

Minimally Invasive Glaucoma Surgery (MIGS)

There are various situations in cataract surgery where opinions matter and we learn from the experience of each other. UPJO brings up a panel discussion on preferred practice patterns in Microinvasive Glaucoma Surgery (MIGS). The expert panel consisted of:

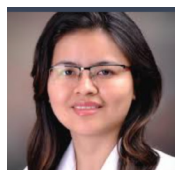
EXPERT PANEL



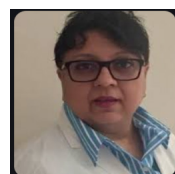
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“Glaucoma is a notorious disease in terms of its late diagnosis, progression and irreversible nature. Minimally invasive glaucoma surgery (MIGS) is an emerging option for management of same, so we planned a panel discussion on recent practice trends and challenges of MIGS and hereby sharing the excerpts to guide and help practitioners in routine practice.”

Q1. In which patients do you prefer MIGS?

PS: a) Early to moderate primary open angle glaucoma (POAG)- Non-compliant or intolerant to medications
b) Failed trab in POAG – Those on medication but IOP not under control before moving to the next the procedure will prefer MIGS

DA: Mild to moderate POAG

SD: MIGS is preferred for patients with mild-to-moderate primary open-angle glaucoma, especially when combined with cataract surgery. It is also an excellent option for patients who are medication-intolerant or suffer from ocular surface disease, as it reduces the dependency on medications. In cases of recent-onset secondary glaucoma or proximal glaucoma with an open angle, procedures like Kahook's dual blade (KDB), bent ab-interno needle goniotomy (BANG), or gonioscopy-assisted transluminal trabeculectomy (GATT)

are highly beneficial. Few angle-closure glaucoma cases may also be suitable after iridectomy, provided no significant synechial closure exists. Additionally, MIGS can also be used for pediatric glaucoma, though its role in juvenile glaucoma remains more limited.

VP: My perspective of MIGS is very broad and I view it as devices or procedures that restrict 'inflow' (i.e., reduce aqueous production) and those that enhance 'outflow' (i.e., procedures and devices that help to enhance drainage of aqueous). Usually, I prefer one MIGS device or procedure in mild to moderate glaucoma, as determined by updated visual fields. However, I have been combining two MIGS procedures in advanced glaucoma – reducing inflow and enhancing outflow - with good effect. ECP is the only procedure that reduces inflow; however, all the other procedures (BANG, KDB, Tanito microhook, iStent/inject, MIT, etc) enhance outflow. It helps to avoid creating a bleb with all its incumbent risks, yet it does not jeopardize a future trab, if it is (ever) required.

Q2. Which MIGS device do you commonly prefer?

PS: KDB, BANG, GATT and iSTENT

DA: It depends upon the patient's affordability:

If not willing to pay: BANG or microhook

If willing to pay: KDB

In government hospitals, iSTENT is an expensive option

SD: The selection of MIGS is influenced by factors such as target intraocular pressure, cost considerations, and the surgeon's expertise. In India, commonly used options include KDB goniotomy, BANG, GATT, and iStent. Subconjunctival devices like the Xen implant or PreserFlo are not yet available in the country.

At our institute, KDB is preferred due to its simplicity, affordability, and effectiveness in achieving pressure control, while GATT is favored when the cost is a significant factor. The iStent is reserved for cases of open-angle glaucoma, whereas KDB, BANG, and GATT are viable options for angle-closure glaucoma following a peripheral iridotomy.

Trabecular meshwork-based procedures are generally selected for patients with mild to moderate glaucoma. For advanced cases, ECP (endocyclophotocoagulation) may be considered, although my personal experience with this procedure is limited. Whenever possible, I combine MIGS with cataract surgery to optimize patient outcomes.

VP: The availability of MIGS is still quite limited in India. Each eye is evaluated with respect to type, stage and severity of glaucoma, number of glaucoma medication/s, purchasing power of the patient, and the procedures are agreed upon after informed consent. Therefore, procedures that are discussed are - Open angle glaucoma or if the angle opens post LPI (+cataract surgery or in pseudophakic eyes) • Excisional goniotomy (Kahook Dual Blade – KDB/Bent needle angle goniotomy - (BANG) • iStent inject • Endocyclophotocoagulation (ECP) Angle-closure glaucoma with extensive-angle synechiae/plateau iris syndrome and refractory glaucoma • ECP patient makes an informed choice based on their affordability and insurance cover. This is particularly important for iStent inject; so far, the majority I tend to avoid GATT as I do not believe that a 360° ripping of the TM has any significant advantage vis-à-vis segmental goniotomy, especially in adults. y of my patients who have undergone istent/injection have been reimbursed fully by insurance.

Q3. What is a learning curve of MIGS?

PS: The learning curve is definitely there, contrary to as easy as it looks in edited videos.

DA: The initial learning curve is steep, especially for those who are not well-oriented to gonioscopy. Once the angle structure is clearly visualized, learning MIGS becomes easier.

SD: The learning curve of MIGS varies depending on the specific procedure and the surgeon's prior experience with angle-based surgeries. Techniques like KDB, BANG, and iStent implantation generally have a shorter learning curve due to their simplicity and minimal need for advanced surgical maneuvers. Procedures like GATT may take longer to master. Familiarity with gonioscopy is critical for all MIGS, as a clear view of the angle is essential. On average, most surgeons achieve proficiency after 20 to 30 cases.

VP: As with any new surgery, one must train for angle surgery. The learning curve can vary from individual to

individual. It actually begins in the OPD (rather than in the OR) with the practice and mastering of gonioscopy. In my experience this is the biggest hurdle, followed by mastering of intraoperative gonioscopy. In terms of procedures, GATT has a very significant learning curve; moreover, cannulation of the Schlemm's canal is 'blind' for over 2 quadrants with an increased risk of false passage, DM detachment, hyphaema, etc. Such a procedure can also take much longer (20–40 minutes) compared to a goniotomy (typically 2–4 minutes in my hand).

Q4. Combined procedure, i.e., phacoemulsification + MIGS, is superior or equivalent to the stepwise approach in your clinical practice?

PS: Combined MIGS has its benefits but needs long term studies to prove that the benefit is from combined procedure and not only IOP drop due to phacoemulsification.

DA: Combined procedure should be equivalent: The major advantage is that in one procedure, both cataract and glaucoma is addressed

SD: In my clinical practice, a combined procedure like phacoemulsification with MIGS is often preferred for patients with coexisting cataracts and mild-to-moderate glaucoma. This approach is generally superior, as it enables simultaneous visual rehabilitation and effective intraocular pressure (IOP) reduction, reducing the need for multiple surgeries. Literature supports the enhanced outcomes of MIGS when performed alongside cataract surgery, making it particularly beneficial for lowering the medication burden and improving patient compliance. However, a standalone approach is considered for patients without cataracts, younger individuals with secondary (proximal) glaucoma, or pseudophakic glaucoma.

VP: Yes, combining MIGS with phaco has a superior effect in terms of efficacy. In any case, one also loses the massive advantage of utilizing the incisions made for the purpose of cataract surgery if one is considering a stepwise approach.

Q5. Is it superior to conventional Trabec?

If yes why?

If no, why?

PS: No, trabeculectomy has a much more pronounced IOP drop, with more predictable outcomes and long-term results available.

DA: As per the literature, it is not superior to trab.

SD: MIGS offers distinct advantages over conventional trabeculectomy in specific clinical situations but is not considered superior for all cases. The introduction of MIGS, with its more physiological mechanisms, faster recovery, and lower complication rates, has significantly shifted the surgical approach to managing glaucoma in the early stages. MIGS is designed to fill the gap between medications or laser treatments and traditional incisional surgeries like trabeculectomy, not to replace them. MIGS procedures reduce IOP and decrease the need for medication, but patients may still need to use eye drops. MIGS are not suitable for advanced

or progressive glaucoma where the target IOP is very low. In my clinical practice, I perform more trabeculectomies than MIGS, as I often deal with advanced and progressive glaucoma, where the benefits of MIGS are limited.

VP: Yes and no. This is a tough question to answer. It is certainly superior to a trab in terms of safety in mild-to-moderate glaucoma, where I will not even contemplate doing a trab. The biggest advantage of MIGS in early disease is the safety aspect, along with a reduction in anti-glaucoma medications and a 20 to 30% reduction in IOP. On the other hand, by combining inflow-outflow MIGS, I have results that are non-inferior to grab in terms of IOP lowering and much superior to trab in terms of safety (complications and interventions) – which makes it very desirable for the patient. I tend to achieve over 40% reduction in IOP in such cases as well as approximately 75% reduction in medication. Lack of bleb means fewer post-operative interventions, no risk of blebitis and bleb-associated endophthalmitis and other sight-threatening complications associated with trab.

Q6. Is it feasible in pediatric glaucoma patients?

PS: Yes, isolated trabecular dysgenesis has more potential benefits compared to other types of pediatric glaucoma.

DA: Goniotomy in clear corneas has been practiced for a long time.

SD: MIGS procedures, such as the KDB and GATT, can be performed in both mild and advanced pediatric glaucoma, provided the cornea is clear and the angle can be visualized. For primary congenital glaucoma, circumferential 360° GATT demonstrates superior success compared to limited incisional goniotomy. Additionally, for other pediatric glaucoma indications, such as steroid-induced, traumatic, or uveitic glaucoma, KDB, BANG, and GATT offer promising results. However, their use in children requires careful evaluation on a case-by-case basis, considering factors such as safety, efficacy, and long-term outcomes.

VP: Yes, it is. I was routinely doing a goniotomy with an MVR blade (MIGS described a long time ago!) in pediatric patients if corneal clarity permitted and continue to do so; I have also done endoscopy-guided goniotomy if the cornea is not very clear. GATT is also an option in pediatric patients. These minimally invasive techniques are infinitely more advantageous for post-op recovery in babies/kids before trab (and Trab with a metallic trabeculotome) is considered.

Q7. Are you satisfied with the long-term outcomes of MIGS?

PS: We need to wait for a little more time before we comment on this.

DA: Literature doesn't have long-term data beyond 10 years or more. Our experience of 2 to 3 years suggests that few patients progress and may require trabeculectomy.

SD: As the field of MIGS evolves, it has the potential to greatly enhance the quality of life for glaucoma patients by offering safer, less invasive, and more effective treatment options. While long-term data on MIGS outcomes is limited

in India, I consider MIGS a valuable choice for managing early to moderate glaucoma, especially in patients who are not yet suitable for traditional surgical interventions. Although the outcomes are generally positive, ongoing monitoring is crucial to ensure sustained intraocular pressure control, as some patients may still require additional medical therapy or further procedures in the future.

VP: MIGS has not been around in India for a very long time, so we cannot talk about “long-term” outcomes. I am reasonably happy with the 12 to 18 months outcome as I get a 20 to 30% reduction in IOP and an approximately 80% reduction in AGM with NIL serious complications. This makes it very patient-centric – early visual rehabilitation (almost like phaco alone), lesser number of post-op visits, reduction or elimination in use of topical anti-glaucoma medications (AGM) – thereby countering issues of intolerance, compliance, adherence, recurring cost, etc. It, therefore, helps to reset the “AGM clock” in patients – no or fewer drugs mean that patients can wholly or partially rewind time and postpone the onset of potentially blinding disease. One must be able to diagnose glaucoma early for this purpose. General ophthalmologists must be sensitized and post-graduate trainees must be educated about the disease – it is an optic neuropathy where IOP can be normal. Accurate assessment of the optic nerve head is a skill that must be acquired rather than depend solely on OCT findings – which may be ‘green’ in disease and ‘red’ without disease.

Q8: What is the most common intra-operative complication encountered while doing MIGS?

PS: Hyphaema

DA: Hyphaema

SD: MIGS procedures are generally safe, but complications can occur, particularly during the initial learning curve. Common intraoperative complications include bleeding, iris prolapse, and device malposition, especially with the iStent. Rare complications, such as Descemet's membrane detachment, lens contacts, iridodialysis, and cyclodialysis, may occur, particularly during goniotomy procedures. While these complications are typically manageable, they underscore the critical importance of experience and precision in performing MIGS effectively.

VP: Hyphaema is the most serious one I have encountered. However, I have only needed to do a washout for two patients so far (in 400+ procedures) – the indication for AC washout in both cases was a spike in IOP not controlled by medication.

Q9: what is the most common post-operative complications you encountered and which one was most difficult to manage?

PS: Hyphaema, blood mixed aqueous and vitreous

DA: Micro-hyphaema and IOP spikes in the first week, which are usually resolved with conservative management

There was one referred case of post-MIGS hypotony-cyclodialysis was detected and conservative management was done.

SD: Based on my experience with MIGS procedures, the most common post-operative complications include hyphaema, intraocular pressure spikes, and inflammation. While these are typically self-limiting, they can occasionally pose challenges. Among these, IOP spikes are the most challenging to manage, often necessitating an escalation in medications to achieve adequate pressure control.

The iStent procedure stands out as the safest in terms of post-operative complications, with fewer issues compared to other canal-based MIGS procedures. However, I encountered a case of 360° ciliary effusion following a KDB procedure, which led to hypotony maculopathy and was difficult to manage.

VP: Nil serious complications – mostly spike in IOP at 1 week (likely a steroid response) and transient self-absorbing hyphaema. I have only needed to do a washout for two patients so far (in 400+ procedures) – the indication for AC washout was a spike in IOP not controlled by medication. PAS formation is also not uncommon; however, it has not been very extensive, barring one patient. In this patient, I did a goniosynaechiolysis as the patient was not keen to restart AGM. So far, there have not been any serious sight-threatening complications, which have been difficult to manage.

Q10: In terms of cost to benefit ratio, is MIGS feasible in Indian population?

PS: BANG and GATT are feasible

DA: As MIGS are expensive procedures, it may not be feasible for the mass. Only selective affording patients can be considered.

SD: MIGS procedures may have higher upfront costs, making them less feasible for widespread use in India. However, for patients with early to moderate glaucoma. MIGS can reduce long-term medication and hospital visits, offering overall savings. Combining MIGS with cataract surgery improves cost-effectiveness. In the Indian context, procedures like BANG, GATT, and KDB are more practical options due to their affordability and effective outcomes.

VP: In India, most Ophthalmic practitioners tend to equate MIGS with iStent; however, this is not the case. There are many more procedures available and there are several MIGS procedures that can be cost-effective if glaucoma is mild to moderate. BANG, MIT, Goniotomy with Tanito microhook etc, are all very cost-effective procedures. However, if one is willing to invest in an E2 machine (BVI), then ECP can also be done in a reasonably cost-effective manner, as the probe is reusable after ETO sterilization; there is, of course, an initial capex involved. I firmly believe that cost is not necessarily financial; a procedure that interferes with the integrity of the eyeball may be cheap but carries a lifelong risk of infection and may ultimately prove too costly for the patient – as the patient may lose their eye. That is why the need of the hour is not only early diagnosis of glaucoma (in which cases MIGS can be performed along with cataract surgery so that potential blindness can be delayed by resetting the AGM ‘clock’), but also innovation is imperative, especially in advanced glaucoma.

In a gist, we could say that if we take into account: proper patient selection, indication and technique, MIGS is a viable emerging option for the management of mild to moderate glaucoma.

Abbreviations

MIGS: Minimally Invasive Glaucoma Surgery

POAG: Primary Open Angle Glaucoma

KDB: Kahook’s Dual Blade

BANG: Bent Ab-interno Needle Goniotomy

GATT: Gonioscopy Assisted Transluminal Trabeculectomy

ECP: Endocyclophotocoagulation

OCT: Optical Coherence Tomography

IOP: Intra Ocular Pressure

MIT: Micro Incisional Trabeculectomy

BVI: Beaver- Visitec International

AGM: Anti Glaucoma Medications

PAS: Peripheral Anterior Synechiae

ETO: Ethylene Oxide

LPI: Laser Peripheral Iridotomy