Original Article

Efficacy and Safety of Medical Treatment in Acute Angle Closure Glaucoma at Thammasat Hospital

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Abstract

Introduction: Acute angle closure glaucoma (AACG) is a suddenly high intraocular pressure (IOP) from pupillary blocking which may cause optic neuropathy. The key concept of AACG management is to break the pupillary block and lower the IOP in order to prevent blindness. The IOP-lowering medical treatments are prescribed to reduce the IOP in the initial stage. They are used to help clear up the cornea and reduce ocular inflammation before performing laser-peripheral iridotomy (L-PI).

Objectives: Determine the efficacy and safety of medical treatments in the initial management of AACG at Thammasat University Hospital.

Methods: Prospective descriptive study. Twelve cases of AACG were diagnosed at Thammasat Hospital. All participants were enrolled in this study. Patients without a history of drug allergy underwent a protocol of management in which they received one tablet of oral acetazolamide (250 mg), followed by one tablet every six hours, pure oral glycerin one gram per kilogram of body weight taken one time, topical timolol (0.5%) twice daily and brimonidine (0.2%) twice daily which was applied to the affected eye. The IOP were recorded at regular intervals. Medication was provided until resolution of AACG, which is defined as IOP <= 30 mmHg and resolution of acute symptoms. Qualitative data were calculated as percentages. Quantitative data were calculated as mean and standard deviation.

Results: Fifteen eyes of 12 patients, 5 (41.67%) men with the mean age of 67.58 (± 6.4) years were studied. With medical therapy, AACG resolved within 1, 12, and 24 hours are 7 (46.67%), 5 (33.33%), and 2 (13.33%), respectively. No serious adverse effects of IOP-lowering medical treatment were observed. Successful L-PI was performed in all subjects.

Conclusions: Prescription of IOP-lowering medical treatment is efficient and safe for the initial stage of IOP reduction. Medical management of AACG should still remain as the first-line treatment.

Keywords: Acute angle closure glaucoma, Medication treatment, Medication

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Introduction

Acute angle closure glaucoma (AACG) is usually caused by a relatively sudden blockage of the trabecular meshwork by the iris in the anterior chamber angle that leads to a sudden rise in intraocular pressure (IOP).[1,2,4] It is understood that the blockage of anterior chamber angle disturbs the natural aqueous flow from the posterior to the anterior chamber, creating a pressure gradient[6] and leads to a forward moving of the peripheral iris.[3,5] AACG is typically manifested by blurred vision, ocular pain, headache, and seeing halos around lights.[7] Acute systemic symptoms may result in nausea and vomiting. Signs of AACG include high IOP, mid-dilated, sluggish, and irregularly shaped pupil, corneal epithelial edema, congested episcleral and conjunctival blood vessels,[12] and shallow peripheral anterior chamber. The severe and sudden IOP elevation can irreversibly damage the optic nerve,[8] resulting in AACG.[9] The key concept of AACG management is to promptly lower the IOP in order to prevent patient from blindness.[8,10]

AACG treatment involves the admini stration of topical and systemic medications,[10] laser peripheral iridotomy (L-PI) or surgical iridectomy, and cataract surgery or glaucoma surgery.[9] The medical treatments are prescribed to reduce the IOP in the initial stage, which are used to help clear up the cornea and reduce ocular inflammation before preforming L-PI.[10] L-PI is not only the treatment of choice for pupillary-block angle closure but also prevents future AACG.[9,11]

Medical therapy of AACG is itself associated with some ocular and systemic adverse effects. The purpose of this study is to determine the efficacy and safety of medical treatment in the initial management of AACG at Thammasat University Hospital.

Methods

This prospective descriptive study followed the tenets of Helsinki declaration and was approved by the Human Research Ethics Committee of Faculty of Medicine, Thammasat University, Thailand. All participants enrolled in the study were patients diagnosed with AACG at Thammasat Hospital between July 2021 and June 2022. All of the patients were verbally informed about the treatment processes and a written inform consent was obtained from each of them.

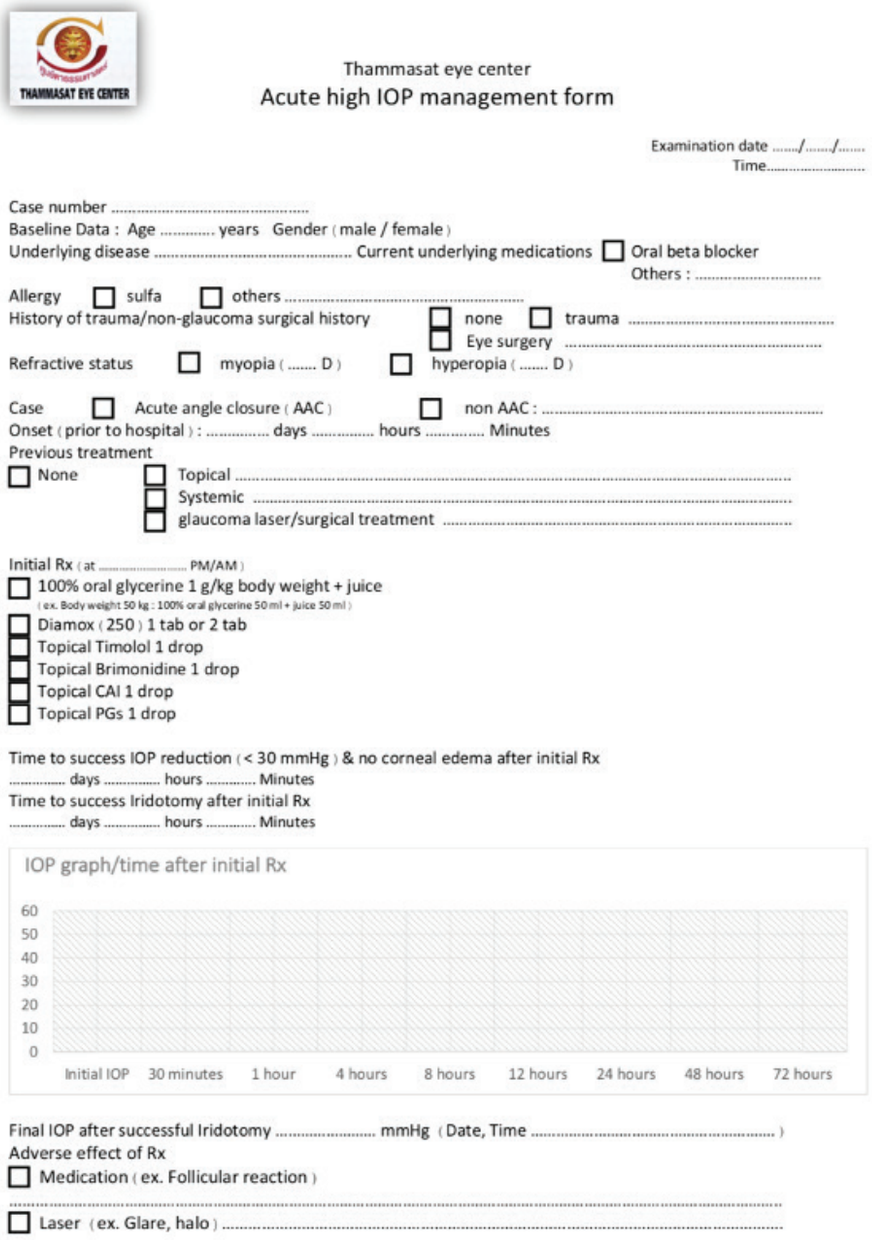
The following criteria were used to define cases of AACG:

1. Presence of at least one of the following symptoms: blurred vision, ocular pain, headache, nausea and/or vomiting, and/or seeing halos around lights.

2. Presence of IOP > 30 mmHg (as measured by Goldmann applanation tonometry) in phakic eyes with the presence of at least one of the following signs: mid-dilated, sluggish, and irregularly shaped pupil, corneal epithelial edema, congested episcleral and conjunctival blood vessels, and shallow peripheral anterior chamber.

On diagnosis, patients without a history of drug allergy underwent a protocol of management in which they received one tablet of oral acetazolamide (250 mg), followed by one tablet every six hours daily, pure oral glycerin one gram per kilogram of body weight taken one time, topical timolol (0.5%) twice daily and brimonidine (0.2%) twice daily which is applied on the affected eye. Patients were monitored at regular intervals for IOP control (as shown in Figure 1), and patients were given medication until resolution of AACG, defined as IOP <= 30 mmHg and resolution of acute symptoms. All subjects were observed for complications and adverse effects of the medical treatment. Exclusion criteria were participants with the presence of other conditions that increase IOP: for example uveitis, intraocular tumor, and patients who have history of prior intraocular surgery other than glaucoma surgery.

Age, gender and baseline data of patients were recorded in the acute high IOP management form, the IOP was checked at a specific time before and after medical treatments were prescribed until AACG was resolved. Method of treatment, complication of the treatment and adverse effect were collected (Figure 1). Qualitative data are presented as percentage. Quantitative data are calculated as mean and standard deviation.



Thammasat eye center

Acute high IOP management form

Examination date ...../...../.....
Time.....

Case number .....
Baseline Data : Age ..... years Gender (male / female)
Underlying disease ..... Current underlying medications ☐ Oral beta blocker
Others : .....
Allergy ☐ sulfa ☐ others .....
History of trauma/non-glaucoma surgical history ☐ none ☐ trauma .....
☐ Eye surgery .....
Refractive status ☐ myopia (..... D) ☐ hyperopia (..... D)

Case ☐ Acute angle closure (AAC) ☐ non AAC : .....
Onset (prior to hospital) : ..... days ..... hours ..... Minutes
Previous treatment
☐ None ☐ Topical .....
☐ Systemic .....
☐ glaucoma laser/surgical treatment .....

Initial Rx (at ..... PM/AM)
☐ 100% oral glycerine 1 g/kg body weight + juice
(ex. Body weight 50 kg : 100% oral glycerine 50 ml + juice 50 ml)
☐ Diamox (250) 1 tab or 2 tab
☐ Topical Timolol 1 drop
☐ Topical Brimonidine 1 drop
☐ Topical CAI 1 drop
☐ Topical PGs 1 drop

Time to success IOP reduction (< 30 mmHg) & no corneal edema after initial Rx
..... days ..... hours ..... Minutes
Time to success Iridotomy after initial Rx
..... days ..... hours ..... Minutes

IOP graph/time after initial Rx

60
50
40
30
20
10
0

Initial IOP 30 minutes 1 hour 4 hours 8 hours 12 hours 24 hours 48 hours 72 hours

Final IOP after successful Iridotomy ..... mmHg (Date, Time .....)
Adverse effect of Rx
☐ Medication (ex. Follicular reaction)
.....
☐ Laser (ex. Glare, halo) .....

Figure 1 AACG record form

Results

Twelve cases (15 eyes) of AACG were diagnosed and enrolled in this study. There was a predominance of women (7 [58.33%]) with the mean age of 67.58 ± 6.4 years (as shown in Table 1). The mean of presenting IOP was 45.67 ± 11.6 mmHg and mean duration of symptoms was 1.4 ± 3.7 days.

Table 1 Patient Demographic Characteristics of AACG subjects

Data	
N (%)	12(100)
Sex, NO.(%)	
Male	5(41.67)
Female	7(58.33)
Age (years old)	
40-49	0(0)
50-59	0(0)
60-69	8(66.67)
70-80	4(33.33)
Mean age	67.58 ± 6.4
Max, Min	79,62
Mean presenting IOP (mmHg)	45.67 ± 11.6
Duration of symptoms (days)	1.4 ± 3.7

With medical therapy, the number of AACG resolved within 1, 12, and 24 hours were 7 (46.67%), 5 (33.33%), and 2 (13.33%), respectively. There were no serious adverse effects of IOP-lowering medical treatment in this study. Successful L-PI was performed in all subjects within 1 to 3.5 days after the medical treatment.

There was a failure of resolution of AACG within 24 hours for only one subject (6.67%), who had symptoms persisted for more than three days before arrival. The presenting IOP in this patient was 50 mmHg. This patient finally required L-PI within 84 hours of admission. There were factors affecting time taken for resolution of the AACG within or more than 24 hours (Table 2).

Table 2 Factors affecting resolution time of AACG (within or more than 24 hours)

Factors	**Within 24 hours (%)**	**More than 24 hours (%)**
Gender		
Male	4(33.33)	1(8.33)
Female	7(58.33)	0(0)
Age		
60-69	7(58.33)	1(8.33)
70-80	4(33.33)	0(0)
Presenting IOP (mmHg)		
30-60	9(60)	0(0)
>60	5(33.33)	1(6.67)
Symptoms duration		
Within 3 days	14(93.33)	0(0)
More than 3 days	0(0)	1(6.67)

Discussion

From this study, conservative management with anti-glaucoma medication is effective and safe for relieving initial high IOP. Moreover, the majority of our patients (93.33%) resolved from AACG within 24 hours without serious adverse events. There was one patient who developed nausea and vomiting after oral acetazolamide administration for half an hour, but the IOP reduction was successful, and the nausea and vomiting disappeared after stopping oral acetazolamide.

There was one subject that the IOP-lowering medications did not work due to the patient's delayed visit to the hospital. The late arrival resulted in the prolonged IOP elevation which may stimulate inflammatory cytokine production in the anterior chamber. Inflammation may in turn influence aqueous humor dynamics and thus IOP elevation. Therefore, this patient needs to be managed by L-PI in order to lower the IOP.

Important key factors for the treatment protocol of AACG at Thammasat Hospital are hospitalization and absolute bed rest. Placing the patient in the supine position for at least a day showed additional positive results in lowering IOP since lying in supine position allows vitreous and lens-iris diaphragm to move posteriorly after antiglaucoma medication was applied in AACG patients. Furthermore, patients also had good compliance taking medications from the medical provider thus allowing a better resolution for AACG patients.

A limitation of this study is small sample size and the population studied was of all Thai descent. Moreover, as a consequence of the COVID-19 pandemic, the number of participants joining the pre-experimental study was limited due to the limit of cases as part of the hospital's protocol. Nonetheless, the information may be beneficial for patients. Initial IOP-lowering medical treatment in AACG has great benefits without serious adverse effects, and should be considered as a first-line treatment.

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