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Outcomes of iStent Inject Versus Kahook Dual Blade Surgery in Glaucoma Patients Undergoing Cataract Surgery

Anna Barkander, MD, M A Economou, MD, PhD,†‡ and Gauti Jóhannesson, MD, PhD*§‖*

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Précis: iStent Inject implantation (iStent) or Kahook Dual Blade goniotomy (KDB) in combination with phacoemulsification have a similar IOP-lowering effect in all stages of glaucoma, and medications are significantly reduced, especially after KDB.

Purpose: To compare the 2-year efficacy and safety of iStent or KDB in combination with phacoemulsification in eyes with mild to advanced open angle glaucoma.

Methods: A retrospective chart review of 153 patients that received iStent or KDB in combination with phacoemulsification at a single center between March 2019 and August 2020. The main outcome parameters at 2 years were: (1) intraocular pressure (IOP)-reduction $\geq 20\%$, with a postoperative IOP ≤ 18 mm Hg, and (2) a reduction of ≥ 1 medication. Results were stratified by glaucoma grade.

Results: After 2 years, mean IOP was reduced from 20.3 ± 6.1 to 14.2 ± 4.1 mm Hg in the phaco-iStent group ($P < 0.001$) and from 20.1 ± 6.1 to 14.7 ± 3.6 mm Hg in the phaco-KDB group ($P < 0.001$). The mean number of medications was reduced from 3.0 ± 0.9 to 2.6 ± 1.1 in the Phaco-iStent group ($P = 0.001$) and from 2.3 ± 1.0 to 1.5 ± 1.3 in the Phaco-KDB group ($P < 0.001$). Success regarding IOP-reduction $\geq 20\%$ with a postoperative IOP ≤ 18 mm Hg was met by 46% in the phaco-iStent group and by 51% in the phaco-KDB group. A reduction of ≥ 1 medication was met by 32% in the phaco-iStent group and by 53% in the phaco-KDB group ($P = 0.013$). Eyes with mild to moderate and advanced glaucoma responded equally well to the success criteria.

Conclusions: iStent and KDB, in combination with phacoemulsification, both lowered IOP effectively in all stages of glaucoma. More medications were reduced after KDB, suggesting that it may be a more effective procedure compared with iStent.

Key Words: Kahook dual blade, goniotomy, trabecular meshwork, iStent Inject, MIGS, phacoemulsification, open angle glaucoma

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Glaucoma and cataracts share high rates of co-morbidity, and cataract surgery is effective, not only for vision improvement but also for intraocular pressure (IOP)-reduction.[1] To improve the IOP-lowering effect further, a microinvasive procedure can be performed in combination with cataract surgery. Microinvasive glaucoma surgeries can have different sites of action, and many of them act on Schlemm´s canal (SC), which is an attractive target since it is easily accessible from the anterior chamber, and up to 75% of the aqueous normally drains through this canal.[2]

iStent Inject (iStent) and Kahook Dual Blade (KDB) are 2 microinvasive procedures that both target the SC. The iStent trabecular bypass stent was first introduced as a single stent in 2012. This first version of iStent was later developed into a second-generation iStent *inject* (Glaukos Corporation, Laguna Hills, CA, USA), consisting of 2 stents.[3] Each stent has a central lumen and 4 side outlets to facilitate aqueous drainage through SC.

Kahook Dual Blade (KDB, New World Medical Inc, Rancho Cucamonga, CA, USA) is a surgical knife designed to excise a strip of the trabecular meshwork (TM), thereby leaving a clear pathway for aqueous humor to drain into SC and further to the distal collector channels. In 2020, a second-generation KDB instrument (KDB Glide, New World Medical) came into the market. KDB glide has incorporated features intended to enhance both its performance and its ease of use,[4] but it is not known if the efficacy and safety are any different from the first-generation of KDB instrument that is used in this study.

iStent is a more widespread device compared with KDB, even though studies have found a trend toward a better IOP-lowering effect or a larger medication reduction after KDB.[5–11] It should be noted though, that these studies have compared the first-generation iStent with KDB. The second-generation iStent–iStent *inject*–has potential for a greater IOP-reduction since more collector channels are accessed with 2 stents, compared with one. KDB does not involve an implant, but since it removes the inner wall of SC over several clock hours, multiple collector channels are theoretically accessed.

Compared with traditional glaucoma filtration surgery, microinvasive SC surgery with iStent or KDB are associated with faster postoperative recovery and better safety.[3] However, the IOP-lowering effect is not as pronounced, and

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From the *Department of Clinical Sciences, Ophthalmology, Umeå University, Umeå, Sweden; †Division of Ophthalmology and Vision, Department of Clinical Neuroscience, Karolinska Institutet, Stockholm, Sweden; ‡Department of Ophthalmology, Capio Sophiahemmet Hospital, Stockholm, Sweden; §Wallenberg Centre for Molecular Medicine, Umeå University, Umeå, Sweden; and ‖Department of Ophthalmology, University of Iceland, Reykjavik, Iceland.

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Reprints: Anna Barkander, MD, Department of Clinical Sciences, Ophthalmology, Umeå University, SE-901 85, Umeå, Sweden (e-mail: anna.barkander@regionjh.se).

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therefore SC-procedures are, in general, preferably used in mild to moderate glaucoma. Patients with advanced glaucoma may also benefit from SC surgery, but there is less known about the efficacy and safety of performing these surgeries in advanced disease.

The aim of this study was to assess the efficacy and safety of the second-generation iStent and goniotomy with KDB, in combination with cataract surgery, in patients with a wide spectrum of glaucomatous visual field damage.

METHODS

This retrospective study was a chart review of all patients who received iStent Inject implantation or KDB goniotomy in combination with phacoemulsification at the eye clinic in Östersund, Sweden, and were operated with these procedures between March 1, 2019 and August 31, 2020. Subjects were identified from the clinic's electronic medical records. Inclusion criteria were mild to advanced primary open angle glaucoma (POAG), pigmentary glaucoma and pseudoexfoliation glaucoma (PXG). The glaucoma was classified as mild, moderate, or advanced according to the Hodapp-Parrish-Anderson criteria.[12] In patients that had surgery on both eyes during the period, only the first operated eye was included. The rationale for choosing the first operated eye was that the outcome of this eye can likely affect the choice of procedure on the second eye.

The protocol of this study was approved by the Institutional Review Board of the Swedish Ethical Review Authority (DNR. 2121-02970) and adhered to the ethical tenets of the Declaration of Helsinki. The study being retrospective in its nature, and all information de-identified, informed consent was not required.

Main Outcome Measures

Baseline data were collected from the last preoperative visit before surgery, and postoperative data at 1 week (day 2–14), 1 month (15–59 d), 6 months (day 121–270), 12 months (day 271–547), and 24 months (day 548–912). Preoperative assessment and data collection included a review of the patient's ophthalmic history, Snellen best-corrected visual acuity, standard automatic perimetry using the Humphrey Field Analyzer (Carl Zeiss Meditec Inc, Dublin, CA, USA), number of glaucoma medications and IOP-measurements. IOP was measured using Goldmann applanation tonometry. In a few cases, rebound tonometry or noncontact tonometry had been used instead of Goldmann applanation tonometry. Visual acuity and mean deviation were recorded at the last preoperative visit before surgery and at 24 months. Since this was a retrospective study, visual acuity, and visual field results were not available for all patients at the specified time points.

Main outcome parameters at 24 months were: (1) IOP-reduction $\geq 20\%$, with a postoperative IOP ≤ 18 mm Hg, and (2) a reduction of ≥ 1 medication. Results were stratified according to glaucoma grade: mild to moderate versus advanced disease.

Adverse events such as IOP-spike, hyphema, prolonged inflammation, and postoperative macular oedema were compared between patients that received phacoemulsification in combination with iStent (phaco-iStent group) and patients that received phacoemulsification in combination with KDB (phaco-KDB group). An IOP-spike was defined as an IOP-elevation ≥ 10 mm Hg from baseline or IOP ≥ 30 mm Hg at postoperative week one. A postoperative hyphema was defined as blood in the anterior chamber at week 1 after surgery. Since blood reflux is expected after SC surgery, a mild hyphema may not be regarded as an adverse event. However, the visual acuity can be affected due to blood in the anterior chamber and probably more so after KDB compared with iStent. We, therefore also assessed the number of complete hyphemas with visual acuity <20/200 in the first postoperative week. To further evaluate the safety, we compared the need for additional glaucoma surgery or transscleral photocoagulation (TCP) during the 2-year follow-up period in the phaco-iStent and the phaco-KDB group.

Surgical Technique

All surgeries were performed by 2 experienced anterior segment surgeons. Phacoemulsification was done first in a standardized routine fashion. The anterior chamber was filled with cohesive viscoelastic, the head of the patient turned away from the surgeon, and the operating microscope tilted 45 degrees. A gonioprism was placed on top of the cornea to ensure an optimal view of the angle. In the phaco-iStent group, the stents were implanted nasally into the TM with a distance of 30 to 60°. In the phaco-KDB group, the tip of the instrument pierced an initial incision into the TM, and the knife was thereafter moved in both directions, removing one-third to one-fourth of TM nasally. No viscoelastic was left in the anterior chamber, and the eye was left with an IOP in the mid-20s to minimize blood reflux.

Patients were given a postoperative topical therapy of 0.1% dexamethasone (Isopto-Maxidex, Novartis) 3 times daily for 3 weeks, and if no contraindications were present, oral acetazolamide (Diamox) 250 mg twice daily for 3 days. Administration of IOP-lowering medications was continued after the surgery, and the first decision to discontinue some of them was generally taken after the first postoperative month.

Statistical Analyses

All data were de-identified and analyzed using SPSS Statistics version 28 (SPSS Inc, Chicago, IL, USA). Descriptive data are presented as mean and SD.

Independent-sample *t*-test (for normally distributed data) or Mann-Whitney *U*-test (for nonnormally distributed data) was used to detect and compare differences between groups. To compare changes from baseline, we used paired samples *t*-test or Wilcoxon´s sign rank test, depending on if the data was normally distributed or not. χ^2 test or Fisher exact test was used to compare outcomes between binary data.

$P < 0.05$ was considered statistically significant, and tests were 2-tailed. Visual acuity was recorded as decimal values but converted to the logarithm of the minimum angle of resolution for statistical analyses.

Cumulative proportions of eyes re-operated were calculated using Kaplan-Meier methods and were compared between groups using the Mantel-Cox log-rank test. Eyes included in the Kaplan-Meier plots which had undergone reoperation were censored from the IOP statistics for each of the following visits.

RESULTS

Patient Demographics

A total of 153 eyes from 153 subjects were included in the analysis of the first operated eye in patients receiving iStent or KDB in combination with phacoemulsification during the specified time period. Baseline data are shown in

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TABLE 1. Baseline Characteristics

Parameter	Phaco-iStent (n = 56)	Phaco-KDB (n = 97)	*P*
Age (y), mean ± SD	75.7 ± 7.8	74.6 ± 5.5	0.349
Gender, n (%)			
Men	36 (64)	46 (47)	0.159
Women	20 (36)	51 (53)	—
Glaucoma grade, n (%)			
M/M	23 (41)	55 (57)	0.062
A	33 (59)	42 (43)	—
Visual field MD, mean ± SD			
M/M	−4.1 ± 2.7	−4.1 ± 2.6	0.981
A	−20.4 ± 6.4	−14.1 ± 6.4	< 0.001*
Glaucoma type, n (%)			
POAG	19 (34)	43 (44)	—
PXG	37 (66)	53 (55)	0.166
PG	0 (0)	1 (1)	—
Anticoagulation therapy, n (%)	22 (39)	31 (32)	0.359
Medications, mean ± SD	3.0 ± 0.9	2.3 ± 1.0	< 0.001*
IOP, mean ± SD	20.3 ± 6.1	20.1 ± 6.1	0.852

*Indicates statistical significance.

A indicates advanced glaucoma; M/M, mild to moderate glaucoma; MD, mean deviation in decibel; NTG, normal tension glaucoma; PG, pigmentary glaucoma; POAG, primary open angle glaucoma; PXG, pseudoexfoliation glaucoma.

Table 1. All patients were Caucasians. The number of preoperative medications was higher in the phaco-iStent group compared with the phaco-KDB group (3.0 ± 0.9 vs. 2.3 ± 1.0, $P < 0.001$), while age, preoperative IOP-levels, glaucoma grade, anticoagulation therapy, and presence of pseudoexfoliations were similar between groups.

According to information in the electronic medical records, more than half of included patients in both the phaco-iStent and the phaco-KDB group had surgery due to suboptimal IOP and/or disease progression - and not only due to cataract development. Advanced glaucoma was present in around half of the included eyes, as was PXG.

Efficacy

At baseline, the mean IOP was 20.3 ± 6.1 mm Hg in the phaco-iStent group and 20.1 ± 6.1 in the phaco-KDB group. At 24 months, mean IOP was reduced to 14.2 ± 4.1 in the phaco-iStent group ($P < 0.001$) and to 14.7 ± 3.6 mm Hg in the phaco-KDB group ($P < 0.001$, Fig. 1). Because of variability in the IOP-lowering effect, we also compared preoperative and postoperative IOP levels in a scatterplot (Fig. 2).

A total of 4 patients (3%) did not have 2-year data due to death (n = 3) or moving to another city (n = 1). Among patients that had 2-year data and did not have further surgery, a majority had IOP-levels ≤ 18 mm Hg at 24 months (Table 2).

Success regarding the outcome of IOP-reduction ≥ 20% with a postoperative IOP ≤ 18 mm Hg was met by 46% of eyes in the phaco-iStent group and by 51% of eyes in the phaco-KDB group (Fig. 3). This success was statistically similar between the phaco-iStent and the phaco-KDB group ($P = 0.620$), and also similar between mild to moderate and advanced glaucoma within the phaco-iStent and the phaco-KDB group ($P = 0.474$ and $P = 0.477$).

At month 24, the mean number of medications was significantly reduced in both the phaco-iStent and the phaco-KDB group ($P = 0.002$ and $P < 0.001$, Fig. 4). A reduction of ≥ 1 medication was met by 32% of eyes in the phaco-iStent group and by 53% of eyes in the phaco-KDB group, which was a significant difference in favor for the phaco-KDB group ($P = 0.013$, Fig. 5). There was no significant difference in reduction of ≥ 1 medication between eyes with mild to moderate or advanced glaucoma within the phaco-iStent or the phaco-KDB group ($P = 0.713$ and $P = 0.138$).

In eyes with mild to moderate glaucoma, 11% of eyes in the phaco-iStent group and 37% of eyes in the phaco-KDB group were medication-free at 24 months. In eyes with advanced glaucoma, 7% of eyes in the phaco-iStent group

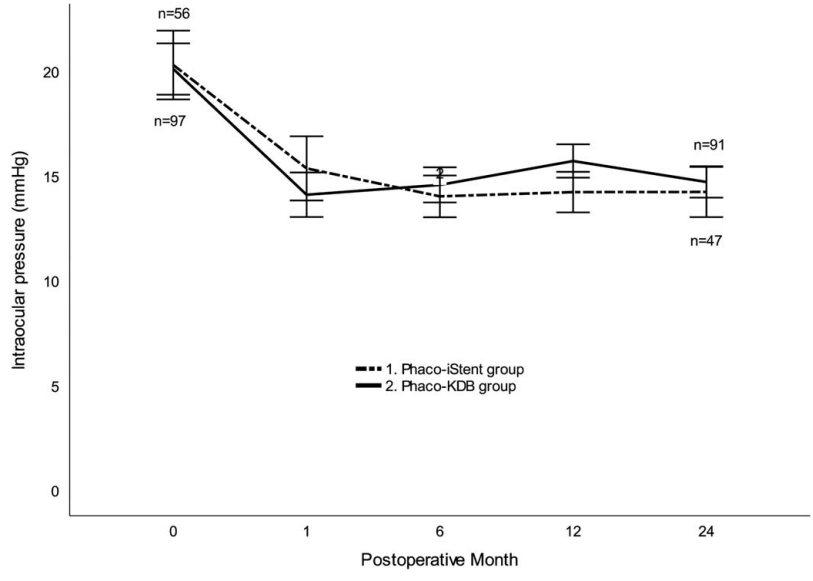

FIGURE 1. The mean IOP-reduction at each time point for phaco-iStent and phaco-KDB groups. At 24 months, IOP levels were reduced from 20.3 ± 6.1 to 14.2 ± 4.1 mm Hg in the Phaco-iStent group ($P < 0.001$) and from 20.1 ± 6.1 to 14.7 ± 3.6 mm Hg in the Phaco-KDB group ($P < 0.001$). Error bars representing 95% confidence interval.

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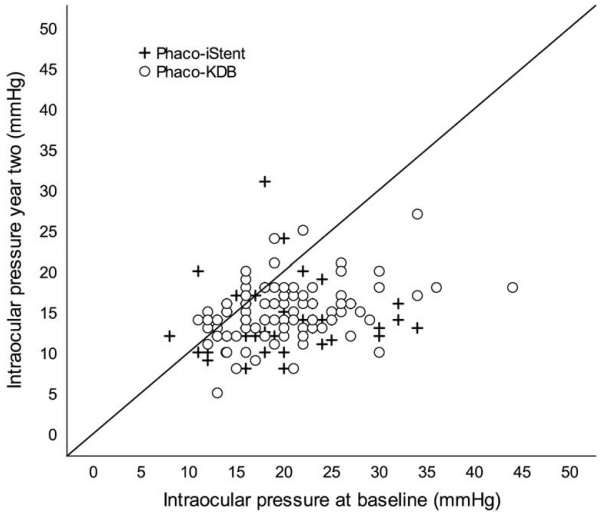

FIGURE 2. Scatterplot displaying IOP levels at baseline (x-axis) and after 2 years (y-axis) in phaco-iStent and phaco-KDB groups.

and 26% of eyes in the phaco-KDB group were medication-free at 24 months (Table 2).

Safety and Adverse Events

There were no cases of cyclodialysis cleft, hypotony, or infection. Hyphema and IOP-spike were the most common adverse events, although they were mostly self-limited and without any apparent negative effect on the results. A hyphema occurred in 14% of eyes in the phaco-iStent group and in 62% of eyes in the phaco-KDB group. A total of 7 eyes had complete hyphemas with visual acuity <20/200 within the first postoperative week (1 eye in the phaco-iStent group and 6 eyes in the phaco-KDB group). Interestingly, all of these complete hyphemas were seen in eyes with PXG, which was a statistical difference compared with eyes with POAG ($P = 0.042$). Hyphema of any type was equally common in eyes with POAG and PXG ($P = 0.801$)

Anticoagulation therapy was not associated with the presence of hyphema in either the phaco-iStent group ($P = 0.080$) or the phaco-KDB group ($P = 0.772$). In the phaco-KDB group, 2 patients needed anterior chamber washout in the operation room because of large hyphemas, and these2 patients also later had a YAG capsulotomy due to blood staining on the posterior lens capsule. YAG capsulotomy due to persistent blood staining on the posterior lens capsule was performed in a total of 3 patients (2 of which also had the previously described anterior chamber washout).

An IOP-spike at week 1 was seen in 5% of eyes in the phaco-iStent group and in 14% of eyes in the phaco-KDB group ($P = 0.120$). Transient postoperative macular oedema, which resolved within 2 months, was seen in 1 patient in the phaco-KDB group. However, OCT examinations had not been routinely performed postoperatively, so there might have been additional cases of subclinical macular oedema that were undiagnosed. Postoperative inflammation, with the requirement of extra corticosteroids beyond the third postoperative week, was seen in 5% of eyes in both the phaco-iStent and the phaco-KDB group, and 88% of these eyes had PXG.

Visual acuity and mean deviation at 24 months were improved or unchanged for all subgroups.

Within 24 months, additional glaucoma surgery or TCP was performed in a total of 11 eyes: 7 eyes in the phaco-iStent group and 4 eyes in the phaco-KDB group (Table 3). This was a significant difference in favor of the phaco-KDB group ($P = 0.046$, Fig. 6). Although PXG was the most common glaucoma type in our study, only 27% of eyes that needed additional glaucoma surgery had PXG. A total of 64% of eyes that needed additional surgery had advanced glaucoma.

DISCUSSION

Microinvasive SC surgeries have mostly been evaluated in mild to moderate glaucoma.[13] However, the results of this study indicate that iStent and KDB, in combination with phacoemulsification, can be effectively and safely performed in advanced glaucoma as well. Some previous studies have also suggested that iStent and KDB can be used across the spectrum of glaucoma severity [10,11,14–16] although most of the included eyes in these studies still had a mild to moderate disease. In contrast, in the current study, around half of included patients had advanced glaucoma. In advanced disease, it is often important to consider the indication for surgery. A patient with

TABLE 2. IOP-levels and Medications at Baseline and After 24 Months

	Phaco-iStent Group				Phaco-KDB Group			
	Mild to moderate glaucoma		Advanced glaucoma		Mild to Moderate glaucoma		Advanced glaucoma	
	Baseline (n = 23), %	Month 24* (n = 19), %	Baseline (n = 33), %	Month 24* (n = 28), %	Baseline (n = 55), %	Month 24* (n = 52), %	Baseline (n = 42), %	Month 24* (n = 39), %
IOP (mm Hg)								
≤ 12	4	16	12	50	9	15	5	44
≤ 15	9	47	27	82	16	52	31	74
≤ 18	30	74	55	100	35	90	52	90
≤ 21	39	90	70	100	56	94	76	100
Meds								
0	0	11	0	7	2	37	0	26
≤ 1	17	26	12	18	35	60	12	39
≤ 2	44	58	30	39	67	81	43	64
≤ 3	78	90	55	57	84	96	88	97
≤ 4	100	100	100	100	100	100	100	100

Meds = number of medications.
*Eyes with further surgery not included.

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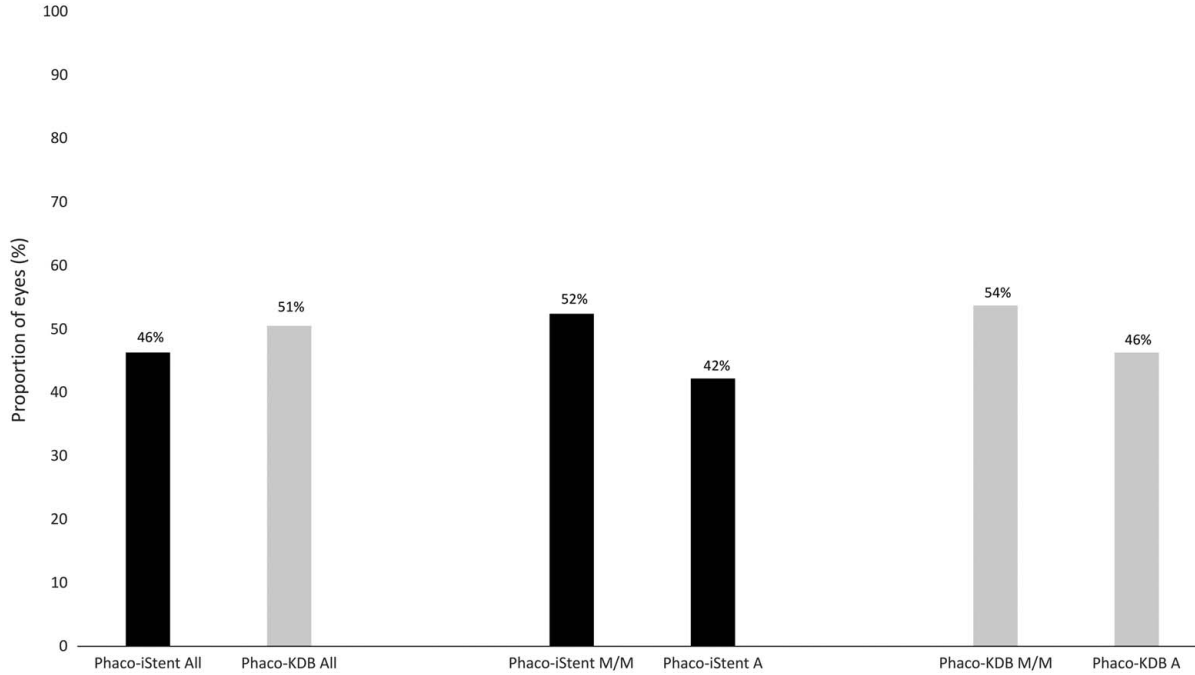

FIGURE 3. IOP-reduction $\geq$20% with a postoperative IOP $\leq$18 mm Hg after 2 years. This outcome was similar between the phaco-iStent and the phaco-KDB group ($P = 0.602$), and also similar between mild to moderate and advanced glaucoma within the phaco-iStent and the phaco-KDB group ($P = 0.474$ and $P = 0.477$). A = advanced glaucoma; M/M = mild to moderate glaucoma.

advanced glaucoma and a stable IOP can have surgery due to cataract development, and this may be a different situation compared with if surgery is performed mainly due to glaucoma progression or uncontrolled IOP. Many patients in our study belonged to this second category of uncontrolled advanced glaucoma. Still, we found comparable results between mild to moderate and advanced disease stages.

To our knowledge, there is only 1 previous study that has compared the second-generation iStent with KDB.[17] In this study, Arnljots and Economou found larger IOP reductions after phaco-KDB compared with phaco-iStent. However, there were only 24 patients at the last follow-up in that study, so the present study may give additional information regarding differences between iStent and KDB. We

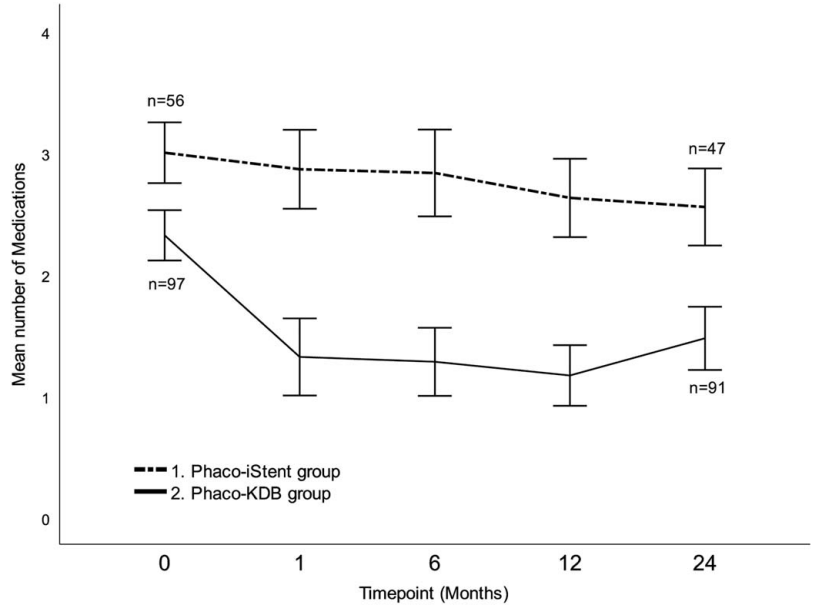

FIGURE 4. The mean medication reduction at each time point for phaco-iStent and phaco-KDB groups. At 24 months, the mean number of medications was reduced from 3.0 $\pm$ 0.9 to 2.6 $\pm$ 1.1 in the Phaco-iStent group ($P = 0.002$) and from 2.3 $\pm$ 1.0 to 1.5 $\pm$ 1.3 in the Phaco-KDB group ($P < 0.001$). Error bars representing 95% confidence interval.

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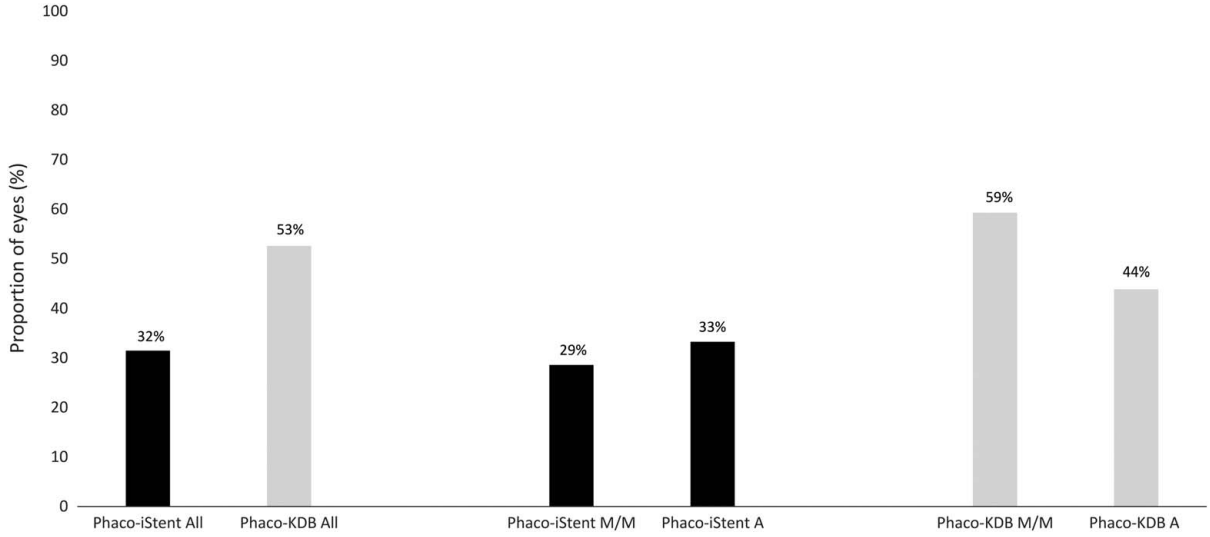

FIGURE 5. Reduction of ≥1 medication after 2 years. This outcome was more frequent in the phaco-KDB group compared to the phaco-iStent group ($P=0.013$), while no significant differences were found within the phaco-iStent or the phaco-KDB group ($P=0.713$ and $P=0.138$). A = advanced glaucoma; M/M = mild to moderate glaucoma.

did not see any differences in the IOP-lowering effect between phaco-iStent and phaco-KDB, but we did see larger medication reductions after KDB, which also suggests that KDB is a more effective procedure.

The goal of microinvasive SC surgery can be to lower the IOP and/or to reduce the number of medications. At 24 months, ~half of the included patients in both the phaco-iStent and the phaco-KDB group had IOP reductions ≥20% with a postoperative IOP ≤18 mmHg. There was a larger association in medication reduction for the phaco-KDB group, compared with the phaco-iStent group, and this is in accordance with Dorairaj et al,[9] who also found that more medications could be reduced after KDB compared with iStent. This larger effect could be explained by the fact that more collector channels are accessed with goniotomy compared with iStent implantation. Also, previous studies have shown that previously implanted iStent *inject* stents may not always be functional due to suboptimal placement, which will likely affect the IOP-lowering potential.[18]

iStent and KDB are generally well-tolerated and safe procedures to perform in combination with cataract surgery. As expected, we found hyphema to be more common after KDB compared with iStent. A few patients had complete hyphemas, and this occurred interestingly only in PXG patients. However, since the total number of complete hyphemas was small, we cannot for certain conclude that PXG is a risk factor for large hyphemas after SC surgery. Most of the large hyphemas cleared spontaneously, but 2 patients needed anterior chamber washout to remove the blood. A need for anterior chamber washout after KDB has only been previously described in studies with a large proportion of PXG eyes,[19,20] which further strengthens the suspicion that PXG might increase the risk of excessive hyphema after SC surgery. Another hypothetical risk factor for hyphema is anticoagulation therapy. Even though over 30% of included patients were on oral anticoagulation therapy at the time of surgery, we did not see any association between anticoagulation therapy and hyphema, which is in line with previous studies.[20,21] Thus, our results indicate

TABLE 3. Characteristics of Patients Having Additional Surgery Within 24 Months

Procedure	Age at baseline (y)	Glaucoma type	Glaucoma grade	IOP at baseline (mm Hg)	Meds at baseline (n)	Subsequent surgical procedure	Subsequent surgical time point (mo)
Phaco-iStent	78	POAG	Advanced	25	4	Trab	12
Phaco-iStent	74	PXG	Advanced	24	4	Trab	13
Phaco-iStent	73	PXG	Mild	35	3	Trab	2
Phaco-iStent	59	POAG	Advanced	27	3	Trab	9
Phaco-iStent	68	POAG	Advanced	26	2	Trab	4
Phaco-iStent	68	POAG	Advanced	16	4	Trab	6
Phaco-iStent	84	PXG	Advanced	20	4	TCP	4
Phaco-KDB	75	POAG	Mild	11	2	Preserflo	22
Phaco-KDB	76	POAG	Advanced	28	4	Trab	18
Phaco-KDB	78	POAG	Mild	32	2	TCP	13
Phaco-KDB	75	POAG	Moderate	22	3	TCP	13

Meds indicates medications; POAG, primary open angle glaucoma; Preserflo, Preserflo microshunt; PXG, pseudoexfoliation glaucoma; TCP, transscleral photocoagulation; Trab, trabeculectomy.

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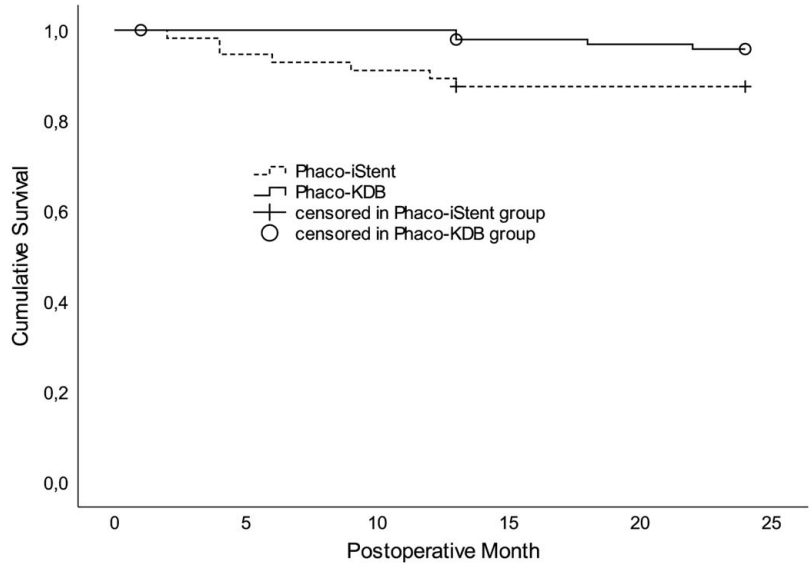

FIGURE 6. Kaplan-Meier survival chart. A total of 7 eyes in the Phaco-iStent group and 4 eyes in the Phaco-KDB group needed further glaucoma surgery or transscleral photocoagulation within 2 years, which was a significant difference ($P < 0.046$, log-rank test).

that anticoagulation therapy is not a risk factor for larger hyphemas in glaucoma patients undergoing SC surgery.

Most patients remained stable during the follow-up of our study, and only 7% needed additional glaucoma surgery or TCP within 24 months. There was a higher likelihood for further surgery in the phaco-iStent group compared with the phaco-KDB group. However, the groups were not matched, and patients in the phaco-iStent group had more medications preoperatively, with less room for additional medical therapy if IOP would increase. Among patients that had advanced glaucoma, the mean deviation was also lower in the phaco-iStent group compared with the phaco-KDB group, which should be taken into consideration.

Among all eyes that needed further glaucoma surgery, only 27% had PXG. This was an unexpected finding since eyes with PXG generally have a more aggressive disease with a faster rate of progression.[22]

This study has several limitations. This includes the retrospective design with a lack of standardized methodology, predefined thresholds for the addition or removal of medications, and a possible bias of the surgeon to which microinvasive glaucoma surgeries device was chosen. Another limitation to assess the IOP-lowering effect of iStent and KDB is a possible IOP-lowering effect of the cataract surgery.[23,24] This IOP-lowering effect has been shown to be 1–2.5 mm Hg on average,[24] which should be taken into consideration when evaluating combined cataract- and glaucoma procedures.

All patients did not have data at all specified time points, and in some cases, visual acuity measurement or visual field examination had not been performed. However, there were only 4 patients that did not have 24-month IOP-data in our study, and a retrospective study with a high follow-up rate can still be valuable due to real-world outcomes. Furthermore, another strength of the study is the fact that we included all operated patients consecutively and did not exclude any patient due to glaucoma severity or co-morbidity.

In conclusion, the study shows that iStent or KDB, in combination with phacoemulsification, have a significant IOP-lowering effect in a cohort of Swedish glaucoma patients with a wide spectrum of disease severity. KDB reduced the number of medications in more patients than iStent.

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