

A Study of Head Injury in Children

In England and Wales accidents are now the major cause of death. In addition accidental injuries are second only to respiratory infections as a reason for admission of children to hospital. In 1972 these represented 16.5% of admissions for all reasons from birth to fourteen years. The number of children in England and Wales is 11.7 million thus 1 child in every 14 is admitted to hospital each year following an accident.

Table 1

**MAJOR CAUSES OF DEATH ENGLAND & WALES 1971
(Registrar General, 1973)**

	Under 1 year		1-15 years	
	No.	%	No.	%
Accidents	451	3.3	1671	34.8
Congenital abnormalities	2950	21.5	675	14.1
Respiratory diseases	2428	17.7	632	13.2
Malignant disease	66	0.5	771	16.1
All causes	13720	100	4797	100

Table 2

**NO. OF CHILDREN ADMITTED TO HOSPITAL IN
ENGLAND AND WALES 1972
(Registrar General, 1974)**

	Under 1 yr	1-14 yrs	Total
Admissions due to accidents	6,990	134,260	141,250
Admissions for all causes	191,220	665,450	856,670
% of admissions due to accidents	3.6	20.2	16.5

Head injury represents a major proportion of such accidental injuries both as a reason for admission to hospital and as a cause of death.

Table 3 & Table 4

Table 3

**ACCIDENTAL DEATHS IN CHILDREN
IN ENGLAND & WALES 1971
(Registrar General, 1973)**

	Under 1 yr	1-15 yrs
Head Injury	60	686
Other Accidents	391	985
TOTAL	451	1671

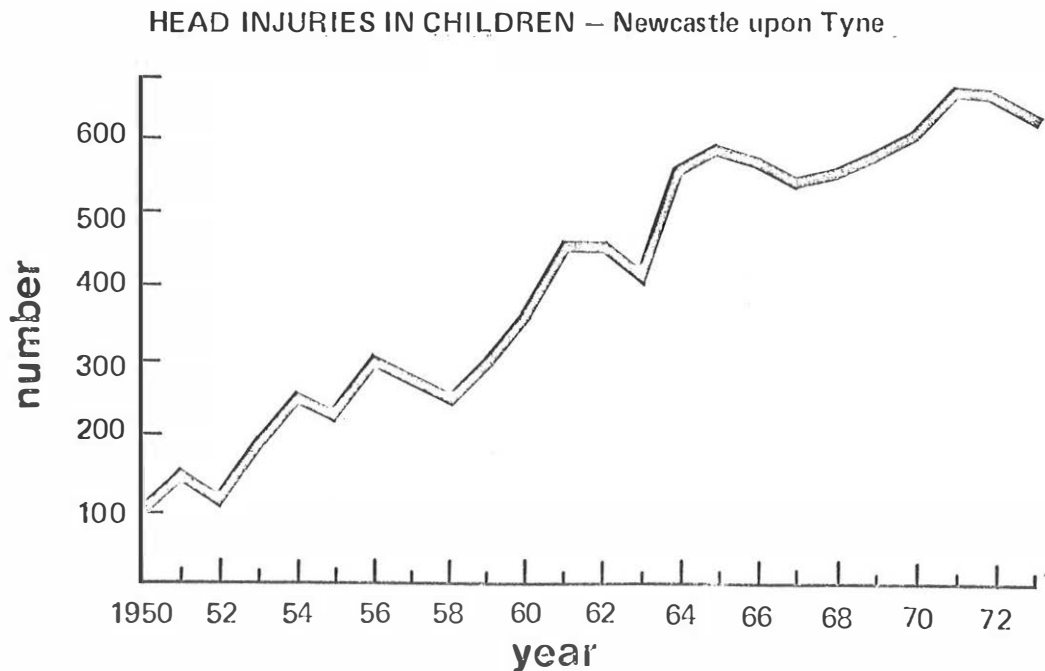
Table 4

**NO. OF CHILDREN ADMITTED TO HOSPITAL WITH
HEAD INJURY IN ENGLAND AND WALES 1972
(Registrar General, 1974)**

	Under 1 yr	1-14 yrs	Total
With skull fracture	998	4188	5186
Without skull fracture	2,200	44,960	47,160

Over the past 20 years there has been a sixfold increase in the number of children admitted to hospital in Newcastle upon Tyne with a head injury. It is difficult to know whether this represents a true increase in the number of children being injured or whether in fact a greater availability of beds and more awareness of the possible serious consequences of minor head injury has contributed to this alarming increase. The situation is indeed complex but the implications for the hospital service of more than 50,000 admissions each year are clear.

Fig. 1.



It is against this background that we have carried out a study of head injuries in children. One of the major problems that we set out to answer was to define the nature and incidence of post head injury behaviour disturbances. George Fredrick Still in 1902 described a boy who displayed "temporary loss of control" following a head injury and since then several studies have been undertaken to determine more about this problem. The reported incidence of such behaviour abnormalities varies between 0.1% and 45%.

Table 5.
INCIDENCE OF PSYCHIATRIC SEQUELAE

		No. of patients	%	Years of follow-up
1903	Bailey	60	45	2
1928	Beekman	331	16	1
1932	Ireland	80	4	1
1942	Cedemark	423	2	3
1954	Robotham	100	36	2
1960	Burkinshaw	238	22	1-6
1961	Rickham	7553	0.1	-
1963	Hjern	305	12	6/12

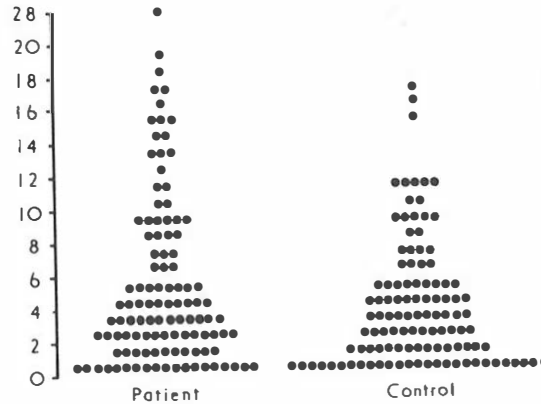
Most of these studies have been retrospective and almost all from specialised neurosurgical centres. Our study was therefore designed on a prospective basis on a completely unselected group of children admitted to hospital following a head injury. The pre-accident behaviour patterns of the children were assessed by a standard questionnaire given to both parents and teachers. A control group was compiled of the child of the same sex next in alphabetical order in the class register. A composite score was obtained for each form and the two groups of children were compared in respect of their pre-accident behaviour as assessed by the teacher.

Figure 2.

Scores on Rutter behaviour inventory of 110 children with head injury.

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Scores on Rutter behaviour inventory of 110 children with head injury.



Children in our study who suffered a head injury were significantly more likely to have displayed abnormal behaviour patterns before the injuries than the control group.

We have up to date information on 96 children of school age 2 years after the injury. The same questionnaire was again given to both parents and teachers. The percentage of children with abnormal behaviour patterns before and after the accident is seen in Table 6 and there is no significant difference in the overall behaviour patterns.

Table 6.

Percentage of children with abnormal behaviour patterns

	Before accident	At 2 year follow up
Parent Scale	27.6	24.8
Teacher Scale	17.0	19.6

However, by analysis of the four major symptoms which are characteristic of what has been called the "post concussional syndrome" the true incidence of this in our study can be determined. Tables 7 and 8 show the incidence of these symptoms as assessed by the parents and teachers before and after the accident. Many children display abnormal symptoms before the accident. Those children who have developed the symptoms as a new phenomenon after the injury are cited as "new cases".

Table 7

**Incidence of symptoms in 96 children at 2 year follow up.
Parental assessment**

	Before accident		After accident			
	No.	%	all cases		new case:	
			No	%	No.	%
Headache	5	5.2	7	7.3	5	5.2
Overactivity	28	29.2	15	15.6	5	5.2
Irritability	16	16.7	17	17.7	9	9.4
Poor concentration	10	10.4	9	9.4	7	7.3

Table 8

**Incidence of symptoms in 94 children at 2 year follow up
Teacher assessment**

	Before accident		After accident			
	No	%	No	%	No	%
Aches & pains	2	2.1	2	2.1	2	2.1
Overactivity	6	6.4	5	5.4	4	4.3
Irritability	5	5.4	3	3.2	2	2.1
Poor concentration	16	17.0	15	16.0	9	9.6

The children were then divided into 2 groups, those showing abnormal behaviour patterns before the accident and those who were normal. Figures 3 and 4 show the incidence of post concussional symptoms in these children.

Fig. 3.

Analysis of post concussional symptoms as recorded by teachers in 94 children at 2 year follow up

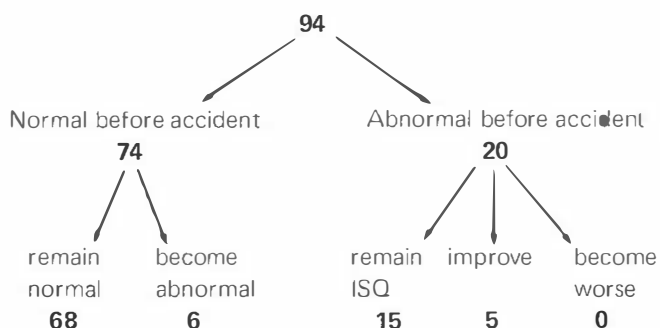
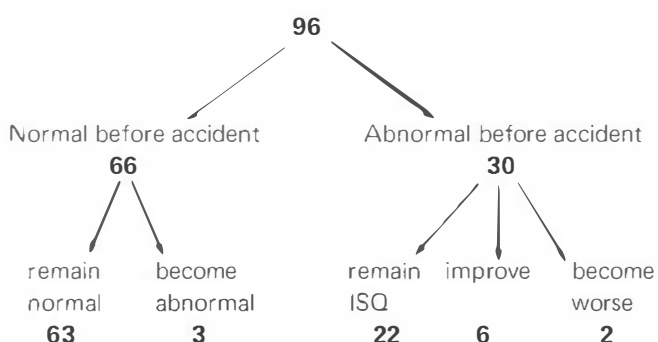


Fig. 4.

Analysis of post concussional symptoms as recorded by parents in 96 children at 2 year follow up



When the 2 behaviour forms are combined the incidence of the post concussional syndrome arising as a new phenomenon can be determined.

Table 9

**Incidence of post concussional symptoms
at 2 year follow up
Parent and teacher assessment**

	No.	%
Unchanged	85	90.4
Post concussional symptoms	9	9.6

In order to determine the factors which predispose to the development of these post concussional symptoms the data has been analysed with regard to the presence of coma and skull fracture at the time of injury. There is a statistically significant association between the presence of coma at the time of injury and the development of these symptoms but not with skull fracture.

Table 10

Relationship of post concussional symptoms to coma and skull fracture

	Unchanged n=85		Post concussional symptoms n=9		Significance of difference χ^2 test
	No	%	No	%	
Unconscious at time of accident	18	21.1	5	55.5	$p < 0.01$
Skull fracture	10	11.8	1	11.1	n.s.

In previous studies the best index of severity of injury has been shown to be the presence or absence of coma. It would appear therefore that the development of post traumatic abnormal behaviour patterns is dependant on the severity of the injury.

Acknowledgements

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