Heading for a Fall? Management of Head Injury in Infants

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Abstract
Head injury is one of the commonest reasons for infants (<1year) to attend the Emergency Department (ED). Clinical management varies considerably and concern about non accidental injury results in a high admission rate in some hospitals. Information was obtained on 103 children under one year of age presenting to the ED with head injury in a prospective study. The average age was 6.7 months and 57% of patients were male. Twenty eight babies had skull x rays with 1 skull fracture diagnosed. None required CT brain scan. Ninety eight (94%) were discharged home from the ED. There were no unplanned returns, readmissions or adverse events. The incidence of traumatic brain injury in children under one year of age presenting with head injury is low and the majority can be safely discharged home.

Introduction
Head injury occurs frequently in childhood and is one of the commonest reasons for attending the Emergency Department. In the UK alone approximately 1000 000 patients attend Emergency Departments each year with head injuries [1], of which up to 500 000 are under 16 years of age [2]. They contribute to 10% of childhood hospital admissions [3]. Most of these injuries are minor: compared to the high incidence of head injury in children the mortality rate is low at 5.3 deaths per 100 000 children per year [4]. Many of the children presenting with head injuries are less than one year of age. In this age group clinical examination can be difficult, particularly for the junior doctor in a busy ED. This is also the age group which is most likely to suffer an inflicted (non-accidental) injury [5]. The aim of the study was to assess current practice in the Children's University Hospital (CUH) and to allow us to compare management to international guidelines.

Methods
A prospective study was carried out between 01/01/06 and 31/08/06. A structured questionnaire was used to collect data on children less than or equal to one year of age presenting to the Emergency Department of Temple Street Childrenâ s University Hospital with head injury. Information was obtained on age, sex, mode of presentation, history, clinical findings, investigations, management and follow up. Outcome measurements were set as 1) the number of missed skull fractures, 2) the number of unplanned returns of patients and 3) adverse outcome.

Results
Data was collected on a total of 103 patients.

Demographics
There was a slight male predominance with 59 males (57%) and 43 females (43%).
The mean age of children presenting was 6.7 months and the youngest child was 28 days old. The ages of presentation are shown in Figure 1.

Figure 1: Age at Presentation

Presentation
Sixty eight percent of the children presented to the Emergency Department with one parent and this was most often the mother. One child presented with another relative and all others presented with both parents. In relation to the time of the trauma, 93% presented within 4 hours, 5% at 4 to 24 hours and only 2 patients presented to the Emergency Department after 24 hours.

Mechanism of Injury
Sixty children (58.2%) fell < 6 feet onto a hard surface. Fifteen children (14.6%) fell < 6 feet onto a soft surface, for example thick carpet. Nine children (8.8%) were brought in due to a head injury that occurred when a parent fell while holding the child. Eighty five percent of these head injuries occurred at home and only 2% happened at a creche.

Clinical Findings
Four of the children had a boggy haematoma. Forty one children had bruising only, thirteen infants had a laceration only and 9 had both. Two of the children had another significant injury apart from head injury. Thirty three percent of patients had no detectable injury and none of the children examined had any neurological abnormalities.

Imaging
Skull x ray was ordered on 28 of the 103 patients. All 4 of the patients who had a boggy haematoma had an x ray and 6 patients who had skull x-rays had no detectable injury.
One skull fracture was diagnosed. There were no CT scans ordered.

Management
There were 6 admissions from 103 patients seen. Three of the children admitted were less than 3 months of age. One was admitted for repair of laceration by the plastic surgery team and one was admitted due to persistent vomiting. Therefore 94% of patients were discharged from the Emergency Department. All of the patients discharged except one were given written information on head injury in children. Of the discharged patients 91% were not followed up further. Five children were asked to attend a consultant led review clinic in the Emergency Department and 3 were referred to the Plastic Surgery OPD.

Outcomes
There were no unplanned returns of patients that had been discharged and there were no cases of missed skull fracture.

Discussion
This study was carried out due to the wide variation in practice between institutions in the management of head injury. The current practice in CUH is based upon the Scottish Intercollegiate Guidelines Network (SIGN) for early management of patients with head injury [6]. Like many of the clinical guidelines developed over the last decade, the emphasis of the SIGN guidelines is on admission and observation with criteria indicative of Traumatic Brain Injury (TBI) or Non Accidental Injury (NAI) used. They advocate the use of skull x rays where there are certain risk factors for fracture or intracranial injury although they acknowledge that skull fractures are less commonly associated with intracranial injury in children and a less useful finding than in adults. The more frequent use of skull x rays and admission for observation are used to identify those who require computed tomography. Following triage the child is seen by a doctor. If the head injury is significant the patient is either observed for a minimum of six hours in the Emergency Department or admitted. If the head injury is minor i.e. no suspicion of fracture, intracranial injury or NAI, the patient is discharged. In CUH an extra safety measure has been developed by the nursing staff for children with minor head injury and no social concerns. All of these patients are observed in the Emergency Department for a minimum of 90 minutes and 3 sets of neurological observations are performed. Prior to discharge parents are given a written head injury advice sheet.

The National Institute of Clinical Excellence (NICE) has recently published very different guidelines in the UK with a change of emphasis with regards to imaging [7]. They are based on the Canadian Head CT rule and the New Orleans criteria. They advocate early CT use for high risk patients and a major reduction in skull x rays and admission for observation, mirroring practice in North America. Currently in the USA, up to 60% of head injury patients undergo computed tomography with a resultant low positivity rate of 5-10 [8]. The practicality of using this system however depends to a large extent on the availability of imaging facilities and staff to carry out and interpret the CT, especially during out of hours service. It has also recently been noted in England that following the introduction of the NICE guidelines adult head injury hospital admissions have risen, therefore following the guidelines does not seem to promote cost effective practice [9].

What is known is that despite the enormous amount of children with head injury attending hospitals each year there has been an inadequate number of large, well designed randomized controlled trials available in this area [10]. Of the research available children under one year of age are sometimes treated separately or omitted entirely. Our study therefore was aimed entirely at this age group. The study confirmed that head injury is a very common presentation to the Emergency Department but that the majority of patients present with minor injury only and the incidence of intracranial injury is low. Only 27% of patients had skull x-rays performed and there were no CT scans used therefore the radiation exposure was kept at a minimum. There were no adverse events or outcomes found. With 94% of the patients discharged from the Emergency Department the substantial financial, emotional and staffing burden of admitting these children for observation is avoided. Currently many institutions admit all infants presenting with head injury. This policy appears to be based on concerns about missing inflicted head injury in this age group. During the study period no child under 1 year of age subsequently diagnosed with a non accidental head injury presented to the ED as a head injury. These children presented with seizure, ALTE, collapse or apnoea, coma or suspected sepsis and the diagnosis of inflicted injury only became apparent after initial resuscitation and admission. Therefore admitting all children under 1 year presenting as head injury is unlikely to assist in identifying this group.

In conclusion, our study shows that with careful history taking and examination combined with selective use of imaging to identify high risk groups, the vast majority of children under 1 year of age with minor head injury can safely be discharged from the Emergency Department. A low threshold for admission remains essential in this age group but should be based on history and clinical findings. There needs to be increased awareness among frontline ED staff that most abusive head injury does not present with a history of head injury and should always be suspected in an infant presenting with acute neurological abnormality or ALTE.

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