

IN THE LABORATORY

A Simplified Basal Electrode for Routine EEG Use

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Since Grinker's (2) original stimulation and recording of electrical activity from the "hypothalamic area" through the intact skull in man, other modifications of his technique have been devised. Grinker's lead consisted of a silver-plated needle electrode mounted on a firm rod and imbedded in the sphenoid bone by puncturing the mucosa. Schwab (4) devised a stiff, blunt metal rod which is held snugly against the posterior nasopharynx by means of a rubber balloon inflated in the nasopharynx. Recently, Greenblatt, *et al.* (1) utilized a telephone wire in combination with a wooden applicator stick to hold a rather sharply pointed electrode in place in the upper pharynx.

Each of the above methods has some of the following disadvantages:

(1) Apprehension and discomfort are caused by the passage of any sharp or dull, rigid metal body into the nasal cavity, and this is usually accentuated by a deviated septum.

(2) The difficulty in "fixing" the electrode in or against tissues often requires a nose and throat consultant and the use of a nasopharyngoscope.

(3) Rather heavy local cocainization is required to eliminate pain.

(4) Artifacts appear to be accentuated from local tissue trauma at the tip of the electrode and from movement of the rigid electrode in response to small contractions of pharyngeal muscles.

(5) There is danger of infection following any break in the mucosa.

In searching for a method to eliminate the above disadvantages, a lead has been constructed with excellent preliminary results. It consists of a 5" length of #18 French rubber catheter with a snug fitting, smoothly rounded lead electrode sealed in the tip with rubber cement. Flexible insulated copper wire is attached to the blunt electrode and extends through the tube and out to the electrode box. To accomplish firm contact between the electrode and the posterior nasopharyngeal wall, the electrode is inserted, and the record is run with the patient supine and the head slightly lower than the body. (An ordinary adjustable barber-chair head rest fastened to the bed accomplishes this.) After insertion, the tube, which is nearly vertical when in position, is filled with liquid mercury which, because of its weight, presses the electrode firmly against the posterior nasopharyngeal wall. To prevent leakage of mercury, the

body of the metal tip electrode is sealed to the inner surface of the rubber tubing with rubber cement.

Placing the lead is accomplished with ease and involves much less difficulty and discomfort to the patient than does the process of passing an ordinary stomach tube. The nostril presenting the least obstruction is sprayed with a 5% cocaine solution to shrink the turbinates. A small quantity of mineral oil is applied to the rubber tube for lubricating purposes, and the tube is passed slowly through the nasal cavity until a rather firm resistance is met. This is the posterior nasopharyngeal wall. At this point in the procedure the tube is filled with mercury, which insures firm contact.

The position of the inserted lead and the electrical activity from it are similar to the "basal sphenoid" lead of Greenblatt, *et al.* and appear to have less artifacts. Hoagland (3), who has used this lead as well as those of Grinker and Schwab, believes it to be superior for routine clinical use.

It is hoped that the description of this electrode, with its ease of construction, simplicity of application, and relative freedom from artifacts, will stimulate more frequent use of the "basal lead," which is of value in diagnosing and localizing tumors deep in the brain.

References

1. GREENBLATT, M., FUNKENSTEIN, D., MILLER, D., and RINKEL, M. *Amer. J. Psychiat.*, 1947, **103**, 749-757.
2. GRINKER, R. R. *Science*, 1938, **87**, 73-74.
3. HOAGLAND, H. Personal communication.
4. SCHWAB, R. S. Personal demonstration.

Oscillographic Scatterplots Illustrating Various Degrees of Correlation¹

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The random fluctuations of electrons in a resistor (or of ions in a gas tube) have many advantages, as sources of illustrative material for courses in statistics, over games of chance, actuarial experience, and scientific agriculture. A thousand cases—or a million—parade themselves before one's eyes in a single second. In 10 seconds one is almost willing to say that he has seen an infinite population. Moreover, the population is normal.² Its

¹ The demonstrations described herein were made in connection with research being carried out under contract with the U. S. Navy, Office of Naval Research (Contract N5ori-76, Report PNR-49).

² The statistical theory of white noise has been worked out by Nyquist, Rice (2), Uhlenbeck, Weisskopf, Weiss and Goudsmit, and others. They are not univocal on the subject of the theoretical normality of the distribution of instantaneous noise amplitudes, but an empirical demonstration of normality has been described by Dunn and White (1).