Evoked visual potentials

Evoked potentials are neurophysiological responses elicited by sensory stimulation and customarily recorded from the surface of the scalp. The evoked potentials obtained from the three sensory systems (auditory, somatosensory, and visual) are characterized by very small signals buried in the noise of the ongoing background electrical activity (usually called EEG). The background activity of the visual cortex, for instance, has an amplitude of about 50 μV, while the evoked cortical potential to a light flash from the same area has an average amplitude of 5–8 μV. Special computer averaging techniques are required to extract these biological evoked signals from the background noise. This technique of averaging evoked potentials has been successfully applied to study how the brain processes sensory information as it ascends the neuraxis from sensory receptors to the cerebral cortex.[1–3]

The clinical utility of evoked potentials is based on the ability to study noninvasively and objectively the integrity of the peripheral and central function of the auditory and somatosensory systems and the retinal and visual pathways' function. In the visual system, evoked potentials are used routinely for the assessment of optic nerve function. They are particularly useful in the diagnosis of multiple sclerosis and optic neuritis. They demonstrate abnormal visual function when the clinical examination is equivocal or at times even normal. The wide application of evoked potentials in general and visual evoked potentials in particular has led to a concern about the use and overuse of evoked potentials and a concern about the quality and standardization of the test.[4,5] Abuse and misuse often occur with any new diagnostic technique. The proper role of evoked potentials at the present time must be limited to the assessment of sensory systems in clinical cases where clinicians suspect the presence of pathology. Nobody argues about the misuse or abuse of an electrocardiogram obtained in a patient suspected to suffer from a cardiac disease. Conversely, a young patient in good general health with a wrist fracture does not need an ECG. Similarly, not every neurological patient requires diagnostic evoked potentials. For instance, there is no clinical reason why a patient with partial complex seizures should undergo a visual evoked potential examination. The judicious use of evoked potentials will gradually decrease the concern about the overutilization of these tests. The remaining problem, however, is the quality control and standardization of the test. The American Electroencephalographic Society has published guidelines for clinical evoked potential studies,[6] suggesting minimal standards that need to be followed by a clinical laboratory performing these tests. There is also a need to have leading laboratories evaluate newer techniques to establish the role of evoked potentials in clinical practice. Computer and electronic technology is moving at a fast pace, and new "gadgets" are constantly appearing on the scene, usually basking in the warmth of their "newness." The work of Lesser et al[7] as reported in this issue of the CLEVELAND CLINIC QUARTERLY represents a solid approach toward the evaluation of light-emitting diodes as stimulators of the visual system. The crucial question of the utility and limitations of the technique is answered through a well-conducted scientific study. Light emitting diodes stimulate the visual system by producing changes in luminance, therefore lacking the sensitivity of pattern-reversal visual evoked potentials. The authors reported the great variability of the responses in normal subjects and caution about its use in clinical settings. They suggest that the method may have applications in young, uncooperative, and anesthe-

tized patients. They wisely conclude that there is a need for a more reliable visual stimulator for clinical situations where pattern reversal stimuli cannot be employed. Their thoughtful approach to the evaluation of new methodology should become a model to be followed.

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