A Modified Technique of Fluorescein Angiography

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Introduction

A Fluorescein Angiography Technique has been in use at the Royal Hobart Hospital for the past three years, which is somewhat different to that which is in routine clinical practice. The technique has been found to be somewhat superior in some respects, and is presented for information.

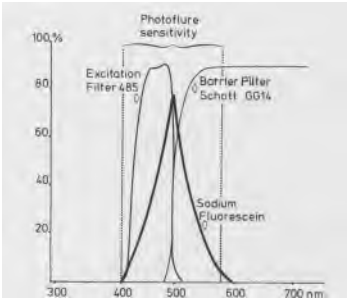

Fig. 1: Transmittance curve for Zeiss interference filter and Schott GG 14 filter.

Technique

A Zeiss Fundus camera is used with a modified flash unit with instant recycle, a Nikon F2 camera body, a remote control foot switch operated motor drive and heavier relays to cope with the demand of constant recycling by the motor drive. The flash output is 120 watt per second.

An injection of 25% fluorescein (Alcon-Fluorescite) is given. The exciting filter is a 485 nm interference filter supplied by Zeiss with peak transmission of 90%, band width from 420 and 480 nm and cutoff at 500 n m. The film used is Kodak's Photoflure film which is a high resolution, high speed blue/green sensitive emulsion. The sensitivity curve of the film is shown in Fig. 1. This particular film and filter combination has been selected because of their matching qualities. The barrier filter used is a Schott GG 14.

The injection is made in a pre-cubital vein with a 19 gauge butterfly needle and 5 mls. of 25% fluorescein. A tourniquet is applied to the arm and the veins below the arm are allowed to become congested. The injection is accomplished in one (1) bolus and the tourniquet is then released as soon as the picture taking is commenced. The effect of the sudden release of the tourniquet is that there is a quick venous return back to the heart from the upper limb and this achieves a high wave front dye concentration.

Processing is done in D19 for two (2) minutes at 22° centigrade. Great emphasis is placed on the early films as this technique works better in the interpretation of early rather than late films, because of the extreme sensitivity of the film. The advantages, we feel, of this system are:

1. That because of the film sensitivity, a lower flash setting can be used than is usual and this is much more conducive to patient comfort;
2. The photographic advantage is the high resolution as can be seen in Figs. 2 to 4, and the high contrast photographically;
3. The rapid flash recycle which is possible.

These factors combined, eliminate unspecified tissue fluorescence and of course, the remainder of the visual spectrum except where the dye is fluorescing. The high resolution is particularly helpful in the visualization of capillaries.

Clinically, there is advantage in the better visualisation of areas of capillary dropout such as in diabetic retinopathy and the peri-foveal area, and the resolution of capillaries on the disc head. Vessel wall details are well seen especially in the early frames as well as vein staining on the later frames. High contrast angiography produces an easier interpretation of angiograms because of the absence of confusing background information.

A minor disadvantage of the technique is that the grain structure is slightly higher than that of Tri-X emulsion, but this

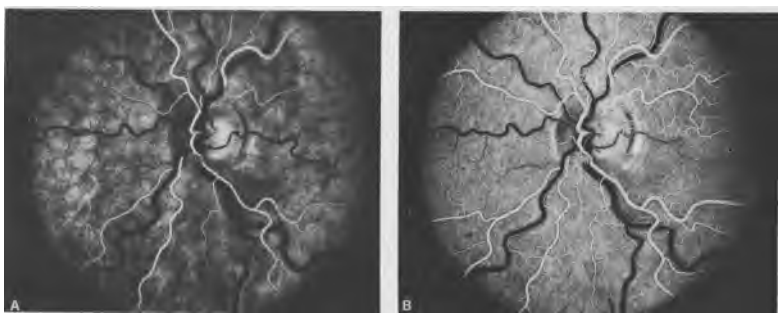

Fig. 2A: Angiogram 1: A very early fluorescein angiogram with capillary filling in the disc and retina. The choroid is filling while the entire retinal circulation has not filled. Note the fine capillary vessels which are seen silhouetted against the background of the fluorescence in the arteries. This demonstrates the importance of capturing the early filling stages and shows up the capillary network almost by "retro-illumination" against the fluorescence. These very early vessels have not filled at this stage but will become filled as the fluorescence diffuses through the arteries, arterioles and into the capillary network.
Fig. 2B: Angiogram 2: The same patient in a later sequence with well defined filling of the arterial system. There is fine resolution and contrast in the capillaries on the disc here which are filled by the retinal circulation.

only applies if positives are required. However, as we read directly from the negatives and find no necessity for black and white prints, this problem is obviated.

It has been found with this technique that the results in the early frames are better than the lates ones. The accuracy of interpretation of the early angiograms has meant that the need for late films has been considerably reduced thereby reducing the time required for the examination. The late films, as achieved with this technique, are not particularly helpful because the emulsion is so sensitive that a lot of the information seen with the use of the less sensitive emulsion becomes blurred by the diffusion of dye in the vitreous cavity. There is no increased incidence, in our opinion, of nausea or vomiting with 25% Fluorescein as opposed to lesser concentrations and strengths that we have previously used.

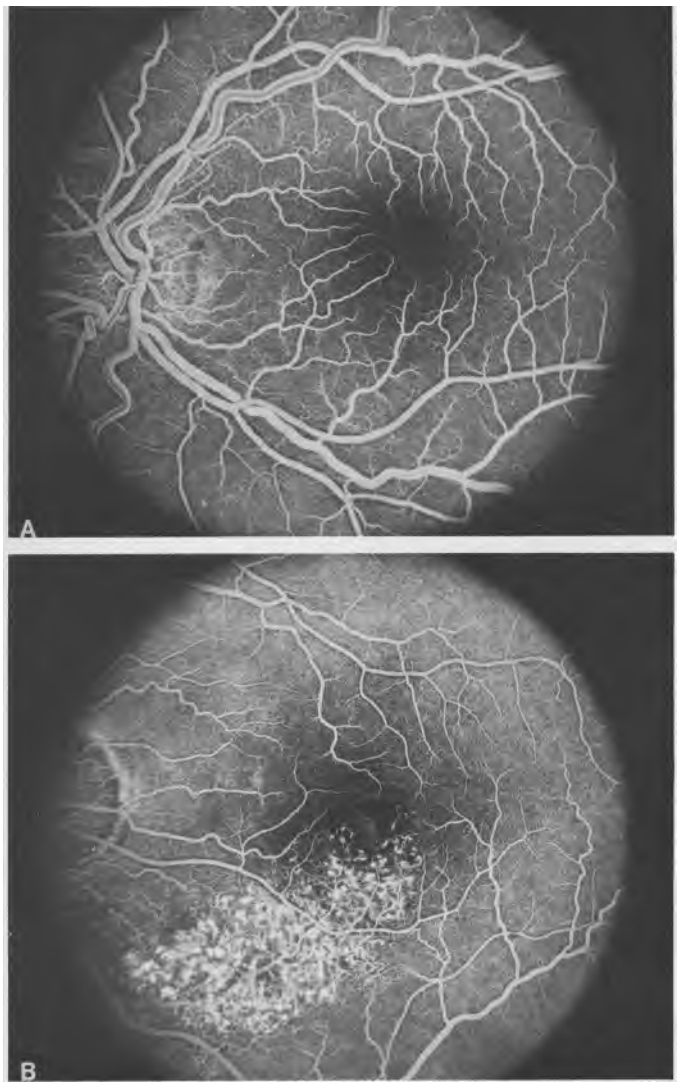

Fig. 3A: Angiogram 3: The peri-foveal capillary network with a high degree of resolution.
Fig. 3B: Angiogram 4: Areas of capillary dropout and an early cystoid macular edema which is forming subsequent to a twig vein occlusion.

Summary

Our technique as described, uses a combination of a much modified Zeiss Camera, Photoflure film, a 485 Zeiss Filter and an injection with 25% fluorescein. We feel that this technique has certain distinct advantages over other techniques that we have used in the past. There is a high photographic resolution and contrast which aids in the interpretation of fluorescein angiograms in our hands.

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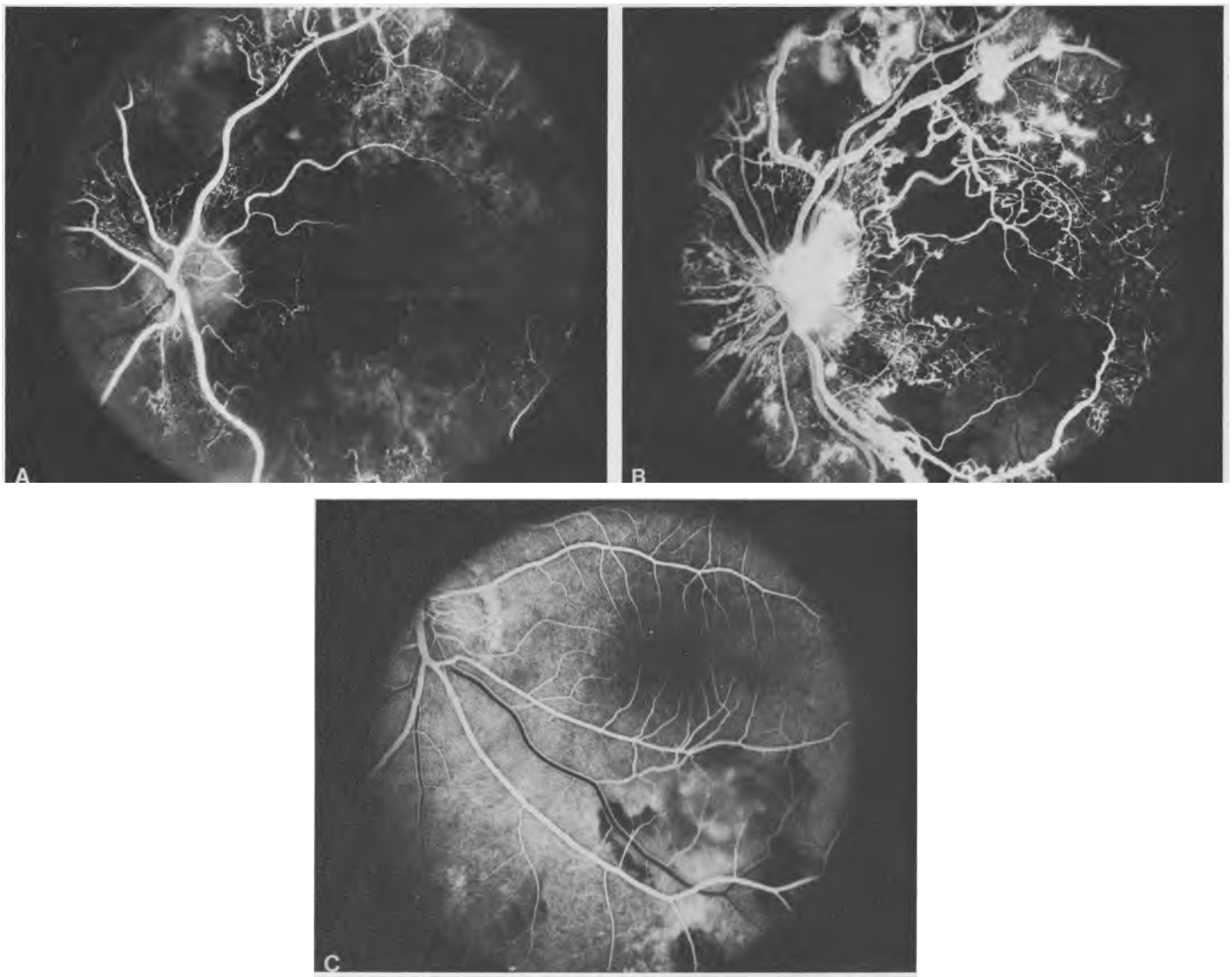

Fig. 4A: Angiogram 5: Gross irregularity of diabetic affected vessels with endothelial distortion. The very early filling of the microaneurysms demonstrates clearly the atrophied areas of capillary network, some of which can be seen as silhouettes against the early filling of the retinal arterioles. The areas of capillary dropout are very gross and are easily seen. The areas of pre-retinal neovascularization can be visualized in the early phases of the angiogram.

Fig. 4B: Angiogram 6: The same patient a few frames on in the sequence and which confirms the information which can be clearly seen on Angiogram 5. This patient tends to confirm that much of the information which is required using this technique can be achieved in the first few frames.

Fig. 4C: Angiogram 7: An area of subretinal neovascularization below the fovea. The area is filling from the choroid. This technique is particularly sensitive in the diagnosis of sub-retinal neovascularized membranes.