

CARD PUPILLOMETER: MEDICAL DEVICE LOST IN PURSUIT OF TECHNOLOGY**Dr. Narwane S. P.* and Dr. Nandal D. H.#***Associate Professor and #Professor and Head,
Department of Pharmacology, Rural Medical College, PIMS, Loni.***Corresponding Author: Dr. Narwane S. P.**

Associate Professor, Department of Pharmacology, Rural Medical College, Pims, Loni.

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INTRODUCTION

Pupillometer is a name given to two different devices. Pupillometer used by ophthalmologist to measure inter-pupillary distance. The other Pupillometer is used to measure pupil size. The measurement of pupil size, which is known as pupillometry, is also a part of neurological examination and psychiatric evaluation.^[1,2]

For neurological examination in patients with brain injury, impaired consciousness pupil size and its reactivity to light is studied. It not only tells about the neurological status, but also trend of the status.^[3] These examinations are also done in critically ill patients.^[4,5,6] Apart from use of pupillometer in medical treatment, this tool is also useful in research and teaching institutes. The effects of various drugs involving have been studied using pupillometer. The importance of pupillary size and how it changes in response to light and drugs is emphasized by demonstrations using pupillometer.

As on today, very costly digital instruments are being used to measure the pupillary size. The present article describes the method of preparation of a card pupillometer that is simple and accurate for use. This pupillometer is very cheap compared to digital pupillometer.

Card Pupillometer

This pupillometer was invented by Helmholtz to measure pupil diameter. This medical device has been used by Wenger to study effects of drugs on pupillary size.^[7] The same card pupillometer has been modified and described in the present article.

The card pupillometer consists of pair of pinholes at every 15mm distance vertically. Each of these pair of pinholes has arrows along with the pinhole number. The number denotes the distance between each pair of holes. The distance between the pinholes increases from 1mm to 10mm. The card is made of black sheet on one side and ECG paper on the opposite side (Figure 1).

Method of Preparation of Card Pupillometer

The pupillometer is made of black paper sheet of size 9x20 cm. A standard ECG paper is glued to one side of the black paper sheet. Holes of successively increasing distance, starting from 1mm to 10mm are made, with

distance of 15mm between each pair of horizontal holes. The lines on the ECG paper help in making holes of precise distance. A paper with arrows printed at distance of 15mm is glued on the ECG paper. These arrows make it easy for the observer to record the distance as indicated by the subject. The paper card thus made is laminated to increase its durability.

The procedure of using the card pupillometer is described below

The card pupillometer is held by subject whose pupillometry is being done. The subject stands with his back to the wall to avoid excess of light being reflected from the back of the card. The black surface is faced towards the face of the subject, which further avoids reflection of light. The subject looks through the pair of pinholes holding the card close to one eye at a time, while the other eye is closed. This prevents any attempt at accommodation. The subject is asked to look for a level of pinholes where the two halos, produced by looking at the pinholes produced, touch at the boundaries to each other. If the holes are too far the halos are away from each other. When the holes are too near, the halos overlap on each other. But when the pinholes match the diameter of the pupil, the halos touch the boundary of each other (Figure 2). The subject indicates the level of the pinholes which can be easily read on the opposite side by observer by looking at the arrow pointed.^[7]

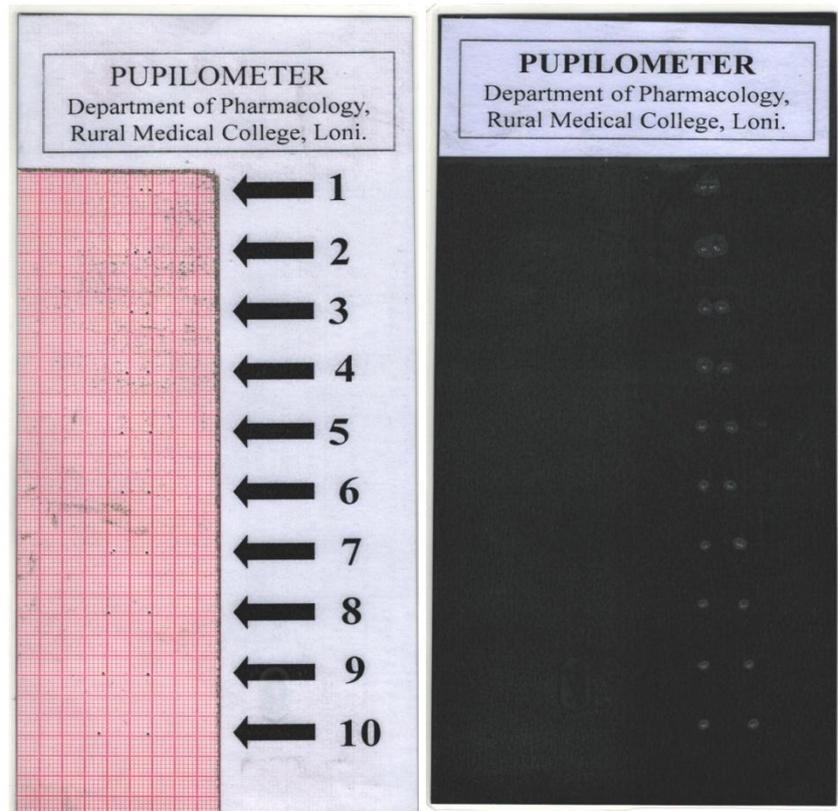


Figure 1: Card pupillometer.

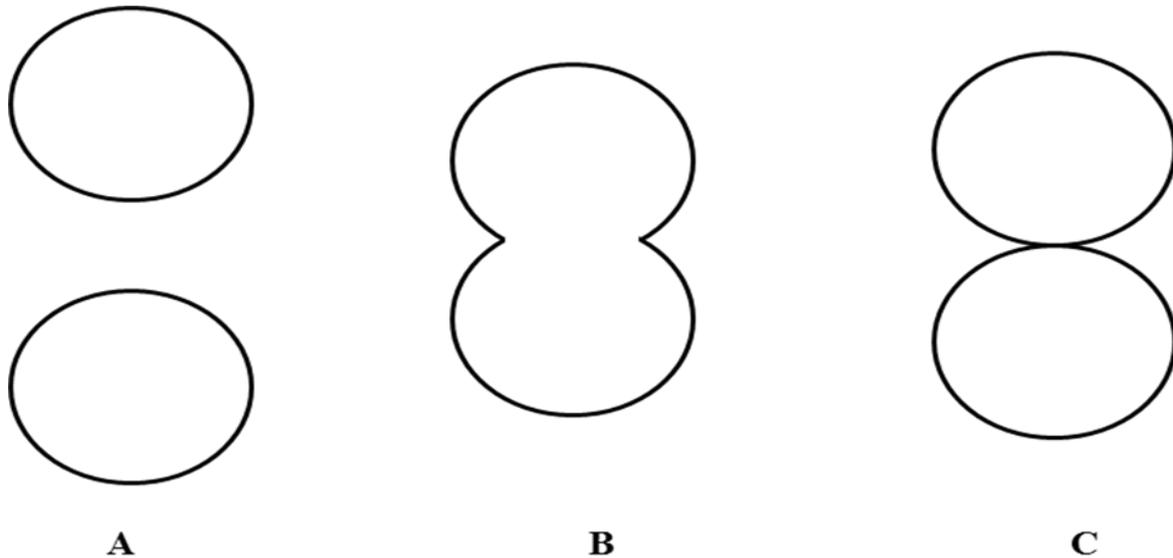


Figure 2: Halos as seen by the subject, (A) wider, (B) narrower, (C) same size as pupil diameter.^[14]

DISCUSSION

Pupillary response is an essential parameter in the systematic assessment tool names as National Institutes of Health Stroke Scale (NIHSS) that is used for quantitative measurement of stroke-related neurologic deficit. This scale not only evaluates the acuity of stroke patients and predicts patient outcome, but also determines possible treatment.^[8]

There are two main types of pupillary assessments, i.e. manual and automated pupil assessment. The Pupillary

size assessment by manual method is subjective and involves use of torch evaluate pupil reactivity and using a pupil gauge to estimate pupil size. However, these methods have shown inter-examiner disagreement in the manual evaluation of pupillary reaction to be as high as 39 percent.^[1,2,4,5,9,10,11,12] With advent of digital pupillometer, these errors have been eliminated.

Automated pupillometry removes subjectivity from the pupillary evaluation, providing more accurate and trend able pupil data, and allowing earlier detection of changes

for more timely patient treatment. Pupil data can be automatically uploaded to the patient record, eliminating the possibility of data entry error.^[13,14]

In view of patient care, the digital pupillometer has surpassed the manual pupil assessment. Another method by which pupillary size can be measured is the card pupillometry. Very few references quote the use of card pupillometry.^[7,14] While this method of assessing pupillary size requires a subject to be cooperative and able to follow the instructions, this method has been an age old way of teaching and research on pupillary size.

CONCLUSION

Card pupillometer is a cheaper alternative to digital instruments where studying the concept of pupillary size and effects of drugs by researchers or medical students. It is also useful for clinicians looking for qualitative response in conscious and cooperative patients.

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