

How do we manage the first seizure in adults?

ABSTRACT—This paper reports an audit of the management of a first generalised seizure in a small district general hospital and describes the management policies of 95 general physicians and 82 neurologists. The audit studied 56 patients who presented in 1990–93 after witnessed generalised convulsions without focal neurological signs or previous history of seizures. Their ages ranged from 16 to 89 (mean 38) and 47 of them were men. In 31% alcohol was incriminated in the seizure. Blood tests were done in most patients but gave little useful information. Skull and chest radiographs were taken in fewer patients but were unhelpful. An electroencephalogram was done in 77% but failed to influence management in any, and only 2 of the 50 computed tomography scans performed led to a change in management. Only 21% received the correct advice about driving. A questionnaire sent to 130 general physicians and 109 neurologists sought their policy on the management of patients after a first generalised seizure. Completed forms were received from 95 physicians and 82 neurologists (response rate 74%). Half of physicians and neurologists perform a computed tomogram on all patients while one-third scan patients only above a certain age. Neurologists perform significantly more electroencephalograms (86% vs 65%) while many more physicians order a chest radiograph (73% vs 16%). About 80% of physicians compared with about 30% of neurologists ask for routine blood tests of haematology and biochemistry. Only 4% of physicians and 1% of neurologists routinely start anticonvulsant treatment.

A generalised seizure is a common medical problem which may afflict as many as 1 in 20 of the population at some stage [1]. Those who have suffered a seizure are worried that they may have further attacks and that the convulsion may indicate serious disease such as a brain tumour. Moreover, they are concerned about the effects of the seizure on their life, including their job and their ability to hold a driving licence. The physician's task is to attempt to identify the cause and to advise the patient, but the task is made more difficult by a number of controversial aspects of management. While a meticulous history and examination will help to identify those who may have a focal lesion or who may have an increased risk of recurrence, the value of investigations remains debatable. The yield from plain radiographs and from routine tests of haematology and biochemistry is minimal [2,3] but the value of electroencephalography and computed tomography scanning is less clear. Another controversial area is the

prescription of anticonvulsants after the first seizure. Does early treatment alter the prognosis and should it be offered to all patients routinely? While debate surrounds investigation and treatment, there is no doubt about the need to advise patients about the implications of the seizure for driving, employment and leisure activities. In 1977 Hopkins and Scambler stated that the care of patients with epilepsy was characterised by unnecessary electroencephalography and inadequate communication with the patient [4]. Have we improved? The aim of this study was to assess the management of first generalised seizures in adults by a retrospective review of practice in one district general hospital and to determine by means of a postal questionnaire survey current attitudes to management by general physicians and neurologists.

Methods

Hospital audit

The review was conducted at the Royal Naval Hospital at Haslar in Gosport. As well as service patients, Haslar admits around 2,300 civilians to the medical wards each year. The case notes of all adult patients admitted between 1 January 1990 and 31 December 1993 following a witnessed generalised convulsion were examined. Patients with a history of previous convulsions, those in whom the diagnosis was not secure or in whom the seizure complicated a recent stroke or head injury were excluded, as were those in whom focal neurological signs were elicited on examination. Ascertainment was enhanced by examining, in addition, the case notes of all patients admitted during this period with cerebral tumours, as some of these patients might have presented after a convulsion. The audit sought the following information: record of family history and alcohol history, selection and results of investigations, use of anticonvulsant treatment and record of any advice about driving given to the patients: after a first fit, patients should be advised to refrain from driving and inform the Driver and Vehicle Licensing Agency (DVLA).

Questionnaire survey

The questionnaire was sent to 130 consultants in general medicine and 109 consultant neurologists working in district general hospitals in England and Wales who were randomly selected from the Medical Directory. They were asked to confirm that they see patients with epileptic seizures. Given a first generalised seizure in an adult patient in whom there is no history of preceding event (eg head injury or stroke),

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no focal element to the fit and no abnormal neurological signs, they were asked which of the following tests they would routinely order: full blood count, erythrocyte sedimentation rate, urea and electrolytes, glucose, liver function tests, calcium, antinuclear antibodies, syphilis serology, chest radiograph, skull radiograph, cranial computed tomography scan, isotope brain scan, cranial magnetic resonance scan and electroencephalogram. They were asked if their hospital had facilities for cranial computed tomography, magnetic resonance imaging and electroencephalography, and whether their decision to scan was influenced by the age of the patient. If they admitted to an age policy, they were asked to describe it. Finally, they were asked whether they would routinely start patients with this history on anticonvulsants. Confidence intervals at the 95% level were calculated for the differences between the physicians and the neurologists.

Results

Hospital audit

During the four year period, 56 patients were admitted following first generalised seizures. Their ages ranged from 16 to 89 (mean 38), 47 were men and 28 of them were servicemen. The family history was recorded in 41 patients (73%), of whom 3 had a first degree and 2 had a second degree relative with epilepsy. An alcohol history was recorded in 91% of the patients and alcohol misuse was judged responsible for the seizure in 18 cases (31%).

The results are shown in Table 1. A full blood count was done in 55 patients (98%) and was abnormal in 8. In 6 alcoholics the mean corpuscular volume was elevated and 2 other patients had an initial leucocytosis which had resolved by the time they were discharged. One patient had an erythrocyte sedimentation rate of 46 mm/h for which no cause was found. In 2 alcoholics the serum sodium was 130 mmol/l and in a third it was 127 mmol/l but these levels *per se* should not provoke a seizure. A patient with schizophrenia was clinically dehydrated on admission and his sodium was only 119 mmol/l. There were no cases of hypoglycaemia but 5 of the 50 patients in whom the glucose was measured had levels of 8.6–10.9 mmol/l. Liver function tests were normal in 39 patients but the transaminases were elevated in 8 alcoholics. Serum calcium was normal in all 35 patients in whom it was measured and no cases of syphilis were found in 15 patients who had serological tests. No useful information emerged from the 30 chest radiographs; old rib fractures were detected in one alcoholic and the remaining films were normal. All 16 (29%) patients who had a skull radiograph also underwent computed tomography scanning. One patient had an old skull fracture and another had a cranial defect resulting from previous neurosurgery. Both abnormalities could have been predicted from the history.

Table 1. Tests performed in 56 patients admitted after first generalised seizure and abnormalities discovered

Test	Number done	%	Number abnormal
FBC	55	98	MCV >98 fl in 6 alcoholics WBC >20 x 10 ⁹ /l in 2 patients
ESR	39	70	ESR 46 mm/h in 1 patient
U&E	55	98	Na 127–130 mmol/l in 3 alcoholics Na 119 mmol/l in 1 patient
Glucose	50	89	8.6–10.9 mmol/l in 5 patients
LFTs	47	84	Transaminase raised in 8 alcoholics
Calcium	35	63	0
Wasserman reaction	15	27	0
Chest X-ray	30	54	Old rib fractures in 1 alcoholic
Skull X-ray	16	29	Old skull fracture in 1 patient Previous surgery in 1 patient
EEG	43	77	14 5—generalised slow waves 7—generalised spike and wave 1—focal slow wave 1—focal spikes
CT scan	50	89	14 7—cortical atrophy 2—arachnoid cyst 1—porencephalic cyst 1—cranial vault defect 1—subdural calcification 1—cerebral infarct 1—glioma

A single waking electroencephalogram was done in 43 patients (77%) and was abnormal in 14. Five patients had generalised non-specific slow wave activity and 7 had widespread polyspike and wave discharges compatible with epilepsy. One patient with focal slow waves had had previous neurosurgery and another patient with focal spike discharges had a normal computed tomogram. The electroencephalogram did not influence management in any patient.

Computed tomograms were done in 50 patients (89%) and 14 were abnormal. Cortical atrophy was seen in 7 patients, all of them with a history of alcohol misuse. Focal defects comprised arachnoid cysts (2), a cerebral infarct, calcification in an old subdural haematoma, a porencephalic cyst and a cranial vault defect in the patient with a history of previous neurosurgery. The one patient with a glioma was also an alcoholic who had deranged liver function tests and an elevated mean corpuscular volume. The first scan was normal in one patient found on a subsequent exami-

nation to have cerebral metastases from a malignant melanoma. Computed tomography only influenced further management in 2 patients.

Treatment was started after the first seizure in 3 patients. In one case this was because of the scan report of a focal abnormality (arachnoid cyst). Ironically, the patient who was found subsequently to have cerebral melanoma deposits was also started on treatment even though her first computed tomogram was normal.

The notes recorded that only 12 patients (21%) were given appropriate advice about driving. In 5 cases (9%) the notes stated that the patient had only been advised to alert the DVLA, in 11 (20%) that the patient had only been advised not to drive. No driving advice was recorded in the remaining 27 patients (48%) although a few of these patients were probably non-drivers.

Questionnaire survey

Forms were returned by 78.5% of physicians and 76.1% of neurologists. One neurologist had retired, one physician had died and 6 physicians did not see patients with seizures, leaving completed questionnaires from 95 physicians and 82 neurologists. The investigations ordered by each group are listed in Table 2.

Physicians and neurologists agreed that routine tests for syphilis and antinuclear antibodies are unhelpful and that there is no place for the isotope scan. Very few clinicians carry out no investigations and even fewer routinely treat the first seizure. The majority ask for a computed tomogram although 5 neurologists opted for magnetic resonance imaging. Of those who do not scan, the reason appears to be clinical rather than logistic since all of this group reported having access to a scanner.

There was less agreement about the influence of age on scanning policy. Half of the physicians and neurologists scan all adults regardless of age; of those with an age policy, twice as many physicians as neurologists scan only those older than 30. Three physicians and 2 neurologists said they would not scan patients older than 60 (2), 65 (2) and 75 while 3 other physicians commented that their attitude to scanning would depend on the physiological rather than the chronological age of the patient. The questionnaire indicated greater use of the electroencephalogram by the neurologists than the physicians, 86% compared with 65%. Limited access to electroencephalogram facilities is probably not the main reason. Of the 32 physicians who do not perform an electroencephalogram, only 10 do not have an electrophysiology department in their hospital.

The most striking differences between physicians and neurologists are in the use of blood tests for haematology and biochemistry, and the use of chest radiographs. Four-fifths of physicians ask for full blood

count, calcium, glucose and urea and electrolytes, compared with only one-third of neurologists. Three times as many physicians request liver function tests and more than twice the number measure the erythrocyte sedimentation rate. A chest radiograph is ordered by 73% of physicians but only 16% of neurologists. All of the 10% of physicians who request skull radiographs also perform computed tomograms.

Discussion

Audit compares what is done with what should be done. Observed clinical practice is compared with a set of measures acknowledged by consensus and by research to be optimal. This study was not strictly an audit since consensus on the management of the first seizure has manifestly not been achieved despite a substantial volume of research. Areas of uncertainty include the role of imaging and electroencephalography, and the value of anticonvulsant treatment of the first fit remains controversial. Two recent studies have shown benefit from early treatment [5,6] but few British doctors seem willing to follow this course of action pending the outcome of a Medical Research Council trial.

Both the hospital audit and the questionnaire survey have revealed similarly high scanning rates: 89% of the hospital patients had a computed tomogram and 87% of the physicians and 79% of the neurologists said they would scan patients after a first fit (although some did declare an age policy). Although 20–34% of computed tomograms are abnormal after a single generalised seizure in adults, only 6–10% are abnormal if there are no focal neurological signs on examination [3,7,8] and focal scan abnormalities are even less likely in patients with evidence of alcoholism [9]. Young *et al* found that only 6% of patients without focal features to their first fit and no focal signs on clinical and electroencephalographic examination, had abnormal computed tomographic scans, and none of them had treatable lesions [8]. Furthermore, 3 patients (who did have focal features) were subsequently found to have tumours after normal scans. In the present hospital audit the first scan was normal in a patient with cerebral metastases. The Royal College of Physicians study found only 13 tumours from scanning 370 patients after a first seizure, although 2 other patients developed overt tumours after a normal scan [3]. There were no clues from the history and examination to suggest which patients were worth scanning. The authors suggested that, while failure to diagnose a tumour early causes distress to the patient and relatives, it may not necessarily alter the outcome. In an authoritative overview, Chadwick alluded to the low yield from scanning in the absence of focal features and suggested that indiscriminate scanning was unlikely to be worthwhile [2]. A recent Swiss study [9] found no focal scan abnormalities in 35 patients with evidence of alcohol

Table 2. Percentage of physicians and neurologists who order each investigation and who scan patients above a minimum age range. Columns on the right give the difference in percentages between the two groups and confidence intervals for the difference

Test	Physicians (n = 95) %	Neurologists (n = 82) %	Difference %	95% confidence intervals for difference
FBC	85	34	51	38, 64
ESR	70	29	41	27, 54
U&E	85	35	50	37, 62
Glucose	85	38	47	34, 60
LFTs	66	22	44	31, 57
Calcium	83	37	46	33, 59
ANF	4	1	3	-2, 8
WR	7	17	10	0, 20
Chest X-ray	73	16	57	45, 69
Skull X-ray	10	0	10	4, 16
EEG	65	86	21	33, 8
Scan—indiscriminate	50	49*	—	—
Scan—age dependent	37	30	—	—
No tests	4	4	—	—
Treatment	4	1	3	-2, 8
Minimum age range for scan				
16-25	12	21	—	—
26-35	6	14	—	—
36-45	11	2	—	—
46-55	4	0	—	—
> 30	20	8	12	1, 23

* Includes 5 (7%) neurologists who perform MRI.

ANF: antinuclear factor. (See Table 1 for other abbreviations)

misuse and suggested that scans may not be 'absolutely necessary' in patients without focal features whose first seizure was provoked by alcohol. Yet the one glioma found in the present audit was in just such a patient. The consensus recommendation in the literature is that scanning should be performed if there are focal abnormalities on clinical examination or electroencephalogram or if there was a focal element to the seizure [2,7,8,10]. However, this advice is based on studies performed in the early 1980s when few clinicians had easy access to computed tomography. In the present study, all respondents had scanners in their hospitals and availability of computed tomography is no longer a problem. There seems little point in waiting several weeks for the result of an electroencephalogram before deciding whether or not to scan if the scan can be done quickly and easily.

Is it appropriate to scan adults of all ages or is an age policy more cost effective? It is undeniable that the

yield from scanning rises with age [7] but most of this increase is accounted for by lesions such as cortical atrophy and cerebral infarction. Tumours were found at all ages in the Royal College of Physicians study of first seizure in adults [3].

The value of the electroencephalogram after a first generalised seizure in adults remains controversial. While Hopkins *et al* derived little useful information from the procedure [3] others have found that focal discharges help to predict which patients may have tumours and consequently be worth scanning [2,7,8,11], and generalised spike and wave activity may predict recurrence [12,13]. Hauser *et al* found that after an idiopathic seizure patients with an electroencephalogram showing generalised spike and wave discharges were twice as likely to have a second seizure within five years as those without, but only 7% had such abnormal discharges, and as a predictor of recurrence the electroencephalogram was no better than a

sibling history of epilepsy [12]. Van Donselaar *et al* found a cumulative risk of seizure recurrence of 81% in patients with epileptic discharges compared with 12% of those with a normal electroencephalogram [13]. However, the electroencephalograms were done within a few days of the seizure and normal recordings were followed by sleep-deprived traces. Most non-specialist units in this country would be unlikely to be able to offer a similar service [14]. Even with such intensive investigation, the sensitivity of the electroencephalogram is low, 7–11% from a waking trace [12,13] rising to 23% after sleep deprivation [13]. Moreover, the long waiting list for electroencephalography in most units limits its usefulness [14]. Hopkins *et al* found that, of the 13 tumours identified in the Royal College of Physicians first fit study, 4 had been surgically resected before the electroencephalogram could be done [3].

The delay in getting encephalograms done may explain the high rate of computed tomograms in this study. If this is so, why do clinicians also request electroencephalograms? The traditional reasons for doing an electroencephalogram are (a) to add weight to the clinical diagnosis, (b) to aid the classification of the epilepsy and (c) to raise suspicion of a structural lesion [2]—and to these may now be added prediction of recurrence [12,13]. The lack of sensitivity of a single electroencephalogram renders it useless as a diagnostic test and there is little point in doing it to look for a focal abnormality if most patients are being scanned anyway. If treatment is not contemplated, as is current practice in the UK, and if most patients are being scanned, then the impact of the electroencephalogram on management after the first fit is weak [15]. Indeed, the Royal College of Physicians study concluded that 'there is no justification for recording an electroencephalogram after an initial seizure in adults' [3]. Hauser, on the other hand, describes the electroencephalogram as 'the most important single test' for the patient with a first seizure [10], advocating both waking and sleep recordings with photic stimulation and hyperventilation. Despite the conflicting evidence, most (86%) neurologists seem to be convinced of the value of the electroencephalogram in this situation. Physicians (65%) do not seem to be quite so sure. In the present hospital audit, the electroencephalogram was done in 77% of the patients but did not influence management in any.

In contrast to the uncertain value of the electroencephalogram it is generally agreed that the chest radiograph and routine blood tests of haematology, biochemistry and serology are unhelpful, although even here there are dissenting views [10]. No cases of calcium disorder, hypoglycaemia or syphilis were detected in 408 adults after their first seizure in the Royal College of Physicians study [3]. Clearly, blood tests are indicated in certain clinical circumstances but their routine use is of debatable value. Blood tests are relatively cheap, however, and may occasionally yield

unexpected findings. Most of the blood test abnormalities detected in this hospital audit were in alcoholic patients; in only one case did the result alter the patient's management, when an elevated erythrocyte sedimentation rate led to a futile search for the cause. Similarly, no useful information emerged from chest and skull radiographs. The questionnaire revealed extensive use of the chest radiograph by physicians and a significant number of neurologists, and inappropriate skull imaging by a few physicians. The apparent popularity of radiographs in this situation is difficult to explain.

While clinicians are divided about the value of some investigations, they agree that there is no place for routine treatment of the first seizure, even though evidence is now accumulating in its favour [5,6]. In a randomised multicentre study of 397 patients, treatment halved the risk of recurrence at 2 years [5]. The very low use of anticonvulsants reported here is consistent with the view that British doctors are conservative in their treatment of first seizures [16], although Sander *et al* found that 15% of patients were treated [17]. Many American clinicians treat the first fit but the British view is still that one seizure does not constitute epilepsy, despite the fact that 72% of single generalised fits will recur within 3 years [18], 62% within 1 year [19]. In a recent debate on the issue [20], the case in favour of early treatment was not proven and the need for further evidence was emphasised. It is likely that some respondents to the questionnaire in this study do not treat patients routinely but do offer anticonvulsants to selected patients, perhaps for social or occupational reasons.

The record of driving advice given to patients in the hospital audit was disappointing, four-fifths of patients apparently receiving inadequate or no advice. In 1977 Hopkins found that 63% of those ineligible to drive because of epilepsy had not received adequate advice [4].

The hospital audit presented here has some deficiencies. It was retrospective and hence may have evaluated note keeping rather than clinical practice. The subject population, with its male preponderance and high proportion of young servicemen, is not typical. Nonetheless it is believed that similar results would have been obtained elsewhere. The proportion of seizures judged to be related to alcohol (31%) was the same as that found in other studies [9,11].

The hospital audit and the questionnaire survey have revealed discrepancies between the management recommended in the literature and clinicians' everyday practice, and between physicians and neurologists in the use of certain investigations. Comments made by some of the respondents are illuminating: one physician, for example, declared that he has routinely scanned all patients with a first fit ever since he missed a subarachnoid haemorrhage; others mentioned that they are aware of the low yield from routine investigations but feel constrained by patients' expectations

and by medicolegal considerations. There may be some therapeutic value in a negative scan and doctors undoubtedly feel more comfortable reassuring patients if a scan has been done. Such complacency may be misplaced; normal computed tomograms after first fits do not necessarily exclude tumours as this audit and other studies have shown [3,8].

Conclusions

First generalised seizures in adults are a common medical problem and probably about one-third are related to alcohol misuse. This study has shown that there is no clear consensus on the management of the condition and the impression is that patients are over-investigated, and may also be under-advised.

There is a clear need for guidelines for general physicians who see the majority of these patients in district hospitals. Guidelines should reflect practical realities, in particular the waiting times for electroencephalograms and the expense and logistic difficulties of performing both waking and sleep-deprived recordings.

Until such guidance is forthcoming what should be done after a first seizure? As a general physician with no specialist skill in epilepsy, the author's practice is to direct the history and examination to seek evidence of metabolic disturbance or alcoholism, or focal features which might indicate a structural lesion. Blood tests are only ordered if clinically indicated and routine chest and skull radiographs are avoided. In the author's experience, electroencephalography has not significantly influenced patient management after a first seizure, and as it has an 8 weeks waiting time in this hospital it is not routinely performed. Despite the very low yield, a computed tomogram is usually arranged for adult patients and can normally be done within days of the seizure. For clinicians who prefer a more selective approach, restricting scanning only to patients who had a focal element to their seizure or who have focal neurological signs will pick up most structural lesions.

At present, patients are not routinely given anticonvulsants because of the risk of adverse events and the burden of the diagnostic label implied by treatment, but the relative advantages and disadvantages of treatment are discussed and the patients offered the choice.

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