Occasional Paper

When do epileptic patients need treatment? Starting and stopping medication

D CHADWICK, E H REYNOLDS

Abstract

Decisions about when to start and stop antiepileptic treatment have important implications for patients with epilepsy. Clinical practice varies and is determined more by dogmatic teaching than by knowledge of either the clinical course of epilepsy or the influence of the drugs. A review of the available evidence shows the need for further studies on the effects of starting and withdrawing treatment on the clinical course and prognosis of epilepsy.

Introduction

In a recent survey based on the records of a general practice in south east England the lifetime prevalence of epilepsy (excluding febrile convulsions but including single seizures) was 20·3/1000.¹ For some patients the disorder may be short lasting, for others epilepsy is a chronic problem demanding long term treatment. This variable prognosis leads to difficulty in deciding, firstly, when to begin antiepileptic treatment with drugs and, secondly, when to withdraw it. Current practice varies and is based on dogmatic clinical teaching rather than scientific evidence. This paper reviews the available evidence on starting and withdrawing treatment with antiepileptic drugs in the light of recent studies of the prognosis of epilepsy. We have not, however, considered treatment of children with febrile convulsions.

Most studies of the prognosis of epilepsy have been undertaken at hospitals or institutions that have accumulated patients with severe and chronic epilepsy. Such studies suggest that only about one third of patients achieve even a two year remission.² Recent investigations of less selected populations, however, indicate a much better outlook. Annegers *et al* identified all newly diagnosed epileptic patients in Rochester, Minnesota, from 1935 to 1974.³ Of those followed up for 20 years, as many as 65% were in a remission that had lasted at least five years. Roughly half of these had successfully stopped treatment. Goodridge and Shorvon showed that by 15 years after the onset of seizures a similar proportion of epileptic patients in a general practice population of 6000 had achieved at least a four year remission.¹ Only 38% of patients were still taking antiepileptic drugs. Further support for a more favourable outcome to epilepsy is derived from recent prospective studies of newly diagnosed, previously untreated patients presenting to hospitals. Roughly 75%

of such patients rapidly achieve a two year remission of epilepsy when receiving treatment with a single drug.^{4,6}

Thus the long term prognosis for most patients with epilepsy is good, and the question arises to what extent the start of antiepileptic treatment and its continuation are responsible for this fact—that is, do antiepileptic drugs simply control or do they cure the disorder?

When to start antiepileptic treatment

Starting treatment with an antiepileptic drug is a major event in the life of an epileptic patient. Such treatment is often begun hastily and without much explanation in response to what appears to be a crisis—that is, the first seizure or series of seizures—which is understandably alarming to the patient and family. Patients, however, have to live with this decision for many years. They are increasingly aware of the toxicity of all types of drug, especially when used on a long term basis. They are often unclear about what to expect from treatment, how long it will last, and the risks of poor compliance and withdrawal seizures. They worry, for example, about how the treatment will interact with alcohol consumption and concomitant drugs, such as oral contraceptives, and how it might affect pregnancy. The decision to treat should preferably be made by a physician experienced in the diagnosis and long term management of epilepsy, who can evaluate the many complex factors that influence the decision, explain the implications, and discuss the patient's anxieties.⁷

DIAGNOSIS OF EPILEPSY

Before treatment with antiepileptic drugs is begun the diagnosis must be confidently established and based on clinical criteria drawn from an adequate history of seizures taken from both the patient and eye witnesses. These criteria will be sufficient to establish a diagnosis in most cases. In some patients valuable confirmatory evidence of epilepsy can be gained from electroencephalographic recordings or more specialised techniques such as telemetry or ambulatory monitoring.⁸

When diagnostic difficulty persists the best course is to let time make matters clear. Therapeutic trials of antiepileptic drugs are rarely justifiable. In such circumstances there is a danger that subsequent withdrawal of an antiepileptic drug may add weight to an erroneous diagnosis because seizures are provoked. An erroneous diagnosis of epilepsy is a common cause of resistance of "attacks" to antiepileptic treatment. Betts found that 20% of patients admitted to psychiatric hospitals with a diagnosis of epilepsy did not have the disorder.⁹ A similarly high proportion of patients admitted to epileptic institutions have been incorrectly diagnosed (J Oxley, personal communication).

When the nature of a patient's attacks has been ascertained the next question to be considered is, How many seizures warrant treatment?

PROSPECTIVE RISK OF EPILEPSY

Antiepileptic treatment has sometimes been advocated before seizures occur. Such prophylactic treatment may be undertaken in patients with a high prospective risk of epilepsy after injury to the head¹⁰ and craniotomy for various neurosurgical conditions,¹¹ but no evidence exists that antiepileptic treatment is effective in either case.^{12,13} Thus it would seem better to delay treatment until seizures occur rather than adopt a policy of blanket

Mersey Regional Department of Medical and Surgical Neurology, Walton Hospital, Liverpool

D CHADWICK, DM, MRCP, consultant neurologist

Department of Neurology, Maudsley and King's College Hospitals, London SE5

E H REYNOLDS, MD, FRCP, consultant neurologist

Correspondence to: Dr Reynolds.

treatment of all potentially epileptic patients, especially as there are major problems of compliance¹⁴ and in determining for how long treatment should be continued.

SINGLE SEIZURES

Reports on the prognosis of a single untreated seizure are conflicting. Gowers said, "when one attack has occurred, whether in apparent consequence of an immediate excitant or not, others usually follow without any immediate traceable cause."¹⁵ In their retrospective general practice study Goodridge and Shorvon found that a single seizure was followed by others in 80% of patients.¹ On the other hand recent retrospective studies based on hospitals have suggested a much lower prevalence of recurrence. Of 70 patients referred to an adult neurology clinic after a single seizure, 27 had a recurrence over a mean follow up of four years nine months.¹⁶ Most recurrences occurred within the first two years. Among 244 patients with an "unprovoked" first seizure Hauser *et al* found that the cumulative risk of recurrence was 18% at one year, 21% at two years, and 27% at three years.¹⁷ In patients with a history of neurological insult the risk of recurrence rose to 34% at 20 months. The comparatively lower prevalence of relapse in the latter studies may be related to the interval between the first seizure and the time when the patient came to medical attention, which was six weeks in the study of Cleland *et al*¹⁶ and unstated by Hauser *et al*.¹⁷ Clearly, all epileptic patients begin with a single seizure, but if several weeks elapse before they are seen at a clinic many will already have had recurrences and will no longer be classified as having had single seizures. This was shown in a study of 133 patients presenting to their general practitioner or a casualty officer with a single seizure (R D C Elwes *et al*, unpublished report). The cumulative probability of recurrence was 62% by one year and 71% by three years; 20% had had a recurrence within one month and 32% within three months.

Most neurologists in the United Kingdom seem not to treat patients after single seizures, preferring to await evidence of recurrent seizures. In the United States of America there is a greater tendency to treat patients after single seizures, although this appears to be based on defensive medicolegal considerations rather than evidence of the value of such a policy. In fact, no adequate investigation of the value or otherwise of treating patients after single seizures has been made, and the required studies on which to base a rational policy are only now being undertaken.

RECURRENT SEIZURES

If two or more seizures occur within a short interval antiepileptic treatment is generally thought to be necessary. There is, however, considerable variation in practice because no studies exist on the clinical course of untreated epilepsy. Problems arise in defining a short interval. Most doctors would include one year within this definition, but what if the interval between seizures is two, three, or four years? As antiepileptic treatment is usually administered for a minimum of two or three years is there any justification in treating patients who have had two seizures at an interval of two, three, or four years?

Hauser *et al* noted that in contrast to a 27% risk of recurrence in patients with a single seizure the risk in patients with two seizures rose to 60%.¹⁸ In a study of 106 previously untreated patients followed up prospectively for up to nine years the longer seizures continued during treatment the less likely the patients were to go into remission.⁶ Furthermore, the intervals between successive untreated tonic-clonic seizures decreased progressively,⁷ suggesting that epilepsy tends to escalate, as proposed by Gowers,¹⁵ and supporting the view that seizures should be suppressed by treatment as soon as possible.⁴ Alternatively, these observations may be explained by patients with inherently more severe epilepsy behaving in this way independently of treatment with drugs.¹⁹ Clearly, studies are required comparing policies of treatment and no treatment in patients with one or two untreated seizures.

PROGNOSTIC FACTORS

Several biological and psychosocial factors adversely influence the prognosis for long term remission of epilepsy. These include partial seizures in contrast with generalised attacks, seizures symptomatic of pre-existing cerebral disease rather than idiopathic epilepsy, the duration of epilepsy and frequency of seizures, and the presence of neuropsychiatric handicaps. Most of these data have been derived from retrospective, hospital based studies of patients with chronic epilepsy,² but they are supported by recent prospective studies of prognosis in new, previously untreated patients.^{4-6,20} When uncertainty exists about the need to start treatment the presence of such adverse prognostic factors may favour treatment (table I).

PRECIPITATING FACTORS

If attacks are precipitated by factors that are avoidable counselling of the patient or a relative might be sufficient and render treatment with drugs unnecessary. Perhaps the most common examples are febrile convulsions in children and alcohol withdrawal seizures in adults. Less commonly, attacks may be precipitated when photosensitive subjects watch a faulty television or video or attend discos.^{21,22} Loss of sleep or changes in sleep patterns, as well as severe emotional stress,²³ may also be avoided.

Many drugs are potentially epileptogenic, including antibiotics, hormonal preparations, antiarrhythmic drugs, radiographic contrast media, and psychotropic drugs,²⁴ of which chlorpromazine and tricyclic antidepressants have been particularly implicated. Withdrawal of barbiturates or benzodiazepines such as diazepam can also provoke seizures.²⁵

COMPLIANCE

Poor compliance and sudden withdrawal of antiepileptic treatment predispose to seizures. They are common in patients being treated for chronic epilepsy and may be the single most common cause for the recurrence of seizures after treatment has been successfully started.⁶ Patients who abuse alcohol or drugs or who have severe personality or psychological handicaps are most likely to exhibit poor compliance and may in some instances be better off without drugs, accepting the continued risk of some seizures.

Stopping antiepileptic treatment

The fact that antiepileptic drugs have been associated with various acute idiosyncratic, dose related adverse reactions and increasingly well documented chronic toxic and teratogenic effects,^{26,27} as well as more subtle effects on behaviour and cognitive function,²⁸ is a potent argument for exploring the possibility of withdrawing drugs in patients who achieve remissions lasting two, three, or more years. Against this are the dangers of a recurrence of seizures, which may have important consequences for driving and employment as well as self esteem.

Advice offered to patients on this subject varies widely. Most paediatricians and paediatric neurologists suggest a trial withdrawal of antiepileptic drugs in most children attaining remission, as they are concerned about the impact of drugs on cognitive function and learning and are impressed by the high expectation of success. Adult neurologists tend to be much more circumspect, expressing concern over the possible effects of further seizures on driving and employment. In the United Kingdom, if not elsewhere, however, most patients attaining prolonged remission are unlikely to receive any advice from a neurologist or other physician with an interest in the treatment of epilepsy because they will have been discharged from regular

TABLE I—Starting antiepileptic treatment

Problem	Usual clinical practice	Factors that may modify usual practice
Prospective risk of epilepsy	No treatment	
Single seizure (clinically diagnosed)	No treatment	Progressive cerebral disorder Clearly epileptic electroencephalogram
Two or more seizures (clinically diagnosed)	Monotherapy	Seizures widely separated in time (>1 year) Identified precipitating factors (such as drugs, alcohol, reflex) Probability of poor compliance (such as personality disorder) Attitude of patient/parents

TABLE II—Relapse after withdrawal of antiepileptic drugs (studies including adults)

Authors	No of patients	Remission before withdrawal (years)	Period of withdrawal	Follow up (years)	Prevalence of relapse (No (%) of patients)
Juul-Jensen ³³	200	>2	2-3 months	5	79 (39)
Janz and Sommer-Burkhardt ³⁴	253	>2	Unspecified	<5	124 (49)
Overweg <i>et al</i> ³⁶	46	>3	Unspecified	>0.75	29 (63)
Oller-Daurella <i>et al</i> ³⁷	317	>5	>1 year	0.5-27	55 (17)
Yahr <i>et al</i> ³⁸	26	>2	Unspecified	Unspecified	12 (46)
Strobo ³⁹	41	>2	Unspecified	Unspecified	19 (46)
Merritt ⁴⁰	89	>3	Unspecified	Unspecified	39 (44)
Van Heycop Ten Ham ⁴¹	151	>5	Unspecified	2	49 (32)

TABLE III—Relapse after withdrawal of antiepileptic drugs in children

Authors	No of patients	Remission before withdrawal (years)	Period of withdrawal (months)	Follow up (years)	Prevalence of relapse (No (%) of patients)
Emerson <i>et al</i> ³⁰	68	>4	2-3	0.5-6	18 (26)
Holowach <i>et al</i> ³⁵	148	>4	Unspecified	5-12	36 (24)
Zenker <i>et al</i> ³²	117	0.5-9	Unspecified	Unspecified	24 (21)
Rodin and John ⁴³	32	1.75-13	0-25-48	2	2 (6)

TABLE IV—Stopping antiepileptic treatment

Absolute requirement	Factors in favour	Factors against
Two to three years free of all seizures	Childhood epilepsy Primary generalised epilepsy Absence of cerebral disorder	Late onset epilepsy Partial epilepsy Cerebral disorder
Patient's informed agreement	Short duration of epilepsy Normal electroencephalogram Non-driver	Long duration of epilepsy Abnormal electroencephalogram Driver

follow up. Of 122 patients with a history of epilepsy drawn from general practice, 49 had stopped treatment, most of them on their own initiative.¹

The few studies that have been undertaken to determine the success of withdrawing drugs and the factors that identify patients likely to remain free of seizures have recently been reviewed.²⁹ Comparison of the available studies is difficult because there is often little information about the patients, a lack of uniformity in the length of remission before withdrawal of the antiepileptic drugs, and no information about the period over which withdrawal occurred and for how long patients were subsequently followed up (tables II and III). Quoted prevalences of relapse tend to be crude figures after follow up for an arbitrary period. Actuarial figures are more valid.³⁰⁻³¹ Furthermore, the numbers of patients in the studies tend to be small, which means that important subgroup analysis may be difficult.

Overall, however, it seems that about 30% of patients achieving two or three years' remission will have a recurrence of seizures on withdrawal of drugs and most seizures will occur either during the period of reduction of antiepileptic drugs or within six months to a year after they are stopped completely.

FACTORS INFLUENCING RELAPSE

The factors that influence the outcome of withdrawal of antiepileptic drugs are similar to those that determine the likelihood of a patient initially achieving a two to three year remission. Thus the prevalence of relapse in children is about 20%,³⁰⁻³¹ whereas in adults it is about 40%.³²⁻³³ The duration of epilepsy and its severity, as judged by the number and frequency of seizures before remission, are directly related to the likelihood of relapse (table IV).³¹⁻³²⁻³⁴

The classification of epilepsy has important consequences. Relapse of petit mal epilepsy and of primary tonic-clonic seizures is rare. The combination of differing types of seizure and the presence of secondary, generalised, or partial epilepsy, however, considerably increases the risk of relapse. The presence of neuropsychiatric or cerebral disorders affects the prognosis adversely.³²⁻³⁵ Whether electroencephalography is a helpful prognostic aid is controversial. Certainly, only those electroencephalograms taken at the time that treatment is withdrawn are of value. Though some groups have found that a persisting abnormality in the electroencephalogram is of adverse prognostic importance,³⁰⁻³³ others have found the electroencephalogram to be unhelpful.³⁴⁻³⁶

Emerson *et al* assessed the relative contribution of several factors to the prognosis after withdrawal of drugs.³⁰ They found that a normal electroencephalogram before withdrawal and a history of only a few tonic-clonic seizures were of greatest importance. Thurston *et al* undertook a similar multivariate analysis and found that the duration of epilepsy and the presence of focal motor seizures, or combinations of seizure types and the presence of neurological deficit, were the most important adverse factors.³¹ These studies were, however, restricted to childhood epilepsies.

PROBLEMS OF WITHDRAWING ANTIEPILEPTIC DRUGS

Patients are assumed to be more likely to have seizures when they stop taking antiepileptic drugs than when they continue them. Advice to continue drugs indefinitely may not, however, guarantee continued remission, partly because patients may become less compliant. Unfortunately, there is

no available information to compare the prevalences of relapse in patients randomly allocated to continuance or withdrawal of treatment. Such information is needed because the most important question is perhaps not the absolute risk of relapse when treatment is stopped but the amount by which stopping treatment increases the risk of further seizures.

Surprisingly, we lack any data that satisfactorily describe the risk of relapse after two or three years' remission in patients continuing treatment. Annegers *et al* found a risk of seizures of 1.6% a year in patients remaining free of seizures for five years.³ The risk of relapse might, however, be greater in patients who have attained shorter remissions, and indeed the study of Elwes *et al* suggests that the risk of subsequent relapses may be as high as 8% a year after a two year remission.⁶ Thus the benefits of continued antiepileptic treatment in terms of better control of seizures might not be great enough to outweigh the adverse effects, particularly if poor compliance is a problem in patients advised to continue treatment.

Another problem is whether increasingly long periods free of seizures carry a better prognosis for withdrawal. Unfortunately, there is no information about whether withdrawal of antiepileptic drugs is considered best after two, three, five, or more years of remission.

Data permitting assessment of the importance of the relative speed at which antiepileptic drugs are withdrawn are also limited. All clinicians are aware of the dangers of suddenly stopping treatment, and all groups agree that relapses commonly occur during or shortly after a reduction in or total withdrawal of treatment. Oller-Daurella *et al* found that withdrawing drugs very slowly resulted in a much lower risk of relapse than that in other studies including adult patients.³⁷

Do seizures that arise in close association with withdrawal of drugs suggest a continuing epileptic disorder that requires continued treatment, or can they be regarded simply as withdrawal seizures similar to those that occur with shorter acting sedative drugs such as alcohol, barbiturates, and benzodiazepines and therefore not necessarily demanding reintroduction of treatment? These questions demand further investigation. The Medical Research Council has recently undertaken to fund a large multicentre study of the problem of withdrawing antiepileptic drugs, which will seek to recruit over 1000 patients from 20 centres in the United Kingdom.

Conclusion

We have summarised our current practice in tables I and IV and hope that in the short term this review will stimulate physicians to take a more circumspect and considered view of the important decisions about starting and stopping antiepileptic treatment. In the longer term large, well organised studies that shed light on the clinical course of epilepsy are obviously necessary. Some have begun, and their results may eventually have an important effect on clinical practice. Until then we shall remain uncertain to what extent the prognosis of epilepsy is determined by its clinical course or by the effects of intervention with antiepileptic drugs.

References

1 Goodridge DMG, Shorvon SD. Epileptic seizures in a population of 6000. II: Treatment and prognosis. *Br Med J* 1983;287:645-7.

2 Rodin EA. *The prognosis of patients with epilepsy*. Springfield, Illinois: Thomas, 1968.

3 Annegers JF, Hauser WA, Elverback LR. Remission of seizures and relapse in patients with epilepsy. *Epilepsia* 1979;20:729-37.

4 Reynolds EH, Elwes RDC, Shorvon SD. Why does epilepsy become intractable? Prevention of chronic epilepsy. *Lancet* 1983;ii:952-4.

5 Turnbull DM, Howell D, Rawlins MD, Chadwick D. Which drug for the adult epileptic patient: phenytoin or valproate? *Br Med J* 1985;290:815-9.

6 Elwes RDC, Johnson AL, Shorvon SD, Reynolds EH. The prognosis for seizure control in newly diagnosed epilepsy. *New Engl J Med* 1984;311:944-7.

7 Reynolds EH. The initiation of anticonvulsant drug therapy. Implications for prognosis. In: Meldrum BM, Pedley TA, eds. *Recent advances in epilepsy*. Vol 2. Edinburgh: Churchill Livingstone, 1985:101-9.

8 Binnie CD. Telemetric EEG monitoring in epilepsy. In: Meldrum BM, Pedley TA, eds. *Recent advances in epilepsy*. Vol 1. Edinburgh: Churchill Livingstone, 1983:155-78.

9 Betts TA. Psychiatry and epilepsy. In: Laidlaw J, Richens A, eds. *Textbook of epilepsy*. Edinburgh: Churchill Livingstone, 1983:227-70.

10 Jennett B. *Epilepsy after non-missile head injuries*. London: William Heinemann, 1975.

11 Foy PM, Copeland GP, Shaw MDM. The incidence of postoperative seizures. *Acta Neurochir (Wien)* 1981;55:253-64.

12 Janz D. Prognosis and prophylaxis of traumatic epilepsy. In: Rose FC, ed. *Research progress in epilepsy*. London: Pitman, 1983:161-74.

13 Shaw MDM, Foy PM, Chadwick D. The effectiveness of prophylactic anticonvulsants following neurosurgery. *Acta Neurochir (Wien)* 1983;69:253-8.

14 McQueen JK, Blackwood DHR, Harris P, Kalbag RM, Johnson AL. Low risk of post traumatic seizures following severe head injury: implications for clinical trials of prophylaxis. *J Neurol Neurosurg Psychiatry* 1983;46:899-904.

15 Gowers WR. *Epilepsy and other chronic convulsive diseases*. London: Churchill Livingstone, 1881.

16 Cleland PG, Mosquera I, Steward WP, Foster JB. Prognosis of isolated seizures in adult life. *Br Med J* 1981;283:1364.

17 Hauser WA, Anderson VE, Loewenson RB, McRoberts SM. Seizure recurrence after a first unprovoked seizure. *New Engl J Med* 1982;307:522-8.

- 18 Hauser WA, Rich SS, Jacobs MP, Anderson VE. Patterns of seizure occurrence and recurrent risks in patients with newly diagnosed epilepsy. *Abstracts of the 15th epilepsy international symposium*. Hartford, Connecticut: American Epilepsy Society, 1983:16.
- 19 Chadwick D, Turnbull DM. The comparative efficacy of antiepileptic drugs. *J Neurol Neurosurg Psychiatry* (in press).
- 20 Shorvon SD, Reynolds EH. Early prognosis of epilepsy. *Br Med J* 1982;285:1699-701.
- 21 Jeavons PM, Harding GFA. *Photosensitive epilepsy. A review of the literature and a study of 460 patients*. London: William Heinemann, 1975.
- 22 Fenwick P. Precipitation and inhibition of seizures. In: Reynolds EH, Trimble MR, eds. *Epilepsy and psychiatry*. Edinburgh: Churchill Livingstone, 1981:306-21.
- 23 Williams D. The emotions and epilepsy. In: Reynolds EH, Trimble MR, eds. *Epilepsy and psychiatry*. Edinburgh: Churchill Livingstone, 1981:49-59.
- 24 Chadwick D. Drug induced convulsions. In: Rose FC, ed. *Research progress in epilepsy*. London: Pitman, 1983:151-60.
- 25 Toone BK, Fenton GW. Epileptic seizures induced by psychotropic drugs. *Psychol Med* 1977;7:265-70.
- 26 Reynolds EH. Chronic antiepileptic toxicity: a review. *Epilepsia* 1975;16:319-52.
- 27 Schmidt D. *Adverse effects of antiepileptic drugs*. New York: Raven Press, 1982.
- 28 Reynolds EH. Mental effects of antiepileptic medication: a review. *Epilepsia* 1983;24:S85-95.
- 29 Chadwick D. The discontinuation of antiepileptic therapy. In: Meldrum BM, Pedley TA, eds. *Recent advances in epilepsy*. Vol 2. Edinburgh: Churchill Livingstone, 1985:111-24.
- 30 Emerson R, D'Souza BJ, Vining EP, Holden KR, Mellits ED, Freeman JM. Stopping medication in children with epilepsy. *New Engl J Med* 1981;304:1125-9.
- 31 Thurston JH, Thurston DL, Hixon BB, Keller AJ. Prognosis in childhood epilepsy. *New Engl J Med* 1982;306:831-6.
- 32 Juul-Jensen P. Frequency of recurrence after discontinuance of anticonvulsant therapy in patients with epileptic seizures. *Epilepsia* 1964;5:352-63.
- 33 Juul-Jensen P. Frequency of recurrence after discontinuance of anticonvulsant therapy in patients with epileptic seizures. A new follow up study after 5 years. *Epilepsia* 1968;9:11-6.
- 34 Janz D, Sommer-Burkhardt EM. Discontinuation of antiepileptic drugs in patients with epilepsy who have been seizure free for more than two years. In: Janz D, ed. *Epileptology*. Stuttgart: Thieme-Verlag, 1975:228-34.
- 35 Holowach J, Thurston DL, O'Leary J. Prognosis of childhood epilepsy. *New Engl J Med* 1972;286:169-74.
- 36 Overweg J, Rowan AJ, Binnie CD, Oosting J, Nagelkerke NJD. Prediction of seizure recurrence after withdrawal of antiepileptic drugs. In: Dam M, Gram L, Penry JK, eds. *Advances in epileptology: XIth epilepsy international symposium*. New York: Raven Press, 1981:503-8.
- 37 Oller-Daurella L, Pamies R, Oller L. Reduction or discontinuance of antiepileptic drugs in patients seizure free for more than 5 years. In: Janz D, ed. *Epileptology*. Stuttgart: Thieme-Verlag, 1976:218-27.
- 38 Yahr MD, Sciarra D, Carter S, Merritt HH. Evaluation of standard anticonvulsant therapy in three hundred nineteen patients. *JAMA* 1952;150:663-7.
- 39 Strobus RRJ. Prognosis in convulsive disorders. *Arch Neurol* 1959;1:216-25.
- 40 Merritt H. Medical treatment in epilepsy. *Br Med J* 1958;1:666-9.
- 41 Van Heycop Ten Ham MW. Complete recovery from epilepsy? *Huisarts en Wetenschap* 1980;23:309-11.
- 42 Zenker C, Groh C, Roth G. Probleme und Erfahrungen beim Absetzen anticonvulsiver Therapie. *Neue Österreichische Zeitschrift für Kinderheilkunde* 1957;2:152-63.
- 43 Rodin EA, John G. Withdrawal of anticonvulsant medications in successfully treated patients with epilepsy. In: Wada JA, Penry JK, eds. *Advances in epileptology: XIth epilepsy international symposium*. New York: Raven Press, 1980:183-6.

(Accepted 14 March 1985)

Lesson of the Week

Injury to cervical spine after a game of British bulldog

J D SPENCER, I W L BINTCLIFFE

The increasing incidence of injuries of the cervical spine in school children has given cause for concern.¹⁻⁴ This has been highlighted by reports of injuries of the cervical spine that occur in rugby football players.^{5,6} In patients with major neurological symptoms it is not difficult to diagnose the presence and extent of the lesion in the cervical spine. In some cases, however, no immediate neurological signs are present and radiographs of the cervical spine can be misleadingly normal. We report on a boy with initially normal neurological and radiological findings who subsequently developed subluxation of the second on the third cervical vertebra as a result of a game of British bulldog.

Case report

A 13 year old boy sustained a hyperflexion injury of his neck while playing a game of British bulldog, a contact sport often played in school classrooms in which children tackle each other as in rugby football. His neck was flexed forcibly while his head was against the floor, and immediately after the injury he had severe pain of the cervical spine with radiation to both shoulders. He was unable to get up, although he was not paralysed.

He was brought to the accident department and fully examined by the casualty officer, and radiographs of the cervical spine were taken. No neurological deficit was found on examination. Movements of the neck were not attempted as there was severe pain and muscle spasm. Radiographs of the cervical spine were passed as normal in the accident department and

Anterior and posterior and lateral radiographs may initially be normal in patients with severe ligamentous injuries to the cervical spine. Accurate diagnosis of such injuries in patients with normal radiographs depends on the accurate interpretation of flexion and extension radiographs

subsequently reported so by the radiologist (fig 1). He was allowed home in a supporting collar, but his neck pain was made worse by movement, even by the vibration of the car taking him home. During the ensuing week, however, his pain improved and he discarded his collar and returned to normal activities at school.

Three months after the initial accident as he was getting out of bed he developed a sharp pain in his neck, which again radiated to both shoulders. He was referred by his general practitioner back to the accident department, where examination showed reduced movement of his neck with neck spasm but no neurological deficit. Flexion and extension radiographs were taken, which showed anterior subluxation of C2 on C3 with flexion (fig 2). Stabilisation of this late subluxation was achieved by interspinous wiring and grafting of the interlaminar bone with the iliac crest bone. He was immobilised in a cervical collar and rested in bed for two weeks before being discharged from hospital. The fusion was radiologically complete at four months (fig 3).

Discussion

Late displacement of the cervical spine after injury is rare but has been described after a recognisable tetrad of radiological signs—namely, widening of the gap between the spinous processes, intervertebral subluxation with widening of the apophyseal joints, a

Lewisham Hospital, London SE13

J D SPENCER, MRCP, FRCS, consultant orthopaedic surgeon (also at Guy's Hospital)
I W L BINTCLIFFE, MB, FRCS, senior orthopaedic registrar

Correspondence to: Mr J D Spencer.