MEDICAL POLICY – 9.03.01
Keratoprosthesis

BCBSA Ref. Policy: 9.03.01

Effective Date: June 1, 2017
Last Revised: May 2, 2017
Replaces: N/A

RELATED MEDICAL POLICIES:
9.03.15 Retinal Prosthesis

Select a hyperlink below to be directed to that section.

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EVIDENCE REVIEW | REFERENCES | HISTORY

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Introduction

The cornea is the clear, dome-shaped tissue that covers the front of the eyeball. The cornea bends light rays to help focus vision. When the cornea becomes cloudy it’s called corneal opacity. This cloudiness can be from any number of eye problems such as inflammation, infection, ulcers on the eye, and many other conditions. When the cloudiness severely limits vision or leads to blindness, a corneal transplant may be done. Most corneal transplants use tissue from donors. If this surgery fails or a person isn’t a candidate for a corneal transplant using donor tissue, surgery using an artificial cornea may be an option. This policy describes when a surgery using an artificial cornea may be considered medically necessary.

Note: The Introduction section is for your general knowledge and is not to be taken as policy coverage criteria. The rest of the policy uses specific words and concepts familiar to medical professionals. It is intended for providers. A provider can be a person, such as a doctor, nurse, psychologist, or dentist. A provider also can be a place where medical care is given, like a hospital, clinic, or lab. This policy informs them about when a service may be covered.

Policy Coverage Criteria

Implantation of a keratoprosthesis is considered a high-risk procedure associated with numerous complications and probable need for additional surgery. Therefore, the likelihood of
regaining vision and the patient’s visual acuity in the opposite eye should be taken into account when considering the appropriateness of this procedure. Treatment should be restricted to centers experienced in treating this condition and staffed by surgeons adequately trained in techniques addressing implantation of this device.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Medical Necessity</th>
</tr>
</thead>
</table>
| The Boston (Dohlman-Doane) Keratoprosthesis (Boston KPro) | The Boston KPro may be considered medically necessary for the surgical treatment of severe corneal opacification under the following conditions:  
• The cornea is severely opaque and vascularized  
AND  
• Best-corrected vision is worse than 20/400 in the affected eye and worse than 20/40 in the opposite eye  
AND  
• No end-stage glaucoma or retinal detachment is present  
AND  
• The patient has at least one of the following indications:  
  o History of 1 or more corneal transplant graft failures  
  o Stevens-Johnson syndrome  
  o Ocular cicatricial pemphigoid  
  o Autoimmune conditions with rare ocular involvement  
  o Ocular chemical burns  
  o An ocular condition unlikely to respond favorably to primary corneal transplant surgery (eg, libel stem cell compromise or postherpetic anesthesia) |

Note: Patients should be able and expected to comply with postoperative care.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Investigational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent keratoprosthesis for all conditions not listed above</td>
<td>A permanent keratoprosthesis for all other conditions not listed in the Medical Necessity section above is considered investigational.</td>
</tr>
<tr>
<td>All other types of permanent keratoprosthesis</td>
<td>All other types of permanent keratoprosthesis not listed in the Medical Necessity section above are considered investigational.</td>
</tr>
</tbody>
</table>
### Background

The cornea is a clear, dome-shaped membrane that covers the front of the eye and helps to bend light rays to give sharp vision. Diseases of the cornea can interfere with providing clear vision. Sometimes a corneal transplant, called a keratoplasty, is needed to treat corneal diseases. In certain conditions, such as Stevens-Johnson syndrome, cicatricial pemphigoid, chemical injury, or prior failed corneal transplant the survival of a transplanted cornea is poor. An artificial cornea, called akeratoprosthesis, has been developed to restore vision in patients for whom a corneal transplant is not an option.

There are different types of keratoprosthetic devices. The Dohlman-Doane Keratoprosthesis, most commonly referred to as the Boston Keratoprosthesis (Boston KPro), is manufactured under the auspices of the Harvard Medical School-affiliated Massachusetts Eye and Ear Infirmary. The AlphaCor, previously known as the Chirila keratoprosthesis (Chirila KPro), is another type of keratopsrosthesis.
Summary of Evidence

The evidence for Boston KPro in individuals who have corneal blindness and failed (or are not candidates for) corneal transplantation includes several case series and systematic reviews. Relevant outcomes are observing a change in disease status, morbid events, quality of life, and treatment-related morbidity. Numerous case series have been published. Together, studies have assessed thousands of eyes. A 2015 systematic review of KPro efficacy included 22 series with a total of 2176 eyes. Systematic reviews and case series with longer follow-up (ie, at least 2 years) have shown improvement in visual outcomes in a substantial percentage of patients with Boston KPro. However, this procedure is high risk and is associated with numerous complications (eg, growth of retro prosthetic membranes) and a probable need for additional surgery. Thus careful patient selection is important. The evidence is sufficient to determine that the technology results in a significant improvement in health outcomes.

The evidence for the AlphaCor device in individuals who have corneal blindness and failed (or are not candidates for) corneal transplantation includes several case series and systematic reviews. Relevant outcomes are observing a change in disease status, morbid events, quality of life, and treatment-related morbidity. Only a few published case series have evaluated the AlphaCor device. There are insufficient data on improvement in vision outcomes using the AlphaCor device. Moreover, the device has been associated with complications, including thinning or melting of the anterior corneal surface and corneal necrosis. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have corneal blindness and have failed (or are not candidates for) corneal transplantation who receive an osteo-odonto-keratoprosthesis (OOKP), the evidence includes case series and a systematic review. Relevant outcomes are observing a change in disease status, morbid events, quality of life, and treatment-related morbidity. A 2012 systematic review of case series, all conducted outside of the United States, found high anatomic survival rates at 5 and 20 years, but vision outcomes were not well-described. OOKP is a complex surgical procedure and has been associated with a number of complications, including extrusion of the keratoprosthesis, retinal detachment, and vitreoretinal complications. The evidence is insufficient to determine the effects of the technology on health outcomes.

Ongoing and Unpublished Clinical Trials

Some currently unpublished trials that might influence this review are listed in Table 1.
Table 1. Summary of Key Trials

<table>
<thead>
<tr>
<th>NCT No.</th>
<th>Trial Name</th>
<th>Planned Enrollment</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongoing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCT02084745</td>
<td>Timing of Glaucoma Drainage Device With Boston KPro Surgery (GDD-KPro)</td>
<td>60</td>
<td>Mar 2017</td>
</tr>
</tbody>
</table>

NCT: national clinical trial.

Clinical Input Received From Physician Specialty Societies and Academic Medical Centers

While the various physician specialty societies and academic medical centers may collaborate with and make recommendations during the review process, input received does not represent an endorsement or position statement by the physician specialty societies or academic medical centers, unless otherwise noted.

In response to requests, input was received from one specialty society and four academic medical centers while this policy was under review in 2009. Reviewers generally supported a limited role for the Boston KPro in selected patients. Some reviewers recommended use without first attempting a transplant in specific conditions that have a poor prognosis for corneal transplant; however, other input indicated that this is controversial. Some reviewers recommended use only in patients who have limited visual acuity in the contralateral eye. Overall, input indicated that the Boston KPro is reserved for cases in which no other alternative (ie, corneal transplantation) is available for treatment of corneal opacification.

Practice Guidelines and Position Statements

A 2013 Preferred Practice Parameter on ocular edema and opacification by the American Academy of Ophthalmology did not provide specific recommendations on the keratoprosthesis, but included this discussion of the technology²⁰:

> ...Significant improvements in the design and postoperative management of the Boston type 1 keratoprosthesis has resulted in a steady rise in the number of these procedures performed both in the United States and abroad. Reduced
incidence of postoperative stromal necrosis and bacterial endophthalmitis due to the chronic use of protective soft contact lenses and topical antibiotics has resulted in improved retention and visual outcomes and has had a positive impact on surgeons’ perceptions of when to recommend keratoprosthesis. Once considered a procedure of last resort in patients with severe bilateral visual impairment, it is now being used for a variety of unilateral and bilateral indications, such as ocular trauma, herpetic keratitis, aniridia, Stevens-Johnson syndrome, and congenital corneal opacification. More recently, as corneal surgeons have gained a greater appreciation of the failure rate of repeat corneal transplantation, a role for a keratoprosthetic in cases of multiple graft failure has become clearer.

Patients with severe dry eye and autoimmune ocular surface diseases (particularly Stevens-Johnson syndrome and OMMP [ocular mucous membrane pemphigoid]) remain a difficult management group despite the other successes of the Boston type 1 keratoprosthesis. Epithelial defects, scleral necrosis, extrusion, and endophthalmitis are the principal concerns. This group of patients has had some success with a Boston type 2 keratoprosthetic designed to be used through the lid and the osteo-odontot-keratoprosthesis.

**Medicare National Coverage**

There is no Medicare national coverage policy. Medicare has established an Ambulatory Payment Classification 0293 for level V anterior segment eye procedures that includes CPT code 65770 (keratoprosthesis) and a HCPCS code for the prosthesis (C1818 - integrated keratoprosthesis OR L8609 - artificial cornea).²¹

**Regulatory Status**

A keratoprosthesis is a Class II FDA device intended to provide a transparent optical pathway through an opacified cornea in an eye that is not a reasonable candidate for a corneal transplant. Two permanent keratoprostheses have received 510(k) marketing clearance by FDA, the Boston KPro (Dohlman-Doane Keratoprosthesis) and the AlphaCor (Chirila keratoprosthesis). Both 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. According to the 510(k) summary, the AlphaCor keratoprosthesis was shown to
be substantially equivalent to the Dohlman-Doane Type I Keratoprosthesis. FDA product code: HQM.

References


<table>
<thead>
<tr>
<th>Date</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/09/12</td>
<td>Update Coding Section – ICD-10 codes are now effective 10/01/2014.</td>
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<tr>
<td>04/16/13</td>
<td>Replace policy. Policy updated with literature review through January 14, 2013; references 1, 7, and 15 added; policy statement unchanged.</td>
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<td>06/04/13</td>
<td>Update Related Policies. Remove 9.03.14 as it was archived.</td>
</tr>
<tr>
<td>10/16/13</td>
<td>Update Related Policies. Add policy 9.03.25.</td>
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<td>05/05/14</td>
<td>Annual Review. Policy updated with literature review through January 14, 2014; references 8 and 19 added; policy statement unchanged. Remove all codes except CPT 65770; it is the only specific code to this policy.</td>
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<tr>
<td>04/24/15</td>
<td>Annual Review. Policy updated with literature review through January 13, 2015. References 10-11 added; additional conditions that are likely to have poor outcomes from a corneal transplant were added to the medically necessary policy statement.</td>
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<td>Update Related Policies. Remove 9.03.506 as it was archived.</td>
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<td>Annual Review, approved May 10, 2016. Policy updated with literature review through February 8, 2016; references 1, 3, 10-13, and 27 added. In medically necessary policy statement, “multiple graft failures changed” to “history of 1 or more” graft failures and “an ocular condition unlikely to respond favorably to primary corneal transplant surgery” was added. Indications for keratoprosthesis retained in policy statement.</td>
</tr>
</tbody>
</table>

**Disclaimer:** This medical policy is a guide in evaluating the medical necessity of a particular service or treatment. The Company adopts policies after careful review of published peer-reviewed scientific literature, national guidelines and local standards of practice. Since medical technology is constantly changing, the Company reserves the right to review and update policies as appropriate. Member contracts differ in their benefits. Always consult the member benefit booklet or contact a customer service representative to determine whether there are any benefit limitations applicable to this service or supply. This medical policy does not apply to Medicare Advantage.

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U.S. Department of Health and Human Services
200 Independence Avenue SW, Room 509F, HHH Building
Washington, D.C. 20201, 1-800-368-1019, 800-537-7697 (TDD)

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