

Audit

An evaluation of treatment and follow up of angle closure patients – Audit in a single eye unit, National Eye Hospital, Sri Lanka

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Abstract

Objective: To evaluate adherence and efficacy of treatment guidelines used in the management of angle closure patients.

Treatment guideline practised in the eye unit is based on the clinical guidelines – The Management of Angle Closure Glaucoma – The Royal College of Ophthalmologists – 2020 and Guideline for Management of Glaucoma – College of Ophthalmologists of Sri Lanka.

Method: Retrospective hospital-based audit.

Material: 101 clinic registered, patients with angle closure (2010 to July 2022) were analyzed using the data extracted from patients' clinic records.

Results: 56 (55%) patients presented with acute angle closure attack. Gonioscopy was performed in 93 (92%) patients on presentation. Initial medical management with intravenous mannitol needed in 30%, oral acetazolamide in 50% with oral KCl in 40%, topical anti glaucoma drugs in 93% and topical steroids in 18% patients on presentation. Post treatment intra ocular pressure (IOP) reduction (<21mmHg) noted in 64% of patients. Laser Peripheral Iridotomy (LPI) done in 85 (84%) patients, in which 72% done without any delay. IOP reduction (<21mmHg) noted in 70% of patients. 23 patients eventually needed trabeculectomy with resultant good IOP control. 74 patients needed cataract extraction.

On follow up; 83% continued with topical anti glaucoma drugs, 5% treatment free and 12 patients defaulted follow up. Repeated gonioscopy was performed in 63% of patients. Regular IOP monitoring, Cup to Disc ratio (C: D), Visual Field (VF) assessments were done accordingly. Documented yearly Optical Coherence Tomography (OCT) noted in 60% of patients.

Conclusion: Study demonstrates that the current treatment protocol is adhered in most of the stages which resulted in favourable IOP control and outcome. Though there is a place for improvement in view of measuring post LPI IOP in 1 hour and stopping continuation of unnecessary drug treatment.

Introduction

Glaucoma is defined as progressive optic neuropathy characterized by degeneration of retinal ganglion cells, which results in structural changes in the optic nerve head and subsequent visual field loss functionally¹.

3 stages of the condition

1st – Primary angle closure suspect (PACS)

2nd – Primary angle closure (PAC)

3rd – Primary angle closure glaucoma (PACG)

In general, studies show that the prevalence of glaucoma ranges from 2.4% to 5%²⁻⁵. Almost all studies have reported primary open angle glaucoma to be more common⁶⁻⁹. PACG blinds more people than Primary Open Angle Glaucoma (POAG) in absolute terms, although the number of those with POAG worldwide is higher^{10,11}. It is estimated that >32 million patients will have PACG by 2040, about three quarters of whom are Asian¹¹. In a study conducted in central Sri Lanka – the Kandy Eye Study shows the overall prevalence of angle closure was 4.7% and the prevalence of PACS, PAC and PACG in at least 1 eye was 2.35%¹². The importance of early diagnosis and immediate treatment of glaucoma is to prevent the ensuing irreversible the structural and functional damages¹⁰. Acute angle closure glaucoma is a common ophthalmic emergency, which requires early recognition followed by appropriate treatment to minimise visual loss. The potential to cause serious and rapid loss of vision makes the clinicians to be cautious in prompt management of PACG. The urgent necessity to lower intraocular pressure is well known.

Management protocol practised in our unit is based on the clinical guidelines – The Management of Angle Closure Glaucoma – The Royal College of Ophthalmologists – 2020 and Guideline for Management of Glaucoma – College of Ophthalmologists of Sri Lanka.

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Method

It is a retrospective hospital-based audit done on patients presenting to a single unit in National Eye Hospital, Colombo, Sri Lanka. Among the all clinic patients, those ones diagnosed with angle closure were selected. 101 clinic registered patients from the year 2010 January to the year 2022 July were analysed using the data extracted from patients' clinic record in storage. Data are subject to errors in the clinical recording and examiner dependent factors. Data were collected by a single person using a google form to minimise the variability of data extracted.

In the audit, documented presenting complaints' variations such as eye pain and visual loss, redness,

the initial examination findings, findings of raised intraocular pressure (IOP) as measured with Goldmann applanation tonometer variations, visual acuity on presentation, sex distribution, age distribution, fundus assessment – Cup to Disc ratio on presentation were analysed. Percentage of the use of gonioscopy (for the assessment of iridocorneal angle), usage of limbal anterior chamber depth/Van Herick test and the usage of anterior segment optical coherence tomography were analysed.

The unit's management protocol pathway includes the 1st stage, 2nd stage management, reassessment, surgical intervention and follow up care. Care includes both in-patient and outpatient care (Table 1).

Table 1. Acute angle closure care pathway

- History and examination
 - Examination for acute angle closure and elevated IOP
 - If any secondary causes – identify
 - If high IOP – need inward care
- 1st stage
 - Stat medications – antiemetics or analgesics – if needed
 - IV Mannitol (if IOP >40mmHg)
 - O. Acetazolamide with KCl
 - Topical IOP lowering drugs
 - Review IOP in 1 hour
- 2nd stage
 - If laser iridotomy is feasible (clear cornea and patient comfortable) – YAG PI in both eyes
 - When PI completed commence topical steroids hourly and then tailing off to 4 times daily for 2 weeks
 - Recheck IOP in one hour
 - Adjustment of topical antiglaucoma drug depending on IOP
- Reassessment
 - IOP monitoring in 2 weeks
 - Patency of PI
 - Reassess with gonioscopy for angle status
 - Fundus assessment for glaucomatous optic neuropathy
 - Visual field assessment and OCT OCT Optic nerve head (ONH)/retinal nerve fibre layer (RNFL)/ganglion cell analysis (GCA)
 - If needed Anterior segment OCT
- Surgical intervention
 - Cataract extraction
 - If persistent uncontrolled IOP – Consider surgery (Trabeculectomy)
- Follow up care
 - Monitoring of IOP at regular intervals according to IOP control and optic neuropathy progression
 - Gonioscopy assessment for peripheral anterior synechiae (PAS), angle status and assessment of PI patency
 - C:D ratio assessment on every visit
 - Monitoring of visual field test (3 times/year for first 2 years and then minimum of 5 fields in 2 year)
 - OCT RNFL/GCA/ONH (annually or more frequently depending on the progression)
 - Continuation of treatment – Topical antiglaucoma drugs – step up or step down according to IOP control and progression of glaucomatous optic neuropathy

Percentage of adherence to the protocol steps analysed using the available documented data, such as percentage of gonioscopy done in initial presentation, variation in the drugs used for initial management, post initial treatment IOP reduction, number of patients needed YAG PI, number of patients needed surgical PI, the post YAG PI IOP measurement in 1 hour, post YAG PI initiation of topical steroids, number of patients eventually underwent trabeculectomy and the number of patients underwent cataract extraction. With regards to the follow-up, the percentage of patients' records with quarterly IOP documentation, fundus assessment documentation, repeated gonioscopy assessment documentation, regular visual field assessment documentation, yearly OCT Optic nerve head (ONH)/retinal nerve fibre layer (RNFL)/ganglion cell analysis (GCA) documentation were analysed. The percentage of patients who ended up treatment free, the patients who needed continuous topical antiglaucoma drugs and the number of drugs needed for IOP control is analysed as well.

Results

The clinical records of 101 patients with the diagnosis of acute angle closure were analysed. Out of which 56 patients (55%) presented with acute angle closure attack. 19 Primary angle closure patients, 71 Primary angle closure glaucoma patients, 7 secondary angle closure glaucoma patients, 4 primary angle closure suspects.

There were 66 women (65%) and 35 men (35%). Age distribution as follows, 3 patients less than 40 years old, 13 patients between 40-49 years old, 36 patients between 50-59 years old, 34 patients between 60-69 years old, 15 patients more than 70 years old. 49 patients (48%) were affected in both eyes. 30 patients' (30%) affected eye was Right and 22 patients' (22%) affected eye was Left side.

Table 2. Patients' details

Number of patients	101
Sex	Female - 66 Male - 35
Affected eye	Right - 30 Left - 22 Both - 49
Mean presenting IOP	33.6mmHg (10-76mmHg)
Positive family history of glaucoma	22 patients (21%)

Common presenting complains in an acute angle closure episode noted were eye pain - 45% of patients, reduced vision - 36% of patients, redness - 19% of patients.

Presenting visual acuity in affected eye 6/60 or worse in 34% of patients. 17% presented with IOP less than 21 mmHg, 52% with the IOP between 21-39 mmHg, 25% with the IOP between 40-59 mmHg, 6% with IOP more than 59 mmHg.

Gonioscopy assessment was performed on presentation in 92% of patients. Not done or not documented in 8% of patients. AS OCT documented in 4 patients. On presentation fundus assessment showed 36% with C: D less than 0.6, 51% with C: D more than 0.6 including 11% with total cupping. 12% of patients showed a poor view of fundus and 1% of pale disc.

Initial management assessment as follows: oral Diamox used in 50 patients accompanied with oral KCl in 40 patients. IV Mannitol used in 30 patients, topical steroids started in 18 patients at the initial stage. In 94 patients topical antiglaucoma treatment initiated. topical pilocarpine used in 2 patients. Both Topical antiglaucoma treatment and oral Diamox needed in 49 patients. Topical antiglaucoma drugs used without the need of oral Diamox in 45 patients. Peripheral iridotomy done in 3 patients in the initial stage itself. Oral analgesics and antiemetic usage documented in 10 patients.

Considering post initial treatment IOP control, in 64% of patients IOP brought down to less than 21 mmHg and in 36% IOP remained more than 20 mmHg.

YAG peripheral iridotomy done after admission in 78 patients (77%). 7 patients were noted to be having PI already. In patients with newly done PI, the timing of PI either the same day as diagnosis or on admission to ward without a delay noted in 56 patients (72%). 22 patients (28%) had their PI done with delay on consecutive visits. In the patients who had their YAG PI, repeated PI needed in 8 patients. Surgical PI done in 5 patients. In 77 patients (91%) YAG PI done in both eyes and in 8 patients (9%) only single eye is done. Post YAG PI initiation of topical steroid in the particular eye noted in all the patients. Post YAG PI one hour IOP measurement not documented in any patients. Considering post YAG PI IOP control, 70% of patients had their IOP below 21 mmHg in their next IOP documented.

In view of patients eventually needed trabeculectomy, 21 patients (24%) had undergone trabeculectomy. 16 patients in one eye and 7 patients in both eyes. 1 patient

is awaiting trabeculectomy. Follow up IOP readings were well maintained in all patients. 54 patients had undergone cataract extraction with 17 patients awaiting surgery and 3 patients not willing for cataract extraction. Clear lens extraction is not documented in any of the patients.

In follow up care, 12 patients were lost to follow up. Quarterly IOP monitoring documented in all the patients. In 58 patients (65%) cup to disc ratio documented 3 monthly and in 31 patients (35%) cup to disc ratio documented 6 monthly. Repeated gonioscopy performed or documented in 64 patients. Documentation seen 2 times in 20 patients, 3 times in 16 patients, 4 times in 22 patients and more than 4 times in 6 patients. Regular visual field assessments done in 89 patients. Documented yearly OCT ONH/RNFL/GCA noted in 53 patients (60%).

83% of patients needed continuous treatment with topical antiglaucoma drugs until the last follow up and 5% is treatment free. Analysis of the patients on topical antiglaucoma drugs showed 2% of them used single drug, 32% of them used 2 types of drugs simultaneously, 61% of them were on 3 types of drugs, 5% of them on 4 drugs.

Follow up visual acuity showed 6/60 or worse on single eye on 23 patients, 6/60 or worse on both eye in 9 patients. 68% of patients showed 6/24 or better visual acuity. Significant progression in glaucomatous optic neuropathy was seen in 22 patients (22%). No progression seen in 78% of patients.

Discussion

Several studies show the prevalence of POAG is more than PACG. But a population-based, cross-sectional study to determine the prevalence and determinants of angle closure in the Kandy District, Sri Lanka showed the overall prevalence of angle closure was 4.7%¹² and a cross-sectional, population-based ophthalmic survey in the Kandy District, Sri Lanka showed the prevalence of POAG in the population aged ≥40 years in central Sri Lanka was 2.3%¹³.

PACG causes a higher rate of severe visual loss than does POAG. This indicates that prompt and timely intervention is necessary for a favourable visual outcome in angle closure attacks and angle closure glaucoma.

Management of angle closure glaucoma has considerable variation with details of drug choices and interventions between eye units. Our unit follows a treatment protocol based on clinical guidelines – The

Management of Angle Closure Glaucoma – The Royal College of Ophthalmologists – 2020 and Guideline for Management of Glaucoma – College of Ophthalmologists of Sri Lanka.

The diagnosis of angle closure and the staging of the disease is made based on history, slit lamp examination, IOP measurement, angle assessment with gonioscopy followed by fundal assessment. In some cases AS-OCT is needed. Regrettably in this study as the data collected from clinic notes, analysis done may be unreliable because of variability in interpretation of angle status, ambiguous recording and missing data.

For the treatment, intravenous mannitol is our osmotic diuretic of choice. Osmotic diuretics were effective in lowering IOP in cases with very high IOP. All osmotic diuretics must be administered with care as they can cause serious complications, especially in patients with cardiovascular and renal disease. Any adverse effects for the osmotic diuretics were not documented in our patients' records that considered in the study. Acetazolamide is effective in lowering IOP and opening the anterior chamber angle in cases of angle closures¹⁴. Beta blocker is used as an additive to acetazolamide in lowering IOP. Other topical antiglaucoma drugs also used according to the need of the patients.

The ZAP Study showed that laser peripheral iridotomy (LPI) achieved a 50% reduction in the 6-year risk of PAC progression in PACS¹⁵. More recently, the Singapore Asymptomatic Narrow Angles Laser Iridotomy Study (ANA-LIS) further confirmed the above findings in patients of Singaporean hospitals¹⁶. Within the 5-year follow-up for the ANA-LIS study, LPI was associated significantly with a 45% reduced risk of PAC progression in patients with PACS. The event rates for IOP elevation and AAC were extremely low. In our unit we practice laser peripheral iridotomy (YAG PI) to be done early as possible when visibility is achieved and preferably in both eyes.

This audit demonstrates that our treatment protocol provided a comprehensive and explicit guidance on the treatment of angle closure patients. This resulted in rapid IOP control following presentation and eventual favourable outcome in most cases. Our protocol was adhered and followed up in most cases. So that 78% of our patients showed no progression of glaucomatous optic neuropathy. Positive findings found in this audit with regards to following the established protocol were, in 92.1% patients diagnostic gonioscopy was performed, IOP measurement and fundus assessment documented in all the patients, in 71.8% YAG peripheral iridotomy done without delay

with very low failure rates, topical steroid always started following peripheral iridotomy, on follow up IOP monitoring, C:D ratio monitoring and Visual Field assessment done adequately in almost all followed up patients. Repeated gonioscopy done in 63.3%. Efficient and rapid IOP control is noted with initial treatment following presentation and eventual favourable outcome in most cases. 78% showed no progression of glaucomatous optic neuropathy. 68.3% having 6/24 or better vision. So the currently used management guideline to be followed continuously in future. Things needed to be considered are some patients (17 patients) with no glaucomatous optic neuropathy with well controlled IOP are being continued on topical anti glaucoma medications. Some of these patients have been started on a trial period without treatment for monitoring of IOP control. Post YAG PI IOP measurement in 1 hour need to be implemented. In documentation, a format need to be implemented to maintain uniformity of documentation with the frequently changing trainees and it will be helpful in assessing the data from clinical records in future.

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