ORIGINAL RESEARCH

Age-related macular degeneration in Hong Kong Chinese — angiographic features and outcomes

Patrick K. W. Wu, FRCS, Raymond C. W. Fu, FRCS, Clement W. N. Chan, FRCS, FHKAM(Ophth)
Department of Ophthalmology, Tung Wah Eastern Hospital, Hong Kong, China.

Correspondence and reprint requests:
Patrick K. W. Wu, Department of Ophthalmology, Tung Wah Eastern Hospital, 19 Eastern Hospital Road, Hong Kong, China.

Abstract

Aim: To study the clinical presentation, angiographic features, treatment modalities and visual outcomes of patients with wet type age-related macular degeneration presenting to a tertiary eye center in Hong Kong.
Materials and methods: Retrospective review of case records of all patients with fundus fluorescein angiography done over a 2-year period at Tung Wah Eastern Hospital.
Results: In total, 57 patients were included. The mean age was 71.2 years. The male to female ratio was approximately 7:3. Less than one-third of patients presented with an acute drop in vision or metamorphopsia. The visual acuity of the presenting eye was 4/60 or worse in 54.4% of patients. The visual acuity of the fellow eye was relatively good in most cases. 84.2% of patients had features of age-related macular degeneration affecting both eyes at presentation. Treatable choroidal neovascular membranes were detected in five patients (8.8%). Laser treatment resulted in stable or improved vision for four of the five patients. 56.2% of the non-treated group and 21.1% of fellow eyes had progressive deterioration of vision.
Conclusion: Age-related macular degeneration is a potentially treatable disease. Enhanced publicity of the importance of early detection might be helpful in preventing blindness in the elderly population.

Key words: *Age-related macular degeneration, Choroidal neovascularization, Fundus fluorescein angiography, Indocyanine green angiography*

Introduction

Age-related macular degeneration (AMD) is one of the most common blinding conditions in the Western world.[1-4] AMD is also commonly seen in the Hong Kong Chinese population. The clinical presentation, angiographic features, treatment modalities, complications, and visual outcomes of patients with AMD presenting to a tertiary eye center in Hong Kong were reviewed. The aim was to compare these parameters in a Hong Kong Chinese population with those of the Western world. The prognosis of these patients were studied with a view to helping the prevention of blindness secondary to this disease.

Materials and methods

This was a retrospective study. The case records of all patients with AMD diagnosed by fundus fluorescein angiography (FFA) performed at Tung Wah Eastern Hospital Eye Centre between January 1997 and December 1998 were studied. The patients mainly consisted of those presenting with features of the 'wet' type disease, with suspicion of choroidal neovascularization (CNV). Patients with the typical 'dry' type of AMD are usually not treatable. FFAs were not performed for these patients and thus they were not included in this study. Indocyanine green angiography (ICG) was performed for selected patients with occult CNV, as this was not routinely performed in our department in the early part of the study period.

The clinical presentations, fundal appearances, FFA, and ICG features of the patients were recorded. The treatment given and visual outcomes were also noted. This information was analyzed and is presented here.

Results

In total, 64 patients with AMD were identified. Seven were lost to follow up or had non-retrievable records and were excluded. Therefore, 57 patients were included in the study. Forty (70.2%) were men and 17 (29.8%) were women (**Figure 1**). The average age at presentation was 71.2 years (range, 54-89years). The males had an average age of 71.3 years (range, 58-89 years) and the females had an average age of 71.0 years (range, 54-89 years). At presentation, the disease mainly affected the left eye for 27 patients (47.4%), and the right eye for 30 patients (52.6%; **Figure 2**).

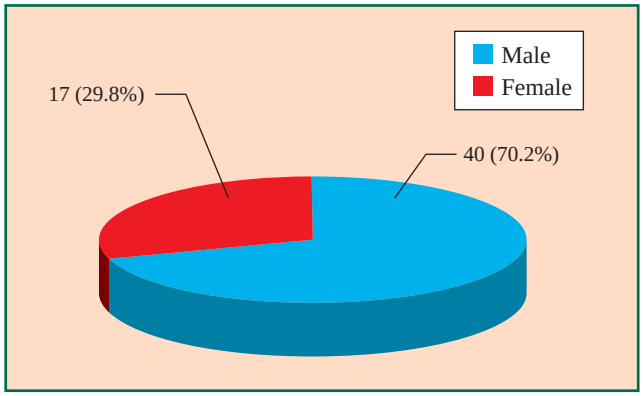


Figure 1. Sex distribution of patients (n = 57).

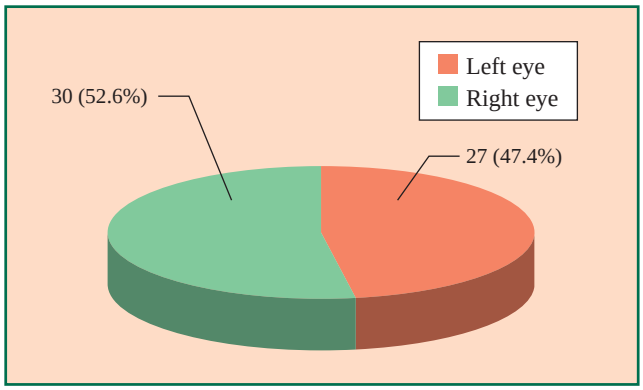
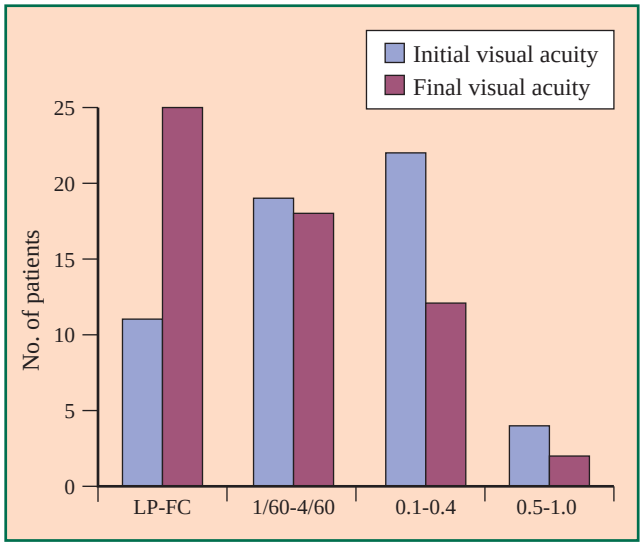


Figure 2. Laterality of the presenting eye (n = 57).



Abbreviations: LP = light perception; FC = finger count.

Figure 3. Initial and final visual acuity of the presenting eye.

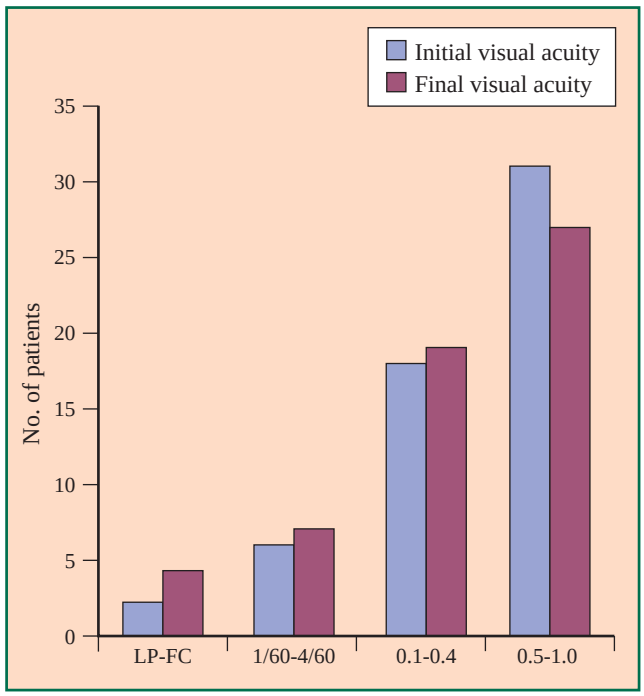
The initial visual acuity of the affected eye at presentation ranged from light perception (LP) only to 0.8, the majority of which had moderate to severe loss of vision (**Figure 3**). The visual acuities of the fellow eyes at presentation were relatively good or manageable for most patients (**Figure 4**).

Concerning the mode of presentation, 11 patients (19.3%) required medical attention because of an acute drop in vision (less than 1 month duration), 7 (12.3%) presented because of metamorphopsia, 2 (3.5%) had floaters in the affected eye, and 32 (56.1%) complained of chronic blurring of the vision in the affected eye. The remainder (5 patients, 8.8%) were diagnosed incidentally to other eye discomfort (**Figure 5**).

At presentation, all affected eyes had signs of the wet type AMD, with or without additional features of dry type. The fellow eye also had features of wet or dry type disease for the majority of patients (84.2%; **Table 1**).

Abnormalities detected in the fluorescein angiograms included window defects, blockage of fluorescein, drusens, and classic or occult CNV (**Table 2**). ICG angiography was performed for 14 patients with occult CNV. The features revealed included hot spots in six, hot plaques in one, and polypoidal vasculopathy in two. Other features included pigment epithelial detachment (PED) or hypofluorescein from scars (**Table 3**).

Where CNV was identified, patients were counseled regarding laser treatment based on results of the Macula



Abbreviations: LP = light perception; FC = finger count.

Figure 4. Initial and final visual acuity of the fellow eye.

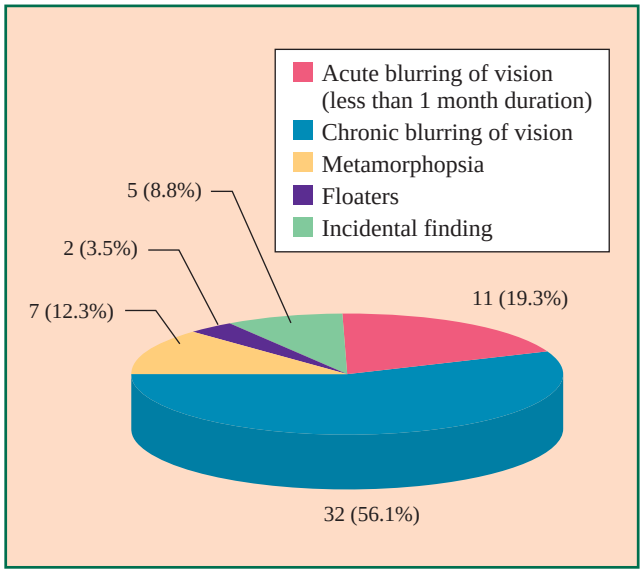


Figure 5. Reason for presentation (n = 57).

Photocoagulation Study.[5,6] Five patients (five eyes) received laser photocoagulation of the lesion, two of which were guided by ICG. All were extrafoveal membranes with sizes varying from 1/2 to 2 disc diameters. Pretreatment visual acuity varied from 1/60 to 0.6. Argon laser was used for three patients and diode laser for two patients. Their post-treatment visual acuity ranged from 1/60 to 0.8. No patients experienced complications of laser treatment. Four patients had successful ablation of the CNV resulting in resolution of the exudates or subretinal fluid. One patient had residual CNV post-laser treatment, which was subfoveal in location and no further laser treatment was attempted after discussion with the patient (**Table 4**).

The patients' eyes were monitored and visual acuity changes noted at follow-up. The duration of follow-ups ranged from 5 to 26 months (mean, 11.3 months). During this period, none of the patients in the laser group had recurrence of the choroidal neovascularization. Their visual acuities were stable. In the non-laser group, only one patient (1.9%) had spontaneous improvement of the fundal condition (spontaneous resolution of PED). The fundal conditions of 19 patients (36.5%) were stable, while the majority (32 patients, 61.5%) suffered a progressive course of the disease with drop in vision. When the conditions of the fellow eyes were studied, it was found that the fundal conditions were stable for 45 patients (78.9%) while the other 12 patients (21.1%) suffered a progressive downhill course during the follow-up period (**Table 5**). The initial and final visual acuities of the presenting and fellow eyes are shown in **Figures 6 and 7**, respectively.

Table 1. The fundal findings at presentation* (n = 57)

		Presenting eye	Fellow eye
	NAD	0	9
Dry type features	Posterior pole drusens	17	24
	RPE pigmentation	1	1
	RPE atrophy	5	10
Wet type features	Hard exudates	22	4
	SRF (dd)	10 (1/2 - 5)	2 (2-3)
	Subretinal hemorrhage (dd)	17 (1/4 - 3)	1 (1/4)
	Vitreous hemorrhage	3	0
	PED (dd)	12 (1/2 - 3)	1 (1)
	Disciform scar	17	6

* There may be multiple features in one eye.
Abbreviations: NAD = nothing abnormal detected; RPE = retinal pigment epithelium; SRF= subretinal fluid; dd = area in disc diameter; PED = pigment epithelial detachment.

Table 2. Fundus fluorescent angiography findings of the presenting eyes (n = 57)

Classical CNV	Extrafoveal* (dd)	3 (1/2 - 2)
	Juxtafoveal (dd)	1 (1)
	Subfoveal* (dd)	6 (1/2 - 3)
Occult CNV	Fibrovascular PED (dd)	4 (1 -2)
	Late leakage of undetermined origin (dd)	19 (1/3 - 4)
No CNV detected†		25

* One patient had both extrafoveal and subfoveal lesion.
† Features included window defect, blockage of fluorescein, drusens, pigment epithelial detachment, or scarring.
Abbreviations: CNV = choroidal neovascularization; dd = area in disc diameter; PED = pigment epithelial detachment.

Table 3. Indocyanine green angiography findings of the presenting eyes (n = 14)

Hot spot (location, dd)	6 (3 subfoveal, 1/4-1/2; 2 extrafoveal, 1/4-1/2; 1 juxtafoveal, 1/2)
Hot plaque (location, dd)	1 (extrafoveal, 2)
Polypoidal vasculopathy	2
Other features*	5

* Features included pigment epithelial detachment blocked by blood, hypofluorescein from scar, and absence of hot spot/plaque.
Abbreviation: dd = area in disc diameter.

Discussion

AMD is one of the major blinding conditions affecting the elderly population in the western world.[1-4] Ethnicity has long been suspected to play a role in the risk of macular degeneration as well as in the neovascular complications.[7-9] The occurrence of AMD in Chinese populations has not been as frequently reported. Pigmentation is likely to be a protective factor, with blacks having the lowest rates of AMD and Chinese having an intermediate predilection compared with Caucasians.[7,8] However, environmental factors may also be important. Sunlight exposure has been thought to be a risk factor for development of AMD.[10-12] The lower prevalence among Chinese has been attributed to their reluctance to receive excessive sun exposure.[13] Diet may also play a role in the disease.[13,14] With the westernization of life style in Hong Kong, it is expected that the importance of this disease may increase in this area during the coming decades.

Table 4. Patients treated by laser (n = 5)

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5
Neovascular lesion as shown by FFA/ICG angiography	Extrafoveal CNV membrane (2 dd)	Extrafoveal CNV membrane (1/2 dd)	Extrafoveal CNV membrane (1/2 dd)	Extrafoveal CNV membrane (1 dd)	Extrafoveal CNV membrane (1 dd) and subfoveal (3/4 dd)
Pre-laser VA	1/60	0.3	0.4	0.6	1/60
Laser type	Argon	Diode	Argon	Diode	Argon
Outcome	Exudates resolved	Exudates and SRF resolved	Exudates and SRF resolved	Exudates resolved	Residual CNV membrane (not treated because subfoveal)
Final VA	4/60	0.4	0.2	0.8	1/60

Abbreviations: FFA = fundus fluorescent angiography; ICG = indocyanine green angiography; CNV = choroidal neovascularization; dd = area in disc diameter; VA = visual acuity; SRF = subretinal fluid.

Table 5. Overall outcome of patients not receiving laser and fellow eyes of all patients

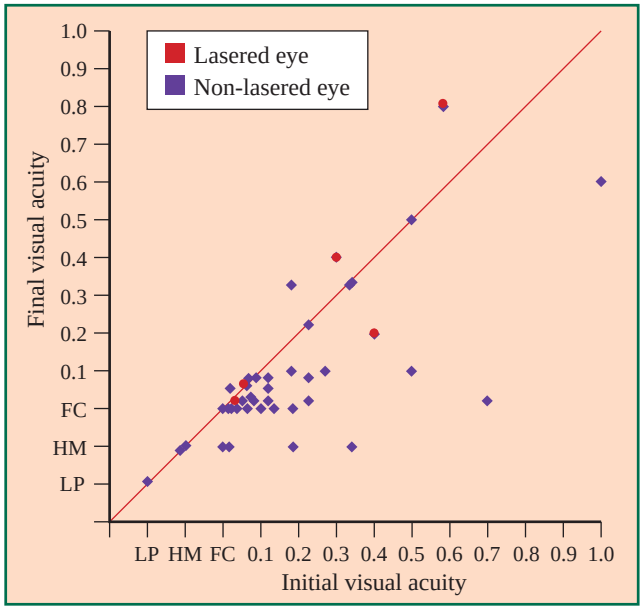
	Presenting eye (non-lasered; n = 52)	Fellow eye (n = 57)
Spontaneously resolved	1 (resolution of PED)	-
Progressive	32	12
Stable	19	45

Abbreviations: PED = pigment epithelial detachment.

AMD is a disease that mainly affects the elderly population. In western populations, the incidence of 'wet' disease is positively correlated with age.[13,15] In our patient group, the mean age was 71.21 years, which may be a reflection of the relatively older affected group. In some studies, AMD has been shown to be more preponderant in females.[8,11,16-17] However, in this study, males constituted 70.2% of patients. The left and right eyes were equally affected in this group of patients, which is compatible with reports in previous studies.[11,13]

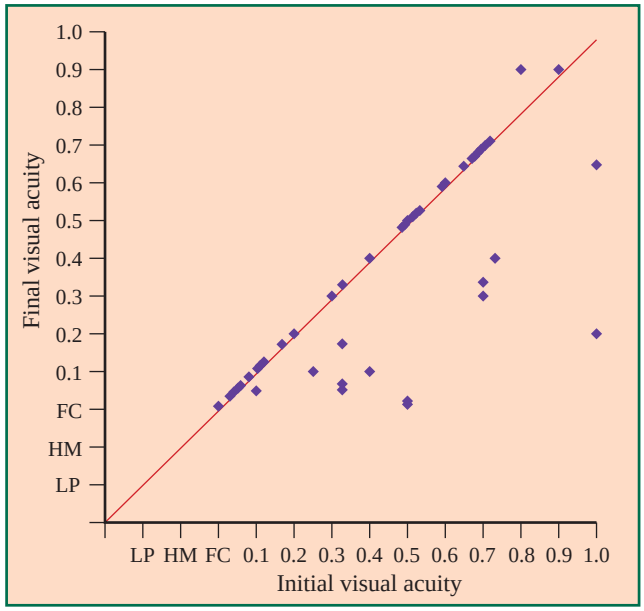
The presenting features of AMD may be different between Chinese and Caucasians. Studies by Chang[13] and Lim[18] have shown that pigment epithelial detachments (PEDs) are more common among Chinese patients with AMD. However, the presence of PEDs only constituted 21% of the presenting eyes in our group of patients; this contrasts with a frequency of as high as 46% in Lim's study.[18]

In reviewing the mode of presentation and the presenting visual acuity of the patients, it was found that the majority presented quite late, not having noticed the severity of their condition. Less than one-third of them presented because of an acute drop in vision or metamorphopsia. The majority (54.4%) presented with a visual acuity 4/60 or worse in the affected eye. Although the poor vision at presentation might be representative of the nature of the disease as being acute in onset and rapidly deteriorating,[19-20] the lateness of presentation probably reflects the fact that elderly people are not alert to changes in one of their eyes, with the fellow eye retaining moderately good or manageable vision



Abbreviations: FC = finger count; HM = hand movement; LP = light perception.

Figure 6. Scattergram showing initial and final visual acuity of the presenting eyes.



Abbreviations: FC = finger count; HM = hand movement; LP = light perception.

Figure 7. Scattergram showing initial and final visual acuity of the fellow eyes.

(86.0% of the patients had visual acuity of 0.1 or better in the fellow eye at presentation). The authors also have the impression that many elderly Chinese people consider 'blurring of vision' as part of the 'normal aging process', which may prevent them from presenting earlier.

AMD is well known to be a bilateral disease.[2,15] Similarly, in this group of patients, more than 80% had signs of wet or dry type AMD in the fellow eye at presentation.

In recent years, idiopathic polypoidal choroidal vasculopathy (IPCV) has been reported to be associated with AMD in some patients. IPCV can occur in any sex or race, although it is more commonly found in non-whites. Drusens are sometimes absent.[21] In our series, two patients with features of IPCV were identified with ICG angiography.

Laser photocoagulation of the entire area of the neovascular lesion is the only proven treatment for CNV secondary to AMD.[22] However, only well-defined lesions shown on FFA or ICG are treatable by this modality. In this group, only five patients had 'treatable' extrafoveal CNV, two of which were based on ICG findings; they subsequently received laser treatment of the lesion. Although laser treatment of subfoveal CNV has also been shown to be beneficial with respect to visual acuity, reading speed, and contrast sensitivity compared with no treatment at 24 and 36 months post-laser,[5] the risk of a significant drop in visual acuity immediately after treatment, and a very low possibility of a final vision of 20/100 or better made this treatment modality unacceptable to our patients.

CNV was shown to be associated with a high recurrence rate after treatment — up to 50% after 5 years.[6] None of our patients had recurrence of CNV after laser treatment. Our small sample size and relatively short duration of follow up may be part of the reason.

In the Macular Photocoagulation Study, 13% of patients had lesions amendable by laser treatment.[5] In this study, only five patients (8.8%) were treatable by laser, which may be related to the late presentation and diagnosis. Although the 'treatable' patients only constituted a small proportion of the whole study group, the visual outcome of the treated group was still encouraging. The majority (80%) of the treated group had their visual acuity stabilized or improved after laser treatment. In the group where improvement occurred, the improvement ranged from one to two decimal Snellen lines. This was in contrast with the non-treated group, in whom the majority (61.5%) had progressive deterioration of their vision. The fellow eye also deteriorated for 21.1% during the follow up period. This suggests that any possible modalities for halting the progression of the disease is worthwhile in reducing blindness among the elderly population.

Unavoidably, this study had its own biases and limitations. The study population was small and the follow up period was relatively short. The retrospective nature of the study and the fact that only 'wet' type AMD eyes with possible CNV were included produced a distorted picture of the disease as a whole. The interpersonal variation among different ophthalmologists within the department in selecting cases for FFA/ICG could have resulted in further biases. However, the authors believe that the patients in this study are, to some extent, representative of how AMD affects the elderly Chinese population in Hong Kong. Further investigation into the disease will rely on large-scale randomized study in the future.

Conclusion

AMD is a potentially treatable blinding disease in the elderly. Findings in this study suggest that the presentation, clinical features, and outcomes of AMD among the Hong Kong Chinese population are, to a large extent, similar to those reported in western populations. Successful treatment is only possible for a small proportion of patients who are detected early.[23] It is felt that the disease has not gained adequate awareness among the public or primary care physicians, as compared with other eye diseases such as cataract or glaucoma. Enhanced publicity of the importance of this disease might be helpful in preventing blindness among the elderly population.

References

1. *Klaver CCW, Wolfs RCW, Vingerling JR, et al. Age -specific prevalence and causes of blindness and visual impairment in an older population: the Rotterdam Study. Arch Ophthalmol 1998;116:653-658.*
2. *Ferris FL. Senile macular degeneration: review of epidemiologic features. Am J Epidemiol 1983;118:132-151.*
3. *Ferris FL, Fine SL, Hyman LG. Age-related macular degeneration and blindness due to neovascular maculopathy. Arch Ophthalmol 1984;102:1640-1642.*
4. *Leibowitz HM, Krueger DE, Maunder LR, et al. The Framingham Eye Study monograph. Surv Ophthalmol 1980: 24(Suppl):335-610.*
5. *Macular Photocoagulation Study Group: subfoveal neovascular lesions in age-related macular degeneration: guidelines for evaluation and treatment in the macular photocoagulation study. Arch Ophthalmol 1991;109: 1241-1257.*
6. *Macular Photocoagulation Study Group: argon laser photocoagulation for neovascular maculopathy. Five-year results from randomized clinical trials. Arch Ophthalmol 1991;109:1109-1114.*
7. *Pieramiei DJ, Bressler NM, Bressler SB, Schachat AP. Choroidal neovascularization in black patients. Arch Ophthalmol 1994;112:1043-1046.*
8. *Capone A, Wallace RT, Meredith TA. Symptomatic choroidal neovascularization in black patients. Arch Ophthalmol 1994;112:1091-1097.*
9. *Schachat AP, Hyman LG, Leske MC, and the Barbados Eye Study Group. Features of age-related macular degeneration in a black population. Arch Ophthalmol 1995;113:728-735.*
10. *Blumenkranz MS, Russell SR, Robey MG, et al. Risk factors in age-related maculopathy complicated by choroidal*

neovascularization. Ophthalmology 1986;96:552-558.
11. *Wu LH. Study of aging macular degeneration in China. Jpn J Ophthalmol 1987;31:349-367.*
12. *Cruikshanks KJ, Klein R, Klein BE. Sunlight and age-related macular degeneration. Arch Ophthalmol 193;111: 514-518.*
13. *Chang TS, Dawn H, Coutright P. Age-related macular degeneration in Chinese-Canadians. Can J Ophthalmol 1999;34:266-271.*
14. *Seddon JM, Umed AA, Sperduto RD, et al. Dietary carotenoids, vitamins A, C and E, and advanced age-related macular degeneration. JAMA 1994;272:1413-1420.*
15. *Vingerling JR, Dielemans I, Hofman A, et al. The prevalence of age-related maculopathy in the Rotterdam Study. Ophthalmology 1995;102:205-210.*
16. *The Framingham Study: VI. Macular degeneration. Surv Ophthalmol 1980;24:428-435.*
17. *Mitchell P, Smith W, Attebo K, Wang JJ. Prevalence of age-related maculopathy in Australia: the Blue Mountains Eye Study. Ophthalmology 1995;102:1450-1460.*
18. *Lim JI, Kwok A, Wilson DK. Symptomatic age-related macular degeneration in Asian patients. Retina 1998;18: 435-438.*
19. *Young R. Pathophysiology of age-related macular degeneration. Surv Ophthalmol 1987;31:291-306.*
20. *Hyman LG, Lilienfeld AM, Feris FL, Fine SL. Senile macular degeneration: a case control study. Am J Epidemiol 1983; 118:213-227.*
21. *Yannuzzi LA, Wong DW, Sporzolini BS, et al. Polypoidal choroidal vasculopathy and neovascularized age-related macular degeneration. Arch Ophthalmol 1999;117:1503-1510.*
22. *Shiraga F, Takasu I, Shiragami C. Treatment options in subfoveal choroidal neovascularization secondary to age-related macular degeneration. Semin Ophthalmol 1998;13: 31-39.*
23. *Fine SL. Early detection of extrafoveal neovascular membranes by daily central field evaluation. Ophthalmology 1985;92:603-609.*

HKJO Quiz

A patient with choroidal folds after trabeculectomy

Raymond C. F. Fu, FRCS, Edwin O.W. Chan FRCS, FCOphthHK
Department of Ophthalmology, Tung Wah Eastern Hospital, Hong Kong, China.

Question

A 37-year-old lady with history of chronic open angle glaucoma in both eyes had left eye trabeculectomy performed by a private ophthalmologist. She was referred to our clinic for the management of presumptive post-trabeculectomy hypotony.

Ocular examination revealed decreased visual acuity and low intraocular pressure in the left eye (**Table 1**). She also had left ptosis and supraduction defect.

Table 1. Visual acuity and intraocular pressure of the patient following trabelulectomy

	Right eye	Left eye
BCVA	6/5	2/60
IOP	22	8

Abbreviations: BCVA = best-corrected visual acuity; IOP = intraocular pressure.

Slit-lamp examination of the left eye revealed a well-formed bleb with shallow anterior chamber. The fundus is shown in **Figure 1**.

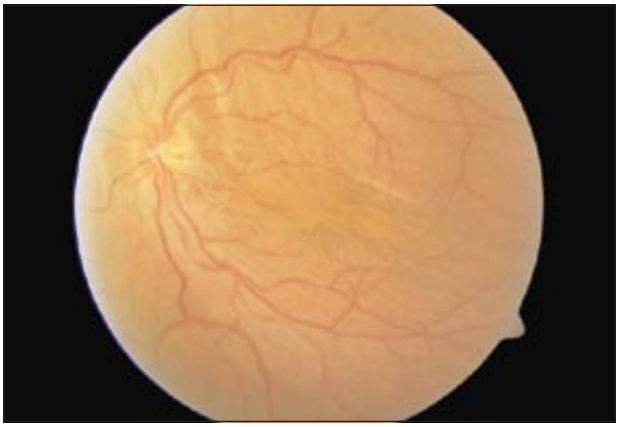


Figure 1. Fundus photo of the patient at presentation.

What is the diagnosis?

(Answer and discussion on page 47)