



Anne Smith

# Nonaccidental injury in childhood

## Background

Nonaccidental injury is a significant cause of mortality and morbidity, especially in infants and young children.

## Objective

This article focuses on physical injuries that are commonly observed when children have been physically harmed as a result of abuse and neglect.

## Discussion

In 2009–2010 statutory child protection agencies in Australia received 187 314 notifications regarding suspected child abuse and neglect, of which 31 295 were substantiated. Substantiated child abuse and neglect occurred for 6.1 per 1000 Australian children. The good news is that these data represent a 10% reduction in the number of notifications and a 4% reduction in the number of substantiated reports compared to 2008–2009 data. Children are vulnerable and child abuse is common. It is therefore important for all general practitioners to be skilled in recognising and responding to child abuse and neglect.

**Keywords:** child, health; child abuse



Child abuse is common. In 2009–2010 substantiated child abuse and neglect occurred for 6.1 per 1000 Australian children.<sup>1</sup> Young children are particularly vulnerable to injury when a caregiver physically restrains, disciplines or assaults them. It is therefore important for all general practitioners to be skilled in recognising and responding to the physical signs of child abuse and neglect.

## What does the term ‘nonaccidental’ mean?

The dichotomy between accidents and ‘nonaccidents’ is spurious; there is a continuum between the two. At one end of the spectrum are unforeseeable and unpreventable events such as being struck by lightning. No fault is attached to conditions regarded as accidents. More commonly the term ‘accident’ is applied to events that are somewhat predictable but occur commonly during the lives of ordinary active children, such as a fracture of the distal radius sustained from a fall onto an outstretched hand.

At the other end of the spectrum are nonaccidental injuries sustained as the result of a deliberate action by another person. Sometimes injuries of this nature are labelled as being caused by assault or ‘deliberately inflicted’. For example, a child who sustains extensive bruising to the buttocks from ‘spanking’ (*Figure 1*). Proof of intention to cause harm is not required for a child’s injury to be judged nonaccidental. In the spanking example there may have been no intention to cause significant injury, but if significant tissue damage occurs it is nonaccidental.

In the grey zone between accidents and nonaccidents are situations that involve carelessness, poor decision making and neglect. Physical injury to a child might occur as a result of an adult’s failure to provide adequate supervision, failure to provide a safe environment or failure to discourage engagement in dangerous activities.

## Types of nonaccidental injury

The most common site of nonaccidental injury is the skin. The most frequently observed injuries are inflammation, bruises, abrasions and lacerations. These wounds are caused by blunt impact with an object or surface, or the application of blunt force such as pressure, bites or suction. Nonaccidental burns and scalds are also relatively common.



Less common skin injuries include incised wounds and stab wounds from sharp implements.

Less common but potentially fatal forms of child abuse include intracranial injury caused by shaking and injury to bones, soft tissues and internal organs.

## What patterns of injury are suggestive of a nonaccidental cause?

### Bruises

Bruises are a normal part of childhood, however some bruises should raise suspicion of nonaccidental injury (*Table 1*). Childhood accidents commonly cause bruising on the front of the body over bony prominences; toddlers frequently have accidentally acquired bruises on their foreheads and older children commonly have bruises on their knees and shins.<sup>2</sup> Bruises in premobile children are very uncommon.<sup>3,4</sup> Bruises over relatively protected parts of the body such as behind the ears, neck, trunk and buttocks should raise concern about a nonaccidental cause.<sup>5</sup> Patterned bruising strongly suggests a nonaccidental cause. Bruises interspersed with abrasions suggest injury caused by rope and circumferential marks around the limbs or neck should raise concerns about a ligature.

Petechiae are pinpoint bruises that have a number of causes including rupture of small blood vessels caused by pressure from



Figure 1. Bruising from impact with linear object

#### Table 1. Bruising suggestive of nonaccidental injury<sup>12</sup>

- Bruising in a child <9 months of age or nonmobile child
- Bruising away from bony prominences
- Bruising to the ears, face, abdomen, arms, back, buttocks and hands
- Multiple bruises in clusters
- Multiple bruises of uniform shape (eg. opposing arc from a bite)
- Bruising that has the shape of an object or a ligature (eg. tram track from a rod shaped object)

impacts, or forceful pressure from ridges of clothing or restraint. They also occur when small vessels rupture as a result of squeezing or pinching the skin or when suction is applied to the skin such as occurs during 'love bites'. It is important to differentiate facial petechiae caused by nonaccidental strangulation from other causes such as forceful vomiting or coughing.

Research over the past decade has discredited many myths about aging of bruises. The age of a bruise cannot be determined from its colour other than to say that 'yellowing' has not been observed in bruising sustained less than 18 hours previously.<sup>6</sup>

### Scalds and burns

Like other forms of physical child abuse and neglect, most nonaccidental thermal injuries are seen in children aged less than 6 years. Thermal injuries can be caused by liquid (scalds), hot objects, flame burns and radiant heat. Scalds are divided into immersion scalds, flowing liquid, splash and splatter injury.

Immersion in hot tap water is the most frequently reported nonaccidental scald. A scald pattern of uniform depth, sparing of flexures, uniform burn line demarcation, bilateral burn symmetry and the absence of splash marks suggest forced immersion.<sup>7</sup>

Contact burns on an unusual part of a child's body, such as the genitals or back of the hand, should generate a high level of suspicion of nonaccidental injury. Sometimes the shape of an object, such as the end of a lit cigarette or the hot metal end of a cigarette lighter, can be seen branded onto a child's skin (*Figure 2*). Heated objects such as kitchen utensils and curling irons have also resulted in nonaccidental contact burns. Scalds and contact burns from hot food can result in injury to the lips and cheeks and may also damage tissues inside the mouth.

### Fractures

Fractures are common in childhood, but again, some fracture patterns are far more commonly attributed to abuse than accidents (*Table 2*). Fractures of metaphyses of long bones are more commonly attributed to abuse than accidents, although nonaccidental long bone injuries occur more commonly in the diaphyses (shafts). When nonaccidental injury has resulted in a skull fracture, the most common fracture pattern seen is that of a single linear parietal skull fracture. Complex

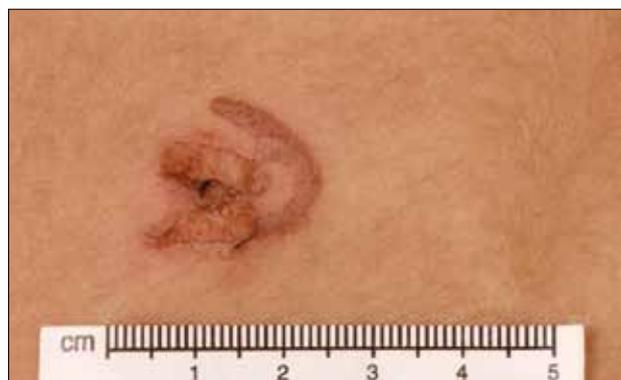


Figure 2. 'Branding' contact burn from cigarette lighter



**Table 2. Differentiating accidental fractures from nonaccidental injury**

Fractures seen significantly more often following nonaccidental injury	Fractures attributed to nonaccidental injury more frequently than to accidents	Nonaccidental injury and accidental causes both common
<ul style="list-style-type: none"> <li>• Classic metaphyseal lesions</li> <li>• Rib, especially posterior</li> <li>• Scapular</li> <li>• Sternal</li> </ul>	<ul style="list-style-type: none"> <li>• Multiple, especially bilateral</li> <li>• Fractures at different stages of healing</li> <li>• Widely separated epiphyses</li> <li>• Vertebral body, subluxations</li> <li>• Digital</li> <li>• Complex skull</li> </ul>	<ul style="list-style-type: none"> <li>• Subperiosteal new bone formation</li> <li>• Clavicle</li> <li>• Long bone</li> <li>• Linear skull</li> </ul>

\* Adapted from Kleinman PKK, editor. Diagnostic imaging of child abuse. 2nd edition. Chicago: Mosby, 1998

and multiple skull fractures should definitely arouse suspicion about a nonaccidental cause.<sup>8</sup>

### Intracranial injury

The diagnosis of inflicted traumatic brain injury is frequently missed.<sup>9</sup> Intracranial injury must be suspected in infants with an altered conscious state or who have neurological symptoms and signs. Unexplained vomiting, irritability and apnoeas in infants should generate concern about possible intracranial injury, particularly from shaking. Prompt referral of children with suspected nonaccidental brain injury or unexplained encephalopathy is important. Evaluation of suspected nonaccidental brain injury should be performed by specialists, who can consider the differential diagnoses and provide testimony capable of withstanding the rigors of cross-examination in court.

### Internal injuries

Mechanical trauma from a punch or kick to the chest or abdomen can lacerate solid organs such as the liver, spleen and kidneys or rupture hollow organs such as the stomach, intestines and bladder. Trauma to the pancreas can result in pancreatitis and blood vessels and mesentery can also be damaged.<sup>10</sup> Bruising to an infant's abdominal wall should generate a high level of suspicion about underlying damage to intra-abdominal contents. Nonaccidental injuries should also be kept in mind as a differential diagnosis in unexplained abdominal pain or tenderness.

### What circumstances should raise concern about possible nonaccidental injury?

In addition to the types of injury sustained, some circumstances may raise suspicion of nonaccidental injury (Table 3). Relying on demographic information and social circumstances is not an efficient way to detect nonaccidental injury.

### What should GPs do if they suspect nonaccidental injury?

If nonaccidental injury is suspected the GP has a number of important duties: managing the child's immediate injuries, assessing the child's (and any other cohabiting children's) immediate safety and reporting

**Table 3. Circumstances suggestive of nonaccidental injury**

- Delay in seeking medical treatment for significant injury
- Explanation of injury cause changes over time without apparent reason
- Explanation of injury cause differs between caregivers without apparent reason
- Explanation offered is inconsistent with child's developmental capabilities
- Possible impairments to caregivers' capacity to supervise and protect the child

the suspected abuse to the local authorities. The long term ongoing family support and monitoring of the child's wellbeing are also important roles for the GP.

A thoughtful, thorough assessment of the child's wounds, the child's developmental capabilities and the congruence with the offered explanation may lead to a suspicion of nonaccidental injury. Take a detailed history of the biomechanics of the injury and the physical circumstances surrounding the event from caregivers at the earliest opportunity. Verbatim comments should be diligently documented and an assessment made as to the strength of the explanation offered to account for the injury. Information from multiple sources, including caregivers and any witnesses is useful.

Healthcare workers are mandated to report nonaccidental injury in children in all states of Australia, but the legislation differs between jurisdictions. This difference results in differing thresholds for notification to statutory child protection agencies. Hence, doctors in South Australia and Queensland are required to report a suspicion about nonaccidental injury whereas doctors in Victoria are mandated to report a belief formed on reasonable grounds that a child has been physically abused<sup>11</sup> (see the article 'Child abuse: mandatory reporting requirements' by Sara Bird in this issue). Australian doctors must remain aware of legislation and the procedures to report cases of children with nonaccidental injuries to child protection agencies in their region. Most specialist child protection units in Australian capital cities also provide around-the-clock advice and secondary



consultations for other health professionals within the state. Whenever nonaccidental injury is considered in a child, prompt consultation with specialists from these centres and/or notification to the statutory child protection agency is critical.

## Summary of important points

- Nonaccidental injury is a significant cause of mortality and morbidity, especially in infants and young children.
- Some patterns of injury are highly suggestive of a nonaccidental cause. General practitioners must recognise these patterns.
- The colour of bruising does not indicate when it occurred.
- General practitioners must be familiar with their legal requirements and report suspected child abuse to their statutory child protection agency as per local legislation.
- When a child has been physically injured and the diagnosis of child abuse is in doubt, consult with a forensic specialist.

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