AN EXOPHTHALMOMETER FOR DIRECT MEASUREMENT*

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NEUROSURGEONS and physicians no less than ophthalmologists are conscious of the difficulties in eliciting minor degrees of exophthalmos or changes in an already known proptosis. The instruments in common use are not beyond criticism, for it is not unusual for different observers to obtain different readings in the same patient.

The ingenious apparatus devised by Hertel is widely used in spite of its being rather bulky, but it is generally agreed that it does not provide a very accurate reading as it relies on indirect measurements, *viz.*, not the position of the globe itself, but its corneal image in a mirror alongside a millimetre scale. The position of the head of the observer, and other factors such as the shifting gaze of the observer and possibly also movements of the patient's eye influence the readings, so that inconstancies of 1 mm. or more

FIG. 1.

are not infrequent. To obviate these difficulties a variety of instruments have been made on the principle of the Luedde exophthalmometer. They all rely on a transparent rule which is placed on the temporal orbital rim; the corneal apex can be seen through the

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rule and its prominence measured. These small instruments are inexpensive, easy to carry and to use, but owing to the fact that the cornea and the rule cannot be brought close together, the results they give are not superior to those obtained with a Hertel exophthalmometer. The instrument designed by Mutch of Aberdeen has the merit of recording a direct measurement. It aims at measuring the projection of the eye beyond the level of a plane formed by the upper and lower orbital rims at their vertical centre over the closed eyelids. Possible sources of inaccuracy in its use arise from the fact that it is employed without reference to any clearly defined bony landmark, and that it has to be placed over a variable thickness of soft tissue, not necessarily identical on the two sides.

A simple means for direct exophthalmometry devoid of some of these pitfalls appears to be provided by the following design, which relies on measuring the forward position of the globe in relation to the fixed and easily identified outer bony canthi of the orbit.

The instrument (Fig. 1) consists of a measure rule (A) carrying a fixed vertical stem (B) and a movable stem (C) sliding along the rule. Between the stems B and C there is a slide (D) carrying a plunger (E) calibrated in millimetres, and ending in a cup (F) resembling that part of the tonometer which fits on to the cornea. Both stems (B and C) end in pads that can be made to rest on the external orbital margins, outside the outer canthi.

Mode of use

The preparation of the patient and the position of the observer are as with tonometry readings. The patient may be prone on a couch or sitting up with his head thrown back, whilst the surgeon stands behind. The corneae are anaesthetised, also as for tonometry. The surgeon adjusts the distance between the stems B and C so that their pads rest on the two external orbital canthi. Firm pressure must be applied on the instrument in order to get a constant and equal maximal depression of the skin on the two bony canthi. Then, before making the patient open his eyes the surgeon slides the plunger (E) so that it approximately centres over one of the corneae (Fig. 2). The patient is now asked to open his eyes and to direct his gaze straight to the ceiling. The cup (F) on the plunger is then brought down on to the cornea so that it covers it centrally (Fig. 3). A direct reading is now taken on the scale on the plunger. With the instrument still in position the plunger (E) is raised from the cornea and slid along the horizontal bar (A) so as to bring it over the cornea of the other eye, the position of which is now measured.

In order to be certain not to vary any factor in subsequent

measurements it is convenient to record the intermarginal distance (B to C) and to apply it in further readings.

In no normal case has the summit of the cornea as determined by these readings been less than 12 mm. above the fixed bony landmark of the outer orbital canthus. Generally the reading is 14-16 mm. No opportunity has presented itself for using the apparatus

FIG. 2.

for the measurement of enophthalmos, but there are no theoretical reasons against such a procedure.

Sometimes a proptosed eye has also some lateral displacement. This cannot be measured by the exophthalmometers available. By measuring the distance from the ipsilateral margin of slide D to the respective stems at the time exophthalmometer readings are

FIG. 3.

made the lateral position of the globe in the orbit is determined, and can be used to assess subsequent lateral deviations. I am indebted for this useful suggestion to Prof. Arnold Sorsby.

The instrument is made by Messrs. Theodore Hamblin Ltd., London.

Summary

A simple device for the direct measurement of exophthalmos is recorded. It is handy and inexpensive. It also allows the measurement of progressive lateral displacement of the globe.