Vaulting the Cornea: Visually Rehabilitating Pellucid Marginal Degeneration (PMD) with Scleral Lenses after Failure with Corneal Gas-Permeable Lenses

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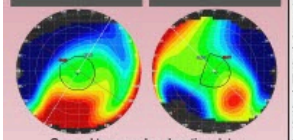
BACKGROUND

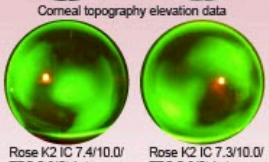
Pellucid Marginal Degeneration (PMD) is a rare, bilateral, non-inflammatory ectatic corneal disorder characterized by inferior peripheral corneal thinning. Unlike keratoconus where the apex typically lies centrally or paracentrally, PMD exhibits maximal thinning inferiorly 1 to 2 mm from the limbus resulting in the characteristic mid-peripheral apex. Standard corneal gas-permeable (GP) lenses are typically designed for a more central corneal apex which may inadvertently bear on the mid-peripheral apex in PMD, leading to discomfort, poor lens stability, and risk of mechanical complications. Corneal GP fits are also highly dependent on the patient's lid anatomy. These challenges can result in failure with corneal GPs. Although there are corneal GP designs for irregular, more oblate corneas on the market, there are limitations to every lens design which can prompt the need for scleral lenses. By creating a fluid reservoir over the irregular corneal surface, well-fitting scleral lenses avoid contact with the cornea, improving patient comfort, lens tolerance, and corneal health.

CORNEAL TOPOGRAPHY

OD | OS



Corneal topography elevation data



Rose K2 IC 7.4/10.0/ TPC 0.9/Std steep

Rose K2 IC 7.3/10.0/ TPC 0.9/Std steep

CASE DESCRIPTION

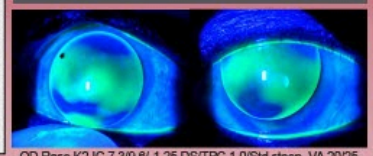
A 52-year-old male with PMD opted for corneal GP lenses due to financial limitations. The lenses exhibited good centration when assessed without eyelid interaction; however, tight upper eyelids caused OD to displace superior-temporally leading to excessive apical bearing. Several lens modifications were made to improve centration: a larger diameter and a steeper base curve. While centration improved slightly, the lens still beared heavily on the apex with lid interaction despite an otherwise optimal fit with the available parameters which resulted in a corneal abrasion OD and ultimately failure with corneal GP lens wear alone. A piggyback was attempted with a soft lens cushion for better comfort and centration; however, this was not successful due to lack of dexterity to handle soft lenses. With financial assistance, the patient was successfully fit with scleral lenses with VA 20/25 OU with no corneal abrasions.

DISCUSSION

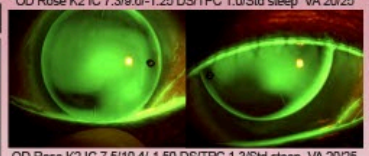
Elevation data from corneal topography provides strong predictive value for the fluorescein pattern seen with a centered corneal GP lenses on eye; however, as demonstrated by the corneal GP fluorescein pattern OD , lens centration is heavily influenced by lid anatomy. Both lid position and degree of laxity are factors which can affect lens position; therefore, careful evaluation of lid anatomy is essential to fitting corneal GP lenses.

CORNEAL GP FLUORESCEIN OD

WITHOUT LIDS | LID ATTACHED



OD Rose K2 IC 7.3/9.6/-1.25 DS/TPC 1.0/Std steep VA 20/25



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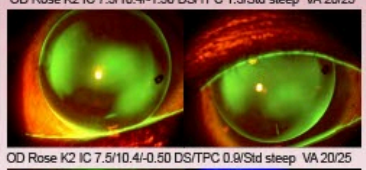
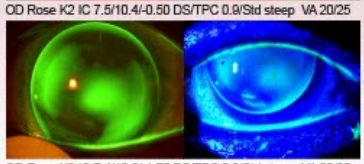


OD Rose K2 IC 7.5/10.4/-0.50 DS/TPC 0.9/Std steep VA 20/25



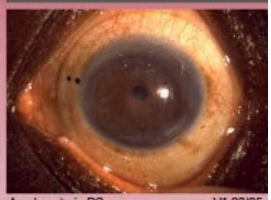
OD Rose K2 IC 7.4/10.0/-1.75 DS/TPC 0.9/Std steep VA 20/25

SCLERAL LENS FIT

OD | OS

Ampleye toric PC VA 20/25
BC 8.04 / PWR +2.00 / DIA 16.50 / sag 4400 / PCZ -4.00 / LLZ -8.00 / SLZ 1.0 / SLZ toric 6.0

4 hour central vault: 250um



Ampleye toric PC VA 20/25
BC 8.04 / PWR +3.25 / DIA 16.50 / sag 4200 / PCZ 4.00 / LLZ -8.00 / SLZ 1.0 / SLZ toric 6.0

4 hour central vault: 200um

CONCLUSION

This case illustrates the limitations of corneal GP lenses in patients with PMD, particularly when tight eyelids induce lens decentration and apical bearing. It highlights the importance of evaluating both anatomical and functional factors—such as eyelid tension and patient dexterity—when selecting a contact lens modality. Scleral lenses offer a safe and effective alternative for patients with advanced ectasia who are unable to tolerate other lens types. With proper training and support, patients with limited dexterity can achieve successful outcomes with scleral lens wear. Financial constraints often limit access to medically-necessary specialty contact lenses, highlighting the need for more financial support from the government and insurance companies.

REFERENCES

ACKNOWLEDGEMENTS

ART CARES program by ART Optical, Mission Eye Care staff