Lipid Deposits and Contact Lens Comfort

Tear film stability is important for good vision and ocular comfort. Blinking mixes the tear film, breaking down its complex, delicate structure, but each time it breaks down, this complicated mixture of proteins, salts, aqueous, and lipids spontaneously reassembles itself into a stable, lubricant barrier. This process of reassembly is affected by the introduction of a contact lens, an object ten times thicker than the normal tear film.

A contact lens divides the tear film in two—pre-lens and post-lens—requiring its miniscule volume to stretch even further. As a result, the thin layer of polar and nonpolar tear lipids that normally rests atop the pre-lens tear film comes within a few microns of the anterior contact lens surface.

The impact of this proximity depends on the surface chemistry of the lens. If the patient has sufficient aqueous tears, a hydrophilic lens surface will attract and maintain a rich layer of aqueous tears around it, so the lipid will be relatively far from the lens surface. But hydrophobic areas on the lens surface attract and adhere the nearby tear lipids, effectively converting the tear film and preventing the lipid from forming an effective barrier to evaporation.

CLINICAL CONSEQUENCES

It is clear from their appearance at the slit lamp that significant lipid deposits are detrimental to contact lens performance. Lipid deposits cause light scatter by forming little elevations on what should be an optically regular lens surface. The lids, instead of sliding over a smooth, cushioned surface, experience friction when moving across a lipid-deposited lens surface. Friction can impact comfort and reduce wettability, which could lead to visual instability.

When patients report symptoms of dryness toward the end of their wear cycle, the cause can be deposition.

And I know that if I do not address the source of their dryness and discomfort, they may eventually become sufficiently uncomfortable to drop out of lens wear.

More recently, Pitt and colleagues validated a method for measuring radiolabeled lipids adsorbed onto silicone hydrogels from an artificial tear fluid. This method found different absolute amounts of lipid than previous studies but, again, there was significantly less cholesterol on lotraflacon B than other silicone hydrogel materials.

THE AIR OPTIX® AQUA DIFFERENCE

Because all silicone hydrogels contain some hydrophobic moieties, each lens material must undergo some modification in order to maintain a wettable surface. Lotraflacon B is differentiated by a permanently bound plasma treatment that results in a continuous and hydrophilic lens surface throughout the 1-month wear cycle.

When patients have experienced issues with significant levels of lipid deposition, it is critical that I evaluate whether to prescribe a contact lens that resists lipid deposits. In these cases I also need to ensure that patients care for and replace their lenses as instructed—and I find patients are most willing to hold up their end of this bargain when I frame the conversation around giving them the best visual experience. The uniform, hydrophilic surface of AIR OPTIX® AQUA contact lenses resists deposits for comfort and vision throughout the wearing period.

INSIGHTS FROM RESEARCH

Over the past decade a number of studies have helped us to understand that silicone hydrogel materials differ in their tendency to attract tear lipids. In 2008, Camey and colleagues measured the in-vitro adsorption of fluorescent-labeled polar and nonpolar lipids to the five then-available silicone hydrogel lens materials and one hydrogel material.

By the end of the 20-day study period, the nonpolar lipid tested (cholesterol) deposited 23.2 and 24.1 µg/lens onto senofilcon A and balafilcon A, respectively—strikingly more than the 3.0 µg/lens found on lotraflacon B.

For both lipids tested, the lotraflacon B material showed significantly lower adsorption than all other materials tested.

In a study quantifying protein and cholesterol deposits extracted from worn lenses, Zhao et al found consistently low cholesterol adsorption for lotraflacon B and significantly higher adsorption for senofilcon A, balafilcon A, and galyafilcon A.

REFERENCES


