Editorial

Receiver-Operating Characteristic Curves and Diagnostic Tests

The theory of signal detectability emphasizes one of the immutable laws of the decision process: there is no benefit without cost. The best we can hope to do, in any situation requiring a diagnostic decision, is to optimize the cost/benefit ratio. The receiver-operating characteristic (ROC) curve provides a unique method for quantifying this important relationship. It shows, in graphic form, how the benefit of a diagnostic test (correct identification or "hit rate") and its cost (incorrect identification or "false alarm rate") are linked. In this issue of JAAA, investigators F. Musiek, Charette, Kelly, Lee, and E. Musiek report results derived from the application of the ROC-curve approach to the evaluation of the middle latency response (MLR) in the identification of auditory central nervous system (CNS) involvement. They compared both latency and amplitude of the MLR in two groups of subjects, 26 individuals with CNS involvement and 26 controls. By varying the diagnostic criterion (i.e., the latency or amplitude value defining an abnormal result), they were able to generate, for a given measure of amplitude or latency, an ROC curve showing how hit rate (correct identification of individuals with CNS involvement) covaried with false alarm rate (incorrect identification of individuals in the control group without CNS involvement).

Some interesting and not always expected results emerged. In the case of the absolute latency of component N1, for example, ROC curves were very close to the chance diagonal (i.e., virtually zero detectability). Receiver-operating characteristic curves for the absolute latency of component P1 were not much better. N1-P1 amplitude measures generated more impressive results, but even here high rate was purchased only at the expense of high false alarm rate. The best index, interaural amplitude difference measured from the contralateral hemisphere, yielded a hit rate of about 80 percent with a corresponding false alarm rate of about 40 percent. With numbers like these in hand, we have a more rational basis for asking whether such a clinical procedure is clinically useful for individual diagnosis.

This form of analysis of diagnostic test performance could be profitably applied to a number of other test procedures proposed for the identification for central auditory deficits.

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