

Clinical Topics

Possible new method to improve detection of diabetic retinopathy: Polaroid non-mydriatic retinal photography

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Abstract

Two retinal cameras (Canon CR2 45NM and CR3 45NM) have recently become available and are capable of producing an instant colour photograph of a 45° field of retina, including the macula and optic disc, without dilatation of the pupils being necessary. The ability of each camera to detect diabetic retinopathy was compared with that of doctors in diabetic clinics using ophthalmoscopy during busy clinic hours. The CR3 was found to be considerably superior to the CR2 in terms of quality of photograph because it can use a smaller pupil. Overall, the detection rate of the camera was more than four times higher than that of ophthalmoscopy through undilated pupils and more than twice as high as that of ophthalmoscopy through dilated pupils. Lesions missed by ophthalmoscopy but detected by the camera included soft exudates and circinate rings of hard exudates, sometimes encroaching on the macula.

Though various aspects of this system of screening for diabetic retinopathy, in particular its ability to detect new retinal vessels, have not yet been assessed, the system may prove beneficial in the detection and monitoring of diabetic retinopathy.

Introduction

While blindness due to diabetic retinopathy can now be prevented by laser treatment, owing to the inadequacy of screening procedures many patients never get the opportunity of receiving this treatment before experiencing serious loss of vision.^{1,2} The recently introduced Canon (Canon Europa NV, London) non-mydriatic, retinal cameras that use Polaroid film provide an instant colour photograph of a 45° field of retina, including the macula and optic disc, through an undilated pupil (fig 1). We assessed their potential as a means of screening for diabetic retinopathy in a busy diabetic clinic.

Patients and results

We initially assessed the Canon CR2 45NM retinal camera, which is cheaper but requires a larger pupil (5 mm) than the CR3 45NM (4 mm) camera. Patients were selected randomly during busy diabetic clinics. Those

already attending an ophthalmologist (we wished to detect those requiring referral) or with insulin dependent diabetes mellitus for less than 10 years were excluded. Their eyes were photographed (fig 2), and they underwent

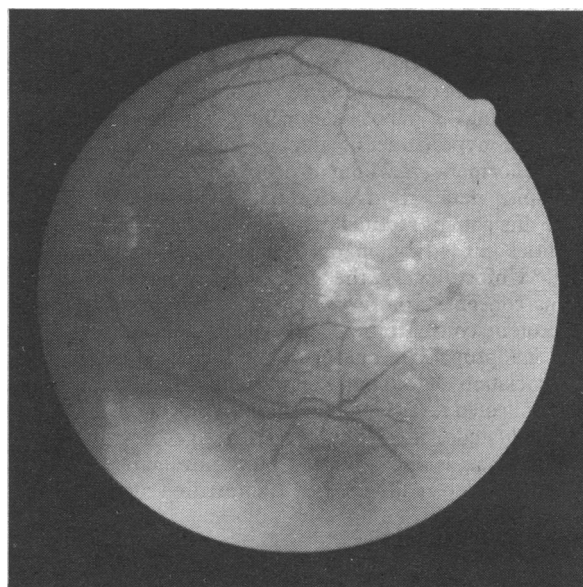


FIG 1—Reproduction of black and white photograph of colour Polaroid taken through undilated pupils with CR2 45NM camera. Though in process of creating reproduction quality has been greatly reduced and most detail lost, the field covered by camera is illustrated. Circinate formation of hard exudate encroaching on macula can still be deciphered.

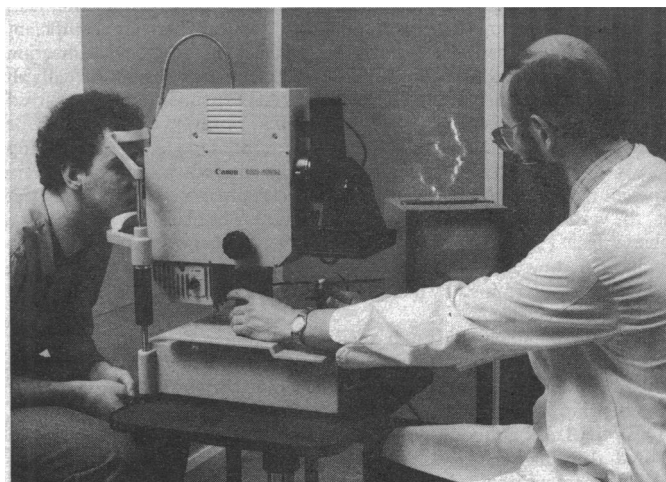


FIG 2—Canon CR3 45NM non-mydriatic retinal camera with Polaroid film back being used for retinal photography.

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conventional ophthalmoscopy through both undilated and dilated pupils, which was done by one of 10 clinic doctors. Of 137 eyes studied, 24 showed diabetic retinopathy on the photographs. In only two (8%) of these was the retinopathy detected by ophthalmoscopy through undilated pupils and in only eight (33%) was it detected through dilated pupils. When the photographs were graded for quality, however, this was generally poor (see below).

As diabetic patients tend to have small pupils due to autonomic neuropathy^{3,4} we assessed the CR3 45NM to see if this would reduce the failure rate of the photographs. For this study patients were selected randomly without exclusions but underwent photography and conventional ophthalmoscopy in the same way as in the study with the CR2 45NM. On this occasion 11 clinic doctors participated, six of whom had taken part in the previous study. The doctors, who were aware of their poor performance in the first study, did marginally better: of 90 eyes studied, 21 showed diabetic retinopathy on the photographs. In only nine (43%) of these was this detected by ophthalmoscopy through undilated pupils and in only 12 (57%) was it detected through dilated pupils. When the photographs were graded for quality and the two cameras compared the CR3 was shown largely to have overcome the problem of the CR2 (table). Both cameras detected serious lesions—namely, cotton wool spots in two eyes and circinate rings of hard exudates, sometimes encroaching on the macula, in three eyes—missed by conventional ophthalmoscopy.

Quality of Polaroid photographs from two studies were graded. Values are numbers (%) of photographs studied

Type of camera used	Unusable	Some retinal detail seen*	Fair	Excellent	Total No of photographs studied
CR2 45NM	30 (22)	56 (41)	33 (24)	18 (13)	137
CR3 45NM	5 (6)	19 (21)	29 (32)	37 (41)	90

* Substantial proportions of field were obscured, usually by dark spot as a result of small pupils.

Discussion

Diabetes is the commonest cause of blindness in the United Kingdom in people aged 30-64.^{5,6} Refinements in photocoagulation, especially in the use of the argon laser, mean that maculopathy and proliferative changes can now be treated effectively if the retinopathy is detected in time.^{7,9} As serious retinopathy that threatens the sight is estimated to be present in one in 10 patients in diabetic clinics¹⁰ and as diabetes is common and its management has many facets, diabetic clinics are busy places where ophthalmoscopy is easily overlooked or undertaken hurriedly. Our study confirms

previous observations that in practice many cases of retinopathy are missed by conventional ophthalmoscopy^{2,11} but also shows that non-mydratric retinal photography is a means of substantially increasing the rate of detection of diabetic retinopathy. Though the improved detection rate by clinic doctors in the second study suggests that with extra effort the effectiveness of ophthalmoscopy can be increased, the results indicate that even then non-mydratric retinal photography is greatly superior. Furthermore, the Polaroid photograph provides a permanent record, which could improve the monitoring of the progress of diabetic retinopathy in each patient and, for research purposes, in populations.

It is cheaper to detect and treat a patient with diabetic retinopathy than to look after a blind person.^{11,12} The likely saving, in financial terms alone, of reducing the incidence of blindness by detecting diabetic retinopathy early enough to treat could thus justify the cost of putting the CR3 45NM camera into widespread use in diabetic clinics. The cost benefit implications, the ability of the system to detect retinal new vessels, the importance of retinopathy outside the 45° field photographed, the level of training required to operate the camera, and the degree of experience in reading the photographs required for accurate interpretation, however, all remain to be assessed.

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What additional immunisations are recommended for a child travelling to Lesotho and South Africa at the age of 9 months? Should the standard vaccination schedule be accelerated and, if so, how?

In Britain it is currently recommended that the primary course of diphtheria, whooping cough, and tetanus (DPT) "triple vaccine" together with oral polio vaccine (OPV) should begin at 3 months of age. The second and third doses should follow at between 4½ to 5 months and 8 to 11 months.¹ There are many alternative regimens. The American Academy of Pediatrics, Committee on Infectious Diseases, recommends DPT and OPV at 2, 4, and 6 months.² In places where the prevalence of these diseases is high, as in parts of southern Africa, primary courses are sometimes started even earlier. The earlier the primary course is begun and the closer together the injections, the greater is the need for a booster during the second year of life, as is advised under the American but not under the British schedule. Both schedules include a booster with diphtheria/tetanus vaccine (DT) and OPV before starting school. BCG vaccination against tuberculosis is advisable for children likely to be exposed to this infection, in whom the miliary or meningitic forms may be prevented. It may be given from birth. Measles vaccination is normally administered in Britain at around age 15 months and this may be brought forward to between 6 and 9 months where measles is endemic and often severe as in many parts of Asia and Africa. Measles vaccine given at this earlier age should be followed by a booster at around 15 months to immunise those whose first dose was inactivated by persisting transferred maternal antibody.

Breast feeding should always be recommended, especially for babies in

countries where faecal/oral infection is rife. As weaning takes place and the child becomes more exposed to this source of infection typhoid vaccine should be considered and is usually begun from around 9 months to 1 year of age. Care should be continually taken to avoid ingestion of contaminated food and water so as to reduce the chance of other infections such as amoebic dysentery, for which there is no immunisation, and cholera, for which immunisation may be given from around 1 year of age but is of doubtful value as a routine measure unless in an epidemic. Normal pooled immunoglobulin may be given at any age to prevent hepatitis A for up to six months but this may be thought unnecessary in young children when the illness is generally mild and lifelong immunity would be gained from a clinical or subclinical infection. Travellers to South Africa and Lesotho will be asked for a certificate confirming yellow fever vaccination within the previous 10 years if they have come from an infected area. Vaccination is not normally insisted on for children aged under 1 year who may alternatively be subject to a short period of surveillance before proceeding to areas where transmission is possible. In addition to efforts aimed at avoiding mosquito bites, prophylactic tablets to prevent malaria should be taken from birth by travellers to certain areas of South Africa, principally the northern border and north east coastal districts.—ERIC WALKER, lecturer in infectious diseases, Glasgow.

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