

The Effect of Thirty Day Continuous Wear of Ciba Focus Night & Day Contact Lenses on Conjunctival Goblet Cell Density

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Purpose

The introduction of silicone hydrogel lenses has created renewed patient and practitioner interest in thirty day continuous contact lens wear. Among the many safety issues the practitioner is confronted with is the effect the lens has on the ocular surface. The present study examines this by use of impression cytology samples taken over a 90 day period to assess ocular surface health based on conjunctival goblet cell density.

Questions

- ▶ What effect would 30 day continuous wear of Focus Night & Day have on the ocular surface as measured through the use of impression cytology?
- ▶ Would the silicone hydrogel affect the ocular surface because of mechanical differences from the conventional hydrogels?
- ▶ Would 30 day continuous wear lead to build up that would alter the ocular surface?

Methods

Twenty subjects, 13 females and 7 males with an average age of 31.17 years had baseline impression cytology performed prior to wearing Ciba Focus Night & Day (lotrafilcon A) lenses on a 30 day continuous wear schedule. The lenses were replaced every 30 days and impression cytology was performed at each replacement to assess goblet cell density.

Background

The authors have previously reported on the technique of impression cytology¹ and its use in the evaluation of the effects of contact lens wear on the anterior segment.^{2,3} This study builds on our previous work by examining the effect of extended wear of silicone hydrogel contact lenses (Ciba Focus Night & Day, Lotrafilcon A, 24% water) on conjunctival goblet cell density.

Impression Cytology

- ▶ A noninvasive conjunctival biopsy⁴
- ▶ Millipore® filter paper is pressed against the anesthetized bulbar conjunctiva using a glass rod
- ▶ This removes epithelial and goblet cells
- ▶ The sample is then attached to a glass slide using double-sided adhesive tape



Anesthetic Instillation



Sample Collection

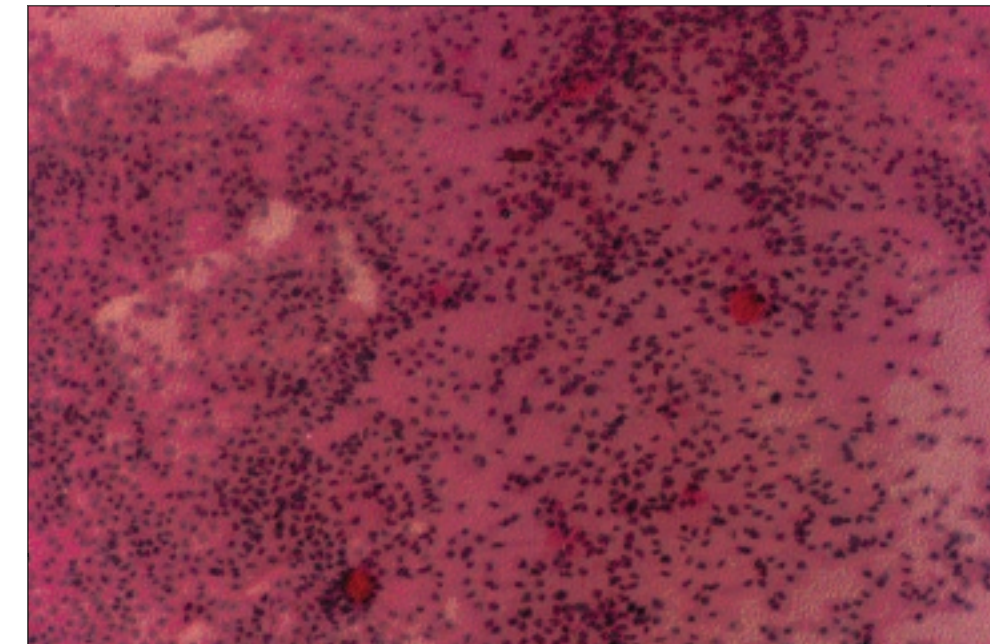
Impression Cytology—Staining Procedure

- ▶ Goblet cells are rich in carbohydrates so they stain red with PAS while epithelial cells stain blue with hematoxylin
- ▶ Samples are fixed in 95% ethanol and stained with Periodic Acid Schiff's reagent (PAS) and hematoxylin

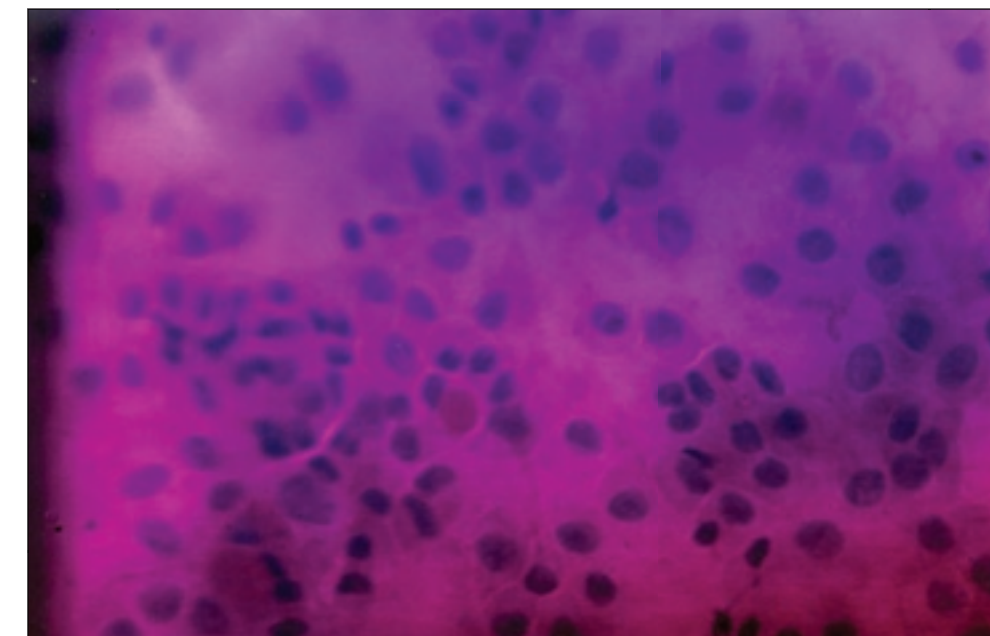


Staining Procedure

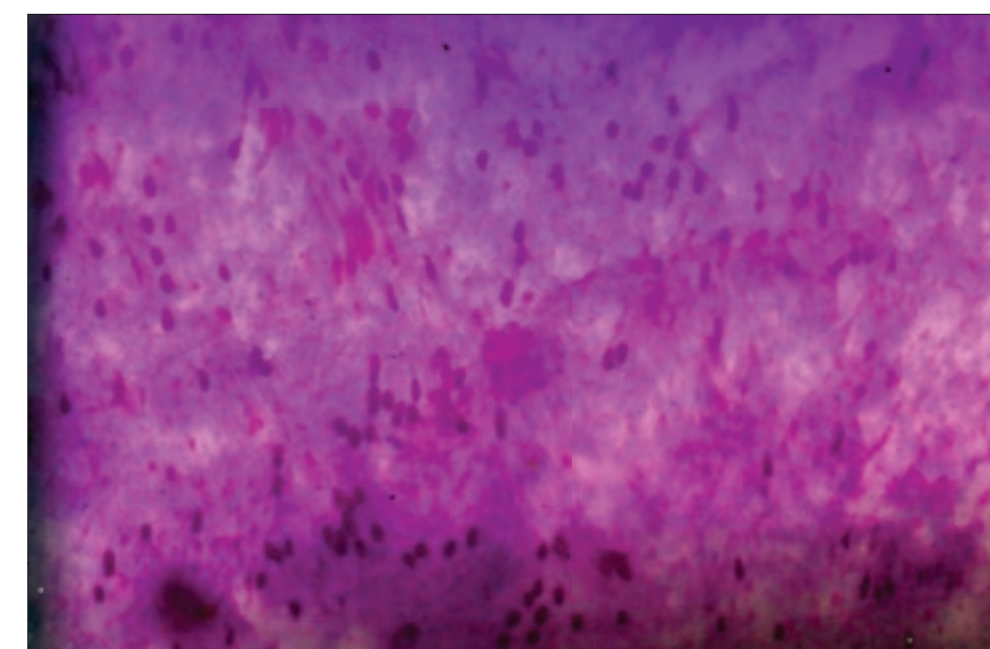
- ▶ Fix with 95% ethanol for 10 minutes
- ▶ Rinse in distilled water 5 minutes
- ▶ Immerse in Periodic acid 5 minutes
- ▶ Rinse in distilled water
- ▶ Immerse in Schiff's reagent 5 minutes
- ▶ Develop to a pink color in tap water 5 minutes
- ▶ Stain with hematoxylin 1 minute
- ▶ Rinse with tap water
- ▶ Decolorize with acid alcohol
- ▶ Rinse with tap water
- ▶ Develop to a blue color in saturated lithium carbonate
- ▶ Let slides dry
- ▶ Clear filter with immersion oil
- ▶ Mount cover slip



Normal Impression Cytology Slide (low magnification)



Normal epithelial and goblet cells (high magnification)



Normal Goblet Cells

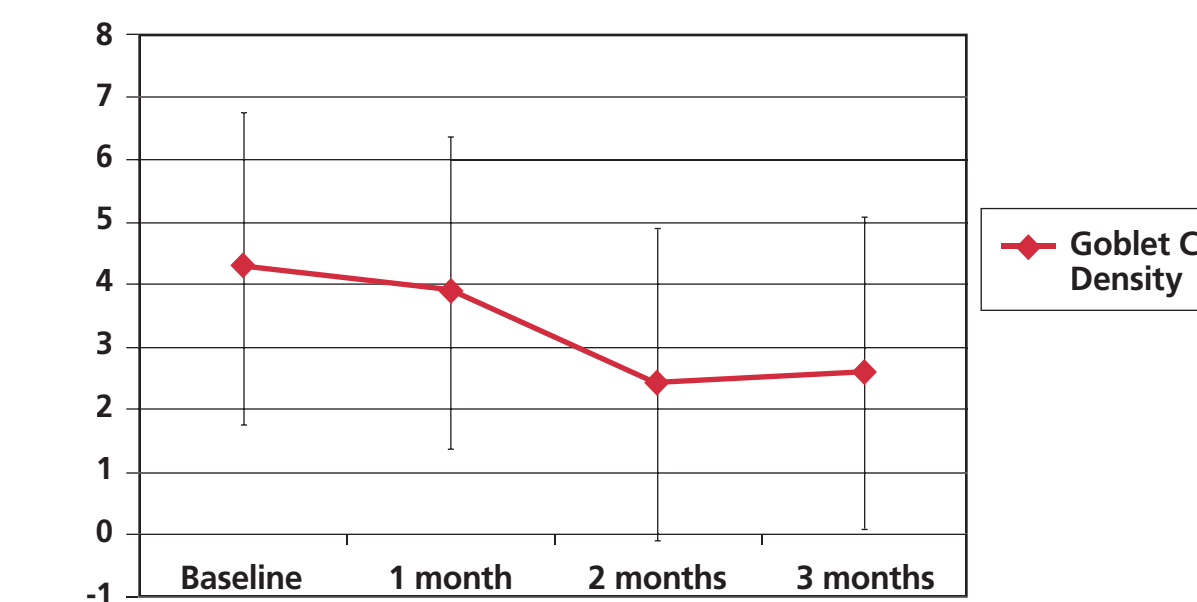
Assessment of Samples

- ▶ Each sample is examined by a trained naïve observer.
- ▶ The samples are analyzed with the Olympus microscope.
- ▶ A minimum of 200 cells per sample are counted per microscopic field.
- ▶ A random field is always used for scoring of goblet cells.
- ▶ The observer performs all the cell counts.

Results

Mean baseline goblet cell density was 4.26%. After one month a small decrease was observed (3.875%). A further decline was observed in the second month to 2.4% and finally stabilization in month three at 2.57%. The standard deviation on the samples was 2.5%. The decrease we observed was not statistically or clinically significant.

Change in Conjunctival Goblet Cell Density



Discussion

Conjunctival goblet cell density has been established as a useful indicator of the health of the anterior segment.⁵ In two previous studies^{2,3} we have examined the effects of hydrogel contact lens wear on conjunctival goblet cell density.

Previous Study—Conventional Replacement Daily Wear

- ▶ Baseline Goblet Cell Density 4.19% +/- 2.33%
- ▶ 10 lenses were replaced due to loss or damage.

- ▶ None of the subjects experienced an inability to wear lenses, ocular surface complications or ocular infection
- ▶ A two-fold increase in goblet cell density was noted with this type of lens in 88% of the subjects

Previous Study—Two Week Disposable Daily Wear

- ▶ Baseline Goblet cell density was 3.23% +/- 1.92%
- ▶ None of the subjects experienced an inability to wear lenses, ocular surface complications or ocular infection
- ▶ The goblet cell density showed no significant change over the course of the study

Previous Studies—Conclusions

- ▶ The increase in goblet cells observed with conventional daily wear contact lenses is probably an adaptive response of the ocular surface to the irritation from a coated contact lens.
- ▶ It does not appear that the goblet cell increase is the result of mechanical irritation since disposable lenses worn for the same period but replaced every two weeks do not cause an increase in goblet cells.
- ▶ The most likely explanation of the goblet cell increase is a response of the ocular surface to the biofilm buildup on a conventional replacement lens that does not occur with disposable lenses.

Current Study—Conclusions

- ▶ 30 day continuous wear of Focus Night & Day contact lenses does not result in significant alterations of conjunctival goblet cell density
- ▶ The effect of 30 day continuous wear of these lenses on the ocular surface as measured by impression cytology is similar to that experienced in daily wear two week disposable conventional hydrogel lenses

References

1. Connor CG, Campbell JB, Tiley WW. Modification of impression cytology for in-office use. J Am Optom Assoc 1991; 62: 898-901.
2. Connor,CG,Campbell,JB,SteelSA,et.al.Theeffectsofdailywearcontactlenses on goblet cell density. J Am Optom Assoc 1994; 65:792-4.
3. Connor CG, Campbell JB, Steel SA. The effects of disposable daily wear contact lenses on goblet cell count. CLAO J 1997; 23(1): 37-39.
4. Egbert PR, Lauber MA, Maurice DM. A simple conjunctival biopsy. Am J Ophthalmol 1977; 84:798-801.
5. Roat MI, Ohji M, Hunt LE, Thoft RA. Conjunctival epithelial cell hypermitosis and goblet cell hyperplasia in atopic keratoconjunctivitis. Am J Ophthalmol 1993;116:456-463.

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