

**Subject:** Keratoprosthesis  
**Guideline #:** CG-SURG-94  
**Status:** Reviewed

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## Description

This document addresses the permanent keratoprosthesis. This ocular device functions as an implanted artificial cornea intended to restore useful vision to individuals with severe corneal disease not amenable to conventional corneal transplantation.

**Note:** For information concerning other ophthalmic topics, see:

- SURG.00061 Presbyopia and Astigmatism-Correcting Intraocular Lenses
- CG-SURG-72 Endothelial Keratoplasty
- CG-SURG-77 Refractive Surgery

## Clinical Indications

### Medically Necessary:

Keratoprosthesis using the Dohlman Doane Boston KPro (“Boston KPro”) device is considered **medically necessary** for the treatment of corneal blindness when the following two (2) criteria are met:

- The cornea is severely opaque and vascularized; **and**
- There is documentation of two (2) or more prior failed corneal transplant procedures.

### Not Medically Necessary:

Keratoprosthesis procedures using an artificial cornea device other than the Boston KPro are considered **not medically necessary**.

Keratoprosthesis procedures are considered **not medically necessary** for all other indications not listed above as medically necessary.

## Coding

*The following codes for treatments and procedures applicable to this guideline are included below for informational purposes. Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement policy. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.*

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**Keratoprosthesis**

**When services may be Medically Necessary when criteria are met:**

**CPT**

65770 Keratoprosthesis

**HCPCS**

C1818 Integrated keratoprosthesis

L8609 Artificial cornea

**ICD-10 Procedure**

08R83JZ Replacement of right cornea with synthetic substitute, percutaneous approach

08R8XJZ Replacement of right cornea with synthetic substitute, external approach

08R93JZ Replacement of left cornea with synthetic substitute, percutaneous approach

08R9XJZ Replacement of left cornea with synthetic substitute, external approach

08U80JZ Supplement right cornea with synthetic substitute, open approach

08U83JZ Supplement right cornea with synthetic substitute, percutaneous approach

08U8XJZ Supplement right cornea with synthetic substitute, external approach

08U90JZ Supplement left cornea with synthetic substitute, open approach

08U93JZ Supplement left cornea with synthetic substitute, percutaneous approach

08U9XJZ Supplement left cornea with synthetic substitute, external approach

**ICD-10 Diagnosis**

H16.441-H16.449 Deep vascularization of cornea

H17.10-H17.13 Central corneal opacity

H54.0X33-H54.8 Blindness and low vision

T86.8401-T86.8499 Complications of corneal transplant

**When services are Not Medically Necessary:**

For the procedure and diagnosis codes listed above when criteria are not met or for all other diagnoses not listed; or when the code describes a procedure or situation designated in the Clinical Indications section as not medically necessary.

**Discussion/General Information**

A keratoprosthetic device is intended to provide a transparent optical pathway through an opacified cornea, either intraoperatively or permanently, in an eye which is not a reasonable candidate for a corneal transplant. A temporary keratoprosthesis is used intraoperatively to aid in visualization of ocular structures. The temporary device is removed following surgery. A permanent keratoprosthesis has been proposed for individuals when attempts at corneal transplant have failed.

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## Keratoprosthesis

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Keratoprosthetic devices differ in design but basically consist of a special tube that acts as a periscope that is anchored to the front surface of the cornea. Implantation techniques differ, and success rates are variable and highly dependent on the skill of the surgeon.

While several keratoprosthetic devices and techniques are under investigation, only two devices have current clearance from the U.S. Food and Drug Administration (FDA). They are the Dohlman-Doane Boston KPro (Massachusetts Eye & Ear Infirmary, Boston, MA) and the AlphaCor™ (CooperVision Surgical Inc., Lake Forest, CA). The Boston KPro utilizes a rigid plastic optic positioned between a front and back plate in the shape of a “collar button.” The AlphaCor prosthesis consists of a poly (2-hydroxyethyl methacrylate) device with a central transparent optic fused to an outer sponge skirt which is inserted in a two-stage surgical procedure. As of mid-2022 the AlphaCor device is no longer available on the market in the U.S.

### *Boston KPro device*

The Boston KPro device was originally cleared by the FDA in 1992 as a Class II device. Both the Boston KPro and AlphaCor devices are indicated as permanent implantable keratoprostheses for eyes that are not corneal transplant candidates and are made of materials that have been proven to be biocompatible. However, only the Boston KPro device is considered medically necessary in this document when criteria are met. Additional information appears below for the AlphaCor device.

In the first multicenter, mixed retrospective/prospective case series study of the Boston KPro, Zerbe reported on 136 eyes that received the device between 2003 and 2005. Each eye had an average of two prior failed corneal transplants. The main outcome measure was visual acuity (VA) and keratoprosthesis survival. The number of subjects with best corrected visual acuity (BCVA) of 20/200 or better went from 3.6% preoperatively to 57% postoperatively. Postoperative BCVA of 20/40 or better was achieved in 19% of the recipients. In the subgroup of 62 postoperative eyes that were followed for at least 1 year, 56.4% retained their BCVA of 20/200 or better and 22.6% retained a BCVA of 20/40 or better. In this subgroup at last follow-up, 11 eyes had improved VA (17.7%) and 8 eyes had decreased VA (12.9%). Decreased vision was most often due to end-stage glaucoma, followed by retinal detachment and age-related macular degeneration. Retroprosthetic membrane formation was the most common postoperative complication occurring in 25% of eyes with 18% of these subjects requiring further treatment (4 required surgical membranectomy; 9 cases required no further treatment). Vitritis was reported in 7 eyes with no incidence of bacterial endophthalmitis or other bacterial complication. The authors concluded that the Boston KPro is a viable option based on early follow-up (Zerbe, 2006).

The largest study published to date involved 300 subjects who received a Boston KPro device (Rudnisky, 2016). In this retrospective case series study, it was reported that visual acuity at an average of 17.1 months improved significantly ( $p < 0.0001$ ) to a mean final value of  $0.89 \pm 0.64$  (20/150). There were also significantly fewer eyes with light perception (6.7%;  $n=19$ ;  $p < 0.0001$ ), although 3.1% ( $n=9$ ) progressed to no light perception. The authors reported no association between age ( $p=0.08$ ), sex ( $p=0.959$ ), operative side ( $p=0.167$ ), or failure ( $p=0.494$ ) and final visual acuity. The median time to achieve 20/200 visual acuity was 1 month and it was retained for an average of 47.8 months. In a multivariate analysis, controlling for preoperative visual acuity, it was demonstrated that two

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factors were associated with final visual outcome: chemical injury was associated with better final vision ( $p=0.007$ ) and age-related macular degeneration was associated with poorer vision ( $p<0.0001$ ).

In 2016, Noel and colleagues reported the results of a retrospective case series study of 43 subjects (44 eyes) who received a Boston KPro device. The primary indication for a Boston KPro was failed corneal transplantation in 70% of subjects with the remaining 30% being a primary procedure. The mean follow-up time was  $21 \pm 12$  months (range 12-57 months) with 95% of subjects completing the last follow-up visit. The authors reported a best-achieved median visual acuity of 20/100 (range 20/20 to no light perception [NLP]), with 37% of subjects achieving a visual acuity of  $> 20/40$  at some point during their postoperative course. At the last follow-up, median visual acuity was 20/400 (range 20/30 to NLP). The two most commonly reported complications included retroprosthetic membrane formation (23 eyes, 52%) and elevated intraocular pressure (10 eyes, 23%). There were 5 cases (11%) of stromal melt and 1 case (2%) of infective keratitis. The authors concluded that their study demonstrates that the Boston KPro improves visual acuity in a majority of cases, and is a viable option in situations in which there is a poor prognosis for traditional penetrating keratoplasty.

A retrospective case series of 25 subjects who received a Boston KPro device reported follow-up times ranging from 2 to 12 months with 20 of the 25 subjects retaining a VA of 20/400 or better, and 12 subjects achieved better than 20/40 vision. There were no dislocations or extrusions, and no reoperations were required within the 2-12 month follow-up (Aquavella, 2005). Additional studies with up to 35 months of outcomes data have reported similar results for anatomic retention of the device and improvements in VA (Chew, 2009; Harissa-Dagher, 2008). In 2009, Bradley reported a case series of 30 eyes (28 individuals) who had received a Boston KPro keratoprosthesis. Average follow-up was 19 months (range, 1-48 months), and retention of the device was 83% with 5 failures (4 corneal melt; 1 infectious keratitis). The number of trial participants with BCVA of 20/200 or better increased from 14% preoperatively to 77% postoperatively, and 23% of individuals had a BCVA of 20/40 or better. Keratoprosthesis replacement was required at least once in 5 eyes (17%).

In 2011, results were published for a retrospective chart review of 35 subjects (40 eyes) who underwent Boston type 1 keratoprosthesis surgery at the University of California, Davis between 2004 and 2010. The purpose of this cohort study was to evaluate retention of VA and development of complications after Boston type 1 keratoprosthesis implantation over a longer follow-up period than previously reported. Preoperative VA ranged from 20/150 to light perception and was  $\leq 20/400$  in 38 eyes (95%). Preoperative diagnoses included failed corneal transplants (19 eyes, 47.5%), chemical injury (10 eyes, 25%), and aniridia (5 eyes, 12.5%). The mean follow-up duration was 33.6 months (range, 5-72 months). Of 36 eyes followed for 1 year and beyond, 32 eyes (89%) achieved postoperative BCVA  $\geq 20/200$ . Of eyes that achieved BCVA  $\geq 20/200$ , at last follow-up, 19 of 32 eyes (59%) followed for greater than or equal to 1 year retained BCVA  $\geq 20/200$ ; 16 of 27 eyes (59%) followed for greater than or equal to 2 years retained BCVA  $\geq 20/200$ ; 7 of 14 eyes (50%) followed for greater than or equal to 3 years retained BCVA  $\geq 20/200$ ; and 2 of 7 eyes (29%) followed for greater than or equal to 4 years retained BCVA  $\geq 20/200$ . End-stage glaucoma most commonly caused vision loss (7 of 13 eyes, 54%) when BCVA  $\geq 20/200$  was not retained (follow-up  $\geq 1$  year). Glaucoma was newly diagnosed in 11 eyes (27.5%); progression was noted in 9 eyes (22.5%). Glaucoma drainage device erosion occurred in 9 eyes (22.5%). Retroprosthetic membrane formed in 22 eyes (55%), 5 eyes (12.5%) developed endophthalmitis, 6 eyes (15%) developed corneal melt, 7 eyes (17.5%) underwent keratoprosthesis replacement, and 23 eyes (57.5%) required major surgery to treat postoperative

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complications. The initial keratoprosthesis was retained in 32 eyes (80%). The authors concluded that keratoprosthesis implantation remains a viable option for salvaging vision. It was noted that a significant number of participants lost vision over the postoperative course, glaucoma and complications related to glaucoma surgery being significant challenges to maintaining good vision after keratoprosthesis surgery. It was acknowledged that this study highlighted the need for long-term follow-up and a team approach to management, and points to a more guarded long-term visual prognosis after surgery (Greiner, 2011).

### *Specialty Society Documents*

Although there is no official position statement currently available from the American Academy of Ophthalmology (AAO) that addresses keratoprosthesis procedures, the following comment is noted in the AAO updated 2018 Preferred Practice Pattern® Guidelines on Conjunctivitis: “In advanced disease with corneal blindness, keratoprosthesis surgery may improve vision, however, all ocular reconstructive surgery is considered high risk” (Varu, 2019).

Additionally, the AAO released a report addressing the outcomes and complications of the Boston Keratoprosthesis (Lee, 2015). This review included 22 studies determined to be relevant for the assessment objectives. Nine studies were rated as level II evidence and 13 were rated as level III evidence. Excluded studies included Level III evidence, case reports, review articles, letters, editorials, and case series with fewer than 25 eyes. Their review indicated that in 9 articles, a best-corrected Snellen visual acuity (BCSVA) of 20/200 or better occurred in 45% to 89% of eyes. Five articles described a BCSVA of 20/50 or better in 43% to 69% of eyes, and 4 articles found a BCSVA of 20/40 or better in 11% to 39% of eyes. Retention rates of the Boston KPro ranged from 65% to 100%. Reasons for loss of vision after Boston KPro implantation most commonly included corneal melts from exposure keratopathy, endophthalmitis, and infectious keratitis or corneal ulceration. The two most common complications after surgery were retroprosthetic membrane formation and elevated intraocular pressure. The two most common posterior segment complications were endophthalmitis and vitritis. Their conclusions were that the Boston KPro device improves vision in cases of severe corneal opacification that are not amenable to corneal transplantation using human cadaveric keratoplasty techniques. However, a number of severe anterior and posterior segment complications can develop, making ongoing close observation paramount for individuals undergoing this surgery.

### *Conclusion*

Studies have shown that keratoprosthesis procedures are associated with a significant failure rate (Aravena, 2018). For this reason, they are intended for select individuals who have lost vision and for whom corneal transplants have not been successful. The keratoprosthesis is considered to be a salvage procedure where no acceptable alternatives exist. For this reason, comparative studies are lacking. Two recently published studies included cases in which keratoprosthesis was the primary procedure used to treat a variety of indications (e.g., corneal scarring, chemical/thermal injury and Stevens-Johnson syndrome). Driver and colleagues (2018) reported results of 67 implanted KPros and Kang and colleagues (2018) reported results of 28 eyes implanted with KPros. Although the authors conclude that the study’s results were promising (no differences observed in KPro retention when compared to matched-controls who had previously failed keratoplasty), both trials were small, retrospective, have significant loss to follow-up, and lack long-term data.

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**References****Peer Reviewed Publications:**

1. Ahmad S, Matthews PM, Lindsley K, et al. Boston type 1 keratoprosthesis versus repeat donor keratoplasty for corneal graft failure. A systematic review and meta-analysis. *Ophthalmol.* 2016; 123(1):165-177.
2. Akpek EK, Harissi-Dagher M, Petrarca R, et al. Outcomes of Boston keratoprosthesis in aniridia: a retrospective multicenter study. *Am J Ophthalmol.* 2007; 144(2):227-231.
3. Aldave AJ, Kamal KM, Vo RC, Yu F. The Boston type I keratoprosthesis: improving outcomes and expanding indications. *Ophthalmology.* 2009; 116(4):640-651.
4. Aldave AJ, Sangwan VS, Basu S, et al. International results with the Boston type I keratoprosthesis. *Ophthalmology.* 2012; 119(8):1530-1538.
5. Alio JL, Mulet ME, Haroun H, et al. Five year follow up of biocolonisable microporous fluorocarbon haptic (BIOKOP) keratoprosthesis implantation in patients with high risk of corneal graft failure. *Br J Ophthalmology.* 2004; 88(12):1585-1589.
6. Aquavella JV, Gearinger MD, Akpek EK, McCormick GJ. Pediatric keratoprosthesis. *Ophthalmology.* 2007; 114(5):989-994.
7. Aquavella JV, Qian Y, McCormick GJ, et al. Keratoprosthesis: the Dohlman-Doane device. *Am J Ophthalmol.* 2005; 140(6):1032-1038.
8. Aravena C, Yu F, Aldave AJ. Long-term visual outcomes, complications, and retention of the boston type I keratoprosthesis. *Cornea.* 2018; 37(1):3-10.
9. Bradley JC, Hernandez EG, Schwab IR, Mannis MJ. Boston type 1 keratoprosthesis: the University of California Davis experience. *Cornea.* 2009; 28(3):321-327.
10. Chan CC, LoVerde L, Qiang J, et al. Incidence, risk factors, and surgical management of Boston Type 1 Keratoprosthesis corneal melts, leaks, and extrusions. *Cornea.* 2016; 35(8):1049-1056.
11. Chew HF, Ayres BD, Hammersmith KM, et al. Boston keratoprosthesis outcomes and complications. *Cornea.* 2009; 28(9):989-996.
12. Ciolino JB, Belin MW, Todani A, et al.; Boston Keratoprosthesis Type 1 Study Group. Retention of the Boston keratoprosthesis type 1: multicenter study results. *Ophthalmology.* 2013; 120(6):1195-1200.
13. Colby KA, Koo EB. Expanding indications for the Boston keratoprosthesis. *Curr Opin Ophthalmol.* 2011; 22(4):267-273.
14. Cortina MS, Hallak JA. Vision-related quality-of-life assessment using NEI VFQ-25 in patients after Boston Keratoprosthesis implantation. *Cornea.* 2015; 34(2):160-164.
15. Crawford GJ, Hicks CR, Lou X, et al. The Chirila Keratoprosthesis: phase I human clinical trial. *Ophthalmology.* 2002; 109(5):883-889.
16. De La Paz MF, De Toledo JA, Charoenrook V, et al. Impact of clinical factors on the long-term functional and anatomic outcomes of osteo-odonto-keratoprosthesis and tibial bone keratoprosthesis. *Am J Ophthalmol.* 2011; 151(5):829-839.
17. Driver TH, Aravena C, Duong HNV, et al. Outcomes of the Boston Type I keratoprosthesis as the primary penetrating corneal procedure. *Cornea.* 2018; 37(11):1400-1407.

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18. Dunlap K, Chak G, Aquavella JV, et al. Short-term visual outcomes of Boston type 1 keratoprosthesis implantation. *Ophthalmology*. 2010; 117(4):687-692.
19. Falcinelli G, Falsini B, Taloni M, et al. Modified osteo-odonto-keratoprosthesis for treatment of corneal blindness: long-term anatomical and functional outcomes in 181 cases. *Arch Ophthalmol*. 2005; 123(10):1319-1329.
20. Greiner MA, Li JY, Mannis MJ. Longer-term vision outcomes and complications with the Boston type 1 keratoprosthesis at the University of California, Davis. *Ophthalmology*. 2011; 118(8):1543-1550.
21. Harissi-Dagher M, Dohlman CH. The Boston Keratoprosthesis in severe ocular trauma. *Can J Ophthalmol*. 2008; 43(2):165-169.
22. Haugsdal JM, Goins KM, Greiner MA, et al. Boston type 1 keratoprosthesis for primary congenital glaucoma. *Br J Ophthalmol*. 2016; 100(3):328-331.
23. Hicks CR, Crawford GJ, Dart JK, et al. AlphaCor: clinical outcomes. *Cornea*. 2006; 25(9):1034-1042.
24. Hicks CR, Crawford GJ, Lou X, et al. Corneal replacement using a synthetic hydrogel cornea, AlphaCor: device, preliminary outcomes and complications. *Eye (Lond)*. 2003; 17(3):385-392.
25. Holak SA, Holak HM, Bleckmann H. AlphaCor keratoprosthesis: postoperative development of six patients. *Graefes Arch Clin Exp Ophthalmol*. 2009; 247(4):535-539.
26. Hou JH, de la Cruz J, Djalilian AR. Outcomes of Boston keratoprosthesis implantation for failed keratoplasty after keratolimbic allograft. *Cornea*. 2012; 31(12):1432-1435.
27. Huang Y, Dong Y, Wang L, et al. Long-term outcomes of MICO keratoprosthesis in the end stage of autoimmune dry eyes: an experience in China. *Br J Ophthalmol*. 2012; 96(1):28-33.
28. Huang Y, Yu J, Liu L, et al. Moscow eye microsurgery complex in Russia keratoprosthesis in Beijing. *Ophthalmology*. 2011; 118(1):41-46.
29. Kang JJ, de la Cruz J, Cortina MS. Visual outcomes of Boston keratoprosthesis implantation as the primary penetrating corneal procedure. *Cornea*. 2012; 31(12):1436-1440.
30. Kang KB, Karas FI, Rai R, et al. Five year outcomes of Boston type I keratoprosthesis as primary versus secondary penetrating corneal procedure in a matched case control study. *PLoS One*. 2018; 13(2):e0192381.
31. Kim MK, Lee JL, Wee WR, et al. Seoul-type keratoprosthesis: preliminary results of the first 7 human cases. *Arch Ophthalmol*. 2002; 120(6):761-766.
32. Li JY, Greiner MA, Brandt JD, et al. Long-term complications associated with glaucoma drainage devices and Boston keratoprosthesis. *Am J Ophthalmol*. 2011; 152(2):209-218.
33. Liu C, Okera S, Tandon R, et al. Visual rehabilitation in end-stage inflammatory ocular surface disease with the osteo-odonto-keratoprosthesis: results from the UK. *Br J Ophthalmol*, 2008; 92(9):1211-1217.
34. Noel CW, Isenberg J, Goldich Y, et al. Type 1 Boston keratoprosthesis: outcomes at two Canadian centres. *Can J Ophthalmol*. 2016; 51(2):76-82.
35. Nouri M, Terada H, Alfonso EC, et al. Endophthalmitis after keratoprosthesis: incidence, bacterial causes, and risk factors. *Arch Ophthalmol*. 2001; 119(4):484-489.
36. Odorcic S, Haas W, Gilmore MS, et al. Fungal infections after Boston Type 1 Keratoprosthesis implantation: literature review and in vitro antifungal activity of hypochlorous acid. *Cornea*. 2015; 34(12):1599-1605.
37. Priddy J, Bardan AS, Tawfik HS, Liu C. Systematic review and meta-analysis of the medium- and long-term outcomes of the Boston Type 1 keratoprosthesis. *Cornea*. 2019; 38(11):1465-1473.
38. Pujari S, Siddique SS, Dohlman CH, Chodosh J. The Boston keratoprosthesis type II: the Massachusetts Eye and Ear Infirmary experience. *Cornea*. 2011; 30(12):1298-1303.

---

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39. Ray S, Khan BF, Dohlman CH, D'Amico DJ. Management of vitreoretinal complications in eyes with permanent keratoprosthesis. *Arch Ophthalmol*. 2002; 120(5):559-566.
40. Rudnisky CJ, Belin MW, Guo R, et al. Visual acuity outcomes of the Boston keratoprosthesis type 1: multicenter study results. *Am J Ophthalmol*. 2016; 162:89-98.
41. Rudnisky CJ, Belin MW, Todani A, et al. Risk factors for the development of retroprosthetic membranes with Boston keratoprosthesis type 1: multicenter study results. *Ophthalmology*. 2012; 119(5):951-955.
42. Sayegh RR, Ang LP, Foster CS, Dohlman CH. The Boston keratoprosthesis in Stevens-Johnson syndrome. *Am J Ophthalmol*. 2008; 145(3):438-444.
43. Shanbhag SS, Saeed HN, Colby KA, Chodosh J. Comparative outcomes of boston keratoprosthesis Type 1 Implantation Based on Vision in the Contralateral Eye. *Cornea*. 2018a; 37(11):1408-1413.
44. Shanbhag SS, Saeed HN, Paschalis EI, Chodosh J. Boston keratoprosthesis type 1 for limbal stem cell deficiency after severe chemical corneal injury: A systematic review. *Ocul Surf*. 2018b; 16(3):272-281.
45. Srikumaran D, Munoz B, Aldave AJ, et al. Long-term outcomes of Boston type 1 keratoprosthesis implantation: a retrospective multicenter cohort. *Ophthalmol*. 2014; 121(11):2159-2164.
46. Tan DT, Tay AB, Theng JT, et al. Keratoprosthesis surgery for end-stage corneal blindness in Asian eyes. *Ophthalmology*. 2008; 115(3):503-510.
47. Xiao X, Xie L. The influencing factors and characteristics of corneal graft endothelial decompensation after penetrating keratoplasty. *Eur J Ophthalmol*. 2010; 20(1):21-28.
48. Yaghouti F, Nouri M, Abad JC, et al. Keratoprosthesis: preoperative prognostic categories. *Cornea*. 2001; 20(1):19-23.
49. Zerbe BL, Belin MW, Ciolino JB; Boston Type 1 Keratoprosthesis Study Group. Results from the multicenter Boston Type 1 Keratoprosthesis Study. *Ophthalmology*. 2006; 113(10):1779-1785.

**Government Agency, Medical Society, and Other Authoritative Publications:**

1. Chen M, Ng SM, Akpek EK, Ahmad S. Artificial corneas versus donor corneas for repeat corneal transplants. *Cochrane Database Syst Rev*. 2020; 5(5):CD009561.
2. Farid M, Rhee MK, Akpek EK, et al. Corneal Edema and Opacification Preferred Practice Pattern®. *Ophthalmology*. 2019; 126(1):216-285.
3. Lee WB, Shtein RM, Kaufman SC, et al. Boston Keratoprosthesis: outcomes and complications. a report by the American Academy of Ophthalmology. *Ophthalmol*. 2015; 122(7):1504-1511.
4. U.S. Food and Drug Administration (FDA). Center for Devices and Radiological Health. Summary of safety and effectiveness for AlphaCor™ 510(k) Summary. K013756. Argus Biomedical Pty Ltd. (Cincinnati, OH). August 29, 2002. Available at: [http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn\\_template.cfm?id=k013756](http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn_template.cfm?id=k013756). Accessed on November 7, 2022.
5. U.S. Food and Drug Administration (FDA). Center for Devices and Radiological Health. 510(k) Summary of safety and effectiveness for Dohlman Doane Keratoprosthesis (Mackeen Consultants, Ltd., Bethesda, MD). Original FDA clearance. January 21, 1992. Available at: <http://www.accessdata.fda.gov/scripts/cdrh/devicesatfda/index.cfm?db=pmn&id=K915062>. Accessed on November 7, 2022.
6. Varu DM, Rhee MK, Akpek EK et al. Conjunctivitis Preferred Practice Pattern®. *Ophthalmology*. 2019; 126(1): 94-169.

Federal and State law, as well as contract language including definitions and specific coverage provisions/exclusions, and Medical Policy take precedence over Clinical UM Guidelines and must be considered first in determining eligibility for coverage. The member's contract benefits in effect on the date that services are rendered must be used. Clinical UM Guidelines, which address medical efficacy, should be considered before utilizing medical opinion in adjudication. Medical technology is constantly evolving, and we reserve the right to review and update Clinical UM Guidelines periodically. Clinical UM guidelines are used when the plan performs utilization review for the subject. Due to variances in utilization patterns, each plan may choose whether or not to adopt a particular Clinical UM Guideline. To determine if review is required for this Clinical UM Guideline, please contact the customer service number on the back of the member's card.

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**Websites for Additional Information**

1. National Eye Institute. Facts about the Cornea and Corneal Disease. Available at: <http://www.nei.nih.gov/health/cornealdisease/>. Accessed on November 7, 2022.

**Index**

Boston KPro  
 Dohlman Doane  
 KeraKlear  
 KPRO, Boston  
 Keratoprosthesis

**The use of specific product names is illustrative only. It is not intended to be a recommendation of one product over another, and is not intended to represent a complete listing of all products available.**

**History**

Status	Date	Action
Reviewed	11/10/2022	Medical Policy & Technology Assessment Committee (MPTAC) review. Updated Coding section to correct ICD-10-CM diagnosis codes to T86.8401-T86.8499.
Reviewed	11/11/2021	MPTAC review. Updated References and Websites sections.
Revised	11/05/2020	MPTAC review. Clarified the MN statement. Updated References and Websites sections. Reformatted Coding section.
Reviewed	11/07/2019	MPTAC review. Updated Background/Overview, References and Websites sections.
New	01/24/2018	MPTAC review. Initial document development. Moved content of SURG.00115 Keratoprosthesis to new clinical utilization management guideline document with the same title.

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