Implantation of Intrastromal Corneal Ring Segments (INTACS)

Policy Number: 9.03.14  Last Review: 11/2020

Blue KC has developed medical policies that serve as one of the sets of guidelines for coverage decisions. Benefit plans vary in coverage and some plans may not provide coverage for certain services discussed in the medical policies. Coverage decisions are subject to all terms and conditions of the applicable benefit plan, including specific exclusions and limitations, and to applicable state and/or federal law. Medical policy does not constitute plan authorization, nor is it an explanation of benefits.

When reviewing for a Medicare beneficiary, guidance from National Coverage Determinations (NCD) and Local Coverage Determinations (LCD) supersede the Medical Policies of Blue KC. Blue KC Medical Policies are used in the absence of guidance from an NCD or LCD.

Policy
Blue Cross and Blue Shield of Kansas City (Blue KC) will provide coverage for implantation of intrastromal corneal ring segments (INTACS) when it is determined to be medically necessary because the criteria shown below are met.

When Policy Topic is covered
Implantation of intrastromal corneal ring segments may be considered medically necessary for the treatment of keratoconus in patients 21 years of age or older who meet the following criteria:

- The patient has experienced a progressive deterioration in their vision, such that they can no longer achieve adequate functional vision with contact lenses or spectacles; AND
- Corneal transplantation is the only alternative to improve their functional vision; AND
- The patient has a clear central cornea with a corneal thickness of 450 microns or greater at the proposed incision site.
When Policy Topic is not covered
Implantation of intrastromal corneal ring segments is considered **not medically necessary** as a treatment of myopia.

Implantation of intrastromal corneal ring segments is considered **investigational** for all other conditions.

**Description of Procedure or Service**

<table>
<thead>
<tr>
<th>Populations</th>
<th>Interventions</th>
<th>Comparators</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals: With keratoconus</td>
<td>Interventions of interest are:</td>
<td>Comparators of interest are:</td>
<td>Relevant outcomes include:</td>
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<td></td>
<td>- Intrastromal corneal ring segments</td>
<td>- Penetrating keratoplasty</td>
<td>- Change in disease status</td>
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<tr>
<td>Individuals: With pellucid</td>
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<td>- Functional outcomes</td>
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<td>marg shall degeneration</td>
<td>- Intrastromal corneal ring segments</td>
<td>- Penetrating keratoplasty</td>
<td>- Treatment-related morbidity</td>
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<tr>
<td>Individuals: With astigmatism</td>
<td>Interventions of interest are:</td>
<td>Comparators of interest are:</td>
<td>Relevant outcomes include:</td>
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<tr>
<td>after penetrating keratoplasty</td>
<td>- Intrastromal corneal ring segments</td>
<td>- Contact lenses or correction with spectacles</td>
<td>- Change in disease status</td>
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<td></td>
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<td>- Functional outcomes</td>
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<td>- Treatment-related morbidity</td>
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</table>

Intrastromal corneal ring segments are composed of microthin soft plastic inserts of variable thickness that are placed in the periphery of the cornea. They have been investigated as a means of improving vision in diseases such as keratoconus and pellucid marginal degeneration, and for astigmatism following penetrating keratoplasty.

For individuals who have keratoconus who receive intrastromal corneal ring segments, the evidence includes primarily single-institution case series. Relevant outcomes are change in disease status, functional outcomes, and treatment-related morbidity. A number of single-center case series with sample sizes ranging from 19 to 105 eyes have been published. These series have generally reported that a substantial proportion of patients with keratoconus treated with this device have improved vision at 1 to 2 years of follow-up. More limited data are available on long-term efficacy. Intrastromal corneal ring segments is associated with a number of adverse events and explantation. Although, a single case series of 572 eyes have suggested that risk of explantation may be modest (6.1%). The net health outcome is uncertain. The evidence is insufficient to determine the effects of the technology on health outcomes.

Clinical input obtained in 2009 strongly supported the use of intrastromal corneal ring segments in a select group of patients with advanced keratoconus whose only other option for restoration of functional vision was the more invasive penetrating keratoplasty. Some clinicians may opt to delay a more invasive procedure, although the success rate of this strategy is as yet unproven. Therefore, use of
intrastromal corneal ring segments may be considered medically necessary in patients with keratoconus who meet the U.S. Food and Drug Administration humanitarian device exemption criteria for use of this device.

For individuals who have pellucid marginal degeneration who receive intrastromal corneal ring segments, the evidence includes a few case series. Relevant outcomes are change in disease status, functional outcomes, and treatment-related morbidity. A small number of case series with fewer than 25 eyes per study have evaluated intrastromal corneal ring segments in patients with pellucid marginal degeneration. Most reports have assessed devices not available in the United States. In 1 study, which included some patients implanted with Intacs, there was no improvement in uncorrected visual acuity 6 months after surgery. Moreover, explantation occurred in about 20% of eyes due to visual deterioration. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have astigmatism after penetrating keratoplasty who receive intrastromal corneal ring segments, the evidence includes a few case series. Relevant outcomes are change in disease status, functional outcomes, and treatment-related morbidity. Two case series, with 9 and 54 patients, were identified; both used devices not available in the United States. Intrastromal corneal ring segments was associated with adverse events such as extrusion and Descemet membrane detachment. The evidence is insufficient to determine the effects of the technology on health outcomes.

**Background**

**Vision Disorders**

Keratoconus is a progressive bilateral dystrophy characterized by paracentral steepening and stromal thinning that impairs visual acuity.

Pellucid marginal degeneration is a noninflammatory progressive degenerative disease, typically characterized by bilateral peripheral thinning (ectasia) of the inferior cornea. Deterioration of functional vision results from the irregular astigmatism induced by asymmetric distortion of the cornea, and visual acuity typically cannot be restored by using spherocylindrical lenses.

**Treatment**

Initial treatment for keratoconus often consists of hard contact lenses. A penetrating keratoplasty (ie, corneal grafting) was traditionally considered the next line of treatment in patients who developed intolerance to contact lenses. While visual acuity is typically improved with penetrating keratoplasty, perioperative complications are an associated risk; long-term topical steroid use is required; and endothelial cell loss occurs over time, which is a particular concern in younger patients. As an alternative, a variety of keratorefractive procedures have been attempted, broadly divided into subtractive and additive techniques. Subtractive techniques include photorefractive keratectomy or laser in situ keratomileusis (LASIK), although, generally, results of these techniques have been poor. In deep anterior lamellar keratoplasty, pathologic corneal stromal tissue is
selectively removed to the level of the Descemet membrane, followed by transplantation of a donor graft. Implantation of intrastromal corneal ring segments (ICRS) represents an additive technique, in which the implants are intended to reinforce the cornea, prevent further deterioration, and potentially obviate the need for penetrating keratoplasty.

Rigid gas permeable contact lenses may be used to treat pellucid marginal degeneration. ICRS, crescentic lamellar keratoplasty, penetrating keratoplasty, and corneal wedge excision have also been proposed as treatments.

ICRS correct myopia by flattening the center of the cornea and represent an alternative to LASIK and other refractive surgeries. A proposed advantage of ICRS is that their insertion does not affect the central cornea and, thus, their effect is not related to the healing process in the cornea. No corneal tissue is removed, and the implants may be removed or replaced. However, mild myopia is effectively treated with spectacles or contact lenses.

**Intrastromal Corneal Ring Segments**

ICRS are composed of microthin soft plastic inserts of variable thickness that are placed in the periphery of the cornea. They are inserted through an incision made in the cornea, into which channels have been created by rotating a lamellar dissector or by using a femtosecond laser. One or 2 segments are implanted in each channel, and various implants with a range of thicknesses are available for different degrees of correction. They affect refraction in the eye by physically changing the shape of the cornea (flattening the front of the eye), thereby correcting the irregular corneal shape and restoring a degree of functional vision. If required, the implants can be removed or replaced at a later date.

**Regulatory Status**

Intacs®, an intrastromal corneal ring, was approved by the U.S. Food and Drug Administration (FDA) for 2 indications. In 1999, Intacs® (KeraVision, now Addition Technology) was approved by FDA through the premarket approval process for the following labeled indication:

“The KeraVision Intacs are intended for the reduction or elimination of mild myopia (-1.00 to -3.00 diopters spherical equivalent at the spectacle plane) in patients:

- Who are 21 years of age or older;
- With documented stability of refraction as demonstrated by a change of less than or equal to 0.50 diopter for at least 12 months prior to the preoperative examination; and
- Where the astigmatic component is +1.00 diopter or less.”

In 2004, Intacs® received additional approval by FDA through the humanitarian device exemption process for the following indication:

“This device is indicated for the reduction or elimination of myopia and astigmatism in patients with keratoconus, who are no longer able to achieve
adequate vision with their contact lenses or spectacles, so that their functional vision may be restored and the need for a corneal transplant procedure may potentially be deferred. The specific set of keratoconic patients proposed to be treated with Intacs prescription inserts are those patients:

- Who have experienced a progressive deterioration in their vision, such that they can no longer achieve adequate functional vision on a daily basis with their contact lenses or spectacles;
- Who are 21 years of age or older;
- Who have clear central corneas;
- Who have a corneal thickness of 450 microns or greater at the proposed incision site; AND
- Who have corneal transplantation as the only remaining option to improve their functional vision.”

Note: The humanitarian device exemption does not require manufacturers to provide data confirming the efficacy of a device but rather data supporting its “probable” benefit. The humanitarian device exemption process is available for devices treating conditions that affect fewer than 4000 Americans per year.

ICRS devices available outside of the United States include:

- Intacs SK
- Ferrara intrastromal corneal ring segments
- KeraRing intrastromal corneal ring segments
- MyoRing intracorneal continuous ring.

**Rationale**

This evidence review was created in April 2005 and has been updated regularly with searches of the MEDLINE database. The most recent literature update was performed through January 20, 2020.

Evidence reviews assess the clinical evidence to determine whether the use of technology improves the net health outcome. Broadly defined, health outcomes are the length of life, quality of life, and ability to function including benefits and harms. Every clinical condition has specific outcomes that are important to patients and managing the course of that condition. Validated outcome measures are necessary to ascertain whether a condition improves or worsens; and whether the magnitude of that change is clinically significant. The net health outcome is a balance of benefits and harms.

To assess whether the evidence is sufficient to draw conclusions about the net health outcome of technology, 2 domains are examined: the relevance, and quality and credibility. To be relevant, studies must represent 1 or more intended clinical use of the technology in the intended population and compare an effective and appropriate alternative at a comparable intensity. For some conditions, the alternative will be supportive care or surveillance. The quality and credibility of the
evidence depend on study design and conduct, minimizing bias and confounding that can generate incorrect findings. The randomized controlled trial (RCT) is preferred to assess efficacy; however, in some circumstances, nonrandomized studies may be adequate. RCTs are rarely large enough or long enough to capture less common adverse events and long-term effects. Other types of studies can be used for these purposes and to assess generalizability to broader clinical populations and settings of clinical practice.

Keratoconus

Clinical Context and Test Purpose
The purpose of intrastromal corneal ring segments is to provide a treatment option that is an alternative to or an improvement on penetrating keratoplasty, in patients with keratoconus.

The question addressed in this evidence review is: Does intrastromal corneal ring segments improve the net health outcome in patients with keratoconus.

The following PICO was used to select literature to inform this review.

Patients
The relevant population of interest is individuals with keratoconus.

Interventions
The intervention of interest is intrastromal corneal ring segments.

Comparators
The comparator of interest is penetrating keratoplasty.

Outcomes
The beneficial outcomes of interest are change in disease status, functional outcomes, and treatment-related morbidity.

Study Selection Criteria
Methodologically credible studies were selected using the following principles:

1. To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
2. In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
3. To assess longer-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
4. Studies with duplicative or overlapping populations were excluded.

According to a Cochrane review by Zadnik et al (2019), there are no published RCTs of intrastromal corneal ring segments for treating keratoconus. The published data on Intacs for keratoconus consists of single-institution case series, many of which used the device commercially available in the United States.
States.\textsuperscript{2,3,4,5,6,7,8,9,10,11,12,13,14,15} Sample sizes ranged from 19 to 105 eyes. Findings from a systematic review of case series by Izquierdo et al (2019) (N=1325 eyes) indicated that intrastromal corneal ring implantation improved uncorrected distance visual acuity (0.23 ± 0.28, Logarithm of the Minimum Angle of Resolution) and corrected distance visual acuity (0.06 ± 0.21, Logarithm of the Minimum Angle of Resolution) at 12 months.\textsuperscript{16} Additionally, these case series have indicated that a substantial proportion of patients with keratoconus treated with this device have improved vision at 1 to 2 years of follow-up. Most studies have reported improvements (in uncorrected or corrected visual acuity) in at least 75% to 80% of patients in whom changes in 2 to 3 lines of corrected or uncorrected visual acuity were considered a success.\textsuperscript{3,4,5,7,11} Approximately 10% of patients required a second procedure because of an unsatisfactory initial result.\textsuperscript{5,6}

One of the larger studies was published by Colin and Malet (2007).\textsuperscript{12} They reported on 2-year follow-up from a prospective, single-center European study in 100 eyes with keratoconus (82 consecutive patients) and Intacs implantation. Patients had been referred for a penetrating keratoplasty procedure due to contact lens intolerance for correction of myopia and irregular astigmatism. Intacs inserts were removed from 4 (4%) eyes due to poor visual outcome or extrusion, and 14 eyes were lost to follow-up. Of the 82 remaining eyes (68 patients), both corrected and uncorrected visual acuity remained relatively stable between 1 and 2 years of follow-up.

Studies with 5 years of follow-up include Bedi et al (2012).\textsuperscript{13} They evaluated the risk of keratoconus progression in a study of 105 consecutive eyes (85 patients) that had undergone Intacs implantation. At the 1-year follow-up, 1 eye had extrusion and 12 (11.4%) had undergone removal of Intacs because of unsatisfactory results; these eyes were managed by penetrating or deep lamellar keratoplasty. Of the 105 eyes, 80% retained the Intacs implant and showed no keratoconus progression over 5 years of follow-up. In addition, Vega-Estrada et al (2013) reported that, in a series of 51 eyes, the improvement in vision obtained at 6 months after Intacs implantation was maintained out to 5 years postoperatively.\textsuperscript{2} However, the analysis only included cases without significant changes in corneal topography over the 12 months prior to surgery. Kymionis et al (2007) reported on 5-year follow-up on 28 patients (36 eyes) who had initially participated in a clinical trial evaluating the safety and efficacy of Intacs implantation in patients with keratoconus.\textsuperscript{14} In 5 patients (7 eyes), the Intacs segments were removed due to patient dissatisfaction. Five-year follow-up was reported for 17 (59%) eyes. Refractive stability was obtained at the 6-month follow-up and remained stable throughout the 5-year follow-up. Alternatively, Kang et al (2019) reported mixed visual acuity findings at the 5-year follow-up for 30 eyes. While improvements in corrected distance visual acuity were maintained at 5 years, compared to preoperative values, uncorrected distance visual acuity and spherical and spherical equivalent worsened at 5 years.\textsuperscript{17}

For adverse events, a larger retrospective study by Nguyen et at (2019)\textsuperscript{18}, evaluated a consecutive series of 572 eyes with femtosecond laser-created Intacs intracorneal ring implantation for keratoconus or corneal ectasia to
assess the incidence of explantation and its determinants. Overall, the intracorneal
ring segments (Intacs) were explanted in 35 eyes (6.1%) of 31 patients.
Explantation was due to medical complications in 15 eyes (2.6%), most frequently
being keratitis with signs of inflammation (n=11, 31%). A total of 20 (3.8%)
explantations were due to optical/refractive considerations. Use of adjunctive
corneal crosslinking did not affect explantation risk.

**Section Summary: Keratoconus**
For individuals who have keratoconus who receive intrastromal corneal ring
segments, the evidence includes case series. Relevant outcomes are change in
disease status, functional outcomes, and treatment-related morbidity. A number of
single-center case series with sample sizes ranging from 19 to 105 eyes have been
published. The series has generally reported that a substantial proportion of
patients with keratoconus treated with this device have improved vision at 1 to 2
years of follow-up. A single case series of 572 eyes have suggested that risk of
explantation may be modest (6.1%). However, long-term data are more limited.
Therefore, the evidence is insufficient to determine the effects of the technology
on health outcomes.

**Pellucid Marginal Degeneration**

**Clinical Context and Test Purpose**
The purpose of intrastromal corneal ring segments is to provide a treatment option
that is an alternative to or an improvement on penetrating keratoplasty, in
patients with pellucid marginal degeneration.

The question addressed in this evidence review is: Does intrastromal corneal ring
segments improve the net health outcome in patients with pellucid marginal
degeneration.

The following PICO was used to select literature to inform this review.

**Patients**
The relevant population of interest is individuals with pellucid marginal
degeneration.

**Interventions**
The intervention of interest is intrastromal corneal ring segments.

**Comparators**
The comparator of interest is penetrating keratoplasty.

**Outcomes**
The beneficial outcomes of interest are change in disease status, functional
outcomes, and treatment-related morbidity.

**Study Selection Criteria**
Methodologically credible studies were selected using the following principles:
1. To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
2. In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
3. To assess longer-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
4. Studies with duplicative or overlapping populations were excluded.

Pinero et al (2009) published a European multicenter retrospective analysis of 21 consecutive eyes in 15 patients who had been implanted with intrastromal corneal ring segments (3 Intacs, 18 KeraRings) for pellucid marginal degeneration. All subjects had experienced reduced best spectacle-corrected visual acuity and/or contact lens intolerance or dissatisfaction prior to implantation. At 6 months after surgery, uncorrected visual acuity had not changed; 17% of eyes lost lines of best-corrected visual acuity, and 44% of eyes gained 2 or more lines of best spectacle-corrected visual acuity. Ring explantation was performed in 4 (19%) eyes due to visual deterioration during the follow-up. Mean keratometry decreased 1.76 diopters (D), from 44.95 to 43.19 D at 6 months postoperatively (p<0.01).

A 2010 publication from Europe retrospectively analyzed intrastromal corneal ring segments implantation (KeraRing) in 16 consecutive eyes of 10 patients with pellucid marginal degeneration who had reduced best spectacle-corrected visual acuity and dissatisfaction with spectacle and contact lens-corrected vision. At 12 months after implantation, uncorrected visual acuity improved from 1.69 to 0.83 (Logarithm of the Minimum Angle of Resolution). At the 36-month follow-up, patients (n=11 eyes) had gained a mean of 2.4 lines uncorrected visual acuity and 3.3 lines of best spectacle-corrected visual acuity. There was a statistically significant reduction in manifest spherical refraction from -2.43 to -0.72 D. For the patients (n=11 eyes) who completed 36-month follow-up, there was no significant change in outcome measures between 12 and 36 months. No intraoperative or postoperative complications were noted aside from white deposits around the segments in 1 patient.

Section Summary: Pellucid Marginal Degeneration
For individuals who have pellucid marginal degeneration who receive intrastromal corneal ring segments, the evidence includes only a few case series, most of which have assessed devices not available in the United States. Relevant outcomes are change in disease status, functional outcomes, and treatment-related morbidity. In 1 study, which included some patients implanted with Intacs, there was no improvement in uncorrected visual acuity 6 months after surgery. Moreover, explantation occurred in about 20% of eyes due to visual deterioration. Therefore, the evidence is insufficient to determine the effects of the technology on health outcomes.

Astigmatism After Penetrating Keratoplasty

Clinical Context and Test Purpose
The purpose of intrastromal corneal ring segments is to provide a treatment option that is an alternative to or an improvement on penetrating keratoplasty, in patients with astigmatism after penetrating keratoplasty.

The question addressed in this evidence review is: Does intrastromal corneal ring segments improve the net health outcome in patients with astigmatism after penetrating keratoplasty.

The following PICO was used to select literature to inform this review.

**Patients**
The relevant population of interest is individuals with astigmatism after penetrating keratoplasty.

**Interventions**
The intervention of interest is intrastromal corneal ring segments.

**Comparators**
The comparator of interest is penetrating keratoplasty.

**Outcomes**
The beneficial outcomes of interest are change in disease status, functional outcomes, and treatment-related morbidity.

**Study Selection Criteria**
Methodologically credible studies were selected using the following principles:

1. To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs;
2. In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.
3. To assess longer-term outcomes and adverse events, single-arm studies that capture longer periods of follow-up and/or larger populations were sought.
4. Studies with duplicative or overlapping populations were excluded.

Two case series (2009, 2012) were identified in which intrastromal corneal ring segments were implanted to correct residual astigmatism after penetrating keratoplasty.\(^{21,22}\) In 1, conducted in Spain, 9 patients received intrastromal corneal ring segments (KeraRings) for high astigmatism (\(>4\) D) after the procedure.\(^{21}\) Mean keratometry decreased 4.17 D (from 46.28 to 42.11 D). Of the 9 patients, 1 reported night halos and 2 had the implant removed due to compulsive eye rubbing and vascularization in the stromal tunnel. The authors noted that, in patients with a corneal transplant with a diameter of 7.5 mm or smaller, intrastromal corneal ring segments should not be used because the segments would be proximate to the graft-host junction. In another study, Coscarelli et al (2012) in Brazil retrospectively reviewed chart records of 54 patients (59 eyes) who had intrastromal corneal ring segments with the Ferrara ring.\(^{22}\) Mean corrected distance visual acuity improved from 0.45 Logarithm of the
Minimum Angle of Resolution preoperatively to 0.30 Logarithm of the Minimum Angle of Resolution postoperatively. Mean corneal topographic astigmatism decreased from 3.37 D preoperatively to 1.69 D postoperatively.

**Section Summary: Astigmatism After Penetrating Keratoplasty**

For individuals who have astigmatism after penetrating keratoplasty who receive intrastromal corneal ring segments, the evidence includes 2 case series. Relevant outcomes are change in disease status, functional outcomes, and treatment-related morbidity. The case series (n=9 and 54, respectively) were identified assessing intrastromal corneal ring segments in patients with astigmatism after penetrating keratoplasty. Neither provides evidence relevant to this review because both were conducted outside of the United States and used devices not cleared by the U.S. Food and Drug Administration. Therefore, the evidence is insufficient to determine the effects of the technology on health outcomes.

**Adverse Events**

Literature searches have identified case reports of adverse events following implantation of intrastromal corneal ring segments, including persistent pain, extrusion, traumatic shattering, bacterial keratitis, fungal keratitis, corneal edema, deep corneal vascularization, Descemet membrane detachment, and alterations of extracellular matrix components and proteinases. In a 2010 multicenter series of 251 intrastromal corneal ring segments implantations, 58 eyes of 47 patients had the devices explanted. The main cause was extrusion (48%), followed by poor refractive outcomes (38%), keratitis (7%), and corneal melting and perforation (7%). The time from implantation to explantation ranged from 0.1 to 82 months.

In another study (2006), 6 of 20 eyes had “significant” problems at 3 to 6 months postoperatively related to corneal thinning and subsequent ring exposure, and a dense corneal infiltrate developed in 1 patient at 7 months. Histopathologic examination of 8 eyes that underwent penetrating keratoplasty after removal of Intacs implants revealed keratocyte apoptosis.

**Summary of Evidence**

For individuals who have keratoconus who receive intrastromal corneal ring segments, the evidence includes primarily single-institution case series. Relevant outcomes are change in disease status, functional outcomes, and treatment-related morbidity. A number of single-center case series with sample sizes ranging from 19 to 105 eyes have been published. These series have generally reported that a substantial proportion of patients with keratoconus treated with this device have improved vision at 1 to 2 years of follow-up. More limited data are available on long-term efficacy. Intrastromal corneal ring segments is associated with a number of adverse events and explantation. Although, a single case series of 572 eyes have suggested that risk of explantation may be modest (6.1%). The net health outcome is uncertain. The evidence is insufficient to determine the effects of the technology on health outcomes.

For individuals who have pellucid marginal degeneration who receive intrastromal corneal ring segments, the evidence includes a few case series. Relevant outcomes
are change in disease status, functional outcomes, and treatment-related morbidity. A small number of case series with fewer than 25 eyes per study have evaluated intrastromal corneal ring segments in patients with pellucid marginal degeneration. Most reports have assessed devices not available in the United States. In 1 study, which included some patients implanted with Intacs, there was no improvement in uncorrected visual acuity 6 months after surgery. Moreover, explantation occurred in about 20% of eyes due to visual deterioration. The evidence is insufficient to determine the effects of the technology on health outcomes.

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SUPPLEMENTAL INFORMATION

Clinical Input 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 this process, through the provision of appropriate reviewers, 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 through 1 physician specialty society and 3 academic medical centers while this policy was under review in 2009. Input considered implantation of intrastromal corneal ring segments to be medically necessary for select patients with keratoconus when the only other option for improving visual acuity is corneal transplantation. Input agreed that implantation of intrastromal corneal ring segments is not medically necessary for treatment of myopia.

Practice Guidelines and Position Statements
In 2007, the National Institute for Health and Care Excellence (NICE) issued guidance on corneal implants for keratoconus. The guidance, based on 9 case series, a nonrandomized controlled trial, and specialists' opinions, concluded that “[c]urrent evidence on the safety and efficacy of corneal implants for keratoconus appears adequate to support the use of this procedure....”

U.S. Preventive Services Task Force Recommendations
Not applicable.
Medicare National Coverage
There is no national coverage determination. In the absence of a national coverage determination, coverage decisions are left to the discretion of local Medicare carriers.

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

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<td>Dec 2021</td>
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<tr>
<td>NCT02512432</td>
<td>INTACS (Intrastromal Corneal Ring Segments) for Corneal Ectasia</td>
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<td>Jun 2025</td>
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NCT: national clinical trial.

REFERENCES

**Billing Coding/Physician Documentation Information**

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**ICD-10 Codes**

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**Additional Policy Key Words**

N/A

**Policy Implementation/Update Information**

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12/1/07  No policy statement changes.
6/1/08   No policy statement changes.
12/1/08  No policy statement changes.
6/1/09   No policy statement changes.
9/10/09  Policy statement revised; may be medically necessary in specified conditions.
11/1/10  No policy statement changes.
11/1/11  No policy statement changes.
11/1/12  No policy statement changes.
11/1/13  No policy statement changes.
11/1/14  No policy statement changes.
11/1/15  No policy statement changes.
11/1/16  No policy statement changes.
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11/1/19  No policy statement changes.
11/1/20  No policy statement changes.

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