

Diabetic Retinopathy Screening in Community Hospitals

Nitiapinyasakul N,* M.D.

Nitiapinyasakul A,* M.D.

Tunya C,** M.D.

ABSTRACT : **Background:** Diabetic Retinopathy (DR) is one of leading causes of visual loss in developed and developing countries. DR screening and LASER treatment can prevent blindness in diabetes.

Objective : To screen DR in type2 diabetes and to perform LASER treatment in patients at risk of blindness.

Study design : Prospective, descriptive study

Methods : Training courses of DR and patients at risks, patient selection and preparation for screening were provided to healthcare staffs at 24 community hospitals in Nakhon Ratchasima Province. Inclusion criteria were patients who were at risks of DR or no previous DR screening. Ophthalmologists from regional hospital performed fundus examination using indirect ophthalmoscope. Diagnosis and treatment options were informed to patients. Reports were sent to their general practitioners for that the patients were referred for LASER treatment at the regional hospital.

Results : Five thousand one hundred and twelve patients were enrolled in this study, which accounted for 24% of DR screening coverage. Seventy-nine percent (79%) of patients were females and 21% were males. Mean age was 55 years. Low vision and blindness were observed in 14.1% and 0.6% respectively. DR was found in 781 cases (15.3%). Five hundred seventy three cases (11.2%) had mild to moderate nonproliferative diabetic retinopathy (NPDR) without maculopathy and 57 cases (1.1%) with had maculopathy. Severe NPDR without maculopathy and with maculopathy presented in 35 cases (0.7%) and 56 cases (1.1 %), respectively and 46 cases (0.9%) were proliferative diabetic retinopathy. Cataract was found in 1,582 cases (31%), of which 157 cases were mature cataract. LASER treatment was performed in 94 cases.

Conclusion : From this pilot study, there was DR in 15% of study population. These risk to blind population were detected and got an appropriated treatment which may help preventing or delaying visual loss. **Thai J Ophthalmol 2004 ; July-December 18(2) : 103-110.**

Background

Diabetic retinopathy is one of leading causes of blindness in developed countries.^{1, 2} Nowadays, it's also a common cause of visual loss in Thailand.³⁻⁶ Nakhon Ratchasima is a second largest province in Thailand. In 2003, of 2.5 million populations, 25,529 registered having type2 diabetes. The province comprises 32 dis-

tricts, with 24 community hospitals and 1 regional hospital.

Early DR detection and proper LASER treatment can prevent and delay blindness. DR screening in Nakhon Ratchasima was initiated in 1995 in 2 community hospitals, Pimai and Pratai, which retinopathy was detected in 11% and 21%, respectively, of which proliferative

*Department of Ophthalmology **Department of Medicine, Maharat Nakhon Ratchasima Hospital.

diabetic retinopathy 2% (7/315) and LASER treatment was performed in 27 cases. From the 1998 study⁴, a cross sectional study looking for a risk factor of ocular complication in diabetes, cases were chosen from stratified randomized samples of diabetes in 8 community hospitals, 842 had type 2 diabetes. Prevalence of DR was 21.8%. Factors associated significantly with the presence of DR were duration, uncontrolled fasting blood sugar (FBS), hypertension and albuminuria. The guidelines for screening of patients at risk for DR were taken place at community hospitals during 1999-2001. Fifteen of 24 community hospitals in Nakhon Ratchasima have screened 2,485 diabetes with risk of developing retinopathy. Three hundred and seventy eight cases were referred to ophthalmologists and 32% were diagnosed for DR. The screening processes were discontinued because of general practitioners' workload and highly number of diabetes.

Objective

To screen DR and to perform LASER treatment in type 2 diabetes in Nakhon Ratchasima province.

Study design : Prospective, descriptive study

Definition : In this study "International Clinical Diabetic Retinopathy and Diabetic Macular Edema Disease Severity Scales"¹ was used for grading DR

- No apparent retinopathy or normal retina means is no abnormalities.
- Mild non-proliferative diabetic retinopathy (NPDR) is microaneurysm only

- Moderate non-proliferative diabetic retinopathy is more than just microaneurysms but less than severe NPDR
- Severe non-proliferative diabetic retinopathy is any of the following and no sign of PDR
 1. More than 20 intraretinal hemorrhages in each of 4 quadrants.
 2. Definite venous beading (VB) in 2 quadrants
 3. Prominent intraretinal microvascular abnormalities in 1 quadrant
- Proliferative diabetic retinopathy is one or more of the following
 1. Neovascularization
 2. Vitreous / Preretinal hemorrhage
- Diabetic macular edema is some apparent retinal thickening or hard exudates in posterior pole at or distant from macula.

Methods

Ophthalmologists and team provided a training course for DR screening to the community team. The training course comprised of

1. Knowledge of DR.
2. Patients preparing for DR screening. Criteria for patients selection were the type 2 diabetes who were at risk for diabetic retinopathy (duration > 5 year or poor controlled fasting blood sugar) or type 2 diabetes who had no previous eye examination by ophthalmologist.
3. DM registration and DM record involved diabetes history (general information, duration, associated disease, continuity of treatment, body mass index) laboratory investigation (FBS or HbA1C, Renal function test, urine albumin, cholesterol) eye examination (visual

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acuity, Schiottz tonometer, anterior segment and indirect ophthalmoscope)

4. Ophthalmologists and ophthalmic nurses provided training for visual acuity and intraocular measurement to nurses in community by using Snellen's chart and Schiottz tonometer respectively.

A visiting schedule was sent to 24 community hospitals. On DR screening day, 1% mydriacyl eye drop was instilled to patients' eyes. Information of side effect and treatment was informed to community staffs. Ophthalmologist performed fundus examination by indirect ophthalmoscope. Diagnosis and treatment was informed to patients and then sent to community staffs. Ophthalmic nurses provided DR education to DM patients. Then community staffs referred DR patients who needed LASER treatment to ophthalmologist in regional hospital.

Results

Eye screening by ophthalmologists was performed during January and November 2003. Twenty-four community hospitals in Nakhon Ratchasima participated in this study. There were 21,732 type 2 diabetes and 5,112 cases got eye examination. Coverage of DR screening in community hospitals was 24%.

Average age was 55 years. Seventy nine percent (4,049/5,112) were female and 21% (1,063/5,112) were male. Fifty-five percents of patients had less than 5 year duration of diabetes and 62.9% of them had uncontrolled FBS. Hypertension was found in 29.6%. Low vision in both eyes was observed in 14.1%. There were 33 cases (0.6%) that had bilateral blindness, of which 2 cases were blind from DR and its complication, 16 corneal

disease, 2 congenital abnormality, 12 absolute glaucoma and 1 post trauma.

DR present in 781 cases (15.2%). Five hundred and seventy three cases (11.2%) had mild to moderate NPDR without maculopathy and 57 cases (1.1%) with maculopathy. Severe NPDR without maculopathy and with maculopathy were found in 35 cases (0.7%) and 56 cases (1.1%), respectively. Forty-six cases (0.9%) were proliferative diabetic retinopathy. Of 107 cases required treatment, 94 of them underwent LASER procedure at Maharat Nakhon Ratchasima regional hospital.

There were 157 mature cataract from overall 1,582 cataract cases, and all of them underwent cataract extraction with posterior segment intraocular lens placement.

Results of eye examination, staging of DR and treatment, factors that associated with DM patients are shown in table 1-4.

Comparison between number of LASER treatment (in 2000-2002 and 2003) before and after community screening for diabetic retinopathy are showed in table 5.

Discussion

Diabetic retinopathy is the most frequent cause of new case of blindness in adults aged 20-74 years². A comparison of the prevalence of diabetic retinopathy reported in previous population-based studies is difficult because of difference methods in DR screening. In Thailand, the prevalence of DR by indirect ophthalmoscope fundus exam was 17-31%.³⁻⁷ The population-based study in 1999 In Nakhon Ratchasima revealed a prevalence of 21%.⁴ In USA, DR is usually performed by using pho-

Table 1 Number of cases in each 24 community hospitals

Hospital	Number of diabetes	eye exam	Cataract	NPDR	NPDR +maculopathy	PDR	LASER before DR screening	LASER
(Total)	(21,732)	(5,112)	(1,580)	(608)	(113)	(48)	(13)	(94)
1 Chockchai	723	503	209	44	3	2	2	3
2 Khornburi	858	476	192	48	5	0	1	2
3 Sengsang	450	364	76	30	9	5	0	7
4 Kamsakaseng	571	231	43	20	0	2	1	2
5 Kamtaleso	545	289	63	47	4	0	1	6
6 Wangnumkwae	772	104	32	13	2	0	0	4
7 Nongbunmak	439	276	76	35	14	2	0	6
8 Sungneon	726	589	170	73	10	7	2	7
9 Kong	800	614	261	44	14	6	0	8
10 Srikaew	803	85	32	16	2	0	1	0
11 Nondang	700	156	50	14	3	1	0	1
12 Haungtalang	932	56	5	4	0	1	0	1
13 Pimai	1,116	95	18	26	3	0	1	1
14 Paktongchai	800	85	20	16	6	1	1	3
15 Dankuntod	1,044	220	73	41	7	4	0	5
16 Chumpung	1,086	73	18	13	2	0	0	1
17 Buayai	1,969	77	18	30	2	2	0	3
18 Nonsuong	1,595	91	20	2	2	3	0	4
19 Nonthai	1,262	33	15	2	2	1	0	2
20 Banleam	501	131	61	21	7	0	0	7
21 Jakkarat	1,040	69	12	19	2	0	0	2
22 Pakchong	1,200	174	9	11	9	5	2	8
23 Pratai	1,200	85	51	15	2	1	1	4
24 Kangsanamnang	600	236	56	24	3	5	0	7

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Table 2 Show staging of DR and treatment

Staging of DR	N	%
No DR	4,308	84.3
Mild to moderate NPDR without maculopathy	573	11.2
Mild to moderate NPDR with maculopathy	57	1.1
Severe NPDR without maculopathy	35	0.7
Severe NPDR with maculopathy	56	1.1
PDR	48	0.9
Post LASER PRP	13	0.3
Obscured fundus	22	0.4

Table 3 Treatment

- Diabetic Retinopathy		
No treatment or follow up 1 year	4,630	90.5
Follow up 1-6 month	387	7.6
LASER PRP and/or macular photocoagulation	94	1.8
Retina surgery	1	0.02
- Cataract		
Cataract surgery (mature SC)	157	3.1

tographic techniques and the prevalence was 20-59%.⁸⁻¹⁸

Tight control of diabetes can prevent retinopathy and delay progression from NPDR to PDR¹⁸. The preventing of vision loss in patients with DM through ophthalmologic screening and treatment costs \$3,190 (127,000 baths) per quality-adjusted life-year save.¹⁹ In EDTRS study, the mortality rate of patients with DR

is much higher than that of the general population. For those who survived, intensive follow up with treatment when indicated, seems to be associated with maintenance of good long-term visual acuity for most patients.²⁰

From our study, over half of type 2 diabetes in Nakhon Ratchasima has uncontrolled fasting blood sugar and less than 5 year duration of diabetes. With better

Table 4 Factors associated with DM patients

Factors	N	(%)
1. Sex		
Male	1,063	20.8
Female	4,049	79.2
2. Duration		
< 5years	2,820	55.2
5-10 years	1,861	36.4
> 10 years	431	8.4
3. FBS		
Control	1,898	37.1
Uncontrolled	3,214	62.9
4. Creatinine		
Normal	4,165	81.5
Increase	10	0.2
No data	937	18.3
5. Urine albumin		
Normal	2,551	49.9
1+ to 4+	526	10.3
No data	2,035	39.8
6. BMI		
< or = 24	1,504	29.4
25-30	1,707	33.4
> 30	428	8.4
No data	1,176	23.0
7. Hypertension		
No hypertension	3,598	70.4
Hypertension	1,514	29.6
8. VA		
Low vision (equal or less than 6/60 both eyes)	719	14.1
No PL both eyes	33	0.6
9. IOP		
< or = 20 mmHg	2,043	40.0
> 20 mm Hg	346	6.8
No data	2,723	53.3
10. Senile Cataract (SC)		
Len clear	3,500	68.5
SC (cases)	1,582	31.0
IOL both eye	30	0.5

Table 5 Comparison between number of LASER treatments during 2001-2002 before and after DR screening in community hospitals.

Year	LASER treatment (no. of cases)
2001	48
2002	57
2003	125
2004	213

medication for DM, their life expectation is longer, this increase the likelihood of getting had DR. Without any system to prevent DR, number of vision threatening or even blind patients in future may increase.

One hundred ninety four cases (3.8%) were vision threatening diabetic retinopathy (NPDR with maculopathy, severe PDR and PDR). There are increasing number of LASER treated patients from 48 cases in 2000 to 213 cases in 2004 following this pilot study.

In our study, there was high number of cataract. This might be due to an overall elderly population.

Intraocular pressure measurement and complete laboratory investigation were not conducted in all patients because there were no tonometer instrument and laboratory investigation in some community hospitals.

Diabetic retinopathy screening is a very useful program which is fit for patients in rural area who have difficulty seeking for a medical care. This program can ease the ophthalmologist in rural area to efficiently screen and treat diabetic patients with sight threatening retinopathy.

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REFERENCES

1. C.P. Wilkinson, Frederick L. Ferris III, Ronald E. Klein, MD. et al. Proposed International Clinical Diabetic Retinopathy and Diabetic Macular Edema Disease. Severity Scales Ophthalmology 2003 ; 110(9) : 1677-82.
2. Donald S. Fong, Lioyd Aiello, Thomas W Gardner, et al. Diabetic Retinopathy. Diabetic Care 2003 ; 26 : supplement : s99-s102.
3. Samaiporn S, Lerdmeemongkolchai P, Anujaree P, et al. Prevalence and risk of diabetic retinopathy in relation to duration of diabetic mellitus. Thai J Ophthalmol 2001 ; 15 : 1-8.
4. Nitiapinyasakul A, Nitiapinyasakul N. Risk factor of Ocular complication in diabetes. Thai J ophthalmol 2000 ; 13(1) : 23-33.
5. Hanutsaha P. Strategies used in Thailand for early detection of diabetic retinopathy. Thai J public Health Ophthalmol 2001 ; 15 : 167-71.
6. Ausayakul S, Jitarasatit J. Prevalence of Diabetic Retinopathy of NIDDM patient Thai J Ophthalmol ; 5(2) : 133-8.
7. Chedtaku T. Major Vascular Complication in NIDDM in Maharat Nakhon Ratchasima Province. Maharat Bulletin ; 1995 : 19(2) : 20-5.
8. Klein R, Klein BEK, Moss SE, et al. The Wisconsin Epidemiologic Study of Diabetic Retinopathy. III. Prevalence and risk of diabetic retinopathy when age of diagnosis is 30 or more years. Arch Ophthalmol ; 1984 : 102 : 527-32.
9. West SK, Klein R, Rodriguez J, et al. Diabetes and diabetic retinopathy in a Mexican-American population : Proyecto VER. Diabetic Care 2001 ; 24 : 1204-9.
10. Flegal KM, Ezzati TM, Harris MI, et al. Prevalence of diabetes in Mexican American, Cubans and Puerto Ricans from the Hispanic Health and Nutrition Examination Survey, 1982-1984, Diabetic Care : 1991 ; 14 : 628-38.
11. Haffner SM, Fong D, Stern MP, et al. Diabetic Retinopathy in Mexican-Americans and non-Hispanic whites. Diabetic Care 1988 ; 11 : 878-84.
12. Hamman RF, Mayer EJ, Moo-Young GA, et al. Prevalence and risk factors of diabetic retinopathy in non-Hispanic whites and Hispanics with NIDDM. San Luis Valley Diabetes Study, Diabetic Care 1989 ; 12 : 1231-7.
13. Tudor SM, Hamman RF, Baron A, et al. Incidence and progression of diabetic retinopathy in Hispanics and non-Hispanic whites with type 2 diabetes. San Luis Valley Diabetes Study, Colorado. Diabetic Care 1998 ; 21 : 53-61.
14. Hamman RF, Marshall JA, Baxter J, et al. Methods and prevalence of non-insulin-dependent diabetes mellitus in a biethnic Colorado population. The San Luis Valley Diabetes Study. Am J Epidemiol 1989 ; 129 : 295-311.
15. Harris MI. Epidemiological correlates of NIDDM in Hispanic, whites and blacks in the US population. Diabetic Care 1991 ; 14 : 639-48.
16. Michell P, Smith W, Wang JJ, Attebo K. Prevalence of diabetic retinopathy in an older community. The Blue Mountains Eye Study. Ophthalmology 1998 ; 105 : 406-11.
17. Leske MC, Wu S, Hyman L, et al. Diabetic retinopathy in a black population : the Barbados Eye Study. Ophthalmology 1999 ; 106 : 1893-9.
18. Rohit Varma, Mina Torres, Fernando Peria, et al. Prevalence of diabetic retinopathy in adult Latinos, The Los Angeles Latino Eye Study. 2004 ; 111 : 1298-306.
19. Jonathan C., Javit, Lloyd Paul Aiello. Cost-Effectiveness of Detecting and Treating Diabetic Retinopathy. American College of Physicians of Physician. 1996 ; 124(1) : 164-9.
20. Emily Y. Chew, Frederick L. Ferris III, Karl G. Csaky, et al. The long-term effects of laser photocoagulation treatment in patients with diabetic retinopathy : EDTRS. Ophthalmology 2003 ; 110(9) : 1683-9.

การคัดกรองภาวะเบาหวานเข้าจอประสาทตาในโรงพยาบาลชุมชน

ณัฐชัย นิธิอภิญาสกุล, พ.บ.*

อัจฉรา นิธิอภิญาสกุล, พ.บ.*

ธัญญา เศรษฐากุล, พ.บ.**

บทคัดย่อ : **ความเป็นมา :** เบาหวานเข้าจอประสาทตาเป็นหนึ่งในสาเหตุสำคัญของการเกิดภาวะสายตาลีเนืองรังทั้งในประเทศที่พัฒนาแล้ว และประเทศกำลังพัฒนา การตรวจคัดกรองและการรักษาด้วยเลเซอร์สามารถป้องกันตาบอดในโรคดังกล่าวนี้ได้

วัตถุประสงค์ : เพื่อคัดกรองภาวะเบาหวานเข้าจอประสาทตาในผู้ป่วยโรคเบาหวานชนิดไม่พึ่งอินซูลิน (Type2 diabetes) และรักษาผู้ป่วยกลุ่มเสี่ยงต่อการตาบอดด้วยเลเซอร์

วิธีการศึกษา : จักษุแพทย์จัดอบรมแพทย์และพยาบาลใน 24 โรงพยาบาลชุมชนของจ.นครราชสีมา เรื่องความรู้โรคเบาหวานเข้าจอประสาทตา ผู้ป่วยกลุ่มเสี่ยง การคัดเลือกผู้ป่วย และการเตรียมผู้ป่วยเพื่อรับการตรวจตาจากจักษุแพทย์ โดยได้กำหนดเกณฑ์ในการคัดเลือกผู้ป่วยเพื่อตรวจตา คือ ผู้ป่วยที่เป็นโรคเบาหวานมานานกว่า 5 ปี คมน้ำตาลในเลือดได้ไม่ดีหรือผู้ป่วยเบาหวานที่ไม่เคยตรวจตาจากจักษุแพทย์ จักษุแพทย์ตรวจจอประสาทตาผู้ป่วยโดยใช้เครื่องมือ Indirect ophthalmoscope ผลการวินิจฉัย และการรักษาผู้ป่วยถูกแจ้งต่อแพทย์ผู้ดูแลผู้ป่วย โดยผู้ป่วยที่ต้องรักษาโดยเลเซอร์จะถูกส่งต่อมายังโรงพยาบาลมหาราช นครราชสีมา

ผลการวิจัย : ผู้ป่วยเบาหวานจำนวน 5,112 คน ได้รับการตรวจจอประสาทตาจากจักษุแพทย์ สามารถครอบคลุมการคัดกรองผู้ป่วยในโรงพยาบาลชุมชนได้ร้อยละ 24 เป็นผู้ป่วยหญิงร้อยละ 79 ผู้ป่วยชายร้อยละ 21 อายุเฉลี่ย 55 ปี ผู้ป่วยสายตาลีเนืองรังและตาบอดทั้งสองตา ร้อยละ 14.1 และ 0.6 ตามลำดับ ตรวจพบภาวะเบาหวานเข้าจอประสาทตา 781 ราย (ร้อยละ 15.3) โดยเป็นชนิดไม่รุนแรง (mild to moderate NPDR) ชนิดที่ไม่มีจุดรับภาพเสื่อม (no maculopathy) ร้อยละ 11.2 และมีจุดรับภาพเสื่อม (with maculopathy) ร้อยละ 1.1 ตรวจพบชนิดรุนแรง (severe NPDR) ที่ไม่มีจุดรับภาพเสื่อม ร้อยละ 0.7 และมีจุดรับภาพเสื่อม ร้อยละ 1.1 ผู้ป่วยร้อยละ 0.9 เป็นเบาหวานเข้าจอประสาทตาชนิด Proliferative diabetic retinopathy ผู้ป่วยจำนวน 94 ราย ได้รับการรักษาด้วยเลเซอร์ นอกจากนี้ตรวจพบต้อกระจก 1,582 ราย โดยเป็นต้อกระจกสุก 157 ราย

สรุป : โครงการนำร่องนี้ ได้คัดกรองผู้ป่วยเบาหวานในโรงพยาบาลชุมชน โดยสามารถวินิจฉัยผู้ป่วยเบาหวานเข้าจอประสาทตาที่มีความเสี่ยงต่อการเกิดตาบอด และสามารถนำผู้ป่วยมารักษาด้วยวิธีที่เหมาะสม ซึ่งสามารถป้องกันตาบอดในผู้ป่วยกลุ่มนี้ได้ **จักษุเวชสาร 2547 ; กรกฎาคม-ธันวาคม 18(2) : 103-110.**

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