

CASE REPORT

Norbert Telmon,¹ M.D., Ph.D.; Jean-Pascal Allery,¹ M.D.; Anne Dorandeu,² M.D.;
and Daniel Rougé,¹ M.D., Ph.D.

Concentrated Bleach Burns in a Child

ABSTRACT: After a review of the literature on inflicted burns in children, we present a case of caustic burns in a child aged 6 months. Its interest lies in the causative agent (concentrated bleach) and in discussion of the intentional nature of the burn.

KEYWORDS: forensic science, maltreatment, child, burn, caustic

Burns are relatively frequent in children and a non-negligible number are intentional and arise from maltreatment, or are due to varying degrees of neglect (1). However, it may be difficult to differentiate non-accidental from accidental burns, especially if there is no other associated injury (2).

Case Report

We report a case of burns by immersion, which is unusual as the causative mechanism was chemical and not thermal. A baby girl aged six months was admitted to the pediatric emergency department for skin lesions of the back. The lesions were discovered in the morning by the parents, who mentioned that she had cried for some time during the night. The day before, the child and her 3-year-old brother had been cared for by their grandparents, who had reported nothing unusual.

On admission the child was found to have a 20% BSA burn of the posterior aspect of the body, the heels, back, lumbar region, buttocks and posterior aspect of the skull (Fig. 1). Burn depth was fairly homogeneous, with deep second degree and some areas of third degree burn in the lumbar area. The border between normal and injured skin was clear and linear. The folds of the buttocks were not affected. These clinical features suggested a burn caused by immersion. There were no other skin lesions, in particular, no splash marks. No signs of other old or recent injury was found, in particular, no bruising or hematoma. Height, weight and psychomotor development were not delayed. A whole-body radiograph did not reveal any old or recent bony lesion.

The burns required topical treatment under general anesthesia and grafting of the lumbar region and a buttock, necessitating a two-month stay in a burn unit.

At six months, epithelialization was complete but some inflammation persisted and pressure garments were required.

Discussion

Review of the literature of 11 articles published since 1970 (3–13) found a total of 5475 children aged from 1 day to 18 years (mean age 27.2 months) who had suffered deliberate burns. The findings were in agreement on several noteworthy points:

- Boys slightly outnumbered girls (56.3% of cases).
- In all observations, the peak age group of victims was between 1 and 3 years.
- Burns were relatively frequent and accounted for 11.7% of voluntary injuries. Moreover, 8.4% of children admitted for burns were in fact victims of maltreatment. This figure may well be underestimated because the injury is isolated or “benign” (the child is not admitted to hospital and treated only as an outpatient).
- Burns are most frequently inflicted by immersion or projection of hot fluid. Spear (14) reported that 1.1% of burns in children are due to chemicals, but he did not distinguish between accidental and non-accidental burns.

Several criteria are classically held to lead to suspicion of abuse rather than accident (15–18). The main ones are:

- Delay of more than two hours between the burn and admission to hospital or seeking medical attention
- Consultation only when complications occur
- Evidence of other injury
- The circumstances reported by the parents: no direct witness of the burns, or involvement of another child in the causative mechanism,
- In burns due to immersion, the presence of burns due to splashes (8).

¹ Department of Forensic Medicine, Rangueil University Hospital, 31403 Toulouse Cedex 4, France.

² Department of Forensic Medicine (Prof. E. Baccino), Hopital Lapeyronie, 371 av. du Doyen Gaston Giraud, 34295 Montpellier Cedex 5, France.

Received 22 May 2001; and in revised form 7 Aug. 2001, 17 and 18 Jan. 2002; accepted 18 Feb. 2002; published 10 July 2002.



FIG. 1—Burns caused by concentrated bleach in a 6-month-old baby girl.

In our case, investigation made it possible to reconstruct the facts. The child was accidentally “bathed” in concentrated bleach (48% sodium hypochlorite) at the grandparents’ home the evening before. Concentrated bleach is generally used in homes to disinfect and clean sanitary facilities, bathtubs, etc. It is sold in 250 cc plastic sachets in supermarkets and hardware stores and is marked “warning: this product causes burns.”

The child had not been rinsed afterwards, as she had not initially shown any signs of pain. These circumstances, as reported by the family, seemed compatible with the lesions observed.

The appearance of the skin injury in chemical burns depends on the causative agent. Acid burns have a dry surface, whereas lesions caused by alkaline agents produce edema and saponification, and lesions due to oxidoreduction are not deep (19). Sodium hypochlorite causes lesions by both mechanisms (alkalinity and oxidoreduction) (19).

Lesions caused by bleach develop slowly and are worsened if they have not been rinsed after contact of the skin with the bleach. Lesions by oxidoreduction (hypochlorite, bromide) are produced in a few hours by coagulation of cutaneous proteins (19,20). The burn does not immediately cause pain and the severity of the lesions depends mainly on duration of contact (21,22).

In some cases, it can be useful to examine the clothing if this has initially been soaked with the chemical agent involved.

The delayed effect is consistent with the child’s crying during the night before the parents discovered the injury.

The lack of initial effect and thus of pain explains the fact that the child did not struggle and so there were no splash marks. The absence of pain may also account for the grandparents’ failure to realize the gravity of the accident. The investigators accepted that the child had been bathed accidentally. As the grandparents, because of their social and educational background, were not necessarily aware of the potential seriousness of contact of the skin with pure bleach, the notion of negligence was also dismissed.

A priori this case remains exceptional, as it is the direct result of the cutaneous toxicity of bleach at a concentration, which is used only in a few countries.

Conclusion

The case we report illustrates the difficulty of diagnosis in burns, in particular, immersion burns in children. Clinical analysis in forensic practice must clearly describe the characteristics of the skin lesions and of any other injury present. The report is then compared with the account given by the parents, in order to differentiate burns related to maltreatment or varying degrees of neglect from those, which are accidental.

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Additional information and reprint requests:

Norbert Telmon, M.D.
 Department of Forensic Medicine
 Rangueil University Hospital
 F-31403 Toulouse Cedex 4
 France
 E-mail: telmon.n@chu-toulouse.fr
 Tel: 33 5 61 32 28 59
 Fax: 33 5 61 32 21 77