Comparison of progression to advanced stage between Polypoidal choroidal vasculopathy and Age-related macular degeneration in South Korea

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ABSTRACT

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Objective: To compare risk factors and progression rate to advanced stage in typical age-related macular degeneration (AMD) and polypoidal choroidal vasculopathy (PCV) in South Korea.

Design: Retrospective study, observational, consecutive case series.

Participants: 365 patients with unilateral advanced stage AMD (222 typical AMD patients and 143 PCV patients).

Methods: All patients underwent fundus photography (FP), fluorescence angiography (FA), and indocyanine green angiography (ICGA) at initial presentation. Age-Related Eye Disease Study (AREDS) score was measured at initial presentation. The rate of progression to advanced stage AMD in the fellow eye was compared between the typical AMD and PCV based on the initial AREDS score (range, 2 to 4).

Main Outcome Measures: Rate of progression to advanced stage in the fellow eye based on initial AREDS score and the correlation between the initial AREDS score and progression to advanced AMD of the fellow eye according to types of AMD.

Results: Progression to advanced AMD in fellow eye was similar between the typical AMD and PCV groups (14.0% vs. 17.0%, respectively, log rank test, z=1, p=0.528). At baseline, PCV group was younger than the typical AMD group with lower AREDS score compared to the typical AMD group. Among patients with initial AREDS score=2 (normal macula or small drusen on the fellow eye), a higher proportion of PCV patients progressed to advanced AMD

than typical AMD patients (9.6% vs. 2.2%, respectively, log rank test, z=1, p<0.001). Initial AREDS score was significantly associated with progression to advanced stage of fellow eye in the typical AMD group, after adjusting for age, gender, and other co-morbidities (odds ratio [OR]=3.708; 95% confidence interval [CI]:1.511-9.102, p=0.004). However in PCV group, initial AREDS score was not associated with progression to advanced stage of fellow eye. (OR=1.885; 95% CI: 0.791-4.492, p=0.055).

Conclusions: Unlike typical AMD, PCV could progress without any typical sign of early AMD. Also, initial AREDS score was not associated with the progression to advanced stage in PCV in contrast to typical AMD.

Key words : polypoidal choroidal vasculopathy, age-related macular degeneration, korean

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I. INTRODUCTION

Macular drusen is considered an important factor for predicting progression for age-related macular degeneration (AMD).[1-3] An international classification and grading system for AMD mainly emphasizes drusen size,[4] and pigmentary abnormalities to determine the risk score for AMD progression, which was highly associated with the development of advance AMD according to the Age-related Eye disease study(AREDS). However, this classification and grading system has mostly been based on the Caucasian population and has not been validated in Asian population. Polypoidal choroidal vasculopathy (PCV) has been recognized as a subtype of neovascular AMD characterized by orange nodules on fundus examination and/or polypoidal lesions on indocyanine green angiography (ICGA).[5,6] Epidemiologic studies have shown that PCV is more common among Asians and African Americans.[7,8] There are previous reports that suggest that clinical findings and natural history of PCV may differ from that of a typical AMD. Iwama et al.[9] reported that drusen have only a minor effect on the clinical course of PCV suggesting that PCV may have a different clinical feature compared to AMD. Sasaki et al.[10] reported that there were differences in the early signs of AMD that predicted the progression and development to typical AMD or to PCV.

Therefore, the goal of this study was to compare clinical features related to the progression of typical AMD and PCV in the Asian population, using a simplified Age-Related Eye Disease

Study (AREDS) risk score system.[4] Based on our results, we question the effectiveness of the simplified AREDS risk score system when applied to the Asian population where PCV appears to be the predominant subtype of exudative AMD.

II. MATERIALS AND METHODS

We retrospectively reviewed medical records of 463 patients who visited the Vitreoretinal Service Clinic of Yonsei University Medical Center between April 1, 1991 and August 31, 2014. This retrospective study was approved by the Institutional Review Board (IRB) of Yonsei University College of Medicine (Reference No. 4-2015-0133) and conducted in accordance with the tenets of the Declaration of Helsinki. Because this was a retrospective study, informed consent was waived by the IRB. Inclusion criteria were as follows: (1) age ≥ 50 years old, (2) patients who were first diagnosed with unilateral advanced AMD (3) patients without other concomitant macular diseases, such as diabetic retinopathy, vein or artery occlusion, or epiretinal membrane, and (4) follow-up periods for at least 12 months.

At initial visit, all patients underwent a dilated fundus examination with an indirect ophthalmoscope, 30° colored fundus photography using the Heidelberg Retinal Angiography system (Heidelberg Engineering), optical coherence tomography (OCT) (CIRRUS OCT; Carl Zeiss, Berlin, Germany; Spectralis® OCT; Heidelberg Engineering), digital fluorescence angiography (FA), and ICGA. During the follow-up period, color fundus photography and OCT were performed periodically. Data were collected from baseline to the end of the follow-up period for each patient.

Unilateral advanced AMD was defined as cases with advanced AMD features in only one eye and no sign of advanced AMD in the fellow eye. Diagnosis of advanced stage AMD was defined as either neovascular AMD or GA (Geographic atrophy) involving the center of the macula.[4] GA was diagnosed based on the presence of depigmentation of RPE specified by following 3 characteristics: roughly round or oval shape, sharp margins, and visibility of underlying large choroidal vessels in the central 3,000 μm, with drusen or pigmentary

abnormalities without neovascular features.[11] In addition, the diagnosis of PCV was made when there was a presence of orange nodules in fundus photographs with polypoidal lesions on ICGA using the Heidelberg Retinal Angiography system (Heidelberg Engineering, Heidelberg, Germany) equipped with a confocal scanning laser ophthalmoscope.

1. Grading of AMD according to AREDS score

We evaluated the initial fundus photographs from the unilateral advanced AMD group for the assignment of AREDS scores, using the simplified 5-step severity scale involving drusen size and pigmentary abnormalities.[4] Initial fundus findings were categorized as "normal macula", "small drusen," "intermediate drusen," "large drusen," or "pigmentary abnormality". The severity scale system assigned 2 points for pre-existing advanced AMD, 1 point for large drusen on either eye, 1 point for intermediate drusen on both eyes, 1 point for pigmentary abnormality on either eye and no points for normal macula or presence of small drusen**.** The initial AREDS score of enrolled patients started at 2 because all patients already had advanced AMD in one eye. For example, if a patient had only "small drusen" or "normal macula" on the fellow eye, no additional points were added to the initial score. Therefore, the total AREDS score of that patient was 2. In the case of a patient with large drusen or pigmentary abnormality on the fellow eye, 1 point was added to the initial score of 2, for a total score of 3. If a patient had large drusen and pigmentary abnormality simultaneously on the fellow eye, 2 points were added, for a total score of 4. Based on the initial AREDS severity scale, the rate of progression to advanced AMD on the fellow eye was calculated for every unilateral case of typical AMD and PCV.

2. Statistical Analysis

Statistical analysis was performed with SPSS software (version 20.0; SPSS Inc., Chicago, IL, USA) using independent sample t-test for continuous variables and chi-square test for nominal variables. Kaplan-Meier survival analysis was used to evaluate the 5-year progression rate to advanced stage in the fellow eye. Univariate and multivariate logistic regression analyses with

backward elimination methods were use used to evaluate the association between the initial AREDS score and progression to advanced stage in the fellow eye, and to identify factors associated with progression to advanced stage. The threshold for statistical significance was considered to be a P value < 0.05.

III. RESULTS

Among 463 AMD patients with follow up of at least 1 year, 98 patients (21.2%) were excluded for bilateral advanced AMD and remaining 365 patients were enrolled. Mean age was 68.5 ±7.9 years, with 193 males and 172 females. Mean follow-up duration was 67.0 ±48.6 months since the initial diagnosis of AMD.

Baseline characteristics of the unilateral advanced AMD are shown in Table 1. There were 222 patients in the typical AMD and 143 patients in the PCV group.

TABLE 1. Baseline Characteristics of unilateral advanced age-related macular degeneration (AMD) patients (Typical AMD vs. Polypoidal choroidal vasculopathy (PCV))

		Typical AMD (n=222)	PCV (n=143)	p-value
	Mean age (years, Mean±SD)	70.2±7.7	65.9±7.5	<0.001 †
	Gender			0.014*
	Male (%)	106/222 (47.7%)	87/143 (60.8%)	
	Female (%)	116/222 (52.3%)	56/143 (39.2%)	
	DM			0.107
	Yes (%)	44/222 (19.8%)	19/143 (13.3%)	
	No (%)	178/222 (80.2%)	124/143 (86.7%)	
	HTN			0.121
	Yes (%)	86/222 (38.7%)	44/143 (30.8%)	
	No (%)	136/222 (61.3%)	99/143 (69.2%)	
Initial AREDS severity score				0.002 *
	2	103/222 (46.4%)	93/143 (65.0%)	
	3	118/222 (53.2%)	50/143 (35.0%)	
	4	1/222 (0.5%)	0/143 (0%)	
	Mean±SD	2.5±0.5	2.4±0.5	0.001*

AMD, age-related macular degeneration; PCV, polypoidal choroidal vasculopathy; M, male; F, female; DM, diabetes mellitus; HTN: hypertension; SE, spherical equivalent; SD: standard deviation
Independent t test and Chi-square test were used. *p<0.05, †p<0.001

Mean age was significantly younger (70.2 years, vs 65.9 years, independent sample t-test, p<0.001) with more males (60.8% vs.47.7%, Chi sqare test, P=0.014), in the PCV group compared to the AMD group. There was no difference in the prevalence of diabetes mellitus (DM) or hypertension (HTN) between the two groups. Evaluation of the fundi showed that there was a significant difference in the distribution of AREDS scores between the PCV group and the typical AMD group (Chi square test, p=0.002) with overall lower AREDS scores in the PCV group (2.4± 0.5 vs. 2.5 ± 0.5, respectively, independent sample t-test, p=0.001). The predominant AREDS score in the typical AMD group was 3(53.2%) and while in PCV group it was 2 (65.0%) at initial presentation.

1. Comparison of Progression rate to advanced AMD between typical AMD and PCV

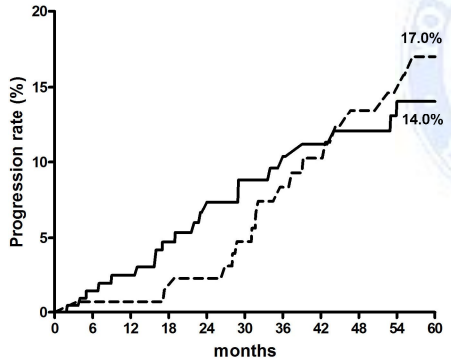

Figure 1.Progression rates to advanced age-related macular degeneration (AMD) of the fellow eye in typical AMD and Polypoidal choroidal vasculopathy (PCV) (typical AMD: 14.0%; PCV: 17.0%, Kaplan-Meier survival analysis, log-rank test, z=1, p=0.528).

There was no significant difference in the 5-year progression rate to advanced stage disease of the fellow eye between the typical AMD group and the PCV group (14.0% vs. 17.0%, respectively, log-rank test, z=1, p=0.528). (Figure 1)

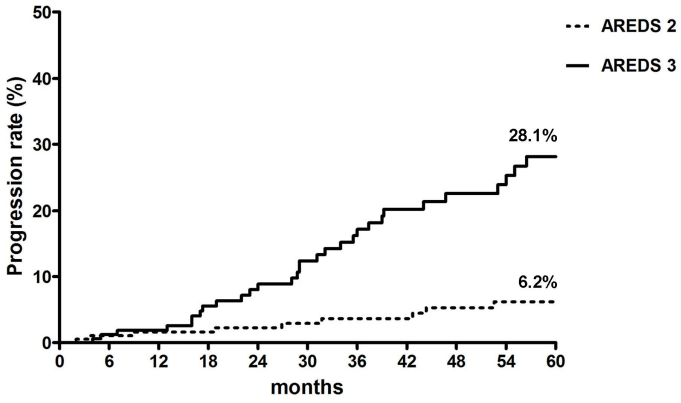

Figure 2. Progression rates to advanced AMD of the fellow eye according to initial Age-Related Eye Disease Study (AREDS) score (AREDS score 2: 6.2%; AREDS score 3: 28.1%, Kaplan-Meier survival analysis, log-rank test, $z=1$, $p<0.001$)

Subgroup analysis showed that when the initial AREDS score was 2, 5-year progression rate to advanced stage of the fellow eye was 6.2% and 28.1% with initial AREDS score of 3, regardless of the type of AMD (log-rank test, $z=1$, $p<0.001$) (Figure 2). Subgroup analysis according to type of AMD and AREDS score severity shows that the 5-year progression rate to advanced stage of the fellow eye was significantly higher in the PCV group (9.6% vs. 2.2%, log-rank test, $z=1$, $p=0.033$) with baseline AREDS score of 2, while there was no difference in the progression rate with baseline AREDS score of 3(25.3% vs.32.0%, log-rank test, $z=1$, $p=0.915$) (Figure 3). We were unable to perform subgroup analysis with baseline AREDS score 4 given low number of patients in each group.

2. Clinical features predicting progression to Advanced AMD

Table 2 showed the distribution of initial fundus findings of the fellow eye in unilateral advanced AMD patients. While “normal macula” (53.8%) was the predominant finding in the PCV group followed by “pigmentary changes”(28%), “normal macula”(36%) and “large drusen”(34.2%) were the predominant findings in the typical AMD group (Chi square test, $p<0.001$). There was only one case of simultaneous presentation of large drusen and pigmentary abnormalities in the initial evaluation of typical AMD group with no case of such in the PCV group.

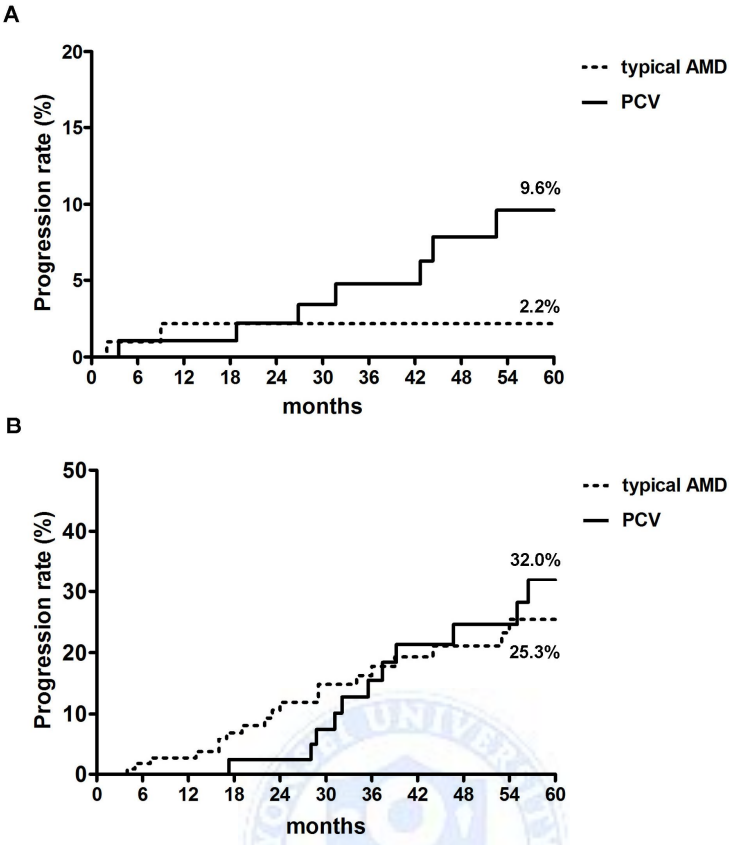

Figure 3A. Progression rates to advanced AMD of the fellow eye in unilateral AMD group with initial AREDS score of 2 (typical AMD: 2.2%; PCV: 9.6%, Kaplan-Meier survival analysis, log-rank test, z=1, p=0.033). 3B. Progression rates to advanced AMD of the fellow

TABLE 2. Initial Fundus Findings of the Fellow Eye in Unilateral advanced AMD

	Typical AMD (%)	PCV (%)	p-value
			<0.001†
Normal macula (%)	80/222 (36.0%)	77/143 (53.8%)	
Small drusen (%)	19/222 (8.6%)	15/143 (10.5%)	
Intermediate drusen (%)	12/222 (5.4%)	2/143 (1.4%)	
Large drusen (%)	76/222 (34.2%)	9/143 (6.3%)	
Pigmentary abnormality (%)	34/222 (15.3%)	40/143 (28.0%)	
Large drusen & pigmentary abnormality (%)	1/222 (0.5%)	0/143 (0%)	

AMD, age-related macular degeneration; PCV, polypoidal choroidal vasculopathy.
Chi-square test were used. *p<0.05, †p<0.001

Table 3 demonstrated the baseline characteristics of patients who progressed to bilateral advanced disease. Mean age was not significantly different between typical AMD and PCV groups (71.5years vs 68.0 years, independent sample t-test, p=0.056). Males were significantly predominant in PCV than typical AMD group (76.7% vs. 59.4%, Chi square test, p=0.004). Initial AREDS score was significantly lower in PCV group than typical AMD group (2.5±0.5 vs 2.8±0.4, independent sample t-test, p=0.010). Among those who developed bilateral advanced disease, 31 out of 32 patients had a new onset CNV in the fellow eye in the AMD group , and all 30 developed new CNV in the fellow eye.

Table 4 list the associations between known AMD risk factors[12], initial AREDS score, and progression to advanced stage disease in the fellow eye. Univariate analysis showed that initial AREDS score was significantly associated with progression to advanced AMD after adjusting for gender, age, DM status, and HTN status in typical AMD group (odds ratio [OR]=3.974, 95% confidence interval [CI]: 1.659–9.516, p=0.002). In PCV group, there were no significantly associated factors with the progression to advanced stage after adjusting for gender, age and DM status with univariate analysis (Table 3)

Multivariate analysis demonstrated that initial AREDS score was not associated with the progression to advanced stage in PCV group, while initial AREDS score was significantly associated with the progression to advanced AMD in typical AMD group (PCV : OR=1.885, 95% CI: 0.791-4.492, p=0.152 ; typical AMD : OR=3.708, 95% CI: 1.511-9.102, p=0.004). Multivariate analysis was performed with backward elimination method, which excluded HTN in the logistic regression model for PCV group. Therefore, odds ratio for each variable of PCV group was adjusted with all variables except HTN (Table 4).

TABLE 3. Baseline Characteristics of patients who progressed to bilateral advanced age-related macular degeneration (AMD) (Typical AMD vs. Polypoidal vascular choroidopathy (PCV))

		Typical AMD (n=32)	PCV (n=30)	p-value
	Mean age (yrs, Mean±SD)	71.5±5.7	68.0±8.0	0.056
	Gender			0.004*
	Male (%)	13/32 (59.4%)	23/30 (76.7%)	
	Female (%)	19/32 (40.6%)	7/30 (23.3%)	
	DM			0.709
	Yes (%)	5/32 (15.6%)	3/30 (10.0%)	
	No (%)	27/32 (84.4%)	27/30 (90.0%)	
	HTN			0.470
	Yes (%)	8/32 (25.0%)	10/30 (33.3%)	
	No (%)	24/32 (75.0%)	20/30 (66.7%)	
	Type of advanced disease			>0.999
	CNV(%)	31/32(96.9%)	30/30(100%)	
	GA(%)	1/32(3.1%)	0/30(0%)	
Initial AREDS severity score				0.009 *
	2	6/32 (18.8%)	15/30 (50.0%)	
	3	26/32 (81.3%)	15/30 (50.0%)	
	4	0/32 (0%)	0/30 (0%)	
	Mean±SD	2.8±0.4	2.5±0.5	0.010 *

AMD, age-related macular degeneration; PCV, polypoidal choroidal vasculopathy; M, male; F, female; DM, diabetes mellitus; HTN: hypertension; CNV : choroidal neovascularization ; GA : geographic atrophy; SE, spherical equivalent; SD: standard deviation
Independent t test , Chi-square test and Fisher's exact were used. *p<0.05, †p<0.001

TABLE 4. Association between initial AREDS score and progression to Advanced AMD of the Fellow Eye after 5 Years with Typical AMD and PCV

Typical AMD	**Univariate Analysis**		**Multivariate Analysis**	
	Crude OR (95% CI)	p-value[a]	Odds Ratio (95% CI)[b]	p-value[a]
Gender (male/female)	0.714(0.334-1.527)	0.385	0.755(0.338-1.688)	0.494
Age	1.027(0.977-1.079)	0.299	1.017(0.963-1.074)	0.541
DM	0.717(0.259-1.983)	0.521	0.844(0.285-2.498)	0.759
HTN	0.479(0.204-1.121)	0.090	0.482(0.198-1.169)	0.106
Initial AREDS score of typical AMD	3.974(1.659-9.516)	0.002*	3.708(1.511-9.102)	0.004*
PCV	**Univariate Analysis**		**Multivariate Analysis**	
	Crude OR (95% CI)	p-value[a]	Odds Ratio (95% CI) [c]	p-value[a]
Gender(male/female)	2.516(0.998-6.339)	0.050	2.566(0.996-6.615)	0.051
Age	1.051(0.994-1.111)	0.078	1.042(0.982-1.105)	0.172
DM	0.674(0.183-2.484)	0.553	0.563(0.144-2.202)	0.409
Initial AREDS score of PCV	2.229(0.982-5.056)	0.055	1.885(0.791-4.492)	0.152

AMD, age-related macular degeneration; PCV, polypoidal choroidal vasculopathy;CI, confidence interval; DM, diabetes mellitus; HTN: hypertension
Logistic regression was used.
[a]p-value estimated using logistic regression analysis
[b]Adjusted for gender, age, DM status, HTN status, Initial AREDS score
[c]Adjusted for gender, age, DM status, Initial AREDS score
*p<0.05, †p<0.001

IV. DISCUSSION

In this study, we looked at the 5-year progression rate to advanced disease in the fellow eye of patients with unilateral advanced AMD or PCV and compared effect of retina risk factors using the AREDS severity score in an Asian population. AREDS study[13] showed that increasing severity of drusen at baseline, the presence of large drusen, the presence of bilateral medium drusen, the presence of advanced AMD in the fellow eye, and the simultaneous presence of large drusen and RPE abnormalities all increased the risk of progression to advanced AMD. In this study, while the severity of AREDS score by retina risk factors significantly affected the progression of the fellow eye when the baseline exam showed typical AMD features, AREDS score had no significant effect on predicting the progression to an advanced stage with PCV. Unlike typical AMD where the presence of drusen or pigmentary abnormality indicates a higher risk for progression of the disease, PCV could progress without preceding drusen or pigmentary abnormality, and AREDS severity score may not be appropriate for predicting the progression of PCV.

The incidence of PCV is relatively higher among the Asian population with reports from 22.3% to 50.0% compared with 8% to 13% among Caucasians who present with exudative AMD.[14-21] When comparing baseline characteristics of PCV and typical AMD, we noted that mean age of patients in the PCV group was significant younger than the typical AMD group and mean initial AREDS severity score was significant lower than that of the typical AMD group. Moreover, when comparing the initial fundus findings in the fellow eyes, there is a significant difference between the two entities with higher proportion of patients with large drusen in the typical AMD and higher proportion of patients with pigmentary abnormalities in PCV, which is reported previously as fundus characteristics of PCV in Asian population[22,23] (Table 2). In this study, subgroups analysis showed that in PCV, progression to bilateral advanced stage was significantly higher than typical AMD whose initial AREDS score was 2 while there was no difference when the initial AREDS score was 3 (Figure 3A,B). These finding suggests that in

PCV, the current retinal risk factor grading system according to AREDS score may not be appropriate for predicting progression. Previous study by Sasaki et al. reported that pigmentary abnormalities without large drusen were associated with PCV (age- and gender-adjusted, OR=15.9, 95% CI: 1.8–140.5).[10] In addition, Fujimura et al. reported that a proportion of abnormal fundus autofluorescence patterns in the fellow eye of unilateral typical AMD patients were higher than that of unilateral PCV, due to larger total soft drusen areas in the fellow eyes of the typical AMD patients, [24] suggesting the difference in the retina findings between the two entities.

Regardless, the 5-year progression rate to advanced AMD in the fellow eye was not significantly different with 14.0% in the typical AMD group and 17.0 % in the PCV group (Figure 1). Ueta et al. reported similar results demonstrating that typical AMD and PCV had similar probabilities of involving the second eye and that RPE atrophy was the most common fundus finding proceeding neovascular changes when progressed to an advanced stage.[25] In the AREDS report no. 18, when patients were diagnosed with advanced AMD in one eye at baseline, the 5-year progression rate to advanced AMD in the fellow eye was 14.8% when the AREDS score was 2 and 35.4% when the AREDS score was 3,[4] which is slightly higher than our study results. However, this may be due to the difference in the total number, race and demographic features of patients between the studies, with our study only including those with unilateral advanced AMD cases at baseline.

Study Limitations

This study has the inherent limitations of a retrospective study and a limited number of cases. Many risk factors, such as a history of smoking[26] and genetic factors,[27] that could affect the progression of AMD were not included. Because our study considered only unilateral advanced AMD patients, the progression rates to advanced AMD do not represent the total progression rate of Asian patients with AMD. Further prospective evaluation of these relationships with respect to smoking, genetic factors, and other associated past histories of large groups and

diverse ethnicities would present a more accurate conclusion about the progression for PCV. Despite of these limitations, this study is the first to show the different characteristics of progression between typical AMD and PCV according to the AREDS score.

V. CONCLUSION

In conclusion, the current study highlights the important difference between the progression of typical AMD and PCV in Asian population by applying a globally recognized risk-scoring system. The progression of PCV to an advanced stage could proceed without any typical sign of early AMD, such as drusen suggesting that the natural progression of PCV may differ from that of typical AMD. Therefore, considering the high proportion of PCV in the Asian population, a revised severity scoring system should be designed, one of which could predict the progression of PCV and its validity should be shown through a large cohort study with an Asian population.

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ABSTRACT(IN KOREAN)

한국인에서 결절성맥락막혈관병증과 연령관련황반변성의 진행양상 비교

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서 유 리

연구목적 : 한국인에서 전형적인 연령관련황반변성과 결절성맥락막혈관병증의 진행양상과 위험인자를 비교하고자 한다.

연구방법 : 후향적 코호트 연구

연구대상 : 단안에만 진행된 연령관련황반변성이 있는 365명의 환자의 의무기록(222명의 전형적인 연령관련황반변성 환자와 143명의 결절성맥락막혈관병증 환자)

방법 : 초진 내원시 시행한 안저사진, 형광안저조영술, 인도사이아닌그린혈관안저촬영 결과를 분석하였고, 이를 바탕으로 Age-Related Eye Disease Study (AREDS) 에서 정한 AREDS score를 계산하였다. 전형적인 연령관련황반변성과 결절성맥락막혈관병증 환자군간의 5년 후 반대쪽 눈의 진행된 연령관련황반변성이 발생하는 비율을 비교하였고, AREDS score별로 군을 나누어 각 군간의 비교도 시행하였다. 또한 전형적인 연령관련황반변성과 결절성맥락막혈관병증 환자군에서 반대쪽 눈의 진행여부와 위험인자간의 연관성을 분석하였다.

결과 : 전형적인 연령관련황반변성군과 결절성맥락막혈관병증 환자군의 5년후 반대쪽 눈의 진행 비율에서는 통계적으로 유의한 차이가 없었다. 두 군의 특성을 비교하였을 때, 결절성맥락막혈관병증 환자군의 평균 연령이 더 낮았고 초기 AREDS score도 전형적인 연령관련황반변성군에 비해 통계적으로 유의하게 더 낮았다. 초기 AREDS score가 2점인 환자들(반대쪽 눈에 아무 병변이 없거나 작은 드루젠만 있는 경우)을 대상으로 5년후 반대쪽 눈의 진행 비율을 비교하면, 결절성맥락막혈관병증 환자들에서 전형적인 연령관련황반변성 환자들에 비해 유의하게 더 많은 비율의 환자가 진행하였다. 위험인자에 대한 회귀분석에서 초기 AREDS score가 전형적인 연령관련황반변성 환자군에서는 반대쪽눈의 진행여부와 유의한 연관성을 보였지만, 결절성맥락막혈관병증 환자군에서는 유의한 연관성을 보이지 않았다.

결론 : 전형적인 연령관련황반변성과는 다르게 결절성맥락막혈관병증은 전형적인 초기 연령관련황반변성의 징후 없이 진행할 수 있다. 또한 초기 AREDS score는 전

형적인 연령관련황반변성에서와는 다르게 결절성맥락막혈관병증의 진행을 예측하지 못한다.

핵심되는 말 : 결절성맥락막혈관병증, 연련관련황반변성, 한국인

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