



UNIVERSITÄTS**medizin.**
MAINZ

The future of glaucoma surgery

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Who will need surgery in the future?

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- “All glaucoma patients should have glaucoma surgery”.

Heinrich Harms, 1975

Who will need surgery in the future?

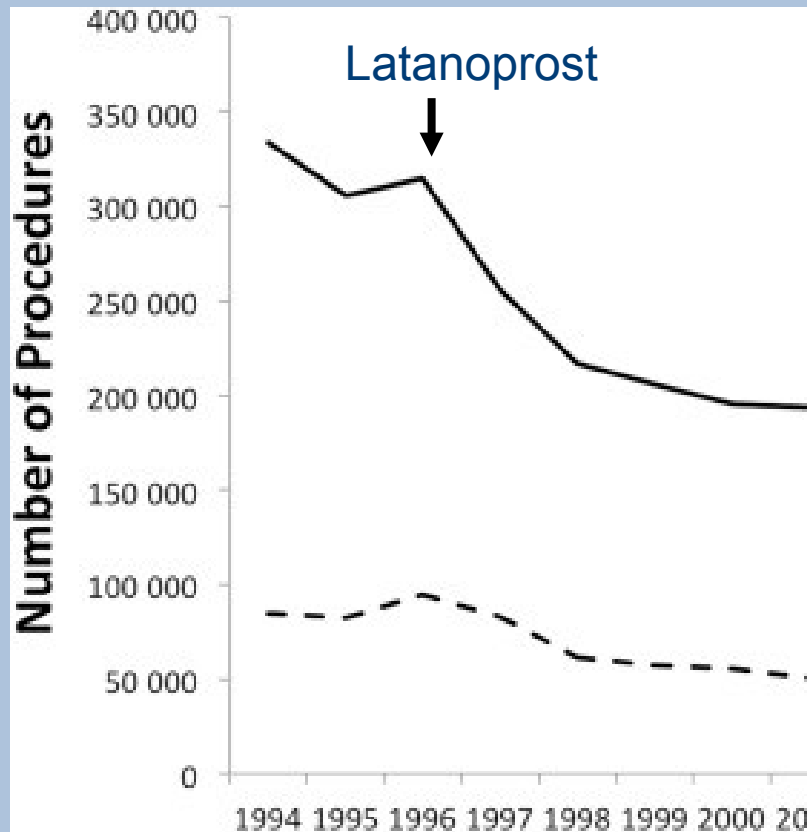
- “All glaucoma patients should have glaucoma surgery if there were the ideal glaucoma surgery”.

Heinrich Harms, 1975

Hypothesis 1

- Number of glaucoma surgeries is going to increase

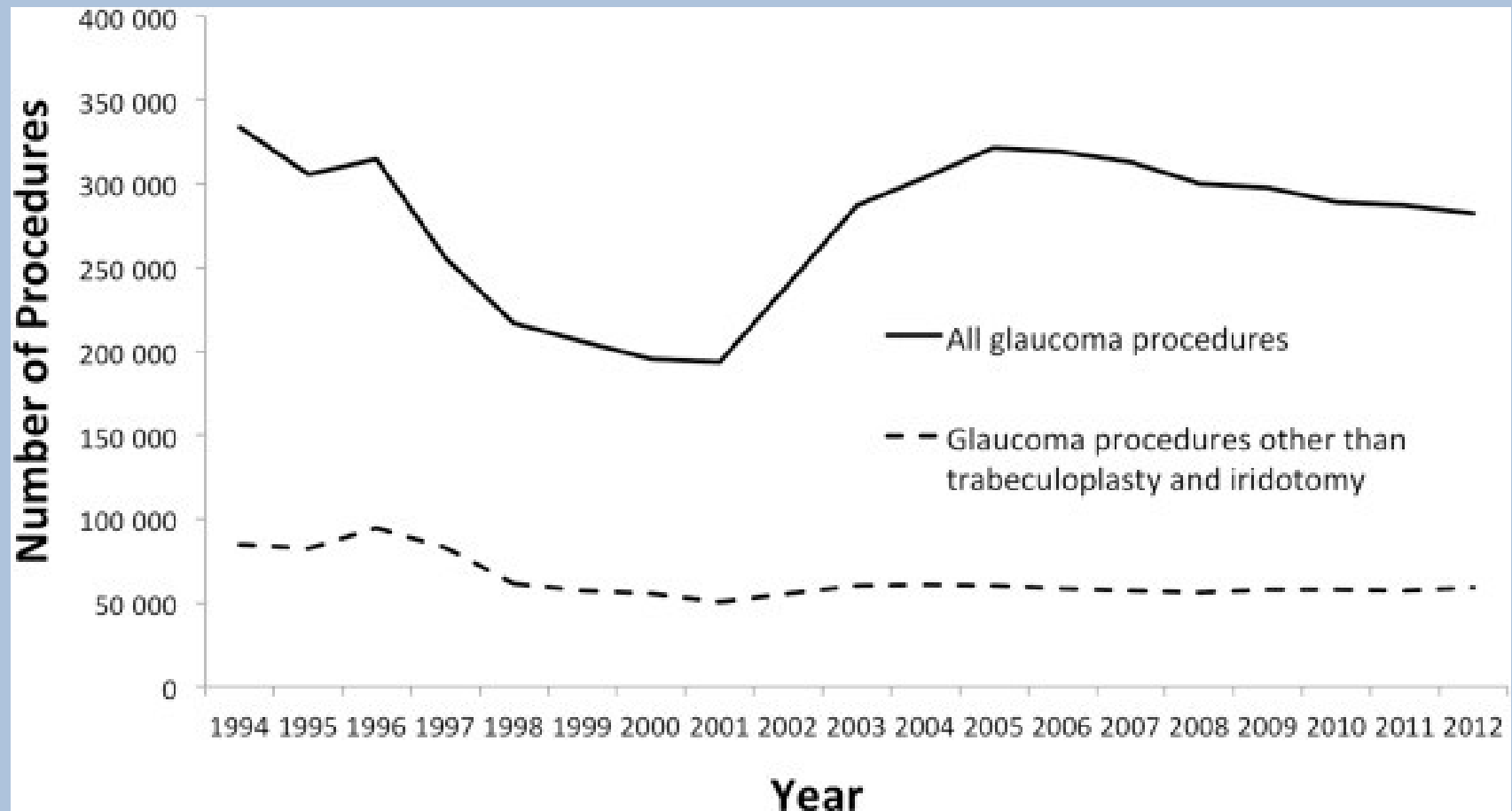
Ramulu et al., 2007 Glaucoma Surgery, USA



All glaucoma procedures

Trabeculoplasty, Iridotomy

Ramulu et al., 2007 Glaucoma Surgery, USA



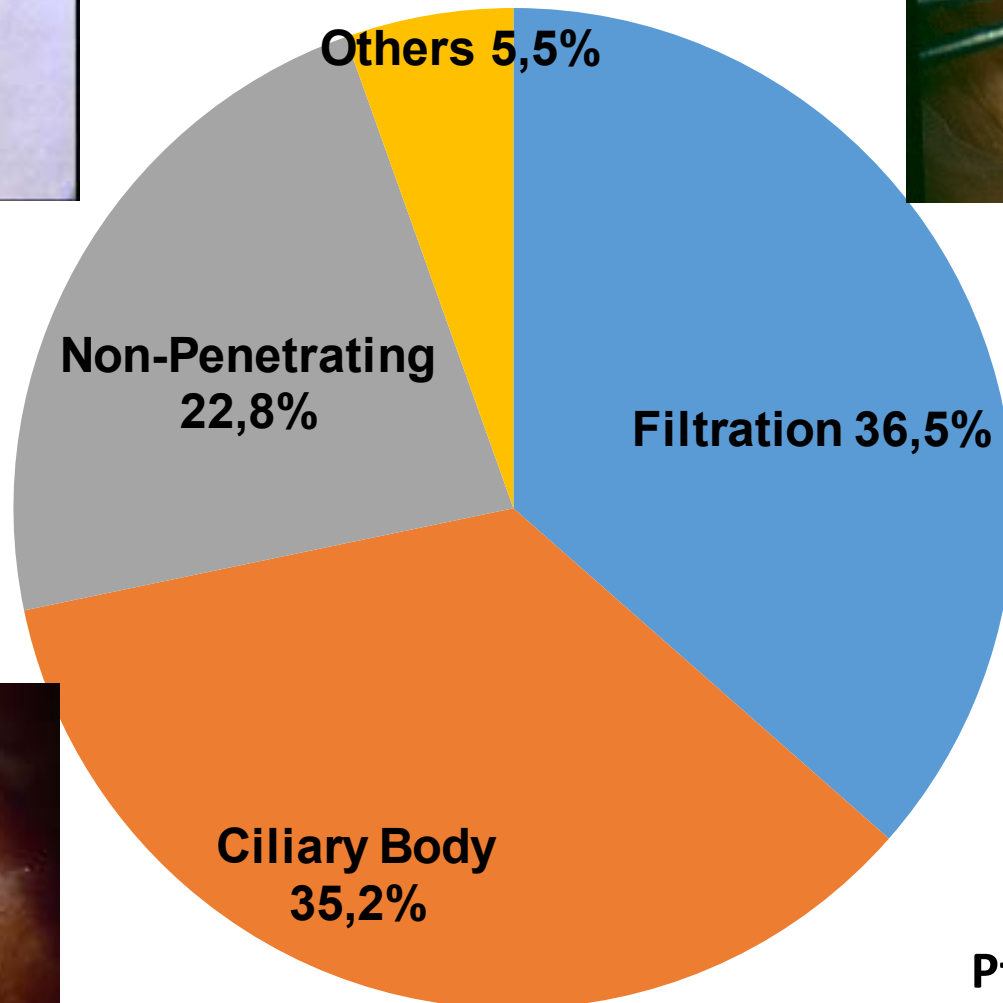
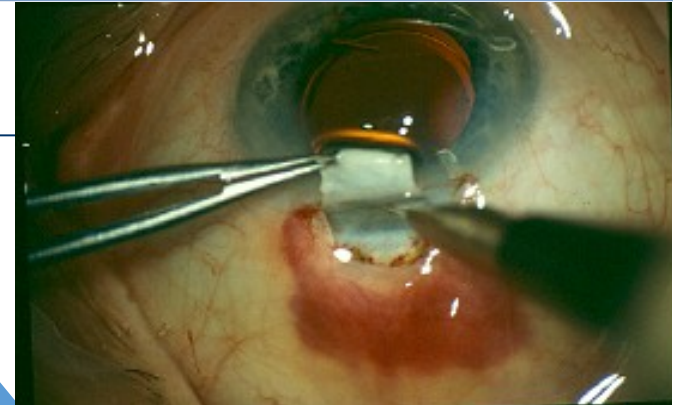
In Germany: More Glaucoma surgery

2005 27.208

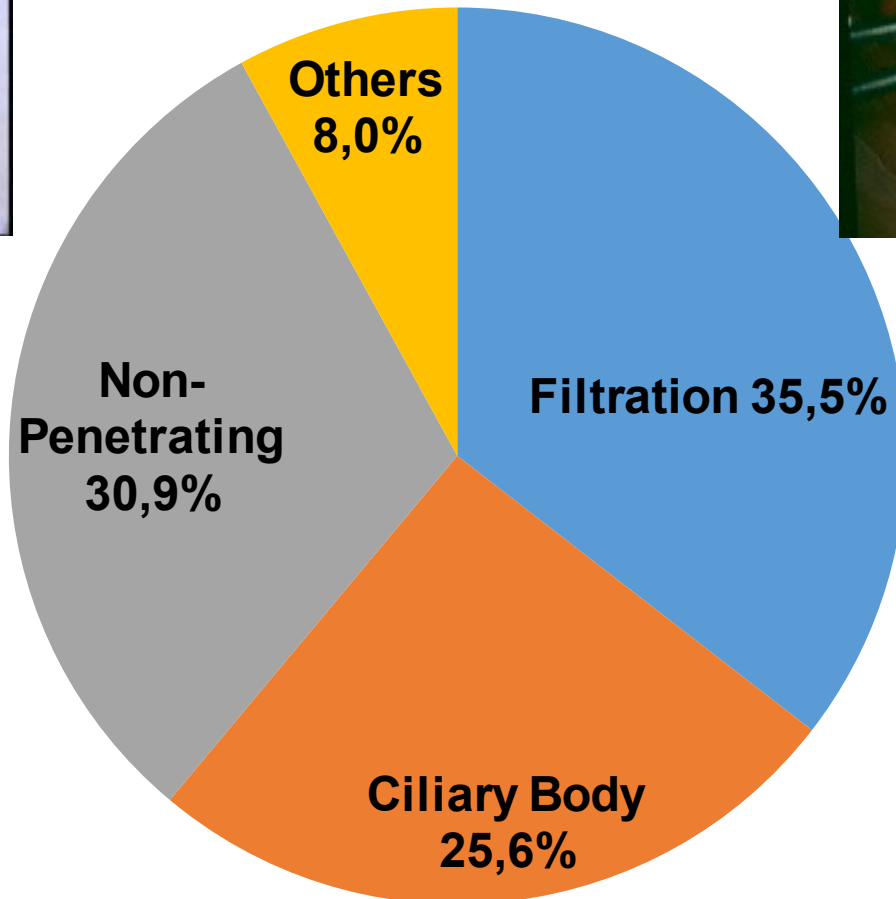
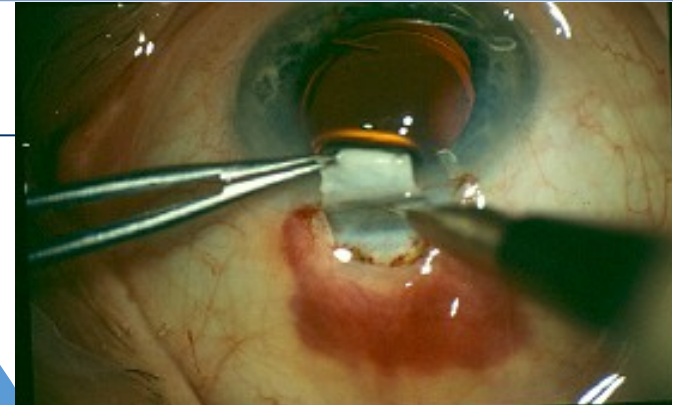
+ 50,2 %

2012 40.865

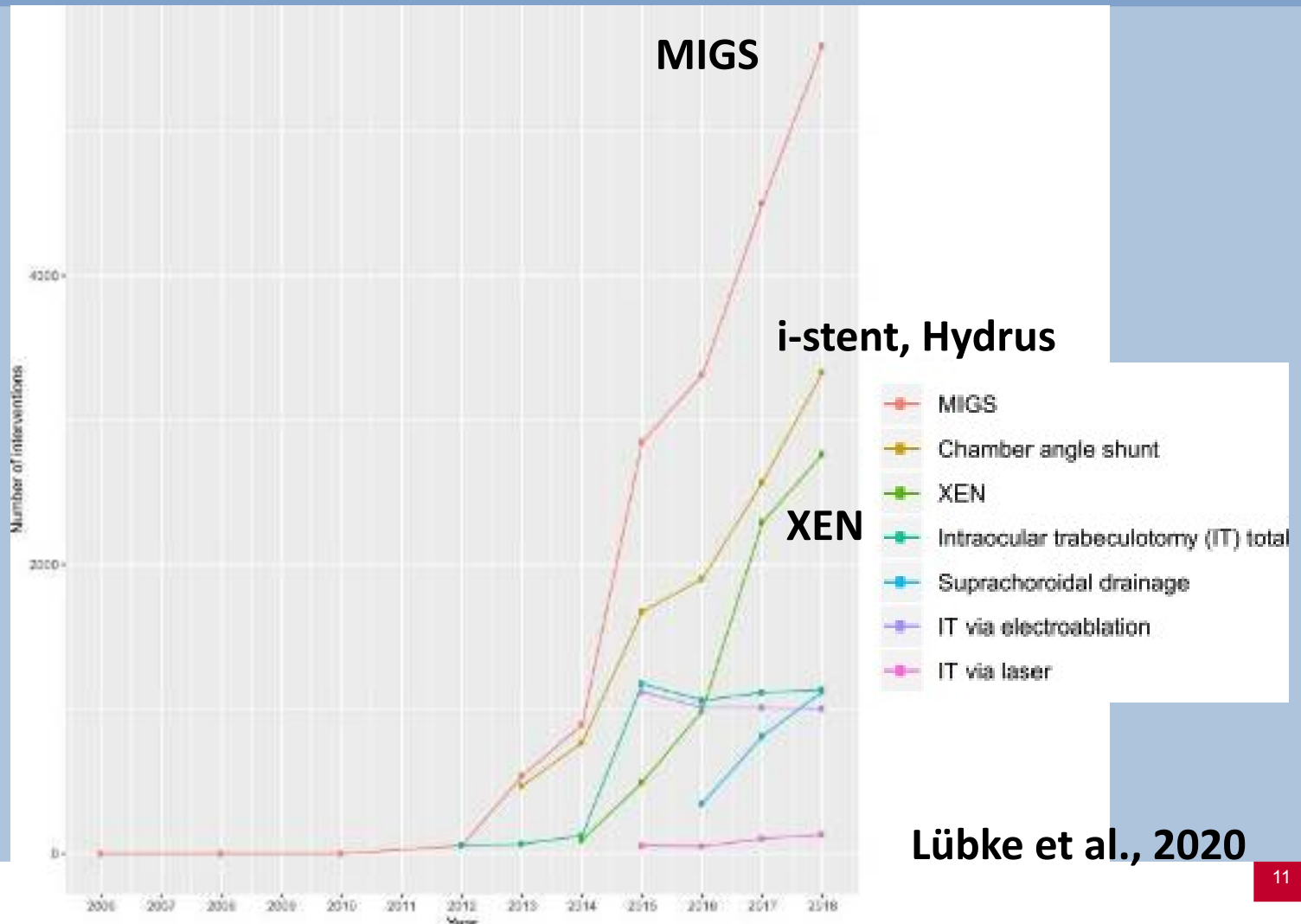
Glaucoma surgeries in Germany 2005



Glaucoma surgeries in Germany 2012



Trends in Glaucoma Surgeries Germany

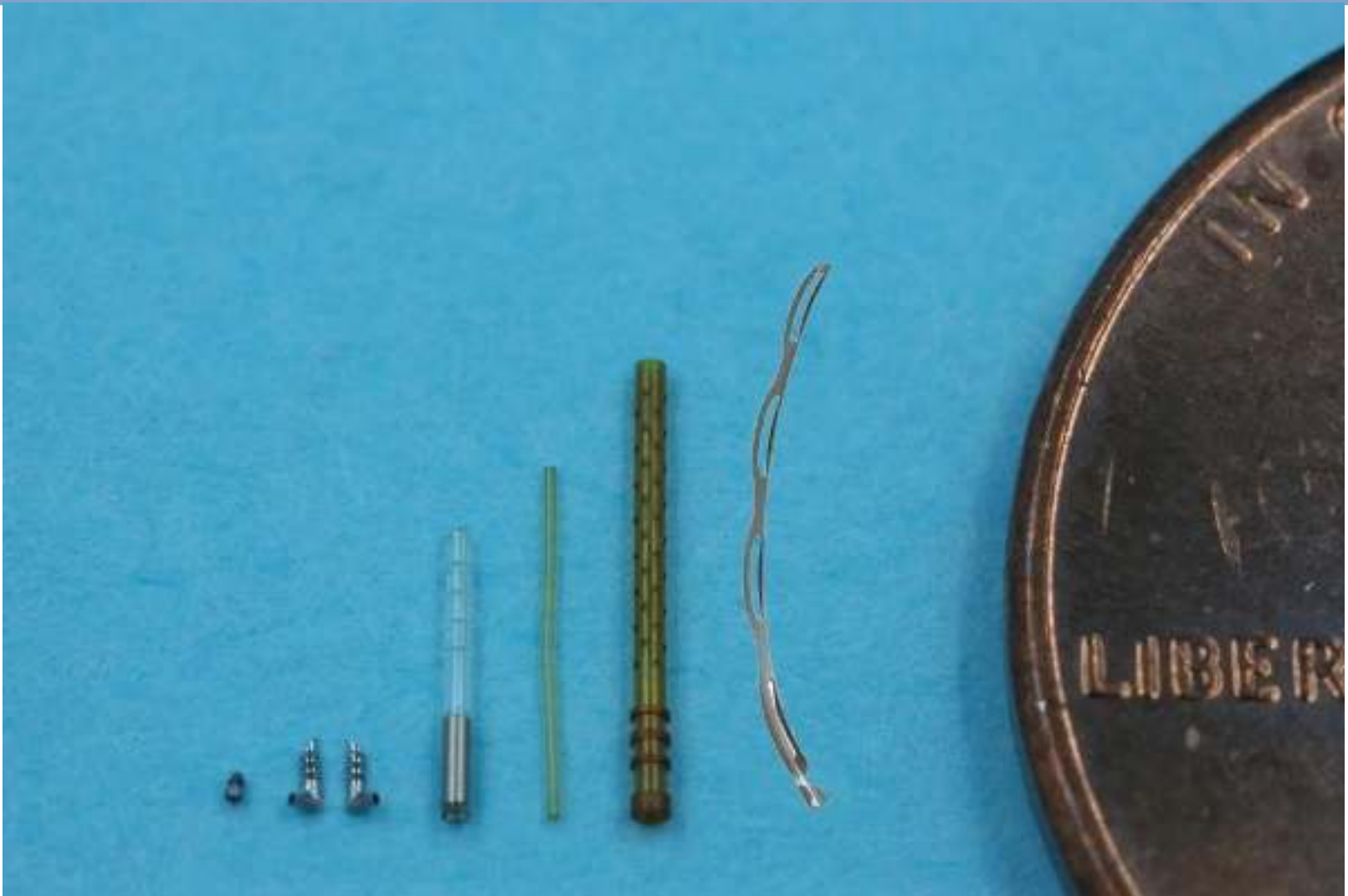


Lübke et al., 2020

Hypothesis 2

- Surgeries perceived as „lighter“ or „minor“ will increase
- Reimbursement will play major role

“Small tubes” for MIGS-Procedures

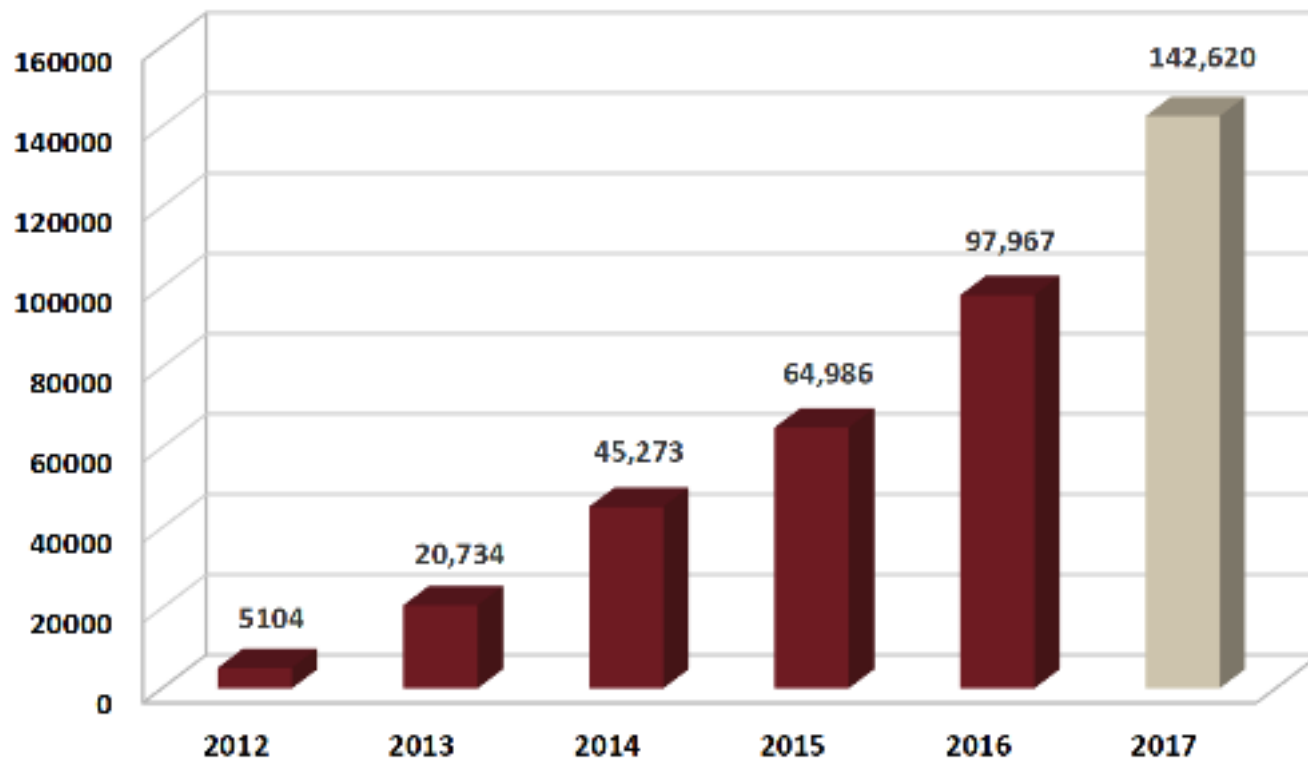


i-Stent inject



MIGS-implants in USA

Figure 48: Number of US MIGS Stents Implanted by Year



Source: Market Scope's Survey of US Glaucoma Surgeons

Phaco plus i-Stent vs phaco alone

Treatment	Mean IOP-reduction (mmHg)	Mean Medications (n)
Phako + stent	8.4 +/- 4.3	0.2 +/- 0.6

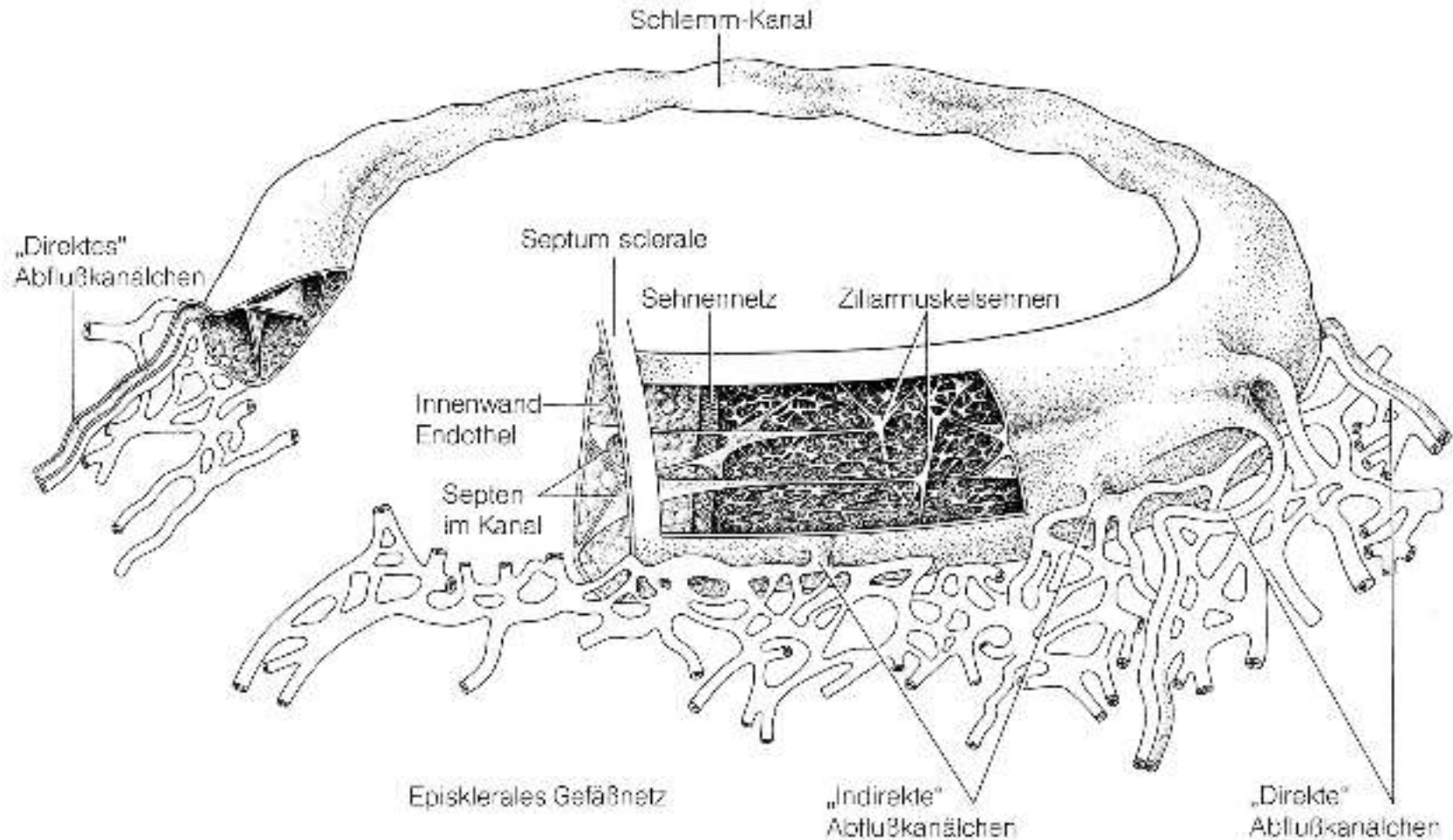
Phaco plus i-Stent vs phaco alone

Treatment	Mean IOP-reduction (mmHg)	Mean Medications (n)
Phako + stent	8.4 +/- 4.3	0.2 +/- 0.6
Phako alone	8.5 +/- 3.6	0.4 +/- 0.7

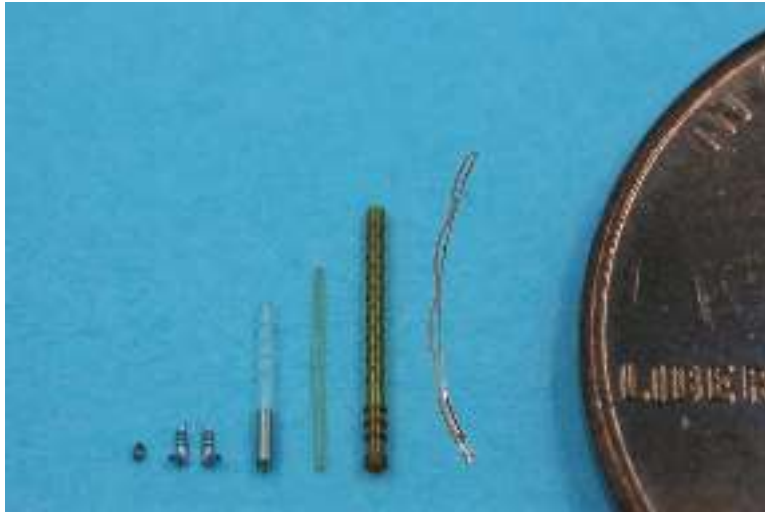
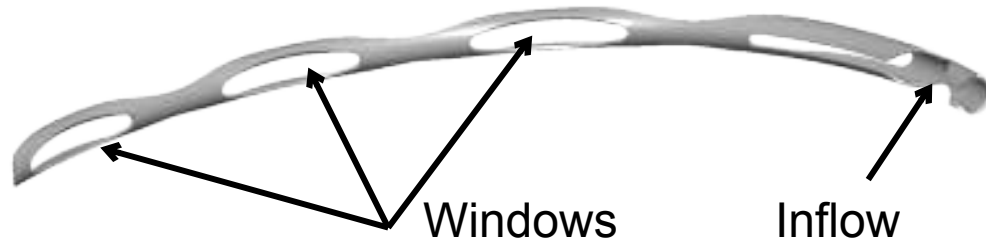
Hypothesis 3

- Surgical diagnostics will play a greater role

Why does the stent not lower IOP more?

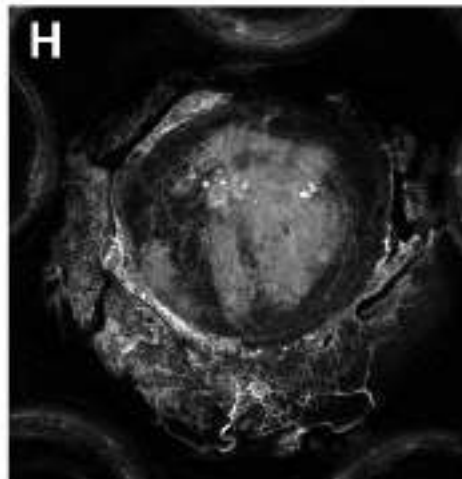
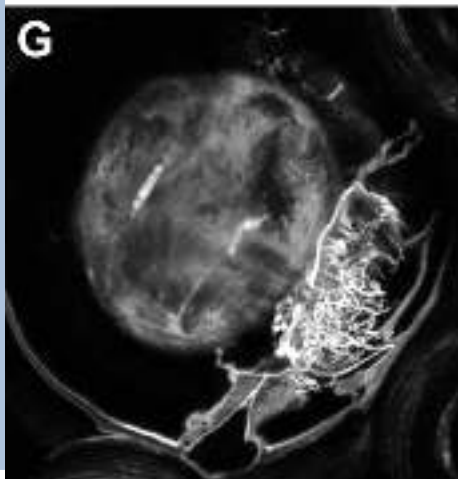
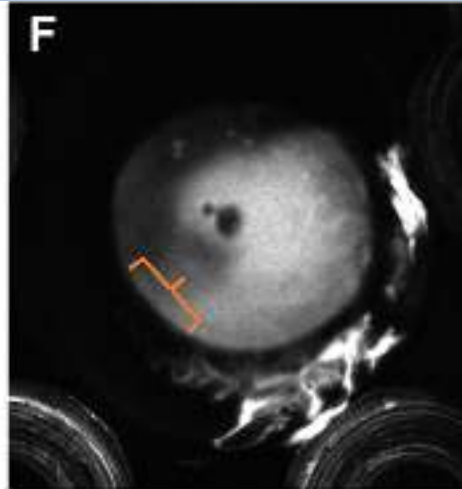
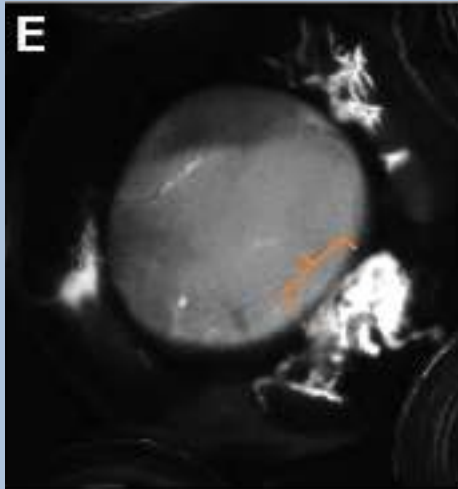


HYDRUS Microstent





Where to put a Schlemm's canal stent?



Strohmaier et al.
Ophthalmol Glaucoma, 2023

Cyclocryotherapy – Scleral thinning

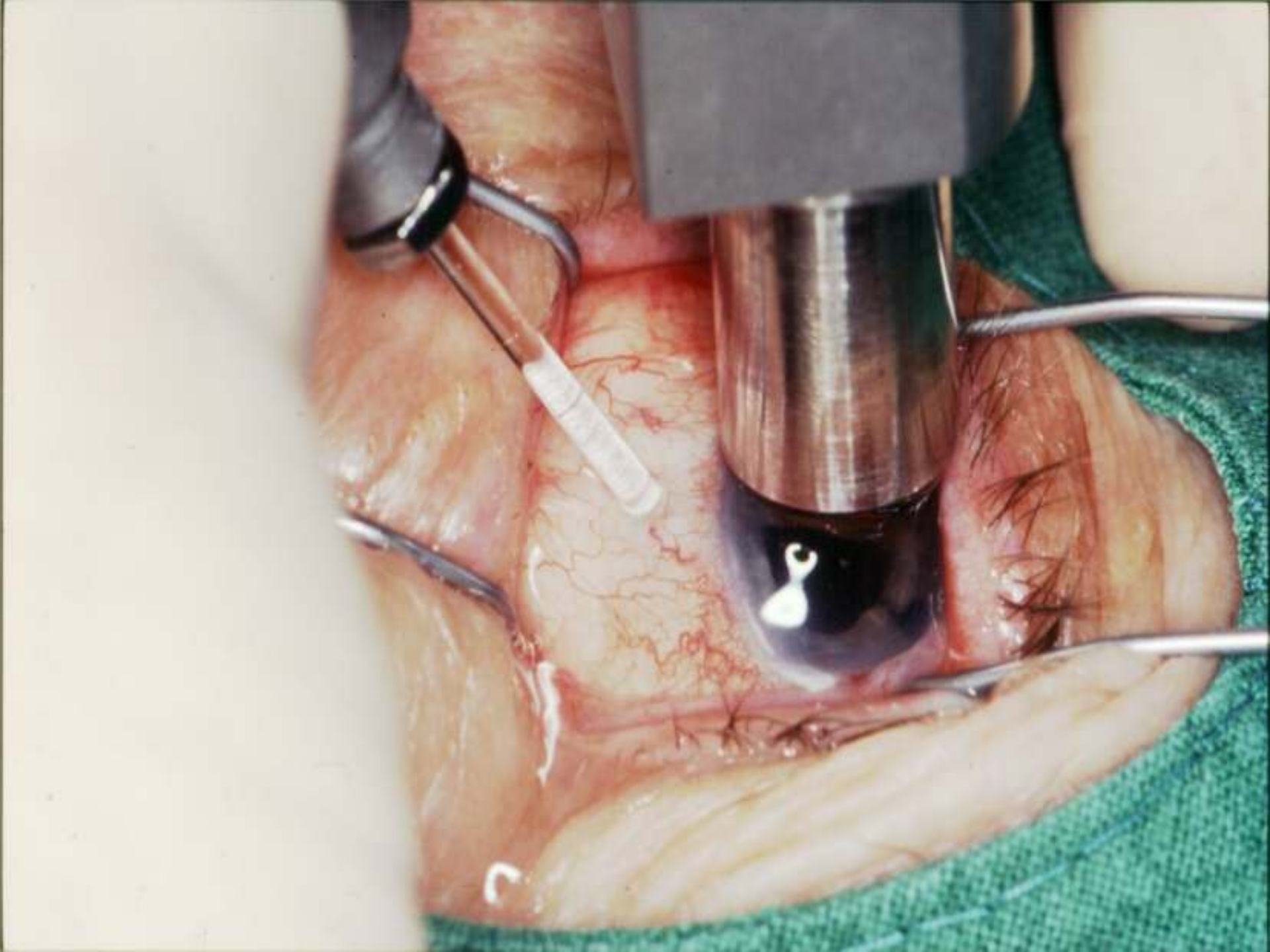


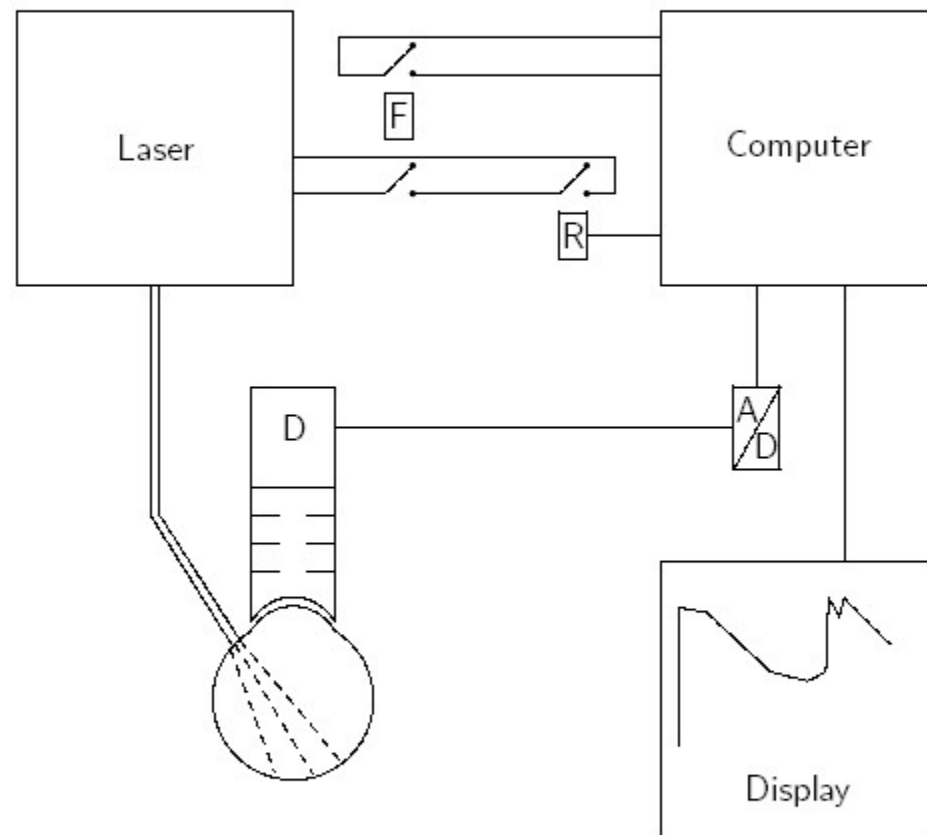
Transillumination before treatment



Cyclophotocoagulation

- Treatment of ciliary body epithelium
- Effects difficult to predict
- Intraoperative control of cyclophotocoagulation advantageous



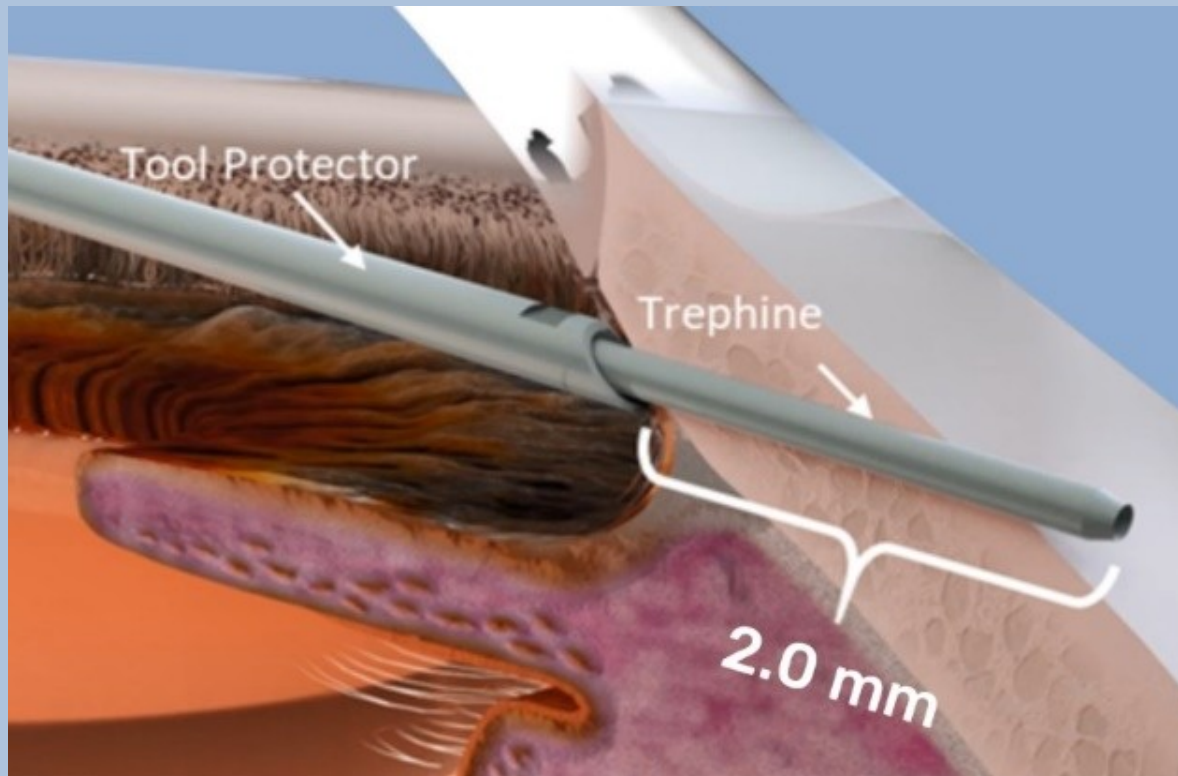


Hypothesis 4

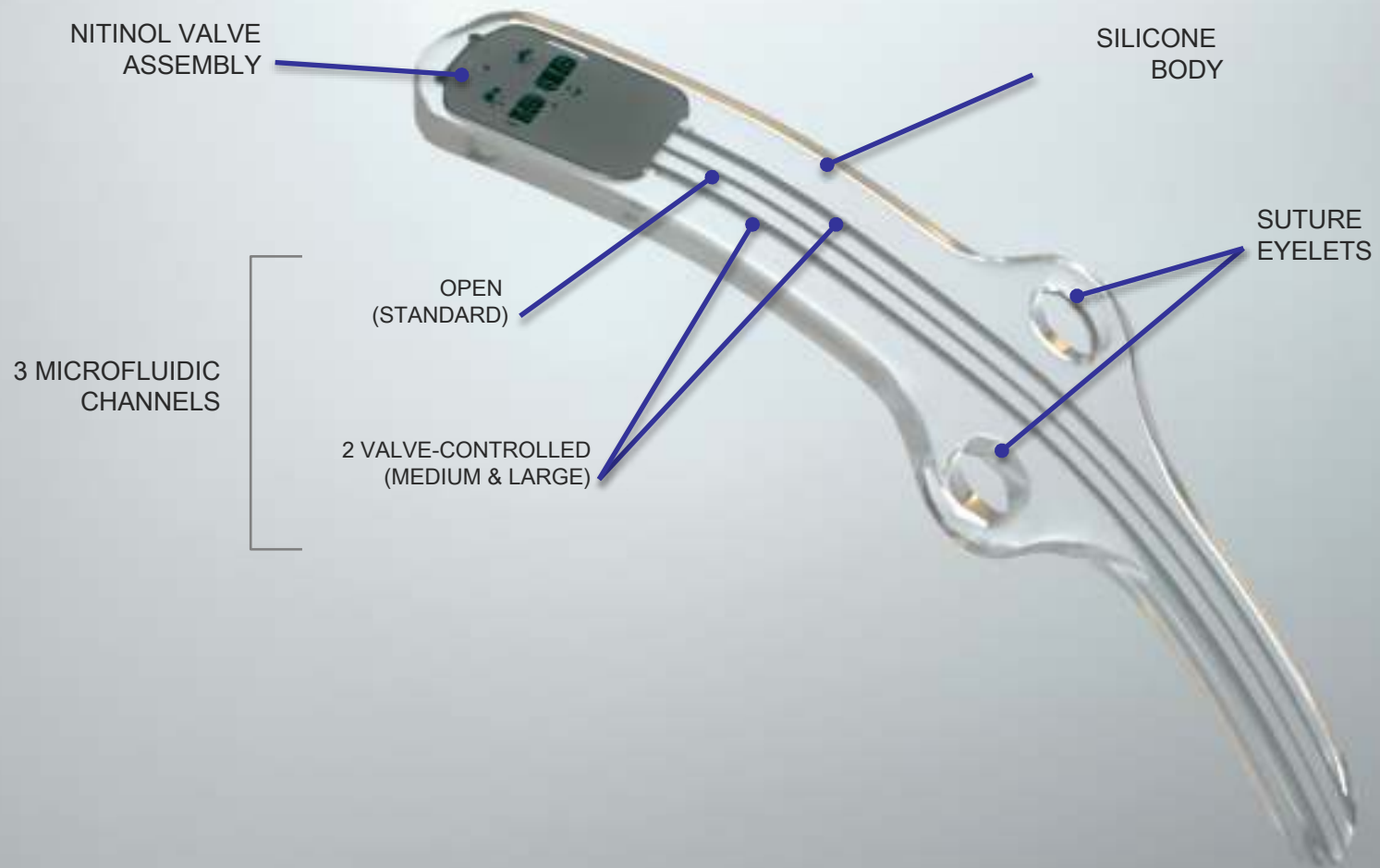
- Fistulating surgery will see revival
- If less complicated and
 - Faster
 - Adjustable
 - Self-adjusting

Faster

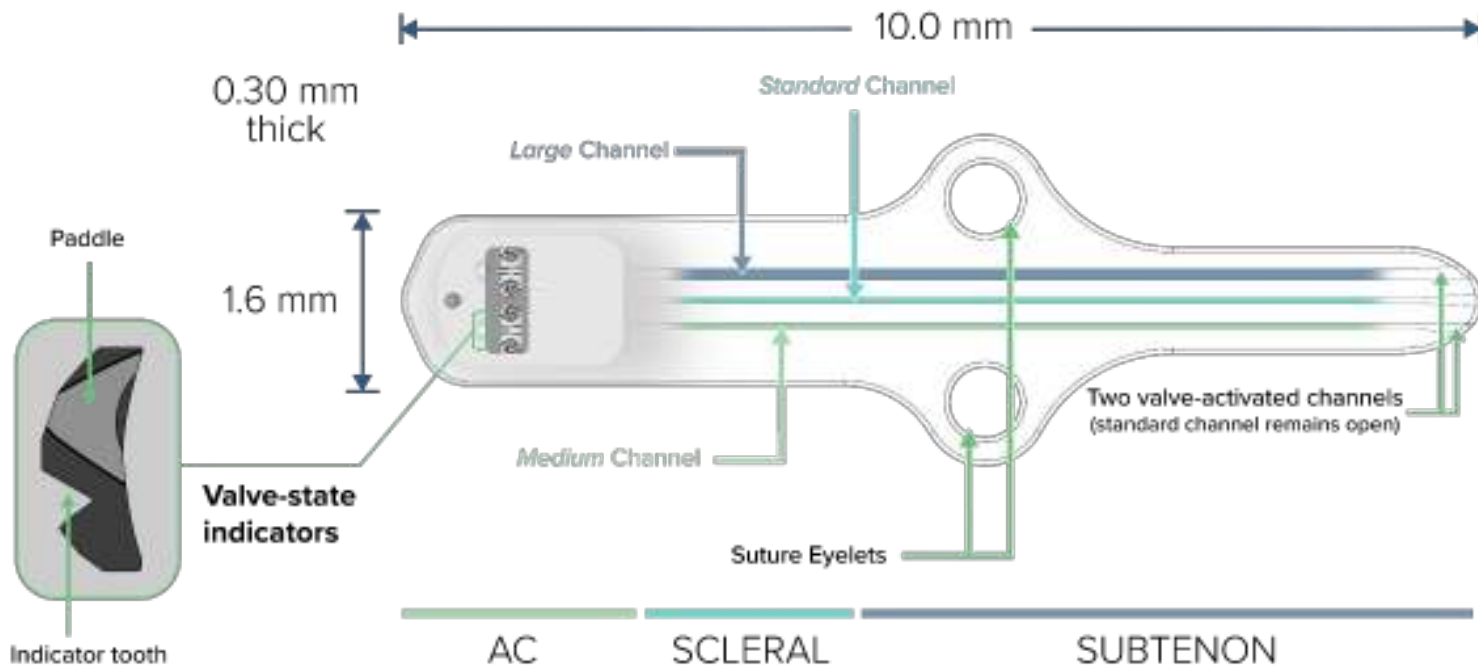
- Preserflow, Xen,



Adjustable system CALIBREYE™



Adjustable system Calibreye™

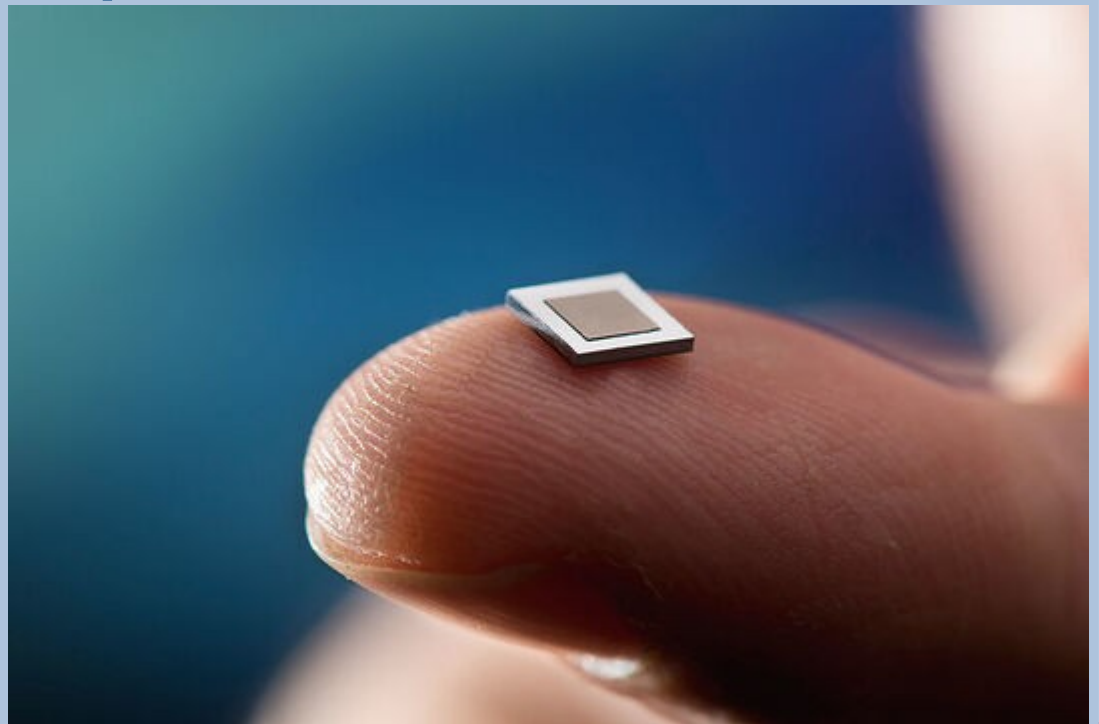


Adjustable (Rheon)



Hypothesis 5

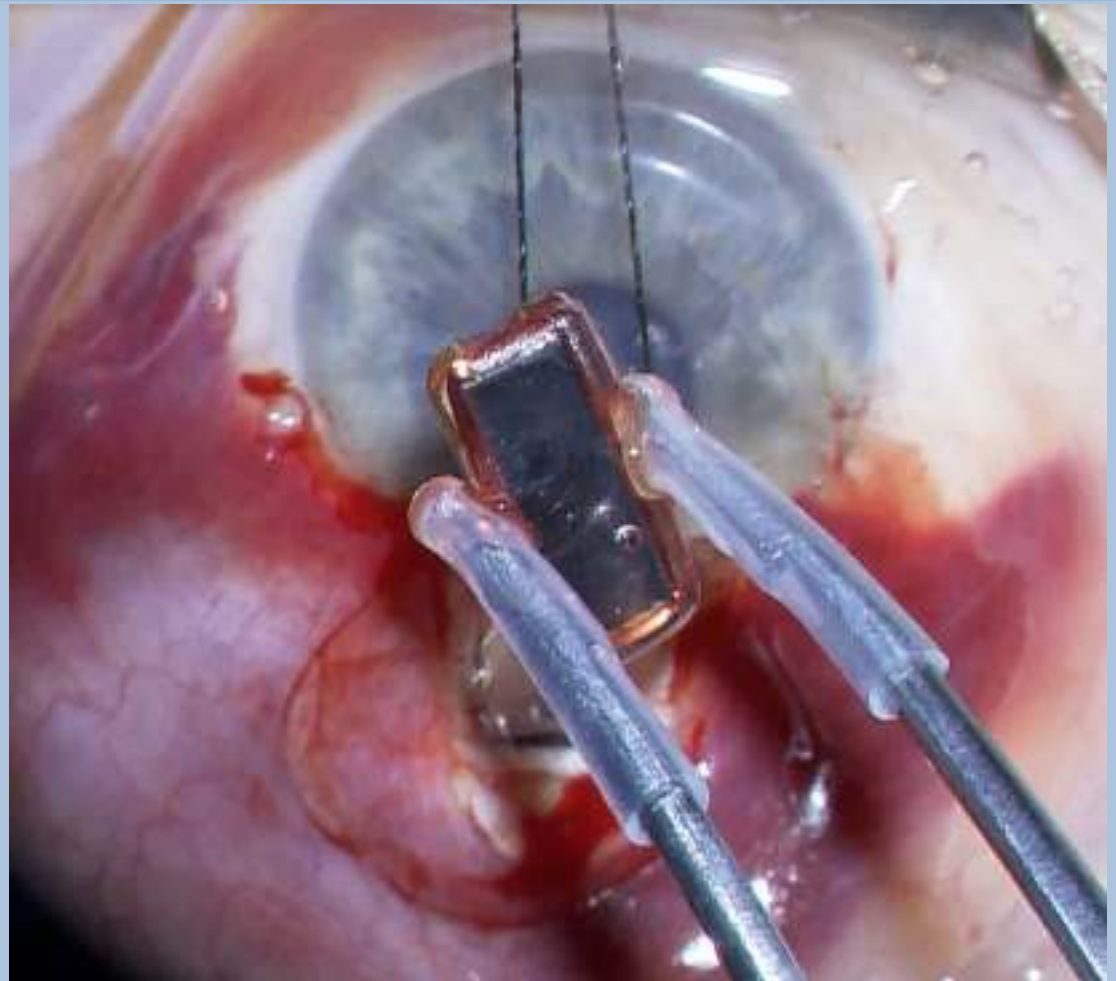
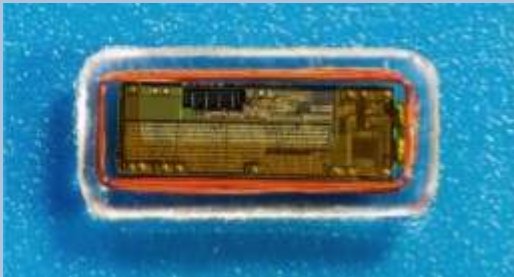
- Pumps will replace tubes



Hypothesis 6

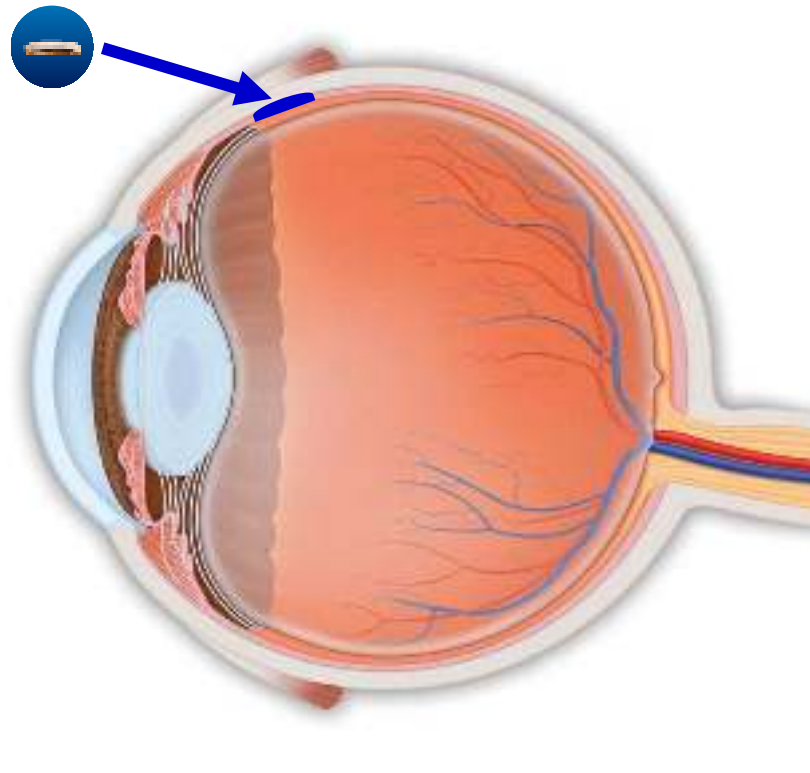
- Real time sensors will be used

Intraocular IOP sensor



Next generation IOP sensor

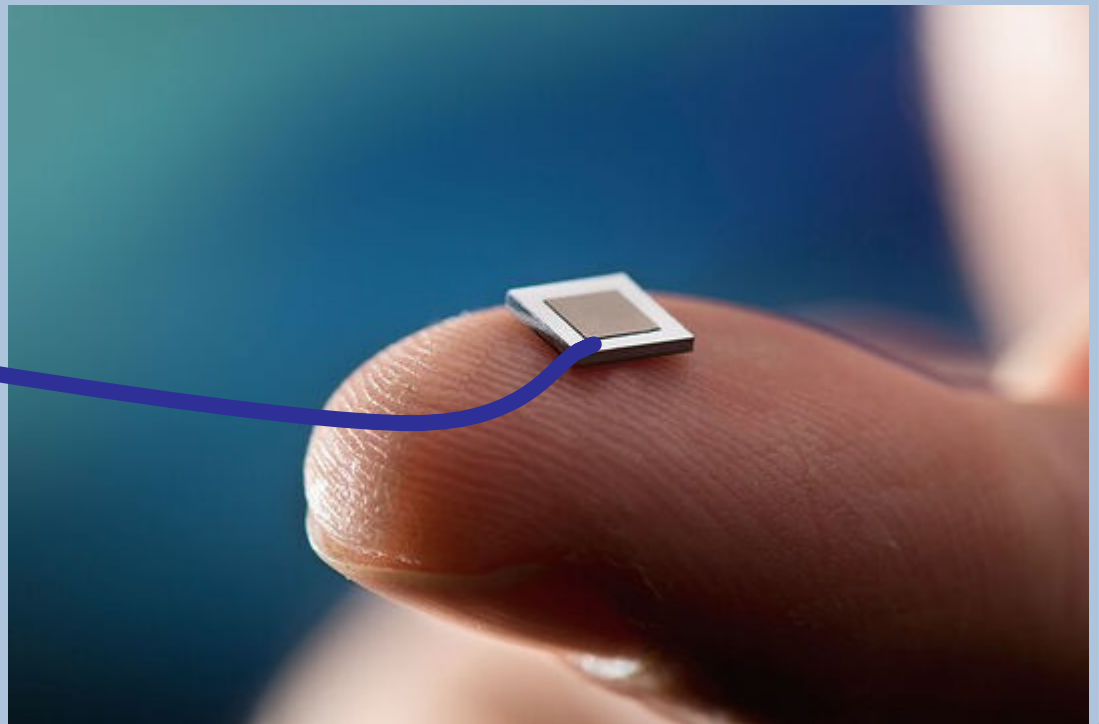
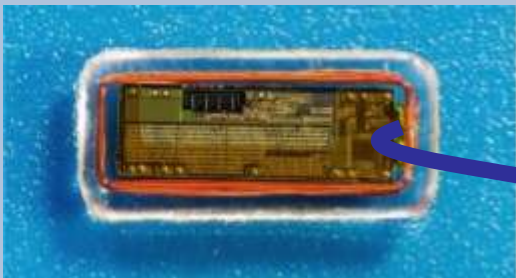
EYEMATE-Inject



Smaller
Soft
Injectable

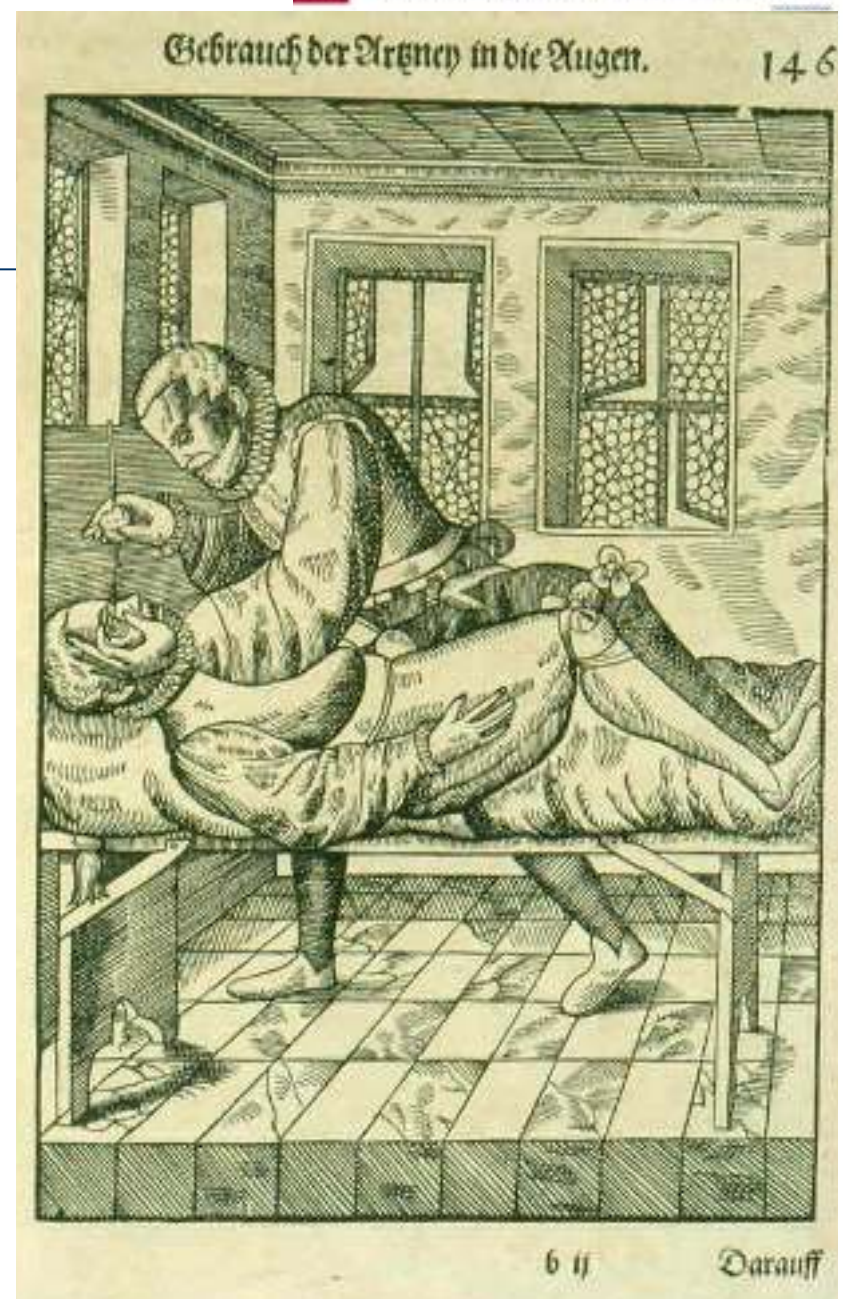
Hypothesis 7

- Pumps should/will be connected to sensors



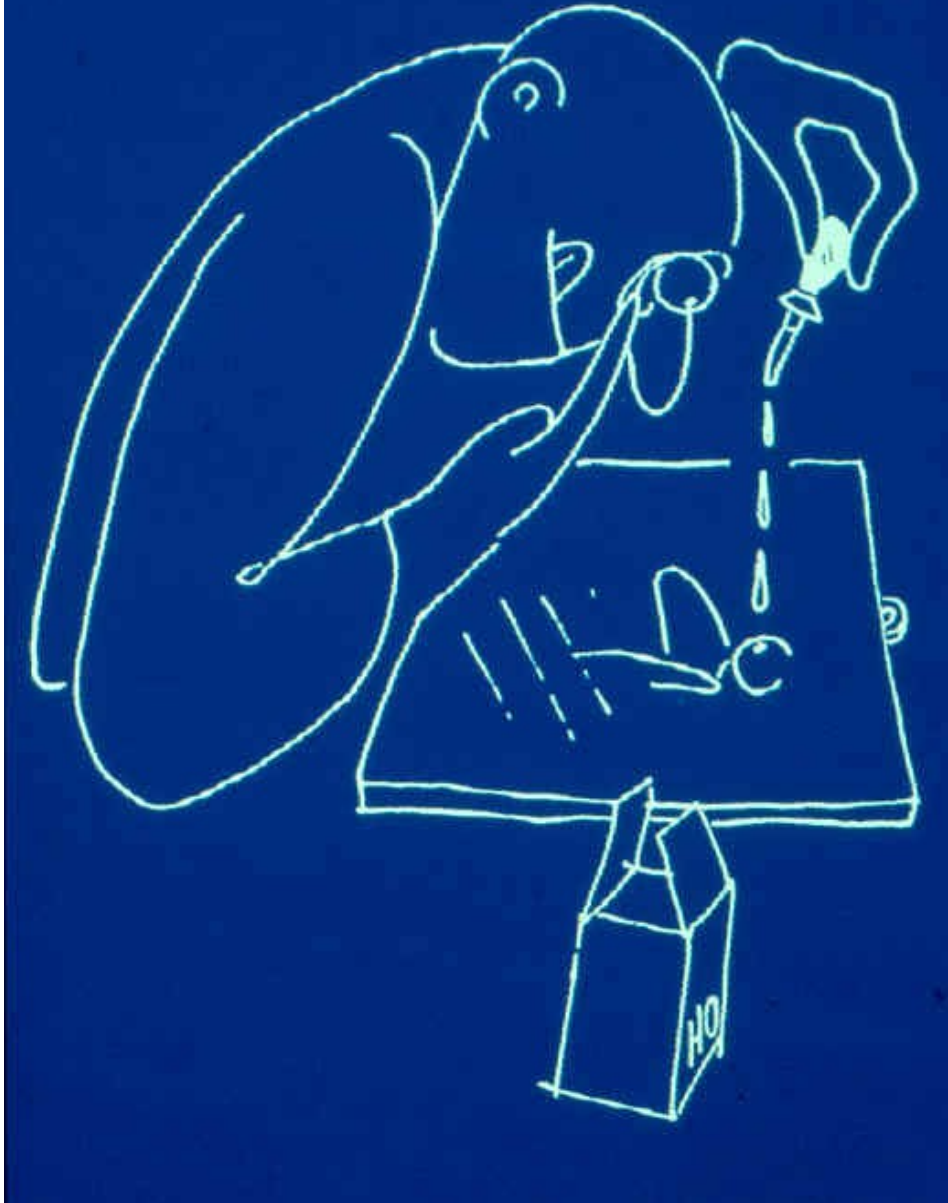
Hypothesis 8

- Surgeons will take over medical glaucoma therapy





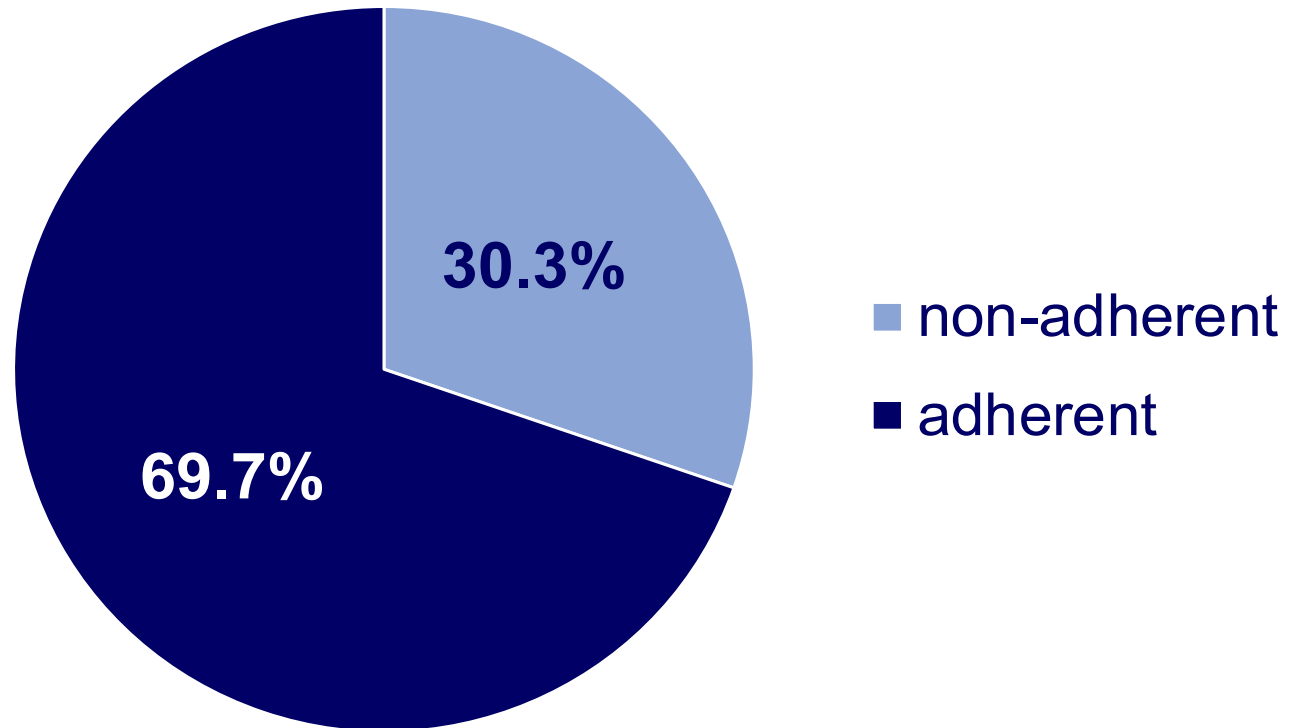
- Doctor's wish:
- Patient drops
 - regularly
 - punctually
 - correctly



- Reality:
- Always fear for the worst!

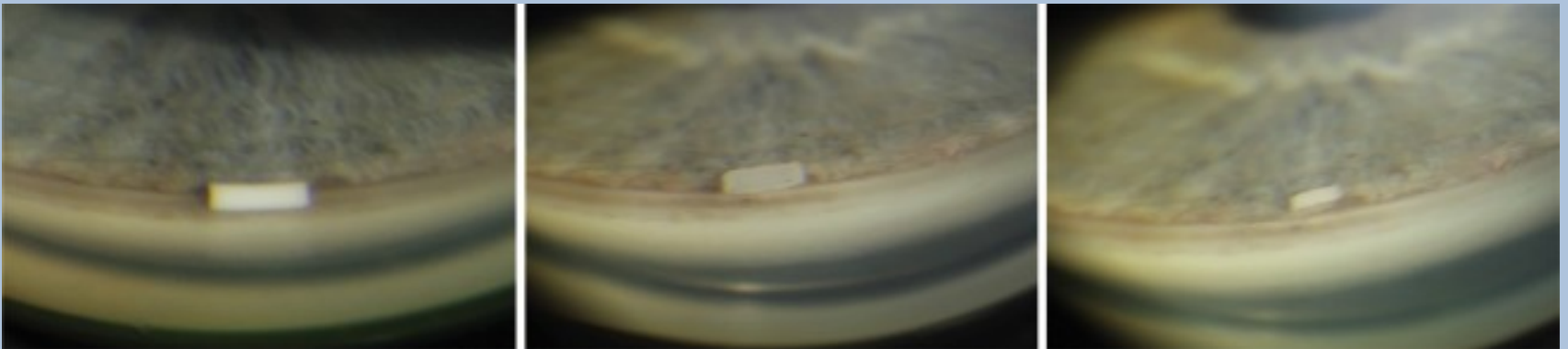
Self-reported adherence in a German cohort

Questionnaires in 201 patients; cut off: 5%



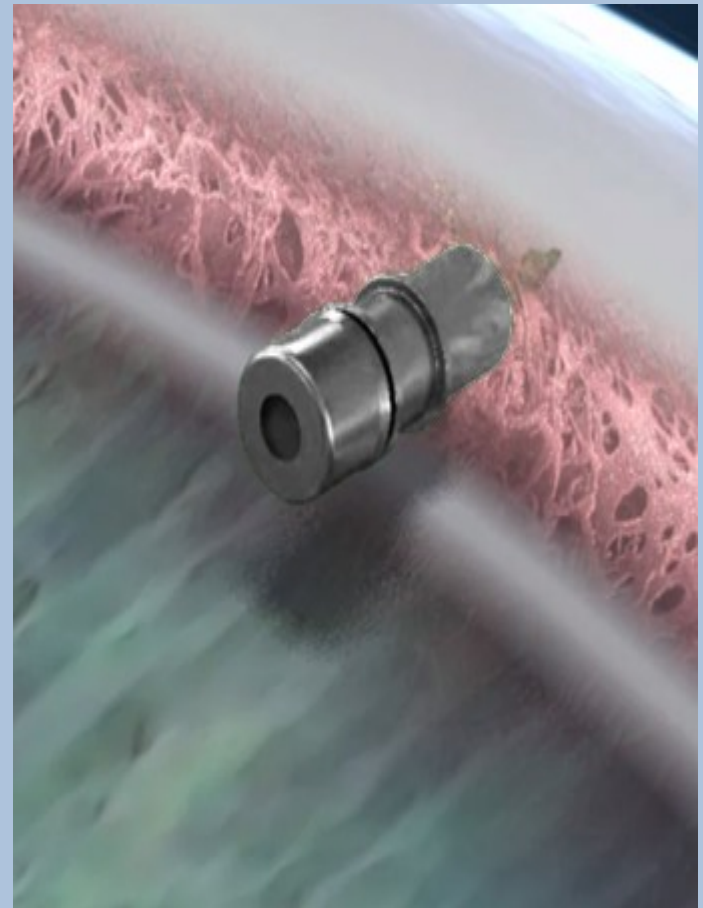
Bimatoprost Slow Release

- Injection into anterior chamber

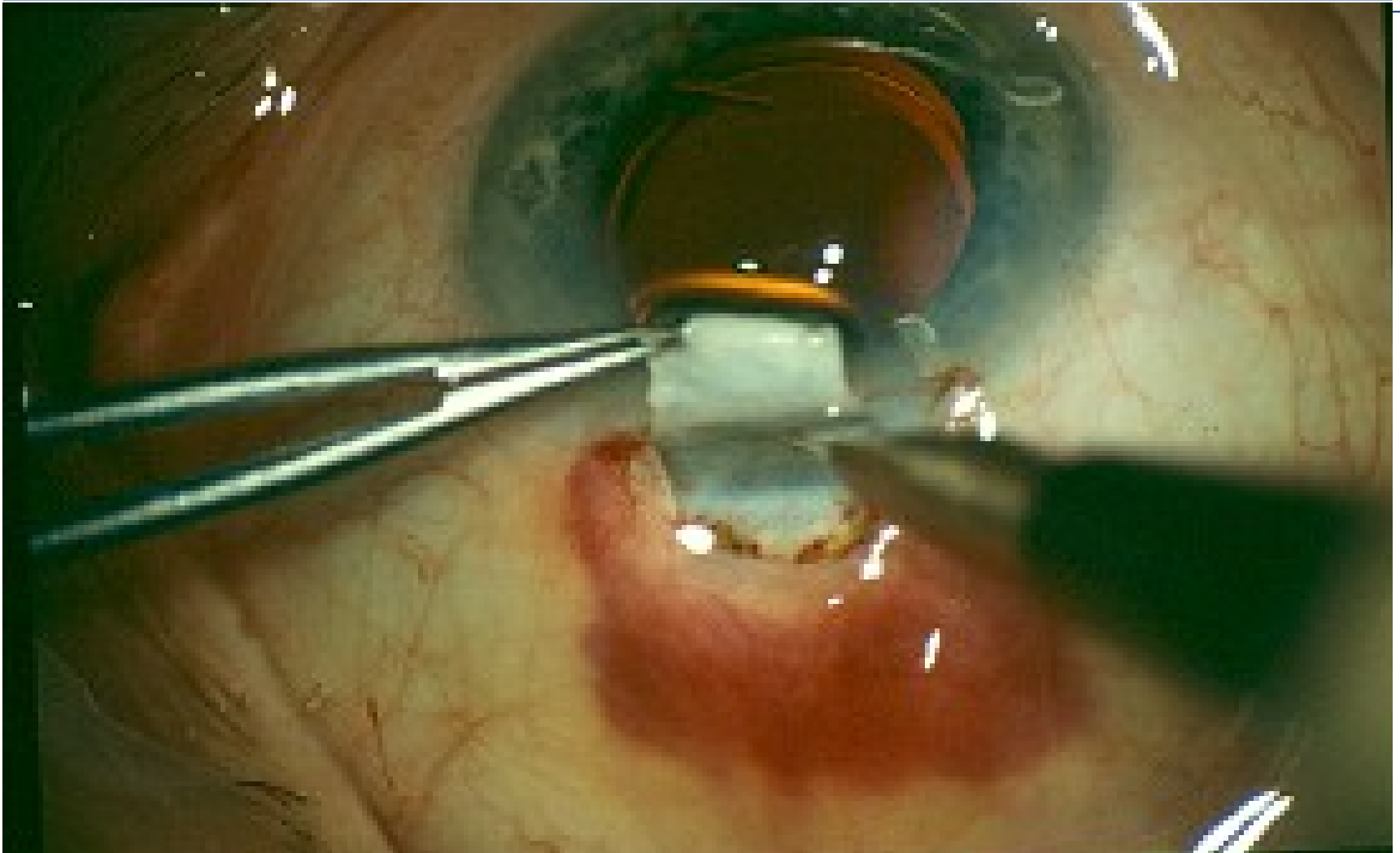


i-Dose (Travoprost)

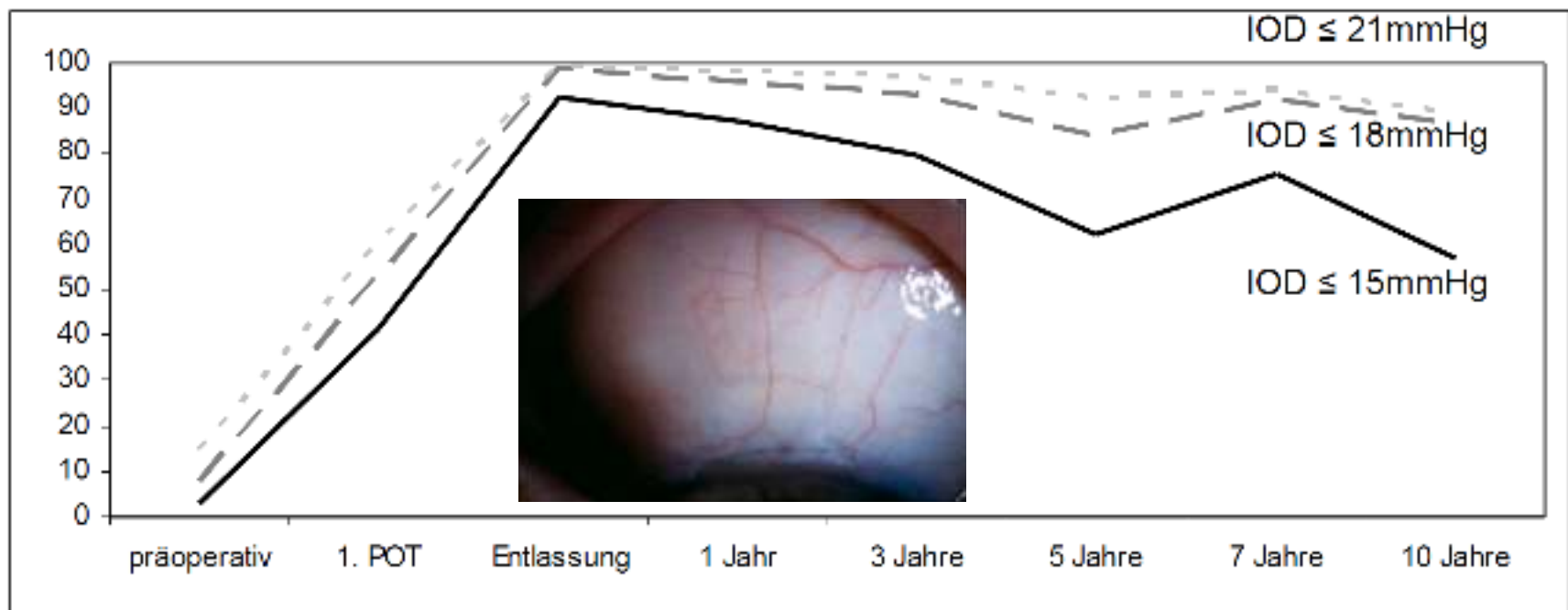
- Click to add Text



What about Trabeculectomy?



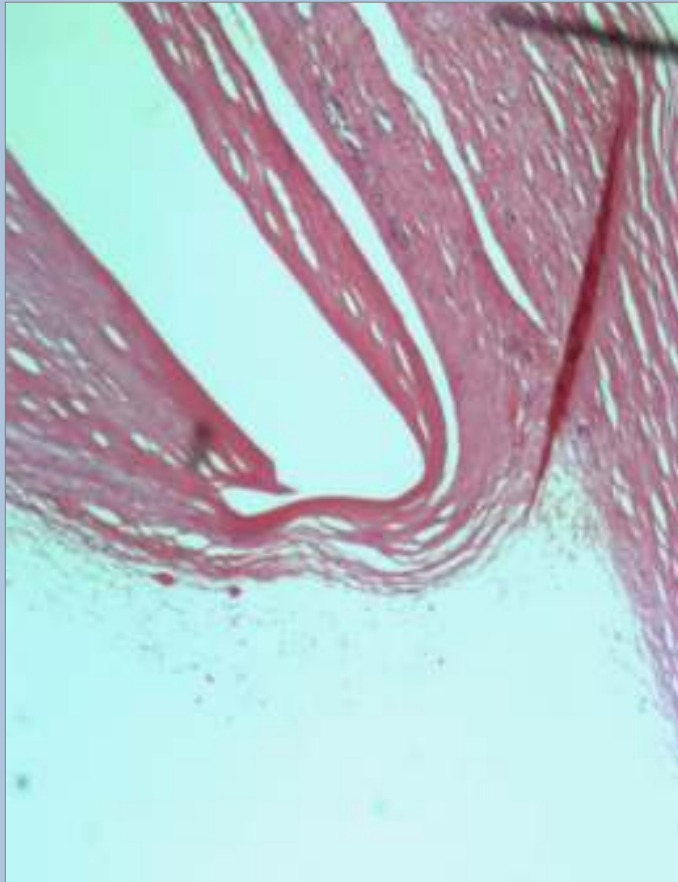
Trabeculectomy in Mainz: 10-Year Results



Hypothesis 9

- Fistulating surgery will remain with us for a long time

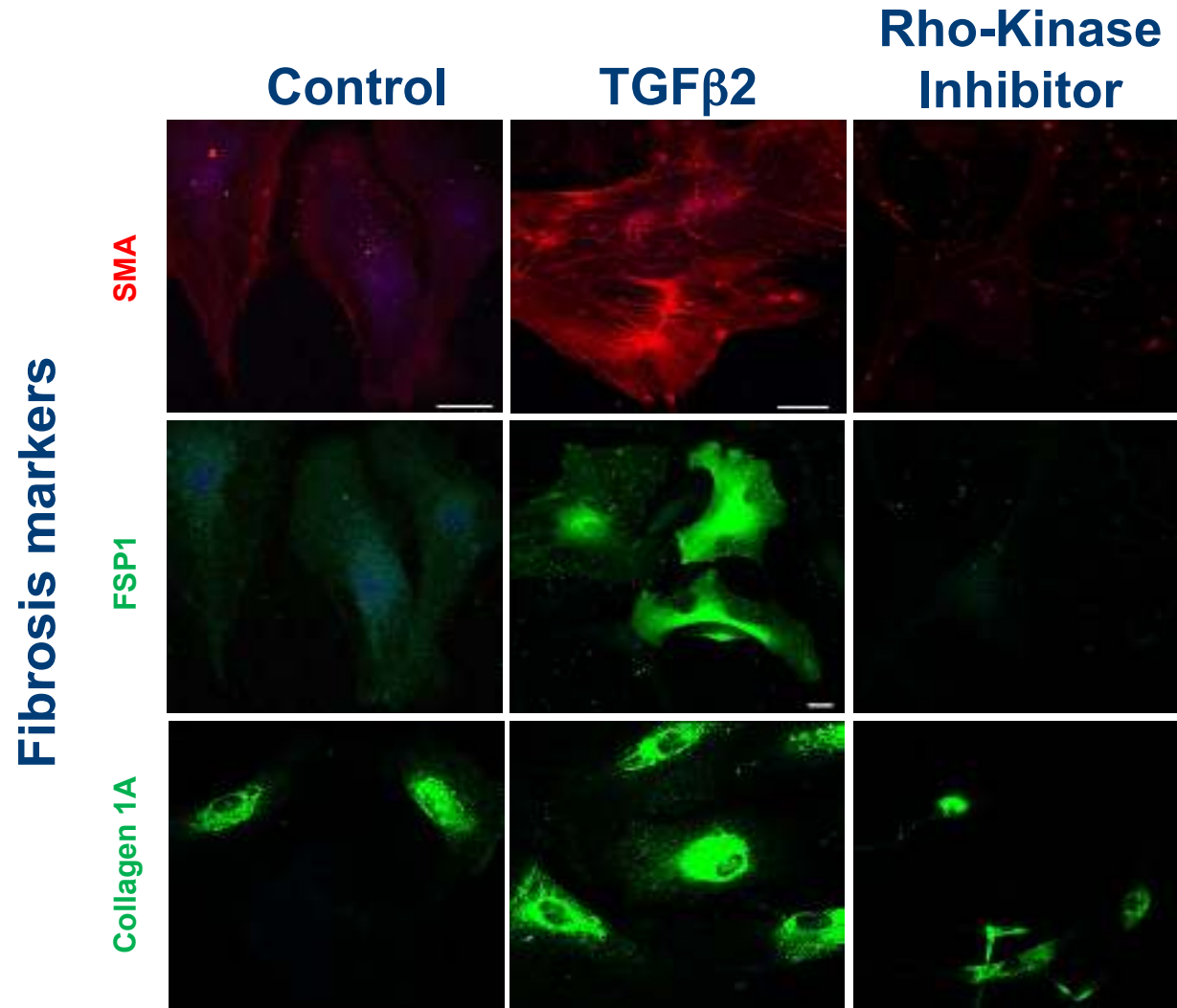
The wound-healing problem



Trabeculectomy

- Modulation of wound healing will improve
 - Rho-Kinase inhibitors

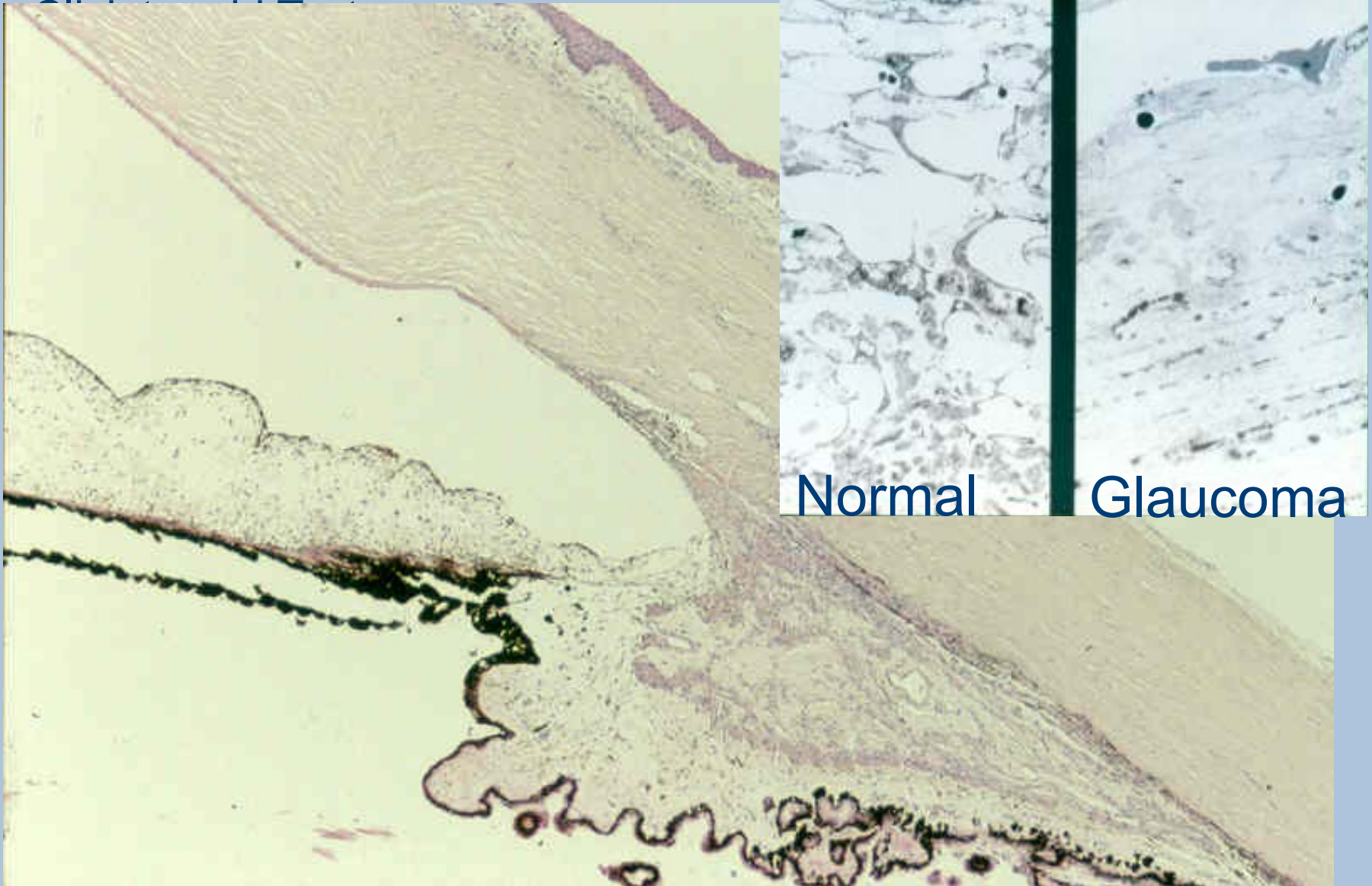
Modulation of wound-healing



Trabeculectomy

- Modulation of wound healing will improve
 - Rho-Kinase inhibitors
 - Antisense nucleotides

Elevated IOP in Glaucoma: Elevated Outflow Resistance



Future Surgery

- Modulation of wound healing
 - Rho-Kinase inhibitors
 - Antisense nucleotides
- Genetic Surgery
 - CRISPR-cas



Future Surgery

- Modulation of wound healing
 - Rho-Kinase inhibitors
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 - mRNA-Vaccination



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BIONTECH

Future Surgery

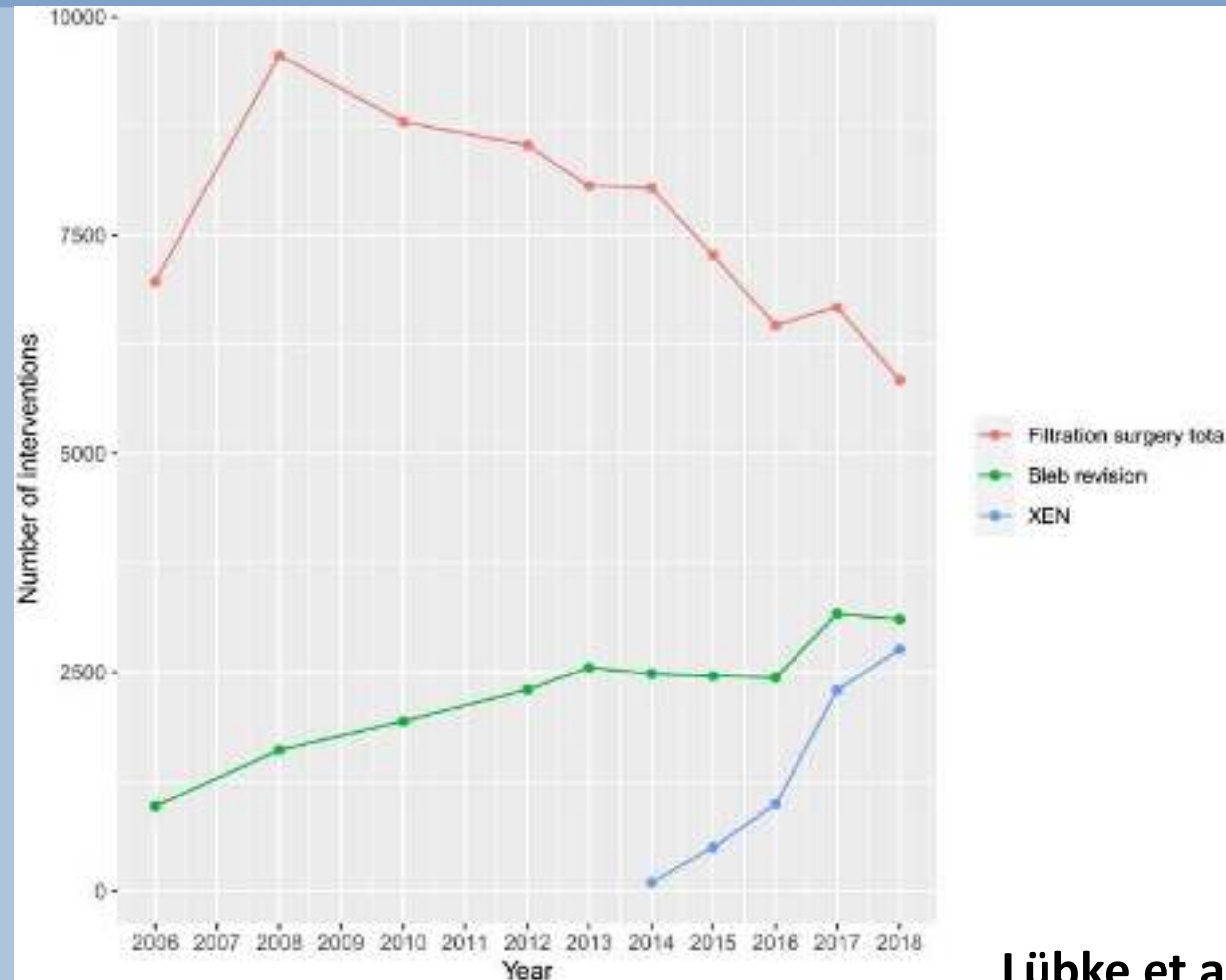
Biontech Headquarters Mainz, Germany



Hypothesis 10

- Surgeons who can perform trabeculectomy will be in short supply

Trends in Glaucoma Surgeries Germany



Lübke et al., 2020

Summary

- More surgery, not less!
- „Lighter“ surgeries preferred
- Real time IOP measurement
- Real time IOP modulation
- Individualized real time IOP lowering
- Surgery meets medication
- Great opportunities for young surgeons!



Thank you for your attention

Department of Ophthalmology Mainz, Germany

