

MODIFIED DYNAMOMETER*

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RENEWED interest in ophthalmodynamometry during recent years has revealed difficulties in the actual technique which may be attributable, at least in part, to the dynamometer in common use, designed by Bailliart (1917). Many of these troubles have their origin in the lack of control over the instrument that is so frequently experienced. This is especially common when the operator is in the early stages of acquiring the technique. Another fault, less readily appreciated, is the ease and speed with which the dynamometer spring loses its "tone" and becomes inaccurate. This loss may be so marked that the instrument can no longer be relied upon to give the same reading when applied to the eye with identical pressures on two consecutive occasions.

In an effort to improve this situation the author has modified Bailliart's dynamometer in the light of recent experience in the Dynamometry Clinic at the Manchester Royal Eye Hospital. The instrument† (Fig. 1) is basically similar to the Bailliart model, but differs from it in certain respects.

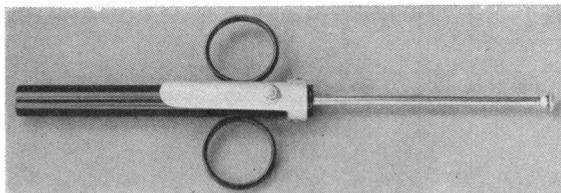


FIG. 1.—Modified dynamometer.

(1) ACCURACY.—The spring is of higher quality. Not only does this materially delay the onset of metal fatigue, but it allows a corresponding increase in the accuracy of the readings. Metal fatigue can cause serious errors. If the dynamometer no longer gives a constant reading to any specific pressure then its value as a means of comparing the ophthalmic artery pressures of the two sides is over. False positive and negative readings will occur. Even when there is no metal fatigue the Bailliart instrument is very inaccurate in readings in the lower part of its range, where errors of up to 100 per cent. may be seen at pressures below 50 g. In addition there is a tendency to give falsely high readings over the rest of the range, though here the error of less degree. On a brand-new Bailliart dynamometer the pressure recorded on one occasion was 150 g. when the actual pressure exerted by the plunger was 130 g. The modified version gives readings that are completely accurate from 50 g. upwards. Below this level repeated

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† Obtainable from Messrs Rayner's, Ltd, London.
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estimations showed error of 10 per cent. at readings of 40 g., and of 20 per cent. at 30 g. As in the Bailliart instrument, calibration starts at 20 g.

(2) CONTROL.—The instrument is applied to the sclera according to the standard technique (Smith, 1960; Liversedge and Smith, 1961), but the provision of finger holds allows a greater degree of control. The operator may grip the barrel in a variety of ways according to individual taste or the pressure exerted (Fig. 2*a, b*). In addition, the locking device to immobilize the piston is more accessible, and may be applied without altering the grip on the barrel. In the Bailliart instrument the braking mechanism has a tendency to groove the piston and consequently the latter tends to slip out of control. The modification avoids this difficulty by using an intervening nylon pad to obviate direct contact of metal on metal.

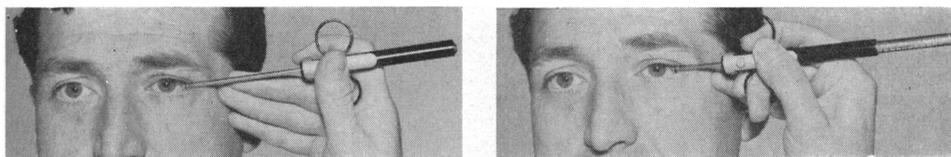


FIG. 2 (*a, b*).—Two methods of gripping the dynamometer.

(3) RANGE.—The piston on the modified dynamometer is longer than that on the standard instrument. This is a considerable advantage when the patient's eyes are deep set, or are relatively close together compared with the inter-temporal width. Furthermore, although not often required to do so, the instrument can give readings beyond the upper limit of the Bailliart model, which is unable to record the systolic pressure of the ophthalmic artery in some hypertensive patients. The relative unreliability of the diastolic pressure as an indication of carotid insufficiency makes this a particularly desirable feature. An additional advantage is the provision of calibration markings all round the piston so that a reading can be taken when it is viewed from any angle while the dynamometer is still in contact with the sclera. This allows a diastolic reading to be taken without removing the instrument from the eye. Subsequently the brake is released and the systolic pressure recorded, the entire procedure being carried out without the observer needing to alter the position of his hands.

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