A method for fundus evaluation in children with oral fluorescein

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SUMMARY A procedure is described for the ophthalmoscopic examination of the fundus in children after 1% or 2% oral fluorescein ingestion without sedation or anaesthesia. No major complications or any allergic reactions were observed. In the ophthalmoscopically normal fundi of the five healthy children studied the fluorescence of the nerve head and retinal blood vessels could be visualised at 15 minutes, increasing at 30 minutes, and declining by 60 minutes. The possible problems of the technique are discussed.

Fluorescein angiography is undoubtedly a valuable investigative procedure in children, especially for the diagnosis of early papilloedema. For obvious reasons intravenous administration of fluorescein should be avoided if possible in these young patients. Peroral administration of the dye has been described, mostly in older patients. The present study is an attempt at standardising the procedure in infants and small children.

Materials and methods

The parents were explained about the purpose, procedure, and the possible side effects of the test. They were informed about the expected temporary yellowish discoloration of the skin, eyes, nails, and urine after administration of the dye and the known fallacies in certain laboratory estimations such as of blood sugar. The possibility of the older children complaining of yellowish vision was also explained. The investigation was undertaken only after we had obtained the informed consent of the parents.

The parents were instructed to keep the child fasting for two to three hours prior to reporting. The time depending on the age of the child. being shorter for younger children. The pupils were adequately dilated by alternate instillations of 5% or 10% phenylephrine and 2% homatropine drops every 15 minutes over one hour.

10% sodium fluorescein (Ophthalmic and Drugs Co., Bombay, India) used for human intravenous fluorescein angiography was diluted to 2% by adding orange-flavoured soft drink. Acceptable palatability was ensured by pretasting it. This solution was then administered to the child at a dosage of 25 mg/kg body weight. No sedatives or anaesthetics were given. Prior antihistamines were not necessary. The diluted dye was given as a fluid for the child to drink or suck from a feeding bottle—spoonfeeding was helpful in some smaller children. Depending on the total dosage of fluorescein dye required and the palatability of the mixture a 1% solution was also employed when necessary.

Initially five healthy children aged between 6 months and 5 years with no detectable fundus lesions were studied by this technique. Subsequently 23 more cases clinically diagnosed as pseudo-papilloedema and of 'suspected' and 'incipient' or 'early' papilloedema between the ages of 1 month and 10 years were investigated by oral fluorescein.

During the fundus examination we concentrated on the posterior polar region with special reference to the optic nerve head and its fluorescence. The optic discs and major blood vessels were examined by the reduced and brighter illuminations of the Keeler binocular indirect opthalmoscope with the standard blue Wratten filter supplied with it. The examination was undertaken initially, and later at 15, 30, and 60 minutes after ingestion of the dye. In eyes with disc oedema, studied subsequently we focused our attention on detecting any late staining of the disc and peripapillary area. If the child co-operated, fundus photographs before and after oral fluorescein were also obtained when possible at the same time intervals.

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Fig. 1A

The fluorescein fundus serial photographs at 30 and 60 minutes of the right eye in a normal child after 2% oral fluorescein. Note the easily visible fluorescence of the disc (more at the margins) and the large retinal blood vessels at 30 minutes (A), markedly declining at 60 minutes (B) with the dye localised mainly to the venous side of the circulation. The disc margins are well defined.

Fig. 1B

The faint degrees of fluorescence were much better detected with reduced levels of illumination.

After oral fluorescein the initial angioscopy of course did not reveal the dye in the retinal blood vessels. At 15 minutes the dye could be visualised, and at 30 minutes the dye was observed to be fairly evenly distributed in the retinal vessels (Fig. 1A). At 60 minutes the dye was less pronounced in the vessels, and was mainly localised to the venous side of the circulation (Fig. 1B).

Our results in the eyes subsequently investigated with clinical diagnoses of early papilloedema or pseudopapilloedema will be detailed later.  

Discussion

Though oral fluorescein angiography has been recommended in certain types of cases, 1,2 the problems and patience required in examining children by this test are obvious. Not the least of them is the difficulty in administering the drug. An acceptable vehicle may have to be found, and the container may vary from a feeding bottle to a spoon or a glass; even administering the liquid through a Ryle’s tube may be considered as a possibility. The palatability of the mixture is obviously important, though an adequate concentration must be attained. The dye solution was administered on a virtually empty stomach to ensure better and quicker absorption.

We found that a dosage of 25 mg/kg body weight in 2% or 1% dilution was acceptable, safe, and effective in the children studied. One of the two who vomited may not have done so because of the dye administered, and in both these children the test could be
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successively performed after three days with 1% dye concentration. Though a higher dosage may probably be used, its possible side effects and toxicity in children are not yet clearly established.¹

Whatever may be the concentration of the dye administered orally, the 'bolus effect' of intravenous injection cannot be achieved, though it has been shown earlier that the 30 minutes serum levels after intravenous and oral administration are similar.¹ The concentration of fluorescein within the blood vessels, however, was sufficient to make them faintly visible angioscopically by 15 minutes after ingestion. The vascular (and optic nerve head) demarcation was satisfactory by 30 minutes (Fig. 1A), and declined consistently in the normal fundi by 60 minutes (Fig. 1B).

The comfortable examination of the fundus in such young children even after intravenous fluorescein would demand a fairly prolonged anaesthesia, or at the best a repeat anaesthetic administered after 30 minutes. For most children requiring this investigation such an anaesthetic would surely be less desirable.

There are obvious problems in the satisfactory assessment without anaesthesia of the child's fundus after dye administered orally. A standard fundus fluorescein camera may be feasible for the older and more co-operative children. A suitable hand-held fundus camera may be employed with the child supine, but this again usually requires general anaesthesia. Photographic recording also has its own problems and sources of error.⁴ A possible alternative is fluorescein funduscopy with the recommended blue filter. Both direct⁵ and binocular indirect ophthalmoscopes may be useful, though we have used the latter with a +14·0 D condensing imaging lens for optimum magnification and stereopsis.

The definition of the dye on funduscopy should theoretically be much sharper if a green barrier filter can be incorporated in the observation system. This should eliminate the practical problem of pseudo-fluorescence and assist a more sensitive and reliable detection of even the faintest level of fluorescence after oral administration of the dye. Till the incorporation of such a barrier filter is practicable, we would recommend using reduced levels of illumination. The optimum intensity of illumination would have to be standardised by the individual clinician on his available apparatus.

Oral fluorescein is hardly ideal for a detailed study of the retinal vasculature. Its main clinical uses remain the detection and localisation of 'late' fluorescence or 'leaks', as from the abnormally permeable blood vessels, macular lesions, and disc oedema. We have found our method of fluorescein funduscopy to be helpful, with emphasis on 'papilloscopy'. Our experiences with oral fluorescein as a diagnostic aid in suspected and incipient papilloedema will be discussed subsequently.⁶

References

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