Transilluminator using fibre ray lighting

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The technique of transillumination was first described over a hundred years ago by von Graefe (1868) in the detection of tumours. It is infrequently used but also has some value in certain other cases.

These include the localization of embedded foreign bodies in the wall of the eye or vicinity (Vannas, 1948).

It has been used to locate the site of incision in glaucoma by the method of Minsky (1950) emphasized by Drance and Schneider (1963). In this procedure the area of the surgical limbus is defined by sclerotic scatter by applying a light to one part of the sclera.

It has been used in the extraction of non-magnetic foreign bodies embedded in the sclera (Moron-Salas, 1963) and for various surgical procedures on the ciliary body.

All these manoeuvres could be improved if the light source could be increased, but until recently this has been impossible because of the limitation of size of the electric bulb at the tip of the probe and by danger of burning if the light source were increased by conventional means.

The ideal instrument, which would contain a light source at its tip of very high intensity and yet be absolutely cold, can now be obtained by fibre ray lighting.

Construction

The principle of fibre ray lighting is not, of course, new and has been known for over 30 years. It is a system for transmitting intense, cold, shadowless light by internal reflection. Fig. 1 shows an individual fibre made up of a core (A) and an outer layer (B). The light enters the end of the fibre from the light source and by a series of reflections emerges at the other end. The whole rod is made up of a large number of individual fibres; a 1 mm. diameter bundle would contain about 10,000 fibres.

FIG. 1 *Diagram of an individual fibre*

The intense light is generated in the light box (Fig. 2) and is transmitted through the flexible cable to the probe.

FIG. 2 Generator with flexible tube, through which light passes like water through a hose pipe

The principle has already found use for gastroscopes, otoscopes, bronchoscopes, and cystoscopes, and there thus seems to be no reason why it should not be used for an ophthalmic transilluminator.

For ophthalmic use the following probes have been developed:

Type 1 (Fig. 3—above) is curved with a final diameter of 0.5 mm.

Type 2 (Fig. 3—below) is straight, but the light emerges at right angles with a final diameter of about 1.5 mm. This straight probe has proved the more satisfactory for retinal detachment surgery. Its method of use is shown in Fig. 4.

FIG. 3 Probes for ophthalmic use. Above—curved probe, from which ray emerges with diameter of 0.5 mm. Below—straight probe, from which light emerges at right angles with diameter of 1.5 mm.

FIG. 4 Method of using straight probe

Method of use

The most important use of this transilluminator would be in the field of retinal detachment. Despite surgical improvements with the implanting of inert materials to reduce the volume of the eye, it is still just as important to be able to locate a retinal break or tear. It is often

not satisfactory to obtain this location by estimation and clearly it would be of great value if a source of light could be applied externally, its position noted by viewing through the pupil, and adjustments made to coincide with the position of the retinal break.

It has been noted in the past that light, after traversing the sclera, is subject to considerable scattering; this phenomenon is also apparent when using the improved light, but nevertheless the transilluminator has been used with excellent results in localizing the hole. There is some degree of light scatter but the central area of intensive light is easily seen. The light probe can be adjusted by the assistant and when it is over the hole, as seen by direct view through the pupil, its position can be marked by inserting a sharp hook in the sclera.

This method of transillumination appears to be equal if not superior to other methods, such as indentation or estimation.

Summary

A transilluminator using fibre ray lighting is described and discussed. Its possible uses in ophthalmology are briefly considered, especially its value in locating the hole in retinal detachments.

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Addendum

Since the submission of this article, Amoils (1968) has published details of a combined cryoprobe and light source. The principle of the light transmission is, of course, similar, but the simple light probe as described above may be considered more versatile and can be used with existing cryo-units.