Research Article

InveStig»ting the J0urney 0f Minimally Invasive Glauc0ma SMrgery (MIGS) AdOgtÏOn Am0ng Glüuc0ma Speciülists in Índia

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Abstract

Purpose : To examine the adoption of Minimally Invasive Glaucoma Surgery (MIGS) among glaucoma specialists in India and identify barriers to its integration into clinical practice.

Methods : This anonymous online survey was conducted among glaucoma specialists in India using a validated questionnaire, following CHERRIES guidelines. The questionnaire was distributed via email and WhatsApp between 16th and 29th February 2024. Participants included those with at least two years of surgical glaucoma fellowship or ten years of glaucoma surgery experience. The questionnaire addressed four themes: MIGS knowledge, attitudes towards adoption, barriers to adoption, and strategies to improve uptake. The primary outcome was barriers to MIGS adoption.

Results : The survey, sent to 405 glaucoma specialists, received 102 responses (25%), with 61 meeting inclusion criteria. Respondents had a mean age of 43.7 + 8.2 years; 64% were women, 84% practiced in urban areas and 52% were in purely private practice. Half reported having moderate MIGS knowledge, 60% believed it reduced IOP with cataract surgery, and two-thirds lacked confidence in intraoperative gonioscopy. In ideal clinical scenarios, 54% would opt for MIGS, though those in rural settings were 75% less likely to do so (p=0.04). Cost (84%), efficacy concerns (79%), and surgical confidence (62%) were significant barriers, though 85% viewed MIGS as safer. Hands-on workshops (77%) and insurance coverage significantly improved adoption likelihood(p=0.07).

Conclusion MIGS adoption among Indian glaucoma specialists remains modest, with about 50% opting for it in the best-case scenario. Cost, limited knowledge, and surgical confidence were key barriers.

Keyords: MIGS, Glaucoma specialists, Glaucoma surgery.

I ntroduction

Minimally Invasive Glaucoma Surgery (MIGS) represents a paradigm shift in the surgical management of glaucoma, offering a safer and less invasive alternative to traditional glaucoma surgery. MIGS is characterised by an ab interno approach, which typically involves smaller incisions and less disruption to the ocular anatomy compared to trabeculectomy and glaucoma drainage devices.' Being minimally invasive, MIGS reduces the risk of complications such as infection and severe hypotony, has relatively shorter recovery times, and can be combined concurrently with cataract surgery, enhancing patient safety and comfort. ''

Several types of MIGS have been developed, each targeting different outflow pathways.'' Trabecular meshwork-based procedures (such as the i S tent and Trab ectom e), suprachoroidal procedures (such as the Cypass device), subconjunctival procedures (such as the XEN Gel Stent and InnFocus MicroShunt) and procedures like canaloplasty and

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UP1OURNAtOFOPNTNA[MOtOGY
An Official Journal of Uttar Pradesh State Ophthalmological Society, UPSOS (Northern Ophthalmnological Society, NOS)

F-ISSN: 2250-1916

How to cite this **article:** Sethi S, Tripathi S, Singh M, Ganesh N, Movdawalla M, Tayab S; Investigating the Journey of Minimally Invasive Glaucoma Surgery (MIGS) Adoption Among Glaucoma Specialists in India. UP Journal of Ophthalmology. 2025; 13(3): 94 - 98.

Received: 03-0ó-25, Accepted: 18-08-25, Published: 26-10-25

viscocanalostomy that aim to modify or enlarge the Schlemin's canal to enhance aqueous outflow, all reduce IOP sufficiently, making these an attractive option for patients with mild to moderate glaucoma, with coexistent visually significant cataract, and on maximum medical therapy.

In recent times, many questionnaire-based studies indicate a positive trend towards the adoption of MIGS among glaucoma surgeons, driven by factors such as improved patient experience and safety profiles. A survey conducted by Vinod et al. among members of the American Glaucoma Society revealed that while trabeculectomy remained the most common initial surgery, there was a notable increase in the adoption of MIGS techniques (Vinod et al., 2017).' However, barriers such as the perceived lower efficacy for adequate IOP reduction compared to traditional methods in the long term, cost, training, patient selection, and concerns about complications continue to influence decision-making in surgical practice. '

While the adoption of MIGS has steadily increased in several parts of the world, especially in the United States and Europe,' [7]" the uptake of these procedures has yet to be as thoroughly studied in India, to the best of our knowledge. Barriers to adoption of MIGS may be unique in the resource-poor settings prevailing in most of the developing world and need to be studied. This questionnaire-based survey distributed to glaucoma specialists across India aims to fill that gap by examining the adoption of MIGS in India and identifying the potential barriers that glaucoma specialists face in integrating these procedures into clinical practice.

Methods

The online survey was approved by the institutional ethics committee of the first author and was conducted as per the tenets of the Declaration of Helsinki. The survey questions were designed based on previous surveys conducted using a validated questionnaire.' The study responses were kept anonymous and conducted following guidelines from the Checklist for Reporting Results of Internet E-Surveys (CHERRIES)." The questionnaire was fielded to glaucoma specialists in India whose names were listed in the Glaucoma Society of India database between 16th and 29th February 2024, using emails and circulated amongst members using social media campaigns, predominantly WhatsApp groups. The questions were hosted on the Google Forms platform, and only one response per member was allowed using the internet protocol (IP) address for individual devices noted by the Google Forms website with permission from the user. For the analysis, we included responses from those who had long-term (minimum 2 years) surgical glaucoma fellowship training or had a minimum of 10 years of experience with surgical management of glaucoma.

The questionnaire construct followed the following four themes: MIGS knowledge, attitude towards adopting MIGS in clinical situations vs. other options, barriers to adopting MIGS and potential strategies to improve MIGS adoption. A detailed questionnaire is presented in the Supplemental document. In summary, after inquiry of demographics, years of experience, practice setting and location, respondents were directed towards questions based on the four themes. Theme one asked about knowledge in terms of familiarity with MIGS, self-reported rating of current MIGS knowledge on a Likert scale from 1-5, whether respondents attended MIGS workshops in the past year, their perception of whether MIGS led to an adequate reduction in IOP when combined with cataract surgery, their familiarity with intraoperative gonioscopy and their potential sources of evolving knowledge about MIGS and glaucoma surgeries in general. Theme two inquired about their attitude to adopting MIGS in clinical scenarios, such as their next steps when there was glaucoma progression in mild to moderate open-angle glaucoma due to non-compliance and drug-related side effects, most preferred next step in the same scenario but on maximal therapy, and their perception of risks of trabeculectomy compared to MIGS procedures.

Theme three inquired about barriers such as infrastructure, cost, respondent's perception of efficacy and safety of MIGS compared to traditional glaucoma surgery, the cost-effectiveness of MIGS, their perception of the effectiveness of cheaper MIGS options such as Gonioscopic assisted transluminal trabeculotomy (GATT), bent ab-interno needle goniectomy (BANG), learning curve of MIGS and potential reasons why they have not yet adopted MIGS in their practice (allowed to mark multiple options for this). Theme four inquired about what could be done to improve their adoption of MIGS in the future. It included questions on the preference of learning methods such as hands -on workshops, institutional fellowship courses, improved insurance claims, patient awareness, availability of trained counsellors for MIGS, and the need for India-centric publications on the outcome of MIGS in Indian eyes.

The primary outcome measures were barriers to MIGS adoption by participants and measures that can be taken to improve adoption.

Statistical analysis:

All continuous variables were expressed as mean with standard deviation or median with interquartile range (IQR), and group differences were analysed using the student t-test or Wilcoxon's rank sum test for non-parametric distributions. Comparison across three or more groups was done using the analysis of variance (ANOVA) or the Kruskall Wallis test for non-parametric distributions. Similarly, categorical variables were expressed as proportions (n, %) and group differences were analysed using the chi-square or Fischer's exact test.

Univariate and multivariable logistic regression analyses were used to identify barriers to MIGS adoption in the Indian glaucoma specialists and outcomes were presented as odds ratio (OR) with 95% confidence intervals (CI). All data were

entered into Microsoft Excel and analysed using STATA 12.1 I.c (STATA Corp, Fort Worth, Texas, USA). All p values <0.05 were considered statistically significant.

Results

The survey was fielded to all 699 glaucoma specialists across India, of which 405 (58%) had valid email IDs or phone numbers and received the request. Of these, 102 (25%) responded, but responses from only 61 were considered for the analysis based on the inclusion criteria of 10+ years of surgical experience or a long-term surgical glaucoma fellowship. Responses were collected over a 13-day study period. The mean age of respondents was 43.7 + 8.2 years (range = 30 — 66 years), with a mean clinical experience of 15.6 + 8.1 years as glaucoma consultants, and 39 (64%) were women. About half the respondents reported being solely in private practice (n=32, 52%). In contrast, the rest reported a mixed practice pattern, including part-time private and part-time institutional, comprising government hospitals, corporate hospitals and charitable ophthalmic institutions. The majority were situated in urban areas (n=51, 84%) and reported catering to a middle-class patient population (n=49, 80%). Additionally, 66% (n=40) reported observing non-compliance to IOP-lowering medications in their practice settings; all reported reduced quality of life of patients using these medications and 66% of patients experienced adverse effects from drops on prolonged use.

On inquiring about knowledge, almost all participants were aware of MIGS, about half reported having moderate knowledge about it on a 1-5 Likert scale, 60% believed that MIGS led to a drop in IOP when combined with cataract surgery, and two-thirds reported being not-confident in intraoperative gonioscopy. The majority reported gaining new information about MIGS from attending conferences, while other sources like webinars, online videos, journals and learning from colleagues helped about half the participants.

On questioning about the attitude of adopting MIGS in clinical scenarios vs other options, participants preferred to change IOP-lowering drops and better counsel patients as the primary measure when there was glaucoma progression in a case of mild-moderate glaucoma due to compliance issues or drug-related side effects. However, in a similar scenario of early glaucoma with uncontrolled IOP (<30 mmHg), despite being on maximal therapy, nearly half (51%) preferred MIGS, whereas a third (33%) preferred trabeculectomy and 11% laser trabeculoplasty as the next best measure (Figure 1). Glaucoma surgeons also perceived a very low to low risk of complications following trabeculectomy and felt that trabeculectomy affected the quality of life only moderately or lower.

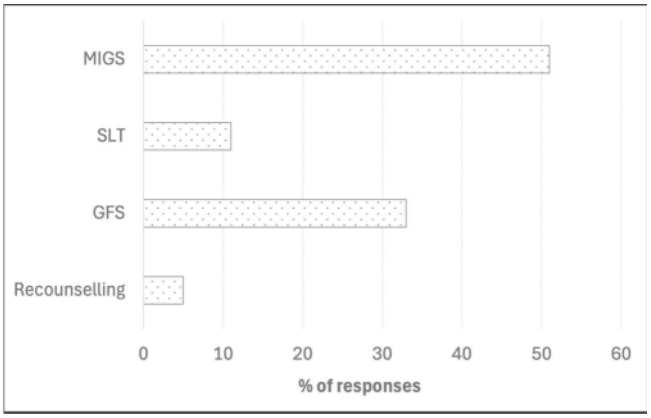

Figure J: Bar diagram showing adoption of various procedures as first line following uncontrolled mild-moderate glaucoma on maximal medical therapy.

On inquiry about barriers to adopting MIGS (table 1, theme 3), though 100% were willing to adopt MIGS, the cost was the most significant barrier reported by 84%, and a similar number (83%) felt it was not cost-effective in their settings. Participants also reported doubts about the efficacy of MIGS over traditional surgery, with 79% perceiving a lower IOP-reducing ability of MIGS, though the majority (85%) believed it to be the safer option. Not being surgically confident (36%), not having confidence in outcomes (waiting for other surgeon's results — 26%), and not having enough knowledge (16%) were the most typical reasons for not yet adopting MIGS in practice (Figure 2). A vast majority(table 1, theme 4) favored more structured training courses at workshops or longer institutional fellowships to increase their exposure to MIGS and enable better adoption in daily practice.

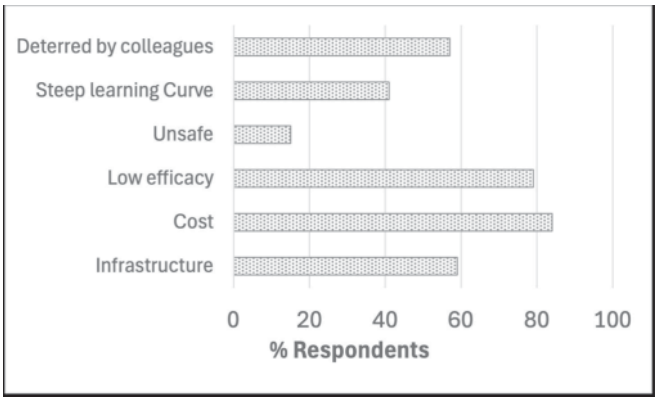

Figure 2: Bar diagram showing barriers to MIGS adoption.

Comparing participants in purely private practice vs. those in mixed practice settings, we found that the cost barriers were felt significantly more by those in institutional settings (93%) compared to those in private practice (75%). There were no other group differences. Comparing participants with respect to knowledge of MIGS, those with low knowledge (self-reported levels of 1 and 2 on the Likert scale) reported attending fewer workshops (61% vs 93%, p=0.08) and being less confident in intra operative gonioscopy (17% vs. 40%,

p=0.006) compared to those with good knowledge (levels 4 and 5). The low-knowledge group also perceived GATT and BANG as more effective (67% vs 20%, p=0.023) compared to those reporting good knowledge of MIGS.

Given an ideal scenario for MIGS with uncontrolled IOP <30mmHg in an eye with early glaucoma and open-angle glaucoma, 54% would consider MIGS as the next alternative. Comparing those who chose vs did not choose MIGS in the ideal case using univariate logistic analysis (table 3), we found that those in rural settings were significantly less likely to select MIGS. Those who considered MIGS to be a safer alternative were positive about MIGS fellowship training, insurance coverage for MIGS, and wanting better patient awareness, so they were more likely to opt for MIGS. In multivariable analysis, after adjusting for these factors, location of practice was the strongest predictor of selecting M IGS, with those in rural settings 75% less likely to opt for MIGS (p=0.045). Also, those who believed that insurance reimbursements should be strengthened for MIGS were nearly three times more likely to offer MIGS to the ideal patient, though this association reached only marginal significance (p=0.07)

Discussion

The survey was taken by about 25% of the GSI membership, with the majority of respondents located in urban areas and catering to the middle-class population. Physicians perceived that problems with long-term IOP-lowering medications were very common, and so were side effects, thereby leading to non-compliance in most patients over time. Therefore, a common thread that emerged was that a procedure that could reduce dependence on medications with a good safety profile was very welcome, even if it cannot totally stop medications altogether. The self-reported knowledge about MIGS amongst participating glaucoma specialists was modest at best, especially intra operative gonioscopy appeared to be the commonest pain point. Conferences were the primary source of new knowledge about MIGS, and coupled with the demand for workshops, more MIGS workshops must be carried out in all ophthalmology conferences, not just glaucoma-centric conferences. Adoption of MIGS was modest at best, with about 50% opting for it in the best-case scenario and less than 10% opting for it at other times, i.e. preferring increasing drops and counselling when MIGS may be a good option. The cost was the most significant barrier to the adoption of MIGS despite it being perceived as safer than filtration surgery. Though there were doubts about its IOP-lowering potential, and rightly so, the lack of surgical exposure and confidence were also deterrents to the widespread adoption of MIGS. This stemmed from a lack of knowledge and insufficient workshops on MIGS currently being conducted. Therefore, the participants felt that surgical exposure during hands-on workshops and institutional fellowship courses would help them adopt MIGS better. Additionally, better insurance reimbursements for MIGS and not lowering the market price of MIGS devices were perceived as a solution to more MIGS adoption. This, along with being in an urban setting, was the strongest predictor for better adoption of MIGS among Indian glaucoma specialists.

We found that approximately 50% of respondents in our survey indicated a willingness to adopt MIGS into their practices, which aligns with broader trends observed in the literature regarding the adoption rates of these procedures. Recent studies have shown a significant increase in the acceptance and implementation of MIGS by glaucoma specialists, particularly in light of the advantages these techniques offer over traditional surgical methods. For instance, a UK glaucoma specialists' survey revealed that 43% of respondents had already integrated MIGS into their practices, indicating a strong inclination towards these procedures.' This is also consistent with findings from a Medicare study, which reported that the percentage of glaucoma surgeries performed as MIGS rose from 10% in 2012 to 25% in 2018, reflecting a growing trend towards minimally invasive techniques." Moreover, the COVID-19 pandemic may have influenced a shift in surgical preferences, with many healthcare systems experiencing backlogs in traditional filtration surgeries. This context has led to an increased interest in MIGS as a viable alternative, as evidenced by a study that noted a surge in MIGS adoption during this period."

The adoption of MIGS has been met with various barriers, with cost emerging as a significant obstacle despite the perceived safety advantages over traditional filtration surgeries. In our survey, the acknowledgement that cost was the most important barrier aligns with findings from the literature, which consistently highlight economic factors as critical in the decision-making process for adopting new surgical techniques. A systematic literature review conducted by Cantor et al. emphasises that while MIGS devices, particularly when combined with cataract surgery, are often viewed as cost-effective, the financial implications can vary significantly based on the type of postoperative care required and the medications prescribed.” Moreover, the economic burden associated with MIGS can be compounded by the initial costs of the devices themselves. This situation creates a paradox where the perceived safety and efficacy of MIGS do not sufficiently outweigh the financial concerns associated with their implementation. This may be particularly true for smaller or rural clinics operating on tighter budgets, as seen from our results where multivariable analysis singled out rural practices to be much less willing to adopt M IGS. As highlighted in our survey and supported by existing literature, addressing the economic challenges associated with MIGS such as device costs, postoperative care expenses, and reimbursement issues will be crucial for enhancing their adoption rates in clinical practice, especially in resource-poor settings. Future efforts to demonstrate the long-term cost-

effectiveness of MIGS, alongside advocacy for better reimbursement models, may help mitigate these barriers and facilitate broader acceptance of these innovative surgical options.

Lastly, the need for further surgical training is crucial to enhance the adoption of MIGS, particularly in light of our survey results indicating that nearly 80% of respondents believe additional training would facilitate better integration of MIGS into their practices. Current literature supports this perspective, highlighting that surgical fellowship training significantly improves patient outcomes and procedural proficiency. For instance, a study by Halenda et al. noted that MIGS techniques are not standard components of ophthalmology residency training in the United States, which may contribute to hesitancy among practitioners to adopt these innovative procedures.[i]'Furthermore, the lack of trained faculty in MIGS procedures is often cited as a barrier to integrating these techniques into residency curricula." By investing in targeted training programs, we can equip ophthalmologists with the necessary skills and confidence to perform MIGS, ultimately leading to increased adoption and improved patient care.

The strength of our study is the relatively good participation from about 25% of the glaucoma specialists invited to participate and the use of a structured, theme-based questionnaire. To the best of our knowledge, this is the first study from India documenting the adoption patterns of MIGS by fellowship-trained glaucoma surgeons. The drawback of our study is the relative concentration of glaucoma specialists in urban areas, making it difficult to draw robust conclusions about the apparent urban-rural divide on the adoption of MIGS. Given these results, MIGS adoption could be improved by offering better hands-on training at workshops and targeted short-term MIGS fellowships and improving insurance reimbursement rates for patients opting for MIGS in India. Similar surveys should be done in the future to document changing trends in adopting MIGS amongst glaucoma specialists.

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