ml were seeded in the nutrient agar plate was performed.

4. Results

The initial microbial concentration was 10^6 cell/ml and a solution was considered to be bactericidal when the growth was less than 10^2 cells/ml. The reduction in concentration of Pseudomonas Aeruginosa achieved by various solutions is shown in the Table 1 and Figure 1.

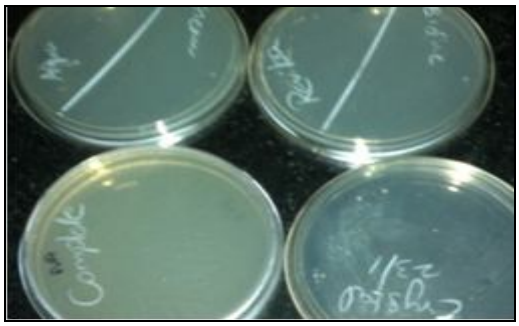

Figure 1: Nutrient agar plates inoculated with pseudomonas

SOLUTION	PSEUDOMONAS AERUGINOSA(10^6)
BIOTRUE (Bausch & Lomb	$<10^2$
COMPLETE (AMO)	$< 10^2$
RENU (Bausch & Lomb)	$<10^1$
REVITA LENS (Abbott)	$<10^2$
CRYSTAL softplus (Classic laboratory)	$<10^3$
AQUA SOFT (Stericon Pharma)	$<10^2$

Table: 1 Antipseudomonal activity of various contact lens solutions

5. Discussion

The anti-pseudomonal effects of six soft contact lens solutions are studied. It is generally accepted by clinicians that the most significant complication of contact lens wear is microbial keratitis and that the most predominant microbial pathogen is Pseudomonas Aeruginosa.[8,11]A recent study showed that Pseudomonas Aeruginosa and Staphylococcus epidermis adhere much more strongly to silicone hydrogel contact lenses than conventional hydrogel contact lenses and that adhesion of Pseudomonas Aeruginosa was 20 times stronger than adhesion of Staphylococcus epidermidis[1, 9, 10] This might help to explain one reason why Pseudomonas infections are the most predominant organism and my motivation to do a comparative study of contact lens solution.

6. Conclusion

Contact lens wearers are in the high risk group of acquiring bacterial keratitis. Therefore in the study different contact lens solutions containing different disinfecting agents which are commercially available in India (Revita, Renu, Crystal, Complete, Aqua Soft and Biotrue) are studied for their efficacy to prevent pseudomonal infection. Out of that RENU (Bausch and Lomb) is the most effective one against Pseudomonas.

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