Preliminary Communications

Is There a Hazard in Laser Photocoagulation?

Brit. med. J., 1966, 1, 719

The use of ruby lasers to perform retinal photocoagulation has been described by several authors—for example, Zaret *et al.* (1963)—and successful treatments have been claimed by Campbell *et al.* (1965) and others.

The advantages of lasers for this procedure are that they can be held in the hand, as they are the size of an ophthalmoscope, and the length of the light pulse is less than one millisecond. This makes it possible to treat out-patients without anaesthetics of any kind.

The light output of a laser is quite unlike that of a conventional arc coagulator; it is highly monochromatic, coherent, and very intense. These factors, together with the short pulse-length, cause the power density of a focused laser beam at the

Photographs of oscilloscope tracings showing ultrasound detected by a small piezoelectric transducer attached to the eyeball of a rabbit during laser photocoagulation. The upper trace shows the recorded ultrasound when the laser was fired into the eye, and the lower trace shows the effect of firing at the eyelid. The central white block shows the duration of the laser pulse, and the laser output energy was enough to produce a moderately sized clinically usable lesion. The time scale is 100 μ sec. per division.

retina to be very high. This being so, the laws of classical physics may not apply and a number of effects other than simple heating might occur. Amar *et al.* (1964) have demonstrated the production of ultrasound when certain biological tissues are exposed to laser radiation; a result predicted from consideration of the higher power densities present. They were also able to detect ultrasound with a transducer attached to the occipital bone of a rabbit when a laser was fired into either eye. The experiment described below confirms their findings and localizes the area of ultrasound generation to the coagulation site.

With the use of a small piezoelectric transducer attached to the equator of the eyeball of a rabbit, bursts of ultrasound have been recorded during coagulation of the retina by laser light. The upper trace in the accompanying figure shows a record of this ultrasound. When the laser beam was directed at one of the eyelids or the sclera to act as a control the amplitude of recorded ultrasound was reduced to about a twentieth, as is shown in the lower trace. The speed of propagation and frequency (approximately 100 kc./s.) of this wave indicate that it is indeed ultrasonic.

Zaret (1965) has warned that the peculiar nature of laser light might represent a hazard to the tissues of the eye—not only to the lens, but also the vitreous and retina. With such high energy concentrations electromagnetic molecular disruption might occur with unexpected results. What effect such phenomena could have on biological tissues is not known.

The detection of ultrasound justifies Zaret's warning, for the retina and vitreous near a coagulation site must be mechanically disturbed, and this would appear to be the antithesis of what is required in a prophylactic operation. Further laser photocoagulation should only proceed with due caution.

This work was carried out with the financial support of the Medical Research Council.

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Medical Memoranda

Pancreatic Fistula after Penetrating Wound of Abdomen

Brit. med. J., 1966, 1, 719–720

Pancreatic fistula after penetrating wounds of the abdomen is extremely rare in civilian practice and a search of the literature has failed to reveal any reported case. Even in wartime such injuries are uncommon, and in a review of penetrating abdominal wounds of the second world war Gordon-Taylor (1953) found that the incidence of pancreatic injury was the lowest among all abdominal organs.

Pancreatic injury due to compression against the vertebral column in closed injuries of the abdomen is commoner, and in

many cases a pancreatic cyst is eventually formed. In a survey of 723,397 surgical cases at the Mayo Clinic, Judd, Mattson, and Mahorner (1931) found that the incidence of pancreatic cyst after closed trauma was 1:40,000. Most cases of pancreatic fistula follow surgical treatment of these cysts.

In pancreatic injuries concomitant damage to other abdominal viscera, the portal system, vena cava, or aorta is usually severe and relatively few patients reach the operating table or survive operation. In view of the rarity of these injuries, we feel that the following case merits presentation.

CASE REPORT

A 13-year-old boy was admitted as an emergency on 29 May 1964, having been stabbed several times in the chest and abdomen