ELSEVIER

Burns 32 (2006) 780–782

BURNS

www.elsevier.com/locate/burns

Case report

Cranial bone sequestration 3 years after electrical burn

Nazım Gümüş [a], Y. Kenan Çoban [b,*], Mehmet Reyhan [c]

[a] *Adana Numune Research Hospital, Turkey*
[b] *Medical Faculty of Sütçü İmam University, Kahramanmaraş, Turkey*
[c] *Başkent University, Department of Nuclear Medicine, Adana, Turkey*

Accepted 27 February 2006

1. Introduction

Cranial burn due to electric current is uncommon. But, it causes severe damage to the head. Scalp, skull bones, meninges and even brain may be burned by it. In the event of deep cranial burn, usually, electron flow is high-voltage (more than 1000 V). Severity of injury varying from patient to patient is correlated with the amperage of the current, which has a direct relationship voltage. Treatment of scalp and cranial bone necrosis after electrical burn is managed according to the amount of damage. In full thickness burn cases, necrotic soft tissue is excised, and generally, the bony vault is covered with vascularized flaps. However, wound infection, flap necrosis, osteomyelitis and bone sequestration may occur during the treatment. Leaving the necrosed skull in situ serves as a scaffold of substitution for bone regeneration [1–3]. We present an unusual case of a child with a cranial electrical burn and flap coverage. Cranial bone sequestration was observed 3 years later.

2. Case report

The patient who had cranial electric burn, was 15-year-old girl. She was burned as a result of contacting a high-voltage electric wire, when she was at 12 years old. Head and neck, right foot and chest were burned seriously. Some of areas which were partial thickness burns had epithelialized spontaneously, but deep burned regions had been treated with surgically. Two toes of right foot had been amputated, and split thickness skin graft was used over the chest and foot wound. Meanwhile, scalp necrosis where the electric current introduced had been excised. Although skull was burned, it was left in situ for the regeneration of bone. The scalp defect was repaired with scalp flap from unburned

Fig. 1. (a) View of the former scalp flap's donor site, which was repaired with skin graft, 3 years before. (b) View of the sequestrated skull bones and its perforation of flap. Note that stitch scar around the flap was not affected from the infection.

* Corresponding author. Tel.: +90 344 2212337; fax: +90 344 2212371.
E-mail address: ykenanc@yahoo.com (Y.K. Çoban).

doi:10.1016/j.burns.2006.02.017

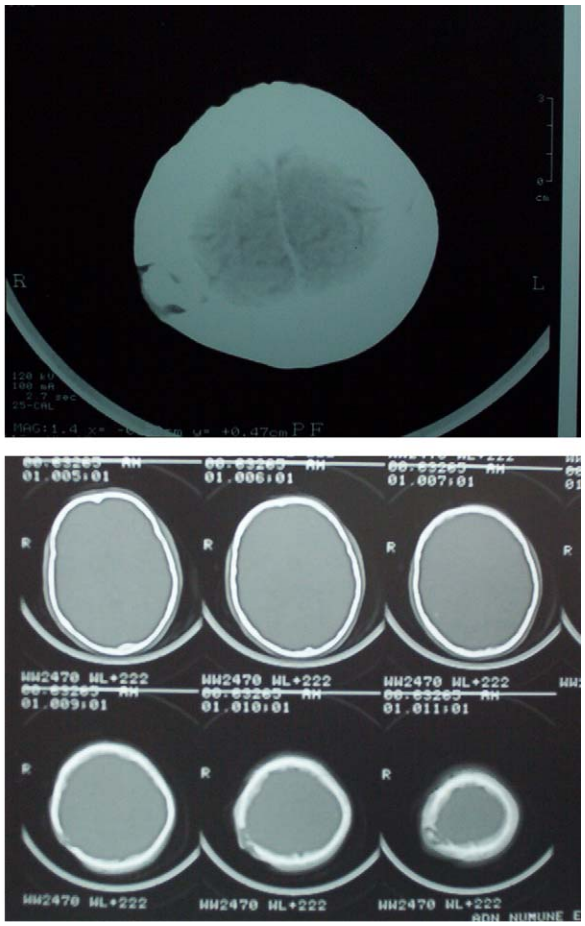

Fig. 2. (a) Image of the computerized tomography viewing the wound. (b) Appearance of the wound in different sections of computerized tomography.

area. Donor area of the flap had been closed with a skin graft. Then, all of the wounds healed unevenfully.

Three years after the first treatment, induration, swelling and later infection were observed on the centre of the scalp flap. Since the medical approach was ineffective, flap

Fig. 4. Postoperative appearance of scalp.

perforation and spontaneous wound drainage occurred (Fig. 1a and b). Radiologic imaging including computerized tomography and bone scintigraphy showed sequestration of skull bone. Bone scintigraphy which were obtained after an injection of 555 MBq (15 mCi) Tc-99m methylene diphosphonate revealed normal findings on the flow and blood pool images, and showed minimal increased tracer uptake on the posterior portion of right parietal bone at late phase in suggestion of chronic osteomyelitis (Figs. 2a,b, and 3).

The former scalp flap was elevated and all necrotic bones and granulation tissue removed. The flap was then returned. Infection was controlled with antibiotics during the treatment. After achieving wound healing, no recurrence was observed during the 4 months' follow-up of the patient (Fig. 4).

3. Discussion

Necrotic soft tissue of the head after electrical burn is debrided as step by step, because necrosis is progressive. In a

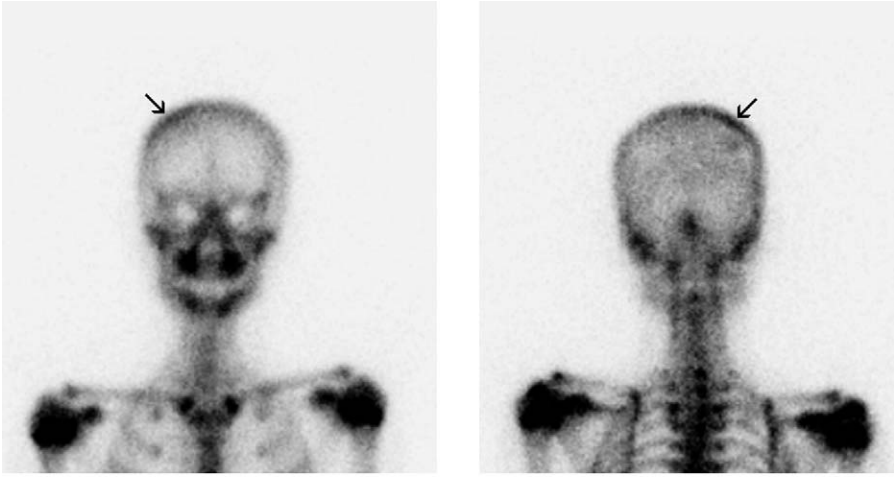

Fig. 3. Anterior–posterior images of late phase bone scintigraphy demonstrated minimal increased tracer uptake on the posterior portion of right parietal bone.

result of wound care, granulation tissue grows so that wound can be repaired with using skin graft or flaps. Cranial bone necrosis due to electrical injury is managed with either craniectomy of burned skull or protection of it. In initial treatment, preservation of the skull in place is recommended for bone regeneration, since it is expected that burned skull acts as if a scaffold of substitution [4–6]. This approach has some disadvantages, such as infection and sequestration. It has been shown that well vascularized flaps including free or pedicled ones minimize them. As the main advantage is avoiding of cranial bone defect, protection of burned skull with a flap is prefered more than craniectomy, especially in early stage [4,7,8].

In this case, we used a scalp flap having been prepared on frontal region for covering of burned skull, after necrotic soft tissue excision in early stage. Donor site was closed with skin graft. Healing was completed. But, 3 years later infection and sequestration was observed. In the treatment of burned calvarium, infection and sequestration have been well described in the literature [4–6]. They may be occur, even if well vascularized flaps lie over calvarial bone structure. Chronically infected cases and some cases, which were treated with repeated resection of necrotic bone have been reported [3,5,9]. But, a long time after healing, sequestration have not been reported previously.

In the evaluation of this case, regeneration of burned skull may take a long period in which sequestration may be occurred. So all of electrical burn patients with calvarial involvement must be closely followed with regard to regeneration of bone and a possible sequestration. Although resection of the burned skull and later replacement with alloplastic material or otolog bone are curative, we think that it must not be chosen at initial management.

References

[1] Hartford CE. Preservation of devitalized calvarium following high-voltage electrical injury: case reports. J Trauma 1989;29(3):391–4.
[2] Norkus T, Klebanovas J, Viksraitis S, Astrauskas T, Gelunas J, Rimkus R, et al. Deep electrical burns of the calvarium: early or delayed reconstruction? Burns 1998;24(6):569–72.
[3] Benito-Ruiz J, Baena-Montilla P, Navarro-Monzonis A, Bonanad E, Cavadas P. Severe electric burn of the skull. Burns 1994;20(6):553–6.
[4] Bizhko IP, Slesarenko SV. Operative treatment of deep burns of the scalp and skull. Burns 1992;18(3):220–3.
[5] Rockwell WB, Bodily KD. Fate of free muscle transfer covering chronically infected burned skull. J Burn Care Rehabil 2001;22(4): 288–91.
[6] Wright HR, Drake DB, Gear AJ, Wheeler JC, Edlich RF. Industrial high-voltage electrical burn of the skull, a preventable injury. J Emerg Med 1997;15(3):345–9.
[7] Celikoz B, Isik S, Turegun M, Selmanpakoglu N. An unusual case of lightning strike: full-thickness burns of the cranial bones. Burns 1996; 22(5):417–9.
[8] Shen Z. Reconstruction of refractory defect of scalp and skull using microsurgical free flap transfer. Microsurgery 1994;15(9):633–8.
[9] Zhonghua Z, Xing SS. Treatment of extensive deep burn of scalp with full-thickness necrosis of calvarial bone. Wai Ke Za Zhi 1995;11(1): 10–2.