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Treatment of Amblyopia by Extended-Wear Occlusion Soft Contact Lenses

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Key Words

Amblyopia
Occlusion
Contact lens
Eye patch
Extended wear

Abstract

Although occlusion eye patches are effective for the treatment of amblyopia, many physical difficulties arise such as allergic reactions of the skin and [un-attractiveness](#). Thus, in dealing with these problems we developed the occlusion [extended-wear](#) soft contact lens (OCL) to be used as a substitute for the eye patches. With these OCL, patients benefited from the 24-hour occlusion instead of the 6- or 8-hourly eye patch. Although there was a slight possibility that corneal problems might arise due to the lens, the amblyopia patients who gave up the eye patch treatment responded positively to the OCL treatment.

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Introduction

Treatment of amblyopia is usually achieved by the use of the occlusion eye patch. Due to its many successful outcomes in the past, clinicians often treat difficult cases using this eye patch. Although eye patching is seldom not tolerated and only a few patients require other methods for preventing or treating amblyopia, the main difficulty in this treatment is usually the inadequacy of parent cooperation and lack of tolerance in eye patch patients. The patients usually range from 1 to 10 years in age which brings about the problem of understanding the vital importance of the eye patches. The main reasons for these difficulties include the development of dermatitis due to the eye patch, the lack of education and the feeling of humiliation when it is worn in public. Although there has been no definite study to determine psychiatric effects on young, sensitive children, it is naturally speculated that by wearing these eye patches much unwanted attention is attracted and this creates further stress for the patients in addition to the original problem of the amblyopia itself.

Materials and Methods

In order to avoid the difficulties of wearing eye patches, such as in cases where doctors as well as patients and their parents give up the treatment, we developed the occlusion extended-wear soft contact lens (OCL). The lens is made of hydroxymethylmethacrylate with a diameter of 13.5 or 14.5 mm, a central thickness of 0.1 mm, and a base curve of 8.1, 8.4 or 8.7 mm. The anterior portion of the lens is color stained and has been proved to be as safe as the color iris hard contact

lenses. With color staining, the DK value did not change (before: 7.1×10^{-11} cm/cm²·s·mm Hg; after: 7.2×10^{-11} cm/cm²·s·mm Hg), and by using a rabbit model, the oxygen pressure under the contact lens was determined to be 60 mm Hg.

Patients can use the OCL on an extended-wear basis for 7 days. The cosmetic appearance is appealing and it cannot be noticed under normal conditions, especially in Asian/oriental patients because of their dark irises (fig. 1). The visual acuity whilst wearing the OCL was shown to be 20/60 to 20/100 while without the OCL it was 20/20. Although patients can keep the visual acuity at a certain level, the spatial frequency determined by Cambridge low-contrast grading changed to 13 from the original level of 520. Patients can only see very dark images, although they show stereopsis.

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Table 1. List of patients

Fig. 1. A patient wearing the soft OCL in the right eye. Note that the lens is not obvious, thus an onlooker would have difficulty in noticing it in the eye.

Results

A total of 9 amblyopia patients (2 male, 7 female; average age 7.0 ± 2.3 years), including 4 with anisometropic amblyopia and 5 with strabismic amblyopia, were all treated by using the OCL. Not all the patients could be treated by the use of an ordinary eye patch. Patients were required to visit the clinic every week in order to check for possible complications of contact lens wear and also to check the visual acuity of both eyes. After 3 months, visual acuity increased in 8 cases as shown in table 1. During the treatment, no serious complications were observed although slight keratitis occurred in 3 cases and these cases were treated by the cessation of OCL use for 1 week.

Discussion

The advantages of using OCL is the 24-hour occlusion and good patient compliance. The patients and their parents were comfortable with the OCL, yet could not use the eye patches for a variety of reasons. Previous trials of using OCL on a daily basis showed the effectiveness but the method was not widely used [1-3]. We feel that the care which has to be taken with daily lenses may have been the cause of the problem. Extended-wear contact lenses alter the corneal epithelial morphology and might increase the rate of corneal ulcerative keratitis compared to daily-use soft contact lens wear, yet it is easier for the patient to control the contact lens and this method should be taken into consideration prior to giving up the whole treatment [4].

The long-term occlusion of healthy eyes can cause amblyopia, therefore young patients should be monitored carefully. The effect of keeping binocular vision may be advantageous. The compliance of the extended-wear contact lens use for the children is low, the application of a gas-permeable rigid contact lens may cause irritation and may not be tolerated by children, thus we feel the use of extended-wear soft OCL may be one choice for the retractable amblyopia patient, if the patients' parents and physician have a strong interest in treating the amblyopia with extensive care of the cornea and visual acuity. The application of gas-permeable rigid contact lenses may provide better compliance, however, we recommend this method strongly.

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