migrates with HbA₁ in the electrophoretic and some other assays and so is included in the HbA₁ result.¹⁰ Nearly half of patients with insulin dependent diabetes mellitus have fetal haemoglobin concentrations exceeding 0.5%.¹¹ Not only may this lead to spuriously raised HbA₁ values in some patients but it may also lead to an increase in the imprecision (and therefore reference range) of the assay as a whole.¹¹

In conclusion, we have found substantial differences in the classification of glycaemic control in diabetic patients when using HbA₁ measurement rather than HbA_{1c}. In relation to the diabetes control and complications trial this inconsistency may have considerable consequences for the long term wellbeing of diabetic patients and may also influence the allocation of resources towards their treatment. Therefore, this study reinforces the need for more standardisation in the methods used for measuring glycated haemoglobin values. Adopting a standardised HbA_{1c} would allow the development of clear guidelines for clinicians based on both recent and subsequent complications trials.

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Indication for computed tomography of the brain in patients with first uncomplicated generalised seizure

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Abstract

Objectives—To assess the yield of emergency computed tomography of the brain in patients with a first generalised epileptic seizure and to evaluate a four item screening questionnaire on alcohol misuse (CAGE questionnaire) as a triage tool to avoid unnecessary scans in cases of seizures related to withdrawal from alcohol.

Design—Prospective, observational.

Setting—Medical casualty unit in a university hospital.

Patients—119 adult patients presenting to casualty within one hour of a generalised seizure.

Measurements—A clinical examination focusing on focal neurological symptoms, the CAGE questionnaire, and computed tomography of the brain with contrast enhancement.

Results—Computed tomography showed a focal, structural lesion of the brain in 40 patients (34% (95% confidence interval 25% to 42%)). In 20 patients (17% (10% to 24%)) an important therapeutic intervention resulted. The presence of a focal neurological deficit had a sensitivity of 50% and a specificity of 89% in predicting focal lesions on computed tomography. Answering "yes" to fewer than two CAGE questions had a sensitivity of 90% and specificity of 44% in identifying patients with focal computed tomography lesions. Focal lesions were not detected on computed tomography in any of the 35 patients (0% (0% to 10%)) who showed no focal neurological symptoms and answered "yes" to two or more CAGE questions.

Conclusions—The diagnostic yield of computed tomography of the brain in adults after a first generalised seizure is high. Combined with the clinical examination, the CAGE questionnaire can reliably identify patients with uncomplicated seizures related to withdrawal from alcohol, in whom computed tomography may not be absolutely necessary.

CAGE questionnaire for detecting alcohol misuse

C Have you ever felt you should *Cut down* on your drinking?

A Have people *Annoyed* you by criticising your drinking?

G Have you ever felt bad or *Guilty* about drinking?

E Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover (*Eye opener*)?

Introduction

Up to 5% of the population are estimated to have a convulsion at some stage in their life.^{1,2} Patients who have a generalised epileptic seizure for the first time are often seen first in a casualty department; the doctors who see them there are often unsure about further evaluation.³ Imaging of the brain, usually with computed tomography is recommended as part of the diagnostic investigation for every adult patient after a first convulsion.^{4,5} The data on the effectiveness of this strategy in identifying patients with treatable lesions, however, are conflicting.⁶⁻¹¹ The value of routine computed tomography has been questioned, particularly in patients with seizures related to withdrawal from alcohol, who represent a large proportion of patients seen in casualty departments with first generalised seizures.¹²⁻¹⁵

We assessed prospectively the yield of routine computed tomography of the brain performed within 24 hours in adults presenting to a casualty department after a first generalised epileptic seizure. We also assessed whether the number of scans could be reduced if the CAGE questionnaire—a simple, four item, validated screening tool for alcohol misuse—was used to identify patients with uncomplicated seizures related to withdrawal from alcohol (see box).^{16,17}

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Methods

The study was conducted in the casualty unit of the department of medicine at our hospital, which has 800 beds and provides non-private, primary and referral care to an urban population of 200 000. The medical casualty unit and an affiliated emergency ward with 20 beds are staffed by house officers in internal medicine in their second or third year of postgraduate training.

From 1 May 1992 to 31 April 1993 eligible patients were brought to the casualty unit within one hour of a suspected generalised epileptic seizure. To increase the reliability of the diagnosis of seizure, only patients meeting diagnostic criteria for a generalised seizure formulated in simple descriptive terms were included.¹⁸ The features that had to be present were (a) a complete, transient loss of consciousness; (b) witnessed tonic-clonic jerks; and (c) oral laceration, urinary loss, or postictal amnesia. A carefully taken medical history ascertained that only patients with a first seizure were included. We excluded patients in status epilepticus and patients with an impairment of consciousness of <14 on the Glasgow coma scale that lasted for more than one hour after they entered the casualty unit.¹⁹

Patients who consented to computed tomography of the brain were admitted to the emergency ward and underwent a standardised general medical and a neurological examination that focused on focal neurological deficits—for example, unilateral cranial nerve dysfunction, such as ocular muscle or central facial palsies; hemianopsia; unilateral motor or sensory deficits; and reflex asymmetries. The examination was performed by a house officer. When uncertain, he or she asked a consultant neurologist to re-examine the patient.

We assessed alcohol habits using the four CAGE questions translated into German. Answering "yes" to two or more of the CAGE questions was taken to indicate a dependence on alcohol.¹⁷

Computed tomography of the brain was performed usually within six hours and always within 24 hours of the seizure. Except for patients whose unenhanced scans showed an intracranial haemorrhage, all patients were also examined with enhancement with bolus injection of intravenous contrast medium. The scans were reported jointly by a junior radiologist and a senior neuroradiologist. We reviewed the written reports and categorised the findings as no abnormality; localised or generalised atrophy; and focal structural lesions. The last category refers to localised structural abnormalities (unilateral or bilateral), such as cerebral infarctions, haematomas, tumours, or abscesses.

The aetiology of seizures was established by an independent review of the hospital charts, including procedural and pathology reports, by two experienced doctors (one specialist in internal medicine and one

TABLE II—Comparison of patients in whom computed tomography showed focal lesion and those in whom it showed atrophy or no abnormality. Values are numbers (percentages) of patients unless stated otherwise

Variable	Focal lesion (n=40)	Atrophy or no abnormality (n=79)	P value
Mean (SD) age (years)	53 (17)	43 (16)	0.0101
Being male	26 (65)	50 (63)	NS
Focal neurological signs	20 (50)	9 (11)	<0.0001
"Yes" answers to CAGE questions*:			
None	29 (73)	37 (47)	
1	7 (18)	7 (9)	
2	2 (5)	11 (14)	0.0035
3	1 (3)	16 (20)	
4	1 (3)	8 (10)	
≥2	4 (10)	35 (44)	0.0002

*See box in text.

neurologist) blinded to the purpose of the study. In cases of dissent the final aetiology was determined by consensus.

The study was reviewed and approved by the hospital's ethics committee.

STATISTICAL ANALYSIS

Means were expressed with standard deviations. Standard formulas were used to calculate test sensitivities and specificities.²⁰ Counts were compared with Fisher's test of exact probability, and continuous variables with the Wilcoxon's rank sum test. Logistic regression analysis, with the presence of a focal lesion on a scan as dependent variable, was performed with the appropriate module in the SAS statistical package.²¹

Results

A total of 132 patients brought to the casualty unit after a suspected epileptic seizure met the inclusion criteria. They represented 1.2% of all patients brought to the unit during the study period.

Thirteen patients were excluded from the analysis because computed tomography was not performed: six patients refused to give consent; clinical circumstances allowed the definite cause of the seizure to be diagnosed in two diabetic patients with severe hypoglycaemia, one terminally ill patient with a known glioblastoma, and one patient with a cocaine intoxication who had ingested 750 g of cocaine in condoms for intestinal transport; and in three patients computed tomography was not ordered because of an oversight.

Table I shows the aetiologies of seizures of the remaining 119 patients (mean age 46 years (SD 16) (range 16–87); 81 men). Computed tomography was normal in 51 patients and showed a localised symmetrical or generalised atrophy in 28. A focal lesion was found in 40 patients (34% (95% confidence interval 25% to 42%)) of whom six had intracranial haematomas and 17 had brain tumours (astrocytoma (seven), meningioma (two), lymphoma (one), and metastasis (seven)). In 20 patients (17% (10% to 24%)) the detection of a focal lesion resulted in major therapeutic interventions: craniotomy (eight patients), high dose corticosteroid treatment (seven), radiotherapy (two), antibiotic treatment for toxoplasmosis (two), and anticoagulation for embolic stroke (one).

Patients whose scans showed a focal lesion were older, more often had persisting focal symptoms in the clinical examination performed after admission to the emergency ward, and answered "yes" to fewer CAGE questions than patients whose scans were normal or showed findings consistent with atrophy (table II).

After age and sex had been adjusted for, the presence of a clinical neurological deficit (odds ratio 4.9 (95% confidence interval 1.7 to 13.7)) and answering "yes" to fewer than two CAGE questions (6.0 (1.9 to 19.5)) remained significant predictors of a focal lesion.

TABLE I—Yield of emergency computed tomography of the brain in 119 patients who had had first generalised seizure

Aetiology of seizure	Total (n=119)	Neurological focal deficit (n=29)	Result of computed tomography		
			No abnormality (n=51)	Atrophy (n=28)	Focal lesion (n=40)
Idiopathic	17	2	17	0	0
Infarction	14	7	5	0	9
Primary neoplasia	10	5	0	0	10
Metastasis	7	5	0	0	7
Intracranial haemorrhage	6	4	0	0	6
Remote trauma	5	0	1	0	4
HIV encephalopathy	4	0	2	2	0
Withdrawal from drug	4	0	4	0	0
Intoxication from drug	3	2	3	0	0
Alzheimer's disease	2	1	0	2	0
Toxoplasmosis	2	2	0	0	2
Viral encephalitis	1	1	1	0	0
Bacterial meningitis	1	0	1	0	0
Arteriovenous malformation	1	0	0	0	1
Arachnoid cyst	1	0	0	0	1
Withdrawal from alcohol	41	0	17	24	0

The neurological examination alone had a sensitivity of 50% and a specificity of 89% in identifying patients with a focal lesion. Lesions would have remained undetected in 20 patients if only a focal finding in the neurological examination had indicated radiology. Answering "yes" to fewer than two CAGE questions had a sensitivity of 90% in identifying patients with focal lesions and a specificity of 44%.

The figure shows our results of using a strategy for computed tomography that combined both a neurological examination and use of the CAGE questionnaire. All focal lesions would have been

Yield of computed tomography of the brain combined with clinical examination and CAGE questionnaire in 119 patients with first generalised seizure

detected if computed tomography had been performed only in patients who either showed a focal neurological deficit in the clinical examination or—in the absence of a neurological deficit—answered "yes" to none or only one of the CAGE questions. Thirty three of the 35 patients who showed no focal neurological symptoms and answered "yes" to two or more CAGE questions, had seizures that were determined as cases of uncomplicated withdrawal from alcohol. The two remaining patients were thought to be dependent on alcohol as well; in one of these, however, the seizure was interpreted as resulting from encephalopathy associated with HIV, and in the other the seizure was regarded as a symptom of concomitant withdrawal from a benzodiazepine.

Discussion

Whether a neuroimaging procedure should be done in every patient after a first epileptic seizure is controversial. Because of different criteria for patient selection the percentage of focal lesions detected with computed tomography reported in former studies varied from 6% to 34%.⁷⁻¹¹ Correspondingly, recommendations for using computed tomography after a first seizure vary. While some investigators prefer to reserve it for patients with focal neurological signs^{7,8} or a partial onset seizure,¹⁰ others advocate using it in every case.^{9,11}

In a third of our patients a focal lesion was detected, including a considerable number of brain tumours and intracranial haemorrhages. In half of these patients the finding of computed tomography resulted in important therapeutic interventions. This high yield alone may justify routine computed tomography in patients presenting to casualty departments after a first generalised seizure.

In view of the pressure imposed by rising costs of health care, however, a more economical approach, which limits the use of computed tomography without missing life threatening but potentially curable conditions, would be desirable. It is unsatisfactory, on the basis of our experience, to restrict computed tomography for this purpose to patients with focal neurological symptoms. However, a strategy for computed tomography that combined the results of the neurological examination and those of the CAGE questionnaire would have eliminated non-contributory scans by identifying patients with uncomplicated seizures related to withdrawal from alcohol.

Some retrospective studies addressing the usefulness of computed tomography in seizures related to withdrawal from alcohol have been conflicting. Feussner *et al* found 1% reversible cerebral lesions in patients with such seizures who had no neurological symptoms and concluded that computed tomography does not improve evaluation in these patients.¹⁴ In contrast, Earnest *et al* recorded intracranial lesions in 16 of 259 (6%) patients with first convulsions related to alcohol and saw no correlation with focal neurological symptoms.¹⁵ They regarded computed tomography as an important test in these patients. Our experience suggests that in patients who have no focal neurological deficit and who probably have seizures related to withdrawal from alcohol (as identified with the CAGE questionnaire) emergency computed tomography of the brain may not be absolutely necessary. Although none of the 35 (0%) patients with these characteristics, however, showed a focal lesion in scans, the upper 95% confidence limit for this percentage reaches 10%. Especially in emergency settings, where thresholds for ordering tests are lower, clinicians may regard this as an unacceptably high probability of missing potentially curable lesions.

LIMITATIONS OF STUDY

To achieve a good reliability of the diagnosis of seizure, only patients with generalised seizures were included. If patients with focal and complex partial seizures had been included, the yield of computed tomography may have been higher. In former series, patients with types of seizures other than generalised accounted for 10% to 55% of the patients, and the yield of computed tomography in these patients was usually higher than in those with generalised convulsions.^{7-9,11}

Since patients with convulsions related to withdrawal from alcohol mostly present as having generalised seizures,²² these patients might be overrepresented in our series. However, a third of adults with a first seizure related to withdrawal from alcohol compares well with other surveys.^{1,3,6,11,13}

We made no effort to evaluate the potential of less expensive methods such as electroencephalography as a triage tool for computed tomography. The results of such an approach, however, have been discouraging.^{10,23} Increasingly, computed tomography is readily available to casualty departments, even in smaller hospitals, while electroencephalography remains a procedure dependent on specialists.

Because the clinical examination was performed by house officers in internal medicine who did not specialise in emergency medicine or neurology and were supervised by a neurologist only when they were uncertain, clinical clues to positive findings on computed tomography may have been missed. The sensitivity of a more comprehensive neurological examination may therefore have been underestimated. However, because non-specialist doctors in casualty departments are often the first to evaluate patients with epileptic seizures, it seemed more realistic to rely on their clinical examinations.

Clinical implications

- Computed tomography is recommended as part of the diagnostic investigation for adults with a first generalised epileptic seizure
- Data on the effectiveness of such a strategy in identifying patients with treatable lesions are conflicting
- This study of 119 patients with a first seizure showed that computed tomography had a high diagnostic yield
- Patients without neurological symptoms and who did not misuse alcohol did not have focal lesions on computed tomography
- Routine tomography should be performed in most patients but may be unnecessary in those with uncomplicated seizures related to withdrawal of alcohol

CONCLUSION

Both the diagnostic yield and the resulting interventions justify computed tomography of the brain in most adult patients in casualty departments who have had a first generalised seizure. However, in patients who have uncomplicated seizures related to withdrawal from alcohol—suggested by two or more “yes” answers to the four CAGE questions and by the absence of focal neurological symptoms on clinical examination—computed tomography may not be mandatory, which would thus greatly reduce the number of scans that yield no positive diagnosis.

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Managing injuries from sharp instruments in health care workers in Mersey

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Exposure of health care workers to bloodborne viruses due to injuries from sharp instruments is of increasing concern. Guidelines exist on the action to be taken if a needlestick accident occurs.^{1,2} We carried out a postal questionnaire survey to investigate the management of such accidents in Mersey Regional Health Authority.

Methods and results

We sent questionnaires to all the consultant microbiologists (17), senior sisters or managers of occupational health departments (14), genitourinary physicians (nine), infectious disease physicians (two), and heads of accident and emergency departments (15) in the Mersey region. We also sent questionnaires to eight of all 12 infection control nurses.

Forty seven (72%) of the 65 questionnaires were returned. The response rate from the occupational groups ranged from 55% to 100%. In answer to the first question, nine of the respondents said that they always referred people injured by sharp instruments to another department so these respondents did not complete the rest of the questionnaire. Not all of the

remaining 38 respondents answered all the questions.

Of the 23 hospitals from which replies were received, 21 had a written policy on injuries from sharp instruments. Three hospitals did not keep records of such incidents. The responses from eight hospitals allowed us to compare the action taken by different respondents in the same hospital. In five of these hospitals the recommended action varied among respondents while in the remaining three hospitals similar management was recommended by all the respondents.

Testing of the donor (patient whose blood or other fluid is on the sharp instrument causing the injury) varied among respondents (table). Most respondents (28 out of 36) recommended long term storage of the serum of the recipient (person injured by the sharp instrument); 11 of these would test for hepatitis B surface antigen before storage. Thirty two respondents reported that they would advise recipients who were not immune to hepatitis B virus to be given hepatitis B specific immunoglobulin if (a) the donor was hepatitis B positive (26), (b) was regarded as high risk (16), or (c) was unknown (four). Thirty two respondents would

Responses to survey in Mersey Regional Health Authority about testing donor for hepatitis B surface antigen and HIV antibody after injury to member of staff from sharp instrument. Values are numbers of respondents (n=34)

	Hepatitis B surface antigen	HIV antibody
Always test	19	6
Test only high risk donor	13	19
Never test	2	9

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