

### Introduction

- ❖ Prescribing contact lens with appropriate material, lens dimensions and wearing modalities is key to successful contact lens wear. Sub-optimal fit or poorly fitting lenses can alter ocular physiology and lens discontinuation. 1-3
- ❖ Hydrogel lens wear has been associated with a number of changes to ocular physiology such as mechanical, inflammatory and hypoxic. 4-6
- ❖ Complications can be minimized by altering lens materials, designs, manufacturing procedures, frequent replacement schedules and care systems etc.
- ❖ With silicone hydrogel lenses attention has started to focus on the mechanical properties and the ocular complications that can arise as a result of stiffer, less flexible materials. 7,8
- ❖ Great deal of research focusing on the impact of soft contact lens on cornea such as corneal neovascularization, corneal staining and topographic changes.
- ❖ Not much work has been done looking at the conjunctival changes with contact lens wear and their relation to subjective comfort.
- ❖ There is not much literature on hemodynamics of the bulbar conjunctiva. A study reported a significantly lower red blood cell velocity in a group of hydrogel lens wearers supporting the notion that contact lenses have an effect on the bulbar conjunctival vasculature. 9

### Objectives

- ❖ To determine if there were any relationship among lens fitting characteristics, conjunctival effects and blood flow changes with higher (PureVision 8.3, 8.6) and lower (Acuvue Advance 8.3, 8.7) modulus silicone hydrogel lenses.
- ❖ To correlate these changes with end of day comfort.

### Methods

#### Participants and contact lenses:

- ❖ Neophytes were enrolled and the study was conducted according to the Tenets of Helsinki. Thirty participants, 22 female and 8 male (age 28±1.5yrs.) wore a random selection of the four aforementioned study lenses for two weeks on a daily wear basis, with a washout period between the first and second pair.

#### Instrumentation:

- ❖ Lens fitting characteristics were assessed with the slit-lamp biomicroscope.
- ❖ Conjunctival hyperaemia, indentation and staining were assessed with the slit-lamp biomicroscope.
- ❖ The conjunctival epithelial thickness was measured using the Optovue™ OCT.
- ❖ Bulbar conjunctival velocity was measured using Hyper Micro Color CCD Camera which was mounted on a modified slit-lamp and images were taken on the temporal conjunctiva (1mm from the limbus). The camera was connected to a PC via USB and AVI movies were recorded at a frame rate of 30fps, with a resolution of 720 x 480 pixels (24bits/pixel).

#### Subjective responses:

- ❖ Subjective comfort was assessed using visual analogue scales at insertion, 2hrs and 6 hrs of lens wear at baseline and 2 weeks.

### Methods

#### Instrumentation:



Biomicroscopy



Lens edge-RTVue OCT



Red blood cell velocity measurement

### Results

#### Lens fitting characteristics:

- ❖ Base Curve differences:
  - Lens movement- Sig different between steep and flat lenses (RM ANOVA, Fit p=0.035). Least movement shown by AA 8.3 lens (Tukey p=0.028).
  - Vertical lens centration- Sig difference between steep and flat lenses (RM ANOVA, Fit p=0.033). Flatter lenses of both AA and PV lenses significantly decentred vertically (RM ANOVA, p<0.05).
- ❖ Modulus differences:
  - No differences observed.

#### Biomicroscopy conjunctival results:

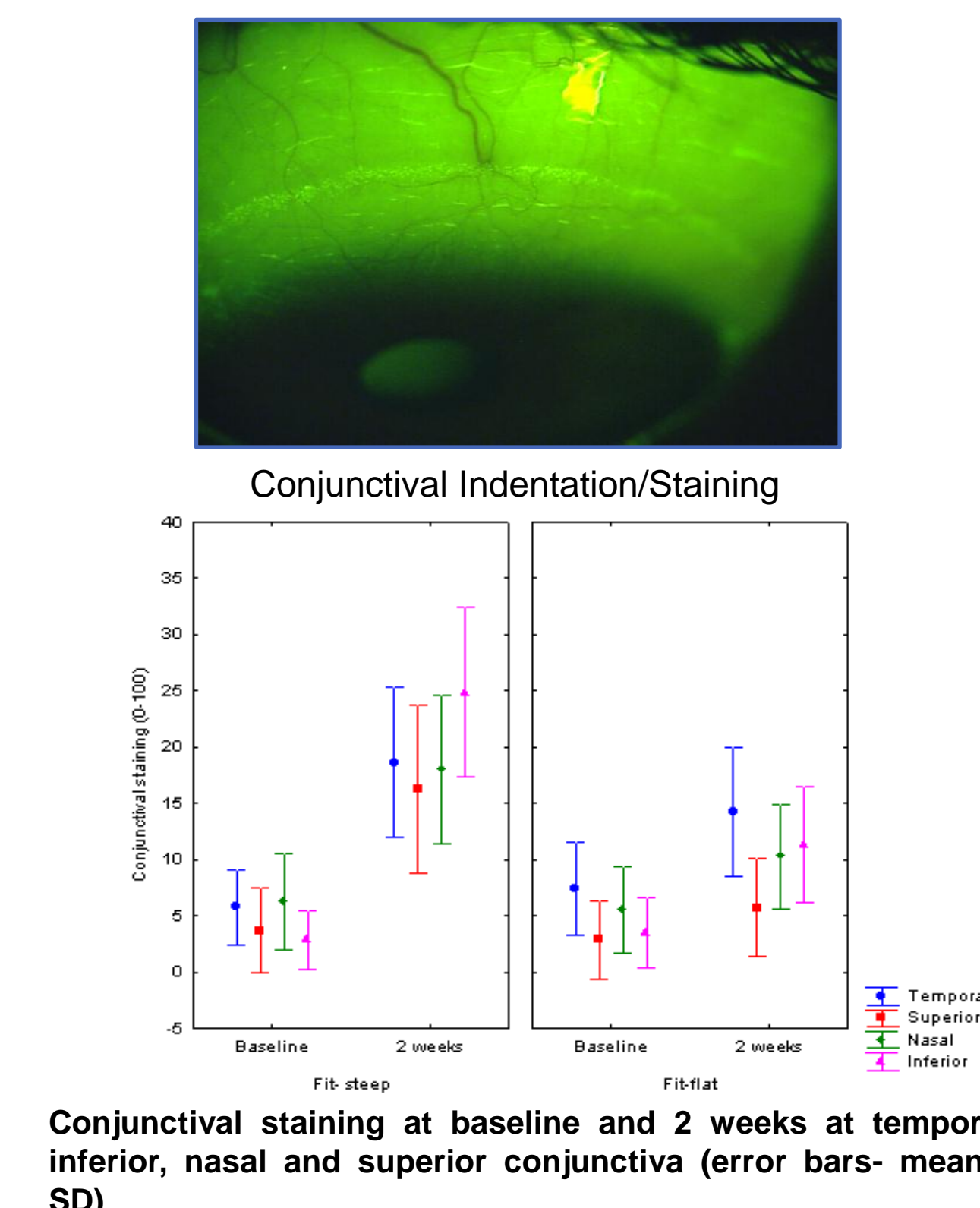
- ❖ Base Curve differences:
  - Steeper AA and PV lenses showed significantly higher conjunctival staining at the 2 week visit (ANOVA, p=0.029).
- ❖ Modulus differences:
  - There was a significant increase in bulbar hyperaemia at the nasal and temporal locations at 2 weeks with AA (lower modulus) and PV (higher modulus) (Tukey, p<0.05).
  - There was increased conjunctival indentation with the AA lenses compared to the PV lenses at 2 week visit (ANOVA, p=0.047).
  - There was a sig interaction between visit, fit and location for conjunctival staining- (RM ANOVA, visit\*fit\*location p=0.029. Steeper fitting lenses of AA and PV showed sig staining at 2 wks (Tukey, p<0.05).

#### Conjunctival epithelial thickness results:

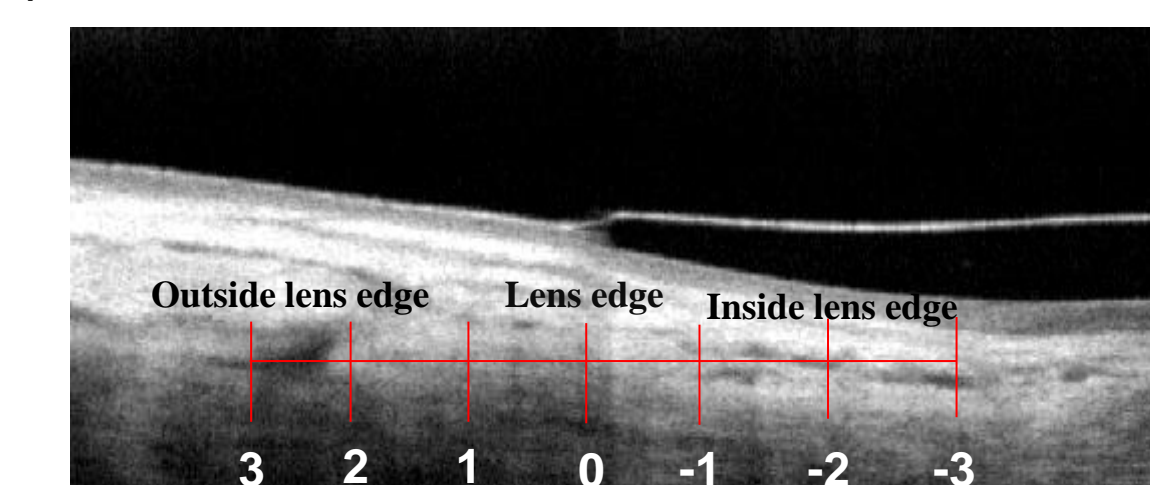
- ❖ Base Curve differences:
  - Steeper BOZR AA lenses showed a significantly greater conjunctival thinning under the lens compared to both PV lenses (Tukey, p=0.003).
- ❖ Modulus differences:
  - Lower modulus resulted in greatest conjunctival epithelial thickness (Tukey, p=0.003).

#### Comfort rating results:

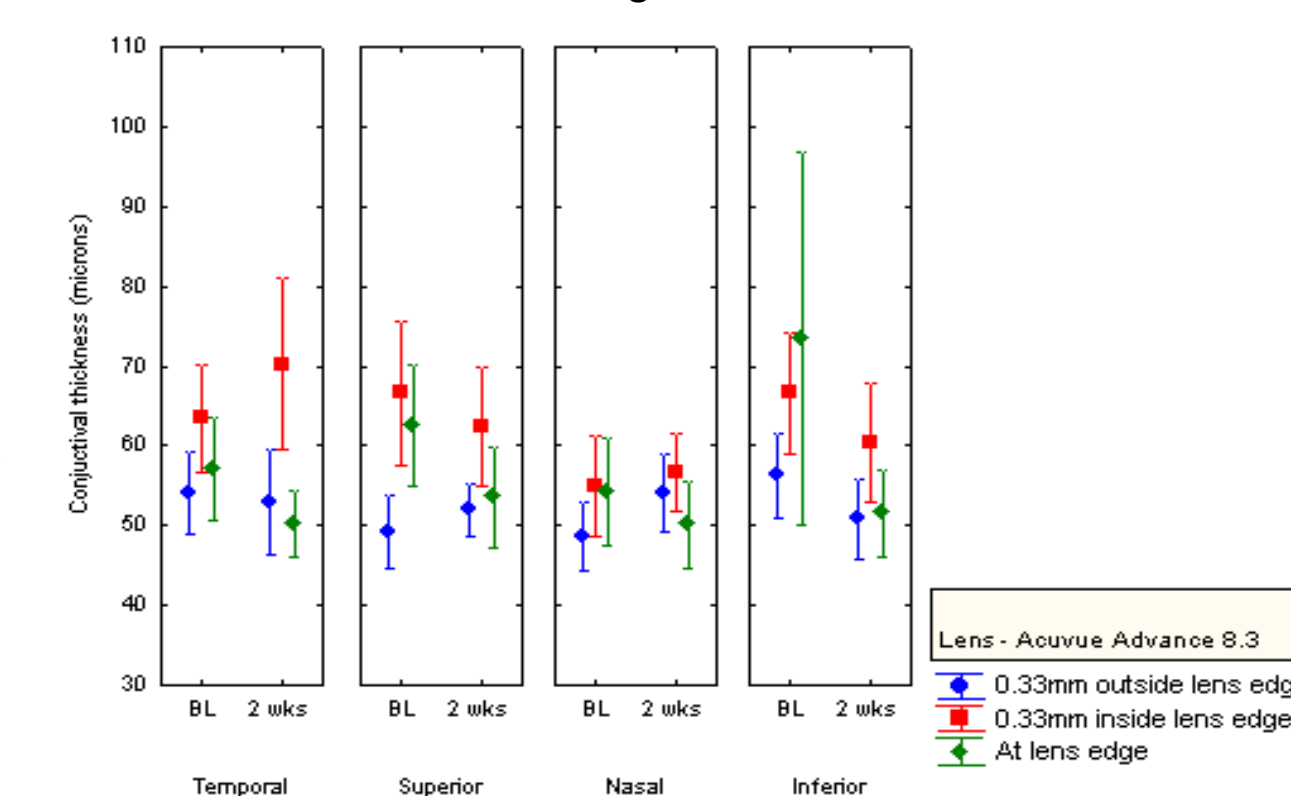
- ❖ Base Curve differences:
  - Steeper lenses more comfortable to flatter lenses at 2 weeks (Tukey, p<0.005)
- ❖ Modulus differences:
  - Lower modulus lenses more comfortable (RM ANOVA, modulus p=0.041), decrease in comfort from insertion to 6hrs (RM ANOVA, p=0.000 AA lens was rated the most comfortable).



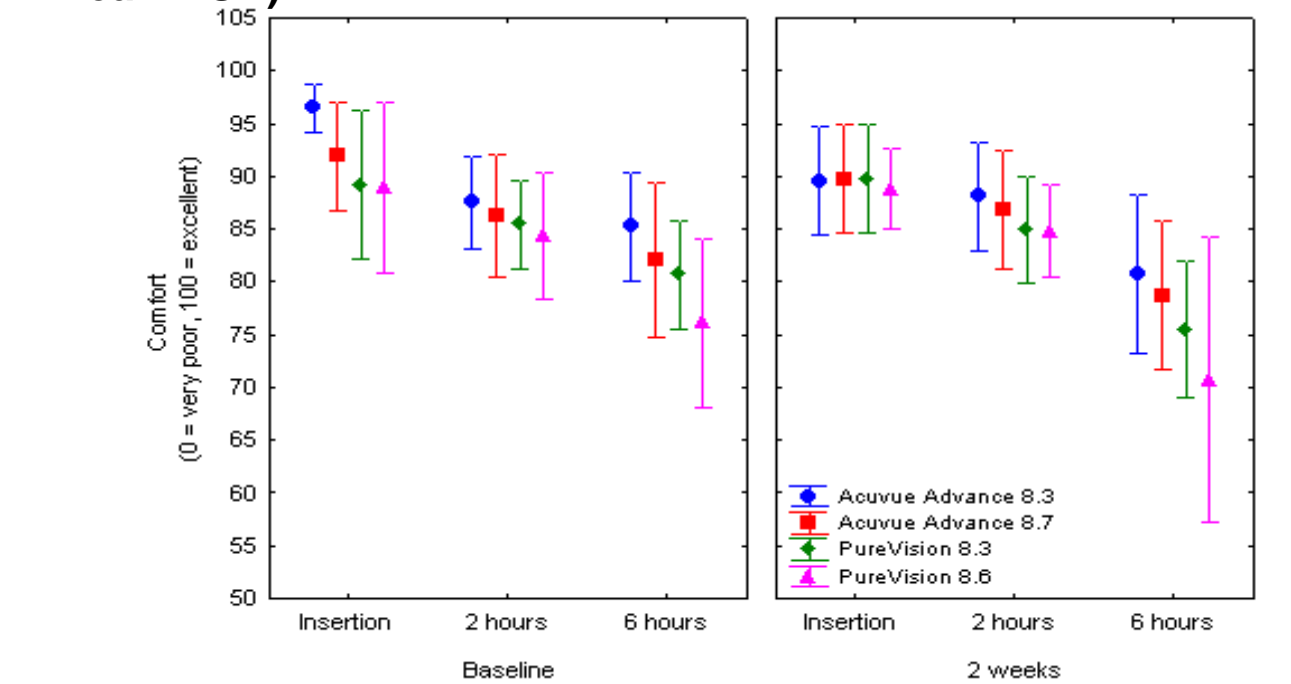
Conjunctival staining at baseline and 2 weeks at temporal, inferior, nasal and superior conjunctiva (error bars- mean ± SD)



Lens edge-RTVue OCT



Mean conjunctival thickness at baseline and 2 weeks at temporal, superior, nasal and inferior conjunctiva (error bars- mean ± SD)

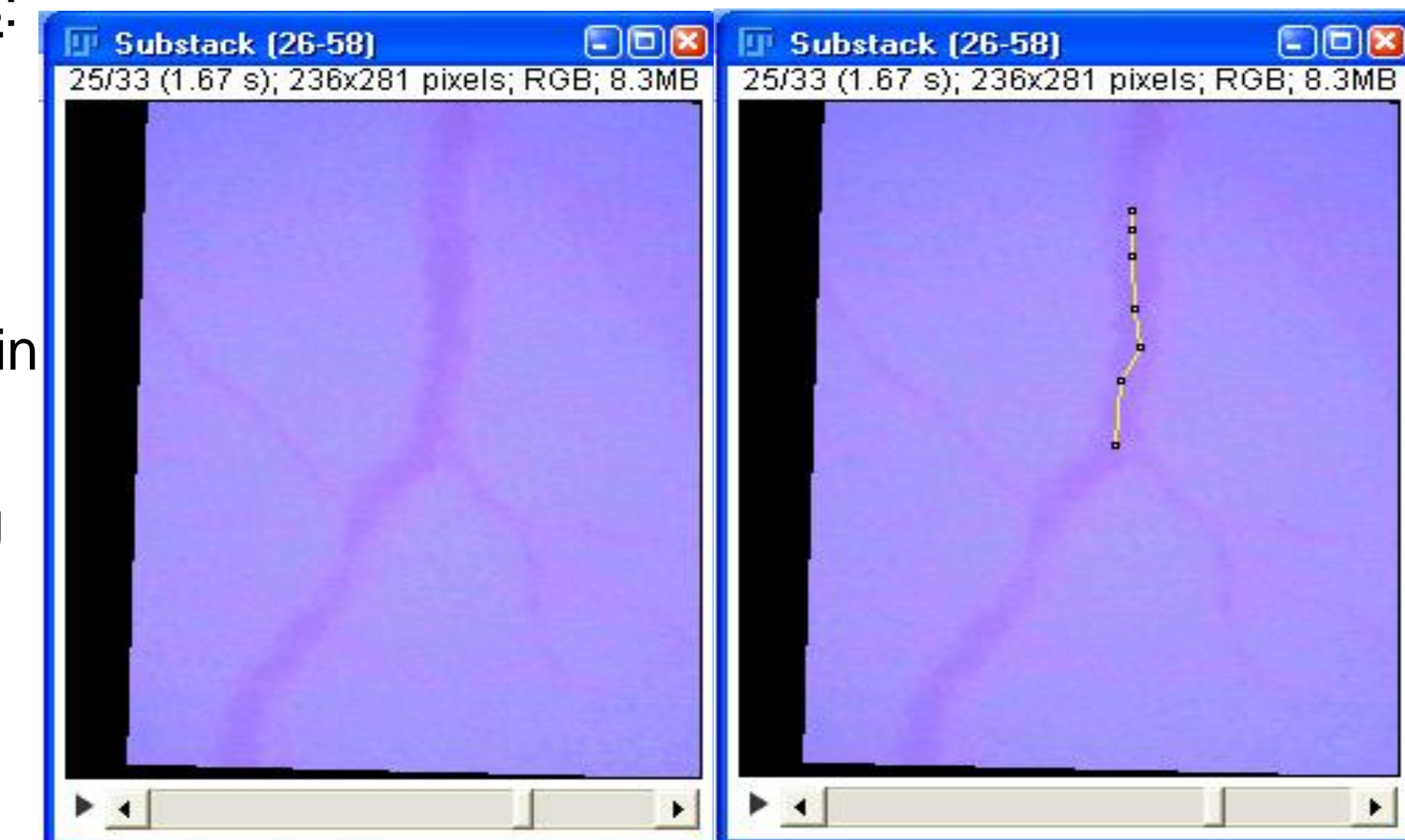


Mean subjective comfort at baseline and 2 weeks at insertion, 2hrs and 6hrs (error bars- mean ± SD)

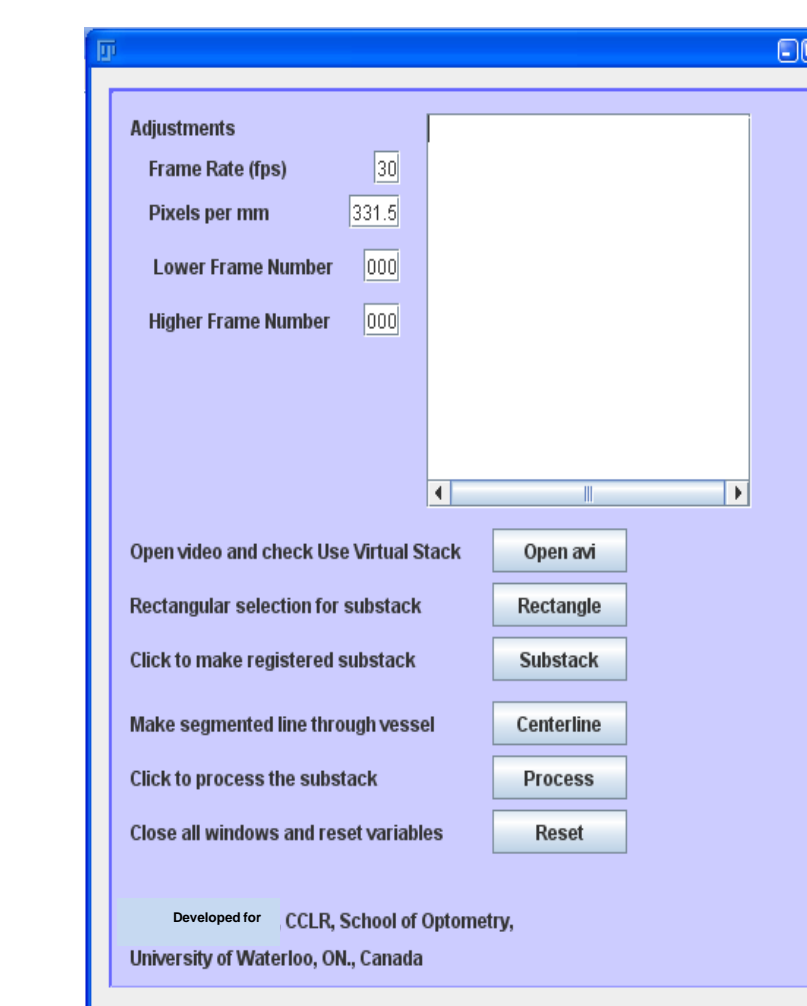
### Results

#### Blood flow at lens edge results:

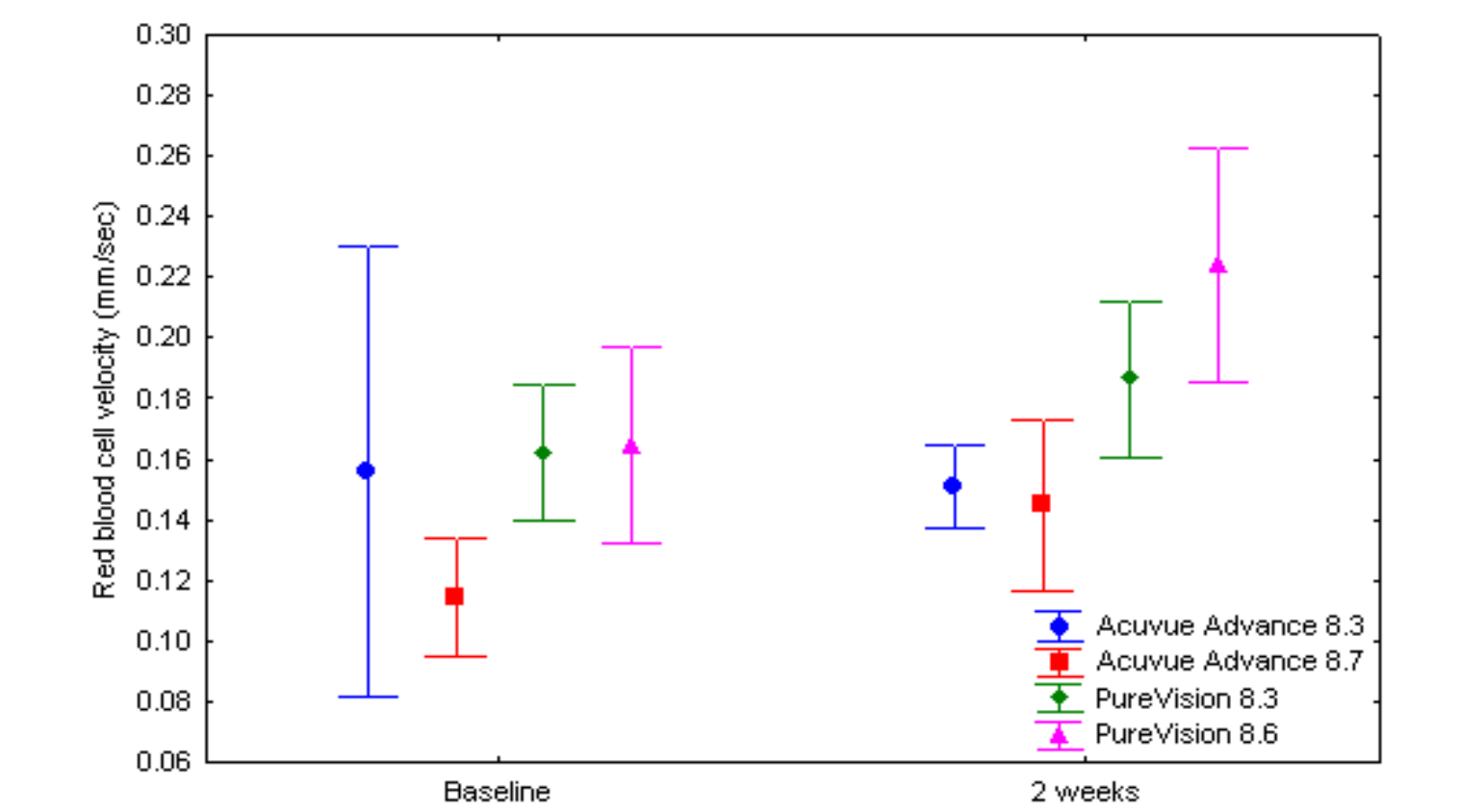
- ❖ Base Curve differences
  - No effects observed
- ❖ Modulus differences
  - There was a sig difference in blood velocity with lower modulus AA lenses causing decreased blood flow (0.14±0.08mm/sec) compared to PV lenses (0.19±0.06mm/sec) (Tukey, p=0.000).



Red blood cell velocity measurement



Interface of the macro used for RBC velocity measurement



Mean red blood cell velocity (mm/sec) at baseline and 2 weeks with AA 8.3, AA 8.7, PV 8.3 and PV 8.6 (error bars- mean ± SD)

### Discussion

- ❖ Lower modulus lenses resulted in the steepest fit, increased conjunctival staining, most conjunctival indentation, most conjunctival epithelial thinning but were rated as the most comfortable.
- ❖ Conjunctival thinning showed a change of 13.6% for the AA 8.3 and 13.3% for the AA 8.7 lenses compared to 12.8% with PV 8.3 and 3.37% with PV 8.6 from baseline to 2 weeks.
- ❖ Steeper lens edge impinges on the conjunctiva causing indentation, perhaps causing compression of epithelium and conjunctival staining.
- ❖ Flatter lens edge lies parallel to the conjunctiva causing LESS or NO indentation, compression of epithelium and conjunctival staining.
- ❖ Baseline blood flow and conjunctival compression with the 8.3 AA lenses were good predictors of end of comfort in this study.

### References

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