Beam obstruction hazard on Q-switched Nd-YAG ophthalmic lasers: a safety device for the Nanolas laser

Sir,—Short pulsed neodymium-YAG lasers are now commonly employed for a wide range of outpatient ophthalmic procedures, and some important safety aspects have been considered elsewhere.1,2 We have recently identified a further potential hazard which applies to the Nanolas Ophthalmic Laser System manufactured by Biophysical Medical SA.

The problem is that the slit-lamp lighting system can be positioned by the operator in such a way that it partially obstructs the laser beam. As far as the operator is concerned this is manifested solely by a slight diminution in intensity of part of the aiming beam system, and it may not be noticed because the operator’s attention is primarily directed towards focusing on the structure to receive treatment. When the laser is fired under these conditions, photo disruption may not occur and the operator is liable to increase the power level to produce the desired effect. Thereafter, should the operator move the slit-lamp illumination system so that it no longer obstructs the laser beam, excessive power levels may be delivered to the eye, with predictable adverse consequences.

To prevent this situation from arising we have developed a safety system which prevents the YAG laser from being fired if the slit-lamp is within the region where it could mask the laser beam.

SAFETY SYSTEM

The system which we have developed is illustrated in Figure 1. A housing has been fitted to the main column of the optical system. This contains a series of microswitches which are activated by a collar which is fitted round the barrel of the slit-lamp. As the lighting system is moved into the zone where it obstructs the laser beam, the collar depresses a trigger bar on the housing, which in turn operates one of the safety system microswitches. This prevents the laser from being operated. The safety switches are ‘closed’ under the ‘no danger’ condition. Hence any break in the additional wiring will cause the system to fail safe.

DISCUSSION

The safety system described does not interfere in any way with either the slit-lamp or the optical or delivery systems. It is very easily fitted and requires only a small amount of additional wiring. No engineering work is required on the actual machine apart from drilling a hole to take an electrical socket. One of the criteria which had to be met by this system was that it should not pose any restriction on the movement or position of the slit-lamp, so that the slit-lamp may be used independently of the laser, and that it should prevent the firing of the YAG laser only if the illumination system entered the exclusion zone. An alternative to a cut-out switch would be an alarm which could sound either when the slit-lamp is in the exclusion zone or when the ‘fire’ button is depressed. We believe that this hazard is not confined to the Nanolas system, and other YAG units in which the height of the slit lamp can be adjusted could have a similar problem.

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Figure 1 Safety system fitted to Nanolas ophthalmic laser. 1. Microswitch housing. 2. Collar on slit-lamp barrel. 3. Microswitch trigger bar.