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Case Report

Some different treatment of sandal burns of the hand in children

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Abstract: The hands account for less than 5% of total body surface area, but loss of the hand constitutes a 57% loss of function for the whole person. In Central Asia, and particularly in Uzbekistan, many episodes of burns take place at homes because of using sandal heaters. During a 16-year period (1992-2007), 61 patients with severe sandal burns of the hand were treated at the Burn department of RSCUMA and Samarkand Inter-Regional Burn Center, Uzbekistan. The main goal of this work was to present the most complete information about sandal burns of the hand and discuss the most effective methods of treatment for sandal burns. As a result of using this method of treatment for burned children in our practice, the percentage of post burn consequences, such as the impact on mobility and growth of the extremities, was greatly reduced.

Keywords: Burns, hand, treatment

Introduction

The hands account for less than 5% of total body surface area, but loss of the hand constitutes a 57% loss of function for the whole person. Whether the burned hand is an isolated injury or part of a large total body surface area burn, its loss represents a major functional impairment [1-3].

Severe hand burns are especially problematic injuries because of their propensity for causing long-term disability. Proper treatment of the burned hand may mean that the patient can return to work and a normal lifestyle. But if not properly treated, burns of the hand can result in severe dysfunction and significant morbidity. Simple interventions can make a huge difference in final outcome [4-6].

In Central Asia, and particularly in Uzbekistan, many episodes of burns take place at homes because of using sandal heaters [7, 8].

Despite improvements in living conditions and public education efforts, the traditional device, a sandal, containing live coals, is still used for heating the lower part of the human body.

However, children, especially toddlers, when left unsupervised, can crawl under the blanket and fall with hand into the coals.

In the case of sandal burns of hand, it usually is not only skin that is injured but also underlying tissues: subcutaneous fat, fasciae, muscles, and even bones.

Materials and methods

During a 16-year period (1992-2007), 61 patients with sandal burns of the hand were treated at the Burn department of RSCUMA and Samarkand Inter-Regional Burn Center, Uzbekistan. Of these, 39, 3% (n = 24) of the patients younger than 1 year of age, 52, 5% (n = 32) of the patients were between 1 and 3 years of age, 6, 6% (n = 4) were between 3 and 5 years of age, 1, 6% (n = 1) were between 5 and 14 years of age. Of the 61 patients admitted to the hospital 68, 8% (n = 42) were in shock. All other patients, transferred from other regional hospitals, had toxemia.

All patients were given high- and low-molecular blood substitutes, 0.9% of sodium chloride for

Figure 1. Patient A, was hospitalized in the Burn department of RSCUMA with the following diagnosis: Sandal burn of forearms and hands III-IV degree. After necrotomy.

correction of their water-salt metabolism, 5% of glucose, and other drugs.

12 patients were surface burns. Burned hands cleansed daily with a mixture of water and chlorhexidine gluconate. The wound dressings were changed every other day. Antiseptic betadine or silver sulfadiazine medications were used.

49 patients were deep burns. The main methods of total and local treatment of severe burns of the hand in addition to other effective methods, included necrotomy, necrectomy, autodermoplasty, and surgical removal of post burn scar deformities.

The characteristics of sandal burns of the hand include coagulation necrosis because of the contact with live coals, circular vascular and nerve compression and, as a result, secondary necrosis. Necrotomy was performed to prevent secondary necrosis and to accelerate the rejection of necrotic tissue (**Figure 1**). After necrotomy, the wound was covered with chemotherapeutic materials that accelerated the rejection of the necrotic tissue.

At the hospital, we observed 22 patients, whose burn surface areas were treated with chemotherapeutic solutions (Trypsin, Chemotrypsin, semiconductor laser therapy). The wound dressings were changed every other day. Antiseptic medications were used. Necrectomy was performed gradually at a small area at a time. After initial removal of damaged tissues, necrectomy was performed for the full depth of the necrosis. In patients, full necrectomy was performed 8-12 days after getting the burn if the burned surface area. Exarticulations or amputations of fingers were done as soon as the non-viability of the fingers was determined. Exarticulation in 3 patients was performed on the 3 d day, in 2 patients on the 4rd and in 2 patients on the 5th day after burn trauma Systemic medication, antibiotics, and vitamins were prescribed to all the patients. They have undergone several transfusions of blood, plasma and other medication.

All these measures were taken to prepare the wound for autodermoplasty. Free skin grafting was normally performed on the granulated wound when the wound was completely ready for autoplastic closure. The wound surface, when ready for plastic surgery, should be bright pink, neat, juicy, with little bleeding, with no edema.

When the wound surface was ready for surgery under general anesthesia, grafts of the skin were taken by hand or with the electrodermatome. Width of the grafts ranged from 3 to 5 cm. Their length depended on the location of donor sites. The thickness of non-perforated skin graft ranged from 0.2 to 0.3 mm. Grafts from the external and internal surfaces of the hip were normally used. Splint should be used for fixing the foot until the transplanted skin is completely engrafted.

The first bandaging was removed on the 2rd or 3th day after surgery. If the skin engrafted well, we proceeded with physical therapy after about the 6th day and remedial gymnastics. After that, the patients were discharged from the hospital for outpatient treatment. It was recommended that they continue with physical therapy.

Results

All patients were healed after the first autodermoplastic surgery. In 11, 5% (n = 7) of the patients, the transplanted skin dissolved in some places. These patients also had a second surgery. Of all surviving patients, 39, 3% (n = 24) came back after treatment and burned skin restoration to the hospital for a new surgery because they had lost the ability to exercise normal movement of their affected extremities.

Complications, especially in the fingers and joints, were as follows: contractures, ulcerating scars, complete and partial dislocations, and growth aberrations. Of all patients, 89% showed satisfactory results, and 11% were unsatisfactory. Unsatisfactory results were reported for the children who had more than 5 years after the burn incident and irreversible changes in the tissues. As a result of using this method of treatment for burned children in our practice, the percentage of post burn consequences, such as the impact on mobility and growth of the extremities, was greatly reduced.

Discussion

The hands and upper extremity are involved with thermal injury about forty percent of the time in published series, but this number is probably even higher if smaller burns that present to primary care physicians and clinics are included [9-13].

In Middle Asia, sandal burns are of special interest. Cases of sandal burns are more frequent during wintertime when people in distant mountain regions use an inappropriate heating system such as the sandal. Most of the patients with sandal burns have upper- or lower-limb injuries. Characteristics of sandal burns include not only skin injuries but also injuries to underlying tissues. Patients with sandal burns require immediate hospitalization, a special treatment described in this article, and fast preparation of an injured site for skin grafting. After skin grafting these patients require a special treatment as well, to avoid post burn contractures, which can affect mobility and growth of the extremities. At Samarkand Regional Burn Center, we have been successful in our treatment of deep sandal burns because of our organization of specialized medical care services, modern equipment, and new medical methods of rehabilitation for burn patients [6-8].

Nowadays sandals are rarely used in the cities and countryside, with the exception of the faraway mountain areas, where the introduction of district-wide heating systems is very difficult and where winters are very cold. Residents in these areas place a handmade square table in the central part of a room and put live coals inside. However, they often do not bother to set up some kind of barrier around the coals. Because of that, children, when left unsupervised, still fall onto the coals and receive deep burns. At present, educational programs for parents and their children are being launched in schools and day care centers with the purpose of sandal burns prevention.

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Disclosure of conflict of interest

None.

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