BRITISH JOURNAL OF OPHTHALMOLOGY

Editorial

Laser beam clipping: two aspects and a safety device

In this issue we publish two different aspects of the laser beam clipping problem. To those of us who perform a modest amount of laser work the irritation of periodic apparent failure of the laser to act is soon explained by some kind and more experienced colleague as beam clipping. For those who find the phrase obscure it may be expressed in more familiar terms as something getting in the light. Beam clipping occurs in circumstances other than lasering. It happens, for example, when we look into another person's eyes and see their pupils black. This is because our own head has beam clipped, not to say beam blocked, the rays of light entering the pupil which are needed to enable us to view the retina. This state of affairs is avoided by the device of a mirror with a hole in it in the direct ophthalmoscope or by the subtler approach of throwing a real image of the pupil into space in front of our own eyes, as in the various indirect systems. As explained in the papers from Woon *et al* and the letter from Moseley *et al* in the present issue, several forms of beam clipping are possible during the use of therapeutic lasers.

Iris clipping, which is dealt with in the paper by Woon *et al*, is not something which would be immediately obvious, and thus we are grateful to the authors for bringing it to our attention. The essence of it is a disproportion between the cross-sectional area of the beam as it traverses the pupil and the size of the pupil itself. It would seem obvious that if the area of the beam is greater than that of the pupil some of the incident light will fall on the iris and only part of the beam will enter the eye. Where the beam has a markedly convergent form, as in the Microlase infrared diode laser, and is aimed at the retina, the beam's cross sectional area at the level of the pupil is likely to be large, hence beam clipping may occur. The same will not be true if the laser is aimed at a point on a plane near the pupil such as the lens capsule.

Woon *et al* make a further point. When an ophthalmoscopic lens of considerable power is being used, say the 90 dioptre

lens, the viewing aperture in the pupil is limited (a detailed explanation is given in the paper), so that the laser beam may be suffering iris clipping without the observer being aware of it. It has to be remembered that in addition to possible beam clipping due to the cross sectional area of the beam being bigger than the pupil, clipping will also occur if the beam is not aimed accurately through the pupillary centre, an error which, according to the authors, is easy to make and difficult to avoid.

The practical consequence of these observations is that less power arrives at the retina than predicted by the power settings (and this may be further complicated by inadvertent alterations in spot size, due to a combination of steep vergence and unintentional defocusing, altering the power density at the retina). As the authors point out, the practical remedy is to work with the widest possible pupil but even with this precaution unnoticed beam clipping can still occur owing to the beam not being directed accurately through the pupillary centre.

Apart from this optical form of beam clipping a purely mechanical form is produced by inadvertent interruption of the incident laser beam by the slit-lamp lighting system. The clipping may not appear to affect the aiming beam, so that the observer may be unaware of what is happening and may therefore increase power settings because of the clipping of the main laser beam, thus subjecting the eye to an overdose of laser if the illuminating system is moved slightly and the laser beam unclipped. (It has to be admitted that somewhat the same type of problem can arise from tilting of a tall contact lens or even the interposition of the observer's thumb.) Moseley *et al* describe an ingenious safety device they have developed for the Nanolas laser to inactivate the laser if clipping by the slit-lamp illuminating system occurs, though their device cannot cope with the observer who puts his or her thumb in the way.

REDMOND SMITH