The effects of punctual occlusion on hydrogel contact lens comfort

Anthony J. Makar
Pacific University

Rebecca J. Makar
Pacific University

Recommended Citation
https://commons.pacificu.edu/opt/1350

This Thesis is brought to you for free and open access by the Theses, Dissertations and Capstone Projects at CommonKnowledge. It has been accepted for inclusion in College of Optometry by an authorized administrator of CommonKnowledge. For more information, please contact CommonKnowledge@pacificu.edu.
The effects of punctual occlusion on hydrogel contact lens comfort

Abstract

Background: Many hydrogel contact lens wearers suffer from discomfort due to a variety of factors including dry eyes, old age, environmental conditions, and even contact lenses. Many patients relieve this discomfort with frequent instillation of lubrication drops, however, this can become quite inconvenient and expensive. In some cases, doctors may treat patients with punctal occlusion when there is severe discomfort that is accompanied by pathological dry eye signs. Doctors often do not offer punctal occlusion to simply improve contact lens comfort alone. It is proposed that through the placement of temporary punctal plugs, effects of punctal occlusion on the comfort of hydrogel contact lens comfort can be observed and quantified.

Methods: Hydrogel contact lens wearers with healthy eyes were invited to participate in the study. Subjects completed a subjective questionnaire pertaining to the comfort of their current contact lenses. Dissolvable collagen plugs were inserted in the subject's lower puncta. A second questionnaire was completed by the patient to report post-procedural contact lens comfort. The post-procedural questionnaires were completed 48 hours after plug insertion and mailed to the project location.

Results: The majority of patients experienced an increase in overall contact lens comfort, as well as improvements in specific discomforts, such as light sensitivity, itching, burning, tired eyes, and ease of contact lens removal.

Conclusion: This study illustrates that punctal occlusion is a treatment option for patients who desire an increase in the comfort of their hydrogel contact lenses.

Degree Type

Thesis

Rights

Terms of use for work posted in CommonKnowledge.

This thesis is available at CommonKnowledge: https://commons.pacificu.edu/opt/1350
Copyright and terms of use

If you have downloaded this document directly from the web or from CommonKnowledge, see the “Rights” section on the previous page for the terms of use.

If you have received this document through an interlibrary loan/document delivery service, the following terms of use apply:

Copyright in this work is held by the author(s). You may download or print any portion of this document for personal use only, or for any use that is allowed by fair use (Title 17, §107 U.S.C.). Except for personal or fair use, you or your borrowing library may not reproduce, remix, republish, post, transmit, or distribute this document, or any portion thereof, without the permission of the copyright owner. [Note: If this document is licensed under a Creative Commons license (see “Rights” on the previous page) which allows broader usage rights, your use is governed by the terms of that license.]

Inquiries regarding further use of these materials should be addressed to: CommonKnowledge Rights, Pacific University Library, 2043 College Way, Forest Grove, OR 97116, (503) 352-7209. Email inquiries may be directed to: copyright@pacificu.edu

This thesis is available at CommonKnowledge: https://commons.pacificu.edu/opt/1350
THE EFFECTS OF PUNCTAL OCCLUSION
ON HYDROGEL CONTACT LENS COMFORT

By

ANTHONY J. MAKAR

&

REBECCA J. MAKAR

A thesis submitted to the faculty of the
College of Optometry
Pacific University
Forest Grove, Oregon
for the degree of
Doctor of Optometry
May, 2000

Advisor:

Kenneth Eakland, OD
Signatures:

Researchers:

Rebecca J. Makar, Optometry Student

Anthony J. Makar, Optometry Student

Advisors:

Ken Enkland, O.D., Pacific University Faculty Advisor
The effects of punctal occlusion on hydrogel contact lens comfort

Anthony J. Makar and Rebecca J. Makar

Pacific University College of Optometry, Forest Grove, Oregon

ABSTRACT

BACKGROUND

Many hydrogel contact lens wearers suffer from discomfort due to a variety of factors including dry eyes, old age, environmental conditions, and even contact lenses. Many patients relieve this discomfort with frequent instillation of lubrication drops, however, this can become quite inconvenient and expensive. In some cases, doctors may treat patients with punctal occlusion when there is severe discomfort that is accompanied by pathological dry eye signs. Doctors often do not offer punctal occlusion to simply improve contact lens comfort alone. It is proposed that through the placement of temporary punctal plugs, effects of punctal occlusion on the comfort of hydrogel contact lens wearers can be observed and quantified.

METHODS

Hydrogel contact lens wearers with healthy eyes were invited to participate in the study. Subjects completed a subjective questionnaire pertaining to the comfort of their current contact lenses. Dissolvable collagen plugs were inserted in the subject's lower puncta. A second questionnaire was completed by the patient to report post-procedural contact lens comfort. The post-procedural questionnaires were completed 48 hours after plug insertion and mailed to the project location.

RESULTS

The majority of patients experienced an increase in overall contact lens comfort, as well as improvements in specific discomforts, such as light sensitivity, itching, burning, tired eyes, and ease of contact lens removal.

CONCLUSION

This study illustrates that punctal occlusion is a treatment option for patients who desire an increase in the comfort of their hydrogel contact lenses.

KEY WORDS

Puncta, hydrogel contact lenses, punctal occlusion, plug, dry eye

Many hydrogel contact lens wearers suffer from discomfort due to a variety of factors that exacerbate dry eyes. It is well accepted that the environment, occupational irritants, systemic medicinals, age related lacrimal dysfunction, and even contact lenses can lead to dry eyes and ocular discomfort. In fact, research shows that dry eyes are the leading cause of contact lens discomfort. However, most patients do not realize that dry eyes are at the root of their contact lens intolerance. Instead, a patient commonly presents to their doctor with symptoms of scratchy or sandy eyes, burning, conjunctivitis (the bulbar conjunctiva may look thickened, edematous and hyperemic), excessive mucous secretion, inability to produce tears, photosensitivity, sinus problems (including postnasal drip), and tearing. Examine Table 1 for specific medical conditions, medications and environmental factors that contribute to dry eye discomfort.

Doctors that suspect a dry eye problem may confirm the diagnosis with a host of tests including Schirmer I, Schirmer II, Rose Bengal staining, Lisimine Green staining, Tear Break Up Time (TBUT), tear meniscus assessment, meibomian gland evaluation, lipid evaluation with a Tearscope, Advanced Nanoliter Osmometery, and diagnostic temporary punctal occlusion. Although many doctors consider Rose Bengal stain to be the best clinical diagnosis for dry eyes, Redmond, MD warns that with many mild cases of dry eyes, no staining may occur. For this reason, he recommends diagnostic punctal occlusion as his benchmark test.

Once a dry eye patient has been identified the doctor will usually recommend an initial treatment of lubrication drops to help supplement the tears. Current research indicates that hypotonic non-preserved artificial tears are the best means of re-wetting the ocular surface. However, frequent instillation of tear lubrication or contact lens re-wetting drops can become quite inconvenient, expensive and frustrating for the patient. In some cases, patients may even decide to terminate contact lens wear altogether. Daniels, OD recommends that if the thought of compliance with a supplementation regimen and the expense involved dissuade the patient from continuing with contact lenses, you might recommend diagnostic collagen or permanent punctal occlusion.

Despite all of our efforts, history has shown that the problem of dry eyes is not solvable. Therefore, when treating this condition, our job is to keep the patient comfortable and to improve their lens wearing experience by
Table 1: Factors contributing to dry eye

determining which drops, ointments and living conditions are best for them. So why do doctors hesitate to offer punctal occlusion as the initial treatment for contact lens discomfort? Unfortunately, most doctors reserve punctal occlusion for patients with severe discomfort accompanied by pathological dry eye signs.

Since the FDA approval of collagen punctal plug in 1989, eye care practitioners have continued to explore the many therapeutic benefits of punctal occlusion. Today, plugs are used as a therapeutic treatment for the relief of the symptoms of dry eye syndrome, to increase efficacy of antiglaucoma eyedrops, to reduce systemic absorption of topical ocular pharmaceuticals, and to promote corneal wound healing postoperatively or after trauma.

Recent studies have looked at punctal occlusion as a plausible treatment for patients with contact lens intolerance and dry eyes. In 1992, Giovanoli and Graham conducted a study to evaluate the effects of inferior punctal occlusion with removable silicone plugs in patients with decreased contact lens wearing time with symptomatic dry eyes. Results indicated that plugs offered improvement of symptoms and signs of dryness in the dry eye test population. In 1998, a similar study conducted by Slusser and Lowther evaluated the effects of lacrimal drainage occlusion with non-dissolvable plugs on hydrogel contact lens wearers with symptoms of dryness. The study followed both the signs and symptoms of dryness over a 4-week clinical trial and found that dry eye patients with punctal occlusion were less symptomatic.

The results of these studies are not surprising. Since contact lenses compete for preexisting tear film, it is critical in cases of dry eye associated with diminished ability to wear contact lenses to increase the reservoir of tears - both to support the physiological needs of the cornea and provide contact lens hydration.

Due to overwhelming amount of research that determined plugs to be an effective and important part of dry eye treatment, doctors are becoming increasingly confident in offering punctal occlusion to their hydrogel patients who have signs of dry eyes. But what about patients who suffer from hydrogel contact lens discomfort without the hallmark signs of dry eye pathology? Could patients who have not been diagnosed with dry eyes benefit from improved contact lens comfort with punctal occlusion?

Anecdotally, some doctors have found punctal occlusion to offer improved contact lens comfort in patients without dry eye pathology. Morier, OD advocates the use of punctal plugs and shared this point in the 23rd Annual Contact Lens Report: Dry Eye: To Plug or Not to Plug. He described a patient with contact lens intolerance and decreased wearing time with no signs of allergy or pathology. He treated her with temporary inferior punctal occlusion and the patient resumed comfortable contact lens wear. Other doctors, such as Hom, OD discourage the use of plugs as initial treatment, even in cases of contact lens patients with marginal dry eyes. He believes that by avoiding the "plug first" mentality, doctors have an improved chance of properly treating the patient. It appears that additional research evaluating contact lens comfort and punctal occlusion would be beneficial in helping doctors treat patients who suffer from contact lens discomfort.

In this exploratory study, it is proposed that through the placement of temporary punctal plugs, effects of punctal occlusion on the comfort level of patient's eyes, while wearing contact lenses, can be observed and subjectively quantified.

Methods:
Over the course of a two-year period, thousands of patients were seen for their complete vision examinations at a multi-specialty ophthalmic/optometric practice. As many patients as possible, time and resources permitting, that presented for the visit wearing hydrogel soft contact lenses were presented with a written invitation to participate in the study. Presentation of the invitation to partake in the study took place after a complete vision examination, which included an extensive medical and personal history, in an attempt to present the opportunity only to those patients who did not have any frank pathology, medical allergies, or preexisting eye conditions. Any patient diagnosed with an infection of any kind, or a watery

<table>
<thead>
<tr>
<th>Medical Conditions</th>
<th>Medications</th>
<th>Environmental Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thyroid abnormalities</td>
<td>Antidepressants</td>
<td>Contact lenses</td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td>Redness-reducing drops</td>
<td>Light</td>
</tr>
<tr>
<td>Asthma</td>
<td>Decongestants</td>
<td>Air pollution</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Antihistamines</td>
<td>Wind</td>
</tr>
<tr>
<td>Glaucoma</td>
<td>Artificial tears</td>
<td>Computer screens</td>
</tr>
<tr>
<td>Lupus</td>
<td>Blood pressure medications</td>
<td>Heaters</td>
</tr>
<tr>
<td>Sjogren's Syndrome</td>
<td>Hormone supplements</td>
<td>Air conditioners</td>
</tr>
<tr>
<td></td>
<td>Oral contraceptives</td>
<td>smoke</td>
</tr>
<tr>
<td></td>
<td>Diuretics</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aloe medication</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tranquilizers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Beta blockers</td>
<td></td>
</tr>
</tbody>
</table>

Source: Eagle Vision
or dry eye was not presented the invitation. Only “normal and successful” hydrogel contact lens wearers were presented the opportunity.

When a patient agreed to become a subject in the study, they were given a subjective questionnaire to complete. It commonly took patients less than five minutes to fill out the form. The questionnaire required the patient to evaluate and rate ten individual symptoms that could be perceived as making one's eyes uncomfortable. At left, each symptom was listed on the form with ten simple “check boxes” next to it, on the right. Each box represented a different degree of severity of the symptom experienced by the patient, with number one box on the far left being “maximum discomfort” due to the given symptom and the number ten box representing “maximum comfort.” Additionally, there was a final question that asked subjects to rate their “overall contact lens comfort” level using the same scale from one to ten (see Figure 1).

After completing the questionnaire, each subject's puncta were immediately evaluated using a calibrated Eagle Vision brand probe and fit bilaterally with the proper size Eagle Vision brand dissolvable collagen punctal occluders. Only the lower puncta were occluded. The procedure was done at the slitlamp.

Initially, patients were told to remove their contacts and two drops of proparacaine 0.5% were instilled into each inferior cul-de-sac. The anesthetic was also placed on a cotton tipped applicator and placed on the lower puncta for about a minute. Extreme caution was used while gauging the puncta for a snug fit (i.e. having the patient view opposite gaze) to avoid any cornea trauma. Care was taken to choose a plug short enough to successfully slip just below the surface of the puncta, so that when expanding it does not protrude up and out, which could abrade the cornea or bulbar conjunctiva. Jeweler's forceps were used at the slitlamp to place the plugs in each puncta. Upon completion of the procedure the cornea and conjunctiva were examined for any trauma.

Lastly, patients were given another questionnaire, the exact same questionnaire, to complete post-procedure. Subjects were told to wait exactly forty-eight hours and then complete a second survey, and send it back to the project location in the stamped envelope provided. Symptoms were only to be evaluated after the two-day time period had elapsed. During the two day period, patients were to keep all other variables, such as home humidity, water consumption, and artificial tear dosage (if any), constant.Subjects were informed to contact the project location immediately in case of any signs of infection or inflammation (i.e. halos, pain, redness, discharge, decreased visual acuity, etc...).

<table>
<thead>
<tr>
<th>Maximum Discomfort</th>
<th>Maximum Comfort</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  2  3  4  5  6  7  8  9  10</td>
<td></td>
</tr>
</tbody>
</table>

1. Burning Eyes
2. Contacts feel tight
   Difficult to remove
3. Dry eye feeling
4. Eyes burn upon closing
during or after:
   watching TV
   computer work
   reading/studying
5. Sensation of foreign body
   in the eye
6. Gritty or sandy sensation
7. Itching
8. Light sensitive
9. Sensitive to wind & dust
10. Tired eyes (any time of day)

Overall comfort of contacts:

Figure 1: Pre and Post Procedure Questionnaire

Results:

Selection of subjects is considered to be random because each person that met the simple inclusion criteria of being a healthy hydrogel wearer was presented the opportunity to participate in the study. There were no exclusion criteria for age, race, nor gender. The only exclusion criteria were those described previously in the methods section.

There were a total of thirty-six subjects who participated in the study. Three subjects provided
data that was incomplete and could not be used in the study. In these three cases, questions were not answered on the survey, or the post-procedure questionnaire was not returned to the project location. Thirty-three patients' data were evaluated, included in the results, and statistically analyzed. Of those evaluated, twenty-nine were women and four were men.

A high number of subjects had symptoms that improved during the study. "Dry eye feeling", "sensation of foreign object in the eye", and "sensitive to wind and dust" were the most commonly improved symptoms with twenty-nine, twenty-six, and twenty-six patients answering a higher number (more comfortable) on the post-procedure questionnaire, respectively. The "overall comfort of contacts" question received thirty votes for increased comfort when comparing the pre and post-procedure surveys. The symptom that subjects rated as least improved was light sensitivity, however, twenty out of the thirty-three subjects chose a more positive response post-procedure. Pre and post survey questions were paired and compared directly using the Wilcoxon Signed Ranks Test. The Sign Test provided similar results. The complete results of this test are presented in Table 2.

Test statistics indicate that the results of all questions asked are significant with $P < 0.025$. The individual question test statistics and those for the "overall comfort" question can be seen in Table 3. Descriptive statistics which provide the mean, median, minimum, maximum, and standard deviation of each paired question are seen in Tables 4 & 5. Here the means for pre and post paired data showed improved comfort for each symptom evaluated and the overall comfort.

Temporary punctal occlusion with collagen plugs significantly improved the individual symptoms evaluated and overall comfort while wearing soft hydrogel contact lenses.

**Discussion:**

Previous studies have documented the efficacy of punctal occlusion in the treatment of hydrogel contact lens wearers with dry eyes. Patient populations in these studies were symptomatic and showed pathological signs of dry eyes. No studies
<table>
<thead>
<tr>
<th>Survey Question</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burning-pre</td>
<td>33</td>
<td>5.45</td>
<td>2.4506</td>
<td>2.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Burning-post</td>
<td>33</td>
<td>7.45</td>
<td>2.1519</td>
<td>2.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Tight - pre</td>
<td>33</td>
<td>4.61</td>
<td>2.6686</td>
<td>1.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Tight - post</td>
<td>33</td>
<td>7.33</td>
<td>2.2867</td>
<td>2.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Dry - pre</td>
<td>33</td>
<td>3.42</td>
<td>1.7859</td>
<td>1.00</td>
<td>8.00</td>
</tr>
<tr>
<td>Dry - post</td>
<td>33</td>
<td>6.82</td>
<td>2.3245</td>
<td>2.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Close &amp; Burn-pre</td>
<td>33</td>
<td>4.82</td>
<td>2.7324</td>
<td>1.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Close &amp; Burn-post</td>
<td>33</td>
<td>7.39</td>
<td>2.2212</td>
<td>1.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Foreign Body - pre</td>
<td>33</td>
<td>4.39</td>
<td>2.2071</td>
<td>1.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Foreign Body - post</td>
<td>33</td>
<td>7.24</td>
<td>2.3589</td>
<td>2.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Grit &amp; Sand - pre</td>
<td>33</td>
<td>4.61</td>
<td>2.4359</td>
<td>1.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Grit &amp; Sand - post</td>
<td>33</td>
<td>7.7</td>
<td>2.3781</td>
<td>2.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Itching - pre</td>
<td>33</td>
<td>5.24</td>
<td>3.0519</td>
<td>1.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Itching - post</td>
<td>33</td>
<td>7.36</td>
<td>2.4344</td>
<td>2.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Light Sens - pre</td>
<td>33</td>
<td>5.45</td>
<td>2.6936</td>
<td>1.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Light Sens - post</td>
<td>33</td>
<td>6.73</td>
<td>2.5406</td>
<td>1.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Wind &amp; Dust - pre</td>
<td>33</td>
<td>3.94</td>
<td>2.2905</td>
<td>1.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Wind &amp; Dust - post</td>
<td>33</td>
<td>6.73</td>
<td>2.0957</td>
<td>2.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Tired Eyes - pre</td>
<td>33</td>
<td>4.45</td>
<td>2.3484</td>
<td>1.00</td>
<td>9.00</td>
</tr>
<tr>
<td>Tired Eyes - post</td>
<td>33</td>
<td>6.97</td>
<td>2.1285</td>
<td>2.00</td>
<td>10.00</td>
</tr>
<tr>
<td>Overall - pre</td>
<td>33</td>
<td>4.58</td>
<td>2.0005</td>
<td>1.00</td>
<td>8.00</td>
</tr>
<tr>
<td>Overall - post</td>
<td>33</td>
<td>7.39</td>
<td>2.2352</td>
<td>2.00</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Table 4: Descriptive statistics

<table>
<thead>
<tr>
<th>Percentiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Question</td>
</tr>
<tr>
<td>Burning-pre</td>
</tr>
<tr>
<td>Burning-post</td>
</tr>
<tr>
<td>Tight - pre</td>
</tr>
<tr>
<td>Tight - post</td>
</tr>
<tr>
<td>Dry - pre</td>
</tr>
<tr>
<td>Dry - post</td>
</tr>
<tr>
<td>Close &amp; Burn-pre</td>
</tr>
<tr>
<td>Close &amp; Burn-post</td>
</tr>
<tr>
<td>Foreign Body - pre</td>
</tr>
<tr>
<td>Foreign Body - post</td>
</tr>
<tr>
<td>Grit &amp; Sand - pre</td>
</tr>
<tr>
<td>Grit &amp; Sand - post</td>
</tr>
<tr>
<td>Itching - pre</td>
</tr>
<tr>
<td>Itching - post</td>
</tr>
<tr>
<td>Light Sens - pre</td>
</tr>
<tr>
<td>Light Sens - post</td>
</tr>
<tr>
<td>Wind &amp; Dust - pre</td>
</tr>
<tr>
<td>Wind &amp; Dust - post</td>
</tr>
<tr>
<td>Tired Eyes - pre</td>
</tr>
<tr>
<td>Tired Eyes - post</td>
</tr>
<tr>
<td>Overall - pre</td>
</tr>
<tr>
<td>Overall - post</td>
</tr>
</tbody>
</table>

Table 5: Descriptive statistics
have previously been performed to determine whether punctal occlusion is efficacious in the management of hydrogel contact lens discomfort that is not attributed to dry eyes or pathology, in normal healthy eyes.

The results of this study demonstrate that temporary punctal occlusion is effective in increasing subjective comfort of hydrogel contact lenses in patients without signs of dry eyes. As indicated by the pre-punctal occlusion questionnaire, most patients felt that their contact lenses were not as comfortable as they could be with an average overall comfort rating of 4.58. The post-punctal occlusion results indicated an improvement with an average subjective comfort rating of 7.39.

Punctal occlusion, although rare, has been associated with some complications including partial or complete punctal extrusion, ampullary pyogenic granuloma, and plug subluxation. Prouty OD believes that granulomatous formation is caused by a reaction to the plug material. Other doctors such as Schachet OD believe that "there is not a tremendous risk in this procedure. The risk is that you might make the person better". Although punctal occlusion is not a risk free procedure, no complications secondary to punctal insertion were observed with any of the 36 test subjects.

As mentioned in the results section, three patients were dropped from the study due to incomplete data. Unfortunately, some of these cases involved failure of subjects to return the post-procedural questionnaire. Ironically, it is usually the happy patients that forget their follow-up appointments or treatment regimens. Data collection may have been more comprehensive if the subjects were required to return to the office for a follow-up appointment two days following plug insertion. This was purposefully avoided in effort to make participation as convenient as possible for the subjects.

The questionnaires in this study were also made extremely simple and provided a quick means for data collection from the subjects. We did note, however, that by using the words "overall comfort" for the final question in the survey may have biased or led the subjects. At the top of the surveys, there are already the words maximum discomfort and maximum comfort. It probably would have been less psychologically leading to have the last question read, "check the box that describes the overall feeling or sensation of your contact lenses."

A potential interest to future researchers may be looking at a similar patient population with the addition of controls. We might recommend a paired group of subjects or a study where one eye per patient is treated and the contralateral eye serves as a control. The untreated eye must also be manipulated so the patient does not know which punctum has been occluded. No control subjects were utilized in this study.

Other areas of interest could include punctal occlusion along with the implementation or suspension of an artificial tear regimen in hydrogel contact lens wearers. Another area of interest could include punctal occlusion along with specific hydrogel contact lens characteristics such as lens thickness and water content. This study was carried out in Anchorage, Alaska, which tends to be cool and dry year around. Climate and the environmental conditions in which the patient works and lives would be a great topic of study. It is questionable whether patients living in a warm and humid climate would benefit as dramatically as the Alaska test population.

In retrospect, the study may have been improved to include a larger test population and an even number of male and female subjects. Although all hydrogel contact lens wearing patients were invited to participate in the study, the 33 test subjects were made up of 29 women and only 4 men. The age of the subjects were not noted and subjects of all ages were invited to participate. Because decreased aqueous production is associated with old age, it would be another factor to control or consider in designing future studies.

Most doctor put "dry eye" at the top of their differential diagnosis list when their contact lens patient complains of discomfort. As a result, most doctors reach for artificial tears to treat these
uncomfortable patients. Many doctors feel that artificial tears must be the solution, along with punctal occlusion if signs are severe. Other doctors believe that artificial tears are not the answer, indicating that preservatives may concentrate in contact lenses. If mild dryness is truly the underlying etiology for contact lens discomfort, then there are many individuals who may benefit from temporary punctal occlusion as a diagnostic test to determine if permanent occlusion may offer improved comfort. Although the elderly are not the majority of soft contact lens wearers, Schein OD, in his paper on the prevalence of dry eye among the U.S. population aged from 65-84 years, notes that 4.3 million elderly people experience ocular irritation often or all of the time. We would predict that hydrogel contact lenses wearing elders are likely to benefit from punctal occlusion.

One additional aspect to consider in a population of uncomfortable contact lens wearers is that there is the possibility that some of the dry eye tests that doctors use may not be sensitive enough to offer a diagnosis of the condition causing the problem. Guillon and Young noted that many standard tests for pathology including Schirmer testing are not sensitive enough for marginal cases. It is very possible that there are millions of people who could be more comfortable in contact lenses if we could determine the very causes of their problems.

Whether grossly symptomatic or asymptomatic (many subjects did not realize their discomforts until they experienced improved comfort secondary to punctal occlusion), and regardless of the specific cause of less than perfect contact lenses comfort, this study has shown that temporary collagen punctal occlusion improves the comfort of hydrogel contact lenses in healthy eyes.

**Conclusion:**

Punctal occlusion for hydrogel contact lens discomfort is an effective treatment in patients without dry eye pathology. The results obtained indicate overwhelming subjective improvements in contact lens comfort after punctal occlusion.

Reserving punctal occlusion for only the pathological dry eye patient is yesterday's medicine. Today's inspiring doctors should feel more confident in offering punctal occlusion as an initial treatment, or at the very least a diagnostic opportunity for all patients who could benefit from improved contact lens comfort.

**Acknowledgments:**

We wish to thank Eagle Vision who donated the collagen punctal plugs used in the study. We also wish to thank Jan Nyboer MD, Griffith Steiner MD, and Christie Francian-Stemmle OD, for their expertise and assistance in gathering data and inserting punctal plugs.

The researchers have no financial interest in any of the products used in this study.