



New England  
College of Optometry

# Unique Indication of Hybrid Lenses in the Setting of a Boston Keratoprosthesis Type I

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## Introduction

The Boston Keratoprosthesis (KPro), although typically reserved for cases ineligible for standard corneal graft options, is the most widely used artificial cornea. Boston KPro patients require life-long management which includes bandage contact lens (BCL) placement. This is necessary to maintain adequate ocular surface hydration, protection, and improved comfort. Often, these lenses need to be replaced or cleaned regularly to maintain quality central vision. Because the Boston KPro is an artificial cornea, there is no concern regarding adequate contact lens movement to maintain tear exchange or oxygen delivery to prevent neovascularization. Although large diameter soft lenses are still used as a standard of care, this case demonstrates a unique indication for hybrid contact lenses in the setting of a Boston Keratoprosthesis.

## Demographics/CC

51 yo Male  
CC: Foreign body sensation OD only x 1 week; wanted to make sure that both lenses were clear prior to glaucoma testing same afternoon

Ocular Hx:  
Boston KPro OD 15 years prior, OS 12 years prior for exposure keratopathy and corneal neovascularization  
Aphakia OD, Pseudophakia OS, Ocular Hypertension OS

Medical Hx:  
Head trauma 20 years prior

Ocular Meds:  
Preservative-free artificial tears  
Dorzolamide BID OS, Polytrim QD OU, Brimonidine BID OS

\*patient is currently followed by MEEI glaucoma service every 2-3 months to monitor for ONH changes (last noted as healthy) due to likely chronic angle closure OS\*

## Contact Lens History

Patient was initially fit with soft BCLs (see Figures 1 and 2)

OD: Kontur 8.9 BC/15.0 dia/plano  
OS: Kontur 8.6 BC/15.0 dia/plano

BCVA with Kontur Lens OD prior to Synergeyes refit: 20/60 (limited due to deposits)  
BCVA with Kontur Lens OS prior to Synergeyes refit: 20/30-

Decision was made to switch to hybrid contact lens OD 9 yrs prior due to consistent debris limiting vision and OS in 6 yrs prior due to poor retention (lens kept falling out and getting lost due to limited sensation)

OD last replaced 1 month prior, OS last replaced 7 months prior; OS cleaned/reinserted 5 months prior

## Anterior Segment Photos

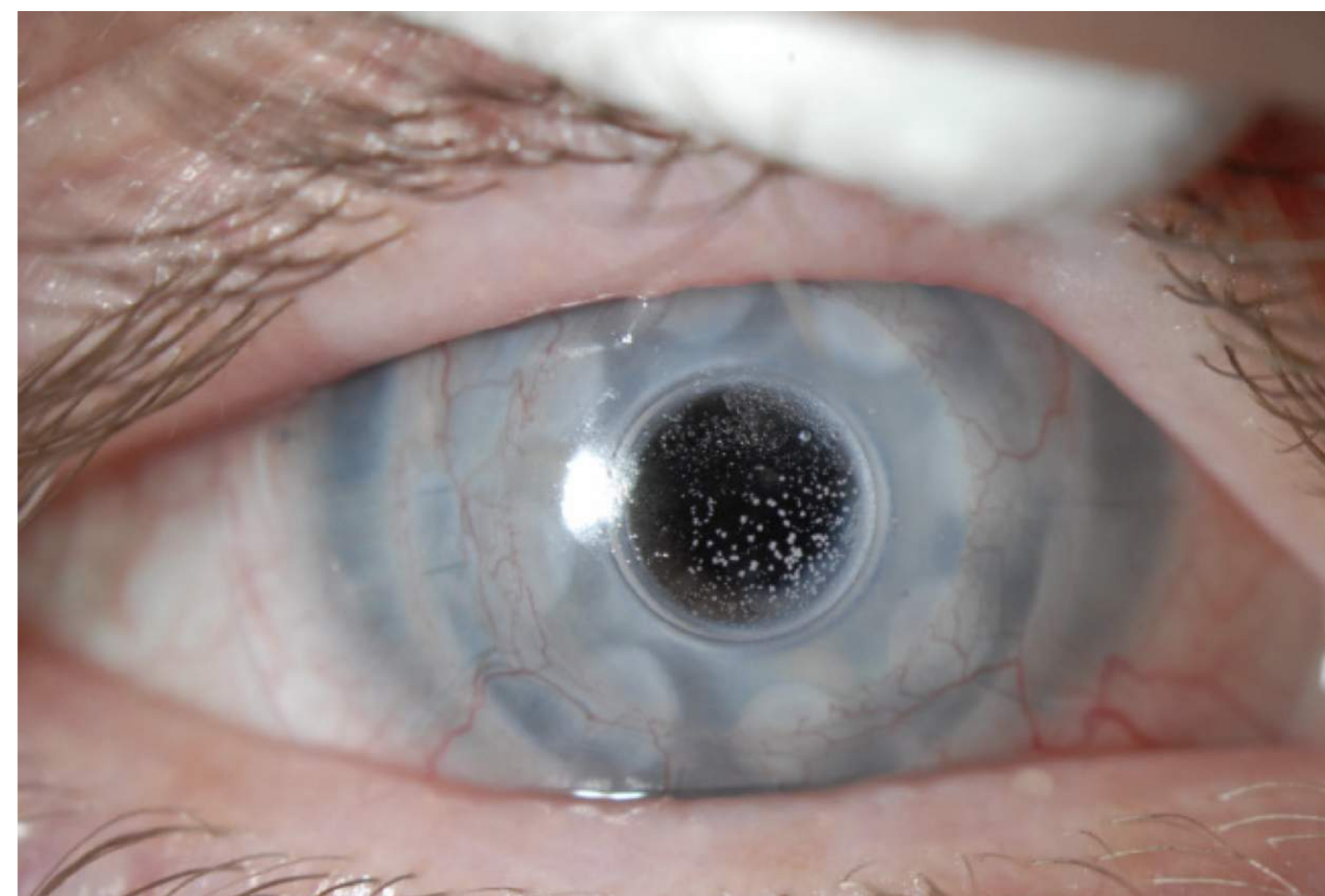


Figure 1. Anterior segment photo showing dense deposits accumulated on this patient's Kontur BCL. Deposits can be seen affecting the central visual axis

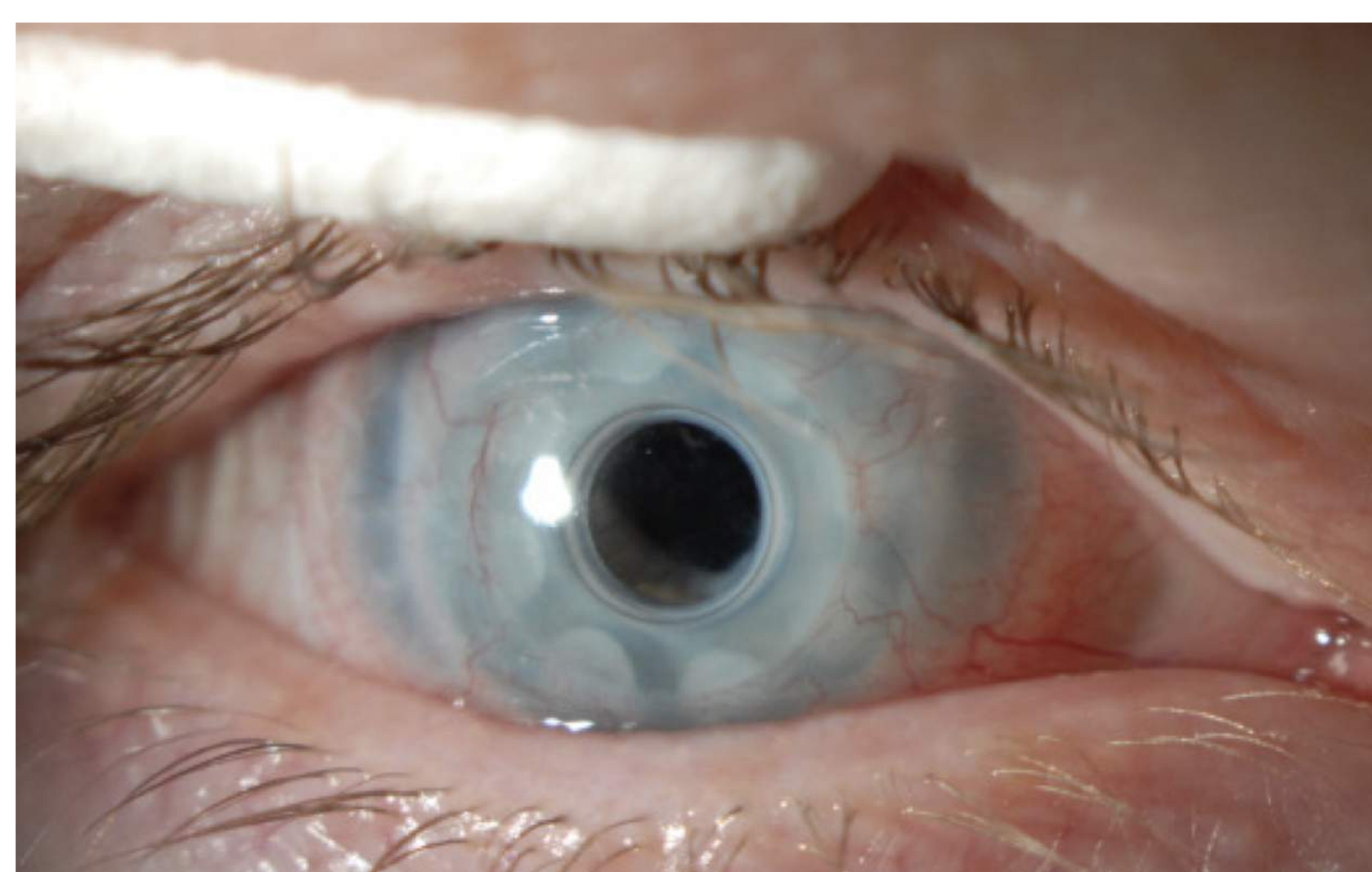


Figure 3. Anterior segment photo showing reduced deposits with a hybrid contact lens fit over the Boston KPro (compare to figures 1 and 2 above)

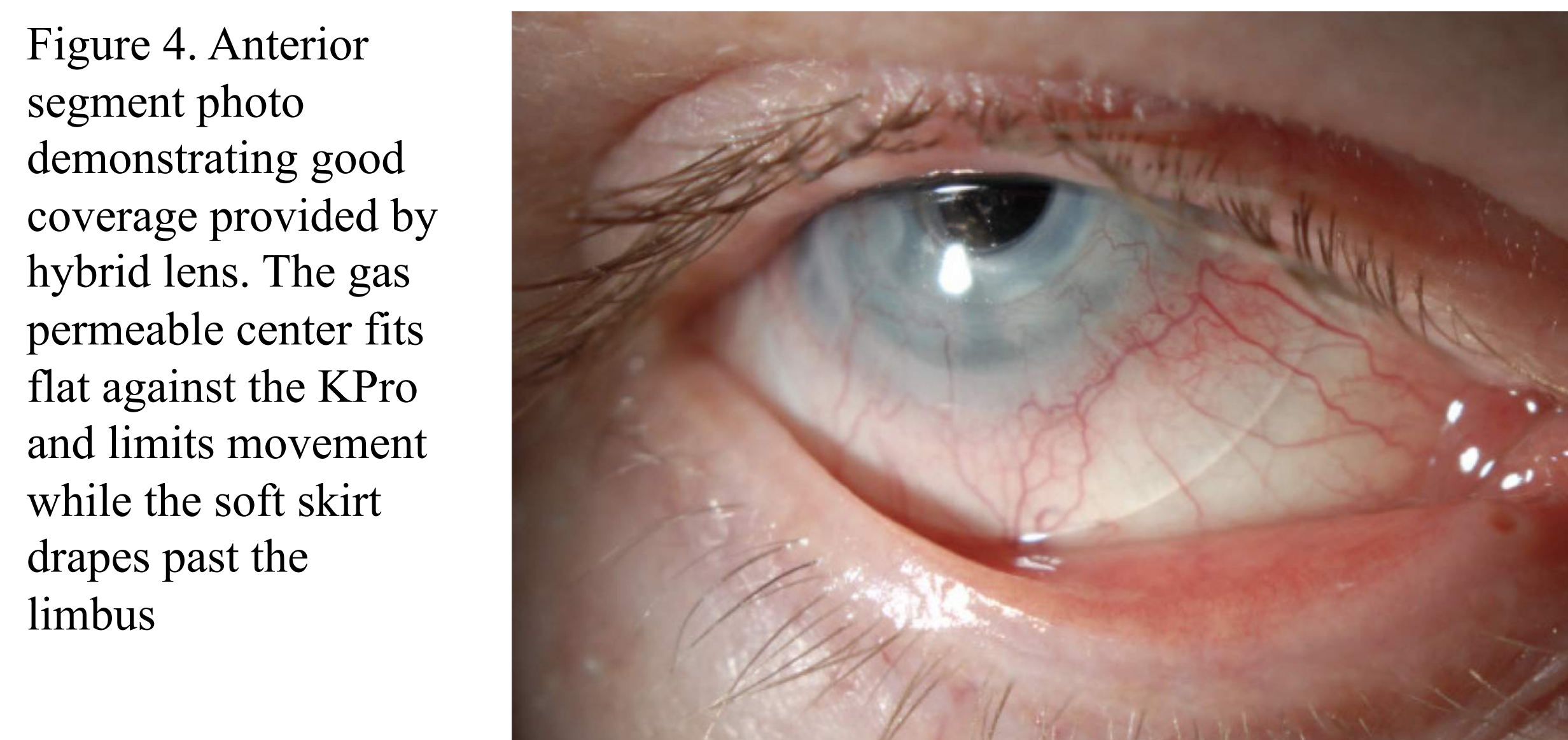


Figure 4. Anterior segment photo demonstrating good coverage provided by hybrid lens. The gas permeable center fits flat against the KPro and limits movement while the soft skirt drapes past the limbus

## Results - con't

Entering Acuity (cc, contact lenses):  
OD 20/20 OS 20/25-1

Slit Lamp findings:  
OD: small eye-lash like fiber inferiorly (removed with cotton swab), Boston KPro Type I, clean bandage lens in place; aphakia  
OS: KPro, BCL in place and well-centered with a few debris; PCIOL

**Contact lenses:**  
OD: SynergEyes KC 14.5/7.1 -7.00 SC 8.5 OR: plano  
OS: SynergEyes KC 14.5/6.9 -10.50 SC 8.5 OR: -0.25 20/25+2

Fit assessment: Lenses well centered, full coverage without bubbles. No lens defects observed. No scratches evident on gas permeable portion of hybrid lens.

Overall assessment and plan:  
BCLs in good condition; no replacement needed at this time. Continue with full time wear.  
Present to optometry prior to future follow-ups with glaucoma/corneal specialists to allow for cleaning/replacement of bandage lens prior to any testing.

## Overview: Boston Kpro

The Boston Keratoprosthesis I is the most widely used artificial cornea. The Boston KPro Type I consists of 3 main parts: front plate (5.0mm) with optical stem, back plate (typically with holes to improve graft access to the aqueous humor), and a titanium locking C-ring.

**Generally indication of a Boston KPro includes several factors:**  
-failed corneal graft with poor prognosis for additional grafts  
-significantly reduced vision in affected eye (<20/200) and compromised vision in other eye  
-lack of pre-existing end-stage glaucoma or retinal compromise limiting good visual potential

Extended wear BCLs are part of long-term management of patients with a Boston KPro. They serve as a method to prevent chronic inflammation, epithelial damage, and dellen formation particularly by maintaining hydration to the tissue adjacent to the KPro. These complications could lead to corneal desiccation and subsequent tissue melting.

### Special Fitting Considerations

- Because the KPro is an artificial cornea, fitting characteristics that would normally lead to neovascularization or staining of the central cornea, such as lack of movement or central bearing, are not a concern.
- Post-operative corneal topography varies and thus some patients require very flat base curve lenses to avoid bubbles while others require keratoconic designs to maintain good centration. Slit lamp examination prior to lens selection is the best way to visualize corneal profile.
- Some patients may experience some photophobia and others may be sensitive to poor cosmesis (particularly those with a dark iris on their unaffected eye). These patients may benefit from a BCL that incorporates tint or custom colors with a clear pupil.

## Discussion

Standard of care is typically a large diameter soft Kontur BCLs which are made of methafilcon A, a 55% water content hydrophilic lens with a Dk of 18.8. However, some patient are better suited to be fitted with a hybrid lens due to the following **indications**:

- Retention:** Fitting a hybrid lens with an the gas permeable center flat over the KPro improves retention while still providing comfort of the soft skirt.
- Vision-limiting deposits:** replacing the hydrophilic lens with a water impermeable center has been shown to reduce vision-reducing deposits. Contributing factors to deposit formation may include decreased blink rate and incomplete blink.

Despite the benefits listed above, hybrid lenses are not typically used unless bandage lens wear with a soft contact lens is not achievable. **Disadvantages** to using a hybrid lens as standard of care include:

- Cost:** in cases where a soft BCL fit is possible and adequately retained , a hybrid lens would offer little added benefit and is typically more costly.
- Fixed diameter:** hybrid lenses are limited in lens diameter. This may prevent adjustments to improve centration or to avoid conjunctival abnormalities such as blebs or tube shunts.

Other considerations:

- The vast majority of Boston KPro patients are followed closely for glaucoma.** To improve testing quality and accuracy, it is beneficial to clean lenses just prior to any glaucoma appointments.
- Hybrid lenses are typically fit flat** over the Boston KPro for suction effect and to avoid the large plus tear lens that results from a steep fitting lens.

## Clinical Pearls

- Consider a wide variety of lens options if a patient exhibits problems with deposits or retention in a Kontur BCL (standard of care).
- Consider conjunctival anatomy/abnormalities of a patient when determining candidacy for a hybrid lens fit, particularly in relation to glaucoma.
- Use the slit lamp to evaluate the profile of an eye with a Boston KPro prior to choosing a contact lens, as corneal topography is not usually reliable.
- Don't forget to over-refract these patients! Unexpected refractive error can result after surgery and should be corrected in the BCL when possible.

## References

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