Diagnosing epilepsy

Editorial

We know how important it is to diagnose epilepsy correctly, but how to do so is surprisingly little validated. An inadequate history and misinterpretation of the electroencephalogram (EEG) are the major reasons 4 to 26% of children and adults in European studies are misdiagnosed with epilepsy.[1,2] Error rates are not available for most countries, or for more precise diagnoses of seizure types, epilepsy syndrome, and cause.

One reason is the lack of an easy test. Many patients, and unfortunately some doctors, believe that an interictal EEG is diagnostic, without realising its limitations. Population-based studies in children and adults show significant false positive and false negative rates for spike wave discharges, let alone less specific abnormalities, and normal variants can be mistaken as pathological.[3] A meta-analysis of sensitivity and specificity in predicting further seizures found very wide variations between observers and suggested that accuracy would be improved by erring on the side of caution.[4] In these studies not all the neurologists were specifically trained in EEG interpretation. In some centres and countries the clinician managing the patient reads the EEG as well, while in others a neurophysiologist reports the EEG, with or without further discussion. Whether this affects diagnostic accuracy is unknown. However, in this issue, Stroink et al. (p 374) show that experienced neurophysiologists have a high concordance for detecting true epileptiform spike wave discharges but can differ markedly in interpreting other abnormalities. Some of the latter was due to differing use of terminology and when this was agreed more precisely, concordance increased. However, the recipient of the report might be unaware of these subtleties. It seems that epileptiform changes are worth noting but everything else has less certainty.

How can diagnostic accuracy be improved? Ideally, clinical events should occur during a video-EEG recording.[5] Detecting interictal epileptiform discharges is useful, but risks more false positives. Clinical events may occur during routine recording, but prolonged recording or provocation are usually needed. Outpatient ambulatory monitoring can work,[6] but in-patient video-telemetry for 3 days or longer seems the best method, though heavy on resources. Even so, one large study found it unhelpful in 36% of cases.[7] Cerebral function monitoring in intensive care appears less reliable.[8] Provocation methods are well known, such as hyperventilation, photic stimulation, sleep deprivation, sleep recordings, reflex stimuli if appropriate, or suggestion for some non-epileptic attacks, but the effects of differing methodology on accuracy is less clear. For example, does counting while hyperventilating help detect subtle events? In addition, Stroink et al. report more problems interpreting sleep-deprived EEGs.

Technology may improve in other ways. Automated computer-aided spike detection or spectral analysis have been tried but still depend on the observer for interpretation. Denser electrode arrays than the traditional 10–20, or a more widespread array covering the temporal lobe, might detect and localize discharges better. Routine EEGs filter out slow and fast waveforms, but this is unnecessary with digital technology. An unfiltered 'full-band EEG' gives more information, such as revealing voltage shifts during epileptiform activity.[9] Magnetic EEG appears no more sensitive than normal EEG, but used together may provide added benefit.[10] Invasive techniques are restricted to surgical work-ups. With infrequent clinical events no technique may be any use.

Non-EEG methods include the history, witness reports, and now home videos of events.[4] Epilepsy is most prevalent in countries that lack comprehensive health services, so from a worldwide perspective the history is the most important diagnostic tool. However, apart from studies in India and China, what the history should comprise is surprisingly unvalidated.[11] This rather fundamental issue merits more attention. In the meantime, the diagnosis should only be made by practitioners with sufficient experience and proper training.

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