Section New Developments, Products and Techniques

A new automatic computerized deviometer

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Abstract

An automatized computerized deviometer is presented based on an infrared TV camera, an image analyzer and a computer. With this instrument it is possible to follow step-by-step the various diagnostic procedures in strabismus and to answer the following questions: is there a strabismus? is it convergent, divergent or vertical strabismus? what is the angle of deviation? which is the paralytic or paretic muscle in the case of incomitant strabismus?

Introduction

This instrument was designed for precise and objective measurement of the angle of strabismus in any position of gaze. Furthermore strategies of testing are presented which allow an orderly examination, step by step, of patients with ocular motility disorders. Finally, the diagnosis of affected muscle(s) in paralytic strabismus is made possible on the basis of the amount of deviation in the different positions of gaze.

All available methods for measuring the angle of strabismus, e.g. the prism cover-test, the major amblyoscope, etc, are based on the subjective observation of the examiner. Their reliability and precision are therefore bound to the experience of the operator. The automatic computerized deviometer (ACD) designed by us was developed in order to reduce the draw-backs of previously available techniques by

1. Relying to a minimum on the ability of the operator in order to obtain accurate measurements.
2. Speeding up the testing procedures in order to avoid errors associated with prolonged fixation in children.
3. Provide the non-experienced strabismologist with a menu of procedures which allow a step-by-step management of the diagnostic approach in strabismus.

The instrument presented in this paper is the second stage of an automatic computerized deviometer designed by Campos and Orciuolo in 1986 [1]. There are some resemblances between the ACD and the instrument developed by Effert and Pflibsen in 1986 [2, 3] based on different principles of acquisition and measurement.

Description of the instrument

The ACD consists of three elements:

1. A modified optic bench with a servo-assisted occluder and an infrared TV camera (Fig. 1);
2. An electronic device specially designed for image elaboration;
3. A commercial computer, serving as an interface with the operator (numerical elaboration and mass memory on floppy disc) (Fig. 2).
In order to adhere to the proposed guidelines, the attention time was kept to a minimum by automation of acquisition and its separation from the measurement phase. This was obtained by memorizing the image of the eye under test before and after the use of the occluder.

The computer used for the ACD is a CBM Plus 4 with a floppy-disc, printer and a special peripheral unit for memorization and treatment of the images. The resolution necessary for the ACD is not high: 49152 bits per image are sufficient. This number is much lower than that one present in standard in-

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**Fig. 1. Optic bench and infrared TV camera.**

**Fig. 2. Computer monitors, joy-stick and printer.**