Keystone First
Family of Health Plans

XEN® gel stent for glaucoma

Clinical Policy ID: CCP.1510

Recent review date: 3/2026

Next review date: 7/2027

Policy contains: Glaucoma, sub-conjunctival filtration, trabeculectomy, XEN gel stent

Keystone First VIP Choice has developed clinical policies to assist with making coverage determinations. Keystone First VIP Choice's clinical policies are based on guidelines from established industry sources, such as the Centers for Medicare & Medicaid Services (CMS), state regulatory agencies, the American Medical Association (AMA), medical specialty professional societies, and peer-reviewed professional literature. These clinical policies along with other sources, such as plan benefits and state and federal laws and regulatory requirements, including any state- or plan-specific definition of "medically necessary," and the specific facts of the particular situation are considered by Keystone First VIP Choice, on a case by case basis, when making coverage determinations. In the event of conflict between this clinical policy and plan benefits and/or state or federal laws and/or regulatory requirements, the plan benefits and/or state and federal laws and/or regulatory requirements shall control. Keystone First VIP Choice's clinical policies are for informational purposes only and not intended as medical advice or to direct treatment. Physicians and other health care providers are solely responsible for the treatment decisions for their patients. Keystone First VIP Choice's clinical policies are reflective of evidence-based medicine at the time of review. As medical science evolves, Keystone First VIP Choice will update its clinical policies as necessary. Keystone First VIP Choice's clinical policies are not guarantees of payment.

Coverage policy

XEN® gel stent (AbbVie Inc., North Chicago, Illinois, formerly Allergan Inc.) is clinically proven and, therefore, may be medically necessary in cases of glaucoma with prior failure of a filtering/cilioablative procedure and/or uncontrolled intraocular pressure (progressive damage and mean diurnal medicated intraocular pressure ≥ 20 mm Hg) on maximally tolerated medical therapy, i.e., ≥ 4 classes of topical intraocular pressure-lowering medications or fewer in the case of tolerability or efficacy issues (American Academy of Ophthalmology, 2020; Panarelli, 2023; Traverso, 2023; U.S. Food and Drug Administration, 2016).

XEN45 insertion is medically necessary only when performed by an ophthalmologist experienced with trabeculectomy and bleb management (U.S. Food and Drug Administration, 2016).

Limitations

Only one XEN45 device per eye is medically necessary.

Alternative covered services

- Trabeculoplasty.
- Trabeculectomy.

Background

Glaucoma is a group of eye diseases characterized by chronic, progressive optic neuropathy with irreversible loss of retinal ganglion cells and their axons. Elevated intraocular pressure (IOP) is a major modifiable risk factor, though a significant proportion of patients with primary open-angle glaucoma have IOP within the normal range (American Academy of Ophthalmology, 2025). An estimated three million Americans have the disease, but only half are aware of having it. About 120,000 Americans are blind from glaucoma. There is approximately a threefold higher prevalence of open-angle glaucoma in Black individuals relative to non-Hispanic White individuals, and glaucoma is the leading cause of blindness in Black individuals (American Academy of Ophthalmology, 2025). Other high-risk groups include people over age 60, those with a family history of glaucoma, Latino/Hispanic individuals (American Academy of Ophthalmology, 2025), diabetics, and the severely nearsighted (Glaucoma Research Foundation, 2024).

There are several types of glaucoma. The most common is open-angle glaucoma, in which drainage is impaired gradually. It has no symptoms, increasing the importance of early detection. Less common forms are: angle-closure glaucoma, in which a sudden blockage results in rapid eye pressure; congenital glaucoma present at birth, and; secondary glaucoma as a complication of another medical condition or treatment (National Eye Institute, 2024).

Glaucoma is an incurable disease, but treatment can lower intraocular pressure and prevent further vision loss. First-line treatments for glaucoma are typically topical ophthalmic drops to reduce intra-ocular pressure, along with various medications. In refractory cases, surgery may be considered, including laser surgery (often selective laser trabeculoplasty, which may also be used as initial therapy (American Academy of Ophthalmology, 2025)), traditional surgery (often trabeculectomy), shunts, or canaloplasty. Minimally invasive glaucoma surgery (MIGS) techniques have become established and widely used treatment options, particularly for mild to moderate disease (Dietze, 2024; American Academy of Ophthalmology, 2025).

Distinct from MIGS, minimally invasive bleb surgery (MIBS) involves bleb-forming devices with different safety and efficacy profiles (American Academy of Ophthalmology, 2025). One such device is the XEN gel stent. XEN was designed for implantation via an ab interno approach, though ab externo techniques have also been described (American Academy of Ophthalmology, 2025). The U.S. Food and Drug Administration issued 510(k) Premarket Notification clearance to the XEN Glaucoma Treatment System on November 21, 2016 for the management of refractory glaucomas, including when previous surgical treatment has failed, primary open angle glaucoma, and pseudoexfoliative or pigmentary glaucoma with open angles that are unresponsive to maximum tolerated medical therapy. The system consists of an injector, a single piece tube of porcine collagen/gelatin inserted permanently. An outflow pathway is created from the anterior chamber to the sub-conjunctival space through which aqueous humor can flow (U.S. Food and Drug Administration, 2016).

Findings

Across guidelines, systematic reviews, meta-analyses, and registry-based observational studies, the evidence consistently characterizes the XEN gel stent as a minimally invasive subconjunctival filtration device that achieves clinically meaningful intraocular pressure reduction in participants with glaucoma, though with lower efficacy than trabeculectomy. The device offers a favorable safety profile relative to traditional filtration surgery, with lower rates of hyphema, hypotony, bleb fibrosis, and bleb leak. However, the evidence also consistently identifies higher rates of bleb needling, a higher failure rate when compared to trabeculectomy, and diminished outcomes when the procedure is combined with cataract surgery. Risk factors for surgical failure include non-White ethnicity, lower dosing or omission of intraoperative mitomycin C, and certain glaucoma subtypes, though the certainty of this evidence remains low. The body of literature underscores that the choice between the XEN

gel stent and trabeculectomy should be individualized, weighing the degree of intraocular pressure control needed against the participant's risk tolerance for complications.

Guidelines

Two major clinical practice guidelines address the role of the XEN gel stent within the surgical management of glaucoma. The American Academy of Ophthalmology Primary Open-Angle Glaucoma Preferred Practice Pattern (Gedde, 2025) and the European Glaucoma Society Guidelines (European Glaucoma Society, 2025) both situate the XEN gel stent within the broader category of bleb-forming surgical procedures that divert aqueous humor into the subconjunctival space.

The American Academy of Ophthalmology guideline describes the XEN gel stent as a 6-millimeter gelatinous tube with a 45-micron lumen designed for placement into the subconjunctival space, primarily via an ab interno approach, though ab externo techniques have also been described. The guideline notes that this device is approved by the United States Food and Drug Administration for use in refractory glaucoma and that the use of intraoperative antifibrotic agents enhances surgical success. It assigns the XEN gel stent a rating of moderate quality evidence with a discretionary recommendation (Gedde, 2025). The European Glaucoma Society guideline similarly describes the device's specifications and its design based on the Hagen-Poiseuille equation of laminar flow. This guideline emphasizes that bleb-forming devices without a plate, including the XEN gel stent, have the potential for greater intraocular pressure reduction compared to non-bleb-forming minimally invasive glaucoma surgeries and may therefore be considered for moderate to advanced glaucoma. The European guideline also highlights the importance of appropriate antimetabolite use, proper device positioning to minimize endothelial cell loss, and the recognition that these procedures carry postoperative bleb management requirements and complication profiles similar to traditional filtration surgery (European Glaucoma Society, 2025).

Both guidelines converge in their recognition of the device as an alternative to trabeculectomy that offers potential advantages in terms of surgical invasiveness and recovery, while cautioning that the same general principles of bleb management and antifibrotic therapy apply. Neither guideline positions the XEN gel stent as a replacement for trabeculectomy; rather, both recommend an individualized, patient-tailored approach to surgical selection.

Systematic reviews

The systematic review evidence addresses the efficacy, safety, risk factors, and morphological outcomes of the XEN gel stent. A Cochrane systematic review by King and colleagues (2018) provided foundational evidence on subconjunctival draining minimally invasive glaucoma devices for medically uncontrolled glaucoma, establishing the evidence base from which subsequent guideline recommendations were developed (King, 2018).

The efficacy of the XEN gel stent in reducing intraocular pressure and medication burden has been consistently demonstrated across multiple large systematic reviews. Panarelli and colleagues (2023) reviewed 59 studies encompassing N = 4,208 participants and documented median declines of intraocular pressure after XEN gel stent placement from 22.0 to 14.6 millimeters of mercury, and from 2.8 to 0.7 for medication use. These patterns were consistent by follow-up duration up to three years, by preoperative level, by participant age, and by whether the procedure was standalone or part of a combination (Panarelli, 2023). Traverso and colleagues (2023) reviewed 96 studies and similarly found significant declines in intraocular pressure after XEN gel stent implantation at 12, 24, and 36 months, each ending under 15 millimeters of mercury. In addition, 15 of those studies demonstrated similar reductions whether phacoemulsification was or was not included, and significant declines were found in 11 studies that directly compared XEN gel stent with trabeculectomy (Traverso, 2023). These two large reviews are concordant in their finding that the XEN gel stent produces durable and clinically meaningful intraocular pressure reduction, with efficacy maintained regardless of whether the procedure is performed in combination with cataract surgery.

The complication profile of the XEN gel stent has been characterized in detail. Gan and colleagues (2024) reviewed 48 studies published between 2017 and 2024, including 16 original studies, 28 case reports, and 4 case series, with participants followed for up to 5 years (Gan, 2024). This body of evidence reveals a temporal pattern of complications: early postoperative events occurring within 30 days include occlusion of the stent lumen (3.9% to 8.8%), hypotony maculopathy (1.9% to 4.6%), choroidal detachment (0% to 15%), conjunctival erosion and exposure of the device (1.1% to 2.3%), wound and bleb leaks (2.1%), and malignant glaucoma (2.2%). Mid-postoperative complications arising between one and six months include stent migration (1.5%), endophthalmitis (0.4% to 3%), macular edema (1.5% to 4.3%), and hypertrophic bleb (8.8%). Late complications, including spontaneous dislocation and intraocular degradation, have been reported only in isolated cases. Most of these complications are mild and transient, responding to conservative management, though endophthalmitis, suprachoroidal hemorrhage, and malignant glaucoma represent rare but potentially sight-threatening events requiring prompt intervention (Gan, 2024).

Regarding predictors of surgical failure, the evidence points consistently to ethnicity and antifibrotic agent use as important prognostic considerations, though findings related to glaucoma diagnosis remain conflicting. Jung and colleagues (2026) synthesized 18 studies with 19 cohorts totaling 9,580 eyes of N = 9,281 participants, of which 12 cohorts evaluated the XEN gel stent and 7 examined the PreserFlo MicroShunt. Non-White ethnicity, specifically Asian and non-Hispanic Black participants, and lower intraoperative dosing or omission of mitomycin C were associated with higher risk of failure, though both associations carried low certainty of evidence. Several studies described higher failure risk for pseudoexfoliative, pigmentary dispersion, angle closure, uveitic, and normal tension subtypes of glaucoma, while lower risk was reported among participants with ocular hypertension or open-angle glaucoma suspect status. Notably, findings regarding the effect of combining phacoemulsification with minimally invasive bleb surgery were mixed: two studies reported higher failure risk for the combined procedure, while one study found a lower risk (Jung, 2026).

The structural characteristics of filtering blebs following XEN gel stent implantation offer emerging insights into predicting surgical outcomes. Sim and colleagues (2026) reviewed 11 studies comprising N = 409 participants and found that, across studies, bleb features consistently associated with surgical success included thicker bleb walls, lower internal reflectivity, posterior episcleral fluid lakes, greater cystic structure density, and the presence of internal cavities and subconjunctival spaces. Importantly, implant positioning significantly influenced outcomes: intra-Tenon and sub-Tenon placements of the device achieved higher qualified success rates (90%) compared to intra-conjunctival placements (61%). These morphological findings are largely consistent with features associated with successful trabeculectomy surgery, suggesting that despite differences in surgical technique, bleb morphology may serve as a unifying determinant of success across subconjunctival filtration procedures (Sim, 2026).

Taken together, these systematic reviews converge on several key findings: the XEN gel stent achieves meaningful intraocular pressure reduction but carries a notable rate of bleb needling and a complication profile that, while generally mild and manageable, includes rare but serious events. Ethnicity and antifibrotic agent use emerge as the most consistently identified prognostic factors, and emerging evidence on bleb morphology demonstrates that structural characteristics visible on imaging correlate with functional outcomes and may eventually guide more timely postoperative interventions.

Meta-analysis

Multiple meta-analyses have quantified the comparative effectiveness and safety of the XEN gel stent. In their analysis of the XEN gel stent versus trabeculectomy, Qedair and colleagues (2025) pooled data from 12 studies encompassing 2,381 eyes (N = 2,381 participants; 1,106 in the XEN45 group and 1,275 in the trabeculectomy group). Trabeculectomy achieved significantly greater intraocular pressure reduction than the XEN45 gel stent (weighted mean difference: 11.9 millimeters of mercury [95% confidence interval (CI): 10.2 to 13.7] versus 9.1

millimeters of mercury [95% CI: 7.4 to 10.8], p = 0.02). Complete success rates were also significantly higher for trabeculectomy at 63.0% (95% CI: 56.0% to 70.0%) compared to 47.0% (95% CI: 40.0% to 55.0%) for the XEN45 gel stent (p = 0.004), while no significant difference was found in qualified success rates (67.0% versus 58.0%, p = 0.44). Failure rates were significantly lower in the trabeculectomy group at 10.0% compared to 25.0% for the XEN45 gel stent (p = 0.002). However, the XEN45 gel stent demonstrated a superior safety profile: participants in the XEN45 group had significantly lower odds of hyphema (odds ratio [OR]: 0.34, p = 0.04), hypotony (OR: 0.31, p = 0.01), bleb fibrosis (OR: 0.68, p = 0.01), and bleb leak (OR: 0.16, p < 0.01). Both procedures achieved comparable reductions in the number of intraocular pressure-lowering medications (p = 0.28) and no significant difference in best-corrected visual acuity outcomes (p = 0.15). Publication bias was detected for intraocular pressure reduction, complete success, and failure outcomes, though leave-one-out sensitivity analyses confirmed the robustness of point estimates (Qedair, 2025).

These findings were broadly consistent with earlier meta-analyses examining XEN gel stent efficacy. Yang and colleagues (2022) pooled 78 studies and found the XEN gel stent to be effective in lowering intraocular pressure (p < 0.01) and reducing the number of glaucoma medications (p < 0.001). Reductions in intraocular pressure for the XEN gel stent and trabeculectomy were similar, but the XEN gel stent had a higher bleb needling rate (p < 0.004) (Yang, 2022). Chen and colleagues (2022) similarly found in their meta-analysis of 56 studies (N = 4,410 participants) that the ab interno XEN gel implant, alone or combined with cataract surgery, reduced intraocular pressure by 35% and reduced the number of antiglaucoma medications, with vision-threatening complications occurring in 1% of participants (Chen, 2022). The convergent finding across these meta-analyses is that the XEN gel stent produces intraocular pressure reduction comparable to trabeculectomy with a more favorable safety profile, though at the cost of higher bleb needling rates and lower complete success rates.

The role of antifibrotic adjunctive therapy has also been examined at the meta-analytic level. Feng and colleagues (2024) pooled 26 studies (N = 2,329 participants) of participants with open-angle glaucoma who received XEN combined with mitomycin C injection. This combination significantly decreased intraocular pressure and the amount of medication used at different time points and remained lower at 24 months following the procedure compared to preoperative levels. Common complications associated with the XEN gel stent with mitomycin C were, in order from most to least common, subconjunctival hemorrhage, hypotony, shallow anterior chamber, bleb needling, hyphema, choroidal detachment, macular edema, tube migration, tube exposure, tube fracture, and endophthalmitis. However, studies lacked clear descriptions of the medications and dosages used or use of a washout period preoperatively, which limits interpretation of the findings (Feng, 2024).

Other evidence

The randomized controlled trial by Sheybani and colleagues (2023) compared XEN45 to trabeculectomy in participants with open-angle glaucoma and an intraocular pressure of 15 to 44 millimeters of mercury on topical medication. The primary endpoint was the percentage of participants achieving 20% or greater reduction in intraocular pressure from baseline without a medication change. At month 12, both treatments achieved the primary endpoint (62.1% and 68.2%, p = 0.487) and significant reductions in medication counts from preoperative baseline values (both p < 0.001), although trabeculectomy achieved a significantly greater mean change in intraocular pressure from baseline (p = 0.024). The XEN gel stent resulted in less need for secondary surgical interventions (p = 0.024 after excluding laser suture lysis), faster visual recovery (p ≤ 0.048), and greater six-month improvements in visual function problems (p ≤ 0.022) (Sheybani, 2023).

Arnould and colleagues (2024) reported two-year outcomes from the Fight Glaucoma Blindness registry, a large international observational dataset encompassing 646 eyes of N = 515 participants who underwent XEN 45 gel stent implantation. This real-world evidence complemented the controlled trial data by demonstrating practical effectiveness in routine clinical settings. At 24 months, mean intraocular pressure decreased from a preoperative level of 21.4 millimeters of mercury to 16.8 millimeters of mercury, representing a mean reduction of 21.7%. The

number of intraocular pressure-lowering medications decreased from a mean of 2.7 at baseline to 1.2 at 24 months. Complete success and qualified success rates at 24 months were 26% and 48%, respectively. An important finding from this registry study was that outcomes differed substantially based on whether the XEN gel stent was implanted as a standalone procedure or combined with cataract surgery. Complete success was 33% in the standalone group compared to 16% in the combined group, and qualified success was 52% versus 42%, respectively. Bleb needling was performed in 28.4% of participants, and 18% underwent a secondary glaucoma procedure (Arnould, 2024).

In 2026, we updated the references, added new evidence from systematic reviews, meta-analyses, and a registry-based observational study, and restructured the findings section thematically. No policy changes were warranted.

References

On February 4, 2026, we searched PubMed and the databases of the Cochrane Library, the U.K. National Health Services Centre for Reviews and Dissemination, the Agency for Healthcare Research and Quality, and the Centers for Medicare & Medicaid Services. Search terms were “glaucoma,” “sub-conjunctival filtration,” “minimally invasive,” and “XEN gel stent”. We included the best available evidence according to established evidence hierarchies (typically systematic reviews, meta-analyses, and full economic analyses, where available) and professional guidelines based on such evidence and clinical expertise.

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Policy updates

3/2022: initial review date and clinical policy effective date: 4/2022

3/2023: Policy references updated.

3/2024: Policy references updated.

3/2025: Policy references updated.

3/2026: Policy references updated.

Related Codes

Below are the most commonly submitted codes for the service(s)/item(s) subject to this policy CCP.1510. This is not an exhaustive list of codes. Providers are expected to consult the appropriate coding manuals and bill accordingly.

Code	Code Description
0449T	Insertion of aqueous drainage device, without extraocular reservoir, internal approach, into the subconjunctival space; initial device

0450T	Insertion of aqueous drainage device, without extraocular reservoir, internal approach, into the subconjunctival space; each additional device
66183	Insertion of anterior segment aqueous drainage device, without extraocular reservoir, external approach
0012T	Glaucoma drainage device procedure (new Category III code effective 1/1/2026)
C1783	Ocular implant, aqueous drainage assist device (HOPD device code)
L8612	Aqueous shunt (ASC/commercial device code)