



Management of skull fractures in children less than 1 year of age[☆]



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ABSTRACT

Background: Management of skull fracture (SF) in pediatric patients varies from observation in the emergency department (ED) to floor admission. Since 2010, a protocol for admitting children with SF specifically to the trauma service was implemented at our institution. The purpose of our study was to review the management of children with SF younger than 1 year of age.

Methods: Retrospective chart review of all patients between 0 and 1 year of age seen in our ED for a SF was done from 2010 to 2013.

Results: A total of 180 patients with a mean age of 4.5 months (1 day–12 months) were identified. Of these, 131 patients (73%) were admitted. Mean length of stay was 1.6 days. Admitted patients had more depressed (21 vs. 8%) and diastatic (43 vs. 14%) fractures. Fifty-seven children had intracranial hemorrhages (32%) but only 8 patients required non-emergent surgery for depressed fractures. Admission to the trauma service increased from none to 76% with phone follow-ups increasing from 12% to 91%.

Conclusions: Instituting a protocol allowed a safer management of patients with SF. Moreover, we argue that asymptomatic infants with isolated SF can be safely discharged home after brief observation in the ED.

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Head trauma is one of the most common childhood injuries [1]. In fact, in the United States, head trauma in children is the cause of approximately 600 000 hospital visits and 95 000 hospital admissions each year [2,3]. A number of studies have identified children under 2 years of age as being prone to skull fractures (SF), with infants younger than 1 year being at particularly high risk [4,5]. Although head injuries in infants are common, serious complications are unusual and neurosurgical interventions are rare [6–9]. In fact, many studies have reported rates of surgical intervention approaching zero among pediatric patients with minor head trauma [6,8,10–13]. Several controversies surround the management of children with isolated SF and the need for in-hospital admission is a debated point in the literature [6,8,13–16]. It is clear that children with skull fractures and altered neurological status require admission. However, it is less certain which children with skull fractures will benefit from a hospital admission. In fact, a brief observation in the Emergency Department (ED) in neurologically intact children has been previously advocated in the literature [5,6,13,16]. Studies show that patients with minor head trauma including SF could be safely observed in an outpatient unit, with nearly all patients being discharged within 24 h [6,8,13,16].

1. Purpose of study

A clinical algorithm for minor head injury has been in place at our institution since 1998 whereby children with simple linear SF are observed in the ED for 3–6 h and discharged home if they are asymptomatic (Fig. 1) [17]. On the other hand, patients with persisting symptoms required admission to floor to any service for observation. Patients presenting with a Glasgow Coma Scale (GCS) of 14 or 15 required a skull X-ray if they presented with a cephalhematoma or if the mechanism of injury included a major fall, a penetrating trauma or suspicion of child abuse. If the images are positive for skull fracture, head CT and admission are required for those presenting a diastasis of ≥ 4 mm, depressed, comminuted or open fracture. Patients presenting with seizures require immediate head CT and admission to floor.

In 2010, this protocol was improved by implementing a comprehensive trauma program where patients with SF requiring admission are systematically admitted to the trauma service. Prior to instituting this protocol, patients were randomly admitted to either the pediatric surgery, pediatrics or neurosurgery service. This allows better management of patients as they received standardize care and had access to a trauma nurse practitioner and social worker specializing in the management of patients with head injuries. Moreover, every child had a phone follow-up by the trauma nurse after discharge. Also, they were automatically entered in our head injury provincial system where they can be referred to the appropriate regional service should they require further management after discharge. The goal of the present study is to review the

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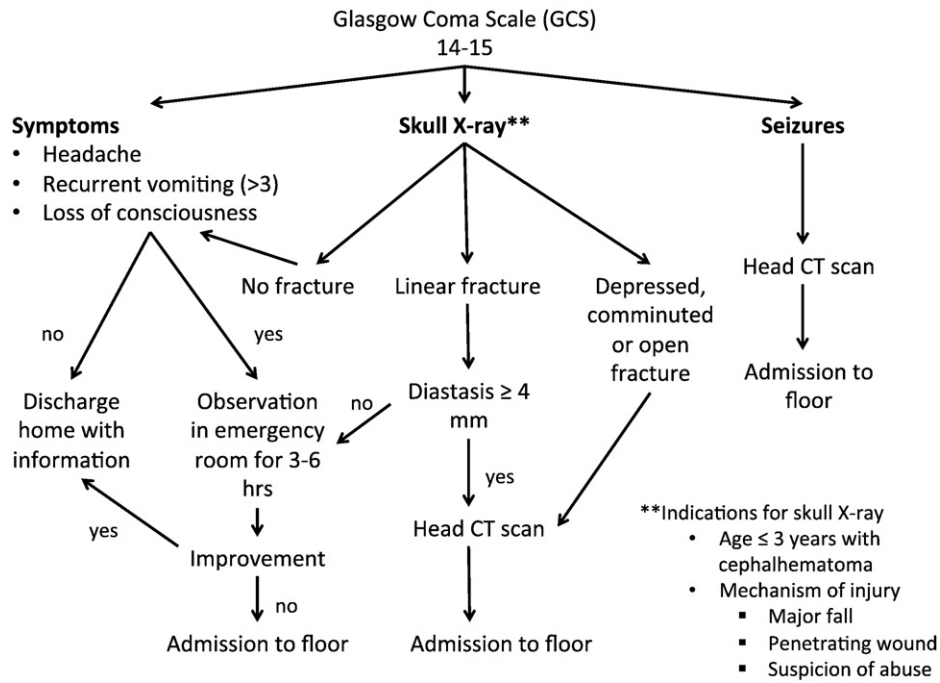


Fig. 1. Clinical management of minor head trauma.

clinical management of all children less than 1 year of age with accidental SF after the implementation of these new guidelines.

2. Methods

We conducted a retrospective chart review of children aged 0–1 year seen at our tertiary pediatric center between January 1st 2010 and December 31st 2013, with a diagnosis of SF. Children were given a diagnosis of SF only if a fracture was identified on skull radiograph or head CT. Comparison was made between individuals who were admitted to the hospital and those who were discharged from the ED after observation. Our hospital's trauma registry identified children admitted while the CHIRPP database (Canadian Hospitals Injury and Prevention Program) identified patients discharged from the ED. Patients were excluded from the study for the following reasons: obstetrical trauma, high-velocity mechanisms, unknown mechanisms and non-accidental trauma. A total of 6 patients were excluded because of obstetrical trauma, 2 for a high-velocity mechanism, 6 for non-accidental trauma (NAT) and 6 for unknown mechanisms of injury as reported per parents' history. All patients with unknown mechanisms of injury were brought for evaluation more than 24 h after the initial event when a large scalp swelling was noted. Since NAT could not be completely ruled out in these 6 patients, they were excluded. At our institution, evaluation for NAT is initiated per emergency physicians' judgment. These children had a detailed social work evaluation, a skeletal survey and ophthalmology consult and were ruled out as abuse on the basis of these negative exams. Moreover, as the purpose of this study aimed to evaluate the management of skull fractures in patients with the more common trivial mechanisms of injury, we have excluded the two patients with high-velocity mechanisms as their management is often very different and also dictated by the search for associated injuries. Collected data included demographic information, mechanism of injury, associated symptoms and signs on physical exam, radiologic evaluation, type of skull fracture, associated intracranial injury, clinical management (discharged from ED or admitted to hospital), surgical procedures, readmissions, follow-up calls by trauma nurse, and presence of residual symptoms.

3. Results

We reviewed the charts of 180 patients who presented at our institution with a diagnosis of skull fracture and who met criteria for entry into our study. Of these, 131 patients were admitted and 49 patients were discharged directly from ED after observation. Table 1 summarizes the characteristics of our population. These patients were similar with regards to the mechanisms of injury, location of skull fracture and presenting symptoms. The age ranged between 1 day and 12 months (mean; 4.5 months). Fracture locations included 133 parietal (74%), 8 frontal (4%), 2 temporal (1%), 9 occipital (5%), and 28 multiple fractures (16%). No patients were identified with basilar skull fractures. There were a variety of mechanisms of injury, but domestic falls

Table 1 Comparisons between patients discharged from the ED and patients admitted to the hospital.

	Admitted (%) (n = 131)	Discharged (%) (n = 49)	P
Age (in months) (median)	4	6	<0.0001
Delay before arrival (h)	3	6	0.0007
Mechanism of injury			
Fall (<1 m)	59 (45.0)	19 (38.8)	0.5
Fall (>1 m)	53 (40.5)	26 (53.1)	0.13
Hit by object	6 (4.6)	2 (4.1)	1.00
Fall from stairs	13 (9.9)	2 (4.1)	0.36
Symptoms at presentation			
Loss of consciousness	4 (3.1)	0	0.57
Irritability/Sleepiness	35 (26.7)	11 (22.4)	0.70
Vomiting	22 (16.8)	5 (10.2)	0.35
Skull fracture location			
Parietal	91 (69.5)	42 (85.7)	0.0352
Frontal	6 (4.6)	2 (4.1)	1.00
Temporal	1 (0.8)	1 (2)	0.47
Occipital	6 (4.6)	3 (6.1)	0.71
Multiple	27 (20.6)	1 (2)	0.0011
Cephalhematoma	111 (84.7)	57 (95.9)	0.04
Glasgow Coma Scale (mean)	14.7	15	0.0113
Hospital transfer	63 (48.1)	9 (18.4)	0.0034
Neurosurgery consultation	84 (64.1)	8 (16.3)	<0.0001

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