

Clinical performance of 'comfort-enhanced' daily disposable soft contact lenses

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Over the last 10 years much has been written about discomfort amongst contact lens wearers, particularly at the end of the day, and that this contributes to some patients dropping out of lens wear each year. There have been several studies to support this assertion. Discomfort, particularly towards the end of the day, is a major cause of contact lens discontinuation.¹ Dry eye symptoms are the most common complaint^{2,3} with over 70% of wearers reporting symptoms late in the day,⁴ and approximately one third of these discontinue lens wear as a result.¹

Most studies assess signs and symptoms of contact lens wear during the working day, therefore missing the important period when end of day discomfort occurs. Although the average duration of contact lens wear is around 13 to 14 hours each day,³⁻⁵ the last 1 to 1.5 hours are generally reported as uncomfortable. Therefore discomfort, rather than choice, often dictates wearing time. As less than 10% of wearers achieve 16 hours of wear a day³ the two studies described in this article were the first to perform a systematic assessment of lens performance after wearing times of greater than 12 hours.

Studies conducted at Aston University have examined enhancement of the nelfilcon A material from CIBA VISION, used in their daily disposable contact lenses. Professor Brian's Tighe's research group identified that the material, which consists of polymerized polyvinyl-alcohol (PVA), leached some of its content into the eye during wear.⁶ While leaching chemicals into the eye could be thought of as a negative feature, PVA is a well-established tear supplement.⁷ In 2006, the present authors published evidence that by manipulating the amount of bound PVA within the contact lens matrix, comfort of the ocular surface could be enhanced; based on this, CIBA VISION were able to develop a new AquaComfort material that enhanced the comfort of the ocular surface compared to the original lens (Figure 1).⁸

Since this study, various manufacturers have launched a number of modified

Johnson) uses LACREON™ Technology, which permanently embeds polyvinyl pyrrolidone into the Etafilcon A material.

CIBA VISION has also further enhanced its Focus DAILIES with AquaComfort daily disposable contact lens by adding hydroxypropylmethylcellulose and polyethylene glycol (which binds to PVA, prolonging its release) to the high molecular weight PVA; this is marketed as DAILIES AquaComfort Plus contact lenses.

In a second study, published in the special "dry eye issue" of the Contact Lens and Anterior Eye journal in 2010, the authors examined 34 subjects wearing each of these new 'comfort enhancing' contact lenses to compare the performance (Figure 2).⁹ It is difficult to objectively assess comfort, as hiding the identity of the lenses from the patient would involve unsealing the lens blisters thus affecting their sterility. However, the researchers were masked to the lenses worn and objectively measured tear film volume, tear stability and bulbar hyperaemia, all of which relate to a long-term healthy, comfortable eye, and the lubricating effects of the contact lens.¹⁰

At the end of a week's wear of each lens type, measures were taken at eight, 12 and 16 hours after lens insertion. Each lens was worn for the same number of hours per day and for the same number of days during the week. After each of the contact

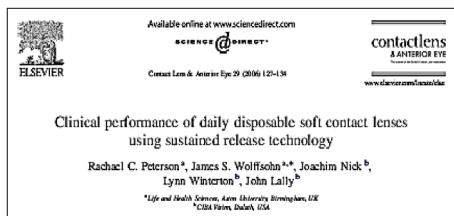


Figure 1

Published study describing development of CIBA VISION's AquaComfort material

daily disposable contact lenses, aimed to enhance patient comfort. The SofLens one day (Bausch and Lomb) optimises comfort through its reduced thickness and mass design, creating smoother back surface transitions and reduced lens / lid interactions during blinking. In addition, the lens is formed from hilafilcon B high water content material and is packaged in a poloxamine-containing lens storage solution that binds to the lens surface, being slowly released onto the lens surface. The 1-Day Acuvue Moist lens (Etafilcon A; Vistakon, Johnson and



Figure 2

Published study to investigate the performance of 'comfort enhanced' daily disposable soft contact lenses

lenses had been worn and assessed, the same measurements were taken on all of the subjects after a week of no contact lens wear (at the same time of day as the eight hours of contact lens wear) to assess the baseline ocular surface characteristics.

As the day progressed, the tear film volume and stability reduced (Table 1). However, the post lens non-invasive tear break-up time (NITBUT) was more stable with the DAILIES AquaComfort Plus contact lens material compared with the other lenses evaluated ($F = 6.0$, $p < 0.01$; Figure 3), with the tear film being held on the contact lens surface rather than residing in the tear meniscus ($p < 0.05$).

Conclusion

As people now spend much more time viewing visual display units (VDUs) (e.g. computer screens) and often in air-conditioned environments, which causes dry eyes due to the reduction in blink rate with concentration, it is advisable to fit contact lenses that provide a stable tear film.¹¹ Hence these studies identify the benefits of modern 'comfort enhancing' daily disposable contact lenses for our patients, in our bid to reduce the challenge of end of day dryness.

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	Time after lens wear			Significance
	8 Hours	12 Hours	16 Hours	
Pre-lens Non-invasive Tear Break-up Time (seconds)	16.1 ± 6.8	14.5 ± 6.0	13.2 ± 7.0	F = 32.0 p < 0.001
Tear Prism Height (mm)	0.27 ± 0.08	0.25 ± 0.08	0.23 ± 0.08	F = 26.96 p < 0.001
Ocular Surface Temperature (°C)	35.70 ± 0.99	35.64 ± 0.94	35.58 ± 0.91	F = 119.7 p < 0.001
Bulbar hyperaemia (% blood vessel coverage)	6.3 ± 3.5	6.3 ± 3.6	7.7 ± 4.5	F = 11.54 p < 0.001

Table 1

Ocular responses to 'comfort enhanced' daily disposable soft contact lens wear. Data is the average of the four lenses used in the study⁹

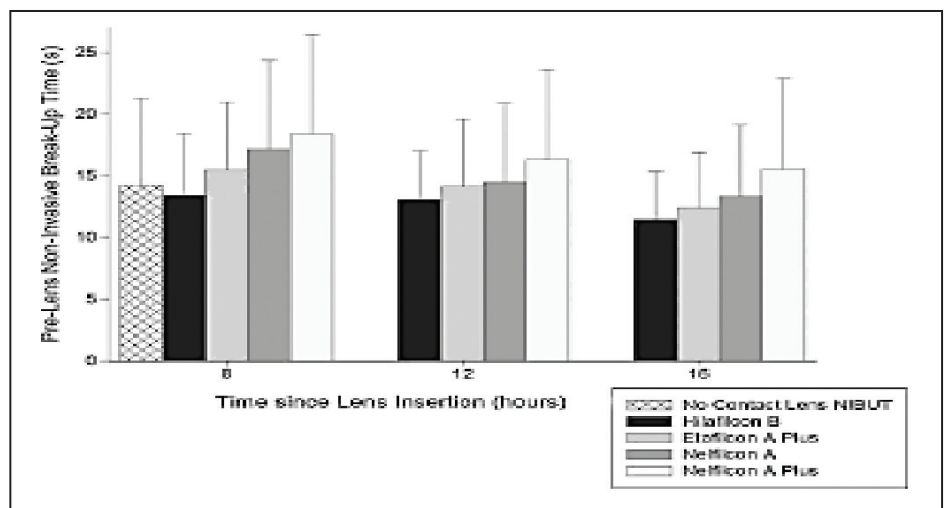


Figure 3

Post lens non-invasive tear break-up time (NITBUT) of 'comfort enhanced' daily disposable soft contact lenses

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