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Original Research Article

Comparison between slit-lamp biomicroscopy and fluorescein angiography in diagnosing diabetic retinopathy

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Abstract: Diabetic retinopathy is the most common diabetic eye disease and a leading cause of blindness. It is established that screening for diabetic retinopathy saves vision at a relatively low cost. Early detection of sight-threatening diabetic retinopathy and treatment with laser therapy can prevent visual impairment and most patients can be saved from major visual loss. So we have done this study to compare the effectiveness and sensitivity between slit-lamp biomicroscopy & fundus fluorescein angiography (FFA) in diagnosing diabetic retinopathy at an early stage. The study was done prospectively over a period of 1year and 8 months (01.09.2011 to 30.04.2013). Patients presented with diabetes in the department of medicine and ophthalmology was identified and diabetic retinopathy grading obtained from slit lamp biomicroscopy & FFA. A total 192 patients were examined. Grading was done using ETDRS (Early Treatment Diabetic Retinopathy Study) criteria. Patient's examination included Best Corrected Visual Acuity (BCVA), anterior segment examination, and slit-lamp biomicroscopy during mydriasis and FFA during mydriasis. A total 383 eyes were examined by two ophthalmologists for diabetic retinopathy grading on slit-lamp biomicroscopy and FFA. The sensitivity of slit-lamp biomicroscopy in diagnosing diabetic retinopathy was 89.14%, with a specificity of 93.6%. The degree of agreement kappa was 0.83 and p value (0.27) was considered statistically significant ($p<0.05$). Slit lamp biomicroscopy is a highly sensitive method for screening diabetic retinopathy grading in diabetes patients. Ophthalmologist do not need to confirm a suspected clinical diagnosis of Proliferative Diabetic Retinopathy using FFA as slit-lamp biomicroscopy proved to be comparable to angiography. So slit-lamp biomicroscopy is a useful tool in diabetic retinopathy screening. It is also cheap and can be done in diagnostic eye camp also.
Keywords: FFA; Slit lamp biomicroscopy; Diabetic retinopathy

INTRODUCTION:

Diabetic retinopathy is the most common diabetic eye disease and a leading cause of blindness. The World Health Organization (WHO) has estimated that, the number of adults with diabetes in the world would increase alarmingly from 135 million in 1995 to 300 million in 2025. In India, this increase is expected to be the greatest, nearly 195%; from 18 million in 1995 to 54 million in 2025. Studies done by the ICMR in the early 1970's had shown the prevalence of diabetes in India to be 2.5% in the urban population and 1.5% in the rural population. However, recent reports have shown the prevalence to be in the range of 12 to 14% in the urban population. Of these patients with diabetes, over 20% are expected to be suffering from diabetic retinopathy. The prevalence of diabetes in the rural population is estimated to be about 5% [1].

The relationship of diabetes mellitus and retinopathy is most interesting. It has been reported in the literature from the developed world that 20 years after the onset of diabetes, nearly all patients with type I diabetes (insulin-dependent) and more than 60% of those with type II diabetes (non-insulin dependent) will have some degree of retinopathy. Diabetic retinopathy is a leading cause of blindness amongst the working age group (<55 years old) in the industrialized countries. The emerging scenario in the developing world suggests that diabetes and blindness secondary to diabetic retinopathy may soon be a major problem in this part of the world as well. Unfortunately, India has no figures

for diabetic retinopathy as a cause for blindness as no proper survey has been carried out as yet [2].

It is established that screening for diabetic retinopathy saves vision at a relatively low cost. Early detection of sight-threatening diabetic retinopathy and treatment with laser therapy can prevent visual impairment and most patients can be saved from major visual loss [3]. Hence, screening for retinopathy is important. This should consist of dilated fundus examination of the diabetics at least once a year [2]. For any screening programme to function effectively it must fulfil certain basic criteria. Firstly, the screening test must have sufficiently high sensitivity (true positive rate) to ensure that substantial numbers of patients with sight-threatening retinopathy are not missed. Secondly, it must have sufficiently high specificity (true negative rate) to ensure that ophthalmic departments are not overwhelmed with unnecessary referrals. The British Diabetic Association proposed that any screening programme for diabetic retinopathy should have at least 80% sensitivity and specificity, and it is against these figures that any screening modality for diabetic retinopathy must be judged. Direct ophthalmoscopy alone has no role in a screening programme since the method consistently fails to meet the 80% sensitivity and specificity targets. There are two principal candidates - retinal photography (in one of its many guises), and screening using the indirect ophthalmoscope or the slit lamp biomicroscope. Photography achieved acceptable sensitivity of 89% and a specificity of 86%, whereas direct ophthalmoscopy achieved sensitivity of only 65% and a specificity of 97%. The major disadvantages of retinal photography are high capital set-up costs, difficulties in reaching all patients who need to be screened. So a cost effective method of screening for diabetic retinopathy has yet to be established, but high sensitivity and specificity are essential[4]. Fluorescein angiography is of greater value in diabetic retinopathy than other disease connected with the retinal blood vessels. The main reason for this is that in diabetic retinopathy some of the most important lesions are in the capillary bed. Capillary channels of normal size are not visible on ophthalmoscopy or on retinal colour photographs, but they can be demonstrated on good quality fluorescein angiogram[5].

The purpose of our study is to compare slit lamp biomicroscopy and fluorescein angiography in diagnosing diabetic retinopathy at an early stage.

MATERIALS & METHODS:

The study was done prospectively in the department of ophthalmology, Pt. J. N. M. Medical College, Raipur from 01.09.2011 to 30.09.2013. Patients attending ophthalmology OPD or admitted in ward with history of diabetes with or without any visual symptoms were included in this study. Patients having diabetic retinopathy with history of LASER photocoagulation or having history of diabetes with hazy media like mature cataract, vitreous haemorrhage and patients with history of hypersensitivity to fluorescein dye were excluded from the study. Total 383 eyes of 192 patients who met the selection criteria were included in this study. They were examined for visual acuity, intra-ocular pressure and posterior segment examination.

Through fundus examination of both eyes was done with particular attention to posterior pole. Slit-lamp biomicroscopy was done with Ocular 78 D non contact fundus lens for posterior pole examination and with Volk 90D non contact fundus lens for peripheral retina examination. Observations of following parameters were noted -

Media: Clarity of media was assessed.

Disc: Size, shape, margin, colour, blood vessels, optic cup, any abnormal vessels.

Blood vessels: Conditions of arteries and veins, A:V ratio, sheathing of vessels, ghost vessels, abnormal blood vessels, venous beading, venous loop, A.V crossing changes.

Macula: Foveal reflex, conditions of macula, macular oedema, macular ischemia.

Any abnormal finding: Microaneurysms, haemorrhage, hard exudate, cotton wool spot, Neovascularisation, any fibrous proliferation.

Fluorescein angiography was performed in all patient using zeiss p 450 plus visupac system and digital camera (canon). After mydriasis seven 30 degree field non-stereoscopic images was captured and graded. Field 1 is centered on the disc; field 2 is centered on the macula; field 3 temporal to the macula so that its nasal edge passes through the center of the macula. Field 4 to 7 are tangent to a vertical line passing through the center of the disc and to horizontal lines passing through its upper and lower poles[6]. Diabetic Retinopathy stage was done according to the Early Treatment Diabetic Retinopathy Study (ETDRS) criteria.

RESULTS AND ANALYSIS:

Out of 192 patients both eyes (n=382) were examined in 191 patients and in 1 patient only 1 eye (other eye excluded due to vitreous haemorrhage) was evaluated. Total 383 eyes were included in our study. Eight (4.1%) patients were suffering from type 1 diabetes mellitus and 184(95.9%) patients were suffering from type 2 diabetes mellitus. Average age of

the patients was 54 ± 10SD years, range being 22years to 80 years and median age was 55.5 years. Slit lamp biomicroscopy detected non proliferative diabetic retinopathy in 214 eyes, and proliferative diabetic retinopathy in 36 eyes. Fluorescein angiography detected non proliferative diabetic retinopathy in 222 patients and proliferative diabetic retinopathy in 42 patients.

Table -1: Comparison between Fluorescein angiography and Slit lamp biomicroscopy

Table-1			FFA			Total
			NO DR	NPDR	PDR	
BIOMICROSCOPY	NO DR	Count	117	16	0	133
		% within FFA	98.3%	7.2%	.0%	34.7%
	NPDR	Count	2	200	12	214
		% within FFA	1.7%	90.1%	28.6%	55.9%
	PDR	Count	0	6	30	36
		% within FFA	.0%	2.7%	71.4%	9.4%
Total		Count	119	222	42	383
		% within FFA	100.0%	100.0%	100.0%	100.0%

In our study Slit lamp biomicroscopy was able to detect NPDR in 55.8% and PDR in 9.4% of cases, whereas fluorescein angiography detects NPDR in 57.9% and PDR in 10.9% 0f cases. Biomicroscopy agreed in 347(90.6%) eyes and disagreed with angiography in 36(9.4%) eyes. Of the latter, 8 cases were over diagnosed and 28 cases were under diagnosed in biomicroscopy. Angiographs diagnosed 200 eyes with NPDR. Agreement with biomicroscopy was 90.1%. Six cases were graded as PDR in biomicroscopy, but angiography showed severe NPDR in those cases. This was due to intraretinal microvascular abnormalities were wrongly diagnosed as new vessels by biomicroscopy. Two eyes were graded as mild NPDR, which were graded as NO DR in angiography. Another 16 eyes graded as mild NPDR stage were misdiagnosed on biomicroscopy as NO DR. This was due to microaneurysms missed on biomicroscopy. 12 cases were graded as severe NPDR in biomicroscopy, but angiography showed PDR in those cases. New vessels were wrongly diagnosed as intraretinal microvascular abnormalities in biomicroscopy.

Considering fluorescein angiography as the gold standard for diabetic retinopathy screening and grading, the sensitivity of slit lamp biomicroscopy in diagnosing diabetic retinopathy was 89.14%, with a specificity of 93.6%. The degree of agreement kappa was 0.832 (asymptomatic standard error = 0.027), indicating a statistically significant agreement between angiography and biomicroscopy over that expected by chance (chi-square=509.953, df=4, approximate t=20.52, approximate significance 0.000).

DISCUSSION:

There are several methods of screening available for diabetic retinopathy including direct ophthalmoscopy, slit lamp biomicroscopy, retinal photography and fundus fluorescein angiography. Until late 1980s fundus photography was the standard method for grading of diabetic retinopathy and it was comparable to fluorescein angiography. In the early 1990s and after seven field stereoscopic photography and fundus fluorescein angiography had been regarded as the gold standard, the ETDRS report no 5 supported the reliability of both clinical and photographic methods to assess retinopathy. Harding S P et al. in 1995 found that fundus photography is sensitive and specific for community based screening of diabetic retinopathy and superior to ophthalmoscopy even in experienced hand [7]. Perumalsamy N et al. in 2003 had studied to develop a screening protocol for detection of sight-threatening diabetic retinopathy in south India. They found screening high-risk groups for sight-threatening retinopathy using indirect ophthalmoscopy may be a useful short-term alternative for India until retinal photography becomes affordable [8]. Prasad *S et al.;* in 2001 had studied to assess the effectiveness of optometrists as screeners for diabetic retinopathy using slit-lamp binocular indirect ophthalmoscopy through dilated pupils. The sensitivity for identification of sight threatening diabetic retinopathy was 76% and specificity 95% [9]. Khalaf S.S. *et al.;* in 2007 compared diagnostic effectiveness and sensitivity of the slit-lamp biomicroscopy and fluorescein angiography for screening of diabetic retinopathy. They found that sensitivity of slit lamp biomicroscopy was 91.2%, with a specificity of 97.9% and the degree of agreement kappa was 0.87[10].

Slit-lamp biomicroscopy is highly sensitive for screening diabetic retinopathy grading in diabetic patients. Fundus fluorescein angiography is expensive, time consuming and not readily available. In developing countries like India very small numbers of eye centers are well equipped with fluorescein angiography. So there is search for alternative methods of screening of diabetic retinopathy which is sensitive and specific and available in most of the centers. In these two studies slit-lamp biomicroscopy is highly sensitive for screening diabetic retinopathy grading in diabetic

patients. Diabetic retinopathy mainly involves the posterior pole of the eye. So it can be easily diagnose by slit lamp biomicroscopy. Fluorescein angiography is also an invasive procedure. Although the adverse reactions is seen in very minority of patients, but there is a risk of hypersensitivity reaction. On the other hand slit lamp biomicroscopy is a non invasive procedure and sensitivity and specificity also high in detecting diabetic retinopathy.

CONCLUSION:

To conclude that slit-lamp biomicroscopy is highly sensitive for screening diabetic retinopathy grading in diabetic patients. It can be taken as a screening method to diagnose diabetic retinopathy in community.

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