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Studies on the treatment of keratoconjunctivitis sicca.*

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Abstract

Fifteen cases of keratoconjunctivitis sicca (KCS) of unknown etiology were treated with soft contact lenses for the purpose of their bandage effects and moisture supply. A soft contact lens was worn on one of the eyes of each case but not on the other to compare its effectiveness. New ophthalmic drops or contact lens wearers were dropped in both eyes. Furthermore, the KCS-index was worked out on the basis of the complaints of 23 patients of KCS of unknown etiology. The indexes before and after treatment were compared. Corneal objective findings were improved in all the eyes wearing soft contact lenses for a long period, and seven stopped wearing them although corneal objective findings were much better, because they had some troubles with handling the lenses, because they had lost them, or because their visual acuity decreased while wearing the lenses. For long term wearing the flattest lenses should be used in the beginning and changed gradually to lenses of greater curvature which are better able to keep their centering. Then immediately after successful fitting, the lenses should be given appropriate refractive power. The new ophthalmic drops for soft contact lens wearers were very much effective as artificial tears to both eyes with and without soft contact lenses. KCS-indexes were numerical values relating to patients' subjective symptoms. KCS-indexes improved by an average of $+6.4 \pm 7.5$ after treatment. On the other hand, KCS-indexes improved by $+10.7 \pm 7.9$ in the group that succeeded in wearing SCL for a long period, and by $+7.6 \pm 2.1$ even in the group that failed.

KEYWORDS: keratoconjunctivitis sicca, soft contact lens, new ophthalmic drops, KCS-index

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STUDIES ON THE TREATMENT OF KERATOCONJUNCTIVITIS SICCA

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Abstract. Fifteen cases of keratoconjunctivitis sicca (KCS) of unknown etiology were treated with soft contact lenses for the purpose of their bandage effects and moisture supply. A soft contact lens was worn on one of the eyes of each case, but not on the other to compare its effectiveness. New ophthalmic drops for contact lens wearers were dropped in both eyes. Furthermore, the KCS-index was worked out on the basis of the complaints of 23 patients of KCS of unknown etiology. The indexes before and after treatment were compared. Corneal objective findings were improved in all the eyes wearing soft contact lens. Eight of the fifteen patients succeeded in wearing soft contact lenses for a long period, and seven stopped wearing them although corneal objective findings were much better, because they had some troubles with handling the lenses, because they had lost them, or because their visual acuity decreased while wearing the lenses. For long term wearing the flattest lenses should be used in the beginning and changed gradually to lenses of greater curvature which are better able to keep their centering. Then immediately after successful fitting, the lenses should be given appropriate refractive power. The new ophthalmic drops for soft contact lens wearers were very much effective as artificial tears to both eyes with and without soft contact lenses. KCS-indexes were numerical values relating to patients subjective symptoms. KCS-indexes improved by an average of $+6.4 \pm 7.5$ after treatment. On the other hand, KCS-indexes improved by $+10.7 \pm 7.9$ in the group that succeeded in wearing SCL for a long period, and by $+7.6 \pm 2.1$ even in the group that failed.

Key words: keratoconjunctivitis sicca, soft contact lens, new ophthalmic drops, KCS-index.

It was reported by the Ministry of Health and Welfare at a meeting (1977) of the Sjögren's Disease Research Committee that subjective symptoms of patients with Sjögren's disease were improved 100% by the application of artificial tears (1). In the present study the authors examined the wearing of soft contact lenses (SCL) and the application of new ophthalmic drops for SCL in patients with keratoconjunctivitis sicca (KCS), although the use of these lenses has been said to be a contraindicated in the case of hypolacrimation in Sjögren's disease. Furthermore KCS-indexes were worked out on the basis of the com-

plaints of KCS patients. The indexes before and after treatment were compared.

MATERIALS AND METHODS

Wearing of SCL. SCLs of 13mm in diameter (12.5mm in some cases) containing water at 40% in weight were worn in 15 cases with KCS (females aged between 33 and 71, a mean age of 50.9) who suffered from diffuse superficial keratitis, filamentous keratitis, or corneal erosion, and complained of a strong foreign body sensation and photophobia. A SCL was worn on one of the eyes of each patient the fitting procedure was similar to that for its optical use, but not on the other eye to compare the effectiveness of the SCL (a patient with open angle glaucoma was allowed to wear the lenses on both her eyes on her strong request, and eye drops of 1% pilocarpine were applied twice a day). The patients applied new ophthalmic drops for soft contact lens wearers (SCL drops, in Table 1) to

TABLE 1. NEW OPHTHALMIC DROPS

NaCl	0.55%
KCl	0.15%
Chlorhexidine gluconate	0.005%
with some surfactants & buffers	
pH	6.5~7.5
Osmotic pressure	290~320 mosM

both eyes. They were obliged to apply drops in the eye with SCL at least four times a day and further applications were made to either eye as desired. The SCL was worn only in the daytime. Precautions similar to those for optical use were given for washing and disinfecting the lenses.

KCS-index. KCS-indexes were obtained from 29 patients with KCS (females aged from 33 to 71) at the Department of Ophthalmology, Okayama University Medical School. The indexes before and after the treatment (wearing of SCL, application of artificial tears and AZ drops [0.02% sodium 1, 4-dimethyl-7-isopropyl azulene-3-sulfate] at the Department of Ophthalmology, and the systemic administration of steroids or immunosuppressives at the 3rd Department of Internal Medicine for 4-14 months) were compared.

The indexes were calculated by modifying the original method of Williamson and co-workers (2), items affected by examiner's subjective opinion were precluded, and only subjective symptoms of the patients were used for calculation: $KCS\text{-index} = 9.6 - 7.4$ (a) $- 2.8$ (b) $- 2.0$ (c) $- 6.2$ (d) $- 5.5$ (e) $+ 1.4$ (f) $+ 2.9$ (g) $- 5.1$ (h) $+ 1.1$ (i) $- 2.1$ (j), where (a) stands for foreign body sensation; (b), burning; (c), tiredness with or without difficulty in opening eyes; (d), dry feeling with or without a poor response to physical or chemical irritants and emotion; (e), redness; (f), difficulty in seeing; (g), itch; (h), aches, soreness or pain; (i), photosensitivity; and (j), excess of secretion watery, ropy, or filmy.

RESULTS

Wearing of SCL. Corneal findings were improved both objectively and subjectively in all cases by wearing SCL.

Of the fifteen patients, SCLs were successfully worn by eight (53.3%) including those who stopped wearing after corneal changes disappeared objectively and those who still wore them after objective and subjective symptoms improved. On the other hand seven patients were unsuccessful in long term wear of SCL (i.e., they could not continue wearing for some reason) in spite of the improvement of corneal findings. The mean age of the successful group was 55 years and that of the unsuccessful group was 51 years. The mean radius of corneal curvature of the successful group was 753.9mm, and that of the unsuccessful was 775.7mm. The mean base curve (BC) of SCL shortly after fitting was 917.5mm in the successful group and 914.3mm in the unsuccessful group. The mean BC of SCL after a final adjustment was 905.0mm in the successful group and 920.0mm in the unsuccessful group.

As for refraction, four patients in the successful group showed myopia, two showed emmetropia, and two showed hyperopia. Two of the unsuccessful cases showed myopia, two emmetropia, and three hyperopia. Visual acuity was improved by the wear of SCL in five eyes of the successful group, but none in the unsuccessful (Table 2).

TABLE 2. WEARLING OF THE SOFT CONTACT LENSE (SCL)

	No. of Cases	Mean radius of corneal curvature (mm)	Initial fitting	
			Mean base curve (B. C.) of SCL (mm)	Mean difference between B. C. and radius of curvature (mm)
Success in wearing	8	753.9	917.5	163.6
Failure in wearing	7	775.7	914.3	138.6

	Final fitting		Ages (mean)	Refraction			Visual acuity	
	Mean B. C. of SCL (mm)	Mean difference between B. C. and radius of curvature (mm)		Myopia	Emmetropia	Hyperopia	Improved	Decreased
Success in wearing	905.0	151.1	54	4	2	2	5	2
Failuer in wearing	920.0	144.3	51	2	2	2	0	1

KCS-index. The mean value of KCS-index in the initial examinations was -5.0 ± 6.4 and the one based on the subjective symptoms calculated in the re-examination in 1978 was $+1.4 \pm 6.2$ (Fig. 1). The KCS-indexes improved by

+6.4 ± 7.5 on average after the treatment (Fig. 1); the improvement was +10.7 ± 7.9 in the successful group after long term wearing of SCL (marked by o in Fig. 1), and +7.6 ± 2.1 even in the unsuccessful (marked by × in Fig. 1).

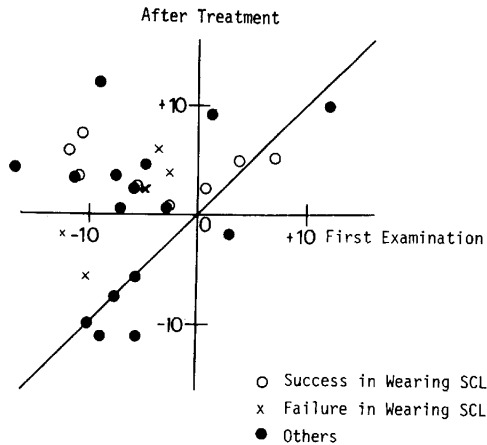


Fig. 1. KCS-indexes improved by an average of +6.4 ± 7.5 after treatment. A high improvement was seen in the group that succeeded in wearing SCL (+10.7 ± 7.9, marked by o), and an improvement was seen in the failure group (+7.6 ± 2.1, marked by ×).

DISCUSSION

Although there have been reports of nonoperative treatment such as hormone therapy, systemic treatment with antitumor drugs or immunosuppressives, local treatment such as application of artificial tears to the eye, and the various operative therapies, there is no other suitable method than frequent application of artificial tears to the eye for improvement of subjective symptoms (1, 3, 4). In the present study, the patients with KCS wore SCL for its bandage effects and moisture supply.

SCL was developed in Czechoslovakia in 1960 and was put into practical use in U.S.A. in 1971. In 1972, its use was also authorized by the Ministry of Health and Welfare in Japan. SCL is extensively used today for the purpose of correcting refraction errors (optical use), and its materials and design have been improved remarkably. Medical applications of the SCL include lagophthalmic keratitis, Stevens-Johnson disease, corneal ulcer and bullous keratopathy in an attempt to accelerate healing by blocking external stimulation of the injured cornea as a sclero-corneal contact lens which makes the best use of its material (5-14).

Recently, SCL has also been used as a delivery system by making use of its uptaking and releasing properties (15-19).

The wearing of SCL has not been used as a treatment against hypolacri-

mation in Sjögren's disease, but its medical use in KCS for its bandage effects and moisture supply has been noted since 1971 (20-30).

In spite of the satisfactory results of its use those reports referred only to whether there was any drug used at the same time or whether subjective or objective symptoms had improved. Researches did not refer to the clinical cases in which the SCL were applied or to the ways of fitting the lenses.

In the present study, SCL was worn on one of the eyes of the patients with severe pain and foreign body sensation, whose findings of corneal erosion, filamentous keratitis, or diffuse superficial keratitis satisfied the diagnostic criteria of Sjögren's disease (specified by the Ministry of Health and Welfare Research Committee). The other eye was left without SCL as a control to compare its effectiveness. As a result, objective findings of the cornea improved in all cases, as noted in other investigator's reports (20-30). However, it should not be forgotten that there were some patients who stopped wearing SCL while on the road to recovery. Patients with KCS need to wear SCL without any trouble for a long time (23). When the patients were divided into two groups: a group of successful cases and a group of unsuccessful cases, there were definite differences between them in the fitting processes, the severity of symptoms, and the changes of visual acuity as a result of wearing SCL, particularly of the visual acuity for near distance. The two groups are compared regarding various factors as follows:

Age. The mean age of the successful group was 54 years, and that of the unsuccessful group was 51 years. The difference between the two groups is not great, but the unsuccessful group consisted of patients in their early 30s with severer subjective complaints than objective findings, and of older patients who complained of difficulties in handling the lenses such as frequent losses and so on. Momose (30) also suggested that troublesome handling could be a cause for discontinued wearing of SCL. SCL convenient to handle and wear continuously need to be developed for long-term applications.

The radius of corneal curvature and the BC of SCL. Up to the present there have been few reports on BC of SCL in the fitting of Soflens (Bausch & Lomb) (6, 7, 8, 12, 21) which didn't have a sufficient series of lenses to be chosen for right fitting. There were other reports of more precise SCL that SCL were fitted in a similar manner to that in its optical use in reference to keratometric values of the normal eye of each patient (5, 9, 11, 21) or in a manner of fitting slightly flatter lenses than in optical use. (10, 14, 26, 27, 30)

Since the materials and the designs of SCL are different, there are no fixed fitting patterns for the BC. In our clinic, the BC was empirically made 120-140 mm flatter than the radius of corneal curvature in its optical use to facilitate tear exchange and improve oxygen supply. In the present medical use, a flatter fitting than in optical use was adopted in the beginning. As a result, the mean

radius of corneal curvature of the unsuccessful group was 775.7 mm which was greater than the mean (753.9 mm) of the successful group. The BC was 163.6 mm flatter in the successful group in the beginning of fitting than the radius of corneal curvature and 138.6 mm flatter in the unsuccessful group. After the final fitting the BC was 151.1 mm in the successful group and 144.3 mm in the unsuccessful group. This may show that the flatter the lens is, the more successful it is. Himi (10) suggested making the BC as flat as possible for continuous wearing of SCL.

Kiso and co-workers (26) also reported that it was necessary to use a flatter SCL in medical use than in optical use so that a slight divergence of the lens from the surface of the cornea may stimulate active exchange of tears and thus supply more oxygen. Particularly in our cases in which lacrimal secretion was very little and viscous, it was necessary to wear the lens as flat as possible to facilitate moisture supply.

Power of SCL. Plane SCLs are now available for medical use. However, although they are suitable for their bandage effects, they are not convenient in the cases of KCS which need long-term treatment as reported by Dohlman (23), because refraction appears to be an important factor in the success or failure of wearing SCL. Since SCL were fitted as flat as possible, the refraction was set a little to the hyperopic side. Most of the patients were old enough to suffer from presbyopia. Decrease in visual acuity in the unsuccessful group may have caused them to stop wearing SCL.

Therefore, it seems to be necessary that, for long-term treatment, the lenses should be given appropriate refractive power immediately after the success of fitting.

Other factors. Some patients failed to continue wearing SCL because of troublesome handling including; loss of SCL by older patients; inability to wear and take off lenses by themselves; and stronger subjective complaints than objective findings. Therefore, an effort should be made to improve the materials and designs of SCL to make them suitable for long-term continuous wearing (31).

Application of SCL drops 4 or 5 times a day gave enough moisture to the eye with SCL. But some patients needed more frequent applications in the beginning, because they feared that otherwise they might experience the pain they had before. But applications became less frequent as corneal findings improved. The SCL drops were very effective for moisture supply as mentioned above, and an antiseptic, chlorhexidine gluconate, in the drops which SCL absorbed to a small extent, made SCL safer against contamination and produced a lens-cleaning effect (32, 33). Therefore, this drug can be recommended for use with SCL. Application of the SCL drops to the control eye without SCL was also popular among the patients. If the drops can be obtained cheaply and be covered by insurance, then they will be very suitable for use as artificial tears.

KCS-index. The KCS-index was established by Williamson and co-workers (2) for diagnosis of Sjögren's disease by a computer based on ten subjective symptoms and seven gross signs. In the present study, the indexes of the patients with KCS of unknown etiology were worked out on the basis only of subjective symptoms, and it was confirmed that the index values in the initial examinations were below +4.0 for almost all the patients. Since subjective symptoms of the patients with KCS could be expressed in terms of numerical values, the index values in the initial examinations were compared with those obtained during the treatment in January, 1978, in order to examine changes of their subjective symptoms after treatment. The indexes showed improvement by +6.4 (mean) after treatment; improvement by +10.7 (mean) in the successful group and by +7.6 (mean) even in the unsuccessful. There was not a sufficient number of cases to discuss what was effective in improving the indexes. But it may be significant that therapeutic effects could be evaluated with the indexes based on patients' subjective symptoms, even though patients are usually distressed with subjective symptoms rather than the objective findings of disease.

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