Clinical Surgery

THE EYE

CONSULTANT EDITOR

SIR STEWART DUKE-ELDER

CLINICAL SURGERY—2

THE EYE

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CLINICAL SURGERY

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PREFACE

This volume is intended to present a short but yet relatively complete description of the more common ocular affections. It is not the intention to go into elaborate detail or to describe unusual conditions that are rarely encountered in practice; its aim is rather to present a broad outline of each clinical picture with the main essential of its diagnosis and treatment. In all cases particular attention has been given to recent views so that an up-to-date assessment will be available for the practitioner. In the discussions of treatment the medical aspects are particularly stressed; the indications for surgical intervention are discussed at some length but the minutiae of surgical techniques are omitted. For these the corresponding volume in the complementary series on *Operative Surgery* should be consulted.

Institute of Ophthalmology
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REDMOND J. H. SMITH

OBJECTIVE EXAMINATION

Inspection of the Eyes and Eyelids

Position of the globes

The position and general appearance of the eyes and lids should be noted. Parallelism of the eyes should be confirmed by asking the patient to look at a light held in the examiner's hand; its reflection in the cornea should be approximately in the centre of each pupil.

Any tendency to proptosis (exophthalmos) should be looked for: this may be bilateral and equal, bilateral but unequal, or purely unilateral.

Pathological bilateral equal proptosis is difficult to distinguish from naturally prominent eyes and here the history will be particularly important. Prominence of the eyes which has been life-long is unlikely to be pathological except in certain rare anomalies of cranial ossification (the craniostenoses), or when there are enlarged eyeballs, as in extreme myopia or much more rarely in buphthalmos (infantile glaucoma). If bilateral proptosis is associated with swelling of the eyelids, retraction or lagging of the upper lid and inflammation of the conjunctiva is more likely to be pathological.

Unequal or unilateral proptosis are much more likely to be pathological, particularly if one eye is 3 mm. or more in advance of its fellow. Exceptions to this occur where the configuration of the face shows marked asymmetry or where one eye is markedly short-sighted.

A comparison of the prominence of one or other eye is best made by sitting the patient down and looking at the eyes from above and behind (*Figure 1*). Measurement of the degree of proptosis may be effected by an exophthalmometer, or more simply by measurement of the distance between the plane of the outer orbital (bony) margin and the anterior surface of the cornea by means of a plastic ruler viewed from the lateral aspect. A rough guide as to whether an eye is abnormally prominent is given by holding a straight-edge placed against the superior and inferior orbital margins; it will just touch or just miss the anterior surface of the cornea if the eye is in its normal position (Last, 1961).

Position of the lids

Ptosis or drooping can be seen by simple inspection. There are a variety of causes, the commonest of which are congenital deformity, paralysis of the third cranial nerve or paralysis of the sympathetic nerve supply. Associated signs of paralysis of these nerves should be looked for and in this respect the

pupillary reactions may give useful information. Simple measurement of ptosis may be effected by measuring the distance between the upper or lower lid of each eye or by comparing the proportions of each pupil covered in the primary position of gaze if the pupils are of equal size.

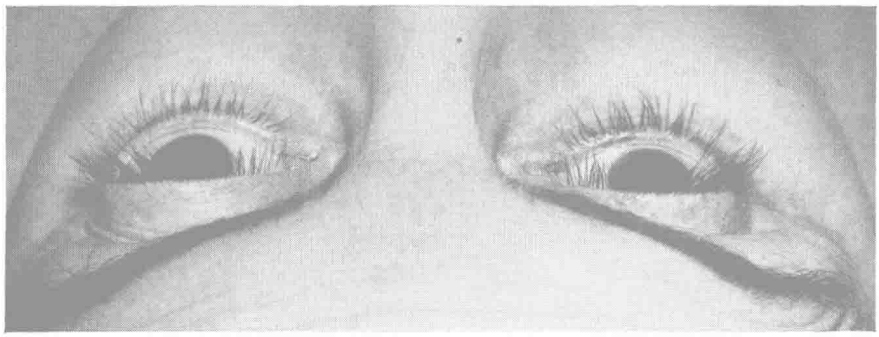

Figure 1.—View of the eyes from above in a patient with slight proptosis of the left eye.

Retraction of the upper lid, an important sign in endocrine exophthalmos, is suggested by an exaggeration of the orbito-palpebral sulcus of the upper lid or a distinct lagging of the upper lid on downward gaze.

Ectropion, turning out of the ciliary margin to expose the palpebral

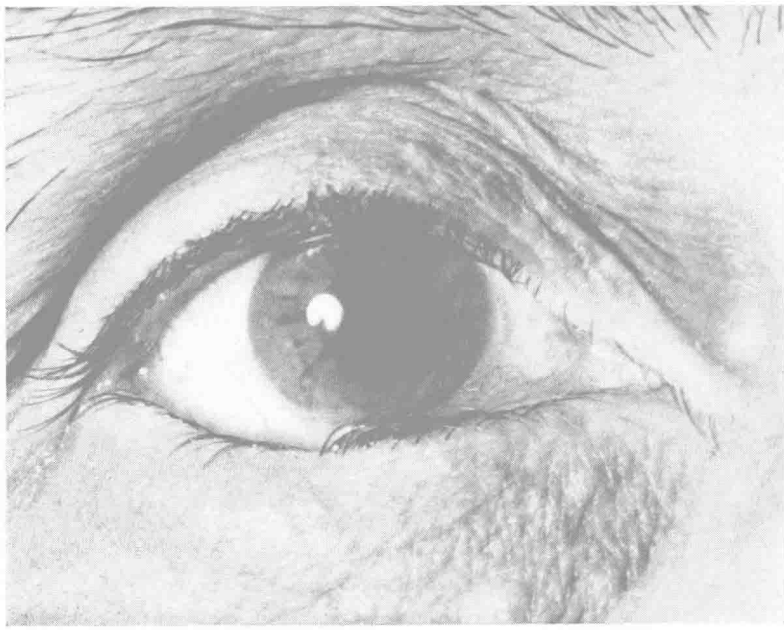

Figure 2.—Entropion of the lower eyelid.

conjunctiva, or entropion (*Figure 2*), inturning of the ciliary margin so that it disappears from view, can be verified by simple inspection.

Signs of inflammation

Conjunctival injection (*Figure 3*), the principal sign of conjunctivitis, is of a brick red or scarlet colour, is often accompanied by some mucopurulent or purulent discharge, tends to be generalized over the globe and inner surface of the lids but a little less intense near the limbus and, particularly in cases caused by infection with bacteria, soon becomes bilateral. It is not usually accompanied by pain, although there may be moderate discomfort and the visual functions remain unimpaired.

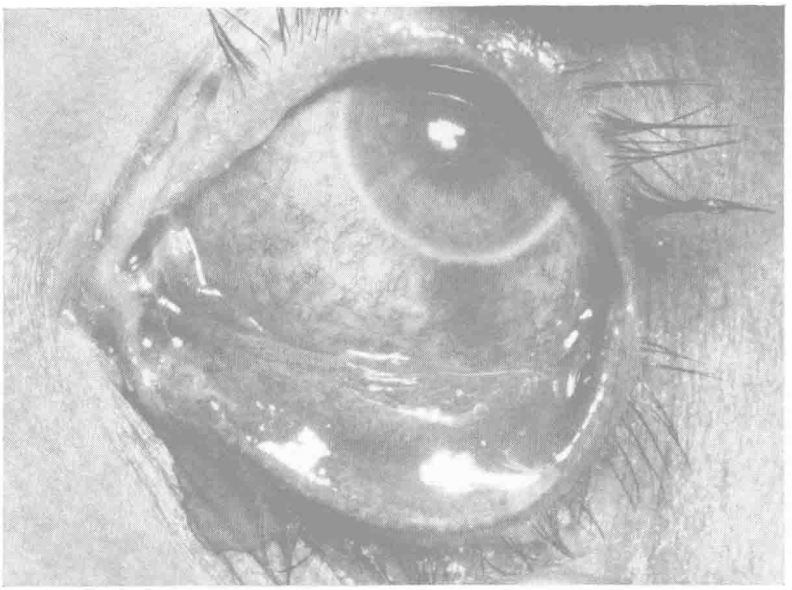

Figure 3.—Conjunctivitis—note the increased injection of conjunctival vessels in the periphery of the globe compared to the part nearer the cornea. The conjunctiva lining the lid is also intensely inflamed, mucopus is present and there is a small subconjunctival haemorrhage just below the limbus.

Ciliary injection (*Figure 4*), the sign of irritation of the iris ciliary body or cornea, is of a slightly more violet hue than conjunctival injection, is unaccompanied by discharge and tends to be most obvious in the region near the limbus. It may be accompanied both by pain and impairment of vision.

Inflammation of the lids may be distributed along the lid margins as in blepharitis, localized and near the lid margin as in a stye, or may be accompanied by more general swelling in the case of infected chalazia or cellulitis in the vicinity of the lids. The eyelids swell extremely readily so that comparatively mild inflammation in the neighbourhood may give rise to severe oedema that is somewhat disproportionate.

Ulceration of the cornea is demonstrated by the instillation of a drop of 1 per cent fluorescein followed by several drops of isotonic saline solution (or of a local anaesthetic if the eye is painful). It is extremely important that the fluorescein be fully sterilized as it may harbour *Pseudomonas pyocyaneas*. The ulcerated area is shown as a sharply delineated green patch on the cornea.

Photophobia and blepharospasm are easily noticed on simple inspection. Their principal causes are corneal inflammation or meningeal irritation. Thus in consideration of the latter possibility the former should be excluded first.

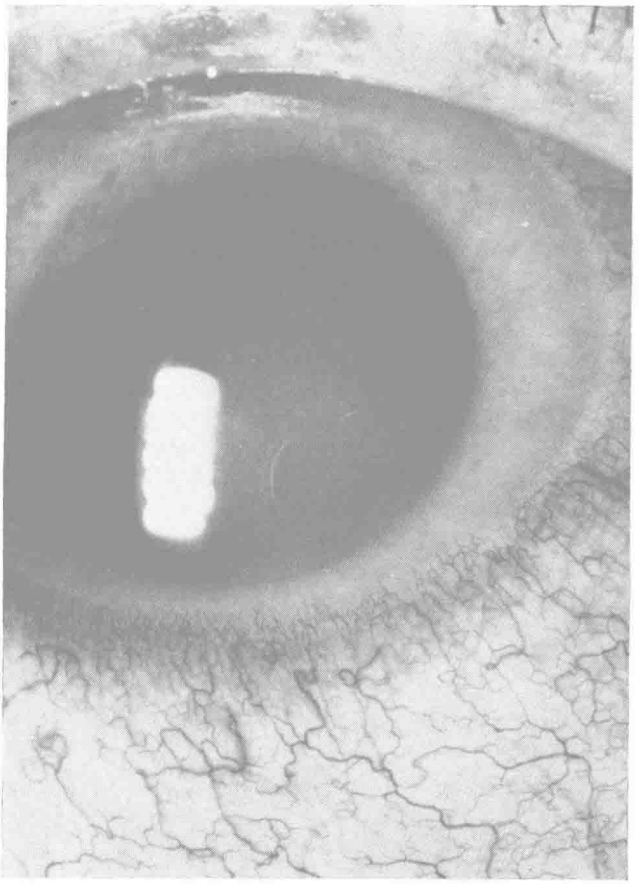

Figure 4.—Ciliary injection—note the increased injection of small vessels near the margin of the cornea compared to those farther out on the globe.

Evidence of inflammation of the lacrimal sac should be looked for. In mild and chronic cases gentle pressure over the sac may cause regurgitation of mucopus from the lacrimal puncta, while in acute cases an inflamed swelling will be seen just below the medial canthus of the eyelids.

Signs associated with ocular injury

Eyelids.—In examination of injuries to the eyelid the most important feature is an assessment of the resultant degree of exposure of the cornea. Gross loss of part or all of a lid, particularly the upper lid, is especially dangerous. Another point of importance is the integrity of the lower lacrimal canaliculus which may be divided. Bruising is of little consequence in itself except that it may preclude examination of the eyes and more especially, in cases of head injury, the pupillary responses.

Conjunctiva.—Small tears and haemorrhages in the conjunctiva are of little consequence but inspection of the wound, ophthalmoscopy (*see* page 8) and estimation of the ocular tension (*see* page 11) should be carried out to exclude rupture of the sclera. Large subconjunctival haemorrhages, particularly if associated with injury to the head, fall into two groups: (*a*) local extravasation from ruptured conjunctival vessels and (*b*) extravasation from the orbit as a result of a fracture of the skull. It may be difficult to distinguish one group from the other but a useful sign is the extent of the extravasation. If it does not appear to extend posteriorly on the globe beyond the conjunctival fornices then it is probably due to a conjunctival injury. If, on the other hand, extravasation extends posteriorly beyond the limits of view, that is into the orbit, then it may well be caused by a fractured skull.

Cornea.—Abrasion of the cornea may best be seen after instillation of fluorescein (*see* page 4) but the exact depth of corneal injuries can only accurately be estimated with the slit-lamp (*see* page 8). Perforating corneal wounds are frequently accompanied by one or more of the following signs: (*a*) absence or undue shallowness of the anterior chamber; (*b*) eccentricity and pear-shaped distortion of the pupil; or (*c*) prolapse of part of the iris. This is always associated with distortion of the pupil. The prolapsed iris looks like a small piece of sodden brown cardboard sticking to the margin of the cornea.

Deeper injuries.—After severe ocular contusions (not necessarily perforating) or deep perforating wounds, blood may be seen in the anterior chamber, the lens may be opaque or dislocated and there may be blood in the vitreous humour or upon the retina. The last two signs can only be elicited by ophthalmoscopy (*see* page 8).

Motility of the eyelids

During the inspection of the patient attention should be directed to the movements of the lids and any defect in blinking or forced closure noted.

Motility of the eyeballs

Gross defects of ocular movement may readily be seen upon simple inspection although slighter defects of movement may not be so obvious.

The patient is instructed to look at a target such as the examiner's finger which is then moved so as to bring the eyes into the various positions of gaze; to right and left, upwards and downwards and into the four diagonal quadrants. The affected eye will fail to move in the direction of action of a completely paralysed muscle, but so much movement may occur if the muscle is

only partially paralysed that it may not be possible to see that it is defective. A study of the accompanying diplopia will usually, however, enable the defective muscle to be identified.

Analysis of diplopia

Several rules must be borne in mind when analysing diplopia.

(1) Diplopia is maximal when the eyes are turned in the direction of action of the paralysed muscle.

(2) The false image is always the one which, at the position when the separation of diplopia is maximal, is farthest out in the case of a horizontally acting muscle, farthest up in the case of an elevator and farthest down in the case of a depressor.

(3) The false image belongs to the paralysed eye.

(4) The oblique muscles have their greatest elevating or depressing action when the eye is adducted but the vertically acting recti (superior and inferior recti) have their greatest elevating or depressing action when the eye is abducted.

Bearing these four rules in mind it is possible to detect a paralysed muscle in the following way.

(1) Establish whether the diplopia is horizontal or vertical.

(2) If it is horizontal, get the patient to look at a pencil held upright and move it to the position where separation is greatest.

(3) Find out to which eye the farthest-out image belongs. This is done either by covering one or other eye quickly and asking the patient to note which image keeps disappearing, or by using a white light as the fixation target instead of a pencil and having the patient wear a red glass in front of the right eye and a green in the left. Knowing which eye casts the false image makes it easy to diagnose the paralysed muscle. For example, in diplopia to the patient's right side, if the farthest image belongs to the right eye, the muscle at fault is the right lateral rectus, but if the farthest image belongs to the left eye the paralysed muscle is the left medial rectus.

(4) If the diplopia is vertical once again find out the position of maximum separation using a horizontally held pencil as the target and find out to which eye the false image belongs. Bearing in mind the earlier rule (4), we know that if the false image belongs to the abducted eye the muscle at fault is a rectus. (the superior if diplopia is maximal in elevation but the inferior if maximal in depression) and that if the false image belongs to the adducted eye (for example the left eye in gaze to the right or the right eye in gaze to the left) then the muscle at fault is an oblique (the superior oblique in depression or the inferior oblique in elevation). If diplopia is maximal looking up and to the right and the false image, that is the highest image, belongs to the left eye, then the paralysed muscle is the left inferior oblique. If, in another case, the highest image belongs to the right eye the paralysed muscle would be the right superior rectus.

A more refined method of testing for weakness of an extraocular muscle is the Hess screen, by means of which the extent of the paresis can be estimated. For details of this the reader is referred to one of the larger textbooks of ophthalmology.

Examination of the Pupils

The pupils should first be inspected in diffuse illumination and note taken of their size, equality and shape. A slight difference in size (anisocoria) unaccompanied by any other abnormality is fairly common and not of great significance.

Light reflex

The response to light must now be studied. This is best done by shining the light from a torch into the pupil, making sure that the patient does not turn his eyes towards the light and induce a convergence—accommodation reaction. The direct reaction to light should be brisk and well sustained as should the consensual in the other eye. Failure of the *direct* reaction may mean a failure of any part of the reflex arc, either on the sensory (optic nerve) or motor (oculomotor nerve) side. If failure of the direct reaction on one side is also accompanied by failure of the consensual on the other then once again the defect may be sensory or motor. If, however, the consensual reaction is preserved on the contralateral side in the face of failure of the direct reaction then the defect must be on the motor side of the reflex in the illuminated pupil. Conversely, if the direct reaction is present but the consensual is absent then the defect is in the motor component of the unilluminated pupil.

Failure of the sensory side of the reflex arc is proved if the direct reaction of a pupil is poor or absent but the consensual is brisk when the other eye is illuminated.

Accommodation convergence reflex

The accommodation convergence reflex is simply elicited by instructing the patient to look at a distant object and then at the examiner's finger. It should be brisk and equal.

Argyll Robertson pupil.—This is small and shows no response to light but reacts briskly to accommodation convergence.

Pupil in head injuries.—Whereas in the majority of intracranial lesions, aneurysms, tumours, abscesses and so on, the pupillary reflexes become disturbed according to which part of the reflex arc is damaged, a rather inexplicable series of pupillary changes may occur in severe cases of head injury, particularly where there is fracture of the skull and intracranial bleeding.

Bilateral dilatation with loss of all reflexes is of grave prognostic importance. Unilateral dilatation accompanies extradural haemorrhage and is generally on the same side as the haemorrhage but may rarely be contralateral (Vance, 1927).

Mortality per cent

According to Blakeslee (1929) the pupillary findings of the gravest import are bilateral fixed dilated pupils which are followed by 94 per cent mortality, bilateral fixed constricted pupils which are followed by 70 per cent mortality, and a unilateral fixed dilated pupil which is followed by 50 per cent mortality.

Inspection of the Eye with Focused Light

The technique of focal illumination of the eye is an essential part of an ophthalmological examination although it is not of great importance from a general surgical point of view. The light may be that from a specially constructed torch which will form a point focus, or that obtained by focusing the light of an ordinary electric lamp filament by means of a strong convex lens held by the examiner, or the more refined and specialized light from the slit-lamp.

Observation, in the case of the torch or condensing lens, is facilitated by a monocular loupe, usually of $\times 8$ or $\times 10$ magnification, while in the case of the slit-lamp, a binocular microscope mounted conveniently on an instrument table together with the lamp is used.

Focal illumination provides information as to the state of the cornea, anterior chamber, iris, lens and anterior part of the vitreous body and—with slight modifications to the apparatus and the employment of special contact lenses—can also be used to examine the drainage angle of the anterior chamber, the posterior part of the vitreous body and the retina.

The beam of light employed passes through the transparent media illuminating any lesion in its course. Thus minute corneal foreign bodies or other opacities may be identified, the clarity or any abnormal turbidity of the aqueous humour can be assessed and the extent and depth of lenticular lesions accurately gauged.

Ophthalmoscopy

Theory

The normal pupil appears black because rays of light from any part of the retina which is illuminated pass out of the eye by approximately the same pathway as that by which they entered. Hence under conditions of ordinary general illumination the observer's head will always obstruct the entry of any rays of light which could illuminate that part of the fundus he was trying to observe; but if a beam of light is directed into the eye in such a fashion that the observer can see the emergent rays, the pupil appears red. These conditions are fulfilled in the ophthalmoscope.

The most convenient type in general clinical use is the battery operated direct ophthalmoscope in which the rays emergent from the patient's retina are observed through a small hole in the mirror of the illuminating system.

Technique

If the patient's right eye is to be examined the surgeon holds the ophthalmoscope in his right hand, directs the beam into the patient's eye and puts his own right eye close behind the sight-hole. Observation is started at a distance of about one foot; this ensures that any opacities in the optical media of the eye, which appear as black marks against the red fundus background, are not missed. The examiner then approaches as close to the patient as possible for inspection of the optic fundus. It will be found helpful to rest the left hand lightly on the patient's forehead with the thumb on the eyebrow. The examiner can then approach until his nose touches the interphalangeal joint of his left thumb (*Figure 5*).

Figure 5.—Using the direct ophthalmoscope.

The beginner will find at first that a bright reflection of the light from the cornea seems to hinder his view but with a little practice it will be found that by very slight tilting of the instrument it can easily be avoided. The corneal reflex is, in fact, a useful guide to the optic disc. If the ophthalmoscope is manoeuvred so that the reflex appears slightly to the temporal side and

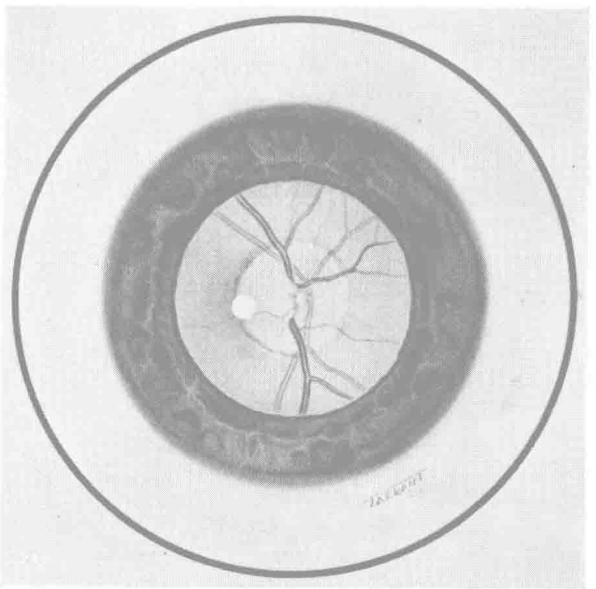

Figure 6.—Diagram of right eye to show the position of the corneal reflex (the white spot) relative to the pupil when the optic disc is being examined.