Current situation of minimally invasive glaucoma surgery in Brazil

Situação atual de cirurgia minimamente invasiva para glaucoma no Brasil

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Glaucoma is the leading cause of irreversible blindness in the world, affecting approximately 60 million people;[1] and the estimates for 2040 are over 110 million individuals.[2] The surgical treatment scenario of glaucoma has undergone major changes in recent decades with the introduction of selective laser trabeculoplasty (SLT), less aggressive cyclodestructive procedures and minimally invasive glaucoma surgery (MIGS).

Minimally invasive glaucoma surgery has a better safety profile, providing faster recovery and lower incidence of severe complications, which are often associated with filtering surgeries, such as hypotonia, blebitis and choroidal detachment.[3] On the other hand, it is costly and less effective reducing intraocular pressure (IOP). MIGS is indicated for patients with mild or moderate glaucoma, stable, with indication for cataract surgery phacoemulsification (phaco).[4] In specific cases, it could also be performed alone (stand-alone) in phakic or pseudophakic eyes.

The four main approaches to reducing IOP by MIGS include increasing trabecular outflow through the juxtacanalicular meshwork bypass, increasing uveoscleral outflow through suprachoroidal pathways, reducing aqueous production from the ciliary body, or creating a subconjunctival drainage pathway.[5]

Currently, in Brazil, the following types of MIGS are available, acting to increase trabecular outflow: gonioscopy-assisted transluminal trabeculotomy (GATT),[6] Kahook Dual Blade® (KDB),[7] and the iStent® G1 and iStent inject®,[8] reinforcing the indication in cases of primary open-angle glaucoma (POAG).[9,10] There are descriptions in the literature of GATT in cases of steroid-induced,[11] congenital and juvenile glaucoma,[12] and of KDB in cases of infantile,[13] uveitic[14] glaucoma, and even in appositional angle-closure glaucoma, when the angle opens after the lens extraction.[15]

GONIOSCOPY-ASSISTED TRANSLUMINAL TRABECULOTOMY

Described in 2014, the GATT involves the introduction of a microcatheter circumferentially running through Schlemm's canal, creating a 360° ab interno trabeculotomy.[6] Alternatively, suture with Prolene® or Nylon 5-0 or 6-0 with a tip modified by cautery can be used, reducing costs, and maintaining safety profile and results.[16]

Grover *et al*.[17] followed up 198 patients undergoing GATT for 24 months, and found a mean IOP reduction by 9.2 mmHg in POAG patients, and a mean reduction of 1.43 medication. The mean reduction was 37.3%, with hyphema as the most common postoperative complication, observed in 23 to 38% of cases.[6]

ISTENT® (FIRST GENERATION-G1)

The iStent® G1 is a snorkel-shaped, heparin-coated titanium non-ferromagnetic device inserted into the trabecular meshwork improving communication with Schlemm's canal.[9]

In a multicenter study involving 240 eyes with cataract and POAG, randomized into two groups to receive phaco alone or phaco-iStent®, the latter performed significantly better, with 72% achieving the desired outcome. An IOP of <22 mmHg without glaucoma medications was observed as compared to 50% in the control group at one-year follow-up.[18] The most common complications included hyphema, mispositioning, and obstruction by iris, blood, or vitreous, occurring in 3 to 20% of cases.[9]

ISTENT INJECT®

The iStent inject® consists of two small titanium stents coated with heparin, inserted in the nasal portion of the trabecular meshwork, and placed 2 to 3 clock hours apart.

A retrospective study, conducted by Guedes et al.,[19] compared iStent® and iStent Inject®, in 73 eyes with POAG, divided into two groups. Six months after surgery, it demonstrated an IOP reduction from 16.5 to 13.9 mmHg in the eyes with iStent® G1, and from 17.3 to 12.7 mmHg in those with iStent inject®. This reduction was significantly greater in iStent inject® eyes than in iStent® G1 eyes (26.6 *versus* 15.8%).

KAHOOK DUAL BLADE®

The KDB consists of partial excision of the trabecular meshwork by a modified goniotomy blade, and creation of a straight opening for Schlemm's canal. KDB has a theoretical advantage over other trabeculotomy procedures, such as GATT, since it removes the trabecular meshwork tissue and leaves no residual leaflets that could lead to fibrosis over time.[20]

Dorairaj et al.[7] evaluated 52 eyes undergoing phaco-KDB, and reported the mean IOP reduced from 16.8 at baseline to 12.4 mmHg after 12 months, a reduction by 26.2%. Another retrospective study compared phaco-KDB with phaco-GATT, and 6 months later, 81.7% of KDB eyes and 84.6% of GATT eyes achieved surgical success (20% IOP reduction or reduction in use of ocular hypotensive medication). Eighty percent of eyes submitted to KDB achieved target IOP ≤18 mmHg *versus* 59.3% for GATT, and 61.4% of eyes submitted to KDB achieved IOP ≤15 mmHg *versus* 25.9% for GATT. Therefore, the reductions in mean IOP and medications were similar in the groups, but a higher percentage in the KDB group reached the target IOP.[21] Complications included hyphema, transient IOP elevation, corneal edema, iris recess, cyclodialysis, and Descemet's membrane detachment.[7,22]

Although the literature lacks more randomized studies with no participation of the health product industries, the results demonstrated over these years justify the indication of MIGS in cases of stable mild or moderate glaucoma, especially in eyes that will undergo cataract surgery.

When comparing these three alternatives, it is important to consider the different surgical techniques, bearing in mind the learning curve, from the easiest to the hardest modality – iStent® – KDB – GATT; procedure costs – GATT < KDB < iStent®; and the power to reduce IOP – Gatt ≥ KDB > iStent®.

It is important to understand that MIGS is not intended to fully replace more invasive surgeries, such as trabeculectomy or drainage implants. However, it is a valuable option for glaucoma surgeons, for being less invasive, safe, effective in reducing IOP, and capable of improving prognosis of the disease and patient's quality of life.

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