Neovascular Glaucoma: A Retrospective Review of 5-year Experience in Songklanagarind Hospital

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Objective: *To review causes, treatment modalities, and success of neovascular glaucoma treatment in the past five years at Songklanagarind Hospital.*

Material and Method: *Neovascular glaucoma of any causes between February 2005 and January 2010 were retrospectively reviewed. The patients were divided into six major treatment subgroups. A medical treatment group, an intraocular bevacizumab injection group (IOB), a trabeculectomy with mitomycin C group, a trabeculectomy with mitomycin C plus adjunctive intraocular bevacizumab injection group, a glaucoma drainage device group, and a transscleral cyclophotocoagulation group. All treatment outcomes were compared and classified as success or failure according to the specific criteria.*

Results: *One hundred and sixty-six eyes were reviewed. The mean age at the time of diagnosis was 60 $\pm$ 16 years and the average follow-up duration was 21 $\pm$ 18 months. The most common etiology was central retinal vein occlusion (47%) followed by proliferative diabetic retinopathy (42%) and ocular ischemic syndrome (5%). The mean pressure was reduced from 38.1 $\pm$ 12.5 mmHg at baseline to 17.8 $\pm$ 12.3 mmHg at the final visit. After treatment, visual acuity was worse, remained stable, and improved in 45%, 37%, and 18% of the patients, respectively. In the trabeculectomy with mitomycin C plus intraocular bevacizumab injection group 54% of eyes were classified as a complete success, which was significantly higher than the other groups ($p<0.001$). Although filtering surgeries with adjunctive bevacizumab showed no benefit over standard filtering surgeries in terms of VA change, pressure reduction, and success criteria but complications were found to be less in eyes treated with adjuvant bevacizumab.*

Conclusion: *Key factors are treatment of the underlying disease responsible for ischemic triggers and treatment of the increased intra-ocular pressure. Even treatment with bevacizumab cannot increase the success rate but this seems to reduce the surgical complications.*

Keywords: *Neovascular glaucoma, Bevacizumab (Avastin), Trabeculectomy, Glaucoma drainage device*

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Neovascular glaucoma (NVG) is a common and serious complication of several retinal disorders. The mainstay treatment of neovascularization of iris (NVI) and neovascularization of angle (NVA) as well as NVG is panretinal photocoagulation (PRP) in the early stage of disease. Glaucoma surgery is indicated when elevated IOP is not controlled adequately by medical treatment. Trabeculectomy in NVG patients usually results in frequent intraoperative complications and poor surgical outcomes[1]. Glaucoma drainage devices (GDD) are being used in NVG that does not respond to medications or trabeculectomy[2]. To date, either pre-operative or intra-operative injection of bevacizumab is an adjuvant treatment procedure to reduce intra-operative and post operative complications of trabeculectomy for NVG. The efficacy and safety of the treatment of NVG with intravitreal bevacizumab has been reported in many series[3-8].

The objectives of the present study were to review the causes, treatments and treatment outcomes of NVG in the era of antivascular endothelial growth factor (anti-VEGF) treatment at Songklanagarind Hospital in the past 5 years.

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Material and Method

A retrospective comparative study was carried out after the Ethics Committee of Prince of Songkla University approved the present study. The paper-based as well as computer-based medical records were

reviewed. For all subjects, the inclusion criteria included the diagnosis of NVG of any causes between February 2005 and January 2010. The subjects who had duration of follow-up duration less than 3 months and any incomplete medical records such as no record of the cause of NVG and the treatment given were excluded.

A comprehensive review was undertaken. The subjects were divided into 6 subgroups according to the major treatment methods: a medical treatment group (Med), an intraocular bevacizumab injection group (IOB), a trabeculectomy with mitomycin C group (Trab + MMC), a trabeculectomy with mitomycin C plus adjunctive intraocular bevacizumab injection group (Trab + MMC + IOB), a glaucoma drainage device group (GDD) and a transscleral cyclophotocoagulation group (TSCPC). Visual acuity (VA) was converted into the logarithm of the minimum angle of resolution (logMAR) equivalent to compare between the first and last visit. The IOP at the time of diagnosis, a week, a month and three months after the major treatment procedure as well as the IOP at the final follow-up were recorded and compared. The procedures and number of antiglaucoma medications before and after the major surgical procedures, the intra-operative and post operative complications were also reviewed.

For all groups except the Med group, the surgical treatment outcome was defined as follows: complete success as IOP less than or equal to 21 mmHg without antiglaucoma medications, qualified success as IOP less than or equal to 21 mmHg with antiglaucoma medications, qualified failure as IOP greater than 21 mmHg with antiglaucoma medications, and complete failure for eyes that required further surgical procedures that had to be done in the operating room such as repeated trabeculectomy, needling, and GDD implantation. Phthisis bulbi, IOP less than 6 mmHg and lost light perception after procedures were also considered as complete failure. Treatment outcomes were evaluated at the final visit.

The primary outcome reviewed was the percentage of each success criteria for each treatment group. The secondary purposes of review were to evaluate the benefit of intra-ocular bevacizumab injection. The authors aim to compare the IOP and the complications between the Trab + MMC group and the Trab + MMC + IOB group.

The independent t-test, Mann-Whitney U test, and Chi-square test were used as appropriate. Quantitative parameters were compared among groups using one-way analysis of variance. If the parameters were not normally distributed, the Kruskal-Wallis test was used. Statistical analysis was done by using the software package SPSS version 14 (SPSS Inc., USA). A p-value < 0.05 was considered to be significant.

Results

A total of 166 eyes of 166 patients were reviewed (55% male, 45% female). The mean age at the diagnosis was 60 ± 16 years and the follow-up duration was 21 ± 18 months. The patients' characteristics and data of each treatment group are summarized in Table 1.

The most common etiology of NVG was CRVO (47%) followed by PDR (42%) and OIS (5%). Other causes of NVG included radiation induced retinopathy, central retinal artery occlusion, hemiretinal vein occlusion, and chronic chorioretinal inflammation. The neovascularizations (NVs) if present were most commonly found on the iris surface (33%). Twenty-two percent of eyes had no NV but peripheral anterior synechia (PAS) formation indicated the last stage of NVG. Seventy percent of all cases were treated with panretinal photocoagulation (PRP) during treatment.

The mean VA at the time of diagnosis was 1.77 ± 0.76. The VAs at the baseline of each group were significantly different ($p < 0.001$) when compared between the groups. If the TSCPC group was excluded, there was no statistical difference ($p = 0.46$). The mean VA at the final visit was 1.99 ± 0.86. The difference was found when each group was compared ($p < 0.001$). When the TSCPC group was not included, there was no difference ($p = 0.27$). After treatment, VA was worse, remained stable, and improved in 45%, 37%, and 18% of the patients, respectively. The final visual acuities did not change significantly from the baselines ($p = 0.55$).

The baseline IOP of each group was not different except for the TSCPC group that was higher than the others. After treatment, the mean IOP was reduced from 38.1 ± 12.5 mmHg at baseline to 22.2 ± 13.6, 21.3 ± 11.6, 19.8 ± 11.4 and 17.8 ± 12.3 mmHg at the first week, first month, third month, and last visit after treatment, respectively (Fig. 1). The IOP at each follow-up interval and the final visit were significantly different when compared among groups even after exclusion of the TSCPC group. The IOPs of each group are summarized in Table 1.

The success criteria were assessed in all eyes except for the Med group. Twenty-four eyes (54.5%) in the Trab + MMC + IOB group were classified as complete success that was significantly higher than the others ($p < 0.001$). On the other hand, complete

Table 1. Demographic data of each treatment group

Parameters	Total	Med Group	IOB Group	Trab+MMC Group	Trab+MMC +IOB Group	GDD Group	TSCPC Group	p-value
No. of eyes, (%)	166	19(11.4)	38(22.9)	13(7.8)	44(26.5)	24(14.5)	28(16.9)	
Eye, No. (%)								0.42
Right	76 (45.8)	11(57.9)	18(47.4)	4(30.8)	22(50.0)	12(50.0)	9(32.1)	
Left	90 (54.2)	8(42.1)	20(52.6)	9(69.2)	22(50.0)	12(50.0)	19(67.9)	
Gender, No. (%)								0.68
Male	92 (55.4)	13(86.4)	22(57.9)	4(30.8)	23(52.3)	10(41.7)	17(60.7)	
Female	74 (44.6)	6(31.6)	16(42.1)	9(69.2)	21(47.7)	14(58.3)	11(39.3)	
Age (years)								
Mean ± SD	60.4±15.6	66.9±10.2	64.2±13.9	59.3±18.8	55.5±16.7	58.6±10.2	60.8±19.2	0.06
Range	19-94	50-88	31-88	25-82	19-86	40-75	23-94	
Etiology, No. (%)								0.23
CRVO	78 (47.0)	6(31.6)	19(50)	6(46.1)	18(40.9)	11(45.8)	18(64.3)	
PDR	70 (42.2)	10(52.6)	12(31.6)	6(46.1)	21(47.7)	12(50.0)	9(32.1)	
OIS	8 (4.8)	3(15.8)	4(10.5)	-	1(2.3)	-	-	
Other	10 (6.0)	-	3(7.9)	1(7.8)	4(9.1)	1(4.2)	1(3.6)	
VA (logMAR), Mean ± SD								
Baseline	1.77±0.76	1.85±0.90	1.66±0.62	1.58±0.58	1.52±0.67	1.43±0.59	2.66±0.47	p<0.001
Final visit	1.99±0.86	2.14±0.97	1.79±0.85	1.86±0.74	1.65±0.79	1.83±0.72	2.93±0.26	p<0.001
IOP (mmHg), Mean ± SD								
Baseline	38.1±12.5	34.5±16.6	32.6±13.6	37.5±7.8	40.0±12.3	38.1±6.6	45.0±9.9	0.07
1 week	22.2±13.6	24.6±9.8	27.2±10.9	17.3±12.2	12.8±9.5	13.8±8.9	37.9±10.2	p<0.001
1 month	21.3±11.6	25.1±9.4	23.1±10.7	20.9±9.3	16.2±9.5	15.1±9.1	29.6±14.0	p<0.001
3 month	19.8±11.4	25.1±7.6	23.1±12.6	18.1±6.2	16.5±9.9	12.5±5.5	14.7±13.6	p<0.001
Final visit	17.8±12.3	26.3±11.4	23.1□13.2	19.8±10.6	15.3±10.4	9.5±4.9	38.1±6.6	0.01
PRP, No. (%)	116(69.9)	13(68.4)	27(71.0)	10(76.9)	42(95.5)	19(79.2)	4(14.3)	
Success criteria, No. (%)								
Complete success	37(25.2)	N/A	1(2.6)	3(23.1)	24(54.5)	8(33.3)	1(3.6)	p<0.001
Qualified success	36(24.5)	N/A	20(52.6)	2(15.4)	5(11.5)	9(37.5)	-	p<0.001
Qualified failure	13(8.8)	N/A	8(21.1)	2(15.4)	2(4.5)	-	1(3.6)	p<0.001
Complete failure	61(41.5)	N/A	9(23.7)	6(46.1)	13(29.5)	7(29.2)	26(92.8)	p<0.001
Antiglaucoma, Mean ± SD								
First visit	3.6±0.9	2.8±0.9	3.2±1.1	3.6±0.6	3.8±0.8	4.0±0.6	3.6±0.6	0.06
Final visit	1.6±1.5	2.7±1.1	2.7±1.2	1.4±1.3	0.8±1.3	0.4±0.6	1.6±1.6	0.04
Follow-up (months), Mean ± SD	21.4±17.9	17.9±21.5	20.7±19.6	24.0±18.1	21.7±16.1	24.5±16.0	20.1±17.9	0.29

CRVO = central retinal vein occlusion; PDR = proliferative diabetic retinopathy; OIS = ocular ischemic syndrome; VA = visual acuity; logMAR = logarithm of the minimum angle of resolution; IOP = intraocular pressure; SD = standard deviation; PRP = panretinal photocoagulation; MMC = mitomycin C; IOB = intraocular bevacizumab; TSCPC = transscleral cyclophotocoagulation

failure was significantly found in 26 eyes (92.8%) of the TSCPC group ($p < 0.001$). For all eyes, the most common result was complete failure (41.5%), followed by complete success (25.2%) and qualified failure success (24.5%).

For all NVG subgroups except the Med group, 58% of eyes required additional procedures to control the IOP. The three most common additional procedures were laser suture lysis, TSCPC, and needling with MMC.

The NVG patients were primarily implanted with GDDs in 24 eyes when the IOP could not be adequately controlled with medication. Six eyes were secondarily implanted after the primary surgical treatments failed to control the IOP even with additional antiglaucoma; five eyes were in the Trab+MMC+ IOB group and one eye was in the Trab+MMC group. For

all 30 eyes that were implanted with GDDs, 26 eyes were implanted with Baerveldt devices and the rest with Ahmed devices. The most common complication of GDD implantation was the intra-operative or post operative hyphema (7 eyes), followed by a shallow or flat anterior chamber (4 eyes), and GDD tube exposure that required surgical manipulation (3 eyes).

Regarding the use of anti-VEGFs, 100 of the 166 eyes (60%) were injected intra-ocularly with bevacizumab. Thirty-eight NVG eyes were primarily treated with intra-ocular bevacizumab (IOB). Four eyes in the IOB group were injected intracamerally, the rest were intravitreally injected. Besides the primary injection, bevacizumab was also used pre-operatively in the treatment of NVG. Thirty-six eyes (82%) in the Trab+MMC+IOB group and 18 eyes (75%) of the GDD group were injected via the intravitreal route. The mean pre-operative duration was 6.4 $\pm$ 11.2 days, (range, 3-45 days).

To evaluate the benefit of adjuvant IOB injection on the outcome of trabeculectomy, the Trab+MMC and the Trab+MMC+IOB were separately analyzed. The Trab+MMC group did not receive IOB because of a history of cerebrovascular disease in 6 eyes; 2 eyes had uncontrolled systemic hypertension and 5 eyes had high-risk cardiovascular disease.

Four eyes of the Trab+MMC+IOB group received bevacizumab via the intracameral route. Comparing these two groups, there were no significant differences in terms of baseline IOP, VA change, success criteria, and the number of antiglaucoma medications required after trabeculectomy ($p > 0.05$ for all). Although the IOP after trabeculectomy was higher in the Trab +MMC group at all follow-up durations these were not significantly different ($p = 0.33$), (Fig. 2). Statistically significant differences were found in the complication rates during or after trabeculectomy and the number of the additional procedures to control IOP after trabeculectomy. Intra-ocular bleeding during or after trabeculectomy was found in 46% of eyes treated without adjuvant IOB and 18% of eyes treated with adjuvant IOB ($p < 0.001$). Seventy-seven percent of the Trab+MMC group and 40% of the Trab+MMC+IOB group did require further procedures to control the IOP ($p = 0.04$). The most common procedure was needling with mitomycin C. The methods of adjunctive injection such as pre-operative IOB injection prior to performing trabeculectomy without IOB, or pre-operative IOB injection followed by trabeculectomy with IOB, or no pre-operative IOB injection but performed trabeculectomy with IOB were not different in terms of success criteria ($p = 0.33$).

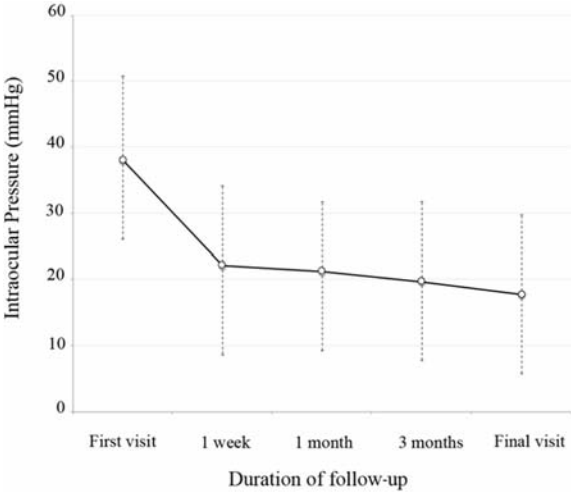

Fig. 1 This graph shows the change in mean intraocular pressure at the first visit and each follow-up interval after receiving treatment of all neovascular glaucoma eyes. The bars indicate the standard deviation

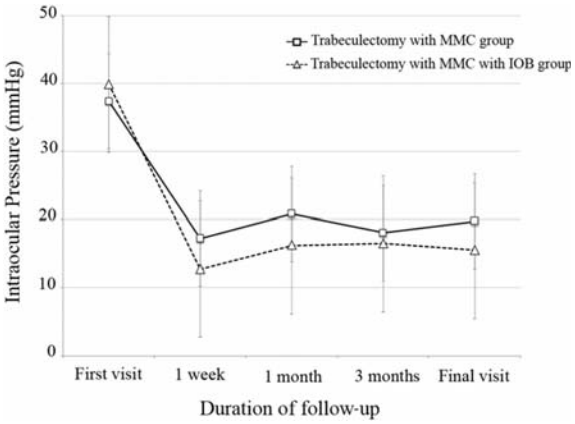

Fig. 2 This graph shows the change in mean intraocular pressure at the first visit and each follow-up interval after receiving treatment in the Trabeculectomy with mitomycin C group (solid line) and the Trabeculectomy with mitomycin C plus intraocular bevacizumab group (dashed line). The bars indicate the standard deviation

Of all the present study eyes at the final follow-up examination, the IOP in the GDD group was 9.5 $\pm$ 4.9 mmHg which was significantly lower compared to the Trab+MMC+IOB and Trab+MMC groups where IOPs were 15.3 $\pm$ 10.4 and 19.8 $\pm$ 10.6 mmHg, respectively. The IOP was highest in the TSCPC group which was 38.1 $\pm$ 6.6 mmHg ($p = 0.01$). For all groups, an average of 1.6 $\pm$ 1.5 mmHg. Topical antiglaucoma medications was

still used at the final visit to control the IOP.

No serious complications such as endophthalmitis were recorded. Regarding the use of IOB, no other adverse ophthalmic and systemic complications such as cerebrovascular infarction, cardiovascular infarction and uncontrolled hypertension were reported in the present study patients.

Discussion

The pathophysiology of NVG involves growth of fibrovascular tissue on the iris surface and the anterior chamber angle which obstructs aqueous drainage initially causing open angle glaucoma and then contraction of fibrous tissue resulting in angle-closure glaucoma[9]. The main pathogenesis of NVG was retinal ischemia. Only 6 (3%) of all NVG eyes were caused by chronic inflammation. The result was similar to a previous study[1]. PRP was considered the most effective treatment. The present study found that 70 % of all cases were treated with PRP during treatment. It was impossible to perform PRP in all cases of NVG because in the advanced stage of NVG the patients usually present with media opacity including corneal edema, hyphema, and vitreous hemorrhage.

The present study by Sivak-Callcott et al recommended treating the cause of the underlying disease and medical control of IOP and inflammation. When medications fail to control IOP, glaucoma surgery is indicated. But the ideal surgical procedure has yet to be determined[1]. The procedures to reduce the IOP in NVG depend on the stage of disease and the patient's visual potential. The present study divided all NVG eyes into six groups according to the treatment methods. Of all eyes except the Med group, the success criteria were analyzed. Complete failure was the most common treatment result (41%). After the TSCPC group was excluded, the results of complete success, qualified success, qualified failure, and complete failure were 30%, 30%, 30%, and 10%, respectively. Even the success rate of about 60% was high but VA remained poor. Only 18% of the cases showed slight improvement in VA. These were early stage NVG cases that had no corneal edema, hyphema, and vitreous hemorrhage. Even when the IOP was controlled the VA remained unchanged in nearly half of all cases.

The authors found that the IOP could be controlled without any medication with a surgical procedure in less than a quarter of NVG eyes that were treated by trabeculectomy with MMC. Tsai et al also reported a success rate of 28% at 5 years after filtering surgery[10]. Katz et al reported the intra-operative use of mitomycin C to increase the success rate of trabeculectomy in NVG, although the success rate was also limited[11].

Implantation of a GDD had reported success rates of 22% up to 97% for patients with NVG[12]. The present study reported a success rate of 70%. Among six treatment groups, the GDD group had the lowest mean final IOP. As mentioned earlier, 3 of the 30 eyes that were implanted with a GDD required surgical manipulation to correct the complication related to the tube. Two of these needed GDD removal. Although the control of IOP is promising, complications should be taken into account. The TSCPC had become the procedure of choice for advanced refractory glaucoma[13]. Seventeen percent of NVG eyes in the present study were treated by TSCPC. About 70% of the cases treated by TSCPC were defined as failure if the criterion was only the IOP level. This is similar to the result reported by Eid et al (71%).

Bevacizumab (Avastin; Genentech Inc, San Francisco, CA, USA) competes with VEGFs to bind with the receptors on the blood vessels, resulting in inhibition of the formation and the growth of neovascular tissue[14]. Kitnarong et al evaluated the surgical outcome of a trabeculectomy with MMC after an adjunctive treatment with intravitreal bevacizumab. The present study demonstrated a rapid regression of NV in NVG. This effect resulted in the decrease of intra-operative bleeding and improved the surgical success[15]. The current study indicated that the IOP at each follow-up visit of the Trab+MMC+IOB group was lower than the Trab+MMC group but no statistically significant difference was found. However, the authors found that when adjunctive bevacizumab was used the complications and additional surgical procedures were significantly fewer than the conventional filtering surgery. The role of primary use of intra-ocular bevacizumab injection at a dose of 1.25 mg/0.05 ml was also evaluated in the current study in the IOB group. All of the cases achieved rapid and marked regression of NV. Yazdani et al studied the effect of intravitreal bevacizumab on NVG by a placebo controlled trial. The intravitreal bevacizumab group demonstrated significant reduction of NVI and IOP[16]. However, the higher dose of bevacizumab in their study should be a concern. Several experimental findings support the safety of intravitreal bevacizumab when a dose of 1.25mg/0.05 ml was used[17]. Yoeruek et al concluded that bevacizumab is not toxic to human corneal cells *in vitro* at a dose which is 20-fold higher than that used

for intravitreal injection[18]. Recently, Martinez et al reported that complications were under 0.78% and no systemic complications were found[19]. The current review also confirmed that there were no serious adverse events after the use of bevacizumab.

The present study had certain limitations. It was a retrospective review. There was an absence of a control group and protocols for giving the treatment. It is impossible to control the bias regarding the treatment when the patients were assigned the treatment procedure. The NVG eyes in the early stage usually had a chance to maintain VA and a lower level of IOP after receiving antiglaucoma medications or primary intra-ocular bevacizumab injection. On the other hand, most of the advanced cases were treated with filtering surgery or GDD implantation. So the success rate not only depended on the treatment option but also the severity of disease, the NVG itself and the underlying cause of NVG as well. To compare the benefits of bevacizumab as the adjunct to filtering surgery or GDD implantation, a prospective randomized study with a control group and a larger population is still necessary. Further studies are needed to determine the ideal treatment procedure for patients with NVG.

Conclusion

The most common cause of NVG is retinal ischemia. The successful management of NVG is extremely difficult. A diagnosis should be made in the earliest stage possible to provide the physician more choices of treatment and to provide the patient the best chance to maintain vision. Even treatment with anti-VEGFs cannot increase the success rate but this seems to reduce surgical complications.

Potential conflicts of interest

None.

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ต้อหินที่เกิดจากหลอดเลือดเกิดใหม่: ประสบการณ์ 5 ปีย้อนหลังในโรงพยาบาลสงขลานครินทร์

วีระวัฒน์ คิดดี, ธวัช ตันติสารศาสน์, บุญชัย หวังศุภดิลก

วัตถุประสงค์: *เพื่อทบทวนสาเหตุ วิธีการรักษา และความสำเร็จของการรักษาต้อหินที่เกิดจากหลอดเลือดเกิดใหม่ในช่วง 5 ปี ณ โรงพยาบาลสงขลานครินทร์*

วัสดุและวิธีการ: *ทำการศึกษาย้อนหลังเชิงเปรียบเทียบ ในผู้ป่วยต้อหินที่เกิดจากหลอดเลือดเกิดใหม่ที่วินิจฉัยตั้งแต่เดือนกุมภาพันธ์ พ.ศ. 2548 ถึงมกราคม พ.ศ. 2553 แบ่งผู้ป่วยเป็น 6 กลุ่มตามวิธีการรักษา ได้แก่ 1) กลุ่มที่ได้รับการรักษาทางยา 2) กลุ่มที่ฉีดยา bevacizumab เข้านัยน์ตา 3) กลุ่มที่ได้รับการผ่าตัด trabeculectomy ร่วมกับ mitomycinC 4) กลุ่มที่ได้รับการผ่าตัด trabeculectomy ร่วมกับ mitomycinC และ bevacizumab 5) กลุ่มที่ได้รับการผ่าตัด glaucoma drainage device และ 6) กลุ่มที่ได้รับการรักษาโดย transcleral cyclophotocoagulation ทำการบันทึกการตรวจรักษา ติดตามผล และวิเคราะห์เปรียบเทียบผลสำเร็จของการรักษา*

ผลการศึกษา: *ผู้ป่วยทั้งหมด 166 ราย (166 ตา) มีอายุเฉลี่ย 60±16 ปี ระยะเวลาติดตามการรักษาเฉลี่ย 21±18 เดือน สาเหตุของต้อหินที่พบบ่อยที่สุดคือเส้นเลือดดำจอตาส่วนกลางอุดตัน (ร้อยละ 47) รองลงมาคือโรคจอตาเปลี่ยนแปลงจากเบาหวาน (ร้อยละ 42) และกลุ่มอาการนัยน์ตาขาดเลือด (ร้อยละ 5) ผู้ป่วยทั้งหมดมีความดันตาเฉลี่ยก่อนการรักษา 38.1±12.5 มิลลิเมตรปรอท เมื่อตรวจครั้งสุดท้ายหลังการรักษาลดลงเป็น 17.8±12.3 มิลลิเมตรปรอท ผลการรักษาโดยรวม พบผู้ป่วยมีสายตาดีขึ้นร้อยละ 18 สายตาเท่าเดิมร้อยละ 37 และสายตาเลวลงร้อยละ 45 ผู้ป่วยกลุ่มที่ได้รับการรักษาโดยการผ่าตัด trabeculectomy ร่วมกับ mitomycinC และ bevacizumab มีผลการรักษาสำเร็จสมบูรณ์ (complete success) ร้อยละ 54 ซึ่งดีกว่ากลุ่มอื่นอย่างมีนัยสำคัญ ($p<0.001$) การผ่าตัด trabeculectomy ร่วมกับการฉีดยา bevacizumab ไม่มีผลแตกต่างในระดับสายตา ความดันตา และเกณฑ์ความสำเร็จเมื่อเทียบกับวิธีมาตรฐานทั่วไป แต่พบว่าภาวะแทรกซ้อนลดลง*

สรุป: *ปัจจัยสำคัญในการรักษาต้อหินที่เกิดจากหลอดเลือดเกิดใหม่ คือ การรักษาต้นเหตุที่ทำให้เกิดหลอดเลือดและควบคุมความดันตามิให้สูง การรักษาโดย bevacizumab แม้ไม่สามารถเพิ่มอัตราความสำเร็จแต่สามารถลดภาวะแทรกซ้อนจากการผ่าตัด*