

IMAGING

Imaging the less seriously head injured child

J F T Glasgow, S J McGovern

Each year, three and a half million children attend an accident and emergency department (A&E),¹ about 4% of whom have a head injury; hospital admission is required in approximately one tenth.² Head injury accounts for 15% of deaths from 1–15 years of age and 25% from 5–15 years,³ and is arguably *the* principal public health challenge of childhood. Our aim is to define the terms of reference, emphasise dependence on an informed clinical approach, in order to identify those that require imaging as part of immediate management. Because a large proportion of patients attend out of hours and are seen by junior doctors, practice guidelines for x ray examination (and/or hospital admission) have been developed.⁴ It is recognised, however, that these are widely ignored and skull radiographs, 2–9% of which show evidence of fracture,⁵ are used inappropriately as a triage tool.

Severity of head injury is impossible to define in absolute terms. Classifications of severity vary according to speciality group.⁴ Minor head injury is one where the causative mechanism is non-violent, full consciousness and recall have been retained throughout, and neurological features and vomiting are absent (table 1), as are clinical or radiographic evidence of skull fracture. Less serious head injury is therefore a diagnosis of exclusion.⁶ The clinical challenge is to use all available information to distinguish early the child in whom complications of brain injury are more likely, from the majority with superficial injury (table 1). Cogent radioprotective and financial evidence is detailed by the Royal College of Radiologists.⁷

History/mechanism of injury

The central question to answer is whether there is evidence of brain injury, as opposed to superficial injury. History should focus on the mechanism of injury as a means of trying to understand the ergonomics and possible sequelae. Hospital notes often lack this clarity. Most injuries have a benign mechanism; however, falls from a height, road traffic accidents, or a suspicion of child abuse represent more serious injuries, or potentially so. Likewise, the high energy impact of for example, a golf club, golf ball, or motor vehicle dissipated over a small area greatly increases the chance of tissue damage—raising the possibility of brain injury or depressed fracture. Babies that roll off a sofa or bed have about a

1% chance of sustaining a simple skull fracture⁸; on the other hand, those with shaken-impact syndrome always have brain injury.⁹ Use of protective equipment (cycle helmet, seat belt) reduces the likelihood of brain injury.^{10 11} Timing of the injury also should be known; in the ambulatory child, serious complications are very unlikely if six or more hours have elapsed.¹² Information about life and health is essential, such as learning difficulties, a history of bleeding disorder, seizures, or regular use of medicine.

Injury sequelae and early symptoms

If all injuries were reliably witnessed, mechanisms might be clearer. The majority with minor injury have retained consciousness and been responsive throughout. In younger children, even this judgement can be problematic, and thorough assessment is said to be as difficult as in the intoxicated adult.⁴ A breath holding episode for example can confuse staff, and a report of extreme pallor, seizure activity, or period of confusion suggests injury that may be more than minor. Similarly, in older children or adolescents, complaints such as persistent headache unresponsive to simple analgesia, nausea, vomiting more than once, or seizure might suggest possible brain injury. The exception might be the child under two years of age who sustains minor injury within one hour of a meal; here vomiting is generally benign, and can be expected to settle within three hours.¹³

Superficial injury or brain injury?

This requires a general assessment of the child with emphasis on airway, breathing, and circulation followed by examination of both the nervous system, and of the head and scalp. In less serious head injury, the airway, breathing, and circulation will be normal. Neurological examination includes assessment of the level of consciousness as quantified by an age appropriate Glasgow Coma Score, pupil size and reactivity, and limb power, tone, and coordination. Fundoscopy in the school aged child is often unhelpful, whereas the presence of retinal haemorrhages in infants suggests non-accidental injury. Such occult trauma may mask life threatening injury and computed tomography (CT) of the head can be diagnostic.⁹ Moreover, skeletal survey will identify extracranial injuries in 30–70% of abused children with head injuries.⁹

The Queen's
University of Belfast,
Belfast, N Ireland, UK
J F T Glasgow

The Ulster Hospital,
Dundonald, N Ireland,
UK
S J McGovern

Correspondence to:
Dr Glasgow