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How long do we need to observe head injuries in hospital?

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SUMMARY Between 1974 and 1981, 28 701 children in Wales were admitted to hospital for observation after an injury to the head. Only 22 of 35 who subsequently developed intracranial haemorrhage, presented for examination within 24 hours of the injury. All of these patients had symptoms or signs clearly needing continued observation or treatment six hours after the injury. Many children who are currently admitted to hospital could safely be discharged after a limited period of observation.

Head injuries account for a considerable proportion of all paediatric admissions to hospital.[1–3] These children are admitted to hospital because of concern that they may develop delayed, treatable complications from their injury, of which the most common is intracranial haemorrhage.[4 5] Most children admitted with head injuries recover quickly and, in retrospect, admission is shown to be unnecessary. Hospital admission may be emotionally disturbing to the child and is expensive.[6] The large number of children admitted with no subsequent sequelae may lull doctors into a false sense of security, however, and these doctors may then discharge patients who deserve observation.[7]

This study was instigated to help in the clinical evaluation of children presenting for medical attention after head injury and to assess the current effectiveness of the policy of admitting these children for 24 hours' observation in hospital.

Methods

Centralised statistics are available from the Welsh Office as part of the Hospitals Activities Analysis. We studied the medical records of children 0–14 years of age (inclusive) who had been admitted to hospitals in Wales between 1974 and 1981 and had the diagnostic coding ICD (9th Edition) 852: 'Subarachnoid, subdural and extradural haemorrhage following injury'.

Results

Over the period 1974 to 1981, 28 701 children were admitted to hospital in Wales after trauma to the head. Altogether 2920 (10·7%) suffered a fracture of the skull and 25 872 were classified as having a concussional head injury. Forty nine of these patients were registered as suffering from intracranial haemorrhage after a head injury, with the diagnosis: acute (35) (extradural haemorrhage (22); subdural haemorrhage (13)); chronic, subdural haemorrhage (6); incorrect coding (8). Patients with chronic subdural haemorrhage had prolonged symptoms, usually with no history of trauma.

The following discussion relates, therefore, to the remaining 35 patients, all of whom had acute symptoms directly related to a head injury. The actual incidence of acute, intracranial bleeding after trauma in children was therefore 0·13% or one case per 820 admissions to hospital for head injury; considerably less than for patients aged more than 15 years.[8]

Presentation and diagnosis. Delay in making the diagnosis was studied in relation to the delay in presentation to hospital. Twenty patients presented early (less than five hours after injury), in two patients there was an intermediate delay (five to 24 hours), and in 13 presentation was delayed for more than 24 hours. Clinical features of these patients are shown in Table 1.

Early presentation

Thirteen patients had a diagnosis of intracranial haemorrhage made within five hours of the accident—six were comatose on admission to hospital and the remaining seven developed major signs shortly after admission. Four patients presented early, and were diagnosed between five and 24

Table 1 *Time of presentation and diagnosis and clinical features in children suffering acute intracranial haemorrhage after trauma*

Presentation	*Diagnosis*	*History*			*Examination*			
		Unconscious	*Vomiting*	*Fit*	*Coma*	*Drowsy*	*Extracranial haematoma*	*Fractured skull*
Early* (20)	Early* (13)	11	4	0	6	7	8	5
	Intermediate† (5)	2	2	0	0	2	4	4
	Late‡ (2)	1	1	0	1	1	1	1
Intermediate† (2)	Intermediate (2)	2	2	0	0	2	1	1+?
Late‡ (13)								
Non accidental injury (6)	Late‡ (6)	2	1	3	3	3	1	3
Accidental injury (7)	Late‡ (7)	0	1	0	0	0	1	1

*Early=<5 hours; †intermediate 5–24 hours; ‡late >24 hours.

hours. Two of these patients were seen in an accident and emergency department and were discharged having been assessed initially less than two hours after the injury. The other two patients had physical signs and symptoms which meant that continued observation six hours after the injury was clearly indicated.

Case 1. A 13 year old boy was a passenger in a car involved in a crash. He was admitted within one hour when he was noted to be vomiting, bleeding from the ear, had a fractured skull and a fractured radius. His level of consciousness deteriorated over 16 hours and he developed a right hemiparesis due to an extradural haematoma.

Case 2. A 13 year old boy was struck by a car and presented to hospital within two hours. He had been knocked unconscious and at presentation was conscious but vomiting, bleeding from the ear, and had a large extracranial haematoma overlying a long parietal fracture. His level of consciousness gradually deteriorated due to a parietal extradural haemorrhage.

Three patients presenting early had the diagnosis delayed for over 24 hours. Two suffered a serious primary brain injury in association with a subdural haematoma and the third, a 9 year old girl, fell from a horse. She was admitted and observed for four days then discharged to return two days later when a diagnosis was made by computed tomogram.

Intermediate delay in presentation

Only two patients presented between five and 24 hours from the injury, both after falls. Both suffered a transient loss of consciousness followed by vomiting and increasing drowsiness. One had a fracture and the other a large frontotemporal haematoma, but no radiographs were taken in this child. The diagnosis in both children was made immediately on presentation to hospital.

Delayed presentation

There were two subgroups in the group delaying presentation to hospital for more than 24 hours. Six patients suffered definite or highly suspected non-accidental injury. In this group the nature and timing of the injuries was uncertain but all were felt to be acute because of evidence of recent bruising. Three patients had a fractured skull and two had associated limb fractures. Five patients had subdural haemorrhages, and only one an extradural bleed.

The last group of seven patients, suffered from minor head injuries and did not seek any medical help until the development of definite symptoms. One of the seven was dived upon at a swimming pool, after which he was confused and vomiting, with a large haematoma overlying a minor fracture in the temporal bone. It is not clear why his presentation was delayed. The other six patients all had minor injuries, with no symptoms at all initially. One girl began vomiting but this was attributed to 'influenza'.

Epidemiology. The peak incidence of intracranial haemorrhage was in children less than 3 years of age. This was largely accounted for by the six infants who had proved, or highly suspected non-accidental injury (17%). Nevertheless, road traffic accidents (37%) (including those involving cyclists) and falls (31%) were the major causes of intracranial haemorrhage in this series. The ratio of boys:girls of 4:1 is partially a reflection of the higher overall incidence of head injuries to boys,[1 4] but also suggests that boys injure their heads more severely than girls. There was no seasonal variation.

Table 2 *Prognosis of intracranial haemorrhage*

Delay in diagnosis		*Normal*	*Impaired*	*Died*
<5 hours		7	4	2
5–24 hours		6	0	1
>24 hours	Non-accidental injury	0	4	2
	Accidental injury	8	1	0

Prognosis. The prognosis of the children was related to the duration of the period between the injury and diagnosis (see Table 2). A longer period before diagnosis was associated with a good prognosis—with the exception of children suffering from non-accidental injury, who did poorly. The only patient who had impaired development after a late diagnosis (not non-accidental) had suffered severe primary brain damage, which masked the diagnosis.

In this study 15 patients of 34 examined radiologically had fractures of the skull. Six of seven patients who were diagnosed between five and 24 hours from the injury had a fracture. Many of the children with early and intermediate presentation had boggy scalp haematomas.

Discussion

In this study observation of an uncomplicated case of head injury for more than five hours, when there were no residual signs or symptoms, would not have increased the detection of intracranial haemorrhage. Many patients do not in fact present with the head injury itself, but later with symptoms caused by the intracranial bleed. The few patients who were admitted and diagnosed after five hours observation all had clear reasons for staying in hospital. The two patients who were assessed in the accident and emergency department, discharged, and then readmitted with intracranial haemorrhage were both seen within two hours of their injury.

There would seem to be two areas of difficulty. Firstly, large numbers of children are seen with head injuries, and there is an understandable reluctance to admit them all to hospital for a period of 24 hours for observation. Secondly, if a child is assessed soon after an accident, the diagnosis of an early bleed of worse prognostic importance may be missed.

It would seem logical, therefore, to solve these problems by observing some children in hospital for a more limited time. All patients who at the initial assessment have abnormalities on neurological examination or have a fracture should be admitted for a full 24 hours.[9 10] Patients who have more minor symptoms such as drowsiness, vomiting, amnesia, headache, or blurred vision should be observed in hospital until five hours from the time of the injury and then be reassessed. If problems persist observation should be continued. In many patients, however, symptoms will resolve over this time and this series suggests they can be discharged at six hours with as great a degree of confidence as at 24 hours. It is still of great importance, however, to issue written instructions relating to possible problems, particularly to changes in the level of consciousness.

Although most children with intracranial haemorrhage do not have fractures (19 out of 35 in this study), the incidence is much higher than for head injuries overall (10·7%). It has been debated that the presence of a fracture in isolation, should not influence the decision for future medical care,[11] but our data suggest that the incidence of fractures was higher in those patients presenting early who sustained a delayed bleed. Children with a serious head injury should therefore have a skull radiograph. The frequency of large extracranial haematomas, with or without an associated fracture was noted, and this has been previously described.[12]

These findings indicate that it should be possible to reduce appreciably the numbers of children admitted to hospital and also to ensure that children with minor symptoms are not discharged too soon from medical observation. Observation of head injuries in children might well be best done in a special area of a children's accident and emergency department rather than in the ward.

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References

1 Jamieson DL, Kaye HH. Accidental head injury in childhood. *Arch Dis Child* 1974;**49:**376–81.
2 Jennett B. Head injuries in children. *Dev Med Child Neurol* 1972;**14:**137–47.
3 Rune U. Acute head injuries in children. *Acta Paediatr Scand* 1970;**Suppl 209:**12–5.
4 Craft AW, Shaw DA, Cartlidge NEF. Head injuries in children. *Br Med J* 1972;**iv:**200–3.
5 Rose J, Valtonen S, Jennett B. Avoidable factors contributing to death after head injury. *Br Med J* 1977;**ii:**615–8.
6 Mendelow AD, Campbell DA, Jeffrey RR, *et al.* Admission after mild head injury: benefits and costs. *Br Med J* 1982;**285:**1530–2.
7 Jennett B, Galbraith SL. Head injury and admission policy. *Lancet* 1979;**i:**552.
8 Mendelow AD, Teasdale G, Jennett B, Bryden J, Hessett C, Murray G. Risk of intracranial haematoma in head injured adults. *Br Med J* 1983;**287:**1173–6.

[9] McKissock W, Taylor JC, Bloom WH, Till K. Extradural haematoma. *Lancet* 1960;**ii:**167–72.
[10] Jamieson KG, Yelland JD. Extradural hematoma. Report of 167 cases. *J Neurosurg* 1968;**29:**13–23.
[11] Harwood-Nash DC, Bruce Hendrick E, Hudson AR. The significance of skull fractures in children. *Radiology* 1971;**101:**151–5.
[12] Ingraham FD, Campbell JB, Cohen J. Extradural haematoma in infancy and childhood. *JAMA* 1949;**141:**1010–3.

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