A NEW TREATMENT PARADIGM
with ab-interno canaloplasty for POAG

Technique suitable for patients with medication intolerance and the non-compliant

By Prof. Norbert Körber

Over the past decade, minimally-invasive glaucoma surgery (MIGS) has revolutionised glaucoma management, offering a myriad of advantages such as minimal disruption of the eye's natural anatomy and physiology, a shorter recovery period and an enhanced safety profile.[1,2]

However, most MIGS approaches still alter the anterior chamber angle anatomy; for example, trabecular meshwork ablation using an electropulse or micro-trabecular bypass stents, which alter aqueous currents by creating an artificial pathway via one or two points of exit for aqueous humour.[3,4]

In our practice we use canaloplasty to improve the flow of aqueous throughout the entire 360 degrees of the conventional outflow pathway without redirecting aqueous currents to a single point of exit. It offers a comprehensive approach by addressing all aspects of potential outflow resistance in the trabecular meshwork, Schlemm's canal and collector channel systems, with proven safety and long-term efficacy in peer-reviewed studies.[5–7]

The technique

Introduced in 2016, ab-interno canaloplasty is a physician-led refinement of traditional canaloplasty, entailing the intubation of Schlemm's canal with a flexible microcatheter via a self-sealing, clear corneolimbal incision. This approach preserves the conjunctiva and thus can be used earlier in the treatment paradigm in cases of mild-to-moderate glaucoma. As an added benefit, it does not require a permanent implant in the eye.

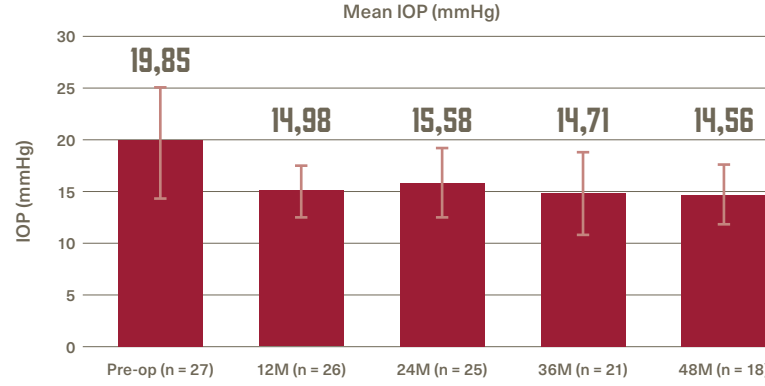
We use the iTrack canaloplasty microcatheter (Nova Eye) and the iTrack Advance. With an illuminated fibre optic tip, both devices provide continuous location feedback and an internal guidewire mechanism that permits catheterisation of up to 360 degrees of the canal during a single intubation.

The ab-interno technique is based on the same principles as traditional canaloplasty and is defined as the 360-degree catheterisation of Schlemm's canal to break obstructions and adhesions, followed by the subsequent viscodilation of Schlemm's canal upon withdrawal of the microcatheter whilst injecting a high-molecular-weight hyaluronic-acid-based ophthalmic viscosurgical device (OVD).

This pressurised delivery of OVD dilates the canal, thus restoring the physiological aqueous outflow pathway. The tissue-sparing aspect of ab-interno canaloplasty allows future surgical options that rely on the preservation of the trabecular meshwork in patients who may

FIGURE 1.

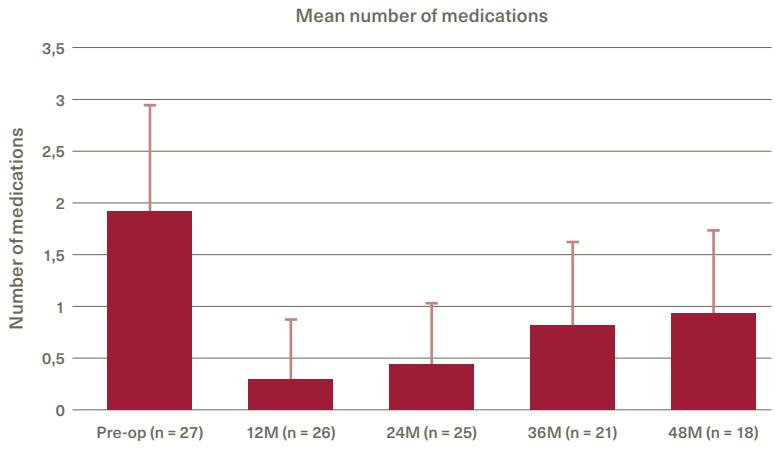
IOP AT BASELINE AND ALL POSTOPERATIVE VISITS FOLLOWING AB-INTERNO CANALOPLASTY.



Abbreviation: M, months; IOP, intraocular pressure

FIGURE 2.

NUMBER OF MEDICATIONS AT BASELINE AND ALL POSTOPERATIVE VISITS FOLLOWING AB-INTERNO CANALOPLASTY.



(Figures courtesy of Prof. Norbert Körber)

need further intervention as the disease progresses.

This comprehensive approach makes ab-interno canaloplasty an effective treatment modality in a variety of glaucoma patients, including those with mild-to-moderate open-angle glaucoma (OAG) and those who are intolerant, non-compliant or unresponsive to anti-glaucoma medication.

Ab-interno canaloplasty can be performed either as a standalone procedure or combined with cataract surgery. Various studies have documented long-term efficacy for reduction of both IOP and anti-glaucoma medication burden along with a satisfying safety profile and low risk of severe complications up to 36 months following surgery.[7–10]

Ab-interno limitations

The ab-interno technique is typically performed in cases of mild-to-moderate glaucoma and, to my knowledge, existing published literature does not incontrovertibly report clinical evidence with more advanced glaucoma stages. Furthermore, despite its minimal learning curve, familiarity with the gonioprism is a known challenge of all the MIGS procedures. In addition, ab-interno canaloplasty can add up to 10–15 minutes of extra time to the traditional phacoemulsification procedure.

Experience as a surgeon

I was one of the first surgeons to use ab-interno canaloplasty in Europe and I recently presented the results of our retrospective, monocentric, consecutive case series using the ab-interno surgical technique at the 2021 European Society of Cataract & Refractive Surgeons meeting in Amsterdam and published the 4-year results.[11]

The study was conducted on 27 eyes of 22 patients with mild-to-moderate OAG experiencing insufficient IOP reduction or intolerance and non-compliance with glaucoma medication, also including a previously failed trabeculectomy. These patients underwent ab-interno canaloplasty with post-surgical follow-ups at 12, 24, 36 and 48 months.

The results were promising and demonstrated the efficacy of the procedure in reducing IOP and medication dependency, as well as patient complications. Mean IOP significantly declined by 30% from baseline ($P < 0.001$), and the reduction was sustained 4 years postoperatively, from 19.8 ± 5.2 mmHg at baseline to 14.6 ± 3.0 mmHg at the last follow-up.

A significant reduction in mean medication usage was evident 4 years postoperatively as well, from 1.92 ± 1.00 at baseline to 0.89 ± 0.83, and we were able to significantly reduce glaucoma medication dependence by the fourth year. Indeed, 4 years postoperatively, 39% of the eyes required no medication, compared with none at baseline, and 72.2% were using one medication or less (Figures 1 and 2).

No serious complications were documented throughout the duration of the study, except for a case of limited descemetolysis near the limbus, which resolved spontaneously within 2 months. We surmise this was due to slow withdrawal of the catheter resulting in local over-delivery of OVD in the canal and subsequent temporary detachment of the Descemet membrane. Overall, our results suggest that ab-interno canaloplasty is not only effective but also a safe surgical procedure.

Future plans in Europe

In 2022 we plan to start a prospective, non-randomised, multicentre

TAKE-HOME MESSAGES

- Ab-interno canaloplasty is a stent- and implant-free procedure;
- It preserves trabecular meshwork tissue for subsequent procedures;
- It leads to a 30% average IOP reduction;[12]
- It is comprehensive—addresses all outflow pathway resistance points, including the collector channel ostia; and
- It can be performed in conjunction with cataract surgery or as a standalone procedure.

study across four investigational sites in Europe, to assess the efficacy, safety and quality of life outcomes of canaloplasty combined with phacoemulsification and performed via an ab-interno approach using the new-generation iTrack Advance, which has reengineered the previous microcatheter via a handheld injector design. This multicentre study, called CATALYST, will be performed over a 12-month period and will enrol up to 50 patients with mild-to-moderate uncontrolled OAG.

To sum up, in my experience, ab-interno canaloplasty offers significant versatility in real-world clinical practice and presents a useful tool in the glaucoma toolkit of comprehensive ophthalmologists and cataract surgeons, who typically see earlier-stage patients than their glaucoma surgeon peers. However, these encouraging results do not currently suggest that the technique can replace traditional glaucoma surgery or ab-externo canaloplasty, which we still use in our practice for more advanced glaucoma cases.

Ab-interno canaloplasty is effective in cases of controlled glaucoma, for patients who are intolerant or non-compliant to anti-glaucoma medications and thus have the treatment goal of reducing the number of medications required while maintaining IOP within target range, and possibly also delays the requirement for more invasive surgery and its subsequent increased risks and post-surgical complications. ▮

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Prof. Körber currently works at Augencentrum Koeln and at the Clinica Oculistica, University-Hospital of Padova, Italy. His areas of interest and expertise are cataract and glaucoma, with a special interest in canaloplasty. He has no financial or proprietary interest in any material or method mentioned but is the principal investigator for the CATALYST clinical study, which uses the product mentioned.

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