



Optimizing the Challenges and Opportunities in Minimally Invasive Glaucoma Surgery

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DESCRIPTION

Glaucoma is a group of eye diseases characterized by damage to the optic nerve, often due to increased Intraocular Pressure (IOP). This damage can lead to progressive, irreversible vision loss and, eventually, blindness if not managed effectively. Traditional treatments for glaucoma have included medications, laser therapy, and conventional surgery. However, minimally invasive glaucoma surgery (MIGS) has emerged as a potential alternative, offering a less invasive option with potential benefits in terms of recovery time, safety, and efficacy.

Understanding Minimally Invasive Glaucoma Surgery (MIGS) refers to a set of surgical procedures designed to lower IOP with minimal trauma to ocular tissues. These procedures aim to enhance the natural outflow pathways of the eye or create new ones to reduce IOP. The primary goal of MIGS is to provide a safer and less invasive alternative to traditional glaucoma surgeries, such as trabeculectomy and tube shunt surgery, which are associated with higher risks and longer recovery periods. Trabecular Micro-Bypass Stents are tiny devices implanted into the trabecular meshwork, the eye's primary drainage pathway, to enhance fluid outflow. Examples include the iStent and Hydrus Microstent. Suprachoroidal shunts are devices, such as the CyPass Micro-Stent, create a new drainage pathway between the anterior chamber of the eye and the suprachoroidal space, facilitating fluid outflow and reducing IOP. Techniques like the Trabectome and Kahook Dual Blade involve removing or modifying a portion of the trabecular meshwork to improve aqueous outflow. Canaloplasty involves dilating and stenting the Schlemm's canal to enhance natural fluid outflow. An example is the iTrack surgical system. Minimally Invasive Subconjunctival (MIGS) filtering procedures like the Xen Gel Stent create a new drainage pathway from the anterior chamber to the subconjunctival space, bypassing the trabecular meshwork entirely.

MIGS procedures generally involve less tissue disruption, which translates to a lower risk of complications such as infection,

bleeding, and scarring. Due to their less invasive nature, MIGS procedures often result in faster recovery times, allowing patients to resume their normal activities more quickly. Many patients who undergo MIGS experience a significant reduction in their reliance on glaucoma medications, which can improve quality of life and reduce medication-related side effects. Many MIGS procedures can be performed in an outpatient setting, reducing the need for hospital stays and associated costs. MIGS offers a range of options that can be selected based on the specific needs and conditions of the patient, providing a more personalized approach to glaucoma management. Not all glaucoma patients are candidates for MIGS. Ideal candidates typically have mild to moderate glaucoma and open angles, though some procedures can be adapted for other forms of the disease. Patient selection is vital for achieving optimal outcomes, and the decision to proceed with MIGS should be made based on a thorough evaluation by an ophthalmologist. Clinical studies have demonstrated the efficacy and safety of various MIGS procedures. For example, the iStent, one of the most widely studied MIGS devices, has shown significant reductions in IOP and medication use in patients with mild to moderate open-angle glaucoma. In a study published in *Ophthalmology*, patients who received the iStent in combination with cataract surgery experienced sustained IOP reduction and reduced dependence on glaucoma medications over a two-year follow-up period.

Similarly, the Xen Gel Stent has been associated with meaningful reductions in IOP in patients with refractory glaucoma. A study in the *Journal of Glaucoma* reported that patients treated with the Xen Gel Stent achieved a substantial decrease in IOP and a reduced need for glaucoma medications, with a favorable safety profile. These outcomes highlight the potential of MIGS to provide effective IOP control with fewer complications compared to traditional glaucoma surgeries. However, long-term studies are needed to fully understand the durability and long-term safety of these procedures.

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Despite the benefits, MIGS procedures are not without challenges. One of the primary concerns is the variability in outcomes among different patients. Factors such as the severity of glaucoma, anatomical variations, and surgeon experience can influence the success of MIGS. Additionally, while MIGS procedures generally have a better safety profile than traditional surgeries, they may not achieve the same level of IOP reduction,

particularly in patients with advanced glaucoma. Another consideration is the cost of MIGS devices and procedures. While MIGS can reduce the need for ongoing medications and more invasive surgeries, the initial cost may be higher than traditional treatment options. Insurance coverage and reimbursement policies vary, and patients should be informed about the potential financial implications.