

## Clinical Research

# Value of Inpatient Diagnostic CCTV-EEG Monitoring in the Elderly

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**Summary:** *Purpose:* To examine the outcome of inpatient diagnostic closed circuit TV-EEG (CCTV-EEG) monitoring in a consecutive series of elderly patients admitted to an adult epilepsy-monitoring unit (EMU) over a continuous 6-year period.

*Methods:* Retrospective review of all admissions to a university hospital adult EMU. Those older than 60 years were identified. Patients who were monitored for status epilepticus were excluded. Data on duration of events, frequency of events, physical examination, medications, preadmission EEG, brain imaging, length of stay, and interictal and ictal EEG were obtained.

*Results:* Of the 18 patients admitted for monitoring only, mean age was 69.5 years (range, 60–90 years). Mean length of

stay was 4.3 days (range, 2–9 days). Five patients had complex partial seizures recorded. Three patients, all treated with anti-epileptic drugs (AEDs), had no spells recorded, and no additional diagnostic information was gained from the admission. The other 10 patients, eight of whom had been treated with AEDs, were symptomatic during their admission, leading to a variety of neurologic but not epileptic, psychiatric, or other medical disorders, and allowing tapering of AEDs.

*Conclusions:* In elderly patients with suspected epilepsy, CCTV-EEG is a very useful diagnostic tool. In this series of 18, 10 patients were diagnosed with potentially treatable medical illnesses not responsive to AEDs. **Key Words:** CCTV-EEG—Elderly—Nonepileptic spells—Seizures.

Incidence figures suggest that there are between 45,000 and 50,000 new cases of epilepsy or first unprovoked seizures among the elderly each year in the United States (1). In a Dutch population-based study, the prevalence of epilepsy in the elderly increased with age from 0.7% for those aged 55–64 years to 1.2% for those aged 85–94 years (2). Despite this, there is little published information about the characteristic presentation of seizures in this age group, the results of diagnostic investigations, and long-term outcome. Closed-circuit television (CCTV)-EEG recording, useful in the diagnosis and classification of epileptic syndromes, seems especially underused in this population where a wide differential diagnosis exists, the yield of interictal EEG recordings is extremely low (3), and in patients with established epilepsy, the ictal semiology may change with age (4). We report the results of inpatient diagnostic CCTV-EEG re-

cordings in patients aged 60 or older admitted over a consecutive 6-year period to a university hospital epilepsy-monitoring unit (EMU).

## METHODS

The EMU maintains a computerized database on all admissions. Between 1/1/92 and 12/31/97, 976 adults were admitted for monitoring. Of the 557 patients admitted for diagnostic monitoring 26 (4.6%) were older than 60 years. Eight were critically ill with known or suspected status epilepticus; in 18 patients, the monitoring study was for diagnostic purposes. Each patient had a history taken and physical examination by one of the authors before CCTV-EEG monitoring, when reports of patient behaviors during spells also were obtained from lay observers. A detailed description of the methods used in our EMU was reported previously (5). We require technically adequate behavioral testing to distinguish between epileptic and nonepileptic seizures. We diagnosed nonepileptic seizures by absence of EEG change during

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unresponsiveness for a minimum of 10 s, without artifactual obscuration of cerebral activity, and with subsequent demonstration of amnesia for verbal and nonverbal stimuli that were presented during the unresponsive period.

## RESULTS

### Demographics

All patients were admitted from the outpatient neurology clinics or transferred directly from an inpatient stay at another institution. The primary concern was that current episodic events or more persistent changes in behavior were epileptic in nature. There were equal numbers of men and women. The mean age at admission was 69.5 years (range, 60–90 years). Mean length of stay was 4.3 days (range, 2–9 days). Of the 18 patients, 16 were taking antiepileptic drugs (AEDs) on admission. Of the 18, eight had epileptic seizures in the past, but their current events were of an uncertain nature.

### Diagnosis of epilepsy

Five patients had complex partial seizures recorded. Four of these five had a history of seizures, but the current semiology was different. In each there was a significant concern that the events were psychogenic. They occurred in the setting of domestic stress in two of the patients, were usually prolonged and had variable semiology in two others, and occurred in another patient with a history of serious psychiatric illness. All five were taking AEDs at the time of admission, and based on the results of CCTV-EEG monitoring, had their AED regimen adjusted.

### Diagnoses other than epilepsy

In 10 patients, eight of whom had been treated with AEDs, diagnoses other than epilepsy were reached. Three patients had no events recorded; all were exposed to AEDs on admission, and two of the three had a history of seizures. Patient observation and other investigations or consultations during admission led to clinical diagnoses of normal-pressure hydrocephalus, severe depression, and a primary brain tumor. The other seven patients who had events recorded without any EEG change had a variety of different medical or psychiatric diagnoses reached with appropriate treatment instituted (for example, implantation of a pacemaker). All eight of these patients had their AEDs tapered.

### Nondiagnostic admission

Three patients had no conclusive diagnosis reached. Two of the three had no events recorded. In the third, the EEG remained unchanged during episodes suspected to be complex partial seizures of frontal lobe origin based on a history of frequent episodes of altered confusion while awakening from sleep and a remote history of generalized tonic-clonic seizures.

### Follow-up

Follow-up information was available for 10 of the patients, with duration varying from 3 months to 4 years. Four of the five patients with complex partial seizures were monitored. Two continued to have medically refractory partial seizures, both being monitored for  $\geq 3$  years. Another had complete resolution of her seizures. The fourth had improvement but incomplete resolution. Outcome in the other patients was consistent with their underlying diagnoses.

## DISCUSSION

Our results indicate that inpatient CCTV-EEG monitoring is useful in elderly patients in whom the diagnosis of epilepsy is being considered. Prolonged clinical observation of patients supplemented by review of video-monitored episodes helped establish the nature of nonepileptic events, while simultaneous EEG ruled out epilepsy. Prolonged interictal EEG data alone provided additional or contrary information to preadmission interictal EEGs. More conclusive diagnoses of epilepsy, primary psychiatric illnesses, or other neurologic or medical conditions will diminish inappropriate use of AEDs in a patient population in which side effects of treatment and drug-drug interactions may be problematic, and help direct other more appropriate therapeutic approaches. Follow-up information in those patients for whom such data were available suggests sustained benefit from establishing the correct diagnosis in many patients.

Although seizures are a likely explanation for recurrent neurologic events seen in patients with a history of seizures, we found that only four of our eight patients with a history of seizures proved to have epileptic events as the underlying cause for their current episodes. Even in those patients, the ictal semiology was distinct from that reported as occurring earlier in life, supporting the observation that ictal semiology may change with age (5).

Lancman et al. (6) published the only other article reporting the results of CCTV-EEG monitoring in the elderly. Their 20 patients, representing 1.5% of all patients who underwent CCTV-EEG recording at a major referral center, were subdivided into two groups, a diagnostic group of nine patients most closely comparable to our patients and a characterization group of 13 patients in whom the diagnosis of epilepsy was reasonably certain but the precise type unclear. CCTV-EEG monitoring in their nine diagnostic cases led to diagnoses of obstructive sleep apnea in two, epilepsy in two, nonepileptic events of psychogenic origin in two, syncope in one, and was nondiagnostic in two, results quite comparable to our series. The small number of patients seen at the EMU in

our department and the Cleveland Clinic suggests that further studies in this patient population may benefit from being multicenter based.

Some inherent limitations of our study are that the data were examined retrospectively and that our institution is a major referral center, and patients seen here need not be representative of the general population. However, we believe that the data underscore the merits of diagnostic CCTV-EEG recording in a population of patients in whom the differential diagnosis is characteristically very broad, and there may be serious consequences from being exposed to unnecessary medications. That 10 of 18 patients were taking AEDs where the eventual diagnosis was a nonepileptic phenomenon emphasizes the particular value of using CCTV-EEG recording.

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