



# Tear Volume Differences with Silicone Hydrogel and Hydrogel Contact Lenses



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## INTRODUCTION

- Ocular dryness is a common complaint of contact lens wearers. Decreased tear volume leads to an increase in ocular dryness.
- The Zone-Quick phenol red thread test measures ocular tear volume.
- Comparing the results of the Zone-Quick phenol red thread test on a patient with and without contact lenses may be useful in deciding which lens material allows the most residual tear volume to remain on the eye.

## PURPOSE

**THIS STUDY ANSWERS THE FOLLOWING QUESTIONS.**

- Is there a difference in the Zone-Quick phenol red thread test results when done without and with contact lenses on?
- Does the type of lens material change the tear volume?
- What is the change while wearing high and low water hydrogel and silicone hydrogel (SiHy) lenses?

## METHODS

- The third year contact lens students with healthy eyes served as subjects for the study. Since study participation was voluntary, the number of subjects tested varied for lens type. 138 subjects tested the high and low water content silicone hydrogel lenses and 121 subjects tested the high and low water content hydrogel lenses. The age range was 22-32.
- The Zone-Quick phenol red thread test was performed on both eyes without lenses. (Photo 1)
- A 10-minute interval allowed the tear volume to return to baseline.
- The Zone-Quick phenol red thread was repeated with contact lenses on the eye.
- Low and high water Hydrogel and Silicone Hydrogel materials were tested.
- Low water lenses were the Bausch & Lomb Soflens 38, polymacon, 38% and Ciba Focus Night & Day lotrafilcon A, 24%.
- High water lenses were Acuvue 2 etafilcon A, 58% and Acuvue Advance, galyfilcon A, 47%.

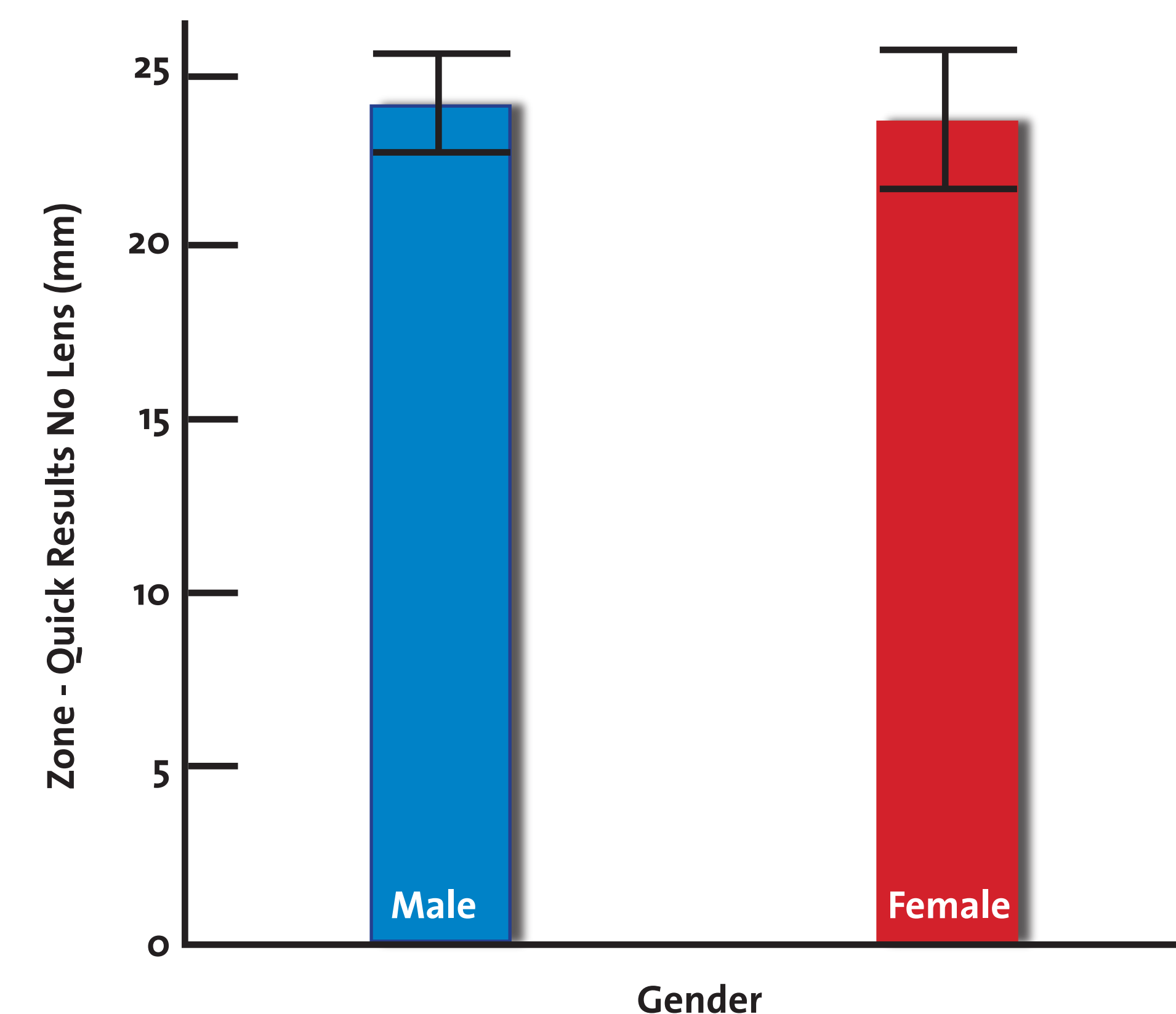
PHOTO 1



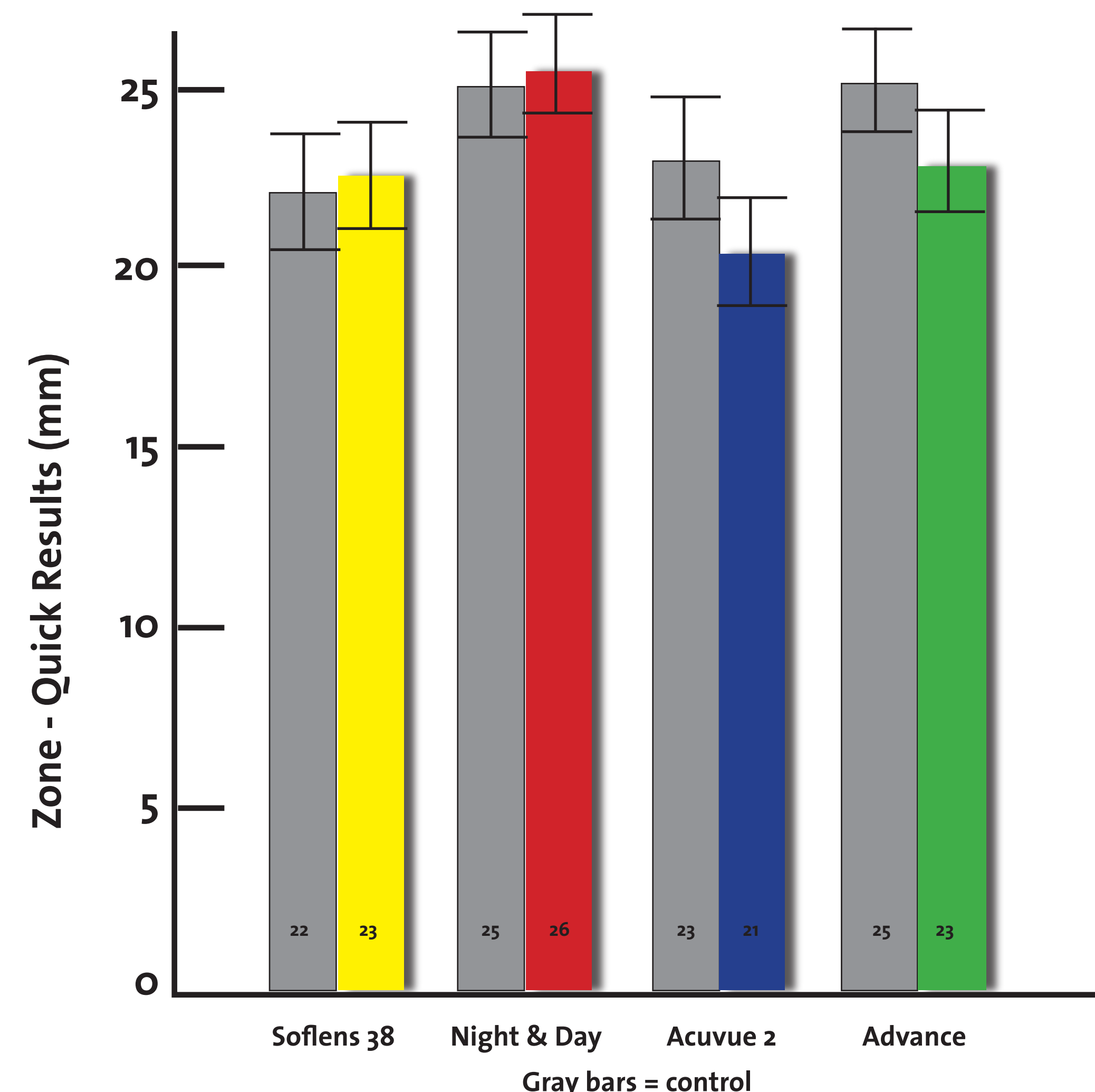
## RESULTS

- The Zone-Quick phenol red thread measurement without lenses showed no difference in baseline ( $t=0.29$ ,  $p>0.05$ ) for males and females. (Graph 1)
- The Zone-Quick phenol red thread test results obtained while wearing one of the lenses was subtracted from the results obtained from the no lens condition. These differences for the low and high water content lenses were then compared with a mixed design ANOVA.
- Water content had a significant impact on tear volume ( $F=14.21$ ,  $p<0.05$ ).
- High water content lenses yielded a lower residual tear volume than low water lenses. (Graph 2)

GRAPH 1



GRAPH 2



## DISCUSSION

- The Zone-Quick phenol red thread test may be used to determine the change in tear volume with contact lenses on. Decreased tear volume generates a thinner and unstable tear film.
- Patients complaining of ocular dryness while wearing contact lenses may benefit by having the tear volume measured with and without lenses on. The water content that shows the least difference may reduce the dryness complaint.
- Patients with decreased aqueous tear production may be better fit with lower water content lenses since the tear volume is not reduced.
- Further study in the clinical applicability of the testing is needed to determine the diagnostic value of repeated Zone-Quick phenol red thread measurements.

## CONCLUSIONS

- There is a difference in the Zone-Quick phenol red thread test results when done without and with contact lenses on for high water content lenses
- The water content, not the lens material influences the change in the tear volume. High water lenses lower the Zone-Quick phenol red thread measurement.
- The tear volume remains unchanged with low water hydrogel and silicone hydrogel as compared to no lens measurements. The tear volume is reduced when measured with a high water hydrogel or silicone hydrogel lens on the eye.