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## LENS COATINGS AND WETTABILITY

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The lens coatings and wettability session was moderated by Tom Arnold, OD, FSLS. The keynote address was given by Maria Walker, OD, MS, FAAO, FSLS. Melissa Barnett, OD, FAAO, FSLS, FBCLA and Nathan Schramm OD, CNS, FSLS presented expert statements. The VIP members were Jan Svochak, Vic McCray, MD and Steve Webb.

Maria Walker began with a review of gas permeable contact lens materials. In 1978, cellulose acetate butyrate was introduced. However, there was poor oxygen transmission and the material was prone to warpage. Silicone acrylate material became available in 1979. The silicone aspect of this material provided improved oxygen permeability. The methacrylate acid portion of the material provided better wettability. However, there was significant protein deposition, lenses were easily broken and scratched, parameters were unstable and lens flexure occurred. In 1987, fluorosilicone acrylate material was introduced. Fluorine improved wettability and maintained oxygen permeability. However, compared to PMMA material, more flexure and surface scratches occurred.

Next, gas permeable lens characteristics were reviewed including wettability, oxygen transmissibility, surface properties, scratch and deposit resistance, surface treatments, refractive index, rigidity and durability, modulus, coefficient of friction, lubricity, UV and optical transmissibility and specific gravity.

Lens wettability is the ability of liquid to spread over the lens surface in vitro. There are different methods to determine lens wettability. The sessile drop test uses a drop of water on a material surface and measures the angle between the liquid and solid. The captive bubble technique uses a bubble of air injected into a liquid with the lens surface submerged. Note that a smaller angle indicates better wetting and improved comfort. The coefficient of friction was discussed which has implications for on eye performance. As seen clinically, lens deposits such as protein and lipid make it difficult to see through a lens that is not wetting.

Nathan Schramm differentiated front surface wetting and post-lens-tear reservoir fogging. The squeegee technique was reviewed. Soft or gas permeable multipurpose solution is applied to a DMV plunger. The plunger is used in a circular motion on the surface of a lens to remove debris and deposits from the lens surface.

Melissa Barnett reviewed the consequences of poor scleral lens surface wettability including decreased vision, diminished lens comfort, increased chair time and increases costs for the patient and practitioner. Patients at increased risk are those with ocular surface disease, ocular rosacea, Meibomian gland dysfunction and filamentary keratitis. Patients with ocular exposure including ptosis, stroke, nerve palsy or eyelid repair are especially at risk for poor surface wettability. External causes include poor plunger hygiene, makeup and skincare regime (especially oil-based products), hand soaps with moisturizing agents and older blocking compounds such as pitch. Excessive lipids in the tear film create a foggy and hydrophobic lens surface.

Traditional treatment strategies include increased lubrication with preservative-free artificial tears over the scleral lens throughout the day, physical removal

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with manual cleaning, rinsing and reapplication, the squeegee technique, and polishing the front surface of lenses (which also removes the plasma surface).

It is critical to educate patients about the importance of treating ocular surface disease, proper hand hygiene and how to apply makeup and creams with scleral lens wear. The management of ocular surface disease is critical since lipids and mucins are attracted to hydrophobic gas permeable material. It is important to educate patients to wash hands before handling scleral lenses and inform patients to use mild, basic hand soaps such as contact lens hand soap or acne treatment hand soaps. Ask patients about face and eye creams and make sure patients are applying creams and makeup after lens insertion. It is important to not apply oil-based moisturizers to the eyelids, not apply any makeup to the inside area of the eyelid margin (waterline) or Meibomian gland orifices due to the increased risk for Meibomian gland dysfunction and gland obstruction over time.

A new option for the scleral lens surface is Tangible Hydra-PEG coating made from the lubricant polyethylene glycol (PEG). It is a 90% water PEG-based polymer mixture that is permanently bonded to the surface of the contact lens. Tangible Hydra-PEG is an FDA approved product that shields the lens from the ocular surface and tear film, minimizes friction and deposition. It encapsulates the lens, creating a mucin-like wetting surface. Tangible Hydra-PEG may be applied to any contact lens. Various studies of Tangible Hydra-PEG were reviewed. Tangible Hydra-PEG reduces protein and lipid deposition, improves end of day comfort, improves fogging and improves comfort. Another study demonstrated a strong patient preference for Tangible Hydra-PEG lenses.