

MEDICINE

ASSESSMENT OF SUSPICIOUS BURN INJURIES

—by Seth Asser

Associate Editor's Note:

This couplet of articles by Dr. Seth Asser and Investigator Phylip Peltier provides insight into current practice in the medical evaluation of suspicious burns and articulates the importance of crime scene investigation. The pair highlights the need for a multidisciplinary approach to child maltreatment. — by Martin Finkel, DO

At least 6 to 15 percent of burned children seen as outpatients and one third of those hospitalized were injured as a result of abuse or neglect. It is therefore essential for anyone caring for injured children to be aware of the signs of non-accidental burns.

The biomechanics of burn injury are readily understood. Energy applied to skin causes direct cell damage or cell death. In almost all burns in the high-risk group—children under five years of age—injury is caused by thermal energy, or heat. The severity of thermal burns is a function of the amount of heat applied to the skin, the duration of exposure, and the thickness of the skin. At 156 F or above, it takes less than one second to produce a full-thickness burn. At the temperature of an average home water heater, 140 F, 5-10 seconds is required. At 124 F, producing a full-thickness burn takes several minutes. Heated metal objects, open flames, or grease—all of which have very high heat content—are damaging on very brief contact. Thick skin—such as that on the soles of the feet—takes longer to burn than thin skin.

In assessing the cause of burns, the two most important factors are the appearance of the injury and the plausibility of the history. **The injury**

The size, shape, depth, and distribution of the injury are telling. Some non-accidental injuries such as forced immersion scalds produce burns with easily recognizable fea-

tures. Forced immersion injuries produce circumferential injury around the extremities, often in "stocking" or "glove" distribution. Forced immersion burns are also seen on the buttocks, lower back, and perineum. These burns are nearly uniform in depth with sharp lines of demarcation. Occasionally there is an area of sparing of the buttock or sole of the feet, where a child is forcibly held down against the tub or sink. Such patterns suggest restriction of motion and significant exposure time. Adults, who have thicker skin and may wear protective clothing, almost always escape injury during forced immersions. Thus, absence of concurrent burn of the caregiver does not exclude involvement.

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Cigarette burns also produce easily recognizable features. They tend to be round, of varying depths, and in clusters, often on the hands or feet. Blistering seen early in cigarette burn injuries is sometimes confused with bullous impetigo, and vice-versa. Cigarette burns can be distinguished by their varying depth and by their characteristic pattern upon healing, namely round craters with hyperpigmented edges.

In burns from hot objects, the injury often closely resembles the object. Very hot objects such as household steam irons may produce a significant injury from a brief accidental touch. Suspicious injuries include very discrete lesions (especially in clusters), and burns in unusual locations such as the antecubital fossa or buttocks.

Some burn patterns are usually accidental. In the pull-down of hot liquid from a stove or table top, burns are predominantly on the head and trunk and have the characteristic "arrow down" pattern where the injury narrows as the liquid trails over the surface.

The history

Determining if the history is plausible requires an understanding of child development, knowledge of burn pathophysiology, and application of common sense. A good history includes a detailed description of events with exact location of people, furniture, appliances, and other features of the room. The story should be assessed with the age and specific abilities of the victim in mind. If the caretaker refers to what could be a trigger event, such as incessant crying or soiling, be alert for signs that the caregiver might have lost control and perpetrated physical abuse.

Assessment of child and caregivers for known risk factors for abuse may serve to identify those at high risk, but cannot alone be relied upon to make a diagnosis of non-accidental trauma. A scene review by an experienced investigator can prove invaluable, providing additional information such as the rate of rise and peak temperature of tap water. Paramedics responding to the scene often can provide details about the events and scene which caregivers might knowingly or inadvertently misreport. In addition, examination for evidence of concurrent and prior injury, including occult trauma, is essential in cases where reasonable suspicion exists. Injuries that appear old, e.g., have old, decomposing eschar or underlying cellulitis, need careful correlation with historical events as they may represent anything from inadequate medical care to attempts to hide abuse or neglect.

By careful assessment of injuries and a critical, reasoned approach to correlation with the history, one can identify injuries that are either non-accidental or at least suspicious enough to warrant further investigation. Children who receive non-accidental burn injuries—many of which are at least partially premeditated—are in a home environment that is seriously psychopathological. It is essential that suspicious injuries be referred for extensive investigation.

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5. Don't view the press as a vehicle for "public relations." PR is a dirty word to a working journalist. A reporter will accept PR material for background, but all PR is suspect, since it's created for whoever paid for it. When you have a story to suggest, shape it in terms of what's called a "hard news peg." What is important and timely about the story? What is the conflict? What is the resolution to a problem? What are the main elements of who, what, when, where, and how?
6. Never, under any circumstances, lie to a reporter.
7. Avoid the use of "no comment" whenever possible. If you feel you must not comment on a story, give a short explanation

- why, such as, "Not until the trial is finished," or be honest and say, "I don't trust your reporting."
8. Cultivate good working relationships with reporters over time. This doesn't necessarily mean trumping up excuses to chat with reporters or trying to be buddy-buddy. Be available. Respond to requests for information in a timely fashion. In short, be reliable when called upon.
9. Don't be afraid to ask questions of the reporter asking questions of you. Most reporters don't have a problem with giving you some idea what their story is about so you have a feel for the broader context in which your comments will be displayed.

10. Exercise your rights to object to mistakes or just plain bad coverage.
11. Leap to ask for corrections *immediately*. Do not form a committee to study the problem and then ask for a correction. Your only hope of getting a correction is to be timely and, in the case of letters to the editor, succinct.
12. Have a "fire brigade" formed and standing by. Judges in Washington state have a small committee that is on call to deal with media problems on behalf of their colleagues. They are ready to handle what's recommended in suggestion #11.

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