Research Article

Incidental Glaucoma in the Un-Affected Eye in Patients Presenting with Ocular Emergencies in a Tertiary Eye Care Hospital in India

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Abstract

Context: This is a retrospective analysis of all patients presenting to the emergency eye care department with either microbial keratitis or trauma and were coincidentally found to have advanced glaucoma in the same or fellow eye.

Aims: Missed diagnosis is a major cause of blindness by glaucoma globally. This study evaluates the clinical profile of incidental glaucoma in the "normal eye" of patients presenting to ocular emergencies.

Settings and design: This was a retrospective review study done in a tertiary eye care hospital in eastern India.

Methods and Material: An electronic medical records audit was done to identify patients presenting to the emergency service of a tertiary eye care hospital between June 2013 to Sept 2020 with the diagnosis of ocular trauma or infection in one eye (affected eye). Patients who were detected to have glaucoma in the same or fellow eye during routine comprehensive evaluation in the emergency clinic and were later referred to the glaucoma department of the institute were included in the study.

Results: Of 5585 patients seen in the emergency ser-

vices, 41 eyes of 41 patients (diagnosis in the affected eye being microbial keratitis in 29 patients and blunt trauma in 12 patients) were referred for glaucoma in the fellow eye. The fellow eye diagnosis in the glaucoma services included primary open angle glaucoma (n=13), pseudoexfoliative glaucoma (n=9), primary angle closure disease (n=8), glaucoma in pseudophakia (n=4), neovascular glaucoma (n=2), normotension glaucoma (n=2), disc suspect (n=2) and buphthalmos (n=1).

Conclusions: Screening for co-existing blinding diseases like glaucoma in emergency eye clinics is important. Prompt referral and care in a glaucoma clinic may prevent blindness from silent glaucoma in the "better fellow eye" in such cases.

Keywords: Emergency Eye Clinic; Screening of Glaucoma; Missing of Glaucoma

1. Introduction

Glaucoma remains the second most common cause of blindness worldwide [1, 2]. The prevalence of glaucoma worldwide is estimated to increase to 111.8 million by 2040 [3]. The visual burden of glaucoma has shown a disturbingly increasing trend in the past 25 years with unequal distribution globally—the prevalence of primary open angle glaucoma (POAG) and glaucoma overall has been highest in people with African ancestry [3]. The Asians on the other hand, have the highest prevalence of primary angle closure glaucoma (PACG) [3]. Lower socio-economic level, older age, female, and higher ambient ultraviolet radiation, are associated with a higher burden of glaucoma [4, 5]. In India, the problem of missed diagnosis and over-treatment/under-treatment add to the ever-increasing disease burden [17]. The causes

are multi-factorial like a busy clinical practice and lack of infrastructure [6]. In this study, we have presented the clinical profile of incidental glaucoma in the contralateral "normal eye" eye of patients presenting after common ocular emergencies like ocular trauma or corneal ulcer in the other eye.

2. Subjects and Methods

A retrospective medical record audit of the hospital electronic medical records (EMR) database was done to identify all patients presenting to the ocular emergencies from June 2013 to Sept 2020. This included 4010 cases of infectious keratitis and 1575 open globe injuries in one eye. The eye affected with the particular ocular emergency (keratitis or trauma) is hereby referred to as the affected eye while the contralateral unaffected eye is referred to as the fellow eye. Of these, patients who were screened and thereby referred to the glaucoma services and consequently diagnosed with glaucoma in the fellow eye were included in this study. Patients lost to follow-up before confirmation of glaucoma in the fellow eye, were excluded. The diagnosis of glaucoma was made according to standard AAO (American Academy of Ophthalmology) guidelines or primary glaucoma (primary open angle glaucoma/POAG, primary angle closure glaucoma/PACG, pseudoexfoliative glaucoma /PXG, normal-tension glaucoma/NTG, and secondary glaucoma [15].

Details retrieved from the database for these patients included demographics like age, gender, presenting eye & fellow eye diagnoses, best-corrected visual acuity (recorded in LogMAR units from ETDRS charts), glaucoma evaluation details in glaucoma services including intraocular pressure (measured by Goldman Applanation Tonometry), optic disc

cupping, gonioscopy finding (using Sussman 4-mirror gonioscope), Humphrey visual field (HVF) analysis (using standard SITA strategy and 24-2/10-2 programs), treatment initiated, and need for medications/ glaucoma filtering surgery in the fellow eye. The vision was labeled as "poor" if the logMAR acuity was worse than 1.3 i.e. worse than counting fingers at 3 meters, which correlates to not being able to perform a visual field test. Eyes with a clinical cup-disc ratio>0.8, focal rim loss, and/or nerve fiber layer defects with or without corresponding visual field defects, were labeled as those with advanced glaucoma [13]. Visual field defects were classified based on Anderson criteria [16].

2.1 Statistics methods

Analysis was done using SPSS version 22 with statistical significance defined as p<0.05. Statistical tests used were chi-square test and the T test. Determinants for delayed referral to glaucoma care were analyzed using multiple regression with various clinical variables (like IOP, CDR, gonioscopy, diagnosis in the fellow eye, age, sex, disease in the affected eye) as independent variables.

3. Results

We included 41 patients fulfilling all inclusion criteria (M:F=37:4). There were 29 patients with microbial keratitis and 12 patients with ocular trauma in the affected eye. The clinical profile of the affected eye is detailed in Table 1. The details of the fellow eyes are described in Table 2. The glaucoma diagnosis in the fellow eyes included primary glaucoma, in n=21 eyes (51.3%) which comprised the major forms of diagnosis. Of 41 eyes referred to the glaucoma services, 27 eyes (65%) had a clinical cup-disc ratio>0.8, suggesting advanced glaucoma at presentation. The BCVA in the fellow eye was worse than 3/60 in 10 eyes. Visual fields could be performed only for 16 eyes. HVF data were absent in 25 eyes owing to poor vision precluding investigations in 10 eyes and 15 patients being lost to follow up from the glaucoma clinic.

The median duration of referral to the glaucoma services was 22.5 days (range=1 day to 1 year) here). There was no significant difference in the clinical parameters (IOP, disc cup-disc ratio, or gonioscopy findings) of patients who were referred on the same day or >7 days. The sole determinant of delay in referral was the time taken to stabilize the presenting eye emergency. All eyes received standard glaucoma care including medications, laser, and surgery when indicated, Table 3. Twenty-nine eyes required anti-glaucoma medication (AGM) treatment for IOP control out of which 21 eyes required ≥2 medications. Of 41 eyes, 4 eyes required YAG LPI (laser peripheral iridotomy), while 5 eyes required combined cataract and glaucoma surgery. None of these eyes had a loss of vision at the final follow-up, despite 65% having advanced glaucoma at presentation.

	Microbial keratitis **N=31**	**Blunt trauma** **N=10**
Clinical associations	Perforated ulcer (n=4) Endophthalmitis (n=3) History of trauma with vegetative matter (n=9)	
Age	Mean age=68.2 years; Standard Deviation= 11.6 year	
Gender	Male=37; Female=4	
BCVA at presentation in affected eye	Up to LogMAR acuity of 1 (n=6) LogMAR acuity 1 to 1.3 (n=1) Worse than LogMAR acuity of 1.3 (n=24)	
Mean lag time for referral of fellow eye to glaucoma clinic	Same day (n=21) Within up to 1 week (n=7) Within up to 1 month (n=6) More than a month (n=7)	

Abbreviations: BCVA (best-corrected visual acuity)

Table 1: Details of Affected Eyes.

Fellow Eye characteristics	**Variables (n)**
Final Diagnosis made in the glaucoma clinic	**Primary Glaucoma** (n=21) POAG (n=13) PAC (n=3) PACG (n=5) NTG (n=2) Disc suspect (n=2) **Secondary glaucoma** (n=16) Pseudoeexfoliative Glaucoma (n=9) Neovascular Glaucoma (n=2) Glaucoma in pseudophakia (n=4)
Distribution of IOP in mm Hg	≤20 (n=23) <20 to <40 (n=10) ≥40 (n=5) Unrecordable (n=3)
Gonioscopy findings	Open angles (n=22) Occludable/closed angles (n=8) No data available (media opacity or patient being symptomatic) (n=11)

Cup-disc ratio distribution	<0.8 (n=14)
	0.8—0.9 (n=16)
	Near total cupping/total cupping (n=8)
	No view of disc (n=3)
Depression of MD of HVF done in glaucoma clinic	<-6dB (n=2)
	≥-6dB to <-12dB (n=4)
	≥-12dB to <-20dB (n=5)
	≥-20dB (n=5)
	Absent data (n=25)
IOP values when referred on the same day	Mean=22.2
	SD=9.9
IOP values when referred later	Mean=24.4
	SD=12.7

Abbreviations: POAG (primary open angle glaucoma), PAC (primary angle closure), PACG (primary angle closure glaucoma), NTG (normotension glaucoma), IOP (intraocular pressure), MD (mean deviation)

Table 2: Details of the Fellow eyes.

Fellow Eye characteristics	Variables (n)
Number of AGMs prescribed at the last follow up	Nil (n=5)
	Up to 2 (n=27)
	More than 2 (n=9)
Surgical Treatment details	Laser YAG PI (n=4)
	Combined cataract & trabeculectomy (n=5)
	Cataract surgery alone (n=2)
	Evisceration (n=1)
	No surgery is needed (n=29)

Abbreviations: AGM (Anti-glaucoma medication), YAG PI (Yittrium Aluminium Garnet Peripheral Iridotomy)

Table 3: Treatment of the Fellow Eyes.

4. Discussion

Being largely asymptomatic, glaucoma is often missed in routine clinics [6, 8]. This may be an important reason why glaucoma is the leading cause of preventable blindness globally. It is disappointing that a vast majority of persons with glaucoma in India are undiagnosed [6]. The Chennai Glaucoma Study reported that 50-90% of the glaucoma cases from both urban & rural India are undiagnosed, with a vast majority of them being diagnosed at advanced stages [7]. Lack of awareness in the general population is the main cause of late presentation as well as a higher risk

of blindness from the disease [8]. Awareness is estimated to range from 0.32% among the rural population in Southern India [9], 8.3% in the rural population in northern India [10] to 13.5% in the urban population in Southern India [11]. To compound this problem, the component of a missed diagnosis cannot be ignored. It is estimated to be as high as more than 90% in communities from developing countries, with the more worrisome fact that more than 50% of those undiagnosed had an eye examination in the recent past [12]. The possible causes of missed diagnoses in developing countries could be over-reliance on IOP alone as defining criteria, lack of a comprehensive evaluation, detailed biomicroscopic dilated fundus evaluation and inadequate training across eye care professionals [13].

This study highlights that emergency services could be another important area for a missed diagnosis or delayed diagnosis of glaucoma. The Asia Pacific Glaucoma Society (APGS) guidelines recommend opportunistic glaucoma screening, which entails glaucoma screening for every patient attending an eye clinic [14]. There is sufficient evidence-based literature available on different types and protocols for the management of emergency eye diseases [18-23]. But the prevalence of a co-existing unrelated serious blinding disease in the fellow eye (like glaucoma) in such situations, has not been explored. The present study illustrates that there may be a significant number of hidden glaucoma cases in the fellow eye, which may go undetected, despite tertiary level eye care services, owing to emergency eye care imparted to the affected eye. The authors think it is important to improvise the emergency care guidelines in tertiary care eye hospitals. This will help provide a new gateway for opportunistic glaucoma (or comprehensive) screening

of the fellow eye for blinding diseases. This assumes even more importance in emergency services in the event of seriously blinding conditions like microbial keratitis or trauma, where the visual prognosis of the affected eye is usually guarded [24, 25] despite the best possible care.

In the present study, among the fellow eyes which were diagnosed to have glaucoma, more than 50% had open angles or normal IOP, with primary glaucoma being the major form of diagnosis. The time to refer was extremely variable. The fact of 23 of 41 eyes had an IOP <20mm Hg at presentation, may have caused the delay in referrals to the glaucoma services or were overlooked as normal at presentation to the emergency at the first visit. Twenty-two of 41 eyes (53.7%) of these eyes had open angles on gonioscopy which may also have been overlooked as normal while those that presented with occludable angles (n=8) were missed in place of the treatment of the affected eye in the emergency clinic. Drawbacks of the present study include the retrospective design of the study and loss to follow up of 15 patients from the glaucoma clinic— owing to the disease complication of the affected eye. We also did not present the clinical outcome of the patients with glaucoma since that was beyond the objectives of this study.

5. Conclusion

Performing a comprehensive eye examination in the fellow eye of all patients presenting in the emergency eye clinic, is very important to avoid missing blinding diseases. This may go a long way to help preserve useful vision in the fellow eye for such patients with serious emergencies in one eye with a consequent poor visual prognosis.

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