Gas Permeable Scleral Contact Lens
Archived Medical Policy

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Policy # 00317
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Applies to all products administered or underwritten by Blue Cross and Blue Shield of Louisiana and its subsidiary, HMO Louisiana, Inc. (collectively referred to as the “Company”), unless otherwise provided in the applicable contract. Medical technology is constantly evolving, and we reserve the right to review and update Medical Policy periodically.

Note: Implantation of Intrastromal Corneal Ring Segments is addressed separately in medical policy 00164.

When Services Are Eligible for Coverage
Coverage for eligible medical treatments or procedures, drugs, devices or biological products may be provided only if:

- Benefits are available in the member’s contract/certificate, and
- Medical necessity criteria and guidelines are met.

Based on review of available data, the Company may consider rigid gas permeable scleral lens for patients who have not responded to topical medications or standard spectacle or contact lens fitting to be eligible for coverage for the following conditions:

- Corneal ectatic disorders (e.g., keratoconus, keratoglobus, pellucid marginal degeneration, Terrien’s marginal degeneration, Fuchs’ superficial marginal keratitis, post-surgical ectasia); or
- Corneal scarring and/or vascularization; or
- Irregular corneal astigmatism (e.g., after keratoplasty or other corneal surgery), if the underlying member contract/certificate covers correction of refractive errors of the eye; or
- Ocular surface disease (e.g., severe dry eye, persistent epithelial defects, neurotrophic keratopathy, exposure keratopathy, graft vs. host disease [GVHD], sequelae of Stevens Johnson syndrome, mucus membrane pemphigoid, post-ocular surface tumor excision, post-glaucoma filtering surgery) with pain and/or decreased visual acuity.

When Services Are Considered Investigational
Coverage is not available for investigational medical treatments or procedures, drugs, devices or biological products.

Based on review of available data, the Company considers rigid gas permeable scleral lens for any other indication not listed above to be investigational.*

Background/Overview
Scleral contact lenses create an elevated chamber over the cornea that can be filled with artificial tears. The base or haptic is fit over the less sensitive sclera. A scleral contact lens has been proposed to provide optical correction, mechanical protection, relief of symptoms, and facilitation of healing for a variety of corneal conditions. Specifically, the scleral contact lens may neutralize corneal surface irregularities and, by

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covering the corneal surface in a reservoir of oxygenated artificial tears, function as a liquid bandage for corneal surface disease. This may be called prosthetic replacement of the ocular surface ecosystem (PROSE).

The development of materials with high gas permeability and technologic innovations in design and manufacturing has stimulated the use of scleral lenses. The Boston Ocular Surface Prosthesis™‡ (Boston Foundation for Sight) is a scleral contact lens that is custom fit using computer-aided design and manufacturing (i.e., computerized lathe). Another design is the Jupiter mini-scleral gas permeable contact lens (Medlens Innovations and Essilor Contact Lenses). The Jupiter scleral lens is fitted using a diagnostic lens series. The Procornea (Eerbeek) scleral lens was developed in Europe. There are 4 variations of the Procornea: spherical, front-surface toric, back-surface toric, and bitoric. Lenses are cut with submicron lathing from a blank. The Rose K2 XL lens (Menicon, Japan) is a semi-scleral lens.

FDA or Other Governmental Regulatory Approval
U.S. Food and Drug Administration (FDA)
The Boston Ocular Surface Prosthesis, which is the prosthetic device used in PROSE, was approved by FDA in 1994. The first generation Rose K™‡ lens received FDA approval in 1995. FDA product code: HQD.

Centers for Medicare and Medicaid Services (CMS)
There is no national coverage determination (NCD).

Rationale/Source
Searches of the literature identified case series with gas permeable scleral contact lens. The largest series are described below.

Boston Ocular Surface Prosthesis
A retrospective analysis of 875 eyes (538 patients) fitted with a Boston scleral lens was reported in 2005 by Rosenthal (founder and president of the nonprofit Boston Foundation for Sight) and Croteau. Rigid gas-permeable corneal contact lenses either were not tolerated or were contraindicated in all eyes. Patients who failed a trial period were not fitted and were excluded from this study. Follow-up ranged from 2 months to 18 years. Of 501 eyes that were fitted primarily to improve vision, 262 had corneal ectasia and 130 eyes were fitted due to inadequate best corrected visual acuity (BCVA) after penetrating keratoplasty. The primary indication was to maintain the integrity of the corneal epithelium in 374 eyes with severe ocular surface disease including corneal stem cell disorders (Stevens-Johnson syndrome, corneal ectasia, chemical, ocular cicatrical pemphigoid, aniridia), neurotrophic corneas (congenital corneal anesthesia, acquired cranial nerve V paresis, after acoustic neuroma surgery, after trigeminal ganglionectomy, after herpes simplex keratitis, after herpes zoster keratitis), and severe dry eye syndrome (GVHD, Sjogren syndrome,
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corneal ectasia, rheumatoid arthritis, radiation), dermatological-associated disorders, exposure, and corneal neuropathic pain. Scleral lenses were found to improve vision, promote healing of persistent epithelial defect, and in patients with dry eye syndrome, reduce ocular pain and disabling photophobia. Attenuation of symptoms was insufficient to continue wearing the prosthesis in eyes with neuropathic pain and in eyes with corneal edema before fitting.

In 2010, Stason et al. reported use of the Boston Ocular Surface Prosthesis in a series of 101 patients with corneal disease who had not responded satisfactorily to conventional treatments and were seen at a tertiary care clinic. The fitting procedure was not completed or was deferred in 21 patients; 80 patients were fitted with a prosthesis in one or both eyes. Of those fitted with a prosthesis, the principal eye diagnosis was corneal ectasia or irregular astigmatism in 42 patients and ocular surface disease (e.g. dry eye syndrome, chronic GVHD) in 38 patients. Sixteen patients had undergone a previous corneal transplantation, and 3 had undergone laser in situ keratomileusis (LASIK). About half were experiencing photophobia and one third reported eye pain at baseline. At 6-month follow-up after fitting, BCVA improved by a change in mean logarithm of the angle of resolution (logMAR) of -0.39 with a change of -0.54 logMAR units in patients with ectasia or astigmatism and -0.22 logMAR in patients with ocular surface disease. For all 141 fitted eyes, 27% had no significant change in vision, 35% gained 1 line, 23% gained 2 lines, and 14% gained 3 lines or more. Mean composite visual functioning scores on the Visual Functioning Questionnaire (VFQ) increased from 57.0 to 77.8 for patients who received a prosthesis (measured in 69 of 80 patients) and were not significantly improved in patients (measured in 12 of 21 patients) who did not (from 65.1 to 69.3). There was significant improvement in all of the vision-related subscales on the VFQ, which included the categories of vision, activities, and ocular pain (from 49.9 at baseline to 72.8 with a prosthesis). Lower baseline VFQ scores were strong predictors of subsequent improvement in visual functioning. The authors concluded that controlled clinical studies will be needed to confirm the effectiveness of the Boston Ocular Surface Prosthesis and to compare it with corneal transplantation, tarsorrhaphy, or other techniques in patients with advanced ectasia or ocular surface disease.

Baran and colleagues from the Boston Foundation for Sight reported 6-month outcomes from PROSE treatment in a series of 59 patients with corneal ectasia. The primary diagnosis was keratoconus in 83% of patients (98 eyes). Fifteen patients (21 eyes) had previously undergone penetrating keratoplasty. Sixteen of the 118 eyes were considered non-candidates because conventional correction was adequate. No devices were dispensed in another 13 eyes due to little improvement in vision during the 6-hour trial period (n = 12) or low endothelial cell count (n = 1). There was significant improvement in visual acuity; of 102 candidate eyes, 95 (93.1%) achieved visual acuity of 20/40 or better. At mean 9-month follow-up, the sclera contact lens was being worn in 88% of the 89 eyes that had a satisfactory fit. For patients still wearing a device at follow-up, the National Eye Institute Visual Function Questionnaire (NEI VFQ-25) score improved by 27.6 points on a 100-point scale. Reasons for not wearing the device included discomfort (n = 4), lack of
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motivation to follow the insertion and removal regimen (n = 2), and limited improvement in visual acuity (n = 1).

Jacobs and Rosenthal published patient-reported outcomes from 33 consecutive patients with severe dry eye from chronic GVHD who were fitted with the Boston scleral lens. All patients had been previously treated with various conventional therapies including punctal occlusion, topical cyclosporine, topical and systemic steroids, and partial tarsorrhaphy. The questionnaire results were obtained between 1 week and greater than 2 years after the lenses were dispensed. All but 1 patient reported reduction in eye pain, with 27 patients (82%) reporting that pain was moderately to greatly reduced. Photophobia was resolved or greatly improved in 20 patients (62%). Ninety-one percent of patients reported moderate to great improvement in quality of life, with 20 of 24 patients (83%) reporting moderate to outstanding improvement in driving and 25 of 28 patients (89%) reporting moderate to outstanding improvement in reading. Two patients (6%) reported that they were not wearing their lenses on a regular basis. One had discontinued because of no improvement while the other discontinued wear because of improvement in symptoms over the prior 4 months.

Jupiter Scleral Lens
In 2000, Jupiter and Katz reported the management of irregular astigmatism in 48 eyes (29 patients) with rigid gas-permeable contact lenses. The corneal diagnosis included keratoconus, postkeratoplasty, pellucid marginal degeneration, interstitial keratitis, traumatic scarring, trachoma, rosacea keratitis, keratoglobus, Terrien’s degeneration, measles keratitis, postlamellar keratectomy, microbial keratitis, herpes simplex keratitis, postcataract surgery astigmatism, postepikeratophakia, post radial keratotomy, and Wegener’s granulomatosis. In this study, nearly one third of the patients with irregular astigmatism had BCVA of 20/25 or better with spectacles. Patients with 20/400 spectacle visual acuity achieved a 2-line average improvement, patients with 20/50 to 20/200 achieved a 4-line average improvement, and patients with 20/400 achieved a 6-line average improvement with the scleral lens.

Pecego and colleagues reported a series of 63 patients (107 eyes) who were fitted with the Jupiter scleral lens. The most common primary diagnoses included keratoconus (42% of eyes), postkeratoplasty astigmatism (30%), and pellucid marginal degeneration (7%). Patients gained a mean of 3.5 lines of vision compared to previous contact lens or glasses correction. A mean of 3.2 lenses per eye were needed to obtain the ideal scleral lens, with a mean number of return to clinic visits of 6.2 over a period of 3 to 17 months. After at least 3 months of wear, 78% of patients reported the lenses to be comfortable, with wear discontinued in 25 eyes (23%).

Schornack and Patel described use of the Jupiter scleral lens in a retrospective review of patients with keratoconus in 2010. Of 209 patients evaluated for possible scleral lens wear, 52 eyes of 32 patients (15%)
had keratoconus and were included in the report. The primary reason for scleral lens evaluation was contact lens intolerance. At the time of presentation, 16 patients were wearing spectacle correction, 8 were wearing corneal rigid gas-permeable lenses, 1 was wearing hydrogel toric lenses, 3 were wearing piggyback systems, and 4 were wearing no correction. Successive diagnostic lens were placed until a lens was applied that had complete limbal and corneal clearance and had a fluid reservoir depth between 0.15 and 0.4 mm. At follow-up visits, revised lenses were ordered as needed to achieve optimal vision, comfort, and fit. The authors noted that at the time of publication, no specific fitting guidelines for scleral lenses have been validated or published. After the initial consultation, 12 patients (20 eyes) chose not to proceed with the fitting process primarily due to a lack of visual benefit compared with habitual correction. Nineteen patients (30 eyes) were fit with Jupiter lens in an average of 2.8 visits (range, 2-4) with an average of 1.5 lenses (range, 1-3). Standard lens designs were prescribed for 23 eyes (77%), and 7 eyes required a custom design to optimize the scleral lens fit. With an average follow-up of 22.5 months (range, 5-34 months), the median BCVA improved in these eyes from 20/40 at baseline to 20/20 with the scleral lens, with an average improvement of 2.9 lines. A 2014 report by the same authors described the successful fitting of the Jupiter scleral lens in 188 eyes of 115 patients. The most common indications were undifferentiated ocular surface disease, exposure keratopathy, and neurotrophic keratopathy. The goals of treatment, achieved in all but 2 patients, were improved ocular comfort, ocular surface protection, and resolution of epitheliopathy. Visual acuity improved from 20/42 to 20/26. Of the patients with at least 12 months of follow-up, 63% reported continued lens wear and 37% had discontinued lens wear.

Procornea Scleral Lens
Visser et al. reported a prospective study of the indications and clinical performance of the Procornea lens in 2007. All of the 178 patients (284 eyes) included in the study had been referred to the tertiary clinic for one of a variety of corneal conditions that had not responded to other contact lenses or therapeutic management. Patients with either fit or early wearing failure were excluded from the study. About half of the patients (50.4%) were diagnosed with keratoconus and 19.7% were postpenetrating keratoplasty. Other forms of irregular corneal surface included eyes with scars related to herpes simplex keratitis (n = 8), other forms of keratitis (n = 2), trauma (n = 5), irradiation (n = 3), pellucid marginal degeneration (n = 7), pterygium (n = 2), and maculae corneae (n = 1). There were 4 types of corneal dystrophy: map-dot-fingerprint (n = 5), Fuchs’ endothelial (n = 2), Reis-Bucklers (n = 2), and lattice (n = 1). Primary keratitis sicca was diagnosed in 4 eyes, neurotrophic keratitis in 7, ocular cicatricial pemphigoid in 2 eyes, and Sjogren syndrome in 2 eyes. The primary indication was for visual correction in 249 (87.7%) eyes. Median visual acuity was 20/100 without a scleral lens and 20/28 with the lens.
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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 1 physician specialty society and 3 academic medical centers. The input supported the medical necessity of the rigid gas permeable scleral contact lens for corneal ectatic disorders, corneal scarring and/or vasularization, irregular corneal astigmatism, and ocular surface disease with pain and/or decreased visual acuity in cases that had failures of all other available treatments (i.e., topical medications or standard contact lens fittings). One reviewer commented that the prosthesis can help to avoid potentially blinding complications with ocular surface disease and that the alternative for patients with keratoconus and other forms of irregular astigmatism would be cornea transplant surgery, which involves a lifetime of close medical monitoring and significant risk.

Summary of Evidence
Gas permeable scleral contact lenses, which are also known as ocular surface prostheses, are formed with an elevated chamber over the cornea and a haptic base over the sclera. Scleral contact lenses are being evaluated in patients with corneal disease, including keratoconus, Stevens Johnson syndrome, chronic ocular GVHD, and in patients with reduced visual acuity after penetrating keratoplasty or other types of eye surgery. The literature on gas permeable scleral contact lenses consists of a number of large case series that enrolled more than 100 patients. The largest series was a retrospective review of more than 538 patients with more than 40 different clinical indications who were fitted with the Boston Ocular Surface Prosthesis. These case series report an improvement in health outcomes in patients who have failed all other available treatments. These uncontrolled studies are suggestive of benefit, but the lack of controlled trials precludes a definite conclusion on treatment benefit.

Clinical input was obtained and supports the medical necessity of the gas permeable scleral contact lens in cases of corneal ectatic disorders, corneal scarring and/or vascularization, irregular corneal astigmatism, and ocular surface disease with pain and/or decreased visual acuity when all other available treatments have failed. For patients with ocular surface diseases who have not responded adequately to topical medications, there is a lack of alternative treatments. For patients with corneal ectatic disorders and irregular astigmatism who have failed standard contact lens, the alternative of corneal transplant surgery is associated with risks. Therefore, the gas permeable scleral contact lens may be considered medically necessary in these patient populations.

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2. Rosenthal P, Croteau A. Fluid-ventilated, gas-permeable scleral contact lens is an effective option for managing severe ocular surface disease and many corneal disorders that would otherwise require penetrating keratoplasty. Eye Contact Lens 2005; 31(3):130-4. PMID 15894881


Policy History
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10/06/2011 Medical Policy Committee review
12/06/2012 Medical Policy Committee review
12/19/2012 Medical Policy Implementation Committee approval. Coverage eligibility unchanged.
11/07/2013 Medical Policy Committee review
11/06/2014 Medical Policy Committee review
08/03/2015 Coding update: ICD10 Diagnosis code section added; ICD9 Procedure code section removed.
10/29/2015 Medical Policy Committee review
11/16/2015 Medical Policy Implementation Committee approval. Coverage eligibility unchanged.
12/01/2016 Medical Policy Committee review
01/01/2017 Coding update: Removing ICD-9 Diagnosis Codes
12/07/2017 Medical Policy Committee review. Recommend archiving policy.
12/20/2017 Medical Policy Implementation Committee approval. Archived.

Next Scheduled Review Date: Archived medical policy.
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*Investigational – A medical treatment, procedure, drug, device, or biological product is Investigational if the effectiveness has not been clearly tested and it has not been incorporated into standard medical practice. Any determination we make that a medical treatment, procedure, drug, device, or biological product is investigational will be based on a consideration of the following:

A. Whether the medical treatment, procedure, drug, device, or biological product can be lawfully marketed without approval of the U.S. Food and Drug Administration (FDA) and whether such approval has been granted at the time the medical treatment, procedure, drug, device, or biological product is sought to be furnished; or

B. Whether the medical treatment, procedure, drug, device, or biological product requires further studies or clinical trials to determine its maximum tolerated dose, toxicity, safety, effectiveness, or effectiveness as compared with the standard means of treatment or diagnosis, must improve health outcomes, according to the consensus of opinion among experts as shown by reliable evidence, including:

1. Consultation with the Blue Cross and Blue Shield Association technology assessment program (TEC) or other nonaffiliated technology evaluation center(s);

2. Credible scientific evidence published in peer-reviewed medical literature generally recognized by the relevant medical community; or

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A. In accordance with nationally accepted standards of medical practice;
B. Clinically appropriate, in terms of type, frequency, extent, level of care, site and duration, and considered effective for the patient's illness, injury or disease; and
C. Not primarily for the personal comfort or convenience of the patient, physician or other health care provider, and not more costly than an alternative service or sequence of services at least as likely to produce equivalent therapeutic or diagnostic results as to the diagnosis or treatment of that patient's illness, injury or disease.

For these purposes, “nationally accepted standards of medical practice” means standards that are based on credible scientific evidence published in peer-reviewed medical literature generally recognized by the relevant medical community, Physician Specialty Society recommendations and the views of Physicians practicing in relevant clinical areas and any other relevant factors.

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