

Original Research Article

Chronic angle closure glaucoma: presentation and outcomes at a tertiary eye hospital of Saudi Arabia

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Received: 24 November 2018

Accepted: 30 November 2018

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ABSTRACT

Background: Detection and management of chronic angle closure glaucoma (CACG) differ from primary open angle glaucoma (POAG). For general ophthalmologists in institutions with limited resources, timely detection and standard management of primary angle closure glaucoma (PACG) remains challenging.

Methods: A retrospective chart review was performed of patients with CACG who presented to an eye unit in a hospital in central Saudi Arabia. Data were analyzed over a 5-year period regarding presentation, determinants and management outcomes of clinically diagnosed CACG cases.

Results: The study sample was comprised of 102 eyes of 53 CACG patients. Bilateral disease at presentation was diagnosed in 92.4% patients. Nearly half of these patients were hypertensive, and more than one-fourth had diabetes or ocular comorbidities. Eighty eyes (78.4%) had a history of ocular surgery. A closed anterior chamber angle was detected in all eyes. The mean intraocular pressure (IOP) was 18.1 ± 6.0 mmHg, with or without medications. IOP greater than 22 mmHg was detected in 26 (25.5%) eyes. The median cup-to-disk (CD) ratio was 0.6 [interquartile range (IQR), 0.4; 0.7]. Laser peripheral iridotomy (PI) was performed in 61 eyes, trabeculectomy in 7 eyes, cataract extraction in 1 eye and combinations glaucoma surgeries in 7 eyes. Ninety-eight eyes had best-corrected visual acuity $\geq 20/200$. The number of glaucoma medications declined significantly following surgery ($\chi^2=32$, $P<0.001$).

Conclusions: Laser PI was the main management modality for CACG in the study area. Goal of preventing blindness in eyes with CACG seems to be achieved.

Keywords: Chronic angle closure glaucoma, Glaucoma, Glaucoma surgery, Laser iridotomy, Vision impairment

INTRODUCTION

The global prevalence of glaucoma in the population aged 40 years or older is 3.5%.¹ Angle closure glaucoma (ACG) painless disease with vision defects that occur in late stage disease. ACG comprised 25% of all glaucoma. ACG can be acute, subacute and chronic. Shorter axial length, shallow anterior chamber depth, lens anatomy is some of the known risk factors for CACG.² The International Society for Geographic and Epidemiological ophthalmology (ISGEO) classified the angle closure diseases (PACD) into three grades. CACG is PACD III and in is characterized by peripheral

synechia, raised IOP, closed angle and glaucomatous optic nerve head changes.³

To halt the progression of CACG, early detection and timely intervention is recommended. Surgical management of CACG includes argon laser peripheral iridoplasty, goniosynechialysis, filtration surgeries and drainage implant and cyclodestruction.²⁻⁵

The selection of the procedure depends on the severity of ocular damage, IOP, surgeon preference and the available resources. Medical treatment to reduce IOP is used as an adjuvant to surgery or to reduce the effects of failed

surgeries. In CACG, latanoprost is superior to timolol for reducing IOP.⁶

CACG comprised 21.3% of total glaucoma cases presenting at an eye hospital in Al Ahsa province in Saudi Arabia.⁷ Another study in central Saudi Arabia reported CACG comprised nearly half of the glaucoma cases.⁸ Laser and topical glaucoma medications managed these cases. Literature on CACG evaluating East Asian and Indian populations indicates a high risk of visual disabilities due to this disease. Information on CACG in an Arab population is limited.

Authors present the demographics, ocular status at presentation and intervention outcomes for cases of CACG managed at a university hospital in Saudi Arabia.

METHODS

This retrospective review of health records was approved by the Research and Ethical committee of the hospital. Data anonymity was maintained to ensure patient confidentiality throughout the study. Patients were diagnosed with PACD III or CACG if they had elevated IOP, optic nerve head (ONH) changes suggestive of glaucoma, visual fields matching the ONH changes and narrow/closed angles on gonioscopy.

Patients with CACG presenting to the hospital between 2010 to 2015 were included in this retrospective chart review. Data were collected on patient demographics including, age, gender and location (province) of residence in Saudi Arabia. Systemic comorbidities were based on a physician's diagnosis and included hypertension, diabetes, coronary artery disease, asthma and high cholesterol. Ocular comorbidities in addition to the CACG were also noted. Data were collected on current glaucoma medications, past ocular surgeries and the number of surgeries. The distance best corrected visual acuity (BCVA) was measured using a Snellen projection ETDRS chart held at 3 meters distance from the patient. BCVA was further graded to determine visual disability as follows: if BCVA was 20/20 to 20/60, it was classified as 'functional normal vision'; BCVA between <20/60 to 20/200 was classified as moderate visual impairment (MVI); BCVA less than 20/200 was classified as severe visual impairment (SVI).⁹

The IOP at presentation was measured with applanation tonometry mounted on the slit lamp biomicroscope (Topcon, USA). The anterior segment was evaluated using a slit lamp. The anterior chamber angle was assessed using a 4-mirror Goniolens (Sussmann and Posner). The angle was classified using a modified Scheie angle grading system.¹⁰ The ONH was evaluated using +90 D Volk lens and slit lamp biomicroscope. The stereoscopic colored fundus photographs were obtained using a digital camera (Topcon, USA). Image J software was used to measure the cup-to-disc ratio vertically and horizontally.¹¹

If glaucoma surgery was performed at our hospital, the details were documented. Data were collected on the number of postoperative medications needed to control elevated IOP.

Statistical analysis

Data were collected on a pretested data collection form. Then the information was transferred to a Statistical Package for Social Studies (SPSS 25) (IBM Corp., Armonk, NY, USA) spreadsheet. The qualitative variables are reported as frequencies and percentage proportions. The distribution of quantitative variables was first evaluated. If these variables were normally distributed, the mean and standard deviation are reported. If distribution was not normal, the median and inter quartile range (IQR) are reported. To compare the number of glaucoma medications before and after surgery, the chi square test was performed with the degree of freedom and two sided P values. Open epi software was used for this calculation.¹² A P value less than 0.05 was considered statistically significant.

RESULTS

The study sample was comprised of 102 eyes of 53 patients with CACG. The mean patient age was 58.6 ± 12.5 years. There were 30 (56.6%) males and 49 (92.5%) patients with bilateral CACG. Forty five (84.9%) patients resided in the central province and the rest were from the Northern Province of Saudi Arabia. Hypertension (23; 43.3%), and diabetes (15; 28.3%) were the main systemic comorbidities. Other ocular comorbidities were reported in 13 patients. As many as 80 (78.4%) eyes had undergone ocular surgery before the patient presented to our hospital. Sixty (75%) of these eyes had undergone at least one surgical procedure.

Table 1: Vision impairment grades at presentation in eyes with chronic angle closure glaucoma (CACG).

Best corrected Visual acuity (BCVA)	Number	Percentage
20/20 to 20/60	42	41.2
<20/60 to 20/200	51	50.0
<20/200 to 20/400	3	2.9
<20/400	6	5.8

The IOP at presentation was available for 100 eyes and the mean value was 18.1 ± 6.0 mmHg. With/without medication, the IOP was more than 22 mmHg in 26 of 102 eyes (25.5%). The median CD ratio was 0.6 (IQR 0.4; 0.7). Among 26 eyes that had high IOP at presentation even with medication, 25 had bilateral CACG, 13 (50%) had undergone laser peripheral iridotomy (PI), 11 (42.3%) were treated with glaucoma medications and one eye underwent cataract surgery and one eye underwent trabeculectomy.

BCVA at presentation is presented in Table 1. Nine eyes had SVI.

The surgical interventions performed at our hospital included laser PI (61 eyes), trabeculectomy (7 eyes), cataract extraction (1 eyes) and combination glaucoma surgeries (7 eyes).

At last follow up, 17 eyes had cataract, one eye was pseudophakic (operated after glaucoma surgery). All eyes had IOP less than 22mmHg. The number of glaucoma medications used by patients with CACG before and after surgery at our institution is compared in Table 2. There was a significant decline in the number of glaucoma medications following surgical intervention at our institution for managing CACG.

Table 2: Number of glaucoma medication used by chronic angle closure glaucoma patients before and after surgery.

No. of glaucoma medications	Before surgery		After surgery		Validation
	No.	%	No.	%	
None	24	23.5	57	55.9	$\chi^2 = 32$ DF = 4 P < 0.001
1	23	22.5	25	24.5	
2	25	24.5	14	13.7	
3	28	27.5	6	5.9	
4 and more	2	2.0	0	0.0	

DISCUSSION

In this series of CACG diagnosed and managed at a tertiary eye hospital in central Saudi Arabia, the bilateral nature of the condition was once again confirmed. More than three-fourths of CACG cases had a history of surgery, suggesting an adequate reach of the ophthalmic services to CACG patients. However, the need for medication and high IOP in such large numbers of operated cases is concerning.

Laser iridotomy was the main mode of management these patients and resulted in adequate IOP control and reduction of medication after intervention. BCVA was preserved in a large number of CACG cases managed at our institution. Cataract extraction/lens removal is used for treating CACG internationally but seems to be less common in the study area.

Nearly half of CACG patients were aged 60 and older in present study. Old age is a known risk factor for CACG.¹³ Increasing size of lens and reduction of anterior chamber volume by age are the reasons for age to influence CACG.¹⁴ Female gender is a known risk factor for CACG.^{2,15} In contrast the male: female ratio of CACG patients was similar in our study. Size of the anterior chamber between genders in an Arab population may not be as different as a Far East Asian population.

In present study, nearly one-fourth of CACG cases and nearly half of patients had diabetes. Diabetes is a known risk factor for primary open angle glaucoma, but the association of DM to CACG could develop only in advanced diabetic retinopathy or neovascular glaucoma.^{16,17} High rate of diabetes in Saudi Arabia could have resulted in such coincidental high rates of DM in CACG cases.¹⁸

The rate of hypertension among CACG cases in our study was 43%. Hypertension among adults in this region of Saudi Arabia was 32.6%.¹⁹ In contrast, an American reported that 65% of glaucoma patients had hypertension.²⁰ Authors are at a loss to explain the lower rate of hypertension noted in our study.

Standard management for CACG as recommended by the American Academy of Ophthalmology is used in the study area.²¹ This was evident in the high rate of laser PIs in our study. Laser PI is probably useful in the early stages of PACG, but once extensive synechial angle closure and glaucomatous optic neuropathy have developed it is less likely to be effective in lowering IOP.²² Le et al, reported a lack of conclusive evidence of the role of PI in slowing the progression of visual field defects in PACG.²³

Iris pigments also result in suboptimal outcomes after laser iridotomy for PACG. Hence, de Silva et al, recommended a two-stage application of argon and YAG laser iridotomy in Asian and African PACG patients.²⁴ A study of a Middle-Eastern population noted more than 50% of the normal adult population had dark brown irides.²⁵ The proportion of iris colours is unknown in the Saudi population. Therefore, authors recommend further research on role of laser PI in an Arab population to address damage to posterior segment due to PACG.

Lens removal is a recommended surgical procedure for managing CACG.⁴ In present study, only one patient underwent cataract surgery for CACG. The option of medical therapy for glaucoma could explain the low rate of cataract surgery in CACG cases in the current study. At last follow a few eyes developed cataract. Laser PI is known to accelerate cataract progression in CACG cases.²⁶ Thus in select cases, cataract surgery is recommended for long term reduction of IOP in CACG.²⁷

Although the preference of glaucoma surgeons is surgic management of CACG cases, glaucoma medication before and after surgeries is needed. In our study only one-fourth of the patients were not using glaucoma medications at presentation.

Postoperatively, these eyes had a significant reduction in IOP and a significant reduction in medications. Authors did not study which glaucoma medications was more effective in obtaining qualified success. A previous study has reported that latanoprost was superior to topical beta-blockers for CACG.⁶

There were some limitations to our study. The dates of last follow up were not available. Hence complications noted at last follow up could not be graded as short term and long-term complications. The number of glaucoma medications before and after surgical interventions in our hospital was available but their names were not noted. Therefore, impact of different glaucoma medications on CACG could not be evaluated.

The present study demonstrated a real-life scenario of diagnosis and management of CACG at a peripheral eye hospital with limited resources in Saudi Arabia. It reflects the need of standard operating procedures for early detection, timely management and life time monitoring of CACG cases. However available resources, visual disabilities in eyes with CACG are prevented effectively using a combination of surgical and medical treatments.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Alzuhairy SA. Chronic angle closure glaucoma: presentation and outcomes at a tertiary eye hospital of Saudi Arabia. *Int Surg J* 2019;6:73-7.