

# Outcome of Trabeculectomy in Primary Angle-Closure Glaucoma

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**Objective:** To study the outcome of trabeculectomy in patients with primary angle-closure glaucoma (PACG).

**Material and Method:** This was a retrospective study performed on data from patients with PACG underwent trabeculectomy at Mettapracharak Hospital, Thailand between January and December 2012. The outcomes of trabeculectomy were assessed in term of final intraocular pressure (IOP), visual acuity change, and the incidence of complications. A complete success was defined as achieving IOP of 21 mmHg or less without medication and a qualified success was defined as IOP of 21 mmHg or less with antiglaucoma medications.

**Results:** Thirty-six eyes from 36 patients were reviewed. The average follow-up period was 23.5±8.8 months. The overall success rate was 80.5%. A complete success in final IOP was found in 21 patients (58.3%), and a qualified success was found in eight patients (22.2%). Two patients (5.5%) had lost two or more lines of Snellen acuity at the last follow-up visit compared with their preoperative visual acuity, and 88.9% of patients had unchanged visual acuity at last follow-up. Bleb encapsulation and increasing cataract formation (19.4% and 16.7% respectively) were the most frequent complications found.

**Conclusion:** Trabeculectomy could provide a good success rate in patients with PACG. However, this procedure had risks of visual loss and some complications.

**Keywords:** Primary angle-closure glaucoma, Trabeculectomy, Intraocular pressure

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Glaucoma is the leading cause of blindness worldwide. It is estimated that 5.9 million people with open-angle glaucoma (OAG) and 5.3 million people with angle-closure glaucoma (ACG) will have bilateral blindness from this disease in 2020<sup>(1)</sup>. More people are affected by primary open-angle glaucoma (POAG) than by primary angle-closure glaucoma (PACG) worldwide. However, in Asia PACG is a major type of glaucoma<sup>(2-5)</sup>. An estimated 18.3 million people will suffer from ACG in Asia by 2020<sup>(1)</sup>, and PACG is associated with a greater risk of blindness in comparison with POAG<sup>(6)</sup>.

Management of PACG aims to prevent optic nerve damage and includes the reduction of intraocular pressure (IOP) by medication and laser peripheral iridotomy (LPI). However, the IOP is still not controlled in some eyes after these treatments, and further surgery is needed.

The partial thickness trabeculectomy has been in use since the mid-1960s. It has been the standard

and most popular operation for uncontrolled IOP in glaucomatous eyes after treatment with laser and maximal medications. It is the operation of choice for both OAG and ACG. The success rate of trabeculectomy in glaucomatous eyes has ranged from 48 to 96%, depending on the studied population, the criteria used to define successful outcome, and follow-up time<sup>(7-10)</sup>. Some studies have been conducted and reported that the success in final IOP was found in 89.3 to 91.9% of patients with PACG at 24 to 42 months follow-up period after trabeculectomy<sup>(11,12)</sup>. However, limited data has been reported about the success outcome of trabeculectomy in Thai patients with PACG.

The purpose of the present study was to evaluate the surgical outcome and complications of trabeculectomy in Thai patients with PACG.

## Material and Method

A retrospective review was performed in patients who underwent trabeculectomy for PACG at Mettapracharak Hospital in Thailand, between January and December 2012. These patients already had LPI carried out and were using the maximum tolerated antiglaucoma medication and their IOP remaining uncontrolled before the surgery.

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Data collections included age, gender, preoperative and postoperative medications, visual acuity, and IOP at preoperative period and at each follow-up visit. Intraoperative and postoperative complications were also reviewed.

All operations were performed by using conventional trabeculectomy technique. A fornix-based conjunctival flap was created and a rectangular half thickness scleral flap was dissected extending into the peripheral clear cornea. Intraoperative mitomycin-C (MMC) was applied under the scleral flap in concentration of 0.4 mg/mL for two minutes. After that, the entire surgical field was irrigated thoroughly with balanced saline solution. The corneoscleral tissue was excised by a 1 mm Kelly's punch and the peripheral iridectomy was performed. The scleral flap was closed with 10-0 nylon buried sutures. The conjunctiva was reapproximated with 10-0 nylon sutures. Postoperatively, all patients received topical steroid and antibiotic eyedrops for at least eight weeks.

Surgical outcomes were assessed in term of IOP, visual acuity change, and incidence of complications. The final IOP was the measurement at the last examination. Trabeculectomy was considered a complete success when the IOP was 21 mmHg or less without antiglaucoma medication. A qualified success was defined as IOP of 21 mmHg or less with antiglaucoma medications. A failure was defined by IOP of more than 21 mmHg or required further glaucoma surgery. Visual acuity change was assessed by comparing the result between the measurement at the last examination and the preoperative measurement.

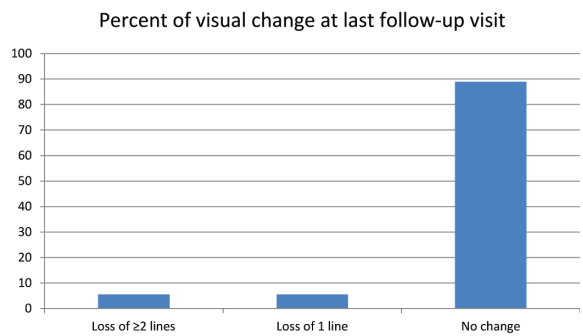
The present study was approved by the Institutional Ethical Committee of the Mettapracharak Hospital.

Data were collected and analyzed by using standard statistical methods.

## Results

Follow-up information was available for 36 eyes. There were 15 (41.7%) male and 21 (58.3%) female patients in the present study. The average age of patients was 61.8±9.2 years. The average follow-up time was 23.5±8.8 months (range 12 to 36 months). All the eyes in the studied population were on topical antiglaucoma medications before surgery and the average number of medications was 3.7±0.5. The average preoperative and postoperative IOP were shown in Table 1.

A complete success in final IOP was found in 21 patients (58.3%) and a qualified success was found



**Fig. 1** Visual acuity status at the last follow-up visit in the studied population.

in eight patients (22.2%). The overall success rate of trabeculectomy in the present study was 80.5%. Seven eyes (19.4%) were classified as failures, which were resulted from bleb encapsulations. These seven patients underwent bleb needling with MMC immediately after bleb encapsulations were diagnosed but none of them was successful.

In term of visual acuity change, two patients (5.5%) had lost two or more lines of Snellen acuity at the last follow-up visit compared with their preoperative visual acuity. Thirty-two patients (88.9%) had unchanged visual acuity at last follow-up. Fig. 1 showed the visual acuity status at the last follow-up visit compared with preoperative visual acuity.

There was no intraoperative complication in the present study. The postoperative complications are shown in Table 2.

**Table 1.** The average preoperative and postoperative intraocular pressure (IOP)

	Mean IOP ± SD (mmHg)
Preoperative IOP	30.9±11.6
Postoperative IOP at 1 month	11.1±4.3
Postoperative IOP at 6 months	11.3±4.3
Postoperative IOP at 12 months	14.2±4.4
Postoperative IOP at 24 months	13.5±4.9

**Table 2.** Postoperative complications

Postoperative complications	Number (%)
Shallow anterior chamber	3 (8.3)
Hypotony	4 (11.1)
Bleb encapsulation	7 (19.4)
Increased cataract	6 (16.7)
Wound leak	1 (2.8)

There was one case of wound leak, which was the result of hypotony and occurred in early postoperative period. The patient underwent primary resuturing, which restored the IOP to 12 mmHg.

## Discussion

PACG tends to be more prevalent in Asians' eyes compared to those of Caucasians<sup>(1)</sup>. In Thailand, the prevalence of PACG was 0.9% in the population aged 50 years or older<sup>(5)</sup>. The number of patients affected by glaucoma in Thailand is expected to rise three-fold over the next 50 years.

It has been demonstrated by many large clinical trials such as the Ocular Hypertension Study (OHTS)<sup>(13)</sup>, the Collaborative Normal-Tension Glaucoma Study (CNTGS)<sup>(14)</sup>, and Early Manifest Glaucoma Trial (EMGTS)<sup>(15)</sup> that lower IOP is associated with reduce risk of glaucoma progression. Management of glaucoma in both OAG and ACG are usually focused on lowering the IOP. However, the mechanisms of increasing IOP in POAG and PACG are different. The most frequent cause of angle closure in PACG is pupillary block, leading to convex iris shape, and iridotomy can relieve this component. Therefore, the strategy in managing PACG is to break the pupillary block by iridotomy followed by topical antiglaucoma medication. However, some patients are unresponsive to such treatment and need further surgical intervention.

Trabeculectomy is the most common surgery used to reduce the IOP in both OAG and ACG patients who are unresponsive to medical and laser treatment. It can provide an acceptable surgical success rate at 68 to 100% in Asian population with chronic ACG<sup>(12,16-19)</sup>. In the present study, we studied the surgical outcome of trabeculectomy with MMC in Thai patients with PACG. The overall success rate in our study was 80.5% at the average follow-up time of 23.5 months. The difference of outcome of trabeculectomy between our and their studies could be from different studied population, surgical techniques, and variation of follow-up time.

The overall success rate of primary trabeculectomy in Thai glaucoma patients had been reported by Lim et al<sup>(20)</sup> at 96.8%, which was higher than our results in the present study. There were some differences between their study and the present study. Lim et al<sup>(20)</sup> studied in types of glaucoma and had shorter follow-up period compared to the present study.

The most common complications found in the present study were bleb encapsulation and increased cataract formation. Incidence of bleb encapsulation had been reported between 10.8 to 40%

after trabeculectomy depending on many factors such as type of glaucoma, surgical technique, and follow-up time<sup>(12,21)</sup>. In the present study, the incidence of bleb encapsulation was 19.4% after trabeculectomy in PACG patients at the average almost two years follow-up. Increased cataract formation is another well-documented complication after trabeculectomy. It was reported by the Advanced Glaucoma Intervention Study (AGIS) that trabeculectomy increased the risk of cataract formation by 78% after adjustment for age and diabetes on the expected 5-year cumulative probability<sup>(22)</sup>. In the present study, we found that the incidence rate of cataract formation after trabeculectomy in PACG was 16.7%. But we had shorter follow-up period than those in AGIS.

Limitations of the present study included its retrospective design, small sample size, and the variability of follow-up periods. With time passing, some new knowledge has been found about the surgical interventions in glaucoma patients. The indications of trabeculectomy in PACG may change. Some procedures such as lens extraction and phacotrabeculectomy have been found to be beneficial in chronic ACG<sup>(23-25)</sup>. Therefore, the best procedure for each patient with PACG depends upon the individual clinical conditions involved.

In summary, trabeculectomy with MMC provided a good success rate for Thai patients with PACG. However, this procedure has the risks of surgical failure, incidence of complications and loss of visual acuity. Therefore, it should be reserved as a choice for some medically unresponsive cases. Other procedures can be weighted for risk and benefit in each individual patient.

## What is already known on this topic?

The outcome of trabeculectomy in PACG has been reported in many studies worldwide. The surgical success rates were reported at 68 to 100% in different populations. In Thailand PACG is the common type of glaucoma and trabeculectomy is the most common surgery in PACG. However, there has never been a report of the outcome of this surgery in Thai patients with PACG.

## What this study adds?

The present study reported the outcome of trabeculectomy in patients with PACG in Thailand.

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#### Potential conflicts of interest

None.

#### References

1. Quigley HA, Broman AT. The number of people with glaucoma worldwide in 2010 and 2020. *Br J Ophthalmol* 2006; 90: 262-7.
2. Foster PJ, Baasanhu J, Alsbirk PH, Munkhbayar D, Uranchimeg D, Johnson GJ. Glaucoma in Mongolia. A population-based survey in Hovsgol province, northern Mongolia. *Arch Ophthalmol* 1996; 114: 1235-41.
3. Foster PJ, Oen FT, Machin D, Ng TP, Devereux JG, Johnson GJ, et al. The prevalence of glaucoma in Chinese residents of Singapore: a cross-sectional population survey of the Tanjong Pagar district. *Arch Ophthalmol* 2000; 118: 1105-11.
4. Dandona L, Dandona R, Mandal P, Srinivas M, John RK, McCarty CA, et al. Angle-closure glaucoma in an urban population in southern India. The Andhra Pradesh eye disease study. *Ophthalmology* 2000; 107: 1710-6.
5. Bourne RR, Sukdom P, Foster PJ, Tantisevi V, Jitapunkul S, Lee PS, et al. Prevalence of glaucoma in Thailand: a population based survey in Rom Klao district, Bangkok. *Br J Ophthalmol* 2003; 87: 1069-74.
6. Foster PJ, Johnson GJ. Glaucoma in China: how big is the problem? *Br J Ophthalmol* 2001; 85: 1277-82.
7. Landers J, Martin K, Sarkies N, Bourne R, Watson P. A twenty-year follow-up study of trabeculectomy: risk factors and outcomes. *Ophthalmology* 2012; 119: 694-702.
8. Stead RE, King AJ. Outcome of trabeculectomy with mitomycin C in patients with advanced glaucoma. *Br J Ophthalmol* 2011; 95: 960-5.
9. Jacobi PC, Dietlein TS, Krieglstein GK. Primary trabeculectomy in young adults: long-term clinical results and factors influencing the outcome. *Ophthalmic Surg Lasers* 1999; 30: 637-46.
10. Nouri-Mahdavi K, Brigatti L, Weitzman M, Caprioli J. Outcomes of trabeculectomy for primary open-angle glaucoma. *Ophthalmology* 1995; 102: 1760-9.
11. Wang M, Ge J, Lin MK, Zhuo YH, Ling YL, Fang M, et al. Clinical observation of trabeculectomy for primary angle closure glaucoma. *Zhonghua Yan Ke Za Zhi* 2009; 45: 338-43.
12. Chen YH, Lu DW, Cheng JH, Chen JT, Chen CL. Trabeculectomy in patients with primary angle-closure glaucoma. *J Glaucoma* 2009; 18: 679-83.
13. Kass MA, Heuer DK, Higginbotham EJ, Johnson CA, Keltner JL, Miller JP, et al. The Ocular Hypertension Treatment Study: a randomized trial determines that topical ocular hypotensive medication delays or prevents the onset of primary open-angle glaucoma. *Arch Ophthalmol* 2002; 120: 701-13.
14. Collaborative Normal-Tension Glaucoma Study Group. Comparison of glaucomatous progression between untreated patients with normal-tension glaucoma and patients with therapeutically reduced intraocular pressures. *Am J Ophthalmol* 1998; 126: 487-97.
15. Heijl A, Leske MC, Bengtsson B, Hyman L, Bengtsson B, Hussein M. Reduction of intraocular pressure and glaucoma progression: results from the Early Manifest Glaucoma Trial. *Arch Ophthalmol* 2002; 120: 1268-79.
16. Aung T, Tow SL, Yap EY, Chan SP, Seah SK. Trabeculectomy for acute primary angle closure. *Ophthalmology* 2000; 107: 1298-302.
17. Tham CC, Lai JS, Poon AS, Lai TY, Lam DS. Results of trabeculectomy with adjunctive intraoperative mitomycin C in Chinese patients with glaucoma. *Ophthalmic Surg Lasers Imaging* 2006; 37: 33-41.
18. Sihota R, Gupta V, Agarwal HC. Long-term evaluation of trabeculectomy in primary open angle glaucoma and chronic primary angle closure glaucoma in an Asian population. *Clin Exp Ophthalmol* 2004; 32: 23-8.
19. Sihota R, Sood A, Gupta V, Gupta V, Dada T, Agarwal HC. A prospective longterm study of primary chronic angle closure glaucoma. *Acta Ophthalmol Scand* 2004; 82: 209-13.
20. Lim LA, Chindasub P, Kitnarong N. The surgical outcome of primary trabeculectomy with mitomycin C and a fornix-based conjunctival flap technique in Thailand. *J Med Assoc Thai* 2008; 91: 1551-7.
21. Schwartz AL, Van Veldhuisen PC, Gaasterland DE, Ederer F, Sullivan EK, Cyrlin MN. The Advanced Glaucoma Intervention Study (AGIS): 5. Encapsulated bleb after initial trabeculectomy. *Am J Ophthalmol* 1999; 127: 8-19.
22. The Advanced Glaucoma Intervention Study: 8. Risk of cataract formation after trabeculectomy.

- Arch Ophthalmol 2001; 119: 1771-9.
23. Roberts TV, Francis IC, Lertusumitkul S, Kappagoda MB, Coroneo MT. Primary phacemulsification for uncontrolled angle-closure glaucoma. J Cataract Refract Surg 2000; 26: 1012-6.
24. Yang CH, Hung PT. Intraocular lens position and anterior chamber angle changes after cataract extraction in eyes with primary angle-closure glaucoma. J Cataract Refract Surg 1997; 23: 1109-13.
25. Lai JS, Tham CC, Chan JC, Lam DS. Phacotrabeculectomy in treatment of primary angle-closure glaucoma and primary open-angle glaucoma. Jpn J Ophthalmol 2004; 48: 408-11.

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### ผลการผ่าตัด *trabeculectomy* ในผู้ป่วยต้อหินมุมปิดปฐมภูมิ

ดวงดาว ทศณรงค์, จตุพร งามจิตติอำไพ

**วัตถุประสงค์:** เพื่อศึกษาผลการผ่าตัดรักษาต้อหินแบบ *trabeculectomy* ในผู้ป่วย *primary angle-closure glaucoma*  
**วัสดุและวิธีการ:** การศึกษานี้เป็นการศึกษาแบบย้อนหลังโดยเก็บรวบรวมข้อมูลจากประวัติของผู้ป่วยต้อหินชนิด *primary angle-closure glaucoma* ซึ่งได้รับการผ่าตัดแบบ *trabeculectomy* ที่โรงพยาบาลเมตตาประชารักษ์ ระหว่างเดือนมกราคม ถึง ธันวาคม พ.ศ. 2555 ผลการผ่าตัดจะถูกประเมินจากค่าความดันตาหลังผ่าตัด การมองเห็นที่เปลี่ยนแปลง และภาวะแทรกซ้อนจากการผ่าตัด โดย *complete success* หมายถึง มีความดันตาหลังผ่าตัดน้อยกว่าหรือเท่ากับ 21 มิลลิเมตรปรอท โดยไม่ต้องใช้ยาต้อหิน และ *qualified success* หมายถึง มีความดันตาหลังผ่าตัดน้อยกว่าหรือเท่ากับ 21 มิลลิเมตรปรอท โดยต้องใช้ยาต้อหิน

**ผลการศึกษา:** ข้อมูลทั้งหมดได้จาก 36 ตา ในผู้ป่วย 36 ราย ระยะเวลาในการติดตามการรักษาเฉลี่ย  $23.5 \pm 8.8$  เดือน ตาที่ได้รับการพิจารณาว่าประสบความสำเร็จในการผ่าตัดวิธีนี้คิดเป็นร้อยละ 80.5 โดยแบ่งเป็น *complete success* ในผู้ป่วย 21 ราย คิดเป็นร้อยละ 58.3 และ *qualified success* ในผู้ป่วย 8 ราย คิดเป็นร้อยละ 22.2 มีผู้ป่วย 2 ราย คิดเป็นร้อยละ 5.5 มีการมองเห็นลดลงอย่างน้อยสองบรรทัดของ Snellen acuity จากการตรวจติดตามการรักษาครั้งสุดท้าย เมื่อเปรียบเทียบกับก่อนการผ่าตัด และมีร้อยละ 88.9 ของผู้ป่วยที่การมองเห็นไม่เปลี่ยนแปลง *Bleb encapsulation* และการเพิ่มขึ้นของต้อกระจกเป็นภาวะแทรกซ้อนที่พบมากที่สุดในการศึกษานี้ซึ่งอยู่ที่ร้อยละ 19.4 และ 16.7 ตามลำดับ

**สรุป:** การผ่าตัดต้อหินชนิด *trabeculectomy* ให้ผลการรักษาที่ดีในผู้ป่วยต้อหินชนิด *primary angle-closure glaucoma* อย่างไรก็ตามการผ่าตัดนี้มีความเสี่ยงที่อาจทำให้การมองเห็นลดลงหลังผ่าตัด และพบภาวะแทรกซ้อนได้จากการผ่าตัด