

COMPUTER DETECTION OF SLEEP-RELATED MYOCLONUS

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Sleep-related myoclonus (nocturnal myoclonus or periodic leg movements of sleep) is a relatively common disorder which is difficult to diagnose without polysomnography. Patients present with DIMS (disorder of initiating and maintaining sleep), or DOES (disorder of excessive somnolence), or both DIMS and DOES. Patients are often not aware of the frequency of their myoclonic movements or the degree to which they are disrupting their sleep. If they happen to snore, they present as if they have sleep apnea. Because nocturnal myoclonus and obstructive sleep apnea co-exist in some patients, it is imperative that diagnostic polysomnography always includes some measurement of myoclonic activity.

Leg movements can be detected by recording an EMG from the Tibialis anterior muscles, and that works reasonably well with visually scored paper recordings. But the amplitude of the EMG, with and without movement, depends on the electrodes and their placement and is fairly arbitrary. This makes computer detection based on EMG signals difficult. Perhaps more important, long paper recordings do not enable the overall incidence and periodicity of myoclonic movements to be readily assessed. There may be 1 or 2 minutes between movements, even in a clinically significant run of 30 or more of them.

The new digital sleep recording and analysis system developed for Epworth Hospital has incorporated a new system for the computer detection of myoclonus. The transducer is a small piezoelectric ceramic strain gauge attached by adhesive tape over the Tibialis anterior muscle. There is no output from this unless there is leg movement (even the tiniest movement) when it produces a low frequency signal representing the intensity and duration of that movement. The computer counts the number of such events per 20 second epoch. Summaries of the occurrence of myoclonus in each epoch for the whole recording are printed on a few sheets of paper during the night along with results of on-line analyses of EEG, EOG, EMG, apnea, SaO₂, etc.

An estimate of the overall frequency of leg movements and their occurrence in runs can be seen at a glance. The analyses indicate whether or not there was EEG arousal associated with myoclonus in any particular epoch and whether it was associated with the end of an apneic event.

Infra-red video-recordings have confirmed the presence of sleep-related myoclonic movements detected this way. Their nature is quite variable between patients. This computer system is being used to monitor the whole range of movement disorders of sleep.