



Quantitative evaluation of lens deposits and the effect of cleaners in worn orthokeratology lenses

【 E-mail 】 thiraoka@md.tsukuba.ac.jp

【 Financial disclosure 】
Yoshimitsu M, Kondo H, and Santodomingo-Rubido J are full-time employees of Menicon Co. Ltd.

○Takahiro Hiraoka¹, Madoka Yoshimitsu², Hideaki Kondo², Jacinto Santodomingo-Rubido³

¹ Department of Ophthalmology, Faculty of Medicine, University of Tsukuba, Ibaraki, Japan. ² R&D center, Menicon Co. Ltd., Kasugai, Aichi, Japan. ³ Menicon R&D Innovation Centre, Fondation Pour Recherches Medicales, Geneva, Switzerland

Background

Owing to potentially serious consequences, infectious keratitis remains the most concerning complication related to orthokeratology (OK) lens wear. Although there are various possible reasons, poor lens care compliance is considered to be one of the key risk factors for contact lens-related infectious keratitis. An additional complication resides in the complex nature of the reverse-geometry back surface design of OK lenses. Such designs provide an ideal place for deposits to adhere to the lens' back surface, especially along the reverse zone. To date, there have been no formal studies that have quantitatively evaluated surface deposition on OK lenses.

Purpose

To assess surface deposition on OK lenses in terms of the degree of lens opacity caused by deposits, and the cleaning.

Methods

Sixteen worn reverse-geometry OK lenses were collected from patients. The external appearance of each lens was photographed using a stereoscopic microscope (Olympus SZX16), and the images were analyzed with JustTLC image analysis software (Sweday) to allow quantitative analysis of the total volume of coloration over the surface in terms of volume per unit area (V/A).

Eight lenses, which exhibited a V/A value exceeding 0.1, were selected to reliably assess the cleaning effects of the two care solutions under investigation. Their V/A values were recorded at baseline (pre-cleaning). Subsequently, they were cleaned with O₂ Care[®] daily cleaner, which included a rubbing step (Menicon) and then the JustTLC evaluation procedure was repeated to calculate V/A scores. The same lenses were then soaked in Progent[®] intensive cleaner (Menicon) and then the JustTLC evaluation procedure was repeated to calculate V/A scores. The V/A values were compared between the three conditions (pre-cleaning = group A; post-O₂ Care[®] cleaning = group B; and post-Progent[®] soaking = group C) via a Kruskal-Wallis test using PASW Statistics 18 (SPSS Inc.)

Results

Table 1. External appearance of the eight OK lenses, which exhibited V/A values >0.1, for the pre-cleaning (group A), post-O₂ Care[®] cleaning (group B) and post-Progent[®] soaking (group C) conditions

No.	Pre-Cleaning (group A)	Post-O ₂ Care [®] Cleaning (group B)	Post-Progent [®] Soaking (group C)	No.	Pre-Cleaning (group A)	Post-O ₂ Care [®] Cleaning (group B)	Post-Progent [®] Soaking (group C)
1	 V/A = 0.119	 0.107	 0.060	5	 V/A = 0.265	 0.036	 0.017
2	 V/A = 0.334	 0.073	 0.025	6	 V/A = 0.210	 0.041	 0.019
3	 V/A = 0.135	 0.100	 0.033	7	 V/A = 0.150	 0.059	 0.028
4	 V/A = 0.122	 0.095	 0.027	8	 V/A = 0.227	 0.046	 0.041

Figure 1. The V/A value of each lens pre-cleaning, post-O₂ Care[®] cleaning, and post-Progent[®] soaking

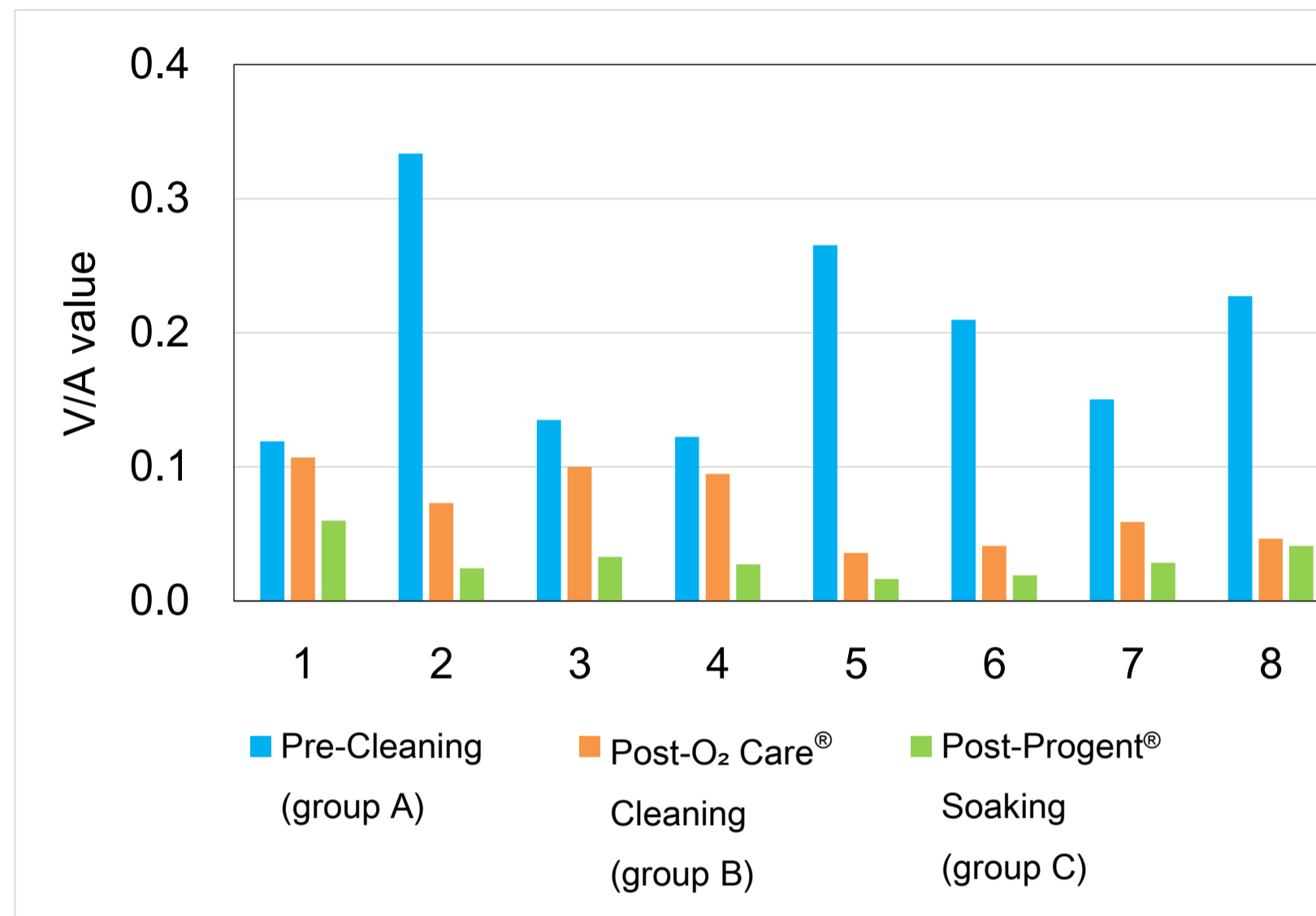
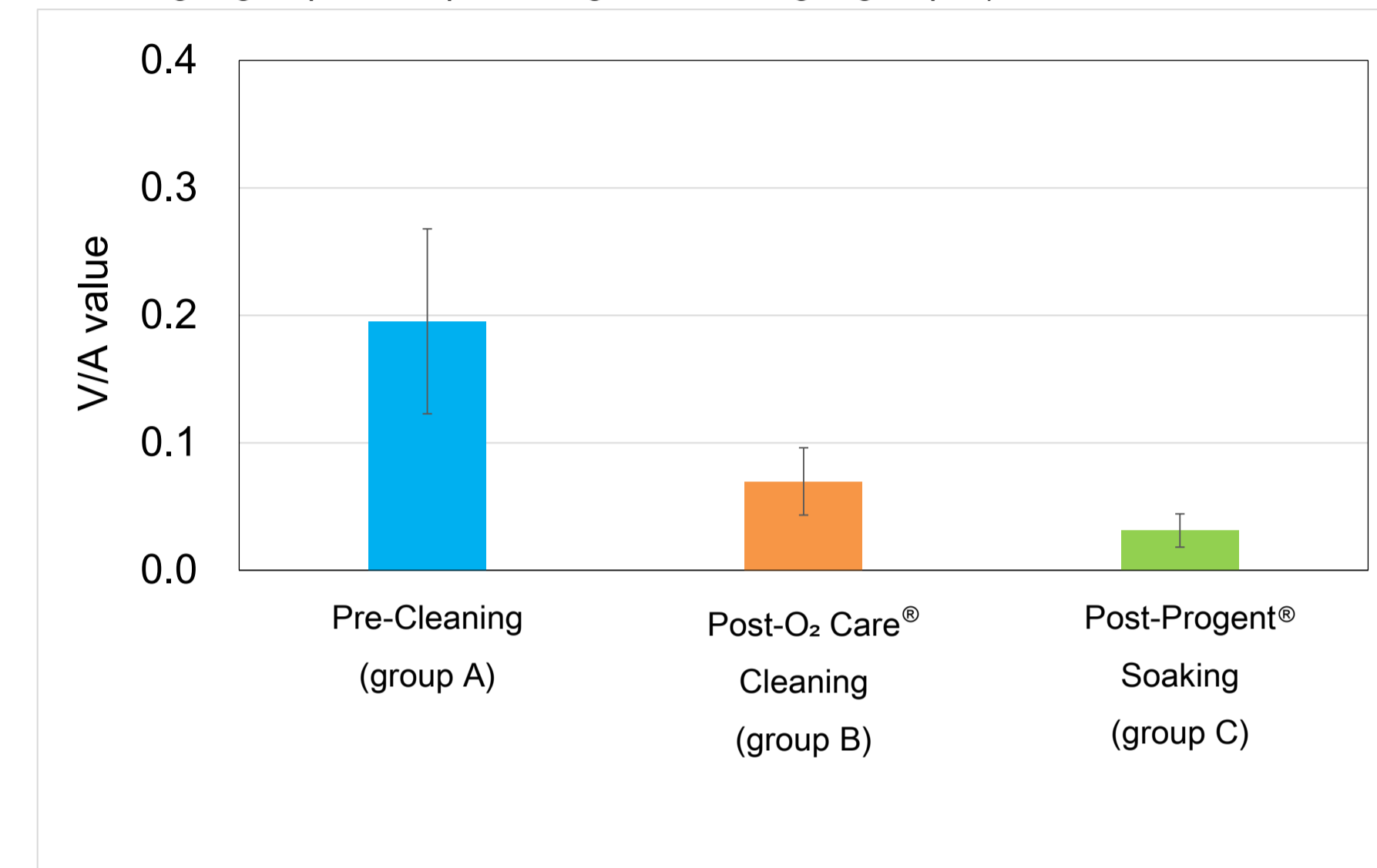


Figure 2. Mean V/A values (+/- SD) for uncleaned lenses (pre-cleaning = group A) and following the use of two different cleaning conditions (post-O₂ Care[®] cleaning = group B and post-Progent[®] soaking = group C)



Mean ± SD V/A values found for the 3 conditions were as follows: group A = 0.195 ± 0.078; group B = 0.070 ± 0.028; and group C = 0.031 ± 0.014. Statistically significant differences were found between the 3 conditions: p < 0.001 for A vs. B; p < 0.001 for A vs. C; and p = 0.003 for B vs. C.

Discussion

To the best of our knowledge, this is the first study that quantitatively evaluated surface deposits on OK lenses and the cleaning effects of lens cleaners against deposits. As shown in the results, considerable amounts of deposition were attached to the collected OK lenses which were attached to worn OK lenses. These deposits were effectively removed by O₂ Care[®] daily cleaner with a rubbing step, and were further cleaned with Progent[®] intensive cleaner. Some studies have shown that surface deposits are a major determinant in the adhesion of *Pseudomonas aeruginosa* to the lens surface of worn OK lenses.^{1,2} *Pseudomonas aeruginosa* has also been reported to be the most common causative organism in OK-related infectious keratitis.³ In addition, Choo et al.⁴ reported that OK lenses retained more bacteria than alignment fitted rigid gas permeable lenses. Therefore, proper patient education on the importance of lens cleaning is critically important for safe OK lens wear.

Conclusions

The worn OK lenses evaluated in this study showed significant levels of deposition, which were able to be successfully removed following the use of the solutions tested. Thus, the results of this study highlight the importance of daily lens cleaning with a rubbing step and the additional use of Menicon Progent[®] to achieve optimal levels of cleaning, especially against deposits within the reverse zone of the lens. Effective lens cleaning is likely to minimize OK-related ocular complications.

References

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