HEAD INJURIES

C J Hobbs

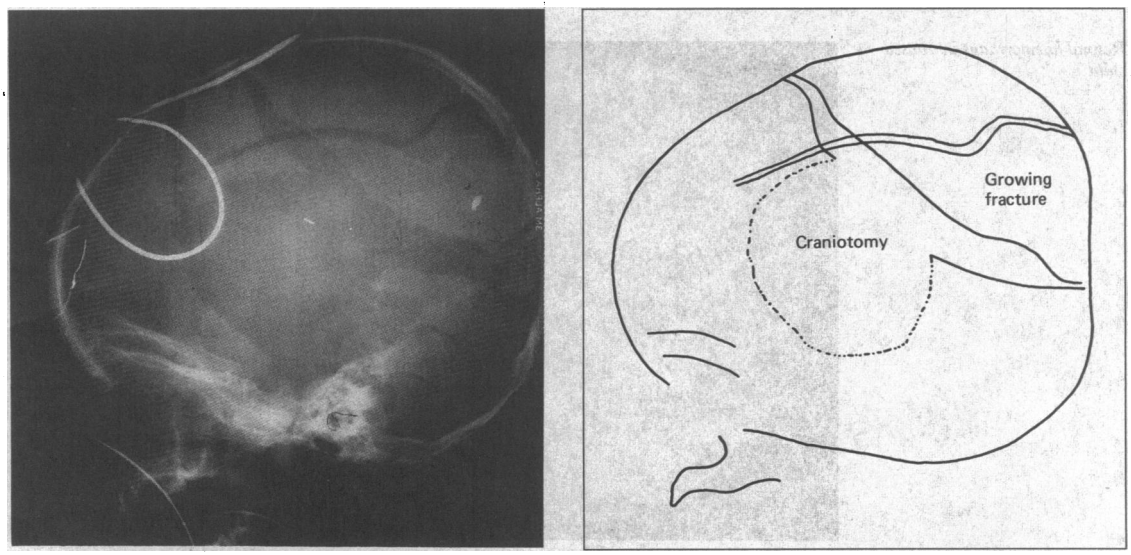
Head injuries with or without fracture of the skull are the commonest cause of death from battering, but abdominal injury to the gut or solid organs can mimic the signs of head injury and can lead to death if they are unrecognised.

Detecting head injuries due to physical abuse

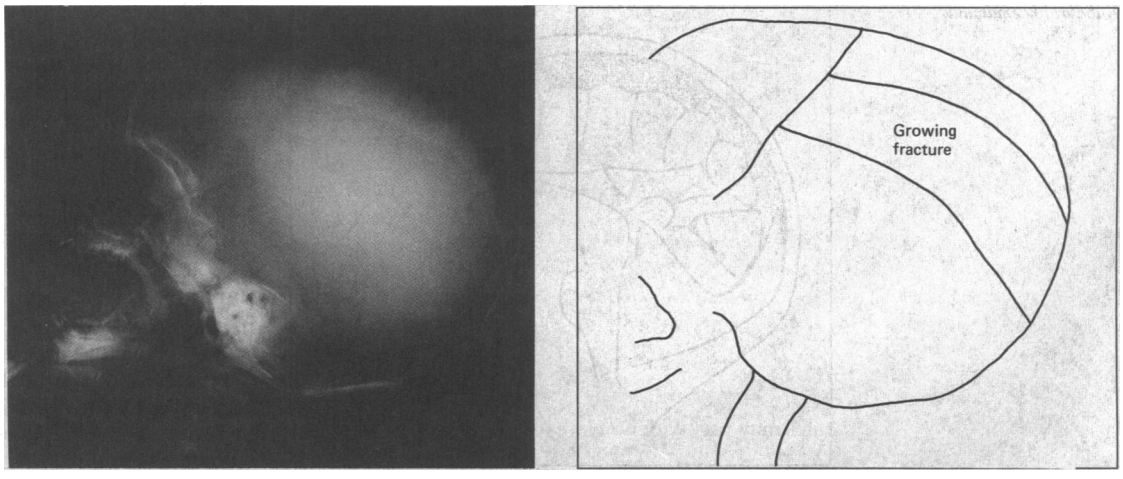
When an infant rolls off a changing table, hospital trolley, or bed, even on to a hard floor, he is unlikely to sustain a fracture of the skull and is almost certainly assured of escaping from major intracranial injury. Falls from greater heights (between 1 and 2 m), as, for example, from a standing adult's shoulder, may result in a single linear parietal hairline fracture of the skull, and the infant may be irritable, vomit, or refuse a feed. Serious intracranial injury is extremely unlikely.

The force entailed in physical abuse—for example, in swinging the child, in violent uncontrolled shaking, and in hitting the child's head with a fist or foot or against a wall—is so much greater that the pattern of injury is different. Fractures are more likely to be extensive, multiple, complex or branched, depressed, wide, separated, and growing and to affect several of the individual skull bones. The occipital bone and base of the skull, which are hardly ever fractured in simple falls, are common sites of injury.

These differences are shown in the table. Children who have been shaken but have not suffered blunt trauma to the head will have no



Extensive bilateral parietal fractures, which are wide and growing. Large lucent area represents surgical evacuation of large haematoma before 15 month old child died. Head was injured when the child was swung by the leg against a wall



Growing fracture of parietal bone in 6 week old abused child. Father claimed to have dropped child, but old rib fractures and intracranial injury were inconsistent with history

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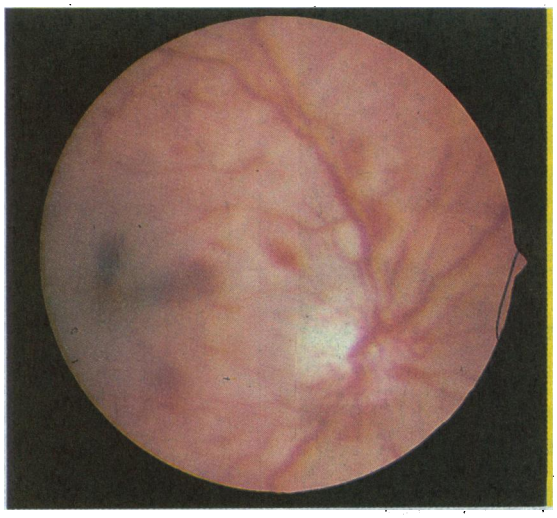
Manifestations of skull fractures

Child usually said to have fallen or banged head—for example, on door—or history may be absent

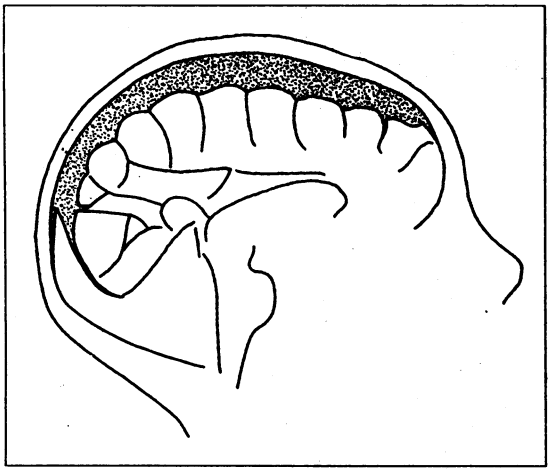
	Accident	*Physical abuse*
Type	Single linear	Multiple, complex, branched
Maximum fracture width	Hairline, narrow, 1-2 mm	Wide, growing, 3 mm or more
Site	Parietal One bone only	Occipital, highly specific Bilateral, parietal More than one bone affected
Depressed	Localised with clear history of fall on to sharp object	As part of complex fracture, extensive or multiple depressed areas
Associated intracranial injury	Unusual except after severe falls (2-3 m or more). Extradural haemorrhage uncommon but serious complication of simple fracture	Subdural haemorrhage, cerebral contusion, intracerebral haemorrhage, and cerebral oedema common

If an infant presents with a cranial swelling a day or two after a minor head injury and has a hairline parietal single linear fracture the cause is usually innocent provided that other injuries are not present

Retinal haemorrhage in abused child



Subdural haematoma



fracture but may share a similar pattern of intracranial injury.

Subdural haematoma

Subdural haematoma in an infant or toddler without an adequate explanation strongly suggests physical abuse. A simple fall is insufficient to explain such an injury. There is often no accompanying fracture, the haematoma arising from disrupted bridging veins spanning the surface of the brain to the dura. The presentation may be immediate or delayed with fits, poor feeding, lethargy, drowsiness, or rapidly developing unconsciousness. There may be evidence of an expanding head—widened sutures on the skull and a full fontanelle—and abnormal findings on computed tomography.

Cerebral contusion, haemorrhage, and oedema

Cerebral contusion, haemorrhage, and oedema are responsible for most of the deaths and long term illness resulting from physical abuse. Neurological deficit after widespread neuronal damage from repeated shaking parallels the punch drunk syndrome of professional boxers. Intraventricular haemorrhage can present as late secondary hydrocephalus. Focal or generalised convulsions may be a further sign of cerebral injury.

Retinal haemorrhages

Like subdural haematoma, the presence of retinal haemorrhage without adequate explanation is strong presumptive evidence of physical abuse. Retinal haemorrhages in newborn infants disappear during the first days of life. A short term rise in intracranial pressure—for example, after shaking—is responsible for the increased pressure in the central retinal vein that leads to retinal haemorrhages. There is often an associated brain injury. Pupils should be dilated with a mydriatic such as 1% cyclopentolate drops and the fundi examined. This may be easier when the baby is feeding or sucking.

"Non-traumatic" presentation of abusive head injuries

There may be no history of trauma or obvious signs of injury in a child with a head injury caused by physical abuse. Unexplained neurological deficit, seizures, apnoeic attacks, hydrocephalus, and raised intracranial pressure may be occult manifestations of child abuse. Trauma should also be considered along with meningitis and encephalitis, tumours, spontaneous intracranial haemorrhage, non-traumatic hydrocephalus, and administration of drugs and poisons. A radiograph of the skull, a skeletal survey, lumbar puncture, and computed tomography are helpful in diagnosis.

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