Burns

Patient and family information, brought to you by the Education Committee of APSA

Overview - "What is it?"

A burn is damage and injury to certain tissues that can be caused by a variety of causes. Skin or flesh burn injuries are caused by sunlight, scald (due to hot water or steam), contact (hot surface like a stove or iron) and electricity. Radiation and some chemicals can also cause burns. The extent of the burn is determined by the temperature of the agent or the kind of chemical causing the burn as well as the length of time of the contact between the offending agent and the child.

Burns are usually described by the depth of the burn:

- *Superficial or first-degree burns* have damage only to the outside layer of the skin (epidermis). Examples include a sunburn or a scalding injury from hot water that turns the skin red without blistering.
- *Partial or second-degree burns* have injury to the inside layer of skin (dermis) but not all the way through. In second-degree burns, the remaining dermis can recover with time. The deeper the damage, the longer it takes to heal the skin and the more scarring there will be. A hallmark of second-degree burns is blistering of the skin.
- *Full-thickness or third-degree burns* involve all the layers of the skin. In this type of burn the skin must be replaced with a skin graft (a portion of healthy skin taken from another part of the child's body and placed on the burn site).
- *Fourth-degree burns* are those that go deeper than the skin, injuring underlying fat, muscle, or even bone.

Other causes of burns include inhalation and chemical burns. Inhalation injury is when the child breathes in smoke and heated gases (such as when trapped in a house fire). This type of burn can cause severe damage to the lungs and even death. Chemicals, such as acids or bases, can cause significant tissue damage. If contact is made with these chemicals, removing the chemical from the skin to prevent more damage is important, as is removing clothes soaked with the chemical. Wash the affected area with running water for at least 30 minutes and seek medical care.

Electrical burns can occur from contact with an electric current or from lightning. Electricity enters the body through one point, travels through the body, and exits from another part of the body in contact with the surface (ground). Patients with electrical burns can sometimes have cardiac arrest (have their heart stop) when they get electrocuted. Since the electricity travels through the body, damage to the muscle, bone and internal organs can be present.

Signs and Symptoms - "What symptoms will my child have?"

Early signs/symptoms:

- First-degree burns have a pink to red tinge to the skin. They tend to be painful at first. A few days later, the burnt skin peels.
- Second-degree burns form blisters. They are painful. The blisters can get big enough and may pop.
- Third-degree burns look grey or white in color. Interestingly, since the skin is completely injured, the nerves of the skin are damaged, too. Therefore, there is no pain in the area of the burn.
- Fourth-degree burns go beyond the skin. They can burn muscle or even bone. Burns due to electric burns can be fourth-degree burns.
- Inhalation injuries can range from difficulty breathing to unconsciousness.

Later signs/symptoms:

- First-degree burns will heal without significant scarring.
- Second-degree burns will heal slower than first-degree burns and may heal with some discoloration. Healed second-degree burns are easily sunburned and will therefore need to be covered by clothing or sunscreen whenever exposed to the sun.
- Third-degree burns that have been grafted can have contraction and scarring of the graft. After skin grafting, the areas may require compression garments to prevent thickening of the scar of the skin graft.

Diagnosis - "What tests are done to find out what my child has?"

A child with a burn should be evaluated by a medical professional who has knowledge of how to care for pediatric burns. Narcotic pain medicines may be given for both pain control and so the doctor can evaluate the severity of the burn.

Inhalation injury is suspected if the child has been trapped in a burning building, has been coughing up soot, or has some singeing of his or her eyebrows, eyelashes, or nose hairs. Oxygen will be given to the child to help his breathing. In some cases, a blood test to see the carbon monoxide level is done. Carbon monoxide is a component of smoke. The longer one breathes in

smoke, the higher the carbon monoxide level is in the blood. Carbon monoxide prevents the body from taking up oxygen. In severe cases, the child may require being placed in a special chamber where he or she would breathe in pure oxygen (hyperbaric chamber) to reverse the effects of the smoke.

Treatment - "What will be done to make my child better?"

Skin covers the entire body and gives a person protection from heat, cold, water loss and infection. The treatment of skin burns depends on how deep and how extensive the damage is. If your child has a burn that is greater than 10% of the entire skin surface, he or she may lose internal fluids and may need to have these fluids replaced intravenously (fluid given into a vein). If there is damage to the lungs because of breathing smoke and hot gases, a breathing tube and a ventilator machine may be necessary during the first days after the injury.

- *First-degree burns* only affect the topmost layer of the skin. When the red skin peels off, the underlying skin would have regenerated to make new mature skin. This type of burn can be painful, especially if the area affected is large. Cool towels may help the initial pain. Keeping a small child wrapped in lots of wet towels can result in lowering their temperature (hypothermia), so one should be careful. For first-degree burns, over-the-counter ointments and/or Tylenol or Motrin are usually the only things needed.

- *Second-degree burns* cause blisters and sloughing of the skin. These burns can vary in depth. Scald burns from hot liquid are usually less deep than oil burns. In children, sedation or anesthesia may be required for examining and cleaning the burn wounds. There are two ways of treating second-degree or partial thickness burns: 1) putting antibiotic paste such as Neosporin or Silvadene (usually twice daily) or 2) placement of a covering such as Biobrane or Mepilex. These coverings protect the skin as it heals.

- *For third- and fourth-degree burns*, skin grafts are needed for healing. Skin grafts are harvested from a part of the body that is not injured. Skin grafts are either split thickness or full thickness. Split thickness grafts harvest the epidermis and the topmost part of the dermis, leaving the deep dermis to reconstitute the skin of the harvested site. The harvested skin graft is placed onto the area where the burned skin has been removed. To make skin grafts cover the most area of skin, the harvested skin is sometimes cut to create a net-like effect. With time, skin cells migrate in to cover the entire area of the burn. Full-thickness skin grafts are used in areas that need a lot of movement (such as the hand or over joints) or areas requiring the best cosmetic results such as the face. Skin grafts are either sewn or stapled. Often a bulky dressing is placed over a new skin draft to encourage the graft to stick on to the burn wounds. In 5-7 days, the dressings are removed to inspect the skin graft.

Children who have been electrocuted or with electrical burns are usually monitored in the intensive care unit. The heart is monitored to make sure that it does not have any abnormal beats or damage. Deep damage to the muscle is monitored by looking at blood levels of a substance released when muscle is injured. If muscle injury is suspected, the patient receives intravenous fluid to wash out the remains of the muscle burn and prevent damage to the kidneys.

Home Care - "What do I need to do once my child goes home?"

Diet: When a child has a big burn, it is important to give him food to heal his wounds. In the hospital, his doctors will make sure that he has enough nutrition to heal. At home, it is important to make sure that your child has a healthy appetite and keeps drinking water.

Activity: What activities your child can have depends on how bad the burn was and what was done to heal it. Sometimes, if there is a fresh skin graft your doctor may want your child to take it easy during the first few days after the skin graft is placed. Your doctor should give you instructions on what your child can do.

Wound care: Wound care depends on how deep the wounds were and what was done to have the wounds heal. Your doctor should give you exact instructions on how to care for the wounds. Also ask your child's doctor if your child can get the wound wet in a shower or a bath.

Medicines: Burn wounds can be painful. Your child may go home with instructions to take over-the-counter medications such as Tylenol or Ibuprofen. Stronger pain medications such as narcotics can be prescribed by your child's doctor if necessary. Some burn wounds are treated at home with antibiotic ointment or cream. Your child's doctor should give you exact instructions on how to use this. If the burn wound gets infected, your child may need to take medicine to treat the infection (antibiotic).

What to call the doctor for: Skin covers the entire body and gives a person protection from heat, cold, water loss and infection. When skin gets a second-degree burn or worse, infection can settle and enter the body. When your child comes home with a burn wound, he or she should be inspected for signs of possible infection such as fevers, redness around the wound, drainage or pus coming from the wound. If you suspect an infection, you should contact your child's physician.

Follow-up care: Your doctor will instruct you on follow up for the burn wounds.

Long Term Outcomes - "Are there future conditions to worry about?"

If the skin has a second-degree burn or worse, the scarring from burns or skin graft can get very thick over time. In some cases, the thickness can limit the motion of the part of the body where

the burn was located. Once the burn or the graft is healed, parents are instructed to massage the area with lotion once or twice a day to soften the scar. In some severe cases of scarring, special garments are made to compress the skin. Your child may need to wear the garments for weeks to months to control the thickness of the scar.

The area of the burn has a high risk of getting sunburned easily. You should instruct your child to cover the burn scars when they are exposed to the sun or a high SPF sunscreen (more than 50 SPF) should be used.

Sometimes, your child's doctor may prescribe physical therapy or occupational therapy to make sure that the movement of the area that was burned remains normal. Having your child follow up with this therapy is important because you don't want the area to "freeze".

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