Calibration of Saccades in Infants

Henry S. Merz

Prism induced shift of fixation was measured in 12 cooperative patients utilizing electro-oculography. These recordings were compared with a voluntary shift in fixation of the same eye. No differences were noted when comparing voluntary movements with prism induced movements. Trial of the prism induced eye movement for calibration in a group of 10 infants has shown it can be used successfully. Invest Ophthalmol Vis Sci 25:1233-1234, 1984

To accurately measure eye movement velocity, it is necessary to know the duration of the movement (time) and the amplitude of the movement. Recording devices, such as electro-oculography, reveal the duration of the saccade but amplitude must be determined by calibration. The eye being measured is made to change fixation between two points a known distance apart. This is straightforward in adults, teenagers, and older children. However, in infants and young children, this level of cooperation cannot be expected. Attempts at calibration by showing interesting toys a known distance apart invariably results in head movement as well as eye movement, resulting in unsatisfactory measurement of saccadic amplitude.

To assist in calibrating saccadic velocity recordings in this young group of patients, we have employed a technique of small prismatic displacement of the image to induce a change in ocular fixation without an accompanying head movement.

Materials and Methods. Saccadic velocity measurements were made by electro-oculography. For horizontal saccadic measurement, Beckmann miniature skin electrodes were placed on the skin just beside the medial and lateral canthi with the indifferent electrode on the brow.

A dynograph with modified rectilinear ink writers, dynograph amplifier, preamplifier, direct nystagmus coupler, and nystagmus velocity coupler were used for the electro-oculographic recordings. The eye position channel had a band width of 0-10 Hz. The gain was 0.6 $\mu$V/cm. The velocity channel had a band width of 2.2-10 Hz, with a gain of 5 $\mu$V/cm.

The child's fixation with one eye was obtained by showing a colorful, moving toy at a distance of one-third of a meter. A 10-diopter prism was introduced before the fixing eye, and the resulting horizontal eye movement was recorded. The infant usually would not move his head but only his eye to effect this small amplitude movement caused by prism displacement of the image. The recorded eye movement could be used for calibration, as the distance the eye moved was known.

To test the correlation between prism induced and voluntary eye movements, 12 patients cooperative enough to make accurate voluntary saccades were tested to compare the size of the EOG recorded eye movement induced by 5°-voluntary movements and 10-prism-diopter-induced movements. The group...
consisted of three male and nine female patients, age range 10–79. Informed consent was obtained from all subjects prior to initiating the study.

Results. The eye movement amplitudes were equal with both methods (Fig. 1). No difference was noted whether the prism was inserted base out or base in.

Ten infants were tested with this technique without significant difficulty. These children were all too young to compare the prism method with voluntary saccades. The reproducibility of calibration movements in an individual infant was good, with only an occasional, random, eye movement when the infant momentarily lost interest in the toy.

Discussion. Calibration usually is achieved by having the subject fixate points of known visual angle separation or track a spot moving through a known displacement. With young children, such tasks make more demands on comprehension and cooperation than are ideal. The use of prism-induced image jump before the fixing eye to induce the calibration eye movement circumvents this problem. It allows simple fixation of a stationary target and provides a relatively involuntary reproducible response.

It would be more difficult to perform calibration movements in eyes with a central organic or suppression scotoma, since accurate changes in fixation would be difficult to accomplish. Placing the prism before the normal eye is probably the best alternative.

Key words: saccades, calibration, prisms

From the Department of Ophthalmology, University of Rochester School of Medicine and Dentistry, Rochester, New York. Supported by NEI Grant EY-0389102 and a grant from Research to Prevent Blindness. Submitted for publication: September 21, 1983, in part as a thesis and partial fulfillment of requirements for membership in the American Ophthalmological Society, May 1983. Reprint requests: Henry S. Metz, MD, Department of Ophthalmology, University of Rochester School of Medicine and Dentistry, Rochester, NY 14642.

Reference


Announcement

American Society of Ophthalmic Registered Nurses: Eighth Annual Meeting

The American Society of Ophthalmic Registered Nurses will hold its eighth annual meeting: Insight Into Eyesight, "In Pursuit of Excellence" on November 12–14, 1984. The meeting will take place at the Peachtree Plaza Hotel in Atlanta, Georgia.

For information and applications, contact: Sue Brown, Administrator, ASORN, Inc., P.O. Box 3030, San Francisco, CA 94119; telephone; (415) 921-4700.