Minimally Invasive Glaucoma Surgery (MIGS)

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- What is MIGS?
- Classification and choice
- Pros and Cons
- When MIGS?

Definition of MIGS

Lower IOP with less surgical risks than traditional Sx.

- Minimally traumatic
- Ab-interno: conjunctival sparing approach
- High safety profile
- Rapid recovery

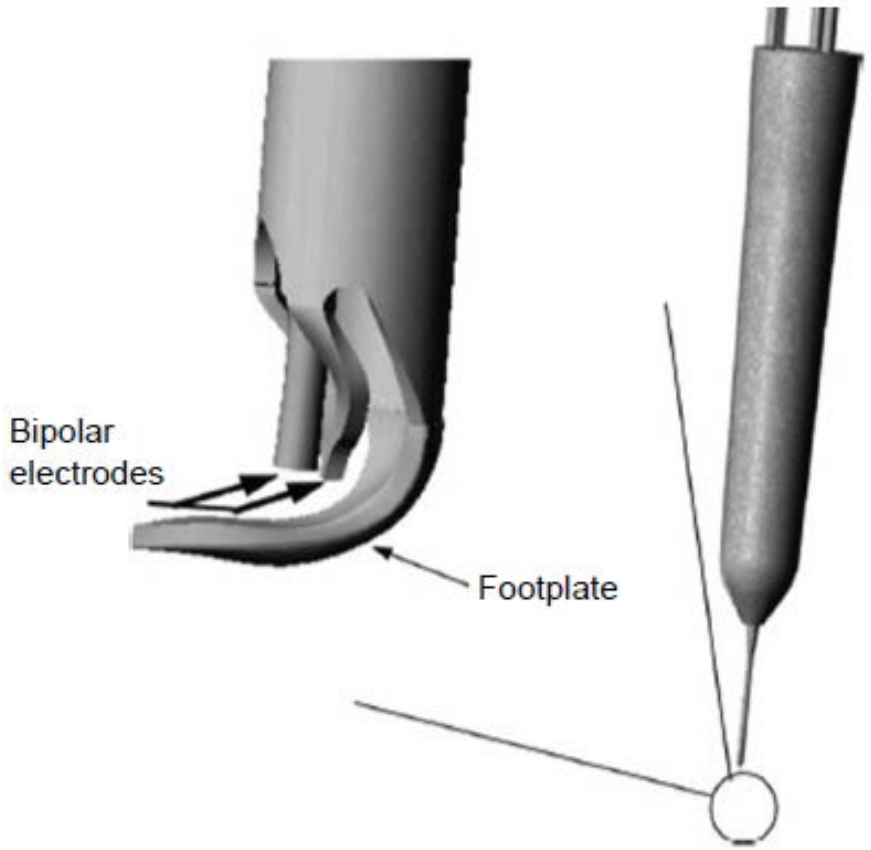
Classification

Technique / Device	Drainage Route & Mechanism of IOP Reduction	Conjunctiva Involved?	Published Randomised Controlled Trial Evidence?
Trabectome (NeoMedix)	Via Schlemm's canal: excision of trabecular meshwork	No	No
iStent (Glaukos)	Via Schlemm's canal: bypass of trabecular meshwork	No	Yes
iStent Inject (Glaukos)	Via Schlemm's canal: bypass of trabecular meshwork	No	No
Hydrus (Ivantis)	Via Schlemm's canal: bypass of trabecular meshwork	No	Yes
AbIC: Ab Interno Canaloplasty with iTrack (Ellex)	Via Schlemm's canal: dilatation of trabecular meshwork	No	No
Cypass (Transcend)	Via supra-choroidal space	No	No
iStent Supra (Glaukos)	Via supra-choroidal space	No	No
Endo-cyclophotocoagulation 'Endo-Diode'	Cyclo-destructive:	No	No
Microshunt (Innfocus)	To sub-tenons / sun-conjunctival space	Yes	No
Xen (Aquesys / Allergan)	To sub-tenons / sun-conjunctival space	Yes	No

1) Increasing trabecular outflow

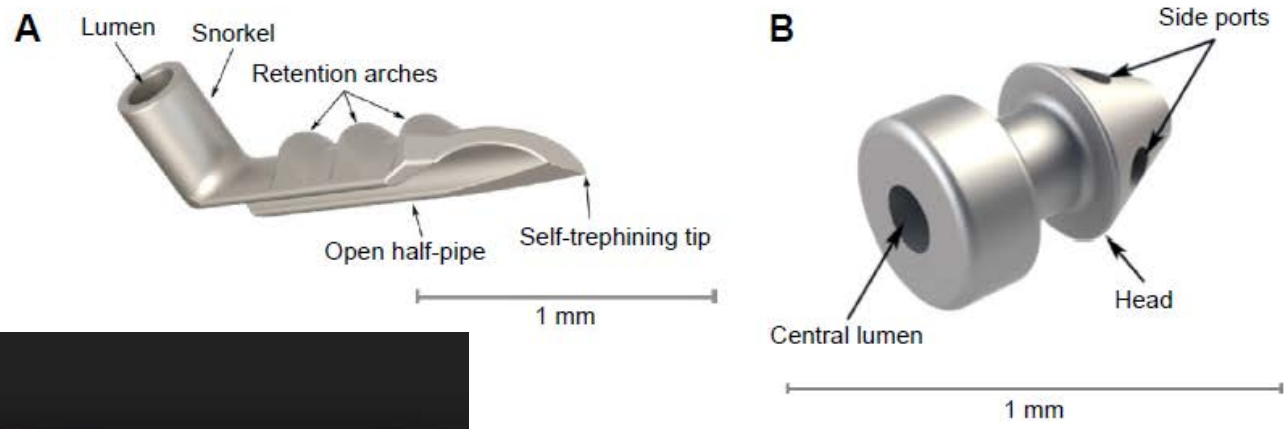
- Trabecutome
- Istent
- Istent inject
- Hydrus
- AbIC
- GATT (gonioscopy assisted transluminal trabeculotomy)
- ELT (excimer laser trabeculotomy)

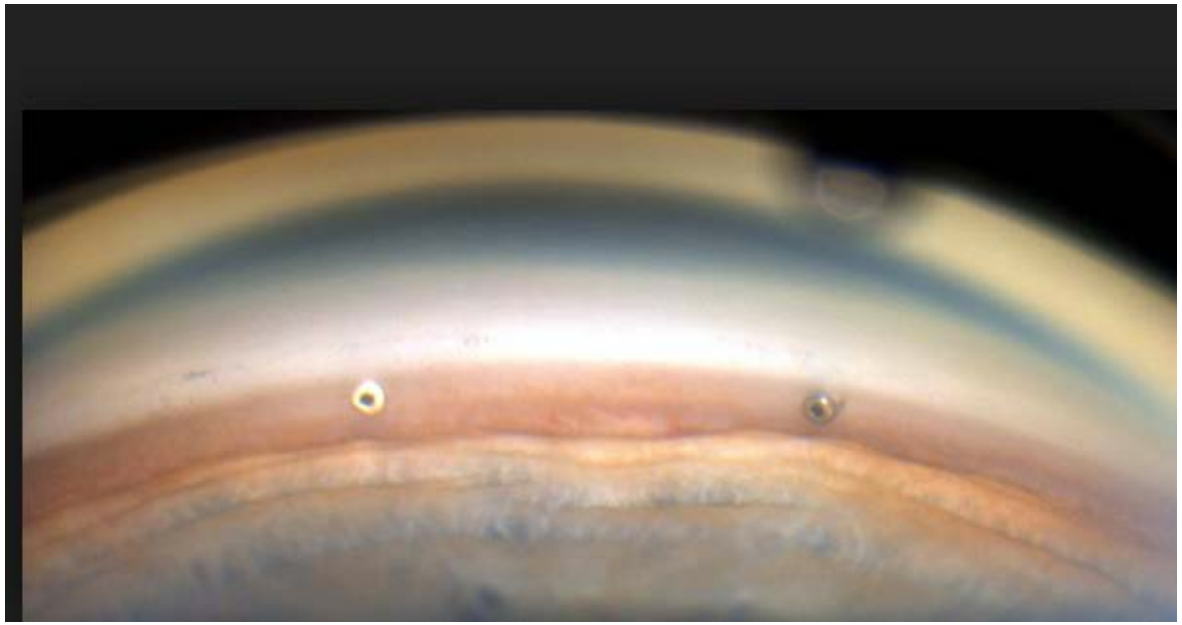
Trabectome



https://www.youtube.com/watch?v=GjkQ3Y-ml-E

iStent





https://www.youtube.com/watch?v=p-6pjueo_Jg

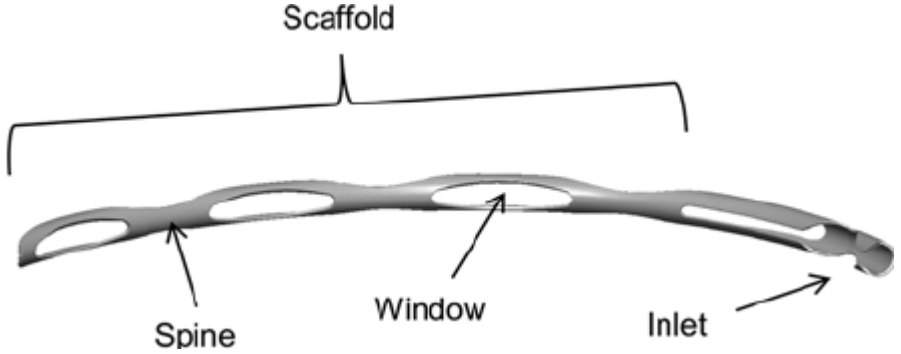
http://dx.doi.org/10.2147/OPTH.S80490

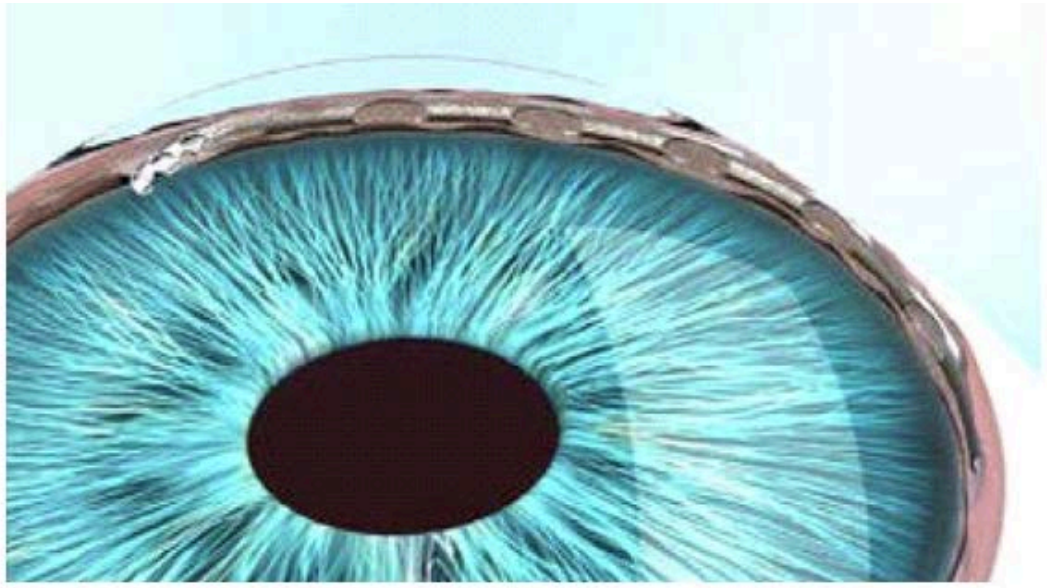
Craven et al[27] (2012)	Multicenter RCT (240)	Baseline IOP on medications was 18.6±3.4 mmHg in the stent/CE/IOL group and 17.9±3.0 mmHg in the CE/IOL group (25.4±3.5 mmHg in stent/CE/IOL and 25.2±3.6 mmHg in CE/IOL after washout). At 12 months, treated IOP was 17.0±2.8 in stent/CE/IOL and 17.0±3.1 mmHg in CE/IOL (*P*-value not reported). 53% of the stent/CE/IOL group, compared to 44% of the CE/IOL group, had ≥20% IOP reduction without medication at 1 year (*P*=0.090)	Baseline: 1.6±0.8 in stent/CE/IOL and 1.5±0.6 in CE/IOL. At 12 months: 0.2±0.6 in stent/CE/IOL and 0.4±0.7 in CE/IOL	8.6% IOP reduction with 88% medication reduction in the stent/CE/IOL group (5.0% IOP reduction and 73% medication reduction in the CE/IOL group)

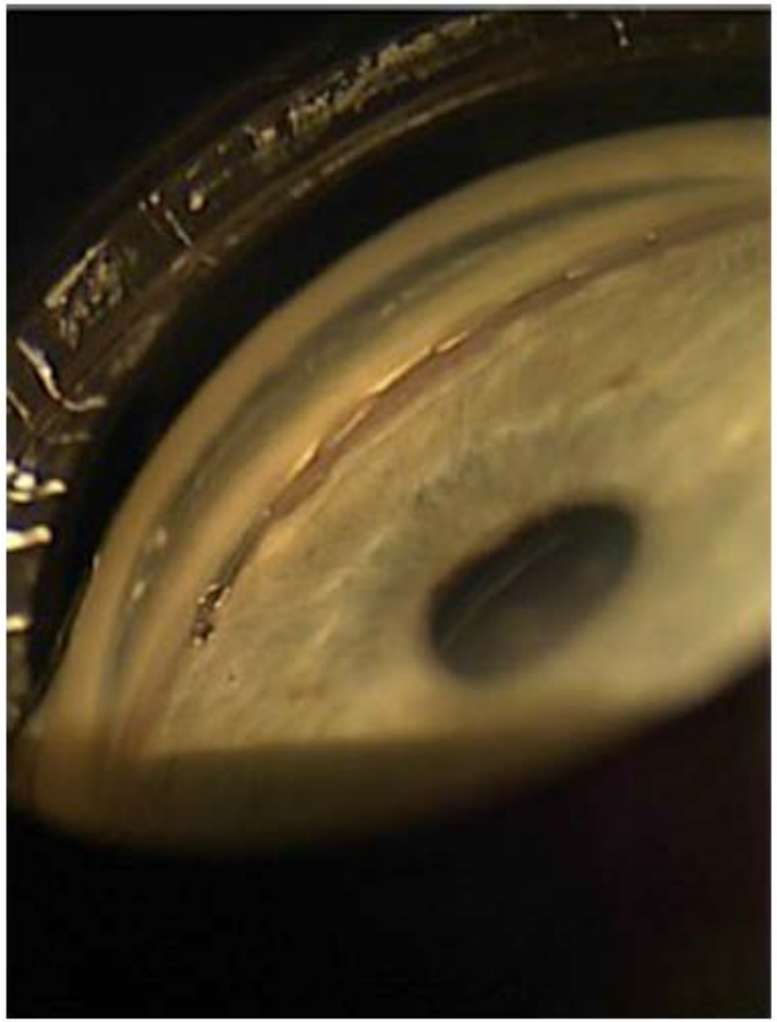
Number of med

IOP reduction

Hydrus



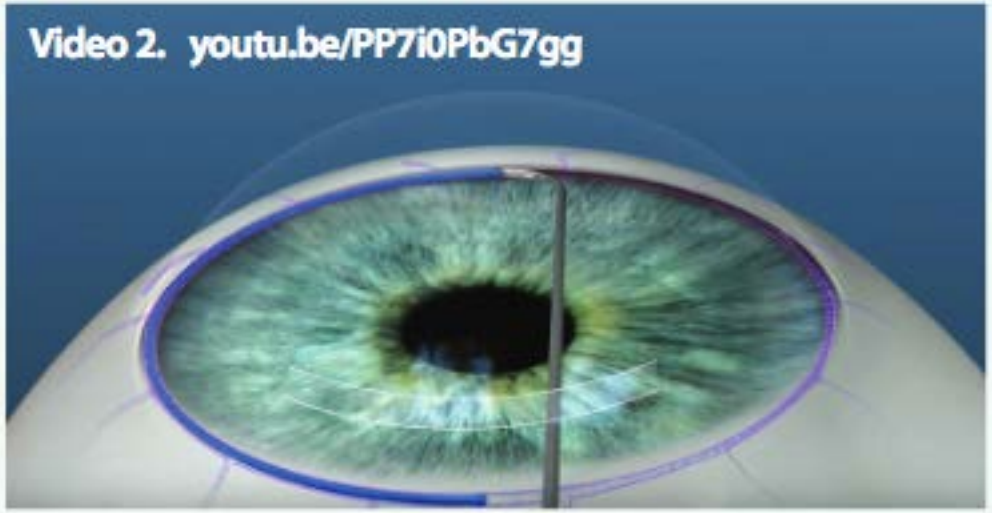




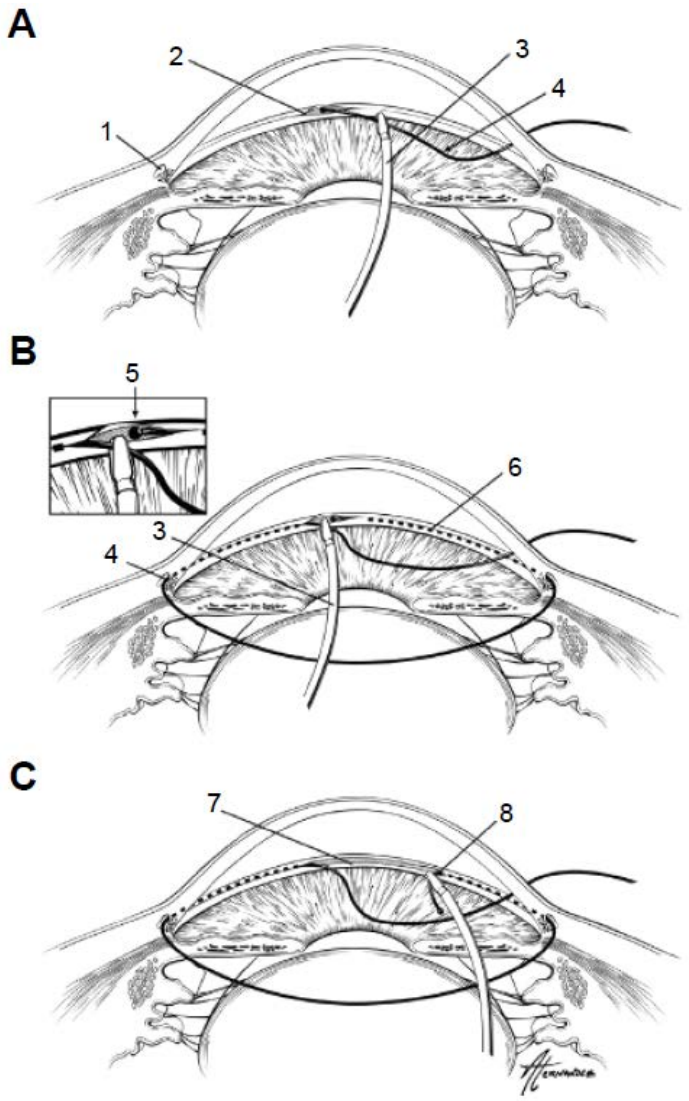
http://dx.doi.org/10.2147/OPTH.S80490

Hydrus with CE/IOL				
Pfeiffer et al[33] (2015)	Single-masked, multicenter RCT (100)	Baseline IOP: 18.9±3.3 mmHg in the Hydrus/CE/IOL group and 18.6±3.8 mmHg in the CE/IOL group. Washed-out baseline: 26.3±4.4 mmHg in Hydrus/CE/IOL and 26.6±4.2 mmHg in CE/IOL. Final washed-out: 16.9±3.3 in Hydrus/CE/IOL and 19.2±4.7 mmHg at 24 months (P=0.0093). 80% of Hydrus patients had ≥20% reduction in washed-out IOP compared to 46% of patients undergoing cataract surgery alone (P=0.0008)	**Number of med** Baseline: 2.0±1.0 in Hydrus/CE/IOL and 2.0±1.1 in CE/IOL. At 24 months: 0.5±1.0 in the Hydrus/CE/IOL group compared with 1.0±1.0 in the CE/IOL group (P=0.0189)	**IOP reduction** After washout: 50% IOP reduction in Hydrus/CE/IOL (28% IOP reduction in CE/IOL)

ABiC (Ab Interno Canaloplasty)



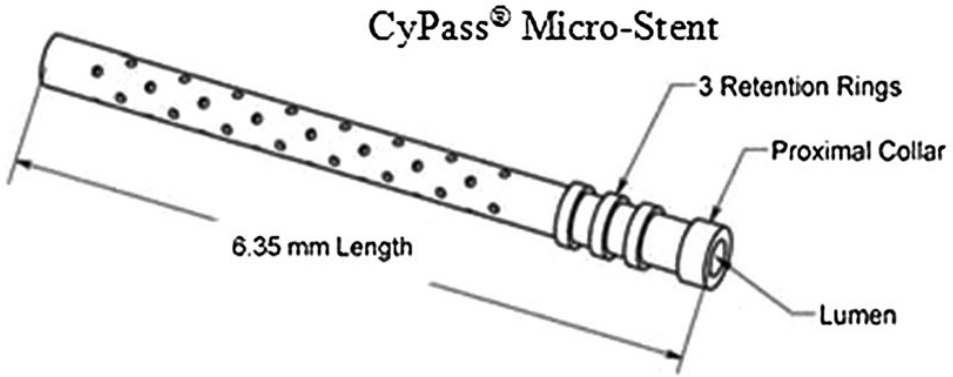
GATT (gonioscopy assisted transluminal trabeculotomy)

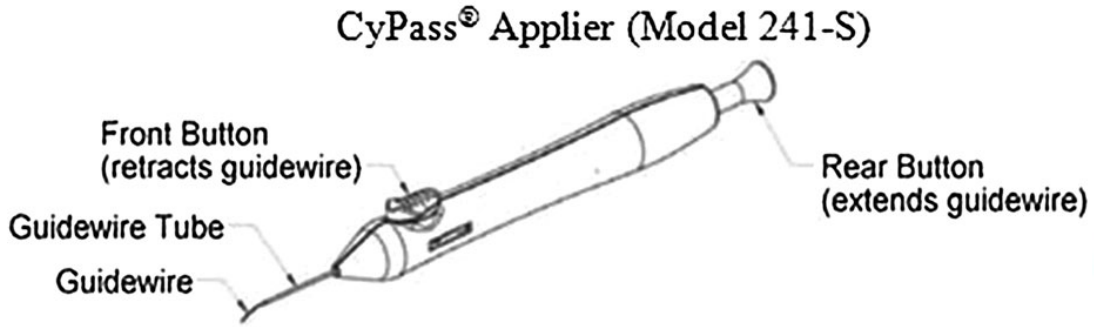


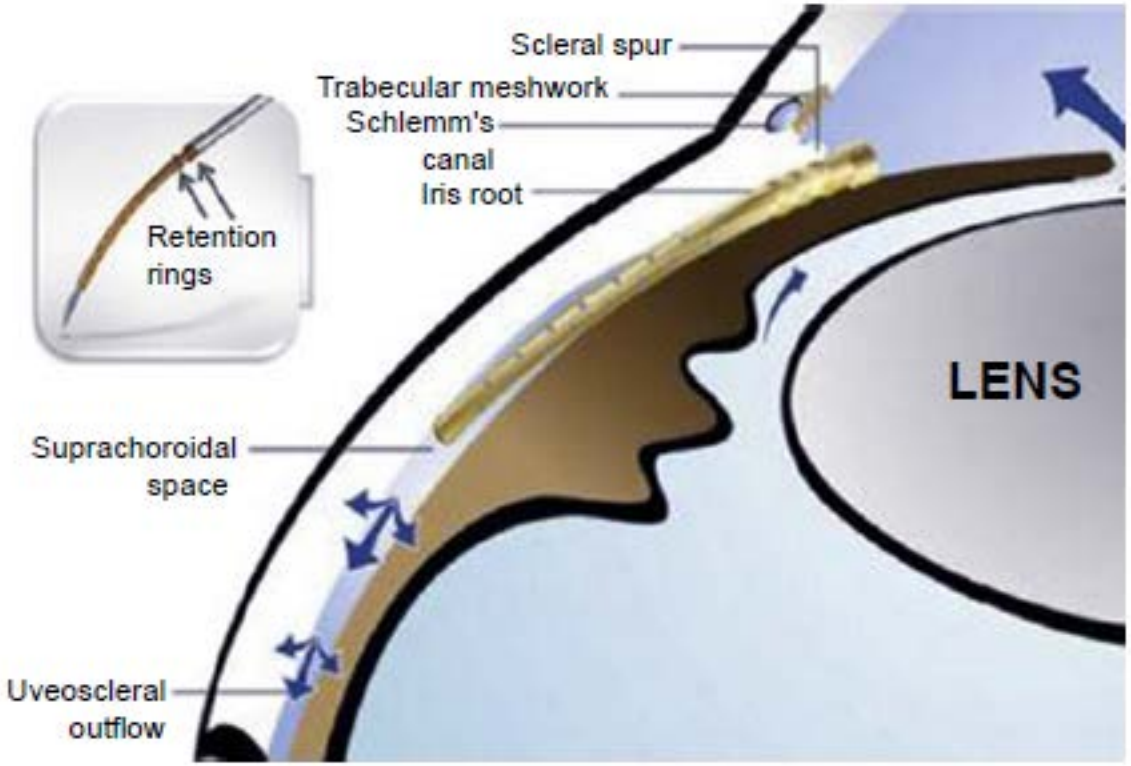
2) Increasing uveoscleral outflow

- Cypass
- Istent supra

Cypass


CyPass® Micro-Stent
3 Retention Rings
Proximal Collar
6.35 mm Length
Lumen


CyPass® Applier (Model 241-S)
Front Button
(retracts guidewire)
Rear Button
(extends guidewire)
Guidewire Tube
Guidewire


Scleral spur
Trabecular meshwork
Schlemm's
canal
Iris root
Retention
rings
LENS
Suprachoroidal
space
Uveoscleral
outflow

Ophthalmology. 2016 Aug 6. pii: S0161-6420(16)30500-0. doi: 10.1016/j.ophtha.2016.06.032. [Epub ahead of print]

Two-Year COMPASS Trial Results: Supraciliary Microstenting with Phacoemulsification in Patients with Open-Angle Glaucoma and Cataracts.

Vold S[1], Ahmed II[2], Craven ER[3], Mattox C[4], Stamper R[5], Packer M[6], Brown RH[7], Ianchulev T[8]; CyPass Study Group.

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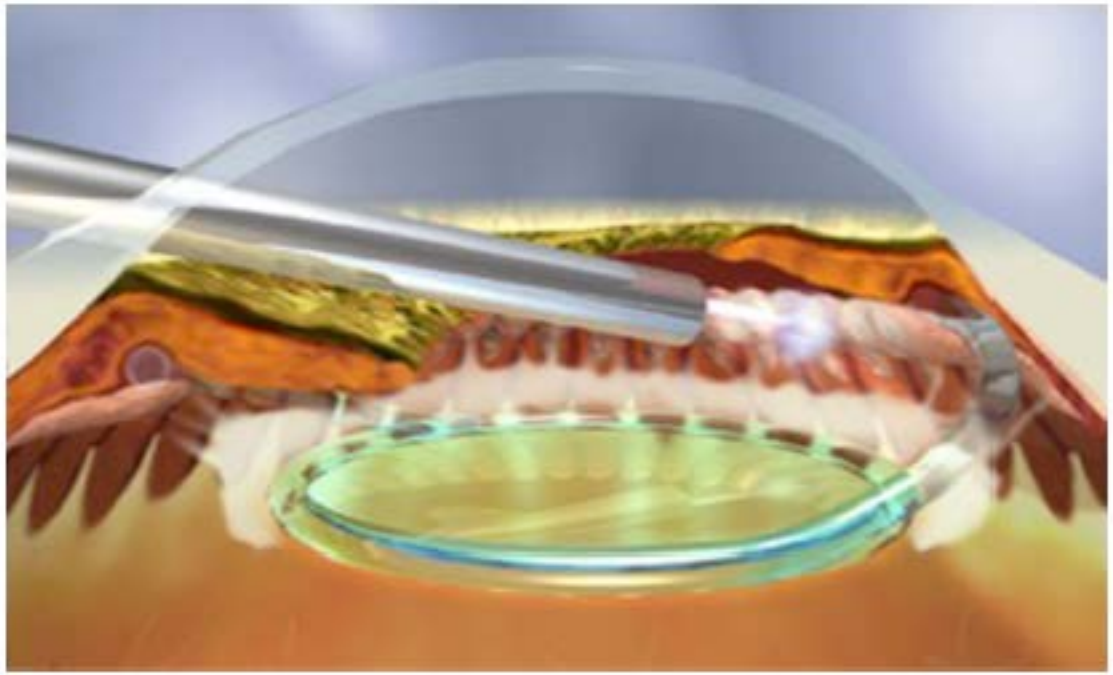
[5]Glaucoma Clinic, University of California-San Francisco Medical Center, San Francisco, California.
[6]Oregon Health & Science University, Portland, Oregon.
[7]Atlanta Ophthalmology Associates, Atlanta, Georgia.
[8]Transcend Medical, Inc., Menlo Park, California; University of California-San Francisco, San Francisco, California. Electronic address: sean@ianchulev.com.

RESULTS: Of 505 subjects, 131 were randomized to the control group and 374 were randomized to the microstent group. Baseline mean IOPs in the control and microstent groups were similar: 24.5±3.0 and 24.4±2.8 mmHg, respectively ($P > 0.05$); mean medications were 1.3±1.0 and 1.4±0.9, respectively ($P > 0.05$). There was early and sustained IOP reduction, with 60% of controls versus 77% of microstent subjects achieving ≥20% unmedicated IOP lowering versus baseline at 24 months ($P = 0.001$). Mean IOP reduction was ↓7.4 mmHg for the microstent group versus ↓5.4 mmHg in controls ($P < 0.001$), with 85% of microstent subjects not requiring IOP medications at 24 months. Mean 24-month medication use was 67% lower in microstent subjects ($P < 0.001$); 59% of control versus 85% of microstent subjects were medication free. Mean medication use in controls decreased from 1.3±1.0 drugs at baseline to 0.7±0.9 and 0.6±0.8 drugs at 12 and 24 months, respectively, and in the microstent group from 1.4±0.9 to 0.2±0.6 drugs at both 12 and 24 months ($P < 0.001$ for reductions in both groups at both follow-ups vs. baseline). No vision-threatening microstent-related AEs occurred. Visual acuity was high in both groups through 24 months; >98% of all subjects achieved 20/40 best-corrected visual acuity or better.

3) Reducing inflow

- ECP (Endo Cyclo Photocoagulation)

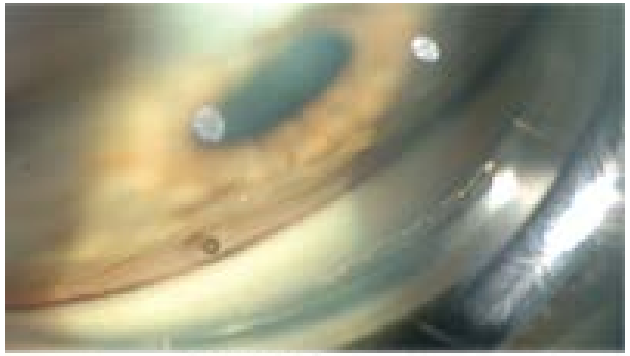


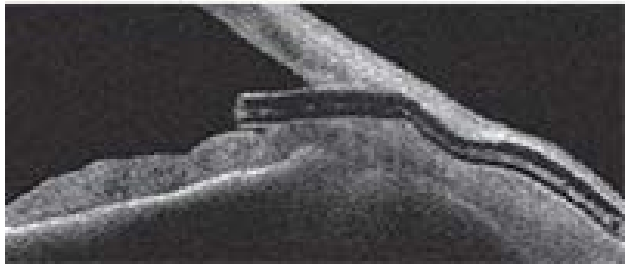
4) Subconjunctival filtration

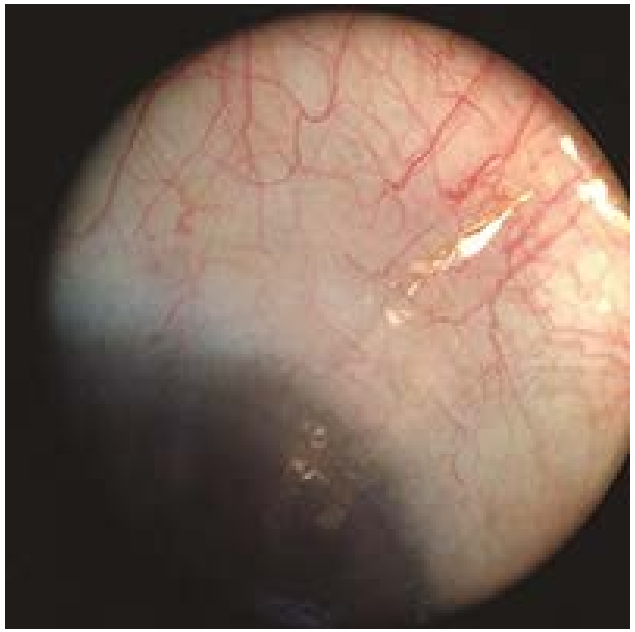
- XEN
- InnFocus
- Express shunt

XEN

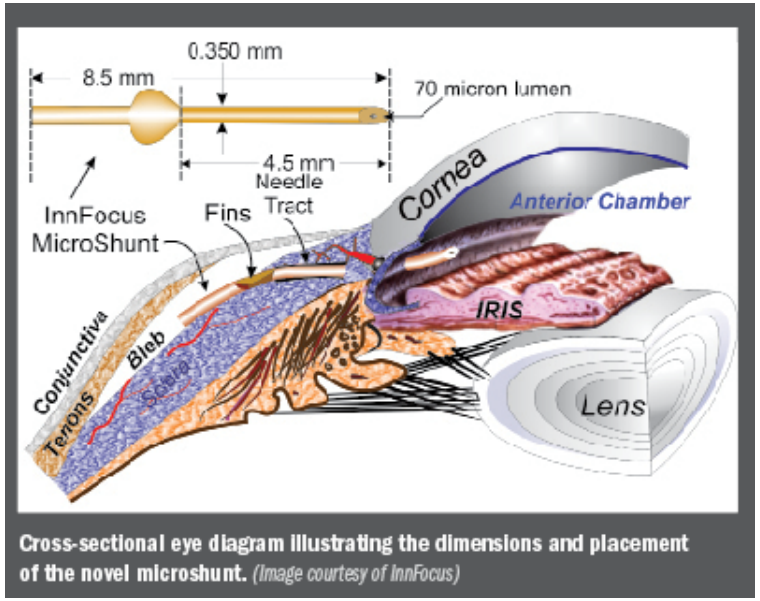
https://www.youtube.com/watch?v=X9FO87SkK88



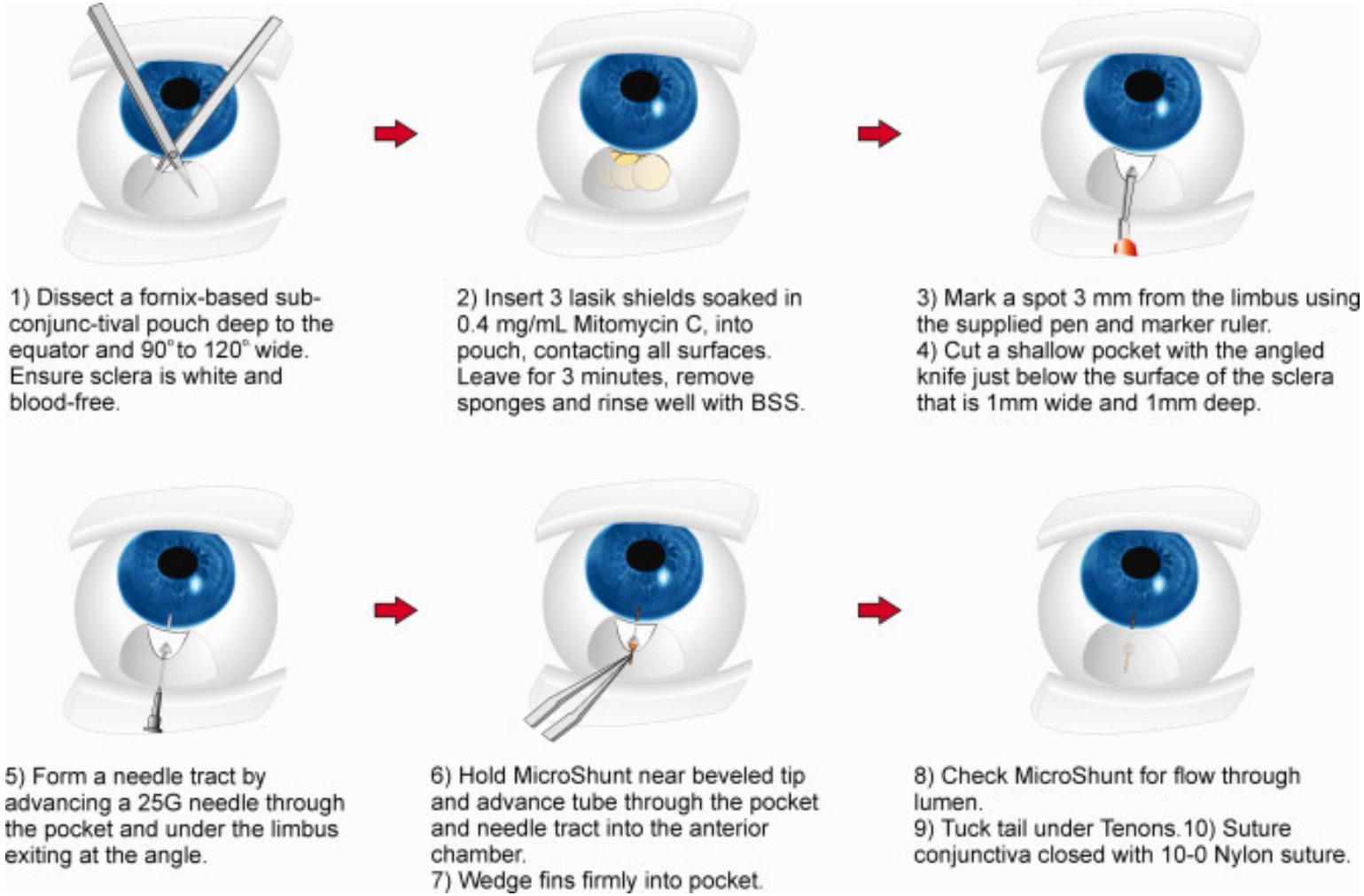




InnFocus



Cross-sectional eye diagram illustrating the dimensions and placement of the novel microshunt. *(Image courtesy of InnFocus)*



1) Dissect a fornix-based sub-conjunc-tival pouch deep to the equator and 90° to 120° wide. Ensure sclera is white and blood-free.

2) Insert 3 lasik shields soaked in 0.4 mg/mL Mitomycin C, into pouch, contacting all surfaces. Leave for 3 minutes, remove sponges and rinse well with BSS.

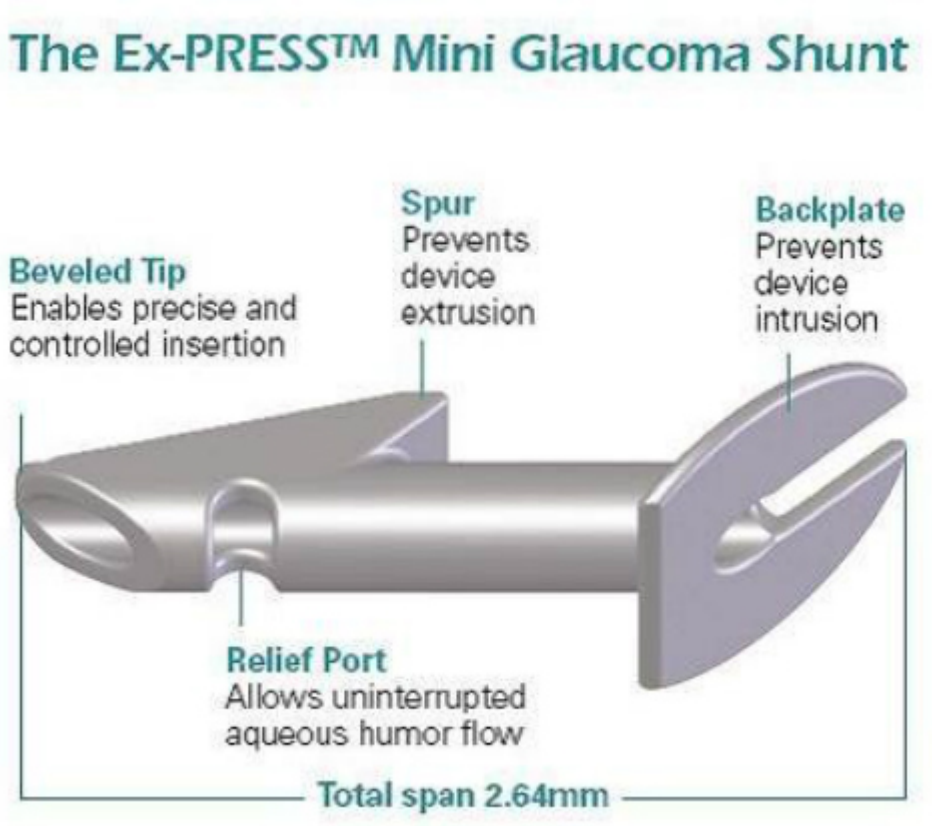
3) Mark a spot 3 mm from the limbus using the supplied pen and marker ruler.
4) Cut a shallow pocket with the angled knife just below the surface of the sclera that is 1mm wide and 1mm deep.

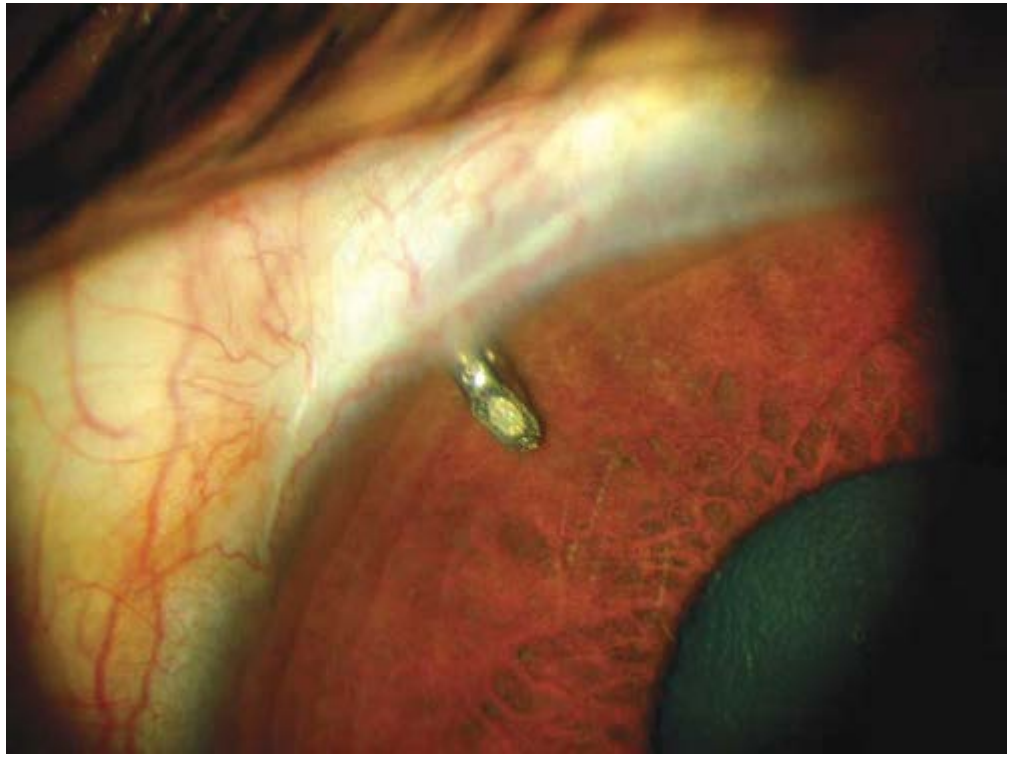
5) Form a needle tract by advancing a 25G needle through the pocket and under the limbus exiting at the angle.

6) Hold MicroShunt near beveled tip and advance tube through the pocket and needle tract into the anterior chamber.
7) Wedge fins firmly into pocket.

8) Check MicroShunt for flow through lumen.
9) Tuck tail under Tenons.10) Suture conjunctiva closed with 10-0 Nylon suture.

Ex-Press shunt





https://www.youtube.com/watch?v=Bg9DHmCuynM

Table 2 Summary of efficacy and safety data

	Phaco/iStent [8]	Phaco/ Hydrus [13]	Phaco/ CyPass [17]	Phaco/XEN45 [22]	InnFocus [3]
Pre-op IOP	18.6	26.3	24.4	16	23.8
Post-op IOP	17.0	16.9	17.0	12	10.7
% IOP drop; % medication reduction	8.0%; 87% (versus 5.5%; 73% in controls)	50%; 73% (versus 28%; 38% in controls)	30.3%; 85.7% (versus 22%; 53.9% in controls)	25%; 84.2%	55%; 69.2%
AEs		12% focal peripheral anterior synechiae		Transcient choroidal detachment = 2, tube extrusion = 1, trabeculectomy = 2	Transcient hypotony = 13%, transcient choroidal effusion = 8.7%

Ansari E, An Update on Implants for Minimally Invasive Glaucoma Surgery (MIGS). Ophthalmol Ther. 2017 Jul 20. doi: 10.1007/s40123-017-0098-2.

Pros of MIGS

- High safety profile
- Minimize patient’s compliance
- Increase QoL
- Not compromising of future drainage operations

Cons of MIGS

- Moderate IOP reduction
- Limited quality and duration of evidence
- Lack of study standardisation
- Lack of cost-effectiveness data
- Incomplete knowledge of ideal patient selection

When MIGS

- Poor compliance
- Early and moderate glaucoma
- Old age and comorbidity
- Combined with Phaco (PhacoPlus)

References

- Ansari E, An Update on Implants for Minimally Invasive Glaucoma Surgery (MIGS). Ophthalmol Ther. 2017 Jul 20. doi: 10.1007/s40123-017-0098-2.

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HIFU

CO_2 laser assisted sclerectomy