

# Trabeculectomy - A Review and 2 Year Follow Up

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## Summary

This study reviewed the trabeculectomies (TEs) carried out in University Malaya Medical Center between 1994 to 1998. One hundred and nine of 132 eyes operated were in the primary glaucoma group of which 63 (47.7%) were of the open angle type and 46 (34.8%) were of the angle closure type. Twenty-three eyes belong to the secondary glaucoma group. Sixty-five eyes had plain or non-augmented trabeculectomy (TE) while 20 were augmented with mitomycin C (MMC) and 11 with 5 fluorouracil (5FU). In 31 eyes the plain TEs were combined with extracapsular cataract extraction (ECCE) and 4 with phacoemulsification. One case had combined ECCE and augmented trabeculectomy with mitomycin-C. The patients were followed up at 1 month, 6 months, 1 year and 2 years. Ninety-four of 132 (71.2%) eyes had successful surgery with intraocular pressure (IOP) of less than 21mmHg (tonometric success) at the end of 2 years. Four of these patients needed topical medication for the IOP control. More failures were seen in patients with cystic blebs than those with diffuse blebs. Complications include hypotony, shallow anterior chamber, cataracts and hyphaema. The majority of cases (53%) had no complications.

**Key Words:** Trabeculectomy, Tonometric success, Intraocular pressure, Glaucoma, Augmented

## Introduction

Glaucoma is a leading cause of blindness. Treatment modules include medical therapy, laser, and surgery. TE is a filtering procedure in which a block of limbal tissue is removed beneath a scleral flap to allow flow of aqueous from anterior chamber to the subconjunctival space. It is commonly done when medical therapy fails although early TE is preferred by some. TE can be done as a single procedure or in combination with cataract surgery and may be augmented with anti fibrotic agents. However, like other surgical procedures it is not without complications

This study was carried out to determine the efficacy of the filtration surgery done at this center in maintaining the reduction of IOP, the dermographic features and common complications of the surgery. Successful surgery was taken as tonometric control of IOP of less than 21 mm Hg.

## Materials and Methods

Records of patients with both primary and secondary glaucomas who underwent primary trabeculectomies from January 1994 to June 1998 were studied. The primary glaucoma cases were primary open angle and angle closure glaucomas. The secondary glaucoma included aphakic, pseudophakic, rubeotic, traumatic, phacomorphic and steroid induced glaucomas. Excluded from this study were those who had repeated filtering procedure or had previous ocular surgery, patients with congenital glaucoma and those who defaulted follow up within 2 years of the postoperative period.

One hundred and thirty five patients had primary TEs done during the stated period. Seventeen had repeat surgery and 9 defaulted follow up within the 2 years postoperative period. Twenty-three of the 109 remaining patients included in this study had TE done

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in the other eye also. Thus 132 eyes were reviewed in this study.

Data collected and recorded included age of patient at time of surgery, sex, race, type of glaucoma, type of surgery performed, pre/postoperative visual acuity, preoperative IOP, postoperative intraocular pressure at 1 month, 6 months, 12 months and 24 months, appearance of the bleb and early and late complications of surgery.

## Results

### Age, sex and racial distribution

Fifty nine (54.12%) of the 109 patients were males (70 eyes) in the age range of 20 to 85 years and 50 (45.8%) were females (62 eyes) in the range of 18 to 89 years. The most common age group who had the filtering surgery done was between the ages of 50 to 69 years with 59 patients. There were 30 cases in the age group 70 years and above, 10 cases in the age group 30 to 49 years and 10 cases were below 30 years of age. Sixty-three (57.8%) of the study population were Chinese, 32 (29.4%) were Malays and 14 (12.8%) patients were Indians. Eighty of the 132 eyes (60.6%) operated upon were right eyes and 52 (39.4%) were left eyes.

### Types of glaucoma

One hundred and nine of the 132 eyes (82.5%) were primary glaucomas with 63 eyes (47.7%) of the open angle type and 46 eyes (34.8%) of the angle closure type. There were 23 eyes (17.4%) in the secondary glaucoma group and the most common was the steroid induced glaucoma Table I.

### Types of glaucoma in relation to age, gender and race

Patients aged 50 years and above had more of the primary open angle glaucoma (47 of 63 eyes) Table I. All angle closure glaucoma cases were seen in patients above 50 years.

In terms of gender males predominated the primary open angle glaucoma with 66% or 35 of 53 patients (41 of 63 eyes) whereas females dominated the angle closure glaucoma with 69% or 25 of 36 patients (32 of 46 eyes).

Chinese was the most common race in the primary glaucoma group with 64% or 57 of 89 patients (68 of

109 eyes). 30 of 53 POAG patients (32 of 68 eyes) and 27 of 36 patients (36 of 46 eyes) in the PACG group were Chinese. Secondary glaucoma was more common in Malays with 10 of 20 patients (13 of 23 eyes).

Tonometric success rates were 91% (120 of 132 eyes) at 1 month, 83.3% (110 eyes) at 6 months, 79.5% at 1 year (105 eyes) and 71.2% at the end of 2 years (94 eyes). Four of the 94 eyes with tonometric success at the end of 2 years needed medication for IOP control.

### Bleb appearance and comparison of intraocular pressure in relation to bleb

The majority of blebs (97 eyes, 73.4%) postoperatively were noted to be diffuse while 25 eyes (18.9%) had cystic blebs. Ten eyes either had flat blebs or description of the bleb was not noted. Twenty of 97 eyes (20.6%) with diffuse bleb and 14 of 25 (56%) eyes with cystic bleb failed to maintain the IOP below 21mm Hg at the end of 2 years.

Table II shows the mean intraocular pressure noted in eyes with diffuse and cystic blebs at 1,6,12 and 24 months postoperative period. Student t test based on equal variance was performed to compare the intraocular pressure between diffuse and cystic bleb at each time period. These were found to be statistically significant. At the end of 2 years the mean IOP in the cystic group was higher at 21.96mm Hg with a p value of 0.001.

Type of incision did not affect tonometric success in this study. The age, gender, race, type of glaucoma and type of surgery also did not affect the final outcome at the end of 2 years.

### Visual outcome

Visual acuity before and 2 years after surgery were compared. Visual acuity improved in 36% of cases (48 eyes), unchanged in 32% (42 eyes) and deteriorated in 32%. Decrease in vision was due to cataracts and worsening of glaucoma.

### Post operative complications

The majority of eyes (70 or 53%) had no complications. The most common complications were shallow anterior chamber (25 or 19%) followed by hypotony taken as IOP less than 10mmHg (12 or 9%), cataracts (11 or 8.3%) and hyphaema (9 or 6.8%). Other complications included epithelial defects, leaking wound, conjunctival

retraction, choroidal effusion and endophthalmitis. Most of these occurred within 6 months postoperatively. Seven cases needed repeat TE due to increasing IOP and progression of glaucoma. A number of cases had two or more complications. (Table III)

Patients free of early complications were seen in 40 of 65 (61.5%) of plain trabeculectomy, 25 of 31 eyes (80.6%) of combined TE with ECCE. All the 4 cases of TE combined with phacoemulsification and in the only case of augmented TE with MMC combined with ECCE had no complications.

### **Types of trabeculectomy performed**

Four ophthalmologists with an interest in glaucoma performed the filtering surgeries in this study. Plain TE was done by making a 3 to 4mm trapezoidal partial thickness scleral flap dissected to clear cornea after a fornix or limbal based conjunctival flap was fashioned. A block of corneal scleral tissue was then excised and a peripheral iridectomy performed. In the case of an augmented TE, the corneal scleral excision and iridectomy were done after a surgical sponge measuring 3 x 4mm (soaked in a solution of 0.2mg/ml MMC or 50mg/ml 5FU) was placed subconjunctivally or under the dissected scleral flap for 4 minutes and the ocular tissues thoroughly irrigated with 20ml balance salt solution. The scleral flap was then closed with 10-0 nylon sutures. The Tenon's capsule and conjunctiva were closed with 8-0 vicryl sutures.

Sixty-five patients had plain or nonaugmented TEs done. In 31 other eyes the plain TE was combined with ECCE and 4 with phacoemulsification. Twenty-one trabeculectomies were augmented with MMC and

11 with 5FU. One case underwent combined augmented trabeculectomy with MMC and ECCE.

Forty-eight eyes with POAG (18 combined with cataract surgery), 38 eyes with PACG (10 combined with cataract surgery) and 13 eyes with secondary glaucoma (7 combined with cataract surgery) had non-augmented or plain TEs.

Augmented trabeculectomy with MMC and 5-FU were carried out in 10 patients (11 eyes) below 50 years and 21 above 50 years. Combined TE with ECCE was done in patients 50 years and above.

The conjunctival flaps made were fornix based in 72 eyes (55%). Thirty-nine of 65 plain trabeculectomy, 22 of those in combined surgery, 10 in augmented trabeculectomy and in the sole case of augmented trabeculectomy with cataract surgery. Limbal based flaps were done in 60 eyes (46%); 26 in plain, 12 in combined surgery and 22 in augmented trabeculectomy.

### **Post operative results**

#### **IOP reduction and tonometric success**

The mean intraocular pressure before surgery was 31.93mmHg. At 1 month, 6 months, 1 year and 2 years the mean IOP were 14.43mm Hg, 16.86mm Hg, 16.93mm Hg, and 17.80mmHg respectively. At the end of 2 years the drop in IOP from the preoperative level was 14.13mmHg (40 %).

**Table I: Type of glaucoma in relation to age and sex**

Glaucoma type	Age groups				Total No. of Eyes
	< 30yrs	30-49yrs	50-69yrs	70yrs	
<b>Primary</b>	9	7	60	33	109
<b>POAG</b> (M=35, F=18)	9	7	30	17	63
<b>PACG</b> (M=11, F=25)	0	0	30	16	46
<b>Secondary</b>	4	5	8	6	23
<b>Steroid</b>	3	2	3	2	10
<b>Pseudophakic</b>	0	1	2	1	4
<b>Neovascular</b>	0	2	2	1	5
<b>Trauma</b>	1	0	1	0	2
<b>Aphakic</b>	0	0	0	1	1
<b>Phacomorphic</b>	0	0	0	1	1

**Table II: Intraocular pressure in relation to bleb**

Time	IOP		p value
	Diffuse (n=97)	Cystic (n=25)	
<b>Preoperative</b>	29.98	37.48	0.017
<b>1 month</b>	13.72	16.08	0.075
<b>6 months</b>	14.77	21.24	<0.001
<b>12 months</b>	15.96	21.08	0.002
<b>24 months</b>	16.57	21.96	0.001

**Table III: Complications of trabeculectomy**

Complications	Plain TE	Plain + ECCE	Aug. (MMC)	Aug. (5-FU)	Total
<b>Shallow anterior chamber</b>	15	2	6	2	25
<b>hypotony</b>	4	1	5	2	12
<b>cataract</b>	9	-	2	-	11
<b>hyphaema</b>	1	2	4	2	9
<b>epithelial defects</b>	-	-	2	1	3
<b>leaking wound</b>	-	-	1	2	2
<b>choroidal effusion</b>	-	-	2	1	3
<b>conjunctival retraction</b>	-	-	1	1	2
<b>endophthalmitis</b>	-	1	-	-	1
<b>repeat trabeculectomy</b>	6	1	-	-	7

### Discussion

Trabeculectomy since its introduction by Sugars and Cairn is the most commonly performed filtering operation for glaucoma. It is relatively safe and effective procedure for short and long term control of IOP<sup>1,2,3</sup>.

Strict criteria for successful TE involves reducing IOP, avoiding or managing complications with no evidence of further damage to the optic disc or further deterioration of visual fields. As trabeculectomy is done to lower IOP this study focuses on tonometric success of less than 21 mmHg as criteria for successful surgery. The tonometric success of 71.2% at the end of 2 years with or without medication and 67.4% without medication is comparable to other studies done<sup>2,4,5</sup>.

Diffuse bleb is a good indicator of tonometric success in this study. There are more eyes with IOP < 21mmHg in this group than in cystic blebs group. Cystic blebs or Tenon's cyst drains less well and is a complication of glaucoma filtering surgery. Cystic bleb usually develops 2 to 6 weeks postoperatively and is characterized by an elevated tense dome shaped thickening of tissue overlying the sclerotomy site. In a study by Arthur and associate<sup>6</sup> 15.5% of cases had cystic blebs and the mean IOP was also higher than in diffuse blebs. The risk factor was among others the male gender. In this study 18.9% of eyes had cystic blebs. There was no sex predilection. The mean intraocular pressure at the end of 2 years in the cystic group was higher (21.96mm Hg) than in diffuse group (16.57mm Hg) and this was statistically significant (p=0.001).

Almost half of the 132 cases (49.2%) in this study underwent plain TE as the filtering surgery was done for the first time. Augmented TE with MMC or 5-FU was done more in younger patients, (below 49 years) as the chances of fibrosis are higher and thus augmented TE was indicated. Comparative study between MMC and 5-FU by Kazuhide et al on 32 eyes reported that the IOP control was better with MMC at the end of 1 year<sup>7</sup>. They also noted that the incidence of complications like corneal epithelial occurred more in the 5 FU group. In this study on 21 augmented cases the mean pressure at the end of 2 years with MMC was slightly lower at 20.4 mmHg than with 5 FU at 21.30mm Hg. The epithelial defects were equally seen in both MMC and 5FU augmented TEs.

Combined surgery (trabeculectomy with ECCE or phacoemulsification) was done more in older patients due to presence of senile cataracts (59.4%). The visual outcome was the same or better than preoperatively. Combined surgery has the advantage of restoration of vision by cataract surgery as well as reducing IOP. It is also more economical to perform one operation rather than two.

The incidence of success and complications of cases with either limbal or fornix based incisions were the same in this study. Lance et al in his study of 69 patients showed no notable difference in glaucoma

control and visual outcome between these two methods<sup>8</sup>. Fornix based flap is preferred in this center (55%) as it gives better exposure, less handling and traumatization and buttonholing of the conjunctival flap. Surgical time is also reduced.

Patients who underwent filtering surgery in this center were mostly above 50 years and mostly in the primary glaucoma group and Chinese. The health conscious Chinese predominantly populate the area in which this medical center is situated. In a study in Singapore<sup>9</sup> more Chinese females than males had narrow angle glaucoma. It was also noted that the ratio of PACG to POAG among Chinese was 3.8:1 whereas in Malays and Indians POAG predominated by 1.3 %. In this study on patients undergoing filtration surgery there were more Chinese in both POAG (56.6%) and PACG (75%). PACG however was as in the Singapore study more common in elderly Chinese female.

## Conclusion

Trabeculectomy is effective in lowering the IOP in the treatment of glaucoma. A tonometric success rate of IOP less than 21mmHg of about 70% is comparable to that in other centers. Complications are few and do not affect the final tonometric or visual outcome. Thus although TE is usually done when medical therapy fails, early surgery can be considered.

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