Paracentesis as an initial intervention in Malay Indonesian eyes with acute primary angle closure

Widya Artini, Tjahjono D. Gondhowiardjo, Edi Supiandi

Department of Ophthalmology, Faculty of Medicine, Universitas Indonesia / Cipto Mangunkusumo General Hospital, Jakarta, Indonesia

Abstrak

Latar belakang: *Sudut tertutup primer akut (STPA) merupakan salah satu penyebab kebutaan akut dan bersifat permanen di Departemen Mata RSUPN Cipto Mangunkusumo. Tata laksana penyakit tersebut masih dalam perdebatan. Tindakan laser iridektomi perifer sulit dilakukan segera karena tekanan intra okular (TIO) yang tinggi menimbulkan edema kornea, sehingga gambaran iris tidak dapat terlihat jelas. Parasentesis dapat menurunkan TIO secara cepat. Penelitian ini bertujuan untuk menilai TIO hasil tindakan parasentesis sebagai tindakan pertama dalam menurunkan TIO pada primer sudut tertutup akut di ras Indonesia Melayu.*

Metode: *Penelitian intervensi ini dilakukan di Klinik Mata RSUPN Cipto Mangunkusumo dan* Jakarta Eye Center *dari Januari 2005 sampai Desember 2007. Subjek penelitian adalah penyandang STPA, sesuai konsensus Asia Pasifik pada ras Indonesia Melayu. Seluruh subjek dilakukan parasentesis. TIO awal dan sesudah parasentesis serta luas sinekia anterior perifer (SAP) dicatat. Keluaran parasentesis dikatakan baik bila TIO ≤ 21 mmHg dan buruk bila TIO > 21 mmHg.*

Hasil: *Dalam penelitian ini, terdapat 45 subjek yang mempunyai STPA. Di antara seluruh subjek, tiga puluh delapan orang adalah perempuan dengan rerata umur 54,6 ± 1,56 tahun. Rerata lama serangan 13,15 ± 7,4 hari dengan rerata luas SAP 7,7 ± 3,1 jam. Terdapat korelasi kuat antara lama serangan dengan luas SAP (r = 0,672; p < 0,001). Rerata TIO awal adalah 55 ± 13,37 mmHg dan TIO setelah parasentesis adalah 27 ± 12,78 mmHg. Terjadi penurunan TIO yang bermakna sebesar 49% (p < 0.001) dengan keluaran baik pada 19 mata, dan keluaran buruk pada 26 mata.*

Kesimpulan: *Parasentesis sebagai tata laksana awal pada mata dengan STPA menurunkan TIO segera, tetapi hanya bersifat sementara.* ***(Med J Indones. 2012;21:113-7)***

Abstract

Background: Acute primary angle closure (APAC) is one of the causes of blindness in Department of Ophthalmology Cipto Mangunkusumo General Hospital. Management of APAC is still controversial. Laser peripheral iridotomy is difficult to be done due to corneal edema as a result of persistent high intraocular pressure (IOP). It is believe that paracentesis will lower IOP immediately. The objective of the study was to assess outcome of paracentesis as the initial management in Malay Indonesian eyes with APAC.

Methods: This intervention study was conducted at the Eye Clinic of Cipto Mangunkusumo Hospital and Jakarta Eye Center commencing in January 2005 until December 2007. Malay Indonesian eyes with APAC were included in this study in accordance with the new Asia Pacific consensus. All APAC eyes underwent paracentesis to lower IOP. The presenting and post-paracentesis IOP and peripheral anterior synechiae were noted. The outcome was termed as good when IOP was ≤ 21 mmHg and poor when IOP was > 21 mmHg.

Results: A total of 45 APAC eyes were recruited. Thirty-eight of these belonged to women; mean age was 54.6 ± 1.56 years. Meanwhile, average duration of symptoms was 13.15 ± 7.4 days and mean of extent of peripheral anterior synechiae (PAS) was 7.7 ± 3.1 hours. There was a strong correlation regarding duration of symptoms to the formation of PAS (r = 0.672; p < 0.001). The mean presenting IOP was 55 ± 13.37 mmHg and mean post-paracentesis IOP was 27 ± 12.78 mmHg. A decrease of 49% in IOP (p < 0.001) was observed after paracentesis with good outcome in 19 eyes and poor outcome in 26 eyes.

Conclusion: Paracentesis as an initial intervention in APAC eyes reduces the IOP immediately, but only as a temporary response. ***(Med J Indones. 2012;21:113-7)***

Keywords: *Acute primary angle closure (APAC), intraocular pressure (IOP), paracentesis, peripheral anterior synechiae (PAS)*

Glaucoma is the second greatest cause of blindness worldwide and it was estimated that over 8.4 million people will be bilaterally blind from primary glaucoma in 2010, rising to 11.1 million by 2020.[1] Surveys conducted by the Indonesian Ministry of Health in 1992 - 1996 showed that the prevalence of blindness in Indonesia constitute 1.5% of the population and glaucoma is the second greatest affliction (0.2%) among them.[2]

Acute primary angle closure (APAC) is one of the most severe clinical symptoms in ophthalmology. The change of the diagnostic term from acute primary angle closure glaucoma (APACG) to acute primary angle closure (APAC) came into force following a worldwide announcement of the Asia Pacific Group of the new criteria regarding the subject of angle closure. The term glaucoma is used if visual field defects together with optic nerve damage are present. If there is no damage of the optic nerve, when the acute eye symptoms revert back to normal, the term glaucoma should not be used.[3, 4]

Pathogenesis of APAC is caused by closing of the entire trabecular meshwork by iris root and abrupt closing of the anterior chamber angle as a result of sudden increase

Correspondence email to: ikkesumantri@gmail.com

of intraocular pressure (IOP). Persistent high IOP causes damage to trabecular meshwork, development of peripheral anterior synechiae (PAS), and permanent blindness as result of optic nerve atrophy.[5-8]

It is imperative to undertake effective and efficient management immediately by lowering the IOP. Paracentesis is a successful procedure as initial treatment to reduce IOP rapidly.[9] Followed by iridotomy peripheral as a definitive therapy to overcome the blockade pupil as the main pathogenesis of APAC.[10-12]

The current initial management is an intensive medical therapy to alleviate the acute process.[5-8] However, this method of therapy requires approximately 12 hours to effectively lower IOP.[9,13] Thus, paracentesis could offer an alternative therapy for a more rapid lowering IOP. To date there is no data available regarding the outcome of paracentesis to lower IOP as an initial therapy for Malay Indonesian APAC eyes.

The purpose of this study is to assess the outcome of paracentesis as the initial method of therapy in those ethnic Malay Indonesian patients with acute primary angle closure.

METHODS

This study is an intervention study conducted at the Eye Clinic of Cipto Mangunkusumo Hospital and Jakarta Eye Center commencing in January 2005 until December 2007. The authors obtained prior approval for the study protocol from the Ethics Committee of the Faculty of Medicine Universitas Indonesia. Written informed consent was obtained from all patients before examination.

Indonesian APAC patients presenting with acute symptoms of less than 1 month were recruited consecutively. The following diagnostic criteria were used for APAC[5-7,11]: (1) the presence of at least two symptoms: eye pain, headache, blurred vision, with/without vomiting; (2) the presence of the following signs: conjunctival injection, a mid-dilated unreactive pupil, and corneal edema; (3) 270 degree or greater of anterior chamber angle closure on gonioscopic examination and; (4) IOP more than 40 mmHg by Goldmann applanation tonometry. Exclusion criteria included those APAC patients who had previously undergone eye surgery, laser peripheral iridotomy, and secondary acute glaucoma.

On admission, all patients underwent a comprehensive eye examination: best corrected visual acuity (BCVA) by Snellen chart; IOP measurement by Goldmann applanation tonometry (average of 3 readings taken). If cornea was clear, dynamic gonioscopy with four mirror contact lenses (Sussmann, Ocular instruments, USA) was done to assess PAS. The extent of PAS in clock hour was graded by using a pie diagram. The diagram was divided into 4 quadrants, each quadrant divided into 3 radial sections. As a result, one diagram consisted of 12 radial sections which were labelled 0-4, 5-8 and 9-12.

Paracentesis was performed on all APAC eyes, and the IOP was observed in 4-, 12-, and 24- hours intervals after the procedure. Paracentesis was performed under a semi-sterile procedure in the following way: the patient was placed in supine position and the affected eye rinsed with diluted povidone iodine. The surgeon used loupe and flashlights. A 30-G 1 mL syringe needle was administered to puncture the anterior chamber at temporal limbus and directed parallel to iris. Thereafter, approximately 50 µL of aqueous humor was drained. It should be noted that the anterior chamber was not seen to be flat. Finally, the eyes were cleaned with diluted povidone iodine. Ofloxacin antibiotic eye drops were given 6 times per day for 5 days.

A record was made of gender, age, duration of symptoms, the presenting IOP, IOP 4-, 12-, 24- hours post-paracentesis, the extent of peripheral anterior synechiae, and the optic nerve head was recorded. The presenting IOP refers to the admission IOP when the patient first presented to the clinic. Peripheral anterior synechiae is generally determined according to the clock hour and is divided into 3 intervals as following, 0-4; 5-8 and 9-12. The outcome was termed as good when the IOP was $\leq$ 21 mmHg at 4-, 12-, and 24- hours and poor when the IOP was > 21 mmHg.

Sample size estimation was calculated by t-test pre and post treatment with clinical differences of 20 mmHg. Error type 1; α: 5%, with power 1-β = 0.8. Numerical data were shown in mean values (mean ± standard deviations). Statistical analysis used was Wilcoxon test to calculate the IOP before and after paracentesis. Variable categories are assessed by Chi-square test and comparison of numerical variables with unpaired Mann-Whitney test or unpaired Student's t test. P-value < 0.05 was considered statistically significantly.

RESULTS

A total of 45 APAC eyes were recruited for this study. There were 38 women (38 eyes), mean age of 54.6 ± 1.56 years. Average duration of symptoms was 13.15 ± 7.4 days and mean presenting of IOP was 55 ± 13.37 mmHg (range 40-78 mmHg). Moreover, mean of PAS extent was 7.7 ± 3.1 hours (Table 1).

Table 1. Characteristics of Malay Indonesian APAC eyes

	Mean ± SD
Gender	
Female (n)	38
Male (n)	7
Age (year)	54.6 ± 1.56
Duration of symptom (days)	13.15 ± 7.4
Presenting IOP (mmHg)	55 ± 13.37

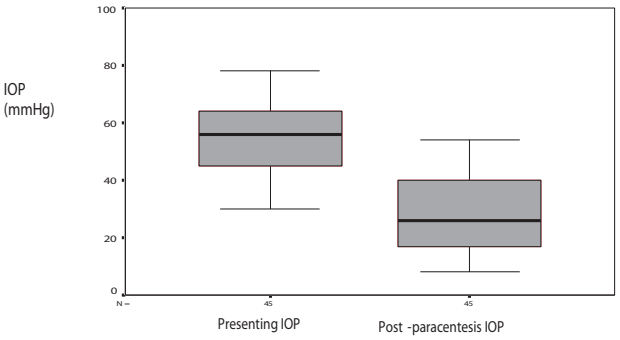
Patients with a shorter duration of symptoms, tend to have eyes with IOP below 50 mmHg, n = 12/45. In contrast, patients with a longer duration of symptoms, tend to have eyes with IOP above 50 mmHg, n = 19/45. Moreover, duration of symptoms and IOP showed comparable significances (p = 0.015). Twenty six patients presented with duration of symptoms of more than 7 days (Table 2). There was a strong correlation between the duration of symptoms and development of PAS (r = 0.672; p < 0.001).

Table 2. Association of the duration of symptoms and presenting IOP

Duration of symptoms	n	Presenting IOP mmHg	
		≤ 50	> 50
≤ 7 days	19	12	7
> 7 days	26	7	19

Chi-square test, p = 0.015

The mean IOP post paracentesis at 4-, 12-, and 24-hours was 15 ± 21, 20 ± 13 and 27 ± 12.78 mmHg respectively (Figure 1). After 24 hours, IOP decreased by 49% compared to presenting IOP (p < 0.001).



Wilcoxon test, p < 0.001

Figure 1. Paracentesis outcome of APAC eyes

The outcome of paracentesis after 24 hours was found to be beneficial in 19 eyes (42%) and 26 eyes had poor outcome. The outcome was not associated with the duration of acute symptoms (p = 0.550). The eyes with a duration of symptoms of more than 7 days, showed a greater decreasing changing value of IOP compared to the eyes with a duration of symptoms less than 7 days, however no significant differences were observed. (p = 0.341) (Table 3).

Table 3. Association of the duration of symptoms to paracentesis outcome

Duration of symptoms	n	Paracentesis outcome		Δ Presenting IOP–post-paracentesis Mean (SD) mmHg
		Good n	Poor n	
≤ 7 days	19	9	10	25.5 (16.3)
> 7 days	26	10	16	30.3 (16.9)
		p = 0.550*		p = 0.341**

* Chi-square test, ** t independen test, SD: standard deviation

Paracentesis as an initial method, lowered the IOP in all degrees of PAS extent, 0-4 of PAS was 50% (p = 0.001), 5-8 of PAS was 59% (p = 0.003), and 9-12 of PAS was 46% (p < 0.001) (Table 4). In lowering IOP, outcome of paracentesis was not influenced by the duration of symptoms and extent of PAS (Table 5).

DISCUSSION

This study described the outcome of the Malay Indonesian APAC eyes to paracentesis, successful was seen only in a total of 19 from 45 eyes, whereas this intervention was proved 100% successful in other developing Asia countries.[6]

Aung et al[11] reported that Asian eyes may be prone to develop more severe attacks of APAC compare to Europeans, and that this may be related to the longer duration of symptoms and difficulty of breaking the acute attacks. Lam et al[9] have reported that paracentesis will break the acute attacks faster than IOP-lowering combined medical therapy.

Primary angle closure glaucoma (PACG) is one of main bilateral causes of blindness if not treated in the early stages and is more common in Asia, particularly in Indonesia. Acute primary angle closure is associated with PACG and diagnosis of APAC eye is usually quite simple. The signs and symptoms can be easily detected; the affected eye becomes red, blurring of vision, pupil is dilated with corneal epithelial edema and cataract Vogt resulting from high IOP. As a result of persistent exposure to high IOP, damage is caused to the eye tissue, resulting in the formation of peripheral anterior synechiae (PAS), leading to adherence of the iris root to the trabecular meshwork. If the PAS extent covers the trabecular meshwork more than 270^0, the normal outflow of aqueous humor from the anterior chamber is then blocked and the IOP therefore increases. IOP can reach to 70 mmHg. The aqueous humor is trapped in the anterior chamber will create great pressure throughout the eye tissue.[5-8] The critical damaged tissue affect the optic nerve fiber layer, followed by the occurrence of visual field defects. This process will cause permanent

Table 4. Association of paracentesis outcome of IOP to peripheral anterior synechiae (PAS)

		PAS		
		0 – 4 Mean (SD) n:15	5 – 8 Mean (SD) n: 12	9 – 12 Mean (SD) n: 18
IOP (mmHg)	Presenting IOP	47.8 (12)	55.9 (14)	62.6 (10)
	Post-paracentesis IOP	2.8 (12)	22.9 (10)	33.8 (12)
	p*	0.001	0.003	< 0.001

* Wilcoxon test

Table 5. Correlation of peripheral anterior synechiae to changing value of IOP based on the duration of symptoms

Extent of PAS	Duration of symptoms (days)	n	Δ presenting IOP -postparacentesis (SD)	p*
0 – 4	≤ 7	14	24.92(18)	0.475
	> 7	1	21.00	
5 – 8	≤ 7	2	26.00(1.4)	0.608
	> 7	10	34.40(21)	
9 – 12	≤ 7	3	28.00(14)	0.913
	> 7	15	28.9 (13)	

* t-independen test

eye blindness if the acute attack is not rapidly broken.[14] The eye can be saved if the patient seeks medical aid promptly, that is within a period of 24 hours, regardless of high IOP.

Current initial management of APAC includes intensive IOP-lowering medications, there are combined therapy of 2% pilocarpine eye drops and beta-blockers eye drops along with oral acetazolamid or intravenous.[5-7] Paracentesis has been proven to be more rapid and efficient method in lowering IOP with a 100% success rate in APAC eyes. It is used to drain the aqueous humor from the anterior chamber. This method usually results in a positive outcome within 4 hours, which demonstrates a fairly rapid response. However, Lam et al[9] reported certain differences in those patients who were admitted to the hospital within 24 hours, where high IOP had not caused any damage to the surrounding tissue. These results prove to be very different from the characteristics demonstrated by our patients, as the majority of them came to hospital only after a period of 2 days. Hence, the less favorable response in success was seen in 19 from 45 eyes.

It seems that the duration of symptoms is an important factor in the success of the outcome. The longer the exposure to high IOP, the more chance there is of necrosis and ischemia in the eye tissue, such as formation of PAS and damage of the structure in trabecular meshwork, which was showed in this study. If PAS occupies large arcs of circumference area of trabecular meshwork, it will prevent outflow of aqueous humor. As a result, although the fluid has been drained through paracentesis, fluid is still produced due to the process of the cilliary body and the reproduced fluid remains trapped in the anterior chamber. This leads to poor outcome of paracentesis. Regardless of the poor outcome, it is still imperative to lower the IOP in all cases, made cornea clear enough and save to do further treatment with laser peripheral iridotomy.

This study also suggests that paracentesis as a significant initial intervention can be implemented, since this is a fairly simple procedure, and it is not influenced by the duration of acute symptoms, the extent of PAS and persistent high IOP. However, caution must be paid to this procedure, in particular to prevent further infection. This method is a temporary IOP reduction only, and must be followed immediately by laser peripheral iridotomy. Further action, sometimes is necessary to overcome the blockade of the pupil, either with gonioplasty or trabeculectomy or lens surgery.[15-18]

The discrepancy evolving from this study was that we failed to calculate the risk factors responsible for influencing the outcome paracentesis. The fundamental reason being this was a merely the part study of our extensive research of APAC. Also, 4 eyes had received the IOP-lowering drugs before being admitted to hospital, however, their IOP remained around 40

mmHg, which could well lead to a biased opinion. Their IOP was eventually lowered after paracentesis was performed. Further research will be carried out to assess the results of these actions and then compared with IOP-lowering medication. Then the two groups will then undergo either iridotomy alone or combined iridotomy followed by gonioplasty.

Other studies have reported that primary surgery for APAC such as cataract surgery or trabeculectomy also produced successful results. However, there is still some controversy since this APAC as a hot eye (inflamation eye) lead to failure.[16-18] Most pathogenesis of APAC is pupillary blockage, but in many cases it is not the only mechanism involved. Iris angle-crowding may coexist with pupillary blockage then causes the angle closed. Iris-lens-cilliary body as the anterior segment relationship is also the important predisposition risk factors. Many interventions could be done in this disease.[8,19] Paracentesis as the initial procedure to lowering IOP could be accepted as an alternative method before resorting to either one of the above mentioned surgical intervention.

The conclusion of this study gave rise to a poor outcome in 26 eyes. However paracentesis as initial intervention to lower IOP was achieved by 49%, regardless of the duration of acute symptoms and the extent of PAS.

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. Department of Health Republic of Indonesia. Result of survey in eye and TNT health index in Indonesian population during 1996-1998.
3. Congdon N, Wang F, Tielsch JM. Issues in the epidemiology and population-based screening of primary angle closure glaucoma. Surv Ophthalmol. 1992;36:411-23.
4. South East Asia Glaucoma Interest Group. Asia Pacific glaucoma guidelines. Sydney: SEAGIG; 2008.
5. Stamper RL, Lieberman MF, Drako MV. Becker-Shaffer's diagnosis and therapy of the glaucoma. Primary angle closure. 8th ed. St. Louis: Mosby Elsevier; 2009. p.188-211.
6. Allingham RR, Moroi SE, Rhee DJ. Shields textbook of glaucomas. 6th ed. Philadelphia: Wolters Kluwer, Lippincott Williams & Wilkins; 2011. p. 189-205.
7. Ritch R, Lowe RF. Angle closure glaucoma: clinical types. In: Ritch R, Shields MB, Krupin T, editors. The glaucomas. 2nd ed. St. Louis: Mosby; 1996. p. 821-40.
8. Park KH, Kim DM, Hong C. Acute angle closure. In: Hong C, Yamamoto T, editors. Angle closure glaucoma. Netherlands: Kugler Pub; 2007. p. 123-31.
9. Lam DSC, Chua JKH, Tham CCY, Lai JSM. Efficacy and safety of immediate anterior chamber paracentesis in the treatment of acute primary angle closure glaucoma. Ophthalmology. 2002;109:64-70.
10. Quigley HA. Long term follow up of laser iridotomy. Ophthalmology. 1981;88:218-24.
11. Aung T, Ang LP, Chan SP, Chaw PTK. Acute primary angle closure: long term intraocular pressure outcome in Asia eye. Am J Ophthalmol. 2001;131:7-12.
12. Krupin T, Mitchell KB, Johnson MF, Becker B. The long term effect of iridectomy for primary acute angle closure glaucoma. Am J Ophthalmol. 1978; 88:506-9.
13. Netland PA. Glaucoma medical therapy. In: Principles and management. Ophthalmology monographs. 2nd ed. The American Academy of Ophthalmology; 2008.
14. Aung T LA, Chew PT. The visual field following acute primary angle closure. Acta Ophthalmol Scand. 2001;79:298-300.
15. Lam DSC, Lai JSM, Tham CCY, Chua JKH, Poon ASY. Argon laser peripheral iridoplasty versus conventional systemic medical therapy in treatment of acute primary angle closure glaucoma. Ophthalmology. 2002;109:1591-6.
16. Aung T, Tow SLC, Yap EY, Chan SP, Seah SK. Trabeculectomy for acute primary angle closure. Ophthalmology. 2000;107:1298-302.
17. Gunning FP, Greve EL. Lens extraction for uncontrolled angle closure glaucoma; long term follow up. J Cataract Refract Surg. 1998;24:1347-56.
18. Jacobi PC, Diet Lein TS, Luke C, Engels B, Krieglstein GK. Primary phacoemulsification and intraocular lens implantation for acute angle closure glaucoma. Ophthalmology. 2002; 109:1597-603.
19. Tarongoy P, Ho CL, Walton DS. Angle closure glaucoma: the role of the lens in the pathogenesis, prevention and treatment. Survey ophthalmol. 2009;54:211-26.