

"The Effectiveness of Plugging the Inferior Puncta"

by

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The Effectiveness of Plugging the Inferior Puncta

Abstract: The purpose of this study was to show the effectiveness of plugging the inferior puncta of ten keratoconjunctivitis sicca patients. Success was measured by either decreasing the patient's subjective symptoms or decreasing the objective clinical signs. The results show that both were decreased. Eight of the ten patients said that their eyes felt "wetter" after wearing the plugs for a week. However, since this study did not have a control group, subjective results may be biased by the placebo effect. Only three of the ten patients were able to decrease their use of artificial tears. This indicates that even with punctal plugs, tear supplements may be needed. Objectively, eight of the ten patients showed a decrease in the rose bengal staining of the bulbar conjunctiva. Overall, every patient had some improvement in objective signs.

Background: The effectiveness of using punctal plugs has been studied by many optometrists and ophthalmologists. Dr. Rebecca Willis, M.D., et al., did a study that involved 18 patients with keratoconjunctivitis sicca. In that study, they found that 11 patients had subjective improvement and were able to decrease the use of tear supplements. These patients were

successful in wearing removable punctal plugs for eight months,
(7) X Dr. Peter Shenon, M.D., suggests the use of laser punctal
occlusion in order to help out keratoconjunctivitis sicca
patients. He stated that punctal occlusion can change a
problem contact lens wearer into a patient that can wear lenses
most of the day without discomfort (5).

The tear film is composed of three layers. The outer most
layer is made up of lipids produced by the meibomian glands.
This lipid layer retards evaporation of the second component of
the tear film which is the aqueous layer. The aqueous layer
accounts for approximately ninety percent of the tear film (1)
and provides many nutrients for the cornea. It is secreted by
the main and accessory lacrimal glands. The inner most
component of the tear film is the mucin layer. Goblet cells on
the conjunctiva produce mucin which is spread over the cornea
by movement of the lids. Mucin changes the epithelium of the
cornea from a hydrophobic state to a hydrophilic state. This
change allows the aqueous layer to evenly cover the cornea.

Keratoconjunctivitis sicca (K.C.S.) is caused by an
absolute or partial reduction in aqueous production. Most
K.S.C. patients are aqueous deficient (7), however they may
also have a mucin or lipid abnormality. Tear deficiency will
cause the devitalization of corneal epithelium and possibly the
loss of epithelial cells. Keratoconjunctivitis sicca is not
caused solely by loss of lacrimal function alone. There may
also be X mechanical causes such as trauma to the lacrimal
system or lids, or blockage of excretory ducts by

conjunctival scarring. There may also be neurological lesions to the lacrimal system causing K.C.S. Keratoconjunctivitis sicca is frequently associated with other diseases such as systemic lupus eryth^romatosis, rheumatoid arthritis, Sjogren's syndrome, Mikulicz's syndrome, and rarely with Riley-Daly syndrome (1,6). Keratoconjunctivitis sicca occurs in 14 percent of rheumatoid arthritis patients (1).

The subjective signs and symptoms of keratoconjunctivitis sicca may vary from no symptoms to burning, gritty, itchy, mattery, and dry eyes. Evaluation of the tear prism size and the amount of debris~~s~~ are two easy, but inconclusive ways to judge tear film quality. One of the easiest, quickest and most reliable tests to make a diagnosis of K.C.S. is staining with rose bengal (4). This chemical stains mucin strands and epithelial cells that are devitalized because of tear film deficiency (3). Another chemical used to test tear film stability is flourescein, which reveals epithelial defects. Schirmer Strip testing may be done to judge the aqueous. The lactoferrin immunological assay is a laboratory test that when used with the Schirmer Strip test provides a balance between high test sensitivity and low false-positives (2). Any of the tests mentioned above can be used as diagnostic tests of K.C.S., but a combination of some of them can give a better overall picture of the quality of the patient's tear film.

Treatments for keratoconjunctivitis sicca vary with the severity of the signs and symptoms. With minimal signs or symptoms, tear conservation measures may be enough. Some

^{include}
examples ~~are~~ decreasing room temperature, increasing the humidity, or wearing protective spectacles to lessen drying from the wind. For more severe cases, topical tear substitutes or lubricants are used. Punctal plugs are usually considered when use of artificial tears are too bothersome for the patient, or are being used at a high frequency throughout the day. When K.C.S. is very severe as with ~~x~~ filamentary keratitis, bandage soft contact lenses ^{can be} ~~are~~ extremely useful. Also, treatment of associated disorders such as blepharitis should not be forgotten.

Bandage lenses may also increase susceptibility to virus opportunistic infection

Methods: This study included ten subjects who had both signs and symptoms of keratoconjunctivitis sicca. The objective signs used were the amount of rose bengal staining on the cornea and the bulbar conjunctiva, flourescein staining of the same structures, flourescein break-up time, and Schirmer Strip testing with anesthesia. The lactoferrin assay was not performed in this study. Corneal and bulbar conjunctival staining was judged on a scale of zero to four, where a zero showed no staining. A flourescein break-up time of less than ten seconds was considered significant. Schirmer Strip testing was evaluated after five minutes and the tear film was considered abnormal if the aqueous measurement was ten millimeters or less and normal if above ten millimeters. Subjective symptoms recorded included burning, itching, and the amount of artificial tear use.

The test results were measured after wearing the collagen

punctal plugs for one week. These plugs dissolve after seven to ten days. Since the superior canaliculus only accounts for twenty percent of the tear extraction (1), I considered plugging the inferior puncta sufficient. This decreased the chance of epiphoria occurring and proved to be more economical. Subjects were told to use their artificial tears as often as they thought necessary.

The evaluations using rose bengal were done before the use of flourescein. The Schirmer Strip test with anesthesia was done last. Ten minutes were allotted between the use of rose bengal and flourescein and between flourescein and the Schirmer Strip test.

Results: The results of the study may be found in table one. Table two summarizes the data to show how the objective signs improved, didn't improve, or had become worse with use of the punctal plugs. One column on each bar graph in table two is marked zero to indicate the patient started without this objective sign. The flourescein staining data was not available for one patient and the flourescein break-up time data was not available for two patients.

The subjective symptoms decreased in eight of the ten cases. Subjects mentioned that their eyes felt "wetter", didn't burn or itch as much, and the stringy discharge was gone. However, since this study did not have a control group, subjective results may be biased by the placebo effect.

Rose bengal staining decreased on the bulbar conjunctiva

in eight of ten patients, and on the cornea in five of nine patients having corneal staining. Also, the amount of flourescein staining decreased on the cornea in four of five patients having initial staining. This shows that the epithelial cells on the conjunctiva and cornea were healthier after one week of wearing the punctal plugs.

Both the Schirmer Strip test and the flourescein break-up time resulted in mixed findings. Only half the patients showed improvement with these tests. The Schirmer strip test did indicate an additional volume, but the flourescein break-up time suggested an unstable tear film.

Usage of artificial tears was reduced in only three of the ten patients. This indicates that when punctal plugs are used, a patient may not be able to completely discontinue using tear supplements, but may be able to decrease the frequency of use throughout the day.

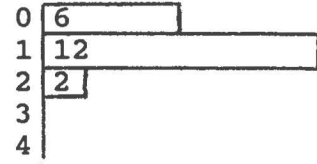
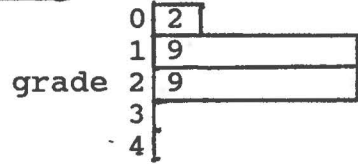
Discussion and Conclusion: The results of this study indicate that plugging the inferior puncta is ^{an} effective way to help treat keratoconjunctivitis sicca both subjectively and objectively. Punctal plugs alone may be used in minor dry eye cases, but in the more severe cases presented in this study, tear supplements were an essential component to plug treatment. As expected, all objective signs were not eliminated, however, many subjective symptoms in eight of the ten subjects were reduced. In the two patients without subjective improvement, the objective signs and symptoms were decreased.

Table 1
Patient data

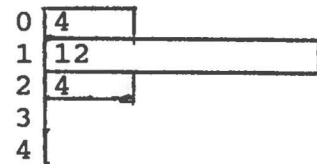
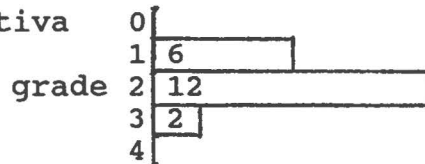
Number of Individual Eyes...
Before Plugs

After Plugs

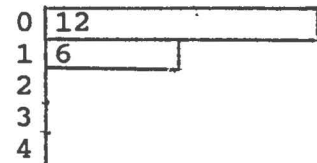
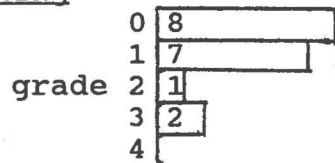
Rose Bengal Staining
-corneal



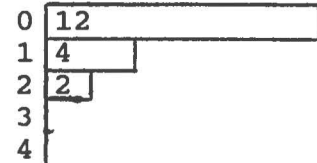
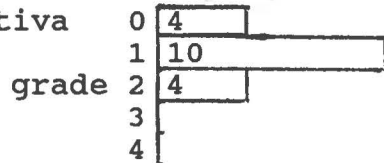
-bulbar conjunctiva



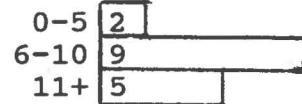
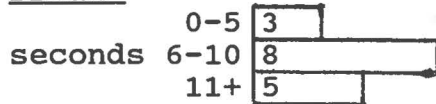
Flourescein Staining
-corneal



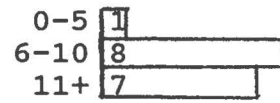
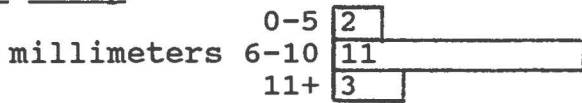
-bulbar conjunctiva



Flourescein Break-
Up Time



Schirmer Strip
Testing



Artificial Tears

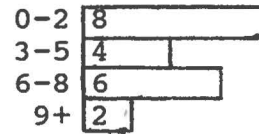
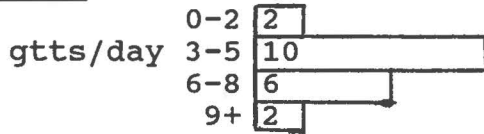
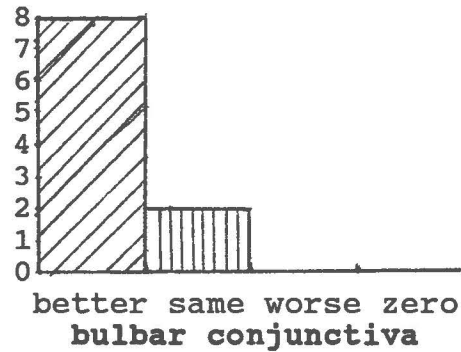
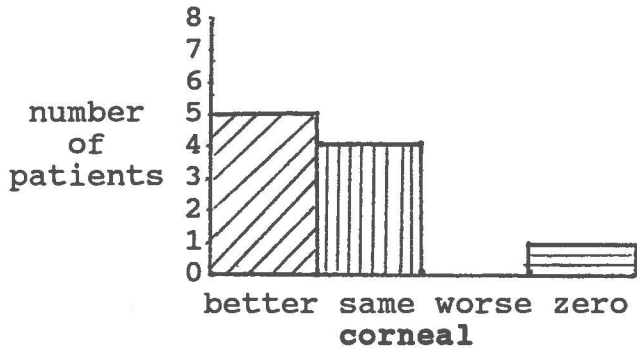
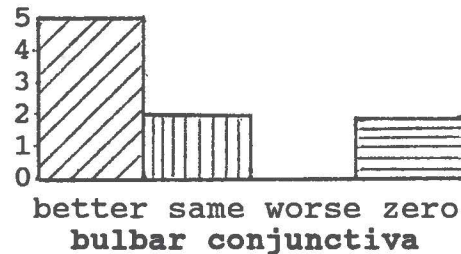
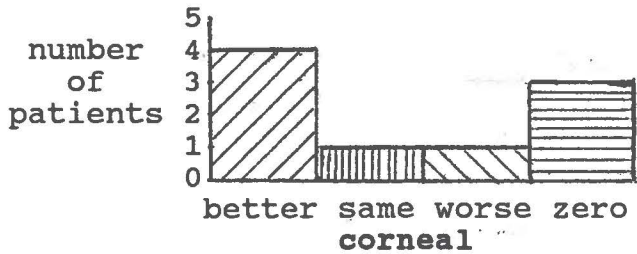


Table 2
Clinical Changes with Collagen Punctal Plugs

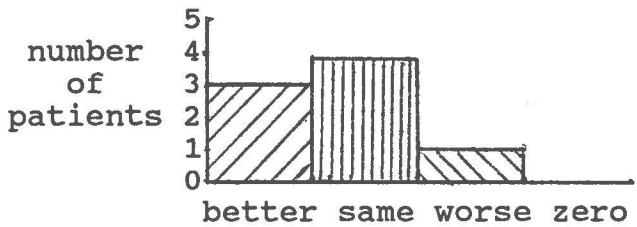
Rose Bengal Staining



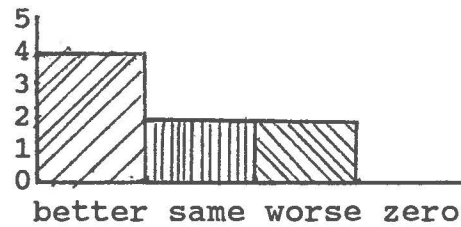
Flourescein Staining



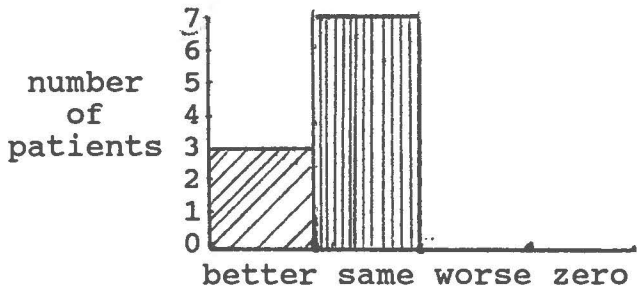
Flourescein Break-up Time



Schirmer Strip Testing



Artificial Tears



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