Complications of Myopia in Rangsit University Eye Clinic

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Abstract:

Myopia is a condition commonly found in patients examined by optometrists. The purpose of this study was to gather baseline data and determine if there was a correlation between the degree of myopia and presence of ocular pathology in patients seen at Rangsit University's eye clinic, with results to be used to improve optometric education, services to improved patient outcome, and research. A retrospective study of patients was conducted by the Rangsit University Eye Clinic between January 2013 and December 2015. A total of 3,121 patients were in the study, age ranging from 1 – 101 with the mean of 52, and a gender breakdown of 1,397 male, 1,724 female, and 1,132 myopic patients seen, 669 had a spherical equivalent (SE) of three diopters or less (mild myopia), 287 patients had a SE greater than three but no greater than 6 diopters (moderate myopia), and 176 patients had a SE greater than 6 diopters (high myopia). Vitreoretinal pathology, glaucoma, or findings indicative of glaucoma were found in 863 (76.24%) of patients seen. The most common findings, posterior vitreous detachment were present in 210 patients (18.55%) and were not found to be correlated to myopia. Retinal hole, retinal tear, and lattice retinal degeneration as a group were found to be correlated with moderate and high myopia, with respective odds ratios (OR) of 3.09 and 4.01. Posterior staphyloma was correlated with moderate myopia (OR = 9.71) and high myopia (OR = 36.0). Epiretinal and epimacular membrane was correlated with high myopia (OR = 0.29). A history of laser retinopexy and vitreoretinal surgery were also correlated with high myopia, with P values of 0.00076 and 0.0026 respectively. The only correlation between glaucoma and myopia found was between high myopia and the diagnosis of glaucoma suspect (OR = 0.29). Vitreoretinal disease and glaucoma were commonly found in the myopic patients seen (27.66%) , more so in those with a higher degree of myopia (more than 6 Dioptors) .

Keyword: *myopia, PVD, Lattice degeneration, Retinal hole, retinal tear, vitreoretinal surgery, Rangsit University*

บทคัดย่อ :

สายตาสั้นพบมากขึ้นในกลุ่มคนรุ่นหลังที่อายุน้อยลง นักทัศนมาตรจึงควรมีความรู้เกี่ยวกับสายตาสั้นเป็นอย่างดี วัตถุประสงค์ของการศึกษาครั้งนี้เพื่อหาภาวะแทรกซ้อนของผู้ป่วยสายตาสั้น นำมาใช้เป็นข้อมูลพื้นฐานในการเรียนการสอน การบริการที่มีผลดีขึ้น และการ วิจัย ของคณะทัศนมาตรศาสตร์ มหาวิทยาลัยรังสิต วิธีการศึกษาศึกษาย้อนหลัง โดยรวบรวมข้อมูลของผู้ป่วยที่มารับการตรวจตา ที่คลินิกตาของมหาวิทยาลัยรังสิต ระหว่างเดือน มกราคม พ.ศ. 2556 ถึงเดือนธันวาคม พ.ศ. 2558 ผู้ป่วยทั้งหมด 3,121 คน เป็นเพศชาย : หญิง 1397:1724 คน อายุตั้งแต่ 1 - 101 ปี เฉลี่ย 52 ปี มีสายตาสั้น 1,132 คน แบ่งเป็นสายตาสั้นน้อย (Spherical equivalent $\leq$ 3 ไดออปเตอร์) จำนวน 669 คน สายตาสั้นปานกลาง (Sph E >3-6 D.) 287 คน และสายตาสั้นมาก (Sph E >6 D.) 176 คน ผู้ป่วยสายตาสั้นมีภาวะแทรกซ้อนเกี่ยวกับ น้ำวุ้น จอตา และต้อหิน 863 รายการ (76.24%) ที่พบมากที่สุดคือ น้ำวุ้นตาเสื่อมและลอกตัว พบได้ 210 คน (18.55%) และไม่มีความสัมพันธ์กับสายตาสั้น โรคแทรกซ้อนจากจอตาบางและเสื่อม จอตามีรู จอตาขาด มีความสัมพันธ์กับสายตาสั้นปานกลาง (Odds ratio 3.09) และสั้นมาก (Or. 4.01.)) ผู้ป่วยที่มีลูกตาโป่งไปทางด้านหลัง มีความสัมพันธ์กับสายตาสั้นปานกลาง (OR. 9.71) และสายตาสั้นมาก (OR36.0) การมีผังผืดในจอตา มีความสัมพันธ์กับสายตาสั้นมาก (OR 0.29) สำหรับการรักษาในจอตา พบว่าผู้ป่วยที่ เคยได้รับการรักษาด้วยแสงเลเซอร์ หรือเคยทำผ่าตัดจอตาและน้ำวุ้นมีความ สัมพันธ์กับสายตาสั้นมาก (P-value 0.00076, 0.0026 ตามลำดับ) ผู้ป่วยที่สงสัยว่าเป็นต้อหินชนิดมุมเปิดมีความสัมพันธ์กับสายตาสั้นมาก (OR. 0.29) ผู้ป่วยสายตาสั้นมีการตรวจพบภาวะแทรกซ้อนทางน้ำวุ้น จอตาและต้อหินมาก (76.24%) และความสัมพันธ์กับสายตาสั้นจะพบมากขึ้นตามความรุนแรงของสายตาสั้นที่เพิ่มมากขึ้น โดยเฉพาะสั้นมากกว่า 6 ไดออปเตอร์

คำสำคัญ*: สายตาสั้น น้ำวุ้นตาเสื่อม จอตาบางและเสื่อม จอตาเป็นรู จอตาขาด การผ่าตัดจอตาและน้ำวุ้น มหาวิทยาลัยรังสิต*

1. Introduction

Myopia is common in East Asia (Grosvenor, 2003), especially pathologic or malignant myopia (Daubs, 1982.) One study in the United States (Katz et al., 1997; Sperduto et al., 1983; Wang et al., 1994; The Eye Disease Case–Control Study Group, 1993) found that myopia is more common in younger patients, and may be related to ocular pathology. A Japanese study (Tokoro, 1988) found that the prevalence of myopia differed from 0.5% in secondary and high school students as compared to 3% of the population age 29. The prevalence of refractive errors in adult Chinese in Singapore is increasing to 38.7% and 9.1% with high myopia (Wong et al., 2000). Report of the Joint World Health Organization showed the impact of myopia and high myopia (WHO, 2015). The 2007 Thailand National survey (Jenchitr and Raiyawa, 2012) found a prevalence of myopia of 0.50 diopter or less for 24.06%, and a prevalence of myopia greater than 1 diopter for 12.74%. Myopia, especially high myopia (SE > 6 D) is associated with peripheral retinal degeneration (Hymas and Neumann, 1969), lattice degeneration (Yura, 1998), posterior vitreous detachment (Morita et al., 1995), and rhematogenous retinal detachment (The Eye Disease Case-Control Study Group, 1993). Axial myopia in particular has been found to be associated with ocular disease (Pierro et al., 1995).

Myopia has also been found to be associated with glaucoma (Fong et al., 1990; Grodum et al., 2001) with myopic patients having a two to threefold increased risk of glaucoma when compared to non-myopic patients. The risk was independent of other glaucoma risk factors such as intra-ocular pressure (Mitchell et al., 1999).

2. Objectives

Myopia is a condition commonly found in patients examined by optometrists. The objective of this study was to gather baseline data and determine if there was a correlation between the degree of myopia and the presence of myopic complications found in patients at a Thai eye clinic, with results to be used to improve optometric education, services as patient outcomes, and research.

3. Method

A retrospective descriptive study of myopic patients at the Rangsit University Eye Clinic between January 2013 – December 2015 was performed. The study inclusion criteria were that the patient had completed an eye exam including measurement of visual acuity, intraocular pressure measurement by non-contact tonometer, refraction, external ophthalmic examination, gonioscopy, fundus examination and fundus photography. Additional testing, such as fundus fluorescein angiography, ultrasonography, optical coherence tomography, and automated perimetry were performed when indicated as in case of myopic macular degeneration (MMD), glaucoma etc. Patients with missing or incomplete exam data were excluded from the study. Exam findings were tabulated and categorically analyzed by degree of myopia (mild myopia (3 diopters and less), moderate myopia (3-6 diopters), or high myopia (more than 6 diopters).

4. Result

A total of 3,121 patients were in the study, age ranging from 1 – 101 with the mean of 52, and a gender breakdown of 1,397 male, 1,724 female. There were 346 patients who were not refracted, and not included in calculations seeking to correlate pathology with myopia, and 379 who were emmetropic. 1,025 patients (36.94%) were hyperopic (36.94%) and 239 (8.61%) had astigmatism in any form. Myopia was found in 1,132 (40.79%) patients with the following breakdown; mild myopia (SE 3 diopters or less), 669 patients; moderate myopia (SE greater than 3 but less than 6 diopters), 287 patients; and high myopia (SE greater than 6 diopters), 176 patients, as shown in Table 1. The ocular findings and complications found in the group studied are listed from most to least common in Table 2. Posterior vitreous detachment (PVD) was the most common finding (210 cases, 18.55%), follow by retinal hole, tear, or lattice degeneration (128 cases,11.31%), epiretinal and epimacular membrane (70 cases, 6.18%), posterior staphyloma and myopic degeneration (43 cases, 3.8%), dry AMD (41 cases 3.62%), wet or disciform AMD (7 cases 0.62%), retinal detachment (25 cases 2.21%), macular hole (23 cases 2.03%), non-proliferative diabetic retinopathy (39 cases 3.45%), proliferative diabetic retinopathy (9 cases 0.8%), primary open angle glaucoma (42 cases, 3.71%), primary open angle glaucoma suspected as above average or large cup to disc ratio and high

intraocular pressure (Ocular hypertension-OHT) when compare to normal Thai (Tongchit et al., 2014; Yokkumpol et al., 2014) (44 cases, 3.89%), ocular hypertension (38 cases, 3.36%), normotensive glaucoma (28 cases, 2.47%). A total of 49 (4.33%) myopic patients had a history of laser retinopexy and 16 myopic patients (1.41%) had a history of vitreoretinal surgery.

Table 3 indicates there was no correlation found between myopia and PVD when comparing myopic to emmetropic patients, but there was no comparison with hyperopic patients. Retinal hole, tear and lattice degeneration were correlated with moderate myopia (Odds Ratio 3.09) and high myopia (OR 4.01), and posterior staphyloma was also correlated with moderate myopia (OR 9.71) and high myopia (OR 36.0). Epiretinal and epimacular membrane were correlated only with high myopia (OR 0.29). A history of laser retinopexy was correlated to mild myopia (P-value 0.0014), moderate myopia (P-value 0.00001) and high myopia (P-value 0.00076), while a history of vitreoretinal surgery was correlated with moderate myopia (P-value 0.048) and high myopia (P-value 0.0026). In general, the prevalence of retinal diseases-related findings increased with the degree of myopia. Regarding glaucoma, as shown in Table 4, the only correlation found was between status as a primary open angle glaucoma suspect and high myopia (OR 0.29). An insufficient case number were present to determine any correlation between the remaining findings listed in Table 3 with myopia.

This study found a percentage of patients with visual impairment lower than that found by both a 2007 Thailand survey, and a 2010 global survey, as shown in Table 5.

Table 1 Age range, type of citizen and degree of myopia of eye patients

Age range (years)	Thai		Foreigners		Total	Myopia			No refractive error	Not record	Total
	M	F	M	F		Mild (≤ 3 D.)	Moderate (>3-6 D.)	High (> 6 D.)			
10 and less	4	6	9	5	24	3	2	1	4	8	18
11 - 20	35	19	16	16	86	23	15	9	12	15	74
21 - 30	117	127	46	30	320	110	57	24	51	41	283
31 - 40	92	168	63	41	364	130	43	37	72	37	319
41 – 50	109	165	80	51	405	100	42	28	58	36	264
51- 60	147	245	110	73	575	86	50	37	62	51	286
61 – 70	223	310	87	77	697	110	56	30	56	75	327
71 – 80	137	242	48	35	462	81	20	6	50	47	204
More than 80	59	108	15	6	188	26	2	4	14	36	82
Total	923	1,390	474	334	3,121	669	287	176	379	346	1,857

Table 2 Ocular finding and complication of myopic patients of RSU Eye Clinic

Ocular finding and complication*	Myopia				No refractive error
	≤ 3 D.	>3-6 D.	>6 D.	Total	
Posterior vitreous detachment (PVD)	106	55	49	210	49
Retinal hole, tear, Lattice degeneration	44	39	45	128	15
Epiretinal, epimacular membrane (ERM,EMM)	44	17	9	70	31
Post Laser retinopexy	21	18	10	49	0
Primary open angle glaucoma suspect	31	8	5	44	18
Posterior staphyloma	6	9	28	43	1
Primary open angle glaucoma-	24	9	9	42	16
Dry age related macular degeneration (Dry AMD)	32	5	4	41	18

Non proliferative diabetic retinopathy (NPDR)	28	6	5	39	18
Ocular hypertension (OHT)	23	12	3	38	12
Laser peripheral iridotomy	25	4	1	30	0
Normotension glaucoma (NTG)	19	7	2	28	12
Retinal detachment (RRD)	11	6	8	25	3
Macular hole	14	4	5	23	13
BRVO, CRVO. BRAO, CRAO	16	3	2	21	6
Post vitreo- retinal surgery	4	4	8	16	-
Proliferative diabetic retinopathy (PDR)	5	2	2	9	2
Disciform age related macular degeneration (Wet AMD)	5	1	1	7	3
Total	458	209	196	863	217

*one patient can has more than one disease for example PVD with retinal tear

Table 3 Correlation of myopic retinal complications and degree of myopia

Vitreoretinal diseases	Degree of myopia*	Odds Ratio	95 % CI	P-value	Significance
Posterior Vitreous Detachment (PVD)	Mild	1.03	0.69, 1.55	0.871	Not sig.
	Moderate	1.22	0.77. 1.95	0.37	Not sig.
	High	1.14	0.71, 1.84	0.564	Not sig
Retinal hole, tear, lattice	Mild	1.43	0.75, 2.76	0.247	Not sig
	Moderate	3.09	1.58, 6.09	0.0003	Sig
	High	4.01	2.08 , 7.84	0.000004	Sig
Epiretina membrane (ERM, EMM)	Mild	0.64	0.38, 1.07	0.07	Not sig
	Moderate	0.53	0.27, 1.03	0.045	Not sig.
	High	0.29	0.12, 0.65	0.000088	Sig.
Posterior staphyloma	Mild	2.87	0.34, 63.59	0.309	Not sig
	Moderate	9.71	1.25, 206.67	0.0088	Sig
	High	36.00	5.17, 718.59	<0.0001	Sig
Post vitreoretinal surgery	Mild	Undefined		0.167	Not sig.
	Moderate	Undefined		0.048	Sig.
	High	Undefined		0.0026	Sig
Post laser retinopexy	Mild	Undefined		0.0014	Sig.
	Moderate	Undefined		0.00001	Sig.
	High	Undefined		0.00076	Sig.

*Mild myopia has spherical equivalent ≤3 Diopters, moderate myopia has Sph E >3-6 D and high myopia has Sph E >6 D

Table 4 Correlation of glaucoma of myopic patient and degree of myopia

Glaucoma	Degree of myopia	Odds Ratio	95 % CI	P-value	Significance
Primary open angle glaucoma (POAG)	Mild	0.69	0.35, 1.40	0.27	Not sig.
	Moderate	0.59	0.23, 1.45	0.21	Not sig.
	High	0.60	0.24, 1.49	0.24	Not sig.
Primary open angle glaucoma suspected (POAGS)	Mild	0.80	0.42, 1.53	0.475	Not sig.
	Moderate	0.44	0.17, 1.10	0.054	Not sig.
	High	0.29	0.09, 0.85	0.011	Sig.

Table 5 Visual impairment of patients in RSU Eye Clinic compare to 2007 National survey in Thailand and Global impairment in 2010 (as WHO definition)

Visual impairment*		RSU Eye Clinic		Thailand (Jenchitr et al,2007)	Global (WHO 2010)	
		Number	%		person (Million)	%
Mild	Low vision one eye	2	0.072	2.18	-	-
	Blind one eye	2	0.072	1.59	-	-
Moderate	Low vision both eyes	5	0.18	1.57	246	3.56
	Blind one eye, Low vision one eye	1	0.036	0.39	-	-
Severe	Blind both eyes	5	0.18	0.59	39	0.56

*Classified by visual acuity only, visual field was not included

5. Discussion

In this study, there were 1,349 (43.22%) patients over the age of 60, of whom 261 (45.98%) were pseudophakes. Of these pseudophakic patients, 120 (45.98%) were emmetropes and 131 (50.19%) had astigmatism. These cases were included since the prevalence of the pathologies considered is unchanged in older pseudophakes (Srinivasa et al., 2016). Patients with a history of laser in situ keratomileusis (LASIK) were also included, since research has shown that refractive surgery does not alter the risk of complications related to myopia (Nassaralla, Santos , Nassaralla , 2008). Since the refractive status of these cases prior to their surgery was unknown, they were not included in Odds Ratio calculations. Patients with myopia due to changes in refraction associated with cataract or diabetes and myopic patients receiving refractive surgery were also not included in this study due to the power of myopia are unstable and the degree of myopia (after refractive surgery) could not be categorized for the study.

It should also be noted that when correlating the presence of pathology and degree of myopia, in some types of pathologies there was an insufficient number of emmetropes to calculate an odds ratio, and P-value was used as a substitute. In this study, only myopia and emmetropia were compared, hyperopic patients could be accounted for complication but it was not in inclusion criteria. Some pathologies were correlated with degree of myopia at a 95 % Confidence Interval, indicating a loose correlation.

It should be noted that this study population took place in Bangkok and included 808 patients (25.88%) who were not Thai citizens, so the results may not apply to the Thai population as a whole. It should also be noted that myopia may be associated with a wider variety of ocular conditions than were considered in this study, and further investigation is needed to expand our understanding of this relationship.

6. Conclusion

This study found that vitreoretinal disease was commonly found in the myopic patients seen, more so in those with a higher degree of myopia (more than 6 diopters). It also determined that signs indicative of glaucoma risk were associated with high levels of myopia (more than 6 diopters). Optometrists providing routine refractive services should also determine the presence or absence of ocular pathology, or conditions leading to increased risk of pathology. As the refractive professional, optometrists should be particularly aware of ocular pathology associated with ammetropia, such as myopia. Optometric curricula should emphasize training students to provide primary eye care in the form of screening for and diagnosis of diseases associated with myopia, as well as proper disease management and referral.

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