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Letter to the Journal

Sir,

Evaluation of Ophthalmoscopy by Non-Ophthalmologists in Diagnosing Chronic Glaucoma in West Africa

In West Africa, chronic glaucoma is a common cause of blindness, sometimes presenting at an early age, and often with complete loss of vision in one eye.[1,2] Because ophthalmic services are poorly distributed, it is important for general medical workers and ophthalmic assistants to be able to identify patients with chronic glaucoma at an early stage before there has been severe loss of vision, so that the patients can be referred to an ophthalmologist for confirmation of diagnosis and treatment.

The possible screening procedures available to identify patients at high risk of having chronic glaucoma are:

(1) measurement of intra-ocular pressure (IOP)
(2) examination of the optic disc
(3) examination of visual fields
(4) a combination of the above

Because of the practical difficulty involved in using visual fields as a screening procedure in rural Africa, and because IOP measurement alone is neither sensitive or specific as a screening procedure for chronic glaucoma, it was decided to evaluate the interobserver agreement for assessment of the optic disc by general doctors and nurses, as a possible screening examination for chronic glaucoma in West Africa.

Methods

Four observers, two ophthalmologists (one with ten years' experience in Africa, the other with eight years' experience in England), a general doctor with no post-graduate ophthalmic experience, and an ophthalmic nurse with very limited experience in ophthalmoscopy, were trained to evaluate the clinical appearances of the optic disc in a standardised way. The format was as follows:-

(1) To assess the vertical cup/disc ratio; recording it as 0.5 or less; 0.6 or more.
(2) To assess the colour of the optic nerve rim; recording it as normal or pale.
(3) To compare the cup/disc ratio between the two eyes; reporting it as symmetrical, or asymmetrical if there was a difference in cup/disc ratio of 0.2 or more between the eyes.
(4) Using the above criteria a diagnosis for each eye of, normal, optic atrophy or glaucoma was made.

After receiving instruction in how to assess the optic disc, the four observers then examined ten patients (20 eyes), and discussed the findings in these patients until agreement was reached between all four observers. After completing the training and standardisation (which took approximately two hours), the four observers then examined 50 patients (100 eyes) and recorded the findings independently without reference to each other.

The patients were examined in a semi-dark room, the optic disc being assessed through undilated pupils using a direct ophthalmoscope. The subjects were patients attending the outpatient eye clinic at Bawku Hospital in Northern Ghana, who were aged 20 or over; complained of difficulty in seeing (distance or reading); and had clear media allowing visualisation of the optic disc. This group of patients was therefore a selected group of hospital out-patients and not a random sample of the general population.

Results

The results of the inter observer agreement for

(1) vertical cup/disc ratio,
(2) colour of the optic nerve rim,
(3) comparison of cup/disc ratio in two eyes,

are shown in Table I with weighted Kappa values. The agreement between observer 1 (ophthalmologist), and observer 2 (ophthalmologist) was excellent for cup/disc ratio and

Table I *Inter-Observer Agreement on 100 Eyes Assessed by Ophthalmoscopy*

	Cup/Disc Ratio	*Colour*	*Symmetry*	*Diagnosis*
Ophth.	.92	.67	.38	.81
Doctor	.74	.73	.63	.75
Nurse	.75	.79	.22	.77

Kappa values for observer 1 (ophthalmologist) against 3 other observers (ophthalmologist, general doctor, and nurse).

FOR MOST PURPOSES:
KAPPA 0.75 indicates EXCELLENT AGREEMENT
KAPPA 0.4–0.75 indicates FAIR to GOOD AGREEMENT
KAPPA 0.4 indicates POOR AGREEMENT[6]

good for colour of optic disc, but poor for comparison between the two eyes. The agreement between observer 1, and observer 3 (general doctor) and observer 4 (eye nurse) was also good for cup disc ratio and colour, but again only poor to fair for comparison of the two optic discs.

The agreement between observer 1 and the other three observers for diagnosis was excellent. Diagnosis was based on the ophthalmoscopy findings and documented as normal, optic atrophy or glaucoma. Glaucoma included patients thought to have definite glaucoma and those patients who were suspected to have glaucoma from the optic disc appearances.

Of the 50 patients examined, 39 were considered to be normal on ophthalmoscopy. Nine were confirmed by subsequent examination, including intraocular pressure measurement, pupil response and visual acuity to have chronic glaucoma. It was not possible to perform visual fields. Two patients had non-glaucomatous optic atrophy. Of the 100 eyes examined, 80 were considered to be normal, 17 to have glaucoma and three optic atrophy.

Of the nine patients confirmed to have chronic glaucoma, all would have been referred by observer 1 (ophthalmologist), one patient would not have been referred by observer 2 (ophthalmologist), two patients would not have been referred by observer 3 (general doctor), and all the glaucoma patients would have been referred by observer 4 (eye nurse) using this system for evaluation of the optic disc.

Of the remaining 41 patients considered not to have glaucoma, none would have been referred by observers 1 and 2, three patients would have been referred by observer 3, and three patients would have been referred by observer 4, as being suspected of having glaucoma.

Discussion

Chronic glaucoma is a common blinding disease, particularly in West Africa. The patients usually present late, with 34% of patients already being blind at diagnosis.[2] Because of sparse ophthalmic services in the rural areas, it is desirable to identify one screening test by which ophthalmic assistants/nurses and general doctors may diagnose or suspect a patient of having glaucoma and to refer the patient to an eye specialist for assessment and management.

Visual field testing by confrontation test is simple, but not sensitive and only identifies gross visual field deficits, while perimetry requires the appropriate equipment and trained staff. In rural situations it is usually impossible to achieve satisfactory co-operation and reliable results for visual field testing in patients with whom communication, and understanding may be a difficulty. Visual field testing is also time consuming. It is therefore not a practical screening test for glaucoma in rural Africa.

The measurement of intra-ocular pressure can be taken quickly and reliably using indentation or applanation tonometry. However, a patient with glaucoma may have a normal intra-ocular pressure, and a high pressure may occur with a normal visual field and normal optic disc.

Assessment of the pupil light reflex may identify optic nerve disease or gross retinal pathology, but it is not a specific test for chronic glaucoma, and is of limited use in areas of Africa where optic nerve disease from other causes (e.g. onchocerciasis) is common. Loss of visual acuity is considered a late sign of glaucoma although 56% of patients with chronic glaucoma in Northern Ghana had a best acuity of less than 6/18 at presentation.[2]

Gloster has shown that the cup/disc ratio as measured from photographs of the optic disc in Caucasian patients attending an eye clinic is closely correlated with the risk of having visual field loss due to COAG.[3] He found that those individuals with a vertical cup/disc ratio of 0.5-0.59 had a one in 25 chance of having glaucomatous field loss compared with a one in five chance for those with a C/D ratio of 0.6-0.69 and two in three chance for those with a C/D ratio of 0.7-0.79.

The present study suggests that the evaluation of the vertical cup/disc ratio and colour of the optic disc can be taught quickly and reliably to a general doctor and an eye nurse who previously had limited experience with ophthalmoscopy. The inter-observer agreement on these two signs was good to excellent, but the agreement on comparison of the cup/disc ratio between the two eyes was only poor to fair. This observation is contrary to previous studies in the United Kingdom[4] and United States of America[5] in which the agreement between ophthalmologists has been shown to be poor. The reasons for this may include:

(1) the patients identified as having glaucoma in this study are likely to represent patients with later stage of disease than those assessed in studies in industrialised countries so that the diagnosis is more obvious;
(2) the patients are younger than those seen in Western countries so that there are less media opacities and visualisation of the disc is clearer;
(3) agreement is to be expected between observers when very specific criteria are used.

For example, in this study, one question asked of the observers was "Is the vertical cup/disc ratio more than a half (0.5) or not?"

Because all 50 patients did not have visual field and intra ocular pressure measurements, one cannot be sure that the 39 patients considered to be normal by ophthalmoscopy do not have early glaucoma. However, if any of these 39 patients did have glaucoma, then they were not identified by either ophthalmologist from the optic disc appearances. Two out of nine patients with definite glaucoma were missed by the general doctor and one out of nine by an ophthalmologist. The eye nurse identified all nine patients with subsequently proven glaucoma.

The assessment of the optic disc is a quicker examination than either intra ocular pressure measurement or assessment of visual fields. Evaluation of the optic disc can be performed in rural situations, requires no topical medication, nor extra equipment apart from the ophthalmoscope.

It is suggested that ophthalmic assistants and general doctors can be taught to identify patients at high risk of having glaucoma by assessing the vertical cup/disc ratio and colour of the neuro-retinal rim. This examination can be performed through undilated pupils in a semi dark room. Until further work on age specific cup/disc ratios in normal and glaucomatous West African populations is reported it is recommended that patients with a vertical cup/disc ratio of 0.6 or more, or with a pale optic nerve rim should be referred for full assessment by an ophthalmologist.

It should be realised however that some patients with early glaucoma will be missed, and some patients with physiological cupping of the disc, but no visual field loss will be referred unnecessarily. This understood, ophthalmoscopy in particular assessment of the vertical cup/disc ratio, appears to be the simplest and most reliable screening procedure available for chronic glaucoma in rural Africa at the present time.

There is need to repeat these observations in other African situations, and to define age specific cup/disc ratios for normal and glaucomatous populations in Africa.

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