

## Glaucoma Surgery

### Disclaimer

*Clinical guidelines are developed and adopted to establish evidence-based clinical criteria for utilization management decisions. Clinical guidelines are applicable according to policy and plan type. The Plan may delegate utilization management decisions of certain services to third parties who may develop and adopt their own clinical criteria.*

*Coverage of services is subject to the terms, conditions, and limitations of a member's policy, as well as applicable state and federal law. Clinical guidelines are also subject to in-force criteria such as the Centers for Medicare & Medicaid Services (CMS) national coverage determination (NCD) or local coverage determination (LCD) for Medicare Advantage plans. Please refer to the member's policy documents (e.g., Certificate/Evidence of Coverage, Schedule of Benefits, Plan Formulary) or contact the Plan to confirm coverage.*

### Summary

Glaucoma is a medical condition where increased eye pressure on the optic nerve responsible for vision leads to peripheral vision loss and can ultimately lead to blindness. It is the leading cause of blindness in people over the age of 60. The most common subtype is called open-angle glaucoma, where the optic nerve is gradually damaged. This was historically thought to be a result of the gradual buildup of intraocular pressure due to problems with the drainage system of the eye. More recently, it has been better defined as progressive atrophy of the optic nerve head with or without elevated intraocular pressure. The second subtype is angle-closure glaucoma, where the drainage system is completely and often acutely blocked, resulting in a more rapid increase in pressure and sudden-onset symptoms. Most people with glaucoma are not aware of the symptoms until the disease has progressed significantly. Diagnosis is usually performed by an ophthalmologist and at-risk patients may require regular screening exams. For most patients, treatment with oral and/or topical medications is adequate to control the intraocular pressure, however some patients may require more aggressive primary therapies. For patients who continued to have elevated pressure despite appropriate medical therapy, a number of surgical or minimally invasive options are available for treatment. This guideline provides clinical criteria, exclusions, and details for the surgical and minimally invasive treatment of glaucoma. These procedures should be performed by a licensed ophthalmologist with expertise in the selected procedure.

## Definitions

“Intraocular Pressure” (i.e., IOP) is the pressure that is generated by the fluid inside of the eye known as “Aqueous Humor.”

“Trabecular Meshwork” is a structure in the anterior portion of the eye that drains the aqueous humor via a structure called Schlemm’s canal and into the general blood circulation.

“Optic Nerve” is the nerve responsible for vision. When compressed or damaged, visual loss may occur.

“Glaucoma” is an irreversible condition where damage occurs to the optic nerve resulting in visual impairment. Risk factors include increased intraocular pressure, obesity, high blood pressure, and family history. There are different types of glaucoma (e.g., open-angle, closed-angle, secondary glaucoma). Open-angle glaucoma (most common) is thought to occur when the fluid in the eye drains through the trabecular network too slowly, resulting in slow increase in pressure, although it can be associated with normal intraocular pressures as well. Acute-angle glaucoma occurs when the iris blocks the trabecular meshwork, resulting in rapid increase in pressure and more sudden and severe symptoms. The specific treatments for each type of glaucoma differ, however, the goal is to reduce intraocular pressure in both and treat any other underlying conditions.

“American Academy of Ophthalmology Glaucoma Severity Scale”, which provides guidance in determining the appropriate treatment interventions (medical vs. surgical) to control intraocular pressure:

- Mild: Optic nerve abnormalities consistent with glaucoma and a normal visual field as tested with standard automated perimetry
- Moderate: Optic nerve abnormalities consistent with glaucoma and visual field abnormalities in one hemifield that are not within 5 degrees of fixation as tested with standard automated perimetry
- Severe: Optic nerve abnormalities consistent with glaucoma and visual field abnormalities in both hemifields and/or loss within 5 degrees of fixation in at least one hemifield as tested with standard automated perimetry

“Trabeculoplasty” is a laser treatment for open-angle glaucoma where the structure of the trabecular meshwork is disrupted to improve drainage of aqueous humor, most often using an argon laser (“Argon Laser Trabeculoplasty” or “ALT”). It can also be performed as “selective laser trabeculoplasty” or “SLT”, where a different type of laser is used that is considered to cause less scarring inside the eyeball.

“Trabeculectomy” is a surgical procedure similar to trabeculoplasty, except that instead of laser treatment, a small part of the trabecular meshwork is surgically opened so that the fluid can exit the intraocular system and drain into a subconjunctival bleb.

“Ab interno trabeculotomy” is a surgical procedure where a small portion of the trabecular meshwork is surgically ablated to improve the outflow of intraocular fluid.

“Laser Iridotomy” is a laser treatment for closed or narrow acute-angle glaucoma to create a small opening in the iris to reduce the intraocular pressure.

“Laser Iridoplasty” is a procedure using laser energy to shrink the peripheral iris; also called goniotomy.

“Iridectomy” is the surgical removal of part of the iris.

“Glaucoma Drainage Implants or Aqueous Shunts” are small implants or gel-like substances used to relieve pressure inside anterior chamber by shunting the aqueous humor elsewhere in an effort to reduce intraocular pressure.

“Canaloplasty” is considered one of the non-penetrating procedures for glaucoma, where a small incision is made and a microcatheter is inserted to open up the canal of Schlemm in order to reduce intraocular pressure.

“Viscocalostomy” is similar to canaloplasty except that instead of a microcatheter, a viscous gel-like substance is injected to open the canal. It also differs in that the canal is only partially opened, where it is fully expanded in canaloplasty.

“Ocular Drug-Eluting Stents or Implants” include an array of procedures and devices that are implanted into or onto structures of the eye to automatically release ocular medications directly.

“Cyclodestruction” or “Cyclophotocoagulation” refers to the use of laser or endoscopic intervention to decrease the rate of aqueous fluid production through destruction of ciliary body function.

“Minimally invasive glaucoma surgery” (MIGS) refers to several newer types of glaucoma surgery that aim to be safer than traditional incisional glaucoma surgery by avoiding conjunctival dissection. Current approaches to MIGS include: increasing trabecular outflow (Trabectome, iStent, Hydrus stent, gonioscopy-assisted transluminal trabeculotomy, excimer laser trabeculotomy); reducing aqueous production (endocyclophotocoagulation); and subconjunctival filtration (XEN gel stent). Most MIGS procedures are combined with cataract surgery.

## Clinical Indications

### General Criteria

The Plan considers surgery or procedures medically necessary for glaucoma when ALL of the following are met:

1. The procedure or surgery is ONE of the following:
  - a. Selective or argon laser trabeculoplasty; *or*
  - b. Surgical trabeculoplasty; *or*
  - c. Surgical trabeculectomy; *or*

- d. Trabeculectomy and associated fistulization procedures, with or without stents or drainage device such as:
    - i. Ahmed glaucoma valve implant; *or*
    - ii. Baerveldt tube shunt; *or*
    - iii. Molteno implant; *or*
    - iv. XEN 45 Gel Stent / XEN Glaucoma Treatment System; *or*
  - e. ExPRESS mini glaucoma shunt; *or*
    - i. *Note: Adjunctive use of antifibrotic agents with ExPRESS mini shunt are considered medically necessary*
  - f. Krupin-Denver eye valve; *and*
2. The member has a documented diagnosis of primary open-angle glaucoma; *and*
  3. An adequate trial of first-line (e.g., latanoprost or timolol) AND second-line (e.g., brimonidine or dorzolamide) medications have failed to control intraocular pressure.
    - a. *Note: Members who are unlikely to be compliant with topical therapy, those with severe visual deficits at baseline, or those with specific contraindications to appropriate medication classes listed above, may qualify for laser trabeculoplasty as a first-line treatment when documented by the treating physician.*

#### Hydrus Microstent

The Plan considers the FDA-approved Hydrus microstent with one stent per eye medically necessary when ALL of the following are met:

1. General Criteria for glaucoma (above) are met OR MCG criteria (A-0190) for cataract removal are met; *and*
2. The member has mild to moderate primary open angle glaucoma; *and*
3. Cataract in the same eye as the glaucoma; *and*
4. Current treatment with at least one ocular hypotensive medication(s); *and*
5. The Hydrus Microstent is performed simultaneous to the cataract surgery; *and*
6. None of the following contraindications have been identified:
  - a. Primary or secondary angle-closure glaucoma; *or*
  - b. Noticeable birth irregularities on the front of the eye; *or*
  - c. Malignant glaucoma; *or*
  - d. Neovascular glaucoma; *or*
  - e. Traumatic glaucoma; *or*
  - f. Uveitic glaucoma or inflammation of eye tissue (uvea).

#### iStent Procedure

The Plan considers the FDA-approved original iStent Trabecular Micro-Bypass model (Models GTS100R and GTS100L) with one stent per eye medically necessary when ALL of the following are met:

1. General Criteria for glaucoma (above) are met OR MCG criteria (A-0190) for cataract removal are met; *and*
2. The member has mild to moderate primary open angle glaucoma; *and*

3. Cataract in the same eye as the glaucoma; *and*
4. Current treatment with at least one ocular hypotensive medication(s); *and*
5. The iStent Procedure is performed simultaneous to the cataract surgery; *and*
6. None of the following contraindications have been identified:
  - a. Primary or secondary angle-closure glaucoma; *or*
  - b. Neovascular glaucoma; *or*
  - c. Retrobulbar tumor; *or*
  - d. Thyroid eye disease; *or*
  - e. Sturge-Weber syndrome or port-wine stain involving the eye.

The Plan considers the FDA-approved second generation model iStent Inject Trabecular Micro-Bypass G2 (Model G2-M-IS) for two stents per eye medically necessary when ALL of the following are met:

1. General Criteria for glaucoma (above) are met OR MCG criteria (A-0190) for cataract removal are met; *and*
2. The member has mild to moderate primary open angle glaucoma; *and*
3. Cataract in the same eye as the glaucoma; *and*
4. Current treatment with at least one ocular hypotensive medication(s); *and*
5. The iStent Procedure is performed simultaneous to the cataract surgery; *and*
6. None of the following contraindications have been identified:
  - a. Primary or secondary angle-closure glaucoma; *or*
  - b. Quick or sudden increase in eye pressure; *or*
  - c. Inflammation of the eye tissue (uvea); *or*
  - d. Malignant or neovascular glaucoma (a severe form of glaucoma that is characterized by an abnormal growth of new blood vessels in the eye); *or*
  - e. Noticeable birth irregularities on the front of the eye; *or*
  - f. Orbital tumor (tumor in the eye socket); *or*
  - g. Thyroid eye disease; *or*
  - h. Sturge-Weber Syndrome (neurological/nerve disorder marked by a distinctive port-wine stain on the forehead, scalp or around the eye); *or*
  - i. Any other type of condition that may cause elevated pressure in the veins of the eye (episcleral venous pressure)

#### XEN 45 Gel Stent / XEN Glaucoma Treatment System

The member has refractory primary open-angle glaucoma, pseudoexfoliative or pigmentary glaucoma (PEX) with open angles that are unresponsive to alternative treatment as defined by:

1. The failure, intolerance or contraindication to conventional medical (maximum tolerated medical therapy of ocular hypotensive medications) and surgical treatment for reduction of intraocular pressure; *and*
2. No more than one XEN 45 Gel Stent per eye.

For the following procedures, the member meets medical necessity when the member meets the criteria below (General Criteria not required):

### Canaloplasty

The Plan considers canaloplasty (ab externo) medically necessary when ALL of the following are met:

1. An adequate trial of first-line (e.g. latanoprost or timolol) AND second-line (e.g. brimonidine or dorzolamide) medications have failed to control intraocular pressure; *and*
2. The member is not a candidate for the above medically necessary procedures (a-h) due to specific contraindications, is high-risk due to other comorbidities, or has an anatomical abnormality; *and*
3. The procedure is performed by a physician with expertise in the procedure and the appropriate instrumentation.
4. None of the following contraindications have been identified:
  - a. Chronic angle closure; *or*
  - b. Narrow angles; *or*
  - c. Angle recession; *or*
  - d. Neovascular glaucoma; *or*
  - e. Ocular hypertension due to increased episcleral venous pressure; *or*
  - f. Previous surgery that precludes Schlemm's canal cannulation such as trabeculectomy, trabeculotomy, goniotomy, and argon laser trabeculoplasty.

### Cyclophotocoagulation

The Plan considers cyclophotocoagulation (either transscleral CPC or endoscopic) medically necessary when at least ONE of the following criteria are met:

1. Member is a poor candidate for glaucoma filtration surgery or drainage implant due to comorbidities or contraindications; *or*
2. Pain relief is desired due to elevated IOP in a blind, painful eye; *or*
3. Elevated IOP in an eye with poor vision or poor visual potential; *or*
4. Glaucoma refractory to first and second line treatment as defined in General Criteria above.

### Laser (nd:YAG) Iridotomy

The Plan considers thermal or laser (nd:YAG) iridotomy medically necessary when at least ONE of the following criteria is met:

1. Treatment of an eye with acute angle closure glaucoma, acute angle closure crisis, or primary chronic angle closure; *or*
2. Treatment of the contralateral eye when the other eye has had an episode of angle closure AND the chamber angle is anatomically narrow in the contralateral eye; *or*
3. Treatment of an eye with symptoms of intermittent angle closure AND gonioscopy demonstrates an anatomically narrow chamber angle.

## Laser Iridoplasty and Surgical Iridectomy

The Plan considers laser iridoplasty or surgical iridectomy medically necessary when at least ONE of the following criteria is met:

1. Treatment of an eye with acute angle closure crisis (AACC) when laser iridotomy is not possible;  
*or*
2. Treatment of an eye with AACC that cannot be medically broken.

## iDose TR (travoprost intracameral implant) and Durysta (bimatoprost intracameral implant)

1. For requests related to iDose TR (travoprost intracameral implant), please see Oscar Clinical Guideline: iDose TR (travoprost intracameral implant) (CG115).
2. For requests related to Durysta (bimatoprost intracameral implant), please see Oscar Clinical Guideline: Durysta (bimatoprost intracameral implant) (CG116).

## Experimental or Investigational / Not Medically Necessary

The Plan does NOT consider medically necessary procedures or surgeries which are experimental, unproven, or investigational, including, but not limited to, the following:

1. Transciliary filtration (e.g. Fugo Blade, Singh Filtration)
  - a. *Rationale:* The evidence for the Singh Filtration procedure and the updated version (Fugo Blade) are limited to case series and reports on feasibility by the primary author. Further large-scale, randomized trials with long-term outcomes and comparison to validated techniques are required to guide clinical implementation.
2. Glaucoma drainage devices or stents that are not FDA approved, including, but not limited to, the following:
  - a. EyePass Glaucoma Implant
  - b. DeepLight SOLX Gold Shunt
  - c. iStent G3 Supra
  - d. STARflo
  - e. Aquashunt
3. Certain drug-eluting implant or stent, including but not limited to the following, as they lack FDA-approval and there is insufficient peer-reviewed evidence for use in glaucoma:
  - a. OTX-DP
  - b. Bimatoprost SR
  - c. MicroPump
4. Beta radiation
  - a. *Rationale:* Kirwan et al (2009) performed a Cochrane review on beta radiation during trabeculectomy and found 4 trials randomizing 551 total patients. They concluded that there was a lower risk of failure but higher rates of cataract formation, and that direct comparisons to antimetabolite treatment were needed. Dhalia et al (2016) performed this direct comparison of beta radiation vs. 5-FU in 301 randomized patients in an

African population and found “no evidence of an important difference between the use of 5FU and beta radiation...”. Further, large-scale, randomized trials are needed to confirm any potential benefit with beta radiation in this setting.

5. Ab interno trabeculectomy (e.g., Trabectome)
  - a. *Rationale:* The literature on the efficacy, safety, and long-term outcomes of trabectome is insufficient and limited to case reports and small retrospective reviews. Kaplowitz et al (2016) performed a systematic review of 17 studies (12 case series, 5 retrospective) looking at ab interno trabeculectomy. 14 of the studies met the inclusion criteria. Average success rates ranged from 12-80%. At the present time, further evidence with prospective, large, randomized trials is required to determine the clinical application of this technique. Furthermore, the FDA has not approved the Trabectome for use in glaucoma and issued a warning letter to the company in 2014 regarding this application.<sup>73-78</sup>
6. Subconjunctival antivascular endothelial growth factor injections to control wound healing
  - a. *Rationale:* The clinical efficacy of these injections has not yet been established, limiting clinical use to the experimental and investigational setting.
7. Visco canalostomy
  - a. *Rationale:* There is a general lack of long-term randomized data on this procedure, and many of the existing studies demonstrate inferior efficacy in lowering IOP. Kobayashi et al (2003) compared visco canalostomy and trabeculectomy on lowering intraocular pressure in 25 patients with primary open-angle glaucoma, and found that visco canalostomy had fewer complications but was inferior at lowering IOP. They concluded that the role of this procedure needed further data to guide widespread clinical implementation. Studies by several other groups have found similar findings to the Kobayashi study. A meta-analysis by Chai et al (2010) looked at 10 randomized controlled trials comparing visco canalostomy with trabeculectomy and found the latter was superior in lowering IOP, reducing post-operative medication needs, and had a lower relative risk of perforation of Descemet membrane. Further long-term, randomized evidence is needed to define the clinical role of visco canalostomy.
8. iStent Procedure in the following circumstances, as it is considered experimental or investigational:
  - i. iStent Infinite- The iStent infinite® Trabecular Micro-Bypass System Model iS3 is an implantable device intended to reduce the intraocular pressure (IOP) of the eye with three micro stents placed in an eye. It is indicated for use in adult patients with primary open-angle glaucoma in whom previous medical and surgical treatment has failed and is the first standalone implantable alternative. There are no published trials, pending results from <https://clinicaltrials.gov/ct2/show/study/NCT03639870>, last checked 5/9/2024. There are no recommendations or guidelines from national society or international society guidelines specific to iStent infinite and furthermore, as a standalone procedure. FDA 510(k) clearance in 2022.



- ii. Children
- iii. Prior significant eye trauma
- iv. Abnormal anterior segment
- v. Eyes with chronic inflammation
- vi. Glaucoma associated with vascular disorders, uveitic glaucoma, pseudophakic glaucoma
- vii. Prior glaucoma surgery, including any type of trabeculoplasty
- viii. Medicated intraocular pressure >24 mmHg
- ix. Unmedicated intraocular pressure <22 or >36
- x. For implantation of more than one stent
- xi. After complications of cataract surgery

9. Cypass Micro-Stent

- a. *Rationale:* The Cypass Micro-Stent is considered experimental or investigational, as its safety and efficacy has not been established. The Cypass Micro-Stent was recalled by the FDA in 2018 due to concerns regarding significant endothelial cell loss and reductions in endothelial cell density (ECD).

Applicable Billing Codes (CPT/HCPCS/ICD-10 Codes)

CPT/HCPCS Codes considered medically necessary if criteria are met:	
<i>Code</i>	<i>Description</i>
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 (List separately in addition to code for primary procedure)
0474T	Insertion of anterior segment aqueous drainage device, with creation of intraocular reservoir, internal approach, into the supraciliary space
0671T	Insertion of anterior segment aqueous drainage device into the trabecular meshwork, without external reservoir, and without concomitant cataract removal, one or more
65850	Trabeculotomy ab externo
65855	Trabeculoplasty by laser surgery
66170	Fistulization of sclera for glaucoma; trabeculectomy ab externo in absence of previous surgery

66172	Fistulization of sclera for glaucoma; trabeculectomy ab externo with scarring from previous ocular surgery or trauma (includes injection of antifibrotic agents)
66174	Transluminal dilation of aqueous outflow canal (eg, canaloplasty); without retention of device or stent
66175	Transluminal dilation of aqueous outflow canal (eg, canaloplasty); with retention of device or stent
66179	Aqueous shunt to extraocular equatorial plate reservoir, external approach; without graft
66180	Aqueous shunt to extraocular equatorial plate reservoir, external approach; with graft
66183	Insertion of anterior segment aqueous drainage device, without extraocular reservoir, external approach
66184	Revision of aqueous shunt to extraocular equatorial plate reservoir; without graft
66185	Revision of aqueous shunt to extraocular equatorial plate reservoir; with graft
66710	Ciliary body destruction; cyclophotocoagulation, transscleral
66711	Ciliary body destruction; cyclophotocoagulation, endoscopic, without concomitant removal of crystalline lens
66720	Ciliary body destruction; cryotherapy
66761	Iridotomy/iridectomy by laser surgery (eg, for glaucoma) (per session)
66989	Extracapsular cataract removal with insertion of intraocular lens prosthesis (1-stage procedure), manual or mechanical technique (eg, irrigation and aspiration or phacoemulsification), complex, requiring devices or techniques not generally used in routine cataract surgery (eg, iris expansion device, suture support for intraocular lens, or primary posterior capsulorrhexis) or performed on patients in the amblyogenic developmental stage; with insertion of intraocular (eg, trabecular meshwork, supraciliary, suprachoroidal) anterior segment aqueous drainage device, without extraocular reservoir, internal approach, one or more
66991	Extracapsular cataract removal with insertion of intraocular lens prosthesis (1 stage procedure), manual or mechanical technique (eg, irrigation and aspiration or phacoemulsification); with insertion of intraocular (eg, trabecular meshwork, supraciliary, suprachoroidal) anterior segment aqueous drainage device, without extraocular reservoir, internal approach, one or more
C1783	Ocular implant, aqueous drainage assist device
L8612	Aqueous shunt

ICD-10 codes considered medically necessary if criteria are met:	
H40.1110 - H40.1194	Primary open-angle glaucoma
Additional ICD-10 codes <i>required</i> for iStent 66989, 66991, C1783 :	
H25.011 - H25.9	Age-related cataract
H26.001 - H26.9	Other cataract
ICD-10 codes considered medically necessary for thermal or laser iridotomy (66761) if criteria are met:	
H40.211 – H40.219	Acute angle-closure glaucoma

Additional CPT/HCPCS Codes considered medically necessary for products iDose TR (travoprost intracameral implant) if criteria are met in Oscar Clinical Guideline: iDose TR (travoprost intracameral implant) (CG115):	
<i>Code</i>	<i>Description</i>
0660T	Implantation of anterior segment intraocular nonbiodegradable drug-eluting system, internal approach
0661T	Removal and reimplantation of anterior segment intraocular nonbiodegradable drug-eluting implant
C9399	Unclassified drugs or biologicals
J3490	Unclassified drugs
Additional CPT/HCPCS Codes considered medically necessary for Durysta (bimatoprost intracameral implant) if criteria are met are met in Oscar Clinical Guideline: Durysta (bimatoprost intracameral implant) (CG116)	
<i>Code</i>	<i>Description</i>
66030	Injection, anterior chamber of eye (separate procedure); medication
J7351	Injection, bimatoprost, intracameral implant, 1 microgram

ICD-10 codes considered <i>not</i> medically necessary for canaloplasty (66174, 66175):	
H21.551 - H21.559	Recession of chamber angle
H40.031 - H40.039	Anatomical narrow angle
H40.051 - H40.059	Ocular hypertension
H40.2210 - H40.2294	Chronic angle-closure glaucoma
H40.50x0 - H40.53x4	Glaucoma secondary to other eye disorders
H40.89	Other specified glaucoma
ICD-10 codes considered experimental, investigational, or <i>not</i> medically necessary for the iStent or Hydrus Procedures (66989, 66991, C1783)	
C69.60 - C69.62	Malignant neoplasm of orbit
E05.00 - E05.01	Thyrotoxicosis with diffuse goiter
H04.021 - H04.029	Chronic dacryoadenitis
H04.031 - H04.039	Chronic enlargement of lacrimal gland
H04.411 - H04.419	Chronic dacryocystitis
H04.421 - H04.429	Chronic lacrimal canaliculitis
H05.10	Unspecified chronic inflammatory disorders of orbit
H20.10 - H20.13	Chronic iridocyclitis
H40.051 - H40.059	Ocular hypertension
H40.20x0 - H40.20x4	Primary angle-closure glaucoma
H40.31x1 - H40.33x4	Glaucoma secondary to eye trauma

H40.41x1 - H40.43x4	Glaucoma secondary to eye inflammation
H40.50x0 - H40.53x4	Glaucoma secondary to other eye disorders
H40.89	Other specified glaucoma
H59.011 - H59.099	Disorders of the eye following cataract surgery
Q85.8	Other phakomatoses, not elsewhere classified

CPT/HCPCS codes considered experimental, investigational, or <i>not</i> medically necessary for Glaucoma Surgery:	
<i>Code</i>	<i>Description</i>
65820	Goniotomy <ul style="list-style-type: none"> <li>• <u>Due to multiple procedure techniques represented by this CPT code, specific exclusions are indicated:</u></li> <li>• When this code is billed for ab interno trabeculectomy it is considered experimental/investigational</li> </ul>
66174	Transluminal dilation of aqueous outflow canal (eg, canaloplasty); without retention of device or stent <ul style="list-style-type: none"> <li>• <u>Due to multiple procedure techniques represented by this CPT code, specific exclusions are indicated:</u></li> <li>• When this code is billed for viscocanalostomy, it is considered experimental/investigational</li> </ul>
66999	Unlisted procedure, anterior segment of eye <ul style="list-style-type: none"> <li>• <u>Due to multiple procedure techniques represented by this CPT code, specific exclusions are indicated:</u></li> <li>• When this code is billed for Trabectome, Viscocanalostomy, Transciliary fistulization/filtration, it is considered experimental/investigational</li> </ul>
0253T	Insertion of anterior segment aqueous drainage device, without extraocular reservoir, internal approach, into the suprachoroidal space <ul style="list-style-type: none"> <li>• <u>Due to multiple products represented by this CPT code, specific exclusions are indicated:</u></li> <li>• When this code is billed for Cypass Micro-Stent or iStent Supra it is considered experimental/investigational.</li> </ul>
0444T	Initial placement of a drug-eluting ocular insert under one or more eyelids, including fitting, training, and insertion, unilateral or bilateral

0445T	Subsequent placement of a drug-eluting ocular insert under one or more eyelids, including re-training, and removal of existing insert, unilateral or bilateral
0671T	<p>Insertion of anterior segment aqueous drainage device into the trabecular meshwork, without external reservoir, and without concomitant cataract removal, one or more</p> <ul style="list-style-type: none"> <li>• <u>Due to multiple products represented by this CPT code, specific exclusions are indicated:</u></li> <li>• When this code is billed for iStent Infinite, it is considered experimental/investigational</li> </ul>
68841	Insertion of drug-eluting implant, including punctal dilation when performed, into lacrimal canaliculus, each

## References

1. American Academy of Ophthalmology Glaucoma Panel. Primary open-angle glaucoma. Preferred Practice Pattern. San Francisco, CA: American Academy of Ophthalmology; 2015.
2. American Academy of Ophthalmology. Primary Angle Closure. Preferred Practice Pattern. San Francisco, CA: American Academy of Ophthalmology; 2016.
3. Barton K, Gedde SJ, Budenz DL, et al; Ahmed Baerveldt Comparison Study Group. The Ahmed Baerveldt Comparison Study methodology, baseline patient characteristics, and intraoperative complications. *Ophthalmology*. 2011;118(3):435-442.
4. Boland MV, Ervin AM, Friedman DS, et al. Comparative effectiveness of treatments for open-angle glaucoma: A systematic review for the U.S. Preventive Services Task Force. *Ann Intern Med*. 2013;158(4):271-279.
5. Buchacra O, Duch S, Milla E, Stirbu O. One-year analysis of the iStent trabecular microbypass in secondary glaucoma. *Clin Ophthalmol*. 2011;5:321-326.
6. Burr J, Azuara-Blanco A, Avenell A, Tuulonen A. Medical versus surgical interventions for open angle glaucoma. *Cochrane Database Syst Rev*. 2012;9:CD004399.
7. Bussel II, Kaplowitz K, Schuman JS, et al. Outcomes of ab interno trabeculectomy with the trabectome after failed trabeculectomy. *Br J Ophthalmol*. 2015;99(2):258-262.
8. Cheng JW, Wei RL, Cai JP, Li Y. Efficacy and tolerability of nonpenetrating filtering surgery with and without implant in treatment of open angle glaucoma: A quantitative evaluation of the evidence. *J Glaucoma*. 2009;18(3):233-237.
9. Chou, R., Selph, S., Blazina, I., Bougatsos, C., Jungbauer, R., Fu, R., ... & Tehrani, S. (2022). Screening for glaucoma in adults: updated evidence report and systematic review for the US Preventive Services Task Force. *Jama*, 327(20), 1998-2012.
10. Chou, R., Selph, S., Blazina, I., Bougatsos, C., Jungbauer, R., Fu, R., ... & Tehrani, S. (2022). Screening for Glaucoma in Adults: A Systematic Review for the US Preventive Services Task Force.
11. Christakis PG, Tsai JC, Kalenak JW, et al. The Ahmed versus Baerveldt study: Three-year treatment outcomes. *Ophthalmology*. 2013;120(11):2232-2240.

12. Dorairaj, S. K., Seibold, L. K., Radcliffe, N. M., Aref, A. A., Jimenez-Román, J., Lazcano-Gomez, G. S., ... & Berdahl, J. P. (2018). 12-month outcomes of goniotomy performed using the kahook dual blade combined with cataract surgery in eyes with medically treated glaucoma. *Advances in therapy*, 35(9), 1460-1469.
13. Do, A., McGlumphy, E., Shukla, A., Dangda, S., Schuman, J. S., Boland, M. V., ... & Craven, E. R. (2021). Comparison of clinical outcomes with open versus closed conjunctiva implantation of the XEN45 Gel Stent. *Ophthalmology Glaucoma*, 4(4), 343-349.
14. Eldaly MA, Bunce C, Elsheikha OZ, Wormald R. Non-penetrating filtration surgery versus trabeculectomy for open-angle glaucoma. *Cochrane Database Syst Rev*. 2014;2:CD007059.
15. Eldaly MA, Bunce C, Elsheikha OZ, Wormald R. Non-penetrating filtration surgery versus trabeculectomy for open-angle glaucoma. *Cochrane Database Syst Rev*. 2014;2:CD007059.
16. FDA. UPDATE: Potential Eye Damage from Alcon CyPass Micro-Stent Used to Treat Open-Angle Glaucoma: FDA Safety Communication. FDA.gov.  
<https://www.fda.gov/medical-devices/safety-communications/update-potential-eye-damage-alcon-cypass-micro-stent-used-treat-open-angle-glaucoma-fda-safety> Updated August 2019.
17. Fea AM, Belda JI, Rekas M, et al. Prospective unmasked randomized evaluation of the iStent inject® versus two ocular hypotensive agents in patients with primary open-angle glaucoma. *Clin Ophthalmol*. 2014; 8:875-882.
18. Filippopoulos T, Rhee DJ. Novel surgical procedures in glaucoma: Advances in penetrating glaucoma surgery. *Curr Opin Ophthalmol*. 2008;19(2):149-154.
19. Francis BA, Singh K, Lin SC, et al. Novel glaucoma procedures: A report by the American Academy of Ophthalmology. *Ophthalmology*. 2011;118(7):1466-1480.
20. Francis BA, Singh K, Lin SC, et al. Novel glaucoma procedures: A report by the American Academy of Ophthalmology. *Ophthalmology*. 2011;118(7):1466-1480.
21. Francis BA, Winarko J. Ab interno Schlemm's canal surgery: Trabectome and i-stent. *Dev Ophthalmol*. 2012;50:125-136.
22. Ghate D, Wang X. Surgical interventions for primary congenital glaucoma. *Cochrane Database Syst Rev*. 2015;1:CD008213.
23. Gillmann, K., Bravetti, G. E., Rao, H. L., Mermoud, A., & Mansouri, K. (2021). Combined and stand-alone XEN 45 gel stent implantation: 3-year outcomes and success predictors. *Acta ophthalmologica*, 99(4), e531-e539.
24. Green E, Wilkins M, Bunce C, Wormald R. 5-Fluorouracil for glaucoma surgery. *Cochrane Database Syst Rev*. 2014;2:CD001132.
25. Grieshaber MC, Fraenkl S, Schoetzau A, et al. Circumferential viscocanalostomy and suture canal distension (canaloplasty) for whites with open-angle glaucoma. *J Glaucoma*. 2011; 20(5):298-302.
26. Grieshaber MC, Peckar C, Pienaar A, et al. Long-term results of up to 12 years of over 700 cases of viscocanalostomy for open-angle glaucoma. *Acta Ophthalmol*. 2015; 93(4):362-367.
27. Grieshaber MC, Pienaar A, Olivier J, Stegmann R. Canaloplasty for primary open-angle glaucoma: long-term outcome. *Br J Ophthalmol*. 2010; 94(11):1478-1482.

28. Grover D, Kersten-Gomez I, Reitsamer H, Sheybani A. Describing the development of a minimally invasive collagen stent for treating glaucoma: first 975 eyes treated with the Xen Gel stent. Paper presented at: The 26th Annual AGS Meeting; March 3, 2016; Ft. Lauderdale, FL.
29. Hayes, Inc. Evolving Evidence Review. *Durysta (Allergan) Implant for Treatment of Glaucoma*. Lansdale, PA: Hayes, Inc.; Feb 2, 2022.
30. Heijl A, Leske MC, Bengtsson B, et al. Reduction of intraocular pressure and glaucoma progression: results from the Early Manifest Glaucoma Trial. *Arch Ophthalmol*. 2002; 120(10):1268-1279.
31. Hirabayashi, M. T., Lee, D., King, J. T., Thomsen, S., & An, J. A. (2019). Comparison of surgical outcomes of 360 circumferential trabeculotomy versus sectoral excisional goniotomy with the Kahook Dual Blade at 6 months. *Clinical Ophthalmology (Auckland, NZ)*, 13, 2017.
32. Hong CH, Arosemena A, Zurakowski D, Ayyala RS. Glaucoma drainage devices: a systematic literature review and current controversies. *Surv Ophthalmol*. 2005; 50(1):48-60.
33. Hayes, Emerging Technology Report. iStent infinite Trabecular Micro-Bypass System for Open-Angle Glaucoma. Lansdale, PA: Hayes, Inc.; Aug 2022.
34. Hayes, Inc. Health Technology Assessment. Canaloplasty for Open-Angle Glaucoma. Lansdale, PA: Hayes, Inc.; Apr 6, 2023.
35. Hayes, Inc. Health Technology Assessment. iStent inject Trabecular Micro-Bypass Stent (Glaukos Corp.) in Combination with Cataract Surgery for Management of Open-Angle Glaucoma. Lansdale, PA: Hayes, Inc.; Oct 2020.
36. Hayes, Inc. Health Technology Assessment. *iStent Inject Trabecular Micro-Bypass Stent (Glaukos Corp.) as a Standalone Procedure for Open-Angle Glaucoma*. Lansdale, PA: Hayes, Inc.; Jan 2021.
37. Hayes, Inc. Health Technology Assessment. *XEN Glaucoma Treatment System (Allergan) for Treatment of Open-Angle Glaucoma*. Lansdale, PA: Hayes, Inc.; Apr 2023.
38. Jacobs DS. Open-angle glaucoma: Treatment. UpToDate [online serial]. Waltham, MA: UpToDate; Accessed May 2017.
39. Jacobs DS. Open-angle glaucoma: Treatment. UpToDate Inc., Waltham, MA. Last reviewed March 2016.
40. Jea SY, Francis BA, Vakili G, et al. Ab interno trabeculectomy versus trabeculectomy for open-angle glaucoma. *Ophthalmology*. 2012;119(1):36-42.
41. Jordan JF, Engels BF, Dinslage S, et al. A novel approach to suprachoroidal drainage for the surgical treatment of intractable glaucoma. *J Glaucoma*. 2006; 15(3):200-205.
42. Kaplowitz K, Bussel II, Honkanen R, et al. Review and meta-analysis of ab-interno trabeculectomy outcomes. *Br J Ophthalmol*. 2016 Jan 5
43. Ke M, Guo J, Qian Z. Meta analysis of non-penetrating trabecular surgery versus trabeculectomy for the treatment of open angle glaucoma. *J Huazhong Univ Sci Technolog Med Sci*. 2011;31(2):264-270.
44. Kennedy JB, SooHoo J, Seibold LK, et al. Suprachoroidal Devices. Eyewiki.aao.org [https://eyewiki.aao.org/Suprachoroidal\\_Devices#iStent\\_Suprachoroidal\\_Bypass\\_System\\_28iStent\\_Supra.29](https://eyewiki.aao.org/Suprachoroidal_Devices#iStent_Suprachoroidal_Bypass_System_28iStent_Supra.29) Updated April 2020.



45. Kim DM, Lim KH. Aqueous shunts: Single-plate Molteno vs ACTSEB. *Acta Ophthalmol Scand*. 1995;73(3):277-280.
46. Kirwan JF, Rennie C, Evans JR. Beta radiation for glaucoma surgery. *Cochrane Database Syst Rev*. 2009;(2):CD003433.
47. Kobayashi H, Kobayashi K, Okinami S. A comparison of the intraocular pressure-lowering effect and safety of viscocanalostomy and trabeculectomy with mitomycin C in bilateral open-angle glaucoma. *Graefes Arch Clin Exp Ophthalmol*. 2003; 241(5):359-366.
48. Lewis RA, von Wolff K, Tetz M, et al. Canaloplasty: circumferential viscodilation and tensioning of Schlemm's canal using a flexible microcatheter for the treatment of open-angle glaucoma in adults: interim clinical study analysis. *J Cataract Refract Surg*. 2007; 33(7):1217-1226.
49. Lewis RA, von Wolff K, Tetz M, et al. Canaloplasty: circumferential viscodilation and tensioning of Schlemm canal using a flexible microcatheter for the treatment of open-angle glaucoma in adults: two-year interim clinical study results. *J Cataract Refract Surg*. 2009; 35(5):814-824.
50. Lewis RA, von Wolff K, Tetz M, et al. Canaloplasty: three-year results of circumferential viscodilation and tensioning of Schlemm canal using a microcatheter to treat open-angle glaucoma. *J Cataract Refract Surg*. 2011; 37(4):682-690.
51. Malvankar-Mahta MS, Iordanous Y, Chen YN, et al. iStent with phacoemulsification versus phacoemulsification alone for patients with glaucoma and cataract: a meta-analysis. *PLoS One*. 2015; 10(7):e0131770.
52. Maris P, Ishida K, Natland P. Comparison of trabeculectomy with Ex-PRESS miniature glaucoma device implanted under sclera. *J Glaucoma*. 2007; 16(1):14-19.
53. Matlach J, Dhillon C, Hain J, et al. Trabeculectomy versus canaloplasty (TVC study) in the treatment of patients with open-angle glaucoma: a prospective randomized clinical trial. *Acta Ophthalmol*. 2015; 93(8):753-761.
54. Matlach J, Klink T. Trabeculectomy versus canaloplasty. *Ophthalmologe*. 2015;112(4):325-331.
55. Melamed S, Fiore PM. Molteno implant surgery in refractory glaucoma. *Surv Ophthalmol*. 1990;34(6):441-448.
56. Minckler DS, Francis BA, Hodapp EA, et al. Aqueous shunts in glaucoma: A report by the American Academy of Ophthalmology. *Ophthalmology*. 2008;115(6):1089-1098.
57. Minckler DS, Hill RA. Use of novel devices for control of intraocular pressure. *Exp Eye Res*. 2009;88(4):792-798.
58. Moradian K, Daneshvar R, Saffarian L, et al. The efficacy of viscocanalostomy for uncontrollable primary open-angle glaucoma in a developing country. *Indian J Ophthalmol*. 2013;61(2):71-73.
59. Mosaed S, Dustin L, Minckler DS. Comparative outcomes between newer and older surgeries for glaucoma. *Trans Am Ophthalmol Soc*. 2009; 107:127-133.
60. Musch DC, Gillespie BW, Niziol LM, et al. Intraocular pressure control and long-term visual loss in the Collaborative Initial Glaucoma Treatment Study. *Ophthalmology*. 2011; 118(9):1766-1773.
61. Myers JS, Masood I, Hornbeak DM, et al. Prospective evaluation of two iStent® trabecular stents, one iStent supra® suprachoroidal stent, and postoperative prostaglandin in refractory glaucoma: 4-year outcomes. *Adv Ther*. 2018;35(3):395-407.

62. Neuhann TH. Trabecular micro-bypass stent implantation during small-incision cataract surgery for open-angle glaucoma or ocular hypertension: long-term results. *J Cataract Refract Surg.* 2015; 41:2664-2671.
63. Otarola F, Virgili G, Shah A, et al. Ab interno trabecular bypass surgery with Schlemm's canal Microstent (Hydrus) for open angle glaucoma. *Cochrane Database Syst Rev.* 2020;3(3):CD012740.
64. Patel I, de Klerk TA, Au L. Manchester iStent study: early results from a prospective UK case series. *Clin Experiment Ophthalmol.* 2013; 41(7):648-652.
65. Price FW Jr, Wellemeier M. Long-term results of Molteno implants. *Ophthalmic Surg.* 1995;26(2):130-135.
66. Rauchegger, T., Angermann, R., Willeit, P., Schmid, E., & Teuchner, B. (2021). Two-year outcomes of minimally invasive XEN Gel Stent implantation in primary open-angle and pseudoexfoliation glaucoma. *Acta Ophthalmologica*, 99(4), 369-375..
67. Rulli E, Biagioli E, Riva I, et al. Efficacy and safety of trabeculectomy vs nonpenetrating surgical procedures: a systematic review and meta-analysis. *JAMA Ophthalmol.* 2013; 131(12):1573-1582.
68. Russo V, Scott IU, Stella A, et al. Nonpenetrating deep sclerectomy with reticulated hyaluronic acid implant versus punch trabeculectomy: a prospective clinical trial. *Eur J Ophthalmol.* 2008; 18(5):751-757.
69. Samples JR, Singh K, Lin SC, et al. Laser trabeculoplasty for open-angle glaucoma: A report by the American Academy of Ophthalmology. *Ophthalmology.* 2011;118(11):2296-2302.
70. Samuelson TW, Katz LJ, Wells JM, et al. Randomized evaluation of the trabecular micro-bypass stent with phacoemulsification in patients with glaucoma and cataract. *Ophthalmology.* 2011; 118(3):459-467.
71. Sarkisian, S. R., Grover, D. S., Gallardo, M. J., Brubaker, J. W., Giamporcaro, J. E., Hornbeak, D. M., ... & iStent infinite Study Group. (2023). Effectiveness and Safety of iStent Infinite Trabecular Micro-Bypass for Uncontrolled Glaucoma. *Journal of Glaucoma*, 32(1), 9-18.
72. Shingleton B, Tetz M, Korber N. Circumferential viscodilation and tensioning of Schlemm canal (canaloplasty) with temporal clear corneal phacoemulsification cataract surgery for open-angle glaucoma and visually significant cataract: one-year results. *J Cataract Refract Surg.* 2008; 34(3):433-440.
73. Smith MF, Doyle JW, Sherwood MB. Comparison of the Baerveldt glaucoma implant with the double-plate Molteno drainage implant. *Arch Ophthalmol.* 1995;113(4):444-447.
74. Spiegel D, Wetzell W, Haffner DS, et al. Initial clinical experience with the trabecular micro-bypass stent in patients with glaucoma. *Adv Ther.* 2007; 24(1):161-170.
75. Tan YL, Chua J, Ho CL. Updates on the surgical management of pediatric glaucoma. *Asia Pac J Ophthalmol (Phila).* 2016;5(1):85-92.
76. Thomas R, Gieser SC, Billson F. Molteno implant surgery for advanced glaucoma. *Aust N Z J Ophthalmol.* 1995;23(1):9-15.
77. Uva MG, Longo A, Reibaldi M. Pneumatic trabeculoplasty versus argon laser trabeculoplasty in primary open-angle glaucoma. *Ophthalmologica.* 2010;224(1):10-15.

78. Wang H, Cheng JW, Wei RL, et al. Meta-analysis of selective laser trabeculoplasty with argon laser trabeculoplasty in the treatment of open-angle glaucoma. *Can J Ophthalmol*. 2013;48(3):186-192.
79. White TC. Aqueous shunt implant surgery for refractory glaucoma. *J Ophthalmic Nurs Technol*. 1996;15(1):7-13.
80. Wilson RP, Cantor L, Katz LJ, et al. Aqueous shunts. Molteno versus Schocket. *Ophthalmology*. 1992;99(5):672-676; discussion 676-678.
81. Widder, R. A., Dietlein, T. S., Dinslage, S., Kuhnrich, P., Rennings, C., & Rössler, G. (2018). The XEN45 Gel Stent as a minimally invasive procedure in glaucoma surgery: success rates, risk profile, and rates of resurgery after 261 surgeries. *Graefe's Archive for Clinical and Experimental Ophthalmology*, 256(4), 765- 771.
82. Yalvac IS, Sahin M, Eksioğlu U, et al. Primary viscocanalostomy versus trabeculectomy for primary open-angle glaucoma: three-year prospective randomized clinical trial. *J Cataract Refract Surg*. 2004; 30(10):2050-2057.
83. Zhang ML, Hirunyachote P, Jampel H. Combined surgery versus cataract surgery alone for eyes with cataract and glaucoma. *Cochrane Database Syst Rev*. 2015;7:CD008671.
84. Singh D, Verma A, Singh M. Transciliary filtration for intractable glaucoma. *Trans Ophthalmol. Soc U K*. 1979;99(1):92-95.
85. Singh D, Verma A, Singh M. Transciliary filtration for intractable glaucoma. *Indian J Ophthalmol*. 1981;29(3):157-160.
86. Singh D, Singh, K. Transciliary filtration using the fugo blade. *Ann Ophthalmol*. 2002;34(3):183-187.
87. Lewis RA. Ab interno approach to the subconjunctival space using a collagen glaucoma stent. *J Cataract Refract Surg*. 2014 Aug;40(8):1301-6
88. Galal A, Bilgic A, Eltanamly R, Osman A. XEN Glaucoma Implant with Mitomycin C 1-Year Follow-Up: Result and Complications. *J Ophthalmol*. 2017;2017:5457246.
89. Pérez-torregrosa VT, Olate-pérez Á, Cerdà-ibáñez M, et al. Combined phacoemulsification and XEN45 surgery from a temporal approach and 2 incisions. *Arch Soc Esp Oftalmol*. 2016;91(9):415-21.
90. Olate-pérez Á, Pérez-torregrosa VT, Gargallo-benedicto A, et al. Prospective study of filtering blebs after XEN45 surgery. *Arch Soc Esp Oftalmol*. 2017;
91. Dhalla K, Cousens S, Bowman R, Wood M, Murdoch I. Is Beta Radiation Better than 5-Fluorouracil as an Adjunct for Trabeculectomy Surgery When Combined with Cataract Surgery? A Randomised Controlled Trial. *PLoS ONE*. 2016;11(9):e0161674.
92. Kirwan JF, Rennie C, Evans JR. Beta radiation for glaucoma surgery. *Cochrane Database Syst Rev*. 2009;(2):CD003433.
93. Bussell II, Kaplowitz Z, Schuman JS, Loewen N1; Trabectome Study Group. Outcomes of ab interno trabeculectomy with the trabectome after failed trabeculectomy. *Br J Ophthalmol*. 2015 Feb;99(2):258-62.
94. Gazzard G, Konstantakopoulou E, Garway-Heath D, et al. Selective Laser Trabeculoplasty Versus Eye Drops for First-Line Treatment of Ocular Hypertension and Glaucoma (LiGHT): A Multicentre

- Randomised Controlled Trial. *Lancet*. 2019;393(10180):1505-1516.  
doi:10.1016/S0140-6736(18)32213-X
95. Hu K, Gazzard G, Bunce C, Wormald R. Ab interno trabecular bypass surgery with Trabectome for open angle glaucoma. *Cochrane Database of Systematic Reviews* 2016, Issue 8. Art. No.: CD011693.
  96. Kaplowitz K, Bussell II, Honkanen R, Schuman JS, Loewen NA. Review and meta-analysis of ab-interno trabeculectomy outcomes. *Br J Ophthalmol*. 2016;100(5):594-600.
  97. Francis BA, Minckler D, Dustin L, Kawji S, Yeh J, Sit A, Mosaed S, Johnstone M; Trabectome Study Group. Combined cataract extraction and trabeculotomy by the internal approach for coexisting cataract and open-angle glaucoma: initial results. *J Cataract Refract Surg*. 2008 Jul;34(7):1096-103.
  98. Filippopoulos T, Rhee DJ. Novel surgical procedures in glaucoma: advances in penetrating glaucoma surgery. *Curr Opin Ophthalmol*. 2008 Mar;19(2):149-54.
  99. Pantcheva MB, Kahook MY. Ab interno trabeculectomy. *Middle East Afr J Ophthalmol*. 2010 Oct;17(4):287-9
  100. Carassa RG, Bettin P, Fiori M, Brancato R. Visco canalostomy versus trabeculectomy in white adults affected by open-angle glaucoma: a 2-year randomized, controlled trial. *Ophthalmology*. 2003;110(5):882-7.
  101. Lüke C, Dietlein TS, Jacobi PC, Konen W, Krieglstein GK. A prospective randomized trial of visco canalostomy versus trabeculectomy in open-angle glaucoma: a 1-year follow-up study. *J Glaucoma*. 2002;11(4):294-9.
  102. Jonescu-cuypers C, Jacobi P, Konen W, Krieglstein G. Primary visco canalostomy versus trabeculectomy in white patients with open-angle glaucoma: A randomized clinical trial. *Ophthalmology*. 2001;108(2):254-8.
  103. Nouredin BN, El-haibi CP, Cheikha A, Bashshur ZF. Visco canalostomy versus trabeculotomy ab externo in primary congenital glaucoma: 1-year follow-up of a prospective controlled pilot study. *Br J Ophthalmol*. 2006;90(10):1281-5.
  104. O'brart DP, Shiew M, Edmunds B. A randomised, prospective study comparing trabeculectomy with visco canalostomy with adjunctive antimetabolite usage for the management of open angle glaucoma uncontrolled by medical therapy. *Br J Ophthalmol*. 2004;88(8):1012-7.
  105. Chai C, Loon SC. Meta-analysis of visco canalostomy versus trabeculectomy in uncontrolled glaucoma. *Glaucoma*. 2010 Oct-Nov;19(8):519-27.
  106. Lichter PR, Musch DC, Gillespie BW, et al; CIGTS Study Group. Interim clinical outcomes in the Collaborative Initial Glaucoma Treatment Study comparing initial treatment randomized to medications or surgery. *Ophthalmology*. 2001;108(11):1943-1953.
  107. McIlraith I, Strasfeld M, Colev G, Hutnik CML. Selective laser trabeculoplasty as initial and adjunctive treatment for open-angle glaucoma. *J Glaucoma*. 2006;15(2):124-30.
  108. Rivier D, Paula JS, Kim E, et al. Glaucoma and keratoprosthesis surgery: Role of adjunctive cyclophotocoagulation. *J Glaucoma* 2009; 18(4):321-324.

109. Rotchford AP, Jayasawal R, Madhusuhan S, et al. Transscleral diode laser cycloablation in patients with good vision. *Br J Ophthalmol* 2010; 94(9):1180-1183.
110. Lin SC. Endoscopic and transcleral cyclophotocoagulation for the treatment of refractory glaucoma. *J Glaucoma* 2008; 17(3):238-247
111. Lima FE, Magacho L, Carvalho DM, et al. A prospective, comparative study between endoscopic cyclophotocoagulation and the Ahmed drainage implant in refractory glaucoma. *J Glaucoma* 2004; 13(3):233-237
112. Carter BC, Plager DA, Neely DE, et al. Endoscopic diode laser cyclophotocoagulation in the management of aphakic and pseudophakic glaucoma in children, *J AAPOS* 2007;11(1):34-40
113. Vold, et al. Two-Year COMPASS Trial Results: Supraciliary Microstenting with Phacoemulsification in Patients with Open-Angle Glaucoma and Cataracts. *Ophthalmology*. 2016 Oct;123(10):2103-12.
114. Hoeh, H. et al. Initial Clinical Experience With the CyPass Micro-Stent: Safety and Surgical Outcomes of a Novel Supraciliary Microstent. *J Glaucoma*. 2016 Jan;25(1):106-12.
115. Hoh, S. et al. Two-year clinical experience with the CyPass micro-stent: safety and surgical outcomes of a novel supraciliary micro-stent. *Klin Monbl Augenheilkd*. 2014 Apr;231(4):377-81.
116. Lai JS, Tham CC, Chan JC, et al. Diode laser transscleral cyclophotocoagulation in the treatment of chronic angle-closure glaucoma: a preliminary study. *J Glaucoma* 2003; 12:360-364
117. Yildirim N, Yalvic IS, Sahin A, et al. A comparative study between diode laser cyclophotocoagulation and the Ahmed glaucoma valve implant in neovascular glaucoma: a long-term follow-up. *J Glaucoma* 2009;18:192-196.
118. Kosoko O, Gaasterland DE, Pollack IP et al. Long-term outcome of initial ciliary ablation with contact diode laser transscleral cyclophotocoagulation for severe glaucoma. The Diode Laser Ciliary Ablation Study Group. *Ophthalmology* 1996;103(8): 1294-1302
119. Kirwan JF, Shah P, Khaw PT. Diode laser cyclophotocoagulation: role in the management of refractory pediatric glaucomas. *Ophthalmology* 2002;109(2): 316-323
120. Ocakoglu O, Arslan OS, Kayiran A. Diode laser transscleral cyclophotocoagulation for the treatment of refractory glaucoma after penetrating keratoplasty. *Curr Eye Res* 2005; 30(7):569-574
121. Scholte T, Derse M, Zierhut M. Transscleral diode laser cyclophotocoagulation for the treatment of refractory glaucoma secondary to inflammatory eye diseases. *Br J Ophthalmol* 2000;84(9):999-1003.
122. Kumar A, Dada T, Singh RP, et al. Diode laser trans-scleral cyclphotocoagulation for glaucoma following silicone oil removal. *Clin Experiment Ophthalmol* 2001; 29(4):220-224
123. Berke SJ. Endocyclophotocoagulation in Glaucoma Eds Shaarawy TM, Sherwood MB, Hitchings RA, and Crowston JG. *Glaucoma*. Vol 2. China: Saunders: 2009:(117)591-598.
124. Lin SC. Endoscopic and transcleral cyclophotocoagulation for the treatment of refractory glaucoma. *J Glaucoma* 2008; 17(3):238-247
125. Lima FE, Magacho L, Carvalho DM, et al. A prospective, comparative study between endoscopic cyclophotocoagulation and the Ahmed drainage implant in refractory glaucoma. *J Glaucoma* 2004; 13(3):233-237

126. Neely DE, Plager DA. Endocyclophotocoagulation for management of difficult pediatric glaucomas. *JAAPOS* 2001; 5(4):221-229
127. Nabili S, Kirkness CM. Trans-scleral diode laser cyclophoto-coagulation in the treatment of diabetic neovascular glaucoma. *Eye* 2004; 18(4):352-356
128. Pokroy R, Greenwald Y, Pollack A, et al. Visual loss after diode laser cyclophotocoagulation for primary open-angle and neovascular glaucoma. *Ophthalmic Surg Lasers Imaging* 2008; 39(1):22-29.
129. Bloom PA, Tasi JC, Sharma K, et al. "Cyclodiode". Trans-scleral diode laser cyclophotocoagulation in the treatment of advanced refractory glaucoma. *Ophthalmology* 1997; 104(9):1508-1519.
130. Azuara-Blanco A, Dua HS. Malignant glaucoma after diode laser laser cyclophotocoagulation. *Am J Ophthalmol* 2004; 138(3):393-396. Shen SY, Lai JS, Lam DS. Necrotizing scleritis following diode laser transscleral cyclophotocoagulation. *Ophthalmic Surg Lasers Imaging* 2004; 35(3):251-253.
131. Bechrakis NE, Muller-Stolzenberg NW, Helbig H, Foerster MH. Sympathetic ophthalmia following laser cyclophotocoagulation. *Arch Ophthalmol* 1994; 112(1):80-84.
132. Jonas JB, Back W, Sauder G, et al. Sympathetic ophthalmia in vater association combined persistent hyperplastic primary vitreous after cyclodestructive procedure. *Eur J Ophthalmol* 2006; 16(1):171-172.
133. Chen J, Cohn RA, Lin SC, et al. Endoscopic photocoagulation of the ciliary body for the treatment of refractory glaucomas. *Am J Ophthalmol* 1997; 124(6):787-796.
134. Gayton JL. Traumatic aniridia during endoscopic laser cycloablation. *J Cataract Refract Surg* 1998; 24(1):134-135.
135. Rivier D, Paula JS, Kim E, et al. Glaucoma and keratoprosthesis surgery: Role of adjunctive cyclophotocoagulation. *J Glaucoma* 2009; 18(4):321-324.
136. Rotchford AP, Jayasawal R, Madhusuhan S, et al. Transscleral diode laser cycloablation in patients with good vision. *Br J Ophthalmol* 2010; 94(9):1180-1183.
137. Gayton JL, VanDerKarr M, Sanders V. Combined cataract and glaucoma surgery: Trabeculectomy versus endoscopic laser cycloablation. *J Cataract Refract Surg* 1999; 25:1214-1219.
138. Craven ER, Katz LJ, Wells JM, Giamporcaro JE; iStent Study Group. Cataract surgery with trabecular micro-bypass stent implantation in patients with mild to moderate open-angle glaucoma and cataract: Two-year follow-up. *J Cataract Refract Surg*. 2012;38(8):1339-1345.
139. U.S. Food and Drug Administration (FDA). FDA approves first glaucoma stent for use with cataract surgery. *FDA News*. Silver Spring, MD: FDA; June 25, 2012. Available at: <http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm309667.htm>.
140. U.S. Food and Drug Administration (FDA). GLAUKOS ISTENT TRABECULAR BYPASS STENT MODEL GTS100R/L. (Glaukos, Corporation. Laguna Hills, CA). Summary of Safety and Effectiveness. (June 2012). [https://www.accessdata.fda.gov/cdrh\\_docs/pdf8/P080030B.pdf](https://www.accessdata.fda.gov/cdrh_docs/pdf8/P080030B.pdf)
141. U.S. Food and Drug Administration (FDA). iStent Inject Trabecular Micro-Bypass System (Model G2-M-IS). (Glaukos, Corporation. San Clemente, CA). Summary of Safety and Effectiveness. (June 2018). [https://www.accessdata.fda.gov/cdrh\\_docs/pdf17/P170043B.pdf](https://www.accessdata.fda.gov/cdrh_docs/pdf17/P170043B.pdf)

142. U.S. Food and Drug Administration (FDA). Hydrus® Microstent. (Ivantis, Inc. Irvine, CA) Summary of Safety and Effectiveness No. P170034. August 10. 2018. Available at: [https://www.accessdata.fda.gov/cdrh\\_docs/pdf17/P170034A.pdf](https://www.accessdata.fda.gov/cdrh_docs/pdf17/P170034A.pdf). Accessed Jun 2021.
143. U.S. Food and Drug Administration (FDA). DURYSTATM (bimatoprost implant), for intracameral administration. FDA.gov. Revised 03/2020. [https://www.accessdata.fda.gov/drugsatfda\\_docs/label/2020/211911s000lbl.pdf](https://www.accessdata.fda.gov/drugsatfda_docs/label/2020/211911s000lbl.pdf)

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